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Marine Species Monitoring

For The U.S. Navy's

Atlantic Fleet Active Sonar Training

(AFAST)


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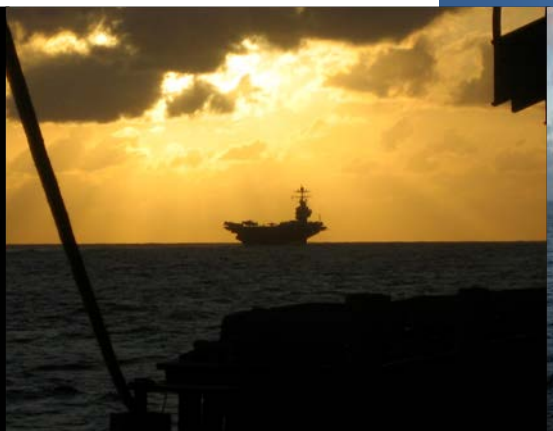
Final Annual Report

2012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LIST OF ACRONYMS

AFAST	Atlantic Fleet Active Sonar Training
AMAR	Autonomous Multi-channel Acoustic Recorder
AMR	Adaptive Management Review
ASW	anti-submarine warfare
ASWEX	Anti-Submarine Warfare Exercise
CFR	Code of Federal Regulations
CHPT	Cherry Point
CNO	Chief of Naval Operations
COMPTUEX	Composite-Training Unit Exercise
DoN	Department of the Navy
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FY	Fiscal Year
GOM	Gulf of Mexico
HARP	High-frequency Acoustic Recording/Recorder Package
hr	hour(s)
ICMP	Integrated Comprehensive Monitoring Program
ITA	Incidental Take Authorization
JAX	Jacksonville
kHz	kilohertz
km	kilometer(s)
LMMO	liaison MMO
LO	lookout
LOA	Letter of Authorization
m	meter(s)
min	minute(s)
MARU	Marine Autonomous Recording Unit
MFAS	mid-frequency active sonar
MMO	marine mammal observer
MMPA	Marine Mammal Protection Act
NEFSC	Northeast Fisheries Science Center
N45	Environmental Readiness Division
NM	nautical mile(s)
NMFS	National Marine Fisheries Services
NUWCDIVNPT	Naval Undersea Warfare Center Division, Newport
OEIS	Overseas Environmental Impact Statement
ONR	Office of Naval Research
OPAREA	operating area
OT	observation team
PAM	passive acoustic monitoring
PTS	permanent threshold shift
R&D	Research & Development
S&T	Science & Technology
SAG	Scientific Advisory Group
SEASWITI	Southeast Anti-submarine Warfare Integration Training Initiative
SERDP	Strategic Environmental Research and Development Program
TTS	temporary threshold shift
ULT	Unit-Level Training
U.S.	United States
UNCW	University of North Carolina at Wilmington
USFF	U.S. Fleet Forces
USWTR	Undersea Warfare Training Range
VACAPES	Virginia Capes

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SECTION I – INTRODUCTION & BACKGROUND

1. Background

The United States (U.S.) Navy developed Range Complex monitoring plans to provide marine mammal and sea turtle monitoring as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA) of 1973. In order to issue an Incidental Take Authorization (ITA) for an activity, Section 101(a)(5)(A) of the MMPA states that National Marine Fisheries Service (NMFS) must set forth "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 Code of Federal Regulations (CFR) Section 216.104(a)(13) note that requests for Letters of Authorization (LOAs) must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present. While the ESA does not have specific monitoring requirements, recent Biological Opinions issued by NMFS also have included terms and conditions requiring the U.S. Navy to develop a monitoring program. In addition to Range Complex monitoring plans, a monitoring plan for Atlantic Fleet Active Sonar Training (AFAST) was developed for protected marine species, primarily marine mammals and sea turtles, as part of the environmental planning and regulatory compliance process associated with a variety of training activities. As part of the issuance of an LOA in early 2009 (NMFS 2009), the U.S. Navy published the initial AFAST Monitoring Plan (DoN 2009).

Based on discussions with NMFS, Range Complex monitoring plans were designed as collections of focused "studies" to gather data that will attempt to address the following questions, which are described more fully in the AFAST Monitoring Plan:

1. Are marine mammals and sea turtles exposed to mid-frequency active sonar (MFAS), especially at levels associated with adverse effects (i.e., based on NMFS' criteria for behavioral harassment, temporary threshold shift [TTS], or permanent threshold shift [PTS])? If so, at what levels are they exposed?
2. If marine mammals and sea turtles are exposed to MFAS in the AFAST Study Area, do they redistribute geographically as a result of continued exposure? If so, how long does the redistribution last?
3. If marine mammals and sea turtles are exposed to MFAS, what are their behavioral responses to various levels?
4. Is the U.S. Navy's suite of mitigation measures for MFAS (e.g., Protective Measures Assessment Protocol) effective for avoiding TTS, injury, and mortality of marine mammals and sea turtles?

Monitoring methods proposed for the Range Complex monitoring plans include a combination of field methods designed both to support range complex-specific monitoring and to contribute information to a larger U.S. Navy-wide science-based program. These field methods include visual surveys from vessels or airplanes, passive acoustic monitoring (PAM), and marine mammal observers (MMOs) aboard U.S. Navy platforms participating in an exercise or event. Each monitoring technique has advantages and disadvantages that vary temporally and spatially, and each method supports one particular study objective better than another. The U.S. Navy uses a combination of techniques so that detection and observation of marine animals is maximized, and meaningful information can be derived to address the research questions proposed above.

In addition to the Fleet-funded monitoring plan described above, the U.S. Navy has developed coordinated Science & Technology (S&T) and Research & Development (R&D) programs focused on marine mammals and sound. These include an extensive program of basic research and exploratory development at the Office of Naval Research as well as the Navy's Living Marine Resources (LMR) applied research program, managed by the Naval Facilities Engineering Command. Both programs are focused on delivering the data and technologies needed by Navy and others to minimize potential risks to marine mammals from human activities like military training.

The Navy Living Marine Resources applied science program includes the following focus areas:

- Marine Mammal Distribution and Abundance Determination
- Criteria and Thresholds to Measure Effects of Navy Generated Sounds
- Improving Monitoring Techniques
- Sound Field Characterization

Total investment in these programs has been over $100 million since 2007, and continued funding at similar levels is foreseen in coming years. Additional information on these programs can be found at the Navy's Green Fleet – Energy, Environment, and Climate Change website (http://greenfleet.dodlive.mil/environment/marine-mammals-ocean-resources).

2. Integrated Comprehensive Monitoring Program (ICMP)

The Integrated Comprehensive Monitoring Program (ICMP) provides the overarching framework for coordination of the U.S. Navy's monitoring (DoN 2010). It has been developed in direct response to permitting requirements for U.S. Navy ranges, which are established in the various MMPA Final Rules, ESA Consultations, Biological Opinions, and applicable regulations. As a framework document, the ICMP applies by regulation to those activities on ranges and operating areas (OPAREAs) for which the U.S. Navy sought and received ITAs.

The ICMP is intended for use as a planning tool to focus U.S. Navy monitoring priorities pursuant to ESA and MMPA requirements. Top priority will always be given to satisfying the mandated legal requirements across all ranges. Once legal requirements are met, any additional monitoring-related research will be planned and prioritized using guidelines outlined by the ICMP, consistent with availability of both funding and scientific resources. As a planning tool, the ICMP is a "living document" and will be routinely updated, as needed. Initial areas of focus for improving U.S. Navy marine species monitoring in 2011/2012 focused on development of a Strategic Plan to be incorporated as a major component of the ICMP to guide investments and help refine specific monitoring actions to more effectively and efficiently address ICMP goals and objectives.

The ICMP is evaluated through the Adaptive Management Review (AMR) process to: (1) assess progress, (2) provide a matrix of goals and objectives for the following year, and (3) make recommendations for refinement and analysis of the monitoring and mitigation techniques. This process includes conducting an annual AMR meeting at which the U.S. Navy and NMFS jointly consider the prior-year goals, monitoring results, and related science advances to determine if monitoring plan modifications are warranted to more effectively address program goals. Modifications to the ICMP that result from AMR discussions are incorporated into a revision to the ICMP and submitted to NMFS.

Under the ICMP, monitoring measures prescribed in range-specific monitoring plans and U.S. Navy-funded research relating to the effects of U.S. Navy training and testing activities on protected marine species should be designed to accomplish one or more of the following top-level goals as prescribed in the current revision of the ICMP (DoN 2010):

(a) An increase in our understanding of the likely occurrence of marine mammals and/or ESA-listed marine species in the vicinity of the action (i.e., presence, abundance, distribution, and/or density of species).

