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

JUN 1 2015

MEMORANDUM FOR: Commander G. Mark Miller, NOAA
Commanding Officer, NOAA Ship *Henry B. Bigelow*

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

SUBJECT: Project Instruction for HB-15-03
AMAPPS – Cetacean and Turtle Survey

Attached is the final Project Instruction for HB-15-03, Cetacean and Turtle Survey, which is scheduled aboard NOAA Ship *Henry B. Bigelow* during the period of 07 June to 02 July, 2015. Of the 23 DAS scheduled for this project, 23 days are funded by 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.

Attachment

cc:
William A. Karp
Nathan Keith

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Fisheries Science Center
166 Water Street
Woods Hole, MA 02543-1026

Project Instructions

Date Submitted:	May 22, 2015
Platform:	NOAA Ship *Henry B. Bigelow*
Project Number:	HB-15-03
Project Title:	AMAPPS – Cetacean and Turtle Survey
Project Dates:	June 7, 2015 to July 2, 2015

Approved by: Russell W. Brown for Dated: 5/26/2015
William A. Karp, Ph.D.
Science and Research Director
Northeast Fisheries Science Center

Approved by: Anne K. Lynch CAPT NOAA Dated: 6/1/2015
Captain Anne K. Lynch, NOAA
Commanding Officer
Marine Operations Center –Atlantic

I. Overview

A. Brief Summary and Project Period

B. Days at Sea (DAS)

Of the 23 DAS scheduled for this project, 0 DAS are funded by an OMAO allocation, 23 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.

C. Operating Area (include optional map/figure showing op area)

The survey will generally be conducted in the Georges Bank region, between 39°N and 42°N latitude and between 70°W and 65°W (Figure 1).

Leg 1: Depending on the distribution of cetaceans, as observed through aerial and prior shipboard survey effort, Leg 1 will either focus on the northern flank of Georges Bank or Gulf of Maine to target sei whales, or the southern flank of Georges Bank to target beaked whales (Figures 1a,2).

Leg 2: We plan to do transects along the southern flank of Georges Bank, starting at roughly 40°N & 69°W, then move northeast by zig-zagging across the shelf break, from approximately 200m to 1500 m depth. Ideally will transit out of US EEZ, across Northeast Channel to work the shelf break of Browns Bank and the Scotian Shelf. Depending on the distribution of turtles, we may request to go into Canadian territorial waters. In contrast to line transects used for density estimation, we will set and adjust our lines daily to optimize our searching ability in any given wind, wave, sun scenario.

D. Summary of Objectives

Leg 1 will focus on either sei whales or beaked whales, depending on the distribution of animals. The main objectives are: 1) Deploy the small boat to collect identification photographs and biopsy samples of as many individuals as possible, and possibly deploy tags; 2) Collect passive acoustic data via sonobuoys, dipping hydrophones and towed array; 3) Develop a better understanding of habitat use and site fidelity for abundance and monitoring of critical areas; 4) Determine the distribution and relative abundance of plankton and prey species.

Leg 2 will primarily focus on sea turtle species, with the following objectives: 1) Use big eyes, binoculars and Puma fixed wing unmanned aerial systems to locate sea turtles, 2) Capture, bring on board, sample, and satellite tag hard-shelled sea turtles (primarily loggerheads), 3) Suction cup tag leatherback sea turtles, 4) Use shipboard equipment (EK60) and deploy instruments to assess gelatinous zooplankton.

E. Participating Institutions

Northeast Fisheries Science Center, Woods Hole, Protected Species Branch
Northeast Fisheries Science Center, Woods Hole, Oceanography Branch
Northeast Fisheries Science Center, Woods Hole, Ecosystem Survey Branch
Integrated Statistics, Inc., Woods Hole, MA

Coonamessett Farm Foundation
Fisheries and Oceans Canada
NOAA Unmanned Aircraft Systems Program
University of Massachusetts Dartmouth

F. Personnel/Science Party: In the following table are the personnel that will participate in the survey. The shipboard Foreign National Sponsor for Leg 1 will be Pete Duley, and for Leg 2 will be Dr. Heather Haas.

PLEASE NOTE: **Two Bigelow survey techs are requested to assist with oceanographic and prey sampling needs during Leg 1.**

LEG 1.

	Name (Last, First)	**Title**	**Date* Aboard**	**Date Disem-bark**	**Gender**	**Affili-ation[1,2]**	**Nation -ality**
1	Cholewiak, Danielle	Chief Scientist	7 June	19 June	F	IS, Inc[1]	US
2	Duley, Peter	Mammal Team/ co-chief Scientist	7 June	19 June	M	NEFSC[1]	US
3	Barkaszi, Mary Jo	Mammal Team	6 June	20 June	F	CSA, Inc.	US
4	Davis, Genevieve	Mammal/ Acoustic team	7 June	19 June	F	IS, Inc[1]	US
5	Force, Mike	Bird Team	7 June	19 June	M	IS, Inc	Canada
6	Gurnee, Julianne	Mammal Team	7 June	19 June	F	IS, Inc[1]	US
7	Jech, Michael	Oceanography	7 June	19 June	M	NEFSC[1]	US
8	Lyssikatos, Marjorie	Mammal Team	7 June	19 June	F	NEFSC[1]	US
9	Moors-Murphy, Hilary	Mammal Team	7 June	19 June	F	DFO	Canada
10	Orphanides, Christopher	Mammal Team	7 June	19 June	M	NEFSC[1]	US
11	Scala, Lorenzo	Mammal Team	7June	19 June	M	Seiche, Inc.	UK
12	Savage, Tom	Teacher-at-Sea	6 June	20 June	M		US
13	Tremblay, Christopher	Mammal/ Acoustic team	7 June	19 June	M	IS, Inc[1]	US
14	Warden, Melissa	Mammal Team	7 June	19 June	F	IS, Inc[1]	US
15	Yin, Suzanne	Mammal Team	7 June	19 June	F	IS, Inc	US

LEG 2:

	Name (Last, First)	Title	Date* Aboard	Date Disem-bark	Gender	Affili-ation[1,2]	Nation-ality
1	Haas, Heather	Chief Scientist	22 June	2 July	Female	NEFSC[1]	USA
2	Broughton, Elisabeth	Oceanographer	23 June	2 July	Female	NOAA[1]	USA
3	Haver, Samara	Acoustics / turtle	23 June	2 July	Female	IS, Inc[1]	USA
4	Izzi, Annamaria	Acoustics lead	23 June	2 July	Female	IS, Inc[1]	USA
5	Jacobs, Todd	Puma lead	22 June	2 July	Male	NOAA[1]	USA
6	James, Mike	Turtle ecologist Lead Leatherbacks Lead Canadian effort	22 June	2 July	Male	DFO	Canada
7	Kellog, Loren	Small Boat Operator	22 June	2 July	Male	IS, Inc[1]	USA
8	Matzen, Eric	Lead small boat ops Lead search & pursue Small boat operator	23 June	2 July	Male	IS, Inc[1]	USA
9	Miller, Shea	Prey sampling , ROV	23 June	2 July	Male	CFF	USA
10	Milliken, Henry	Lead Didson Small boat operator	23 June	2 July	Male	NEFSC[1]	USA
11	Patel, Samir	Turtle ecologist Lead sample & tag	23 June	2 July	Male	CFF	USA
12	Hoffman, Paul	Puma Operations	?	2 July	Male	NOAA[1]	USA
13	Winton, Megan	Data coordinator	23 June	2 July	Female	UMASS	USA
14	Schneider, Kerryn	Puma Operations	?	2 July	Female	NOAA[1]	USA
15	TBD	Sightings and Effort	?	2 July	?	?	?

All Leg 2 scientific crew will embark on June 22 or June 23, depending on June 23 departure time, whether the ship allows scientific personnel to stay aboard on the 22nd, and personal schedules. All leg 2 scientific crew will disembark on July 2nd.

[1]Has a CAC card
* Additional people will be added.

NEFSC= Northeast Fisheries Science Center, Woods Hole, MA
IS, Inc= Integrated Statistics, Inc.
DFO = Department of Fisheries and Oceans
CFF=Coonamessett Farm Foundation
UMASS=University of Massachusetts Dartmouth
NOAA = NOAA Unmanned Aerial Systems team

G. Administrative

1. Points of Contacts**:**

Chief Scientist Leg 1: Dr. Danielle Cholewiak; NEFSC, 166 Water St., Woods Hole, MA 02543; 508-495-2010; danielle.cholewiak@noaa.gov

Chief Scientist Leg 2: Dr. Heather Haas; NEFSC, 166 Water St., Woods Hole, MA 02543; 508-495-2315; heather.haas@noaa.gov

Protected Species Branch Chief: Dr. Mike Simpkins, Branch Chief; NEFSC, 166 Water St., Woods Hole, MA 02543; 508-495-2358; michael.simpkins@noaa.gov

Vessel Operations Coordinator: Nathan J. Keith; NEFSC, 166 Water St, Woods Hole, MA 02543; 508-495-2224; Nathan.Keith@noaa.gov

Commanding Officer *Henry B. Bigelow* : CDR G. Mark Miller Ship Cell 774-487-7585: VOIP 301-713-7770: Iridium 808-684-1194; CO.Henry.Bigelow@noaa.gov

Ops Officer *Henry B. Bigelow*: LT Laura Gibson Ship Cell 774-487-7585: VOIP 301-713-7770: Iridium 808-684-1194;OPS.Henry.Bigelow@noaa.gov

2. Diplomatic Clearances

This project could involve Marine Scientific Research in waters under the jurisdiction of Canada. Diplomatic clearance has been requested by NEFSC.

Foreign National Michael James has been approved.

3. Licenses and Permits

This project will be conducted under the following permits:

Marine Mammal Protected Species Permit Number 17355 (U.S.);

Endangered Species Act Permit Number 16556 (U.S.);

Foreign Fishing Vessel License Number 000005 (Canada) {applied for};

Species at Risk Act permit DFO-MAR-2015-01 (Canada) issued by David Millar (Canada) on 24 March 2015 to Debra Palka.

Species at Risk Act permit 332697 (Canada) {applied for by Michael James}

II. Operations

The Chief Scientist is responsible for ensuring the scientific staff are trained in planned operations and are knowledgeable of project objectives and priorities. The Commanding Officer is responsible for ensuring all operations conform to the ship's accepted practices and procedures.

A. Project Itinerary:

The cruise will consist of two parts, with a port call between the parts.

B. Staging and Destaging: Newport, RI.

3-5 June	Load scientific gear. Gear transfer will also occur between the Gordon Gunther and the Bigelow in Newport on June 5th, including transfer of big-eyes and stands.
7 June	Depart Newport, RI, 10:00h
7-18 June	Conduct survey per Operational Plans
19 June	Return to Newport; disembark and unload scientific gear that are not needed for Leg 2.
22 June	Load scientific gear for Leg 2 and some personnel
23 June	Depart Newport, RI, 08:00h
23 June – July 2	Conduct survey per Operational Plans
2 July	Return to Newport, RI, disembark, unload scientific gear

C. Operations to be conducted:

LEG 1: If aggregations of sei whales are observed prior to the beginning of the survey, the vessel will transit to those areas and focus efforts on this species. If sei whales are not observed, the vessel will transit offshore Georges Bank and focus efforts on beaked whales. Primary cruise activities are described below and include: (1) Conduct visual and acoustic surveys to locate animals; (2) Collect biopsies and photographs of sei or beaked whales from a RHIB on all good weather days that whales are present. Possibly, apply dermal tags to sei whales from a RHIB on all good weather days that whales are present. (3) Collect passive acoustic recordings using a variety of recording platforms. (4) Collect prey field data from bongo, neuston net, and midwater trawls.

Cruise activities may change from hour-to-hour or day-to-day depending on the sea state, weather, availability of whales, and previous accomplishments. The Chief Scientist and Commanding Officer will discuss the upcoming day's anticipated activities and the conditions under which the day's science plans will change. For example, survey operations may be conducted during the first part of the day, but if the wind and seas calm down and whales have been encountered, the Chief Scientist may request to cease survey operations and deploy the RHIBs to conduct photo-identification, biopsy and tagging operations.