(b) An increase in our understanding of the nature, scope, or context of the likely exposure of marine mammals and/or ESA-listed species to any of the potential stressors associated with the action (e.g., sound, explosive detonation, or expended materials), through better understanding of one or more of the following: (1) the nature of the action and its surrounding environment (e.g., sound-source characterization, propagation, and ambient noise levels); (2) the affected species (e.g., life history or dive patterns); (3) the likely co-occurrence of marine mammals and/or ESA-listed marine species with the action (in whole or part); and/or (4) the likely biological or behavioral context of exposure to the stressor for the marine mammal and/or ESA-listed marine species (e.g., age class of exposed animals or known pupping, calving, or feeding areas).

(c) An increase in our understanding of how individual marine mammals or ESA-listed marine animals respond (behaviorally or physiologically) to the specific stressors associated with the action (in specific contexts, where possible, e.g., at what distance or received level).

(d) An increase in our understanding of how anticipated individual responses, to individual stressors or anticipated combinations of stressors, may impact either: 1) the long-term fitness and survival of an individual; or 2) the population, species, or stock (e.g., through effects on annual rates of recruitment or survival).

(e) An increase in our understanding of the effectiveness of mitigation and monitoring measures, including increasing the probability of detecting marine mammals to better achieve the above goals (through improved technology or methodology), both generally and more specifically within the safety zone (thus allowing for more effective implementation of the mitigation). Improved detection technology will be rigorously and scientifically validated prior to being proposed for mitigation, and should meet practicality considerations (engineering, logistic, and fiscal).

(f) A better understanding and record of the manner in which the authorized entity complies with the ITA and incidental take statement.

CNO N45 is responsible for maintaining and updating the ICMP, as necessary, reflecting the results of regulatory agency rulemaking, AMRs, best available science, improved assessment methodologies, and more effective protective measures. This is done as part of the AMR process, in consultation with U.S. Navy technical experts, Fleet Commanders, and Echelon II Commands as appropriate. The ICMP (updated in December 2010) is provided in **Appendix A**.

3. Report Objectives

Design of the Range Complex monitoring plans represented part of a new U.S. Navy-wide and regional assessment, and as with any new program, there are many coordination, logistical, and technical details that continue to be refined. The scope of the Range Complex monitoring plans was to lay out the

background for monitoring, as well as to define initial procedures to be used in meeting certain study objectives derived from NMFS-U.S. Navy agreements.

Overall, this report serves two main objectives:

1. Present data and results from the U.S. Navy-funded marine mammal and sea turtle monitoring conducted in the AFAST Study Area during the period from 02 August 2011 to 01 August 2012 (**Section II**). Due to the time required to consolidate data and generate an annual monitoring report, this report covers a time period that includes the last half of the previous year's LOA (02 August 2011–21 January 2012) as well as the first half of the current year's LOA (22 January 2012–01 August 2012). Because the annual LOA period is 22 January–21 January, an additional table is included that briefly reviews monitoring accomplishments during the third full year of the MMPA authorization (22 January 2011–21 January 2012). Primary focus over the first years of the monitoring program has been on establishing initial monitoring efforts, refining data-collection efforts, and improving overall organization and coordination of the U.S. Navy-wide monitoring program. This report will focus on summarizing collected data and providing a brief description of the major accomplishments from techniques used over the past year.
2. Continue the AMR process by providing an overview of monitoring initiatives and presenting progress made toward development of a Strategic Plan for U.S. Navy monitoring. These initiatives continue to shape the evolution of the AFAST Monitoring Plan for 2013. Input and recommendations from the Scientific Advisory Group (SAG) (e.g., DoN 2011a) form a cornerstone of the Strategic Plan development, reflecting input received from the scientific community and other stakeholders. **Section III** provides an overview of the events that have prompted these most recent adaptive management actions.

SECTION II – ATLANTIC FLEET ACTIVE SONAR TRAINING (AFAST) MONITORING

The AFAST Study Area encompasses waters along the U.S. Atlantic Coast and of the Gulf of Mexico (GOM), consisting of range complex OPAREAs and adjacent waters (**Figure 1**). Potential environmental effects associated with the use of active sonar technology and the improved extended echo ranging system during Atlantic Fleet training exercises, maintenance, and research, development, test, and evaluation activities are more fully described in the *Atlantic Fleet Active Sonar Testing Environmental Impact Statement*/*Overseas Environmental Impact Statement* (AFAST EIS/OEIS; DoN 2008a).

There are 43 species of marine mammals that may be observed either seasonally or year-round in the AFAST Study Area (DoN 2005, 2007, 2008b, 2008c, and 2008d; Waring et al. 2012). All receive protection under the MMPA, while the following seven are afforded additional protection under the ESA: North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*), blue whale (*Balaenoptera musculus*), sperm whale (*Physeter macrocephalus*), and West Indian manatee (*Trichechus manatus*). There are six species of threatened and endangered sea turtles that occur in the AFAST Study Area (DoN 2008a): leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), Kemp's ridley turtle (*Lepidochelys kempii*), and olive ridley turtle (*Lepidochelys olivacea)*. The distribution and habitat preferences of these protected marine species are reviewed in various U.S. Navy Marine Resources Assessments for the U.S. Atlantic Coast and GOM (DoN 2005, 2007, 2008b, 2008c, and 2008d).

1. 2012 AFAST Monitoring Commitments

The goal of the AFAST Monitoring Plan is to implement field methods chosen to address the long-term monitoring objectives outlined in **Section I**. In the original AFAST Monitoring Plan (DoN 2009), the U.S. Navy proposed to implement a diversity of field methods to gather monitoring data for marine mammals and sea turtles in U.S. Navy training areas. For the 2012 monitoring period specifically, the U.S. Navy proposed to conduct visual surveys (aerial and vessels), to deploy PAM devices, and to put MMOs aboard U.S. Navy vessels to meet monitoring requirements. Studies were specifically designed to address the questions outlined in **Section I**. **Table 1** shows the 2012 monitoring-period commitments as agreed upon by NMFS and the U.S. Navy.

Table 1. 2012 monitoring commitments under AFAST Final Rule, LOA, and Biological Opinion.

Marine Mammal Observers (MMOs)	2 events in conjunction with exercises.
MMO/ Lookout Comparison Study	40 hours (hr) data-collection trials.
Aerial Surveys—VACAPES/CHPT/JAX OPAREAs	36 days.
Vessel Surveys—VACAPES/CHPT/JAX OPAREAs	24 days.
Marine Mammal Tagging	JAX in coordination with vessel surveys— study design to be developed.
Passive Acoustics – Baseline	Continue recording and data analysis for 3 strategically located HARPs.
Passive Acoustics – Exercise Monitoring	2 deployments of pop-up buoys in conjunction with exercises.