Visual Surveying: A visual line-transect survey will be conducted during daylight hours (approximately 0600-1800 local time) until the target species are encountered. Scientific personnel will form two visual

marine mammal-sea turtle sighting teams; one on the flying bridge and the other on the anti-roll tank platform. Both teams will use two 25x150 powered binoculars to detect animal groups. Observers on each team will rotate positions within a team every 30 minutes. Sightings and effort data will be entered by the scientists using a hand held data entry system. The data entry computers will be connected with the ship's SCS system to record latitude, longitude, depth and sea surface temperature into the scientist's data entry computers. Thus, power will be needed at the bridge station, on the flying bridge and on the bridge wings.

The visual teams, acoustic team, and bridge personnel will be in radio contact with each other, and data entered by the visual teams will be displayed for the acoustic team to see (who will be located in the dry lab) using the ship's intranet system.

Bridge officers are requested to give a couple minutes' notice before the ship will be starting and ending each transect line or if they need to make minor diversions from the track line to, for example, go around fishing boats.

Surveying will be conducted during good weather conditions (Beaufort sea state 4 and below) while traveling at about 10 knots as measured over the ground. Survey activity will be conducted along transects whose starting point and direction may be a modification of pre-determined track lines depending on daily weather conditions, satellite imagery, and sea conditions. Thus, the exact track lines to be covered during a day will be determined at the bridge meeting at 19:30 the night before. Additional tracklines may be added adaptively in areas where aggregations of target species (beaked whales) are encountered.

Infra-red camera surveying: Two observers will be dedicated to testing the efficacy of an infrared camera system that will likely be mounted at a big-eye station on the anti-roll tank (pending consultation with the ET). This camera system will require both power and a CAT6 cable connection to a computer located within the ship. This system will operate 24h/day. See Figure 3.

Small Boat Operations: cetacean photo-identification and biopsy: The Bigelow RHIB will be deployed on all fair weather days when target species are encountered upon permission of CO. The RHIB will focus on photo identification and biopsy sampling of sei whales or beaked whales. The RHIB will carry a coxswain, photographer, darter and data recorder. Biopsy sampling will be done with a crossbow which has a 150lbs draw weight. The bolts have a modified tip for extracting a skin and blubber sample. All samples will be processed once scientists are back aboard *Henry Bigelow*. Skin samples will be fixed in dimethylsulfoxide (DMSO) and blubber samples will be frozen. The NEFSC RHIB will work within a distance of *Henry Bigelow*, previously agreed upon by the chief scientist and the Commanding Officer. The biopsy effort will be conducted under ESA/MMPA permit #17355issued to NOAA NEFSC.

Passive Acoustic Data Collection: The passive acoustic team may be on-effort 24 hours, with observers rotating between watches. Passive acoustic data collection may include use of the towed hydrophone array, an individual dipping hydrophone, and sonobuoys. The acoustic team will be stationed inside the dry lab. Recordings of acoustic detections will be made onto several desktop computers, utilizing two ship's computers if possible. The acoustic team will require 3-4 GPS feeds from the ship. The main passive acoustic hydrophone array consists of a 400m cable with 8 hydrophone elements. The array should be mounted onto the starboard side net reel, and will be deployed off the stern with the assistance

of several members of the deck crew and the acoustic team. Steel beams were built by the ship to accommodate the array and should be installed on the net reel. A removable deck cable will connect the hydrophone tow cable to the computers in the lab. A second towed array will be brought on board as a back-up.

When deploying and recovering the array, the ship will be requested to slow to 2-3kts. While the array is in the water, the ship will be requested not to make turns greater than 60°, so as to minimize strain on the electrical wires inside the array. Therefore, maneuvers at the end of the tracklines or to follow animals will require a broad turn radius. In addition, when the ship is operating in waters less than 100m depth, maneuvering may be restricted while the array is in the water. In these situations, the visual team and the bridge should communicate with the acoustics team to determine whether the array should be retrieved before the ship breaks track.

Sonabouy deployment near aggregations of sei whales: Sonobuoys could be deployed and monitored near aggregations of large whales from the ship. Transmissions from the buoys would be relayed directly to the ship through VHF antenna mounted on the mast. In weather conditions where small boat operations are possible, sonobuoys would be deployed near aggregations of whales from the RHIB and photo ID and biopsy operations could continue. In both cases (ship deployment and deployment from the rhib) after a recording session is complete, sonobuoys will be retrieved if possible.

Seabird Surveying: One seabird observer will be responsible for recording sea bird data using standard single team strip transect procedures. This person will be located on the flying bridge, and will search for seabirds using the naked eye, and use hand held binoculars to confirm the species identification and group size. Seabird sightings and effort data will be entered by the scientists using a hand held, at sea, data entry system. This computer needs to be hooked up to the ship's intranet via a serial port.

Oceanographic Data Collection: Oceanographic operations will be conducted to collect hydrographic, plankton, and mesopelagic data during several types of operations: fixed-time, opportunistic, and night-time.

Continuous Operations
Position, date, time, ship's speed and course, water depth, surface temperature, salinity, and chlorophyll, weather characteristics, along with other variables will be obtained from the ship's sensors and logged into the Science Computer System (SCS), as is normally done for all surveys (e.g., see Table 1).

EK60 data will be collected continuously during the day in certain habitats, but may be used in passive mode when operating offshore.

Fixed-Time Operations
CTD and plankton sampling will be conducted at approximately 05:00h and 18:00h daily. Additional CTD/plankton sampling will take place opportunistically during daytime and nighttime operations when encountering groups of animals or after completing prey sampling via trawling. A 61cm Bongo plankton net, equipped with two333 μm mesh nets and a CTD mounted on the wire 1m above the nets will be used. The bongo will be towed in a double oblique profile using standard ECOMON protocols. The ship's speed through the water will be approximately 1.5 knots. Wire out speed will be a maximum of 50m/min and wire in speed will be a maximum of 20m/min, both of which depend on water depth. Tows will be a minimum of 5 minutes in duration. Tows will be to within 5 m of the bottom or 200 m if the bottom depth

exceeds 205 m. In addition, a neuston net may be used opportunistically to sample surface prey layers if aggregations of feeding animals are encountered.

Upon retrieval, samples will be rinsed from the nets using seawater and preserved in 5% formaldehyde and seawater. At the end of the cruise samples will be transported to the NMFS lab at Narragansett, RI for future processing. A Laser In-Situ Scattering Transmissometer (LISST) may be mounted alongside the CTD to collect particle size distribution and abundance data in the water column. XBT's may be deployed during the survey daytime periods, in between the CTD deployments, during at least some of the track lines, in particular those transiting across warm/cold core rings and the shelf break.

Night-Time Operations

Systematic and opportunistic night-time sampling of small prey layers will be conducted using a small mid-water trawl, and potentially an Isaacs-Kidd. Sampling will take place on at least 6 nights, with the goal of sampling three areas where target species are present and three where they are not. If passive acoustic operations are not being conducted using the towed array at night, prey sampling may take place every night. The Chief Scientist and Survey team will make decisions jointly as to which nights to sample prey.

The net may be towed targeting layers of zooplankton seen by the 120 kHz and 200 kHz sensors of the ship's EK60 echo sounder. A bongo/CTD cast as described in the fixed-time operations will be conducted in conjunction with the trawling operations to collect complimentary hydrographic and plankton data. Casts will be to a maximum of 200 m. On nights when prey sampling is being conducted, the passive acoustic array will not be deployed until prey sampling operations have finished.

One survey technician from the vessel will be required to assist oceanography staff during each watch.

Isaacs-Kidd mid-water trawl description

PLEASE NOTE: The IKMT may not be used on this survey; decision pending.

The 10-ft IKMT will be deployed to target depth-specific layers that were observed at the lower frequencies of the EK60 and so are consistent with mesopelagic fish and euphausiids. The 10-ft IKMT will be deployed off the stern using the ships stern A-frame and the oceanographic winch. The net will be fished to a maximum of 500 m. Acoustic net sensors may be attached to the net's tow bar to monitor the depth of the net in realtime. To maximize the sampling depth in relation to tow duration, the IKMT can be lowered below its target depth with the ship maintaining minimal speed without sacrificing steerage. The ship can increase speed to 2 – 3 kts (speed over the ground, SOG) when the net reaches maximum tow depth. As the IKMT rises through the water with the increased SOG, the IKMT trawl depth should be maintained in the target depth-specific layer by adjusting the amount of wire out. After the target layer is sampled, the net will be retrieved as fast as safely possible. Upon retrieval, samples will be rinsed from the nets using seawater and preserved in 5% formaldehyde and seawater. Samples will be transported to the NMFS lab at Narragansett, RI for future processing.

A 6-ft IKMT will be used if stern operations using the 10-ft IKMT are unsuccessful. The 6-ft IKMT will be deployed from the port side A-frame using the hydrographic winch. A CTD will be mounted on the top tow bar of the trawl to monitor real-time depth. Deployment, towing, retrieval, and sample preservation would be the same as described for the 10-ft IKMT with the exception that on the Bigelow

the wire angle becomes too steep, causing the wire to rub on the aft block. As a result, tow speed should be lowered.

Pelagic Trawl Description

A shallow-water mid-water trawl (Fig. 4) will be used as the primary mid-water trawl and a polytron mid-water rope trawl (Fig. 5) will be brought as a backup to collect biological samples and verify species composition of acoustic backscatter. The shallow-water mid-water trawl will use 1.8 m superkrub doors and 100-lb tom weights, whereas the polytron trawl will use 3.5-m superkrub and 600-lb tom weights. The trawls will be rigged similarly (Fig. 6). The midwater trawls are designed to be fished at speeds of about 4 knots. The midwater trawls will be deployed during survey operations, and targeted on acoustic backscatter to a maximum depth of about 500 m. The duration and depth of the trawls are not standardized, thus it is incumbent upon the Chief Scientist or Watch Chief to communicate with the bridge officers the haul duration and depths.

Simrad FS70 Trawl Monitoring and Third-wire Winch System

The trawl will be monitored using at least the FS70 and possibly the Scanmar systems. The Simrad FS70 trawl monitoring system is required for pelagic trawling. It is a third-wire device that provides real-time trawl performance information through its sonar images of the trawl opening. The Scanmar wireless trawl sensors provide point measurements of the trawl depth, horizontal and vertical opening, and door spread. The scientific party will record measurements at specified intervals during each deployment.

The Simrad FS70 will be deployed with every haul. Typically, the trawl will be fished obliquely. Officers will record the time, date, navigational, and station data in FSCS, while the scientists will record the catch data for each station deployment. Catch data will be recorded using the FSCS on-board entry system.

Trawl Catch Processing

Trawl catch will processed at a sorting table that will need to be located on the back deck. Fish will be sorted by species and weighed en masse. Fish length will be measured for up to 150 individuals of each species. The complete fish handling system will not be used. We will use only the "watch chief" station to process the fish. The bottom-trawl SCS event will be used and completed by the bridge officer during the trawl

Additional Operations:

The recovery of an acoustics mooring near Lydonia Canyon at location 40.29495N -67.7197W is planned for the HB15-02 ECOMON cruise (Table 2, Figure 8). If that mooring is not recovered during HB15-02, we will attempt to recover it during HB15-03. Instructions for the recovery were provided with the cruise instructions for HB15-02 and can be provided again if necessary.

Leg 2:

Searching for Sea Turtles

During daylight hours, we plan to search for sea turtles using big eyes and binoculars as well as using fixed wing Puma aircraft to survey areas near the ship transect. The requests from Leg 1 in regards to optimizing conditions for visual teams remain in effect for Leg2. Line-transects will be conducted from

approximately 0700-1830 local time with a half hour break at lunchtime. Surveying will be conducted during good weather conditions while traveling at less than 10 knots as measured over the ground. Survey activity will be conducted along transects whose starting point and direction will be a modified depending on daily weather conditions, satellite imagery, and sea conditions. A starting location and initial heading will be determined no later than 19:30 the previous night, but because we are attempting to maximize the probability of seeing a turtle (as opposed to sampling in an unbiased fashion) we expect to alter track lines multiple times throughout the day. Bridge officers are requested to give a couple minutes' notice before the ship will be starting and ending each transect line or if they need to make minor diversions from the track line to, for example, go around fishing boats.

Scientific personnel will search for sea turtles use sets of 25x150 powered binoculars positions on the flying bridge and the anti-roll tank platform. Sightings and effort data will be entered by the scientists using a hand held data entry system. The data entry computers may be connected with the ship's SCS system to record latitude, longitude, depth, and sea surface temperature into the scientist's data entry computers. Thus, power may be needed at the bridge station, on the flying bridge and on the bridge wings.

Personnel (likely 3) from the NOAA Unmanned Aircraft Systems (UAS) Program will conduct flights with Puma fixed wing UASs to search for sea turtles. The flights will occur during as many daylight hours as possible. The Puma can be deployed from the ship or from the small boat. After approximately 1.5 hours, the Puma will return to the vicinity of the ship or small boat and land in the water. The small boat will likely be the best way to retrieve the Puma to exchange batteries and redeploy. When the Puma spots a turtle, it will record the GPS lat/lon and share that information with the Chief Scientist and bridge personnel. The teams and bridge personnel will be in radio contact with each other. It may be necessary for ship's personnel to be at the radar at all times when the Puma is flying to look out for potential hazards. If so that radar observer will need a direct link of communication to the flight crew. If we are successful at placing tags on turtles, we may try to fly over the turtles with the Puma aircraft to obtain digital images.

Deploying small boat for collection of animals or inanimate material

We will depend very heavily on being able to deploy and use the small boat to collect animals and other inanimate material. Because the success of our mission depends on having a properly working small boat, we request the Bigelow have 2 small boats on board so that there is a spare. Because we typically capture turtles from a position at the bow of the small boat, we request that the bow be as free as possible from all equipment and obstructions. If obstructions cannot be removed, we would appreciate if they could be padded.

The small boat will be deployed on all fair weather days at the discretion of the CO, sometimes even before any animals are sighted. Depending on weather conditions the small boat may be deployed for most or all of the daylight hours. The primary mission of the small boat crew will be to capture loggerhead sea turtle using a dip net. When a sea turtle is sighted, the ship shall make way slowly towards the sea turtle so that visual observers can determine which direction the turtle is facing. A visual observer will then direct the small boat to come up behind the turtle and attempt to capture the turtle in a

dip net. When a turtle is caught the small boat, crew will pull the turtle into the small boat, and put in on its plastron. Both the small boat and the ship will then prepare to have the turtle brought aboard the ship.

Deploying small boat for other uses

Secondary goals of small boat crew include attaching suction cup tags to leatherback sea turtles, tracking animals using acoustic and/or VHF transmitters, retrieving the Puma, deploying the ROV, and collecting gelatinous zooplankton near the surface.

Onboard sampling of loggerhead sea turtles

When a loggerhead sea turtle is captured by the small boat, both the small boat and the ship begin to prepare to bring the turtle onboard the ship. The small boat crew will put the turtle into lifting gear so that it can be brought aboard the ship using the side sample station A-frame. The chief scientist will direct several scientific crew to begin sampling the turtle, and the ship can continue along a transect. Sampling takes approximately an hour, and multiple turtles may be aboard at the same time. Unless many turtles are onboard at the same time, some crew will continue to search for additional turtles to sample. When sampling is complete, the Chief Scientist will request the ship to stop so that the turtle can be returned to sea via the A-frame. Blood samples from the turtles will be processed, which begins by transferring the blood to vacutainers and centrifuging. Centrifuge will be provided by scientific party. Fully processed samples will be frozen.

Oceanography –Continuous Operations, Vertical Profiles, and ROV

Continuous Operations: Position, date, time, ship's speed and course, water depth, surface temperature, salinity, and chlorophyll, weather characteristics, along with other variables will be obtained from the ship's sensors and logged into the Science Computer System (SCS), as is normally done for all surveys. EK60 data will be collected continuously during the day, likely on every day. At times, the EK60 may be disabled for specific passive acoustic recording requirements.

Vertical Profiles: We plan to deploy instruments to collect information on the vertical profile of the water column.

A. Vertical Profiles – General Info
   1. Elisabeth Broughton - lead.
   2. Timing
      a) Fixed times: 6am, noon, 6pm, midnight (though these are potentially flexible if a slightly altered schedule would work better.)
      b) Possible extra deployments if we enter turtle or zooplankton hotspots.
   3. EK60 – We would like to run EK 60 for approximately 15 minutes or more before and after each vertical profile.
   4. Each vertical profile will consist of the following:
      a. Seabird 9/11 CTD with an additional PSB data logger attached. If feasible, would like the oxygen, chlorophyll, and PAR sensors on. (*Betsy will recommend an attachment method.)*
      b. Net cast (see below).
      c. Integrated CTD and Video sampling. See below. This will be an integrated deployment of a GoPro camera system and a Didson acoustic camera, on a realtime cable with the Seacat 19 CTD on a realtime conducting cable.

5. To accomplish our vertical profile sampling, we would like support from ship personnel. We request at least one survey technician for the sampling associated with vertical profiles and EK60, and we would like to discuss the logistics with the technician well before the cruise, so we can prepare properly. We also request the use of appropriate winches to deploy the instrumentation listed above. This may include the two hydro winches on the starboard 02 deck with the ship's standard terminations. In addition, we request deck personnel be available to deploy the oceanographic instruments (one to run the winch and two to help with deployment).

B. Net cast

1. Canadian Net System supplied by Betsy / Jon.
    a. HLH willing to purchase if requested by Betsy / Jon.
    b. Depth to match the CTD / imager casts (to 125m)
    c. Net volume calculated based on depth- vertical haul of net opening (area of net opening * depth)
2. Rinse as usual
3. Sample Large (> 5 cm) zooplankton
    a. Identify, enumerate, and measure (i.e., bell diameter for medusae, aboral-to-oral length for ctenophores, aboral to lobes for lobate ctenophores) all organisms. If unusually numerous with more than 25 organisms of one species, could subsample. If so, document subsample routine.
    b. Build a frozen archive of 10 animals per species. Put one animal per bag and use standard label with station, date, ID, and measurements.
    c. Discard large organisms not needed for the frozen archive.
4. Sample small (< 5 cm) zooplankton
    a. Betsy will retain some subset of samples for Oceanography Branch.
    b. Randomly divide sample into <1L subsample and "extra"
        1) Put subsample into a 1L (USPlastics Item #70264 jar and #66215 lids) jar and identify, enumerate, and measure all samples > 2cm and identify to lowest taxa possible and enumerate all animals < 2 cm.
        2) Before discarding the "extra," build a frozen archive of 10 samples (each with 10 animals in it) per species. Put 10 animals per bag and use standard label with station, date, and ID.
5. Preserve in Acid Lugol's (an antiseptic containing potassium iodide)
    a. For larval ctenophores/jellyfish ephyra use a 5% solution – 50 mL to the 1 L sample.
    b. For ctenophore eggs, use a 10 % solution.
6. Post-cruise transport: ship samples to:
    Mike Ford
    Marine Ecology Lab (Breitburg Lab)
    Smithsonian Environmental Research Center (SERC)
    647 Contees Wharf Rd
    Edgewater, MD 21037
    Contact Phone: 240.247.7190

C. Video Sampling

1. Betsy will help get imaging components bundled together on one cage on the live Seacat 19 CTD wire.
    a. VPR for smallest plankton
    b. JellyCam (depth rated to about 800m)
        1) Shea will download, trouble-shoot, maintain JellyCam in between deployments.

2) Use a frame in the image (or other approach) to allow some estimate of volume sampled if analyzed images are spread out in time.

b. Didson (depth rated to 152 m), for the largest macrozooplankton

1) Under Henry's direction, Shea will download, trouble-shoot, maintain Didson in between deployments.

2) The Didson will be operating in autonomous mode and attached to a battery pack.

2. Deployment speed and depth
   a. Try deployments with ship adrift (with no way on). After first cast, look at image quality and sampled volume. If volume too small, try with ship going 1-2 knots. Re-examine video quality. Find sweet spot.
   b. Very slow descent, perhaps on the order of 1 m / 10 sec (6m/minute), which would take about 20 m to drop (without stops).
   b. Depth levels for stops: 10, 20, 40, 60, 80, 100, 125 m
   c. Stop length is 2 minutes (so 7*2=14 minutes)
   d. Moderate ascent. After first cast look at image quality, decide whether to
3. Before leaving Bigelow all JellyCam and Didson data will be downloaded onto NEFSC harddrive.
4. We can use Observer EX for integration data streams (time, CTD, Didson, Jellycam)
5. Mike For will lead the analysis.

Remotely Operated Vehicle: In addition to vertical profiles, we may also want to deploy a ROV is the Deep Trekker DTG2. This ROV can be used to hold various oceanographic instruments, including our GoPro imager or an image of a sea turtle which can be used to assess the ability of the Puma to identify sea turtles. The ROV could be deployed from the ship or small boat. The ROV is tethered but will have its own battery, so we are not requesting the small boats to have power available. The ROV will not be deployed routinely. Rather we will only deploy it opportunistically, at the discretion of the chief scientist and CO.

Passive Acoustic Data Collection: The passive acoustic team will operate primarily at night, but may be on effort 24h using the towed hydrophone array. The acoustic team will be stationed inside the dry lab. Recordings of acoustic detections will be made onto several desktop computers, utilizing two ship's computers if possible. Setup will be the same as for Leg 1. Tracklines to be covered each night will be determined at the bridge meeting based on current location of ship at the end of each survey day.

When deploying and recovering the array, the ship will be requested to slow to 2-3kts. While the array is in the water, the ship will be requested not to make turns greater than 60°, so as to minimize strain on the electrical wires inside the array. Therefore, maneuvers at the end of the tracklines or to follow animals will require a broad turn radius. In addition, when the ship is operating in waters less than 100m depth, maneuvering may be restricted while the array is in the water. In these situations, the visual team and the bridge should communicate with the acoustics team to determine whether the array should be retrieved before the ship breaks track.

Acoustic Mooring Deployment: An acoustic mooring will be deployed near Heezen Canyon on Georges Bank during Leg 2 (Table 2, Figure 8). Eric Matzen will be in charge of coordinating the deployment. See Figures 7 and Appendix III for details regarding the mooring design and deployment protocols.

Other operations: At the discretion of the Chief Scientist, survey lines may be temporarily broken to conduct other operations, such as, but not limited to, additional CTD casts or plankton tows, photographing species of interest, testing of the acoustic gear and additional distance training.

Vessel Sensor and Logging Requirements: The ship's Scientific Computer System (SCS) will be required for logging data on a routine basis and data requirements will be coordinated with the Commanding Officer and Electronics Technician at the beginning of the cruise. It is requested that the sensors be operational, calibrated and that logging capabilities be enabled.

In addition, a subset of these data will be routinely collected and recorded at least once a second during survey operations and will be logged into an SCS event file that will be used by the cetacean scientists on a daily basis. At the end of the visual survey day (after 18:00) the data in the SCS event file will be made available to the Chief Scientist.

CTD Support: CTD operators will be trained and certified by the Center's Oceanography Branch. CTD operator training requires two hours and must be completed prior to the beginning of the cruise unless a trainer is included in the scientific complement. In the event that CTD difficulties are encountered during the cruise, shore based support is available. Requests for support should be forwarded to NEFSC.CTDHelp@noaa.gov which is monitored daily. Once contact has been established via email, to assure continuous support, the CTD help address above should be copied on ***all*** email communications.

The approach to Protected Species and biopsy sampling are permitted under the US ESA/MMPA permit number 775-1874-02 and the Canadian SARA permit license number 330996. The Chief Scientist will have the original licenses in his/her possession and will also provide a copy of these licenses to the Commanding Officer prior to the survey.

Special Consideration:

During daylight hours when the visual line-transect surveys are being conducted, we require that the jack-staff be lowered so that the observers have a clear view of the waters in front of the ship.

The big eye stands for both the upper bridge and anti-roll tank platforms should be mounted to the deck and inspected to ensure they work properly. Also, a tarp or canvas should be mounted on the flying bridge to shade the observers.