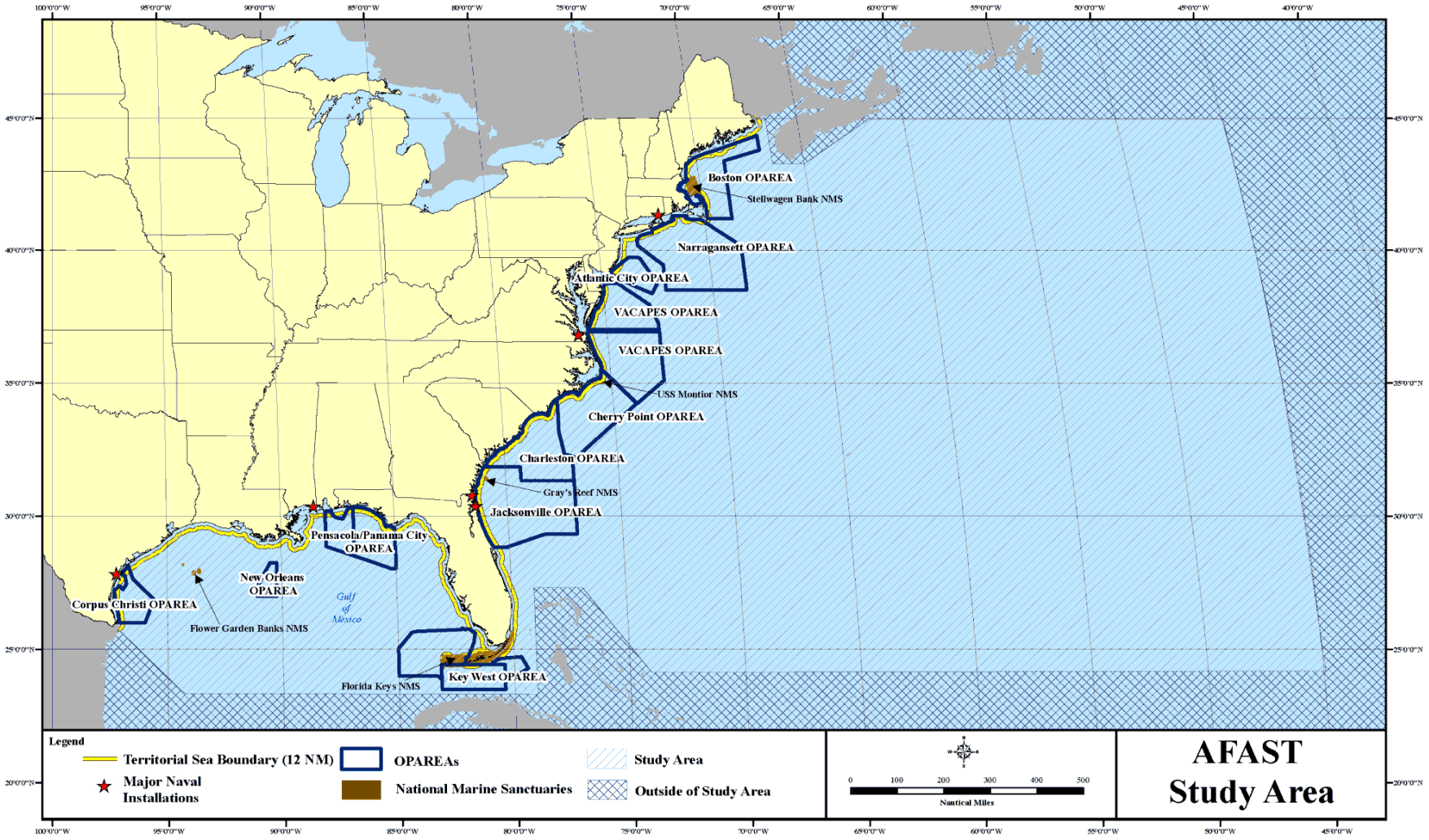

Figure 1. AFAST Study Area.

2. AFAST Monitoring Accomplishments for the Reporting Period

During the 02 August 2011–01 August 2012 reporting period, U.S. Fleet Forces (USFF) implemented aerial and vessel surveys, analyzed previously collected PAM data, and deployed PAM devices. The monitoring effort for the reporting period was conducted in three primary locations—off Cape Hatteras, North Carolina, within the Virginia Capes (VACAPES) OPAREA; Onslow Bay within the Cherry Point (CHPT) OPAREA; and the Jacksonville (JAX) OPAREA. These locations serve as primary study areas for longitudinal baseline-monitoring efforts. These sites are also the primary locations for coordinated anti-submarine warfare (ASW) exercise monitoring events.

During the AMR process preceding AFAST monitoring in 2012, the U.S. Navy had proposed to reallocate some survey effort to support new initiatives that would more directly contribute to addressing the objectives of the ICMP. The modification did not include a change in overall effort, but rather was intended to enable the U.S. Navy to take advantage of additional monitoring locations within the VACAPES (Cape Hatteras survey area), CHPT (Onslow Bay survey area), and JAX OPAREAs and employ various research techniques to address the questions proposed in the AFAST Monitoring Plan.

Total Fleet Forces Command investment in program development (ICMP, SAG, Strategic Plan), AFAST monitoring fieldwork, analysis, and reporting was $2.9 million in FY 2011 and $3.3 million in FY 2012. **Appendix B** includes a listing of publications and presentations resulting from the AFAST monitoring program to date.

Major accomplishments from the USFF's compliance monitoring in the AFAST Study Area for this reporting period (August 2011–July 2012) include:

- Aerial Visual Surveys
    - Conducted monthly aerial surveys (weather permitting) at Cape Hatteras and JAX sites to obtain longitudinal data trends.
    - Conducted aerial surveys before and after an ASW training event in VACAPES.
    - Conducted aerial surveys before, during, and after an ASW training event in JAX.
- Vessel Visual Surveys
    - Conducted monthly vessel surveys (weather permitting) at Cape Hatteras, Onslow Bay, and JAX sites to obtain longitudinal data trends.
    - Conducted photo-identification efforts, collecting large numbers of photographs—3,453 at Cape Hatteras of short-finned pilot whales (*Globicephala macrorynchus*), common bottlenose dolphins (herein referred to as bottlenose dolphin, *Tursiops truncatus*), short-beaked common dolphins (herein referred to as common dolphin, *Delphinus delphis*), sperm whales, humpback whales, and fin whales; 489 at Onslow Bay of Atlantic spotted dolphins (*Stenella frontalis*) and bottlenose dolphins; and 933 at JAX of bottlenose dolphins and Atlantic spotted dolphins.
    - Conducted biopsy-sampling efforts, collecting 43 samples at Cape Hatteras of short-finned pilot whales, bottlenose dolphins, and common dolphins; 5 samples at Onslow Bay from Atlantic spotted dolphins and bottlenose dolphins; and 31 samples at JAX of bottlenose dolphins and Atlantic spotted dolphins.

- Completed vessel surveys during an ASW training event in JAX. During the event, the MMOs visually surveyed the shutdown zone (200 yards) for protected marine species.

- Passive Acoustic Monitoring
  - Maintained three High-frequency Acoustic Recording Packages (HARPs) in VACAPES/CHPT/JAX—total of four deployments (two in Onslow Bay, one in JAX, and one off Cape Hatteras).
  - Deployed Marine Autonomous Recording Units (MARU; i.e., pop-up buoys) in JAX for acoustic monitoring before, during, and after an ASW training event.
  - Invested heavily in analysis of previously collected PAM data.
  - Invested in development of odontocete detectors and classifiers specific to species in the AFAST Study Area to support future passive acoustic data analysis.
- Marine Mammal Observers on U.S. Navy Platform
  - Three MMOs were deployed during an Anti-Submarine Warfare Exercise (ASWEX) training event onboard the ship using MFAS. During the use of MFAS, the shutdown zone was 200 yards. No animals were sighted during the use of MFAS.
- Observer Effectiveness Study
  - Funded development of additional novel analysis methodology and proof-of-concept.
  - Continued data-collection trials as opportunities became available.

Tables 2-4 present monitoring accomplishments for several related time-frames. **Table 2** summarizes the monitoring accomplishments for 02 August 2011 through 01 August 2012, corresponding to the period covered by this annual report. **Table 3** presents a summary of the major accomplishments for U.S. Navy-funded monitoring of protected marine species within the AFAST Study Area to date during the fourth year of the LOA (22 January 2012 through 01 August 2012). As mentioned in **Section I**, because the reporting period (02 August 2011 through 01 August 2012) spans across two annual LOAs, **Table 4** provides a summary of accomplishments for 22 January 2011 through 21 January 2012, corresponding to the third full LOA period. For the monitoring events that could not be accomplished due to safety issues, weather, and/or changing ship schedules, the U.S. Navy will continue working with NMFS to develop the best plan to either capture these events during the remaining permit period or to focus those resources on monitoring that would better achieve the overarching goals of the monitoring program.

Table 2. U.S. Navy-funded monitoring accomplishments within the AFAST Study Area for the period covered by this annual report (02 August 2011 through 01 August 2012).

Study Type	Description of U.S. Navy EIS/LOA monitoring	Associated event type	MMPA/ESA requirement	Accomplished[1]
Aerial surveys – during training event (studies 1 and 3)	n/a	SEASWITI, shallow COMPTUEX, or ULT	1 event in conjunction with a SEASWITI, shallow COMPTUEX, or ULT exercise.	2 events: 31 Aug & 10 Sept 2011 ASW monitoring, VACAPES; Sept 2011 ASW monitoring, JAX
Aerial surveys – before and after training event (studies 2 and 4)	n/a	SEASWITI, shallow COMPTUEX, or ULT	1 event in conjunction with a SEASWITI, shallow COMPTUEX, or ULT exercise.	2 events: 31 Aug & 10 Sept 2011 ASW monitoring, VACAPES; Sept 2011 ASW monitoring, JAX
Aerial surveys – Onslow Bay and JAX (study 2)	1) Monthly surveys in Onslow Bay 2) Monthly surveys in JAX 3) Surveys off Cape Hatteras	n/a	36 days.	29 days: 14 days Hatteras; 0 days Onslow Bay; 15 days JAX
Vessel surveys – during training event (study 3)	n/a	SEASWITI, shallow COMPTUEX, or ULT	2 events in conjunction with SEASWITI, shallow COMPTUEX, or ULT exercises.	1 event: July 2012, ASW monitoring, JAX
Vessel surveys—Onslow Bay and JAX (study 2)	1) Monthly surveys at Cape Hatteras 2) Monthly surveys in Onslow Bay 3) Monthly surveys in JAX	n/a	24 days.	19 days: 10 days in Hatteras; 3 days in Onslow Bay; 5 days in JAX. 79 biopsies collected: Hatteras (43), Onslow Bay (5), JAX (31).
Marine Mammal Observers (studies 1 and 3)		SEASWITI or ULT	2 events in conjunction with exercises.	1 event: July 2012, ASW monitoring, JAX
Passive Acoustic Monitoring (study 2)	1) Maintenance of 4 HARPs (2 in Onslow Bay and 2 in JAX) 2) Use of pop-up buoys for exercise monitoring 3) Use of towed array during vessel surveys	SEASWITI, shallow COMPTUEX, or ULT	2 deployments of pop-up buoys in conjunction with exercises. Continue recording and data analysis for 3 strategically-located HARPs.	3 deployments of HARPs, in Hatteras, Onslow Bay, and JAX
MMO/Lookout Comparison Study	Develop observer comparison study and perform trials		40 hr data-collection trials.	Completed study design and initial pilot study analysis. Continued methods refinement and data collection
Tagging		n/a	JAX in coordination with vessel surveys - study design to be developed.	0 individuals