We request assistance from the ship's ET and survey techs so that we can load ship's SCS data directly into the data collection computers on the two visual sighting platforms and also into the acoustic team's computer.

The steel pipes should be mounted on the reel to accommodate the towed array. To deploy the passive acoustic array we require assistance from the ship's personnel. The array is not to be deployed without the presence of at least one of the passive acoustic team members.

If possible the acoustic team would like the use of two of the ship's computers, like we did in previous years.

To deploy the CTD, bongo, VPR, and IKMT we request the use of the two hydro winches on the starboard 02 deck with the ship's standard terminations and two deck personnel (one to run the winch and

one to help with deployment). At night, in addition to the two deck personnel we need one of the ship's survey techs.

D. **Dive Plan**

All dives are to be conducted in accordance with the requirements and regulations of the NOAA Diving Program (http://www.ndc.noaa.gov/dr.html) and require the approval of the ship's Commanding Officer.

Dives are not planned for this project.

E. Applicable Restrictions

Conditions which preclude normal operations:

In most cases, the marine mammal visual observation teams will survey when the Beaufort sea state is under six (6). The seabird visual observation team, passive acoustic team, and oceanography team may continue surveying even when the Beaufort sea state is 6 and above at the discretion of Commanding Officer and deck lead.

The oceanographic sampling during the day or night may have to be altered if there are fixed gear and multiple vessels in the region of the sampling station.

III. Equipment

Equipment and Supply List: The following sampling and scientific equipment will be placed aboard NOAA Ship *Henry B. Bigelow* prior to departure:

	ITEM	QUANTITY	SUPPLIED BY
1	Passive acoustic data collection equipment	ample	
2	Portable computers	3	
3	Pelorus for measuring sighting angles (mounted at each sighting station)	4	
4	Hand held binoculars	4	
5	25x150 binoculars and yokes	4	
6	Data logs, computerized and paper	ample	
7	Photographic and biopsy equipment	ample	
8	Desks and chairs for sighting stations	3	
9	Bongo equipment and supplies	ample	NMFS, NEFSC, Woods Hole, MA
10	Passive acoustic arrays	2	
11	CTDs	2	
12	Bongo plankton net equipment	2	
13	Video Plankton Recorder	1	
14	10-ft Isaacs-Kidd mid-water trawl	1	
15	6-ft Isaacs-Kidd mid-water trawl	1	
16	Neuston net	1	
17	20% Dimethyl sulfoxide (DMSO, dispensed in capped vials)	1.1 liters	
18	Ethanol, Formalin (see Inventory below)	5 gallons	
19	XBT's	ample	
20	HARP acoustic mooring (650 lbs, see appendix)		
21	Scientific Computer System		
22	Flow-through and meteorology sensors		
23	Deck equipment to deploy CTD & bongo		
24	Deck equipment to deploy VPR, IKMT		
25	Stands to support big eye binoculars	5	
26	Steel pipes for acoustic array		
27	Simard EK60 Scientific Sounder	1	
28	ME70	1	NOAA Ship *Henry Bigelow*
29	Hydro winches on starboard 02 deck to deploy the CTD, bongo and VPR	2	
30	Oceanographic winch to deploy 10-ft IKMT off the stern	1	
31	XBT launcher and software	1	
32	Movable platforms at the bow to allow a photographer or biopsier to see over the ship's bow	2	
33	FS70 trawl monitor	2	
34	Constant tension winch	1	

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

Leg 1:

Common Name of Material	Qty	Notes	Trained Individual	Spill control
Ethanol (97%)	1 gal	Flammability	Peter Duley	
Formaldehyde solution (2%)	1 x 5 gal	Alkalinity	Peter Duley	F
Formaldehyde solution (37%)	2 x 20 L	Alkalinity, Stored in ship chem. lkr	Peter Duley	F
Dimethyl sulfoxide (DMSO)	30 x 2oz.	Tubes will be kept sealed in a box under the fume hood	Peter Duley	F
Chlorox bleach	1 gal	Stored under the fume hood	Peter Duley	A

Leg 2:

Common Name of Material	Qty	Notes	Trained Individual	Spill control
Ethanol (97%)	500ml	Flammability, stored in ship's chemical lkr	Elisabeth Broughton,	
Formaldehyde solution (2%)	1 x 5 gal	Alkalinity, stored in fume hood	Elisabeth Broughton,	F
Formaldehyde solution (37%)	2 x 20 L	Alkalinity, Stored in ship chem. lkr	Elisabeth Broughton,	F
Acid Lugols Solution (5%)	5L	Acid, stored and used in fume hood	Elisabeth Broughton	A
Acetone	8 x 32 oz	Flammability, stored in ship's chemical lkr	Elisabeth Broughton	
Isopropyl Alcohol	4 x 16 oz	Flammability, stored in ship's chemical lkr	Elisabeth Broughton	
Sika Anchofix1	45 x 10.1 oz	Strong adhesive	Elisabeth Broughton	

Common Name of Material	Qty	Notes	Trained Individual	Spill control
Puma LiPo Batteries		Requested info from Puma team	Todd Jacobs	
Sodium Heparin	95 USP units * 60	Stored in 60 sealed 6ml vacutainers	Heather Haas	

C.Chemical safety and spill response procedures

A: ACID

- Wear appropriate protective equipment and clothing during clean-up. Keep upwind. Keep out of low areas.
- Ventilate closed spaces before entering them.
- Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible.
- **Large Spills**: Dike far ahead of spill for later disposal. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal.
- **Small Spills**: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.
- Never return spills in original containers for re-use.
- Neutralize spill area and washings with soda ash or lime. Collect in a non-combustible container for prompt disposal.
- J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

M: Mercury

- Spills: Pick up and place in a suitable container for reclamation or disposal in a method that does not generate dust. Sprinkle area with sulfur or calcium polysulfide to suppress mercury. Use Mercury Spill Kit if need be.

F: Formalin/Formaldehyde

- Ventilate area of leak or spill. Remove all sources of ignition.
- Wear appropriate personal protective equipment.
- Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible.
- Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with a formaldehyde neutralizer (sodium metabisulfate or Spill-X-FP) and follow the manufacturer's instructions for disposal.
- Do not use combustible materials, such as saw dust.

Inventory of Spill Kit supplies

Product Name	Amount	Chemicals it is useful against	Amount it can clean up
Spill-X-FP	1.68 kg	Formaldehyde	10 gallons
Mercury Tamer	250 gm	Mercuric Chloride	2 Liters

D. Radioactive Materials

No Radioactive Isotopes are planned for this project.

E. Inventory (itemized) of Radioactive Materials

No Radioactive Isotopes are planned for this project.

V. Additional Projects

A. Supplementary ("Piggyback") Projects

No Supplementary Projects are planned.

B. NOAA Fleet Ancillary Projects

No NOAA Fleet Ancillary Projects are planned.

VI. Disposition of Data and Reports

A. Data Classifications: *Under Development*

a. OMAO Data

Disposition of data gathered aboard NOAA ships will conform to NAO 216-101 *Ocean Data Acquisitions* and NAO 212-15 *Management of Environmental Data and Information.* To guide the implementation of these NAOs, NOAA's Environmental Data Management Committee (EDMC) provides the *NOAA Data Documentation Procedural Directive* (data documentation) and *NOAA Data Management Planning Procedural Directive* (preparation of Data Management Plans). OMAO is developing procedures and allocating resources to manage OMAO data and Programs are encouraged to do the same for their Project data.

b. Program Data

Program Data - At the end of each leg of the cruise the ship will provide the chief scientist with a copy of data from the EK60 transducer, the ADCP unit and the SCS system. A copy of the SCS data should also be provided to DMS personnel in Woods Hole.

Protected Resources:

North Atlantic right whale protection: The vessel is requested to adhere to right whale protection regulations. Information on Seasonal Management Area (SMA) and Dynamic Management Area (DMA) regulations and information for protecting right whales from collisions with vessels are provided through the NOAA Protected Resources website (http://www.nmfs.noaa.gov/pr/shipstrike/), Right Whale Sighting Advisory System (SAS)

website (http://www.nefsc.noaa.gov/psb/surveys/), the U.S. Coast Guard's "Notices To Mariners" and NOAA weather radio.

Mariners are urged to use caution and proceed at safe speeds in areas where right whales occur. U.S. Law (50 CFR 224.105) prohibits operating vessels 65 feet (19.8 meters) or greater in excess of 10 knots in Seasonal Management Areas (SMAs) along the U.S. east coast. Mariners are also requested to route around voluntary speed restriction zones, Dynamic Management Areas (DMAs) or transit through them at 10 knots or less. Approaching within 500 yards of right whales is prohibited, unless the Chief Scientist is in possession of an ESA/MMPA permit allowing such approaches.

Whale sightings: Sightings of right whales, or dead or entangled whales of any species, are extremely valuable and reports are urgently requested. Please report all right whale sightings north of the Virginia-North Carolina border to 866-755-6622; right whale sightings south of that border should be reported to 877-WHALE HELP. Right whale sightings in any location may be reported to the U.S. Coast Guard via VHF channel 16. Protocols for reporting sightings are described in the Guide to Reporting Whale Sightings placard. The placard is available online (http://www.nefsc.noaa.gov/psb/surveys/documents/20120919_Report_a_Right_Whale.pdf) and laminated copies will be provided by the Protected Species Branch upon request. It is requested that this placard be kept on the bridge for quick reference and to facilitate rapid reporting (via satellite phone if necessary). Opportunistic sightings of other marine mammal species that are live and well may be reported using the Platforms of Opportunity (POP) forms and protocols. To information regarding the WhaleALERT application http://stellwagen.noaa.gov/protect/whalealert.html. For information on reporting a dead whale http://www.nefsc.noaa.gov/psb/surveys/documents/20120919_Report_a_Dead_Whale.pdf.

Endangered Species Act and Marine Mammal Protection Act reporting requirements: This reporting is required and is in addition to the reports in the above two sections. If the ship has an interaction with a sturgeon, Atlantic salmon, whale, dolphin, porpoise, marine turtle, or seal (e.g., collision with a whale or bycatch of a sea turtle), the NMFS Greater Atlantic Regional Fisheries Office must be notified within 24 hours of the interaction. All e-mail correspondences should be made to the following e-mail address: incidental.take@noaa.gov. Please indicate in the subject line which protected species was encountered. If the take involves a marine mammal, or sea turtle that is alive, injured and in need of assistance or monitoring, please call the NOAA Northeast Region marine animal hotline at: 866-755-6622. The chief scientist will be notified before reports are made.

If the vessel's company notices an animal that is entangled, injured, in distress, or dead, outside the scope of scientific operations, they should contact the Northeast Regional

Office's 24-hour hotline at 866-755-6622 to report the incident and receive further instructions.

Marine turtle, Sturgeon and Atlantic salmon bycatch: All marine turtles, sturgeon and Atlantic salmon taken incidental to fishing activities must be handled, resuscitated (turtles only) and documented according to established procedures in the Endangered Species Act Section 7 Consultation Biological Opinion issued on November 30, 2012. All marine turtles taken incidental to fishing activities must 1) behandled and resuscitated according to established procedures, 2) be clearly photographed(multiple views if possible, including at least one photograph of the head scutes), 3) beidentified to the species level, 4) have width and length (carapace notch to notch, and notchto tip) measured in centimeters, 5) have supporting data recorded including GPS or Lorancoordinates recorded describing the location of the interaction; time of interaction; date ofinteraction; condition of the animal upon retrieval (alive uninjured, alive injured, fresh dead,decomposed, comatose or unresponsive); the condition of the animal upon return to thewater; GPS or Loran coordinates of the location at which it was released; and a description of the care or handling provided. Live animals shall then be returned to the sea. Dead turtles shall, if feasible, be frozen and returned to the Woods Hole Laboratory.

Marine mammal bycatch: All marine mammals taken incidental to fishing activities must 1) be completely disentangle from gear 2) take photographs, document any injuries, and returned to the sea immediately 3) for dead specimens, be clearly photographed (multiple views if possible, including at least one photograph of the head, 4) be identified to the species level, 5) weigh(kg) and measure(cm)if possible (snout to tail (seals), beak to the notch in the fluke/tail (whales, dolphins and porpoises)) 6) attached a carcass tag 7)have supporting data recorded including GPS or Loran coordinates recorded describing the location of the interaction; time of interaction; date of interaction; condition of the animal upon retrieval (alive uninjured, alive injured, fresh dead, decomposed, comatose or unresponsive.

Stellwagen Bank: Any artifacts brought aboard the vessel due to fishing in the Stellwagen Bank National Marine Sanctuary must be immediately returned, as near as possible, to the location of interception. An artifact is defined as anything of man-made origin with the exception of modern fishing gear. Stations located within Stellwagen Bank will be identified prior to the cruise and reported to the chief scientist.

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 officers, applicable crew, the Chief Scientist, and members of the scientific party and is normally arranged by the Operations Officer and Chief Scientist.

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.

The Customer Satisfaction Survey is one of the primary methods OMAO and Marine Operations (MO) utilize to improve ship customer service. Information submitted through the form is automatically input into a spreadsheet accessible to OMAO and MO management for use in preparing quarterly briefings. Marine Operations Centers (MOC) address concerns and praise with the applicable ship. Following the quarterly briefings the data are briefed to the Deputy Director of OMAO.

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 Scientist. The Chief Scientist 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 Scientist is 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 Scientist is 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 Scientist will ensure that all non NOAA or non Federal scientists aboard also have proper orders. It is the responsibility of the Chief Scientist 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 Scientist must provide an electronic listing of emergency contacts to the Executive Officer for all members of the scientific party, with the following information: contact 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, safetyshoes (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-toedshoes/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.

Certified Boat Operators: Under NAO217-103 MANAGEMENT OF NOAA SMALL BOATS, certified small boat operators must have current CPR and First Aid certification as well as a Small Boat Safety course and Fast Rescue Boat certification which includes classroom and on water components. Photocopies of the small boat operators required documentation must be provided to the Master of the vessel prior to any cruise which conducts small boat operations. Boat Operators included on leg 1 of this cruise are: Cholewiak, Duley, Yin. Boat Operators included on leg 2 are: Matzen, Milliken, Kellog. Coxswains will not work beyond the 12 hours per day as permitted under the STCW guidelines. Initial boat operations will be conducted with Henry Bigelow crew until such time when CO may grant authorization to operate independently.

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 e-mail 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 at least 30 days in advance.

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.

Full compliance with NAO 207-12 is required.

Responsibilities of the Chief Scientist:

1. Provide the Commanding Officer with the e-mail generated by the Servicing Security Office granting approval for the foreign national guest's visit. (For NMFS-sponsored guests, this e-mail will be transmitted by FNRS.)This e-mail 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 e-mail 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 :

1. Figures
2. Tables
3. Details regarding acoustic mooring deployment

APPENDIX I: FIGURES

Figure 1a. Planned area of operations for HB 15-03 Leg 1.Depending on cetacean distribution at the time, survey effort may focus either in the Gulf of Maine / northwestern side of Georges Bank, or the shelf break and offshore side of Georges Bank. Initial tracklines will be determined prior to survey departure.

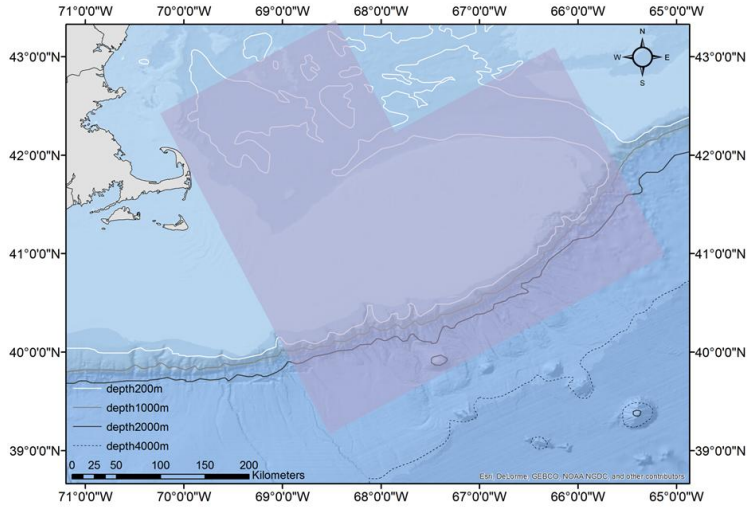


Figure 1b. Planned area of operations for HB 15-03, Leg 2. The area in the red ellipse represents the area where we are hoping to encounter turtles. If there are turtles outside of this area but within the green shaded area, we may seek to travel within the green shaded area.

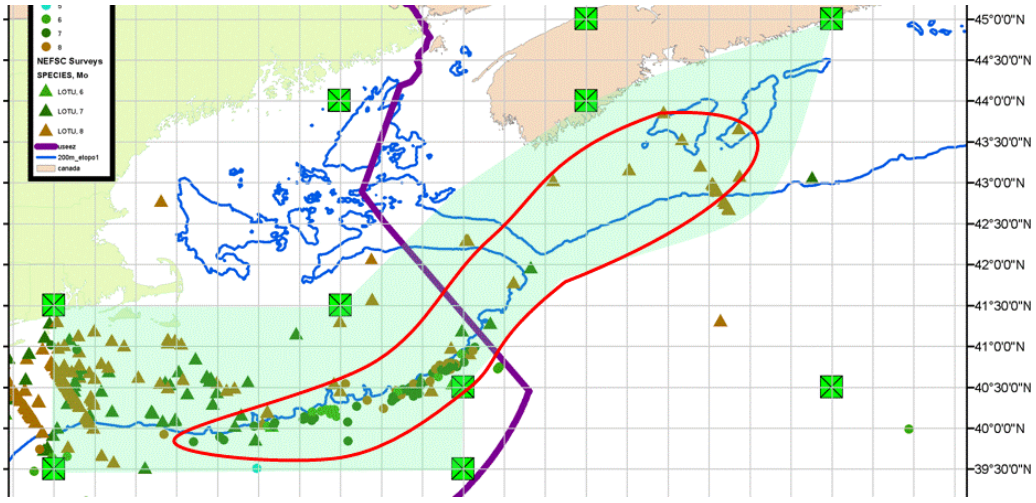


Figure 2. Sample offshore survey lines that may be used for Leg 1

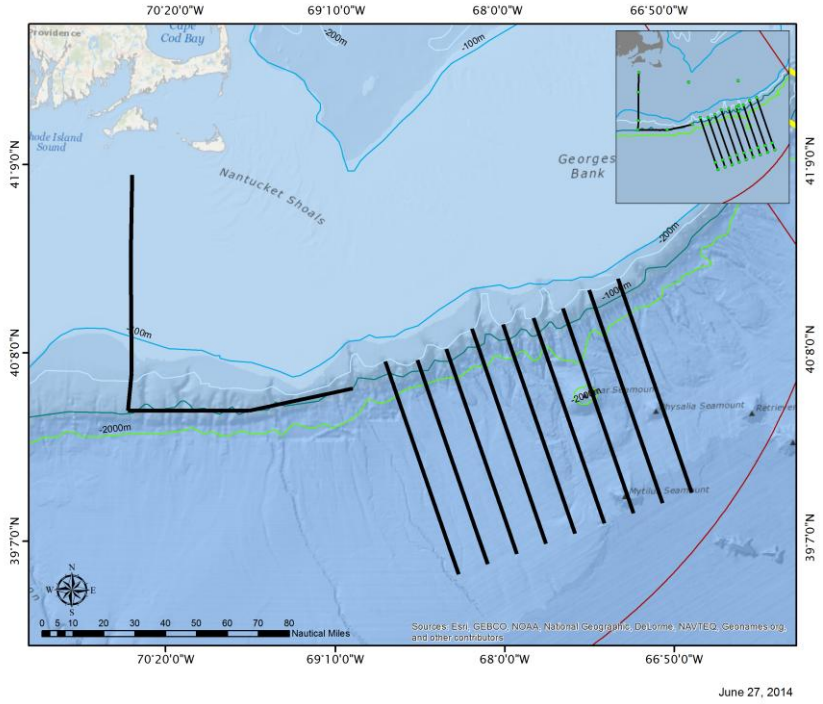
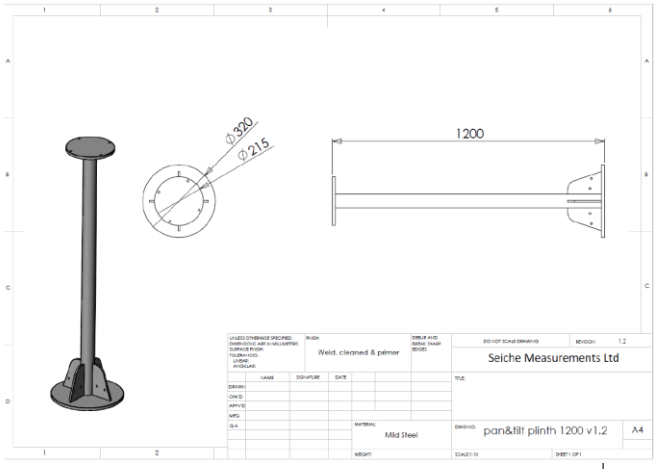
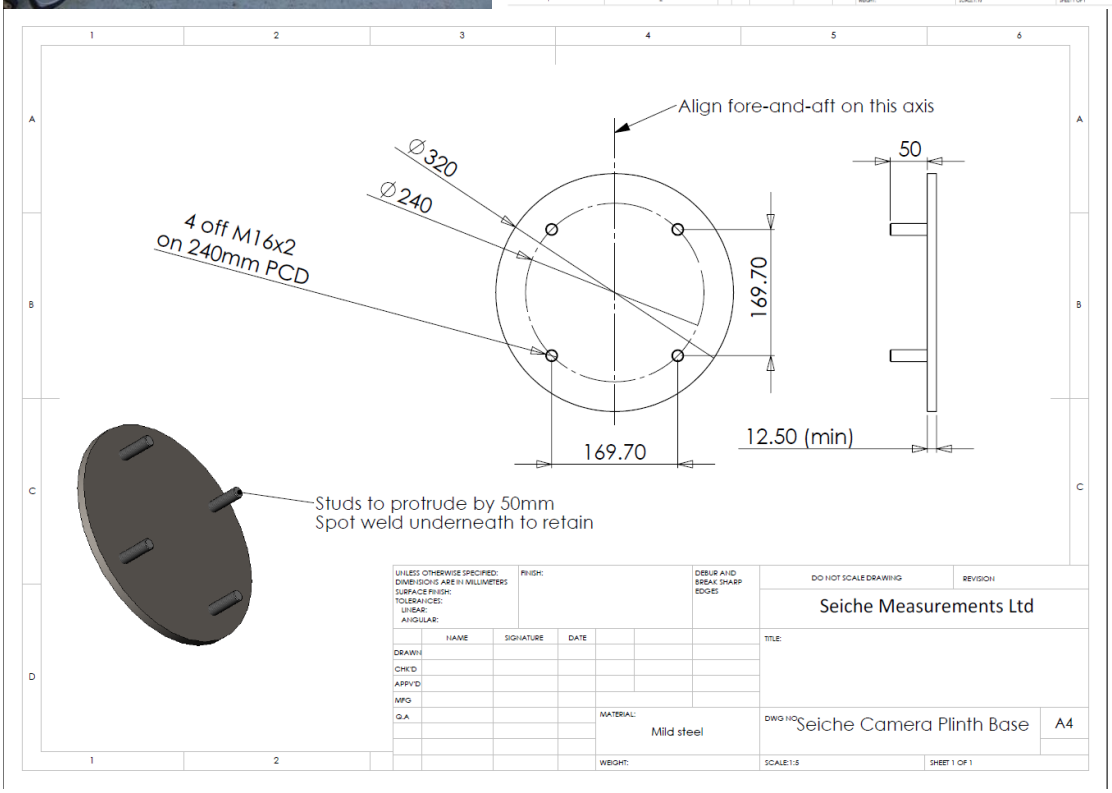


Figure 3. Infra-red camera system that will be utilized during survey to scan for detections of cetaceans.