Key: ASW=anti-submarine warfare; COMPTUEX=Composite-Training Unit Exercise; ESA=Endangered Species Act; EIS=Environmental Impact Statement; HARP=High-frequency Acoustic Recording Package; JAX=Jacksonville; LOA=Letter of Authorization; MMO=Marine Mammal Observer; MMPA=Marine Mammal Protection Act; SEASWITI=Southeast Anti-Submarine Warfare Integration Training Initiative; ULT=Unit-Level Training

Table 3. U.S. Navy-funded monitoring accomplishments within the AFAST Study Area for 2012 corresponding to the fourth year LOA period to date (22 January through 01 August).

Study Type	Description of U.S. Navy EIS/LOA Monitoring	Associated Event Type	MMPA/ESA Requirement	Accomplished[1]
Aerial surveys – during training event (studies 1 and 3)	n/a	SEASWITI, shallow COMPTUEX, or ULT	1 event in conjunction with a SEASWITI, shallow COMPTUEX, or ULT exercise.	0 events
Aerial surveys – before and after training event (studies 2 and 4)	n/a	SEASWITI, shallow COMPTUEX, or ULT	1 event in conjunction with a SEASWITI, shallow COMPTUEX, or ULT exercise.	0 events
Aerial surveys – Onslow Bay and JAX (study 2)	1) Monthly surveys in Onslow Bay 2) Monthly surveys in JAX 3) Surveys off Cape Hatteras	n/a	36 days.	20 days: 10 days Hatteras; 0 days Onslow Bay; 10 days JAX
Vessel surveys – during training event (study 3)	n/a	SEASWITI, shallow COMPTUEX, or ULT	2 events in conjunction with SEASWITI, shallow COMPTUEX, or ULT exercises.	1 event: July 2012, ASW monitoring, JAX
Vessel surveys— Onslow Bay and JAX (study 2)	1) Monthly surveys at Cape Hatteras 2) Monthly surveys in Onslow Bay 3) Monthly surveys in JAX	n/a	24 days.	19 days: 10 days in Hatteras; 3 days in Onslow Bay; 5 days in JAX. 69 biopsies collected: Hatteras (43), Onslow Bay (3), JAX (23).
Marine Mammal Observers (studies 1 and 3)		SEASWITI or ULT	2 events in conjunction with exercises.	1 event: July 2012, ASW monitoring, JAX
Passive Acoustic Monitoring (study 2)	1) Maintenance of 4 HARPs (2 in Onslow Bay and 2 in JAX) 2) Use of pop-up buoys for exercise monitoring 3) Use of towed array during vessel surveys	SEASWITI, shallow COMPTUEX, or ULT	2 deployments of pop-up buoys in conjunction with exercises. Continue recording and data analysis for 3 strategically-located HARPs.	3 deployments of HARPs, in Hatteras, Onslow Bay, and JAX
MMO/Lookout Comparison Study	Develop observer comparison study and perform trials		40 hr data-collection trials.	-Funded development of additional novel analysis methodology and proof of concept Continued data-collection trials as opportunities became available.
Tagging		n/a	JAX in coordination with vessel surveys - study design to be developed.	0 individuals

[1] Accomplishments only cover approximately the first 6 months of the current LOA period. Activities counting toward fulfillment of 2012 commitments are ongoing through 21 January 2013.

Key: ASW=anti-submarine warfare; COMPTUEX=Composite-Training Unit Exercise; ESA=Endangered Species Act; EIS=Environmental Impact Statement; HARP=High-frequency Acoustic Recording Package; JAX=Jacksonville; LOA=Letter of Authorization; MMO=Marine Mammal Observer; MMPA=Marine Mammal Protection Act; SEASWITI=Southeast Anti-Submarine Warfare Integration Training Initiative; ULT=Unit-Level Training

Table 4. U.S. Navy-funded monitoring accomplishments within the AFAST Study Area from 22 January 2011 through 21 January 2012, corresponding to the third year LOA period.

Study Type	Description of U.S. Navy EIS/LOA Monitoring	Associated Event Type	MMPA/ESA Requirement	Accomplished
Aerial surveys – during training event (studies 1 and 3)	n/a	SEASWITI, shallow COMPTUEX, or ULT	1 event in conjunction with a SEASWITI, shallow COMPTUEX, or ULT exercise.	2 events: 31 Aug & 10 Sept 2011 ASW monitoring, VACAPES; Sept 2011 ASW monitoring, JAX
Aerial surveys – before and after training event (studies 2 and 4)	n/a	SEASWITI, shallow COMPTUEX, or ULT	1 event in conjunction with a SEASWITI, shallow COMPTUEX, or ULT exercise.	2 events: 31 Aug & 10 Sept 2011 ASW monitoring, VACAPES; Sept 2011 ASW monitoring, JAX
Aerial surveys – Onslow Bay and JAX (study 2)	1) Monthly surveys in Onslow Bay 2) Monthly surveys in JAX 3) Surveys off Cape Hatteras	n/a	36 days.	33 days: 10 days in Hatteras, 4 days in Onslow Bay, 19 days in JAX
Vessel surveys – during training event (study 3)	n/a	SEASWITI, shallow COMPTUEX, or ULT	2 events in conjunction with SEASWITI, shallow COMPTUEX, or ULT exercises.	1 event: July 2012, ASW monitoring, JAX
Vessel surveys— Onslow Bay and JAX (study 2)	1) Monthly surveys in Onslow Bay 2) Monthly surveys in JAX 3) Behavioral response study off Cape Hatteras	n/a	24 days.	18 days: 6 days in Hatteras; 5 days in Onslow Bay; 7 days in JAX. 34 biopsies collected: Hatteras (24), Onslow Bay (2), JAX (8). 11 D-tags deployed in Hatteras.
Marine Mammal Observers (studies 1 and 3)		SEASWITI or ULT	2 events in conjunction with exercises.	1 event: July 2012, ASW monitoring, JAX
Passive Acoustic Monitoring (study 2)	1) Maintenance of 4 High-frequency Recording Packages (HARPs) (2 in Onslow Bay and 2 in JAX) 2) Use of pop-up buoys for exercise monitoring 3) Use of towed array during vessel surveys	SEASWITI, shallow COMPTUEX, or ULT	2 deployments of pop-up buoys in conjunction with exercises. Continue recording and data analysis for 3 strategically located HARPs	4 deployments of HARPs; deployment of 12 pop-ups during JAX ASWEX
MMO/Lookout Comparison Study	Develop observer comparison study and perform trials		40 hr data-collection trials.	Completed study design and initial pilot study analysis. Continued methods refinement and data collection
Tagging		n/a	JAX in coordination with vessel surveys - study design to be developed.	0 individuals

Key: ASW=anti-submarine warfare; ASWEX=Anti-submarine Warfare Training Exercise; COMPTUEX=Composite-Training Unit Exercise; ESA=Endangered Species Act; EIS=Environmental Impact Statement; HARP=High-frequency Acoustic Recording Package; JAX=Jacksonville; LOA=Letter of Authorization; MMO=Marine Mammal Observer; MMPA=Marine Mammal Protection Act; n/a=not applicable; SEASWITI=Southeast Anti-Submarine Warfare Integration Training Initiative; ULT=Unit-Level Training

3. Longitudinal Baseline Monitoring – VACAPES/CHPT/JAX

In 2005, the U.S. Navy contracted with a consortium of researchers from Duke University, the University of North Carolina at Wilmington (UNCW), the University of St. Andrews, and the NMFS Northeast Fisheries Science Center (NEFSC) to conduct a pilot study and to develop subsequently a survey and monitoring plan. The plan included a recommended approach for data collection at the proposed site of the Undersea Warfare Training Range (USWTR) in Onslow Bay off the coast of North Carolina. The identified methods included surveys (aerial/shipboard, frequency, spatial extent, etc.), PAM, photo-identification, and data analysis (e.g., standard line-transect, spatial modeling) appropriate to establish a fine-scale seasonal baseline of protected species distribution and abundance (DoN 2010). As a result, a protected marine species monitoring program was initiated in June 2007 in Onslow Bay. Due to a re-evaluation of the proposed location for USWTR, the preferred location was changed to the JAX OPAREA, and subsequently a parallel monitoring program was initiated in January 2009 at the proposed USWTR site off the coast of Jacksonville, Florida (DoN 2010). In 2011, the program expanded beyond the previous Onslow Bay focus site to include a region of high U.S. Navy training activity off the coast of Cape Hatteras to the north, which also serves to complement a pilot whale behavioral study that was initiated in that region at the same time. The overall approach to program design and methods has been consistent with the work that has been performed in Onslow Bay over the past 5 years, and work across the locations continues to evolve in response to the AMR process and changing priorities.