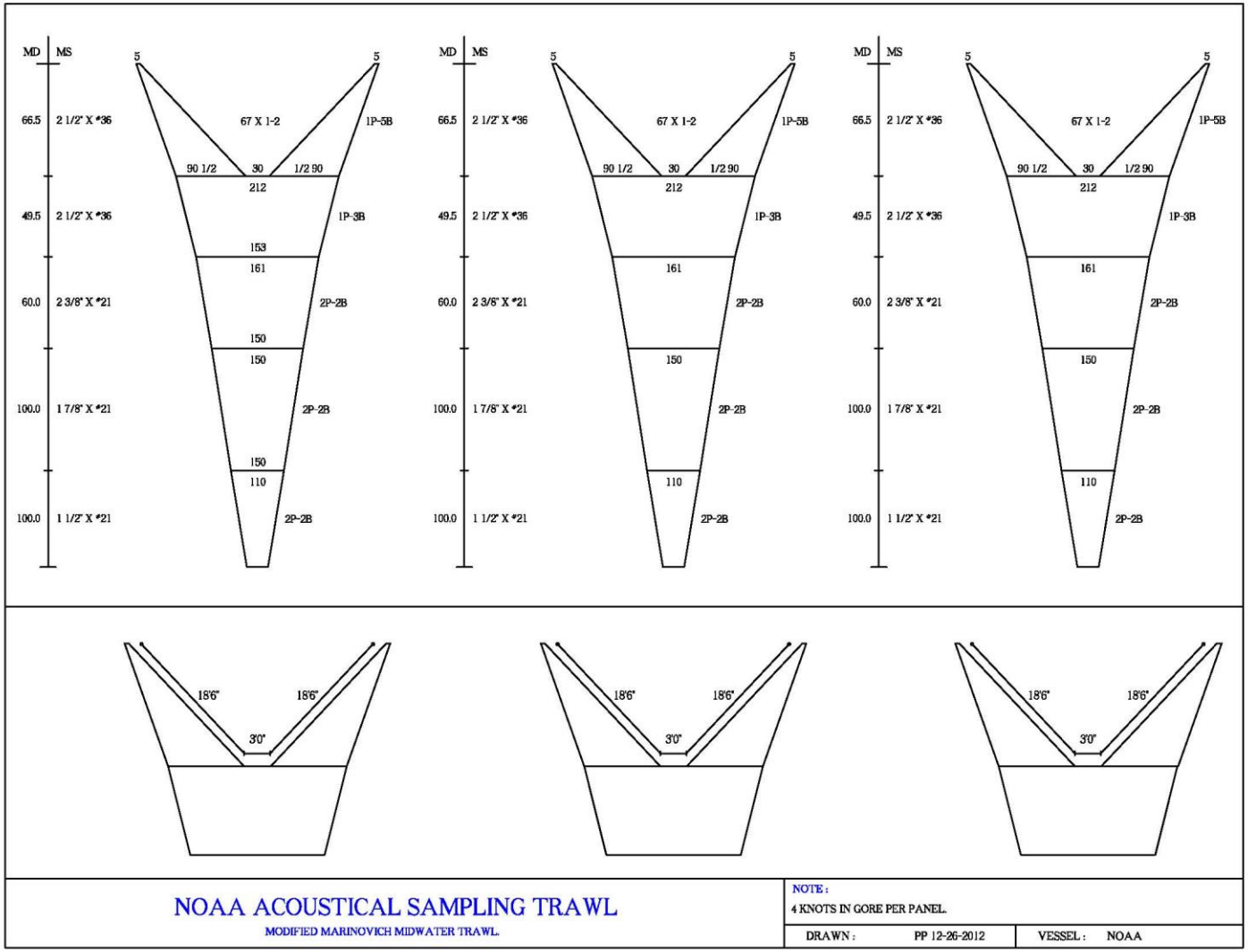


Figure 4. Shallow-water mid-water trawl (Swan Net Gundry)

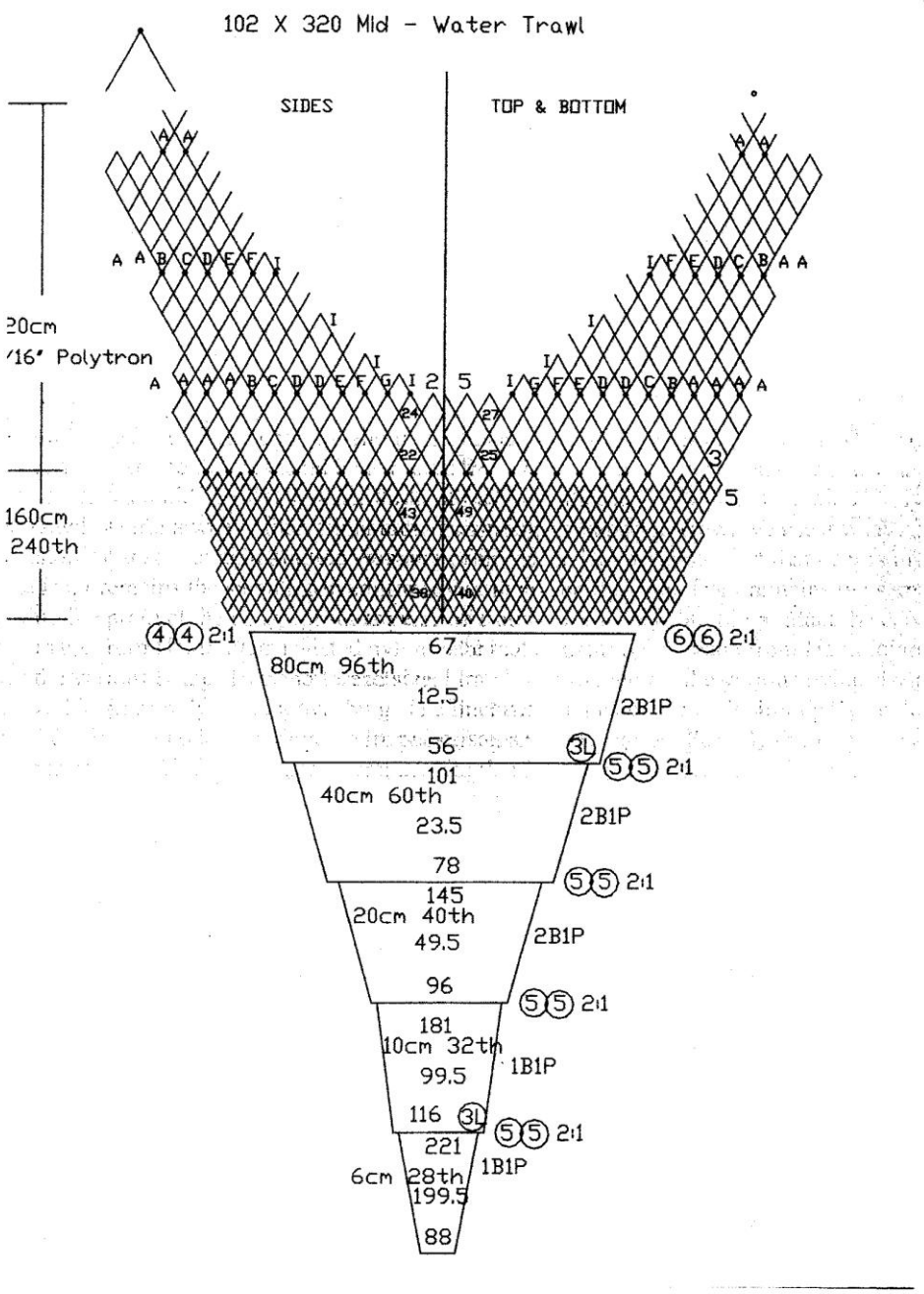


Figure 5. Polytron mid-water rope trawl (Superior Trawl).

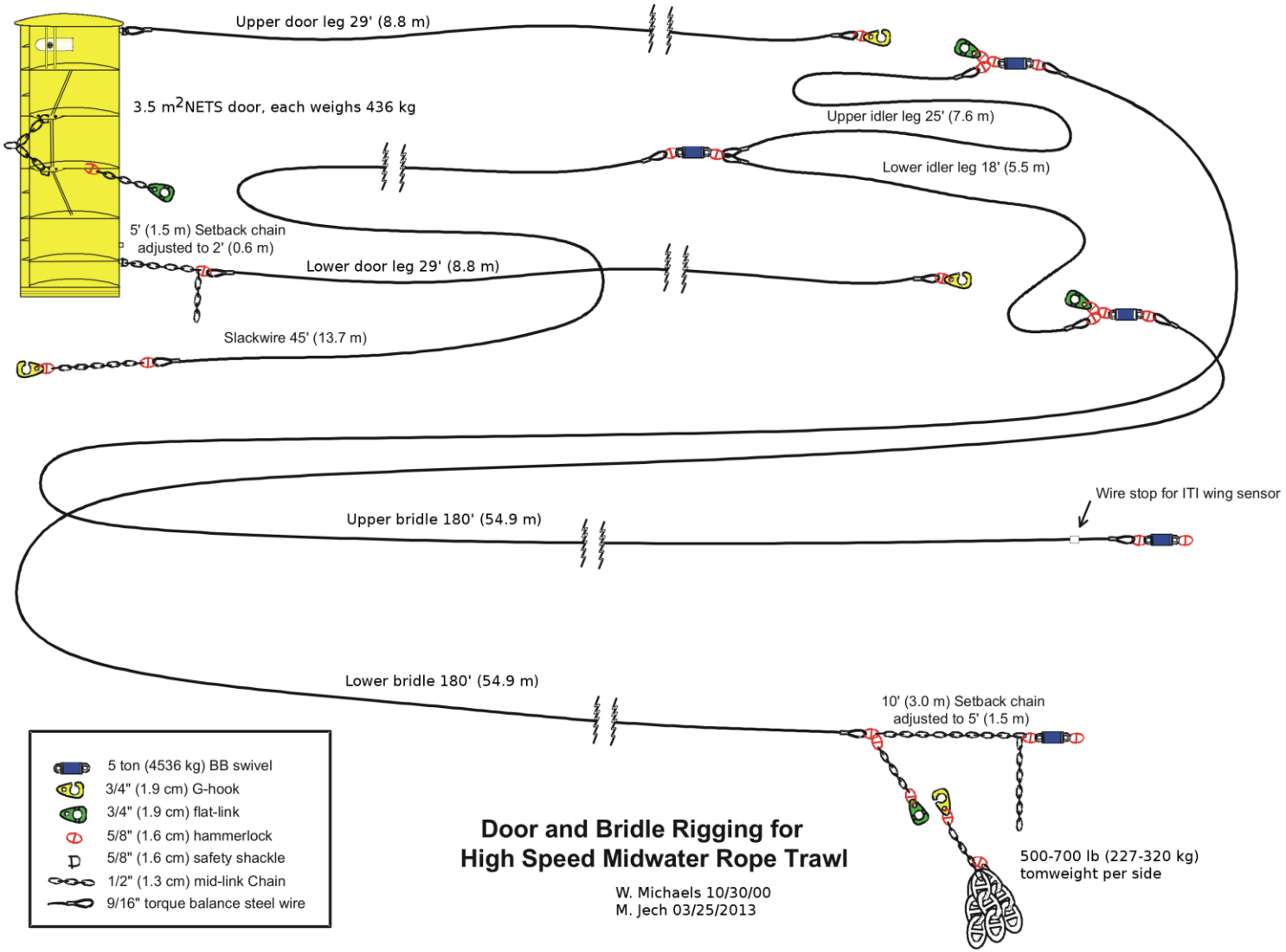


Figure 6. Rigging for the pelagic trawls.

Figure 7: HARP Acoustic Mooring Diagram. One moorings of this type will be deployed at site HARP_01 (see Figure 8 for site).

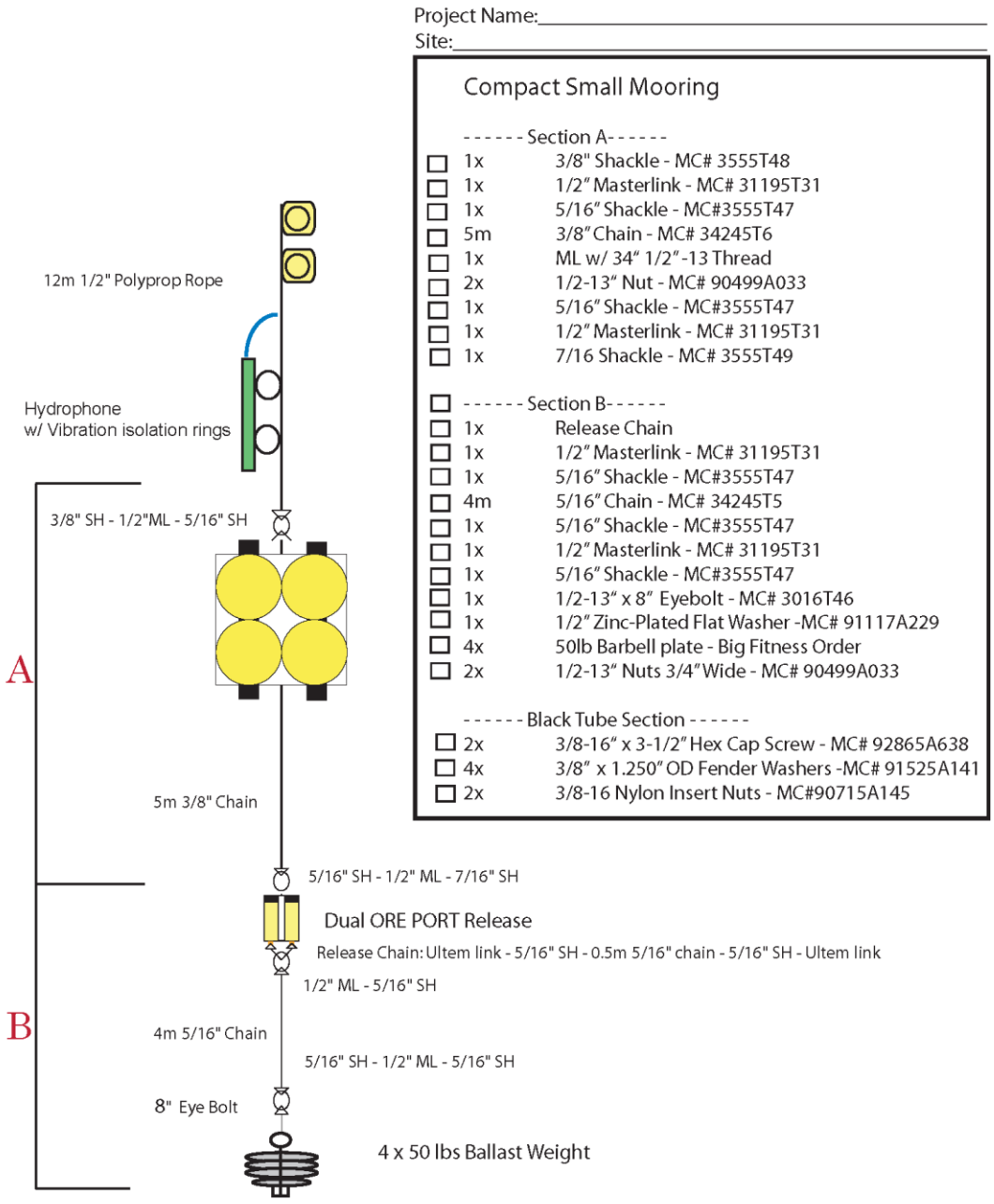
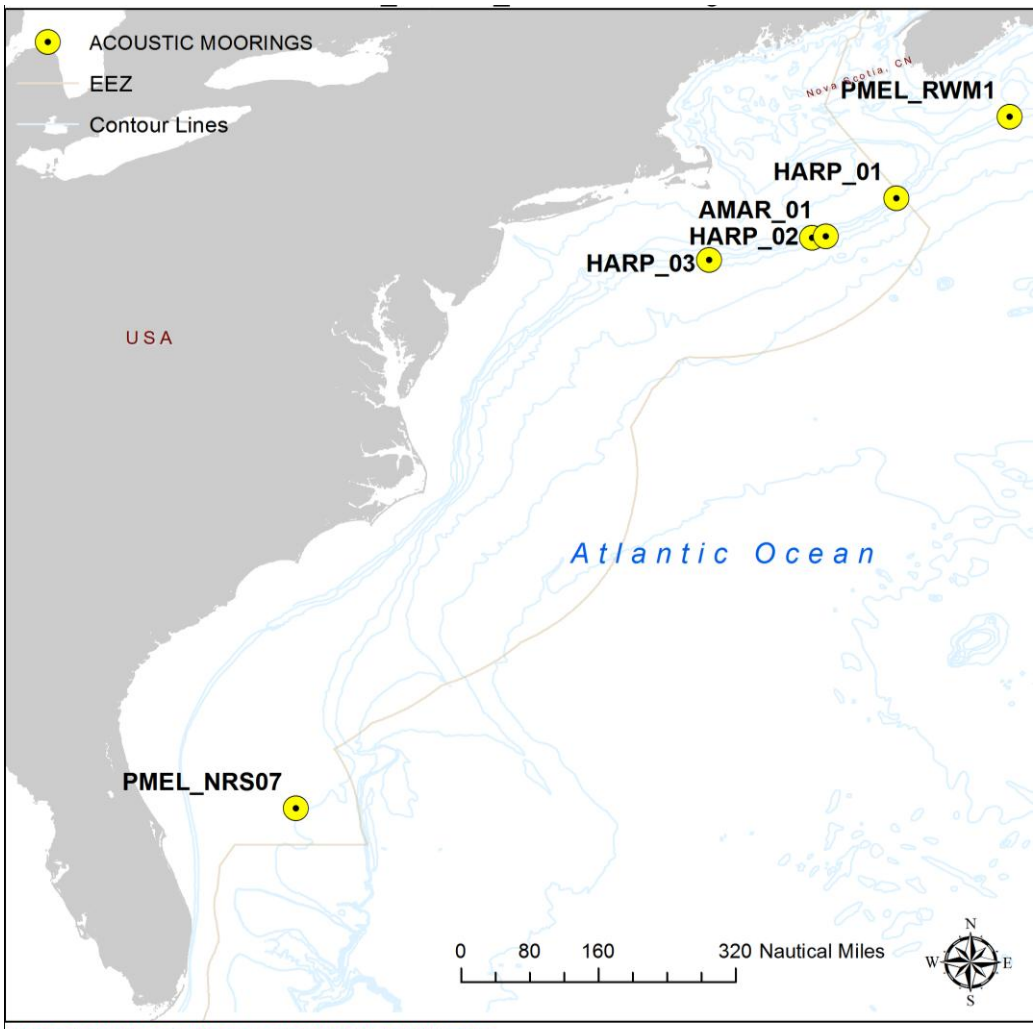


Figure 8: Locations of acoustic moorings, including HARP_01 which will be deployed on Leg 2, and AMAR_01, which will be recovered during Leg1 if not recovered during HB15-02.



LOCATION FORMAT: DECIMAL MINUTES

PMEL NRS07:	29 00.000 N	078 00.000 W	(Blake Plateau)	Deployment
HARP 03:	39 49.753 N	069 58.862 W	(S. Nantucket)	Deployment
HARP 02:	40 15.796 N	067 59.173 W	(Oceanographer Canyon)	Deployment
AMAR 01:	40 17.697 N	067 43.184 W	(Lydonia Canyon)	Recovery
HARP 01:	41 02.669 N	066 20.921 W	(Georges Bank)	Deployment
PMEL RWM1:	42 39.006 N	064 08.994 W	(Brown's Bank)	Recovery

APPENDIX II: TABLES

Table 1. Scientific Computer Sensors, and logging rates of those sensors, required during *Henry Bigelow HB 14-03*, AMAPPS Cetacean and Turtle Abundance Survey. Additional sensors may be requested.

Sensor Name	Units	Log Rate (secs)
ADCP-Depth	(Meters)	1
ADCP-F/A-GroundSpeed	(Knots)	1
ADCP-F/A-WaterSpeed	(Knots)	1
ADCP-P/S-GroundSpeed	(Knots)	1
ADCP-P/S-WaterSpeed	(Knots)	1
Air-Temp	(Degrees C)	1
Baro-Press	(Millibars)	1
CenterBoardPos-Value	(Position)	1
Date	(Date)	1
Doppler-Depth	(Meters)	1
Doppler-KeelOffset	(Meters)	1
Doppler-P/S-BottomSpeed	(Knots)	1
Doppler-P/S-WaterSpeed	(Knots)	1
EK60-18kHz-Depth	(Meters)	1
EK60-38kHz-Depth	(Meters)	1
ES60-200hz-Depth	(Meters)	1
ES60-50hz-Depth	(Meters)	1
GYRO	(Degrees)	1
ME70-Depth	(Meters)	1
Mid-SeaTemp-C	(Degrees C)	1

Sensor Name	Units	Log Rate (secs)
MX420-COG	(Degrees)	1
MX420-Lat	(DEGMIN)	1
POSMV-COG	(Degrees)	1
POSMV-Elevation	(Value)	1
POSMV-hdops	(Value)	1
POSMV-Heading	(Degrees)	1
POSMV-Lat	(DEGMIN)	1
POSMV-Lon	(DEGMIN)	1
POSMV-Quality	(Value)	1
POSMV-Sats	(Value)	1
POSMV-SOG	(Knots)	1
POSMV-Time	(Time)	1
SAMOS-AirTemp-Value	(Degrees C)	1
SAMOS-TRUE-WIND-DIR-Value	(Degrees)	1
SAMOS-TRUE-WIND-Spd-Value	(Knots)	1
YOUNG-TWIND-Speed	(Knots)	1
Fluorometer data		
MX420-Lon	(DEGMIN)	1
MX420-SOG	(Knots)	1
MX420-Time	(Time)	1

Table 2: Stations for acoustic recorder deployments and recoveries. See Figure 8 for positions in decimal minutes.

STATION	Procedure	Mooring	Latitude	Longitude	General_Location	Depth
AMAR_01	RECOVERY	AMAR	40.29495	-67.7197	Lydonia Canyon	800m
HARP_01	DEPLOYMENT	HARP	41.04449	-66.3486	Georges Bank	1000m

APPENDIX III: DEPLOYMENT PROCEDURES: HARP_01

Points of Contact:
Onboard:
Eric Matzen | NEFSC |Will coordinate deployment on Leg 2

On Shore:
Danielle Cholewiak | NEFSC |508-495-2010| cell: 607-592-9187| Danielle.cholewiak@noaa.gov
Ryan Griswold | SIO | office: 858-534-5765 | cell: 619-708-1894 |

Mooring Design
Mooring design is 21m long and weighs a total of 650lb consist: of:

- Mclane glass floats
- HARP Hydrophone Recorder
- Float Cage, 400 lbs weight
- Dual ORE PORT acoustic release system, 30 lbs
- 200lb anchor weights

1. Deployment
NOTE: DEPLOYMENTS SHOULD TARGET A DEPTH OF ~1000m. PLEASE CHECK SITE DEPTHS AND ADJUST SHIP POSITION IF NECESSARY.

Eric Matzen will be in charge of the mooring deployment. He will coordinate with the Chief Scientist and ship's crew to discuss deployment timing and logistics. For technical questions during deployment, Ryan Griswold Field Support Lead from Scripps Institution of Oceanography will be available. (619-708-1894 mobile; 858-534-5765 office)

The following steps focus on the procedure for deploying the underwater autonomous recorders and their associated moorings. Equipment preparation and deployment will be carried out by the deck crew under supervision of deck officer or embarked science officer. Deployment vessel positioning usually takes 10 minutes per mooring. This operation must be carried out in daylight hours as no strobe is affixed to the mooring top float, and always in appropriate sea states. HARP recorders are not normally deployed in sea states exceeding Beaufort Sea State 4. This can be reassessed based on vessel size and deployment crew/equipment available.

Equipment Power On and Check

Prior to starting the deployment procedure, all equipment must be turned on and tested.

1. *HARPS*

Connect the HARP and power it on as per the HARP User Guide. Verify that the HARP is recording.