In 2012, the longitudinal baseline study consisted of year-round multi-disciplinary monitoring through the use of aerial and vessel-based visual surveys, photo-identification studies, biopsy sampling, and PAM with HARPs. Monthly visual surveys were conducted year-round (weather permitting) using sets of established track lines and standard Distance-sampling techniques. Recent changes in the overall approach to the longitudinal baseline monitoring component of the AFAST program are discussed in **Section III** – *Adaptive Management Recommendations*. A summary of accomplishments and basic results of these monitoring efforts for the reporting period is presented in the following subsections. The annual reporting period for this component of the AFAST monitoring program has been adjusted to avoid bisecting the field season and to allow researchers sufficient time to conduct analyses. As a result, the most recent "annual" report covering activities for June 2010 through December 2011 is provided in **Appendix C**. Future reports on this component of the AFAST monitoring program will cover a full calendar year and be made available through the U.S. Navy's Marine Species Monitoring Program web portal (www.navymarinespeciesmonitoring.com) in approximately March of each year. In addition, presentations from the annual review meeting and monthly progress reports for August 2011 through July 2012, covering all three locations (Cape Hatteras, Onslow Bay, and JAX), are provided in **Appendix D** **and** **Appendix E**.

Although the initial intent of the Onslow Bay and JAX monitoring program was to support development of the planned USWTR, the program has evolved into established fixed sites for the overall AFAST monitoring program. The intention was to provide robust baseline data supporting projects designed to examine the potential long-term effects to marine species that may be chronically exposed to ASW training as the USWTR is completed and becomes operational. The monitoring work at these sites provides a longitudinal baseline of marine species distribution and abundance in key U.S. Navy training areas during periods when training is not occurring. In addition, these sites are also used as areas to conduct coordinated ASW exercise monitoring employing a variety of methods including aerial/shipboard visual surveys and temporary fixed passive-acoustic arrays. Monitoring both during and outside (pre- and post-) of training events is intended to gather important data that will begin to address the questions outlined in the Introduction.

3.1 VACAPES/CHPT/JAX Aerial Visual Surveys

Figure 2 shows the Cape Hatteras, Onslow Bay, and Jacksonville survey areas with established tracklines used for line-transect aerial surveys. Aerial surveys were conducted using standard Distance-sampling protocols in all sites. During the current reporting period (August 2011 through July 2012), the Cape Hatteras and JAX sites were surveyed. No aerial surveys of the Onslow Bay survey site were conducted during the current reporting period. **Appendix C** provides a detailed report of survey data and analyses for July 2010 through December 2011. **Appendix E** provides individual detailed monthly progress reports for August 2011 through July 2012.

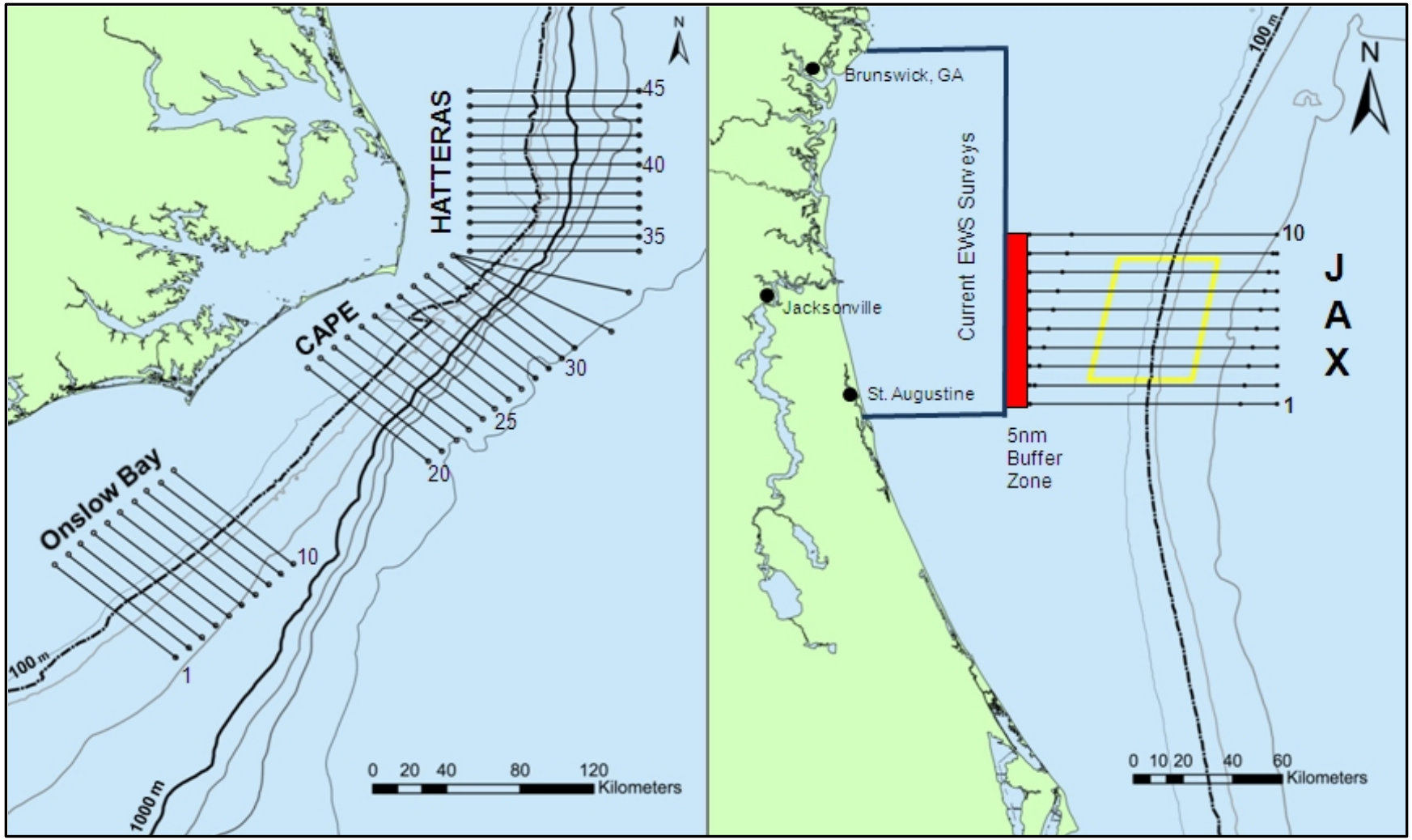

Figure 2. Cape Hatteras, Onslow Bay, and Jacksonville survey areas and established tracklines used for longitudinal baseline monitoring. Aerial surveys at the Jacksonville location are coordinated with the North Atlantic right whale Early Warning System (EWS) surveys to maximize coverage of potential right whale ocurrence within the region.

3.1.1 VACAPES (Cape Hatteras)

Fourteen days of aerial survey effort were conducted during 02 August 2011 through 01 August 2012. Aerial survey coverage was 118 tracklines. Observations included the identification of 14 cetacean, 2 sea turtle, and 4 pelagic fish species within the survey area. Sightings and effort data are presented in **Tables 5 and 6**, and **Figures 3 and 4**. No aerial surveys were conducted during August, September, and December 2011, and April and July 2012, due to unfavorable weather conditions.

Several notable sightings were made during this monitoring period from the Hatteras aerial surveys. During October 2011, the team encountered four species of cetaceans not yet observed during U.S. Navy marine species monitoring efforts off Cape Hatteras, including a fin whale, a pygmy/dwarf sperm whale (*Kogia* spp.), and a large multi-species group of Clymene dolphins (*Stenella clymene*) and spinner dolphins (*Stenella longirostris*). During January 2012, two species of baleen whales were observed that had not previously been recorded during effort off Cape Hatteras—a single humpback whale and a pair of minke whales (*Balaenoptera acutorostrata*). During February 2012, two groups (250 and 450 individuals) of striped dolphins (*Stenella coeruleoalba*) were sighted; this species had not been recorded previously during the team's monitoring efforts off Cape Hatteras. During mid-March 2012, a minke whale cow/calf pair was observed during 2 consecutive days of aerial monitoring. Multi-species groups of common and striped dolphins were also recorded. The melon-headed whale (*Peponocephala electra*) was a new (to the Hatteras survey effort) species observed. The survey team also documented a humpback whale carcass that was heavily scavenged. A sighting during May 2012 of Risso's dolphins (*Grampus griseus*) marked the first aerial observation of this species in this survey area since effort began in May 2011. Also during May 2012 was the first aerial observation of a whale shark (*Rhincodon typus*) in Hatteras during U.S. Navy monitoring efforts.