2. *Satellite Beacon*

Use the magnet to power on the satellite beacon as per the User Manual. The only way to test the beacon is by observing received emails from Iridium with correct position reports.
Eric will pre-arrange email or phone contact with Scripps at the appropriate time for beacon tests prior to deployment.

3. *Dual ORE PORT Acoustic Release*

Functionality of acoustic release system will be tested prior to deployment.

4. *Mooring Hardware and Connections*

Note that the field team and/or vessel crew may determine it necessary to attach a loop of line above the flotation package in order to facilitate retrieval, based on vessel layout and capabilities. If this is done, ensure the line is not likely to cause additional acoustic noise in the data recording.

When assembling the mooring, ensure all nuts and bolts are tight and all shackles have their cotter pins installed.

Deployment Procedure

All deployment and retrieval tasks must have a risk assessment conducted in a team meeting prior to all deployments and retrievals. All necessary safe work procedures and processes utilizes for its equipment will be communicated to vessel officers and deck crews via an Operations Plan and associated HSE Plan (if requested) before the start of deployments and retrievals to ensure all procedural overlaps and requirements are appropriately communicated. A Job Safety Analysis (JSA) review is recommended to be held before the deployment to clearly identify tasks, roles, hazards, and controls. If a prefilled JSA is requested prior to deployment or retrieval for the ship's safety rep, one can be provided.

Each HARP and associated mooring will be deployed as follows:

1. Job Safety Analysis meeting with all personnel involved in the deployment (recommended).

2. Steps for HARP assembly and deployment (subject to change based on vessel equipment and crew consultation):

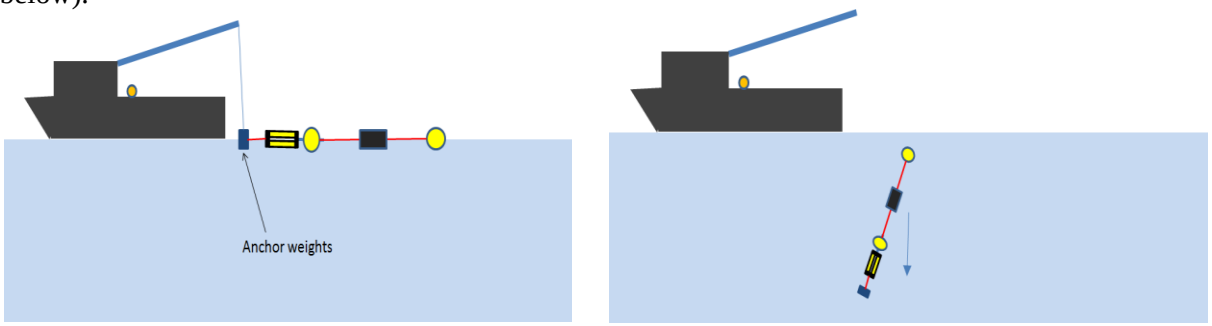
    a. Organize all mooring items on-deck near the deployment location and clear of any unrelated tools, equipment, etc. that may interfere with deployment. The on-deck deployment location should be chosen to ensure risk of mooring line entanglement with vessel propellers and thrusters is mitigated, and such that there is a clear lowering path for the HARP and mooring to drift down stream with the prevailing currents. On the CCGS Hudson this may be accomplished via deck crane or A-frame. A-frame is only to be utilized if a clear deployment path to the waterline is available without dragging the HARP and mooring across the deck.

    b. Assemble the mooring as per mooring design/provided assembly instructions.

c. Manoeuver vessel to within 500m of deployment position, upstream from the intended deployment location and maintain position.

d. Using a SeaCatch TR-7 or similar quick release mechanism, lift the float via over the stern or side of the vessel to the waterline and release. Let the float and HARP drift away from the vessel. If the deployment is done over the side of the vessel, use pass-through taglines attached to the vessel and HARP to control the mooring, using enough slack to allow the mooring to drift with the vessel until the anchor, release and glass sphere floats are ready to be deployed.

e. Attach pass-through tag-lines to the shackle above the glass balls and have two deck hands manage/minimize movement on the deck of the ship. Lift the anchor assembly via anchor stem post; the acoustic release assembly and glass spheres are in-line and will be lifted over the side (or aft) of the vessel. Slowly lower to just above the surface of the water (see figure below). The anchor should be submerged just below the waterline to ensure shock loading during deployment is minimized. Release the tether lines holding the float float (SUBS C2 or OF4 for deep and shallow mooring respectively) and HARP and let drift astern of the vessel. When deployment position confirmed with vessel master and the complete mooring assembly has drifted downstream with just the anchor assembly at the waterline, the quick release can be activated and the anchor will fall to the seafloor (see figure below).



Anchor lowered to surface of water; mooring falling to sea floor after quick release of anchor.

f. Take a GPS position at time of release. Record the bottom depth.

3. Debrief meeting to capture lessons learned and any HSE concerns.

APPENDIX IV: PUMA Aircraft Operations Permit.

	AIRCRAFT OPERATIONS CENTER NOAA Office of Marine and Aviation Operations	CATEGORY 220	VERSION 2.0
		EFFECTIVE DATE 6 April 2015	
	AUTHORIZED BY:  Captain Harris B. Halverson II, NOAA Commanding Officer, Aircraft Operations Center	*PREVIOUS VERSION DATE* *1 January 2014*	
		REVIEW DATE 1 January 2017	
		RESPONSIBLE Chief, Operations Branch	

POLICY 220-1-11

AEROVIRONMENT RQ-20 PUMA STANDARD OPERATING PROCEDURES

1. PURPOSE

1.1 This policy prescribes guidance and limitations with regards to the safe operation of National Oceanic and Atmospheric Administration (NOAA) RQ-20 Puma unmanned aircraft.

2. SCOPE

2.1 The NOAA RQ-20 Puma shall be operated in accordance with the AeroVironment Puma Operator's Manual, NOAA Aircraft Operations Center (AOC) Airworthiness Certificate, Federal Aviation Administration (FAA) Certificate of Authorization(s) and the following Standard Operating Procedures (SOP). Where a conflict exists with the Operator's Manual, these procedures will govern.

3. STANDARD OPERATING PROCEDURES

3.1 Pilots shall announce to all persons near the operation: "Battery In" when the battery is inserted to power the Air Vehicle (AV); and "Battery Out" when the battery is removed to un-power the AV.

3.2 The Vehicle Operator (VO) shall announce "Clear Payload" and will wait for the Mission Operator (MO) to respond "Payload Clear" prior to moving the payload while on the ground.

3.3 The VO shall announce "Clear Prop" and will wait for the MO to respond "Prop Clear" prior to engaging the throttle while on the ground.

3.4 Loss of Link settings on the hand controller (VO responsibility) and the mission laptop (MO responsibility) shall be checked prior to launch to ensure they are set properly and do not conflict with airspace, geographic or operational constraints.

3.5 Puma pilots shall utilize assigned operating frequencies as dictated by the National Telecommunications and Information Administration (NTIA) or other controlling authority. If none are specified, the Pilot-in-Command (PIC) may select any frequency for operations but should de-conflict its use as much as practical.

3.6 Eye protection shall be worn by the individual conducting the launch.

3.7 If sea conditions produce an unsteady deck, the individual launching the AV shall have somebody steady his/her back during launch.

3.8 While conducting shipboard operations, the PIC shall not launch or land the AV without approval from the vessel Commanding Officer (CO), Officer on Duty (OOD) or small boat operator as applicable.

3.9 During launch, the VO shall climb the AV to at least 150 ft. AGL prior to engaging another flight mode such as ALT or NAV. This allows for obstacle clearance during the throttle back and initial level off.

3.10 The AV shall not be flown any lower than 200 ft. AGL for mission data collection or 100 ft. AGL during final approach until AUTOLAND selected/engaged.

3.11 The Puma shall not be flown in weather conditions less than the following:

a. National Airspace: Per the Certificate of Authorization (COA) or FAA small Unmanned Aircraft System (sUAS) Memorandum of Understanding (MOU).

b. Special Use or International Airspace: Ceiling 500 ft. and Visibility 2 statute miles.

3.12 When flying beyond visual line of sight from a moving platform, the Ground Control Station (GCS) position shall be overlaid on the mission laptop at all times. If the GCS position is lost or the mission computer crashes mid-flight, the vehicle/vessel should hold its current position as much as practical until regaining visual sight of the AV or restoring the GCS position.

3.13 Telemetry shall be recorded for all flights unless the downlink does not contain recordable information due to a payload re-configuration. In this case, the new payload shall be authorized via an amended airworthiness statement by AOC Science and Engineering Branch prior to flight operations.

3.14 The telemetry record for each flight shall contain the entire evolution from preflight through recovery. Breaks in the recording are allowed if/when delays occur between preflight and launch. Dockside functional checks do not require telemetry recording.

3.15 The AV shall not be flown in SLOW mode in areas of turbulence or wind shear. It is possible for the AV to stall and enter an unusual attitude or spin with little altitude for the autopilot to recover. Manual recovery is also unlikely in this situation.

3.16 At all times a direct line of communication shall be maintained between the vehicle operator, mission operator, OOD/small boat operator, and visual observer (if required).

3.17 When operating from a moving platform with AV waypoints slaved to the Ground Control Station (GCS), coordinate all vessel/vehicle course and/or speed changes between flight crew and vehicle/vessel crew.

3.18 The AV shall be landed only in AUTOLAND unless an emergency situation dictates otherwise.

3.19 The final approach path and E to L shall not cross over any people, vehicles and/or vessels.

3.20 The AV launch and landing site shall not be in a heavily traveled boat or shipping channel.

3.21 All land operations shall designate an area, to include the GCS and landing site, reserved exclusively for mission essential personnel during flight operations. If necessary while operating on public land, control measures should be established to limit access into these areas by the general public.

3.22 The landing waypoint L shall not be programmed any closer to people, vehicles and/or vessels than prescribed by the following flight conditions:

a. Day / Night Land operations & Day Water operations – 0.02 km

b. Night Water operation – 0.04 km

3.23 Approaches shall be made to allow for a straight ahead climb to 100 ft. AGL during a go-around before a turn has to be made. This does not preclude the VO from turning at his/her discretion prior to 100 ft. for safety of flight.

3.24 Night landings shall be made via a full autonomous E to L approach and shall not be hand flown.

3.25 The VO or MO shall announce “Aircraft Landing” when the AV is inbound on the approach. All crew members near the landing site should maintain visual sight of the AV during final approach and landing.

3.26 The PIC shall provide a safety brief about hazards and proper recovery techniques to all personnel assisting in AV recovery.

3.27 After landing and prior to AV recovery, the VO shall verify the AV is in AUTOLAND and terminate control of the AV from the GCS.

3.28 During shipboard operations, the mission crew shall provide the small boat recovery team at least 30 minutes warning prior to launch and recovery. This may change at the PICs discretion if alternate arrangements have been established with the ship’s command.

3.29 Untrained assistant operations as described in Chapter 7 of the Puma Operator’s Manual are not authorized.

3.30 At the conclusion of flight operations on each day that includes water landings, the AV and AV batteries shall receive a freshwater rinse and be allowed to dry. Following the freshwater rinse, the battery and camera pin contacts shall be cleaned with isopropyl alcohol to prevent corrosion.

3.31 Operators shall perform a post mission inspection and full inventory of the system. Any discrepancies shall be reported to the AOC UAS Section and Puma crew chiefs. Defective equipment shall be clearly labeled and removed from the Pelican cases (if practical) to prevent the part from being used during subsequent flights.

3.32 During periods of long term battery storage, the Puma crew chiefs shall keep the batteries sufficiently charged to mitigate self-discharge and ultimate loss of the Li-Po cells.

Record of Changes/Revisions

This policy is a living document that is modified to reflect changes in Federal policy and/or organizational strategic goals and objectives. Modifications made to this document are recorded in the Change/Revision Record below. This record shall be maintained throughout the life of the document. Only the changes from the current and most recent version are required.

Change / Revision Record

Version No.	Date	Section	DESCRIPTION OF CHANGE
2.0	6 Apr 2015	3.17	Changed Global Positioning System (GPS) to Ground Control Station (GCS)
1.0	1 Jan 2014	All	Initial Policy