Table 5. Sightings from aerial surveys conducted in the Cape Hatteras survey area, August 2011 through July 2012.

Common Name	Scientific Name	# of Sightings	# of Individuals
Bottlenose Dolphin	*Tursiops truncatus*	46	990
Short-finned Pilot Whale	*Globicephala macrorhynchus*	21	265
Sperm Whale	*Physeter macrocephalus*	4	5
Unidentified Beaked Whale	*Mesoplodon* spp.	7	15
Common Dolphin	*Delphinus delphis*	8	675
Atlantic Spotted Dolphin	*Stenella frontalis*	7	210
Unidentified Cetacean		4	5
Unidentified Delphinid		6	38
Cuvier's Beaked Whale	*Ziphius cavirostris*	6	10
Fin Whale	*Balaenoptera physalus*	5	8
Striped Dolphin	*Stenella coeruleoalba*	4	885
Minke Whale	*Balaenoptera acutorostrata*	4	8
Clymene Dolphin	*Stenella clymene*	3	235
Risso's Dolphin	*Grampus griseus*	3	28
Humpback Whale	*Megaptera novaeangliae*	2	2
Melon-headed Whale	*Peponocephala electra*	2	395
Spinner Dolphin	*Stenella longirostris*	1	70
Unidentified Kogiid	*Kogia* spp.	1	1
Unidentified *Balaenoptera*	*Balaenoptera* spp.	1	1
Loggerhead Turtle	*Caretta caretta*	39	60
Leatherback Turtle	*Dermochelys coriacea*	4	4
Unidentified Sea Turtle		6	6
Unidentified Shark		27	157
Manta Ray	*Manta birostris*	53	66
Cownose Ray	*Rhinoptera bonasus*	1	100
Ocean Sunfish	*Mola mola*	8	10
Whale Shark	*Rhincodon typus*	1	1

Table 6. Effort details for aerial surveys conducted in the Cape Hatteras survey area, August 2011 through July 2012.

Number of Survey Days	14
Total Hr Underway*	97.3
Total Tracklines Covered	118

* Total hr underway reported as Hobbs hr = total engine time

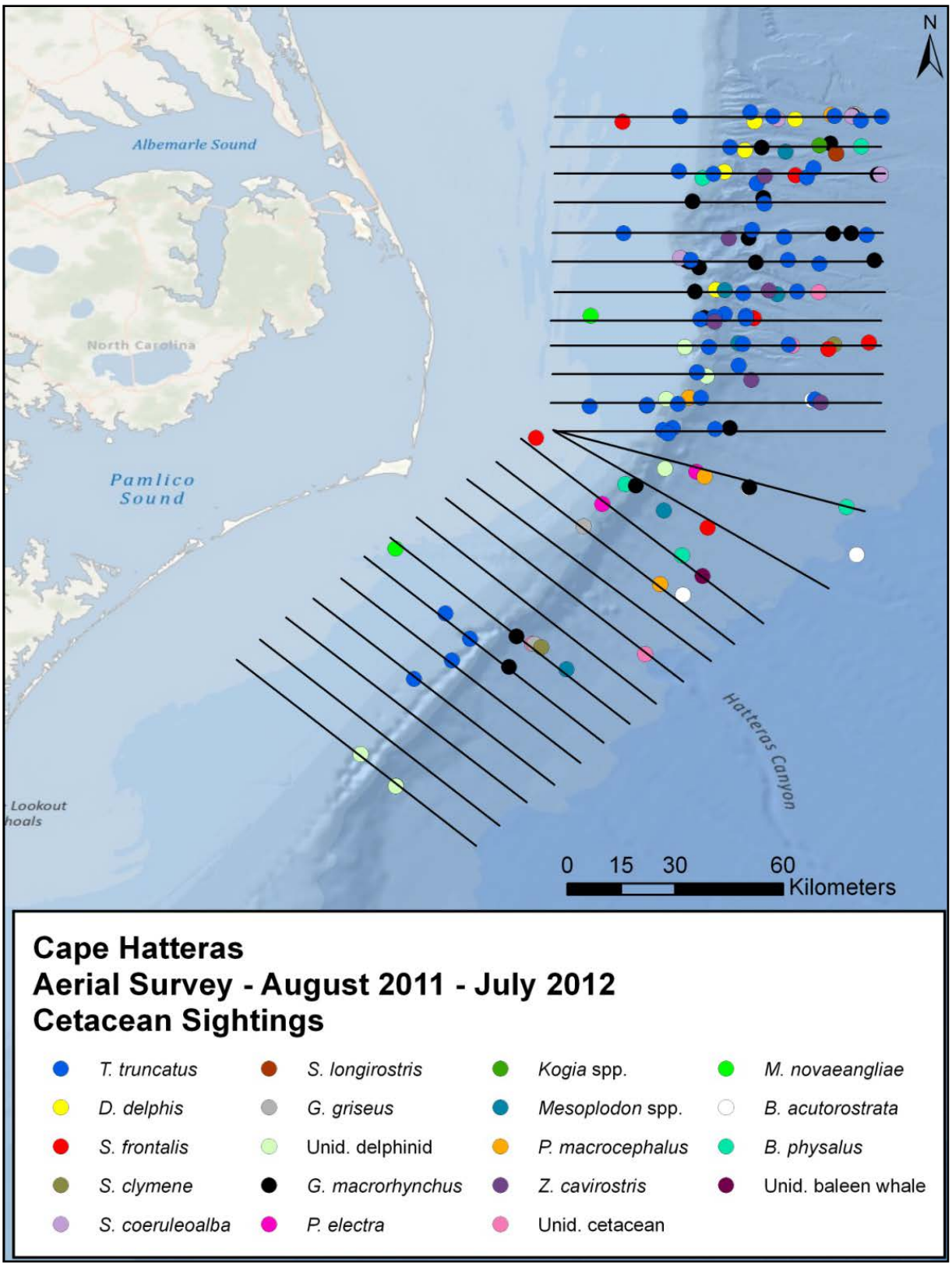

Figure 3. Locations of cetacean sightings from aerial surveys conducted in the Cape Hatteras survey area, August 2011 through July 2012.

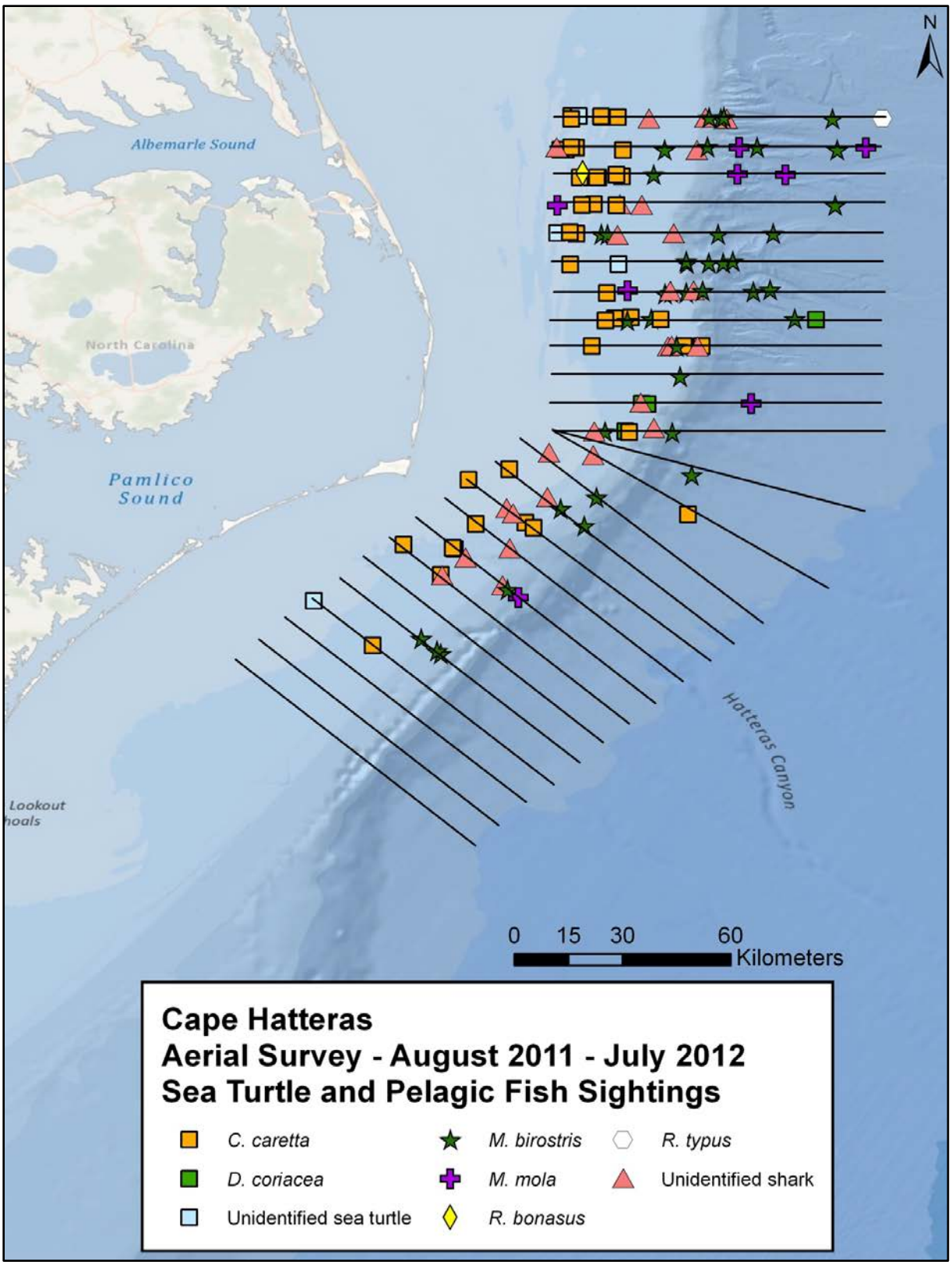

Figure 4. Locations of sea turtle and pelagic fish sightings from aerial surveys conducted in the Cape Hatteras survey area, August 2011 through July 2012.

3.1.2 Onslow Bay

No aerial surveys of the Onslow Bay survey site were conducted during the reporting period.

3.1.3 JAX

Fifteen days of aerial survey effort were conducted during this period. Aerial survey coverage was 134 tracklines. No survey effort was conducted in JAX in November and December 2011, and February and June 2012, due to unfavorable weather conditions. Observations included the identification of six cetacean, two sea turtle, and four pelagic fish species within the survey area. Sightings and effort details are presented in **Tables 7 and 8**, and **Figures 5, 6, and 7**.

Table 7. Sightings from aerial surveys conducted in the JAX survey area, August 2011 through July 2012.

Common Name	Scientific Name	# of Sightings	# of Individuals
Bottlenose Dolphin	*Tursiops truncatus*	54	560
Atlantic Spotted Dolphin	*Stenella frontalis*	40	810
Risso's Dolphin	*Grampus griseus*	9	134
Short-finned Pilot Whale	*Globicephala macrorhynchus*	4	25
Rough-toothed Dolphin	*Steno bredanensis*	2	78
Unidentified Delphinid		2	3
Humpback Whale	*Megaptera novaeangliae*	1	1
Unidentified Cetacean		1	1
Loggerhead Turtle	*Caretta caretta*	289	453
Leatherback Turtle	*Dermochelys coriacea*	35	35
Unidentified Sea Turtle		26	34
Unidentified Shark		35	39
Manta Ray	*Manta birostris*	11	13
Ocean Sunfish	*Mola mola*	5	5
Cownose Ray	*Rhinoptera bonasus*	1	200
Whale Shark	*Rhincodon typus*	1	1

Table 8. Effort details for aerial surveys conducted in the JAX survey area, August 2011 through July 2012.

Number of Survey Days	15
Total Hr Underway*	19
Total Tracklines Covered	134

* Total hr underway reported as Hobbs hr = total engine time

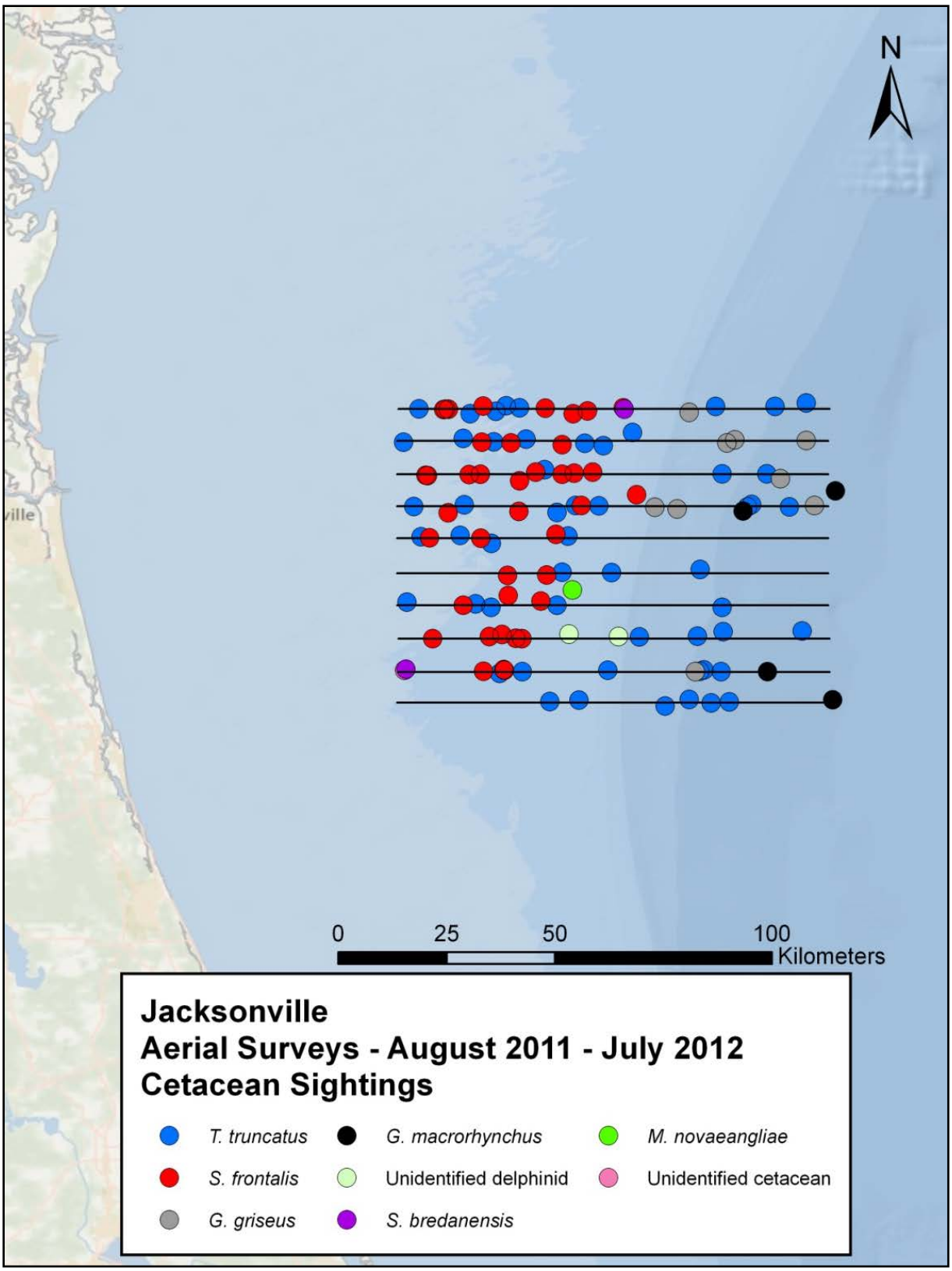

Figure 5. Locations of cetacean sightings from aerial surveys conducted in the JAX survey area, August 2011 through July 2012.

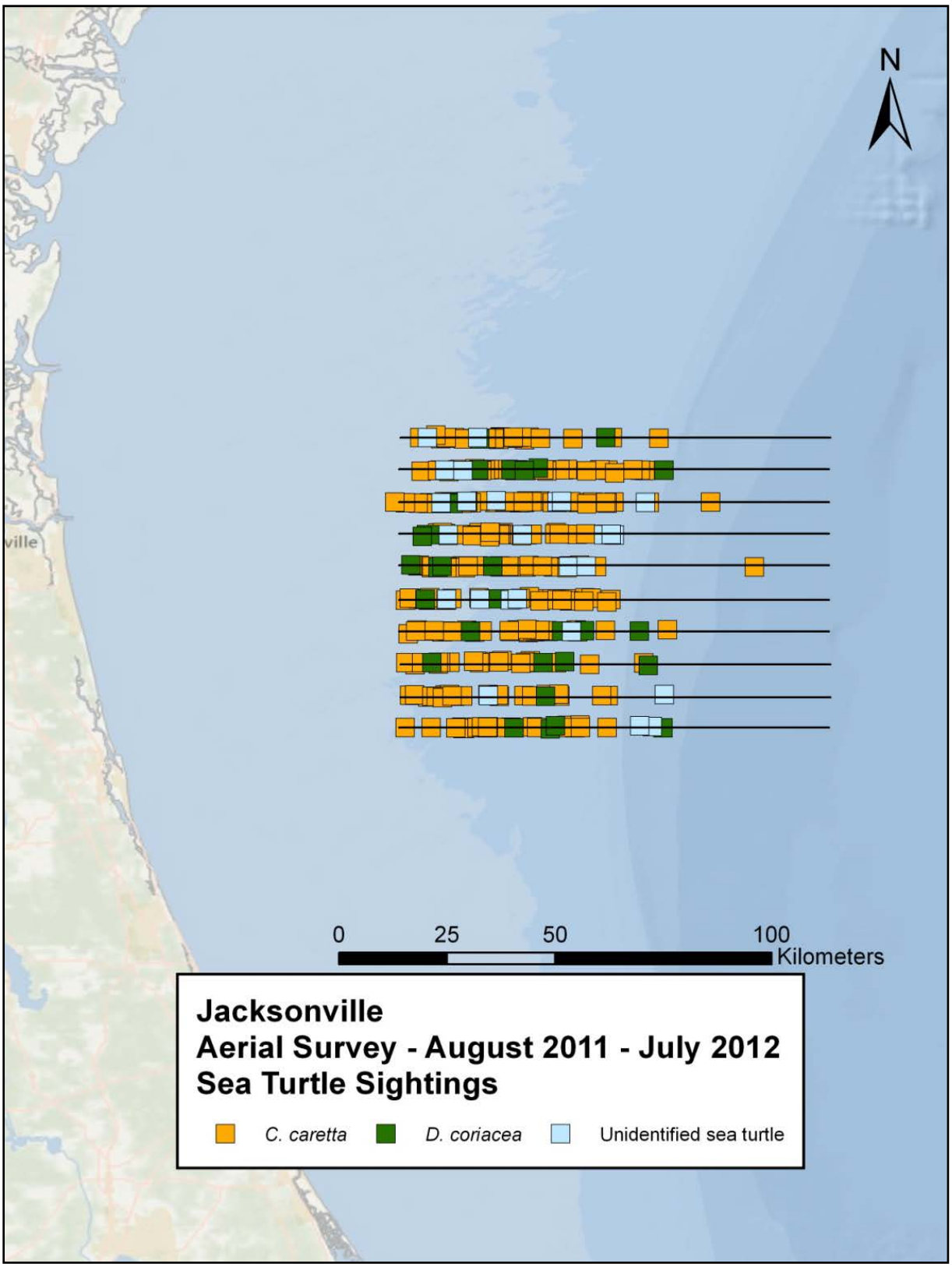

Figure 6. Locations of sea turtle sightings from aerial surveys conducted in the JAX survey area, August 2011 through July 2012.

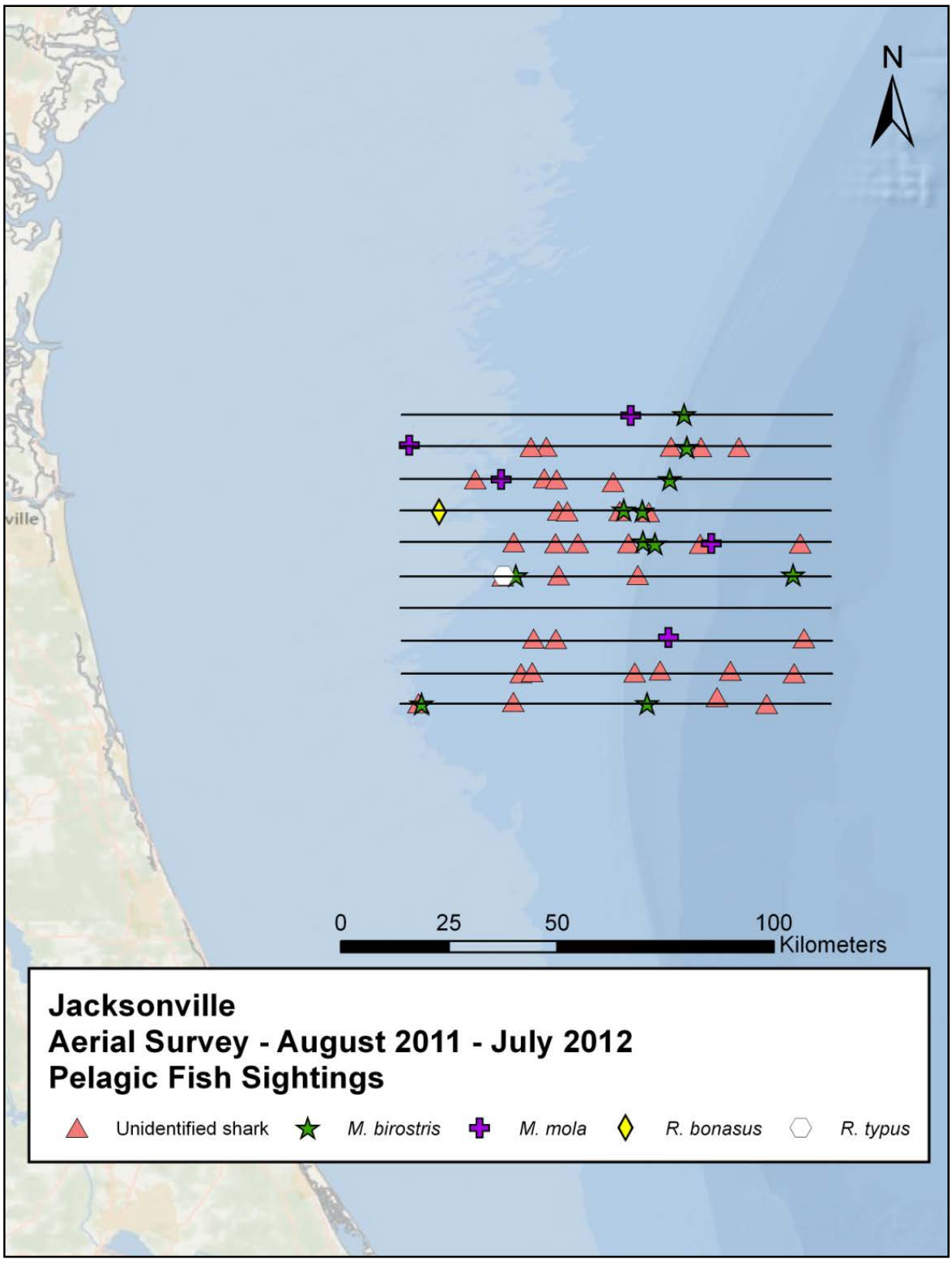

Figure 7. Locations of pelagic fish sightings from aerial surveys conducted in the JAX survey area, August 2011 through July 2012.

The following includes information on notable sightings made this monitoring period during JAX aerial surveys. During October 2011, a large group of 43 rough-toothed dolphins (*Steno bredanensis*) were recorded; the individuals remained stationary at the surface throughout observations. Prior to this sighting, this species had not been observed during U.S. Navy marine species monitoring efforts in JAX since October 2010. During January 2012, a humpback whale was observed breaching inshore of the shelf break.

3.2 VACAPES/CHPT/JAX Vessel Visual Surveys

Vessel surveys integrating biopsy and photo-identification protocols were conducted in the Cape Hatteras, Onslow Bay, and JAX survey areas from 01 August 2011 through 31 July 2012.

3.2.1 Cape Hatteras

Ten biopsy and photo-identification sampling surveys were conducted from August 2011 to July 2012. No surveys were conducted during August, and October through December 2011, and January, April, and July 2012 due to unfavorable weather conditions. Most survey effort was concentrated along the shelf break and occasionally extended into deeper pelagic waters. Sightings and survey effort are presented in **Tables 9 and 10,** and **Figures 8 and 9.**

Table 9. Sightings from vessel surveys conducted in the Cape Hatteras survey area, August 2011 through July 2012.

Common Name	Scientific Name	# of Sightings	# of Individuals
Short-finned Pilot Whale	*Globicephala macrorhynchus*	33	2,437
Bottlenose Dolphin	*Tursiops truncatus*	33	798
Common Dolphin	*Delphinus delphis*	11	2,370
Atlantic Spotted Dolphin	*Stenella frontalis*	2	86
Sperm Whale	*Physeter macrocephalus*	2	7
Fin Whale	*Balaenoptera physalus*	1	3
Humpback Whale	*Megaptera novaeangliae*	1	1
Cuvier's Beaked Whale	*Ziphius cavirostris*	1	2
Loggerhead Turtle	*Caretta caretta*	1	1

Table 10. Effort details for vessel surveys conducted in the Cape Hatteras survey area, August 2011 through July 2012.

Number of Survey Days	10
Total Survey Time (hr:min)	91:51
Time On Effort (hr:min)	60:11
Total km Surveyed	512.6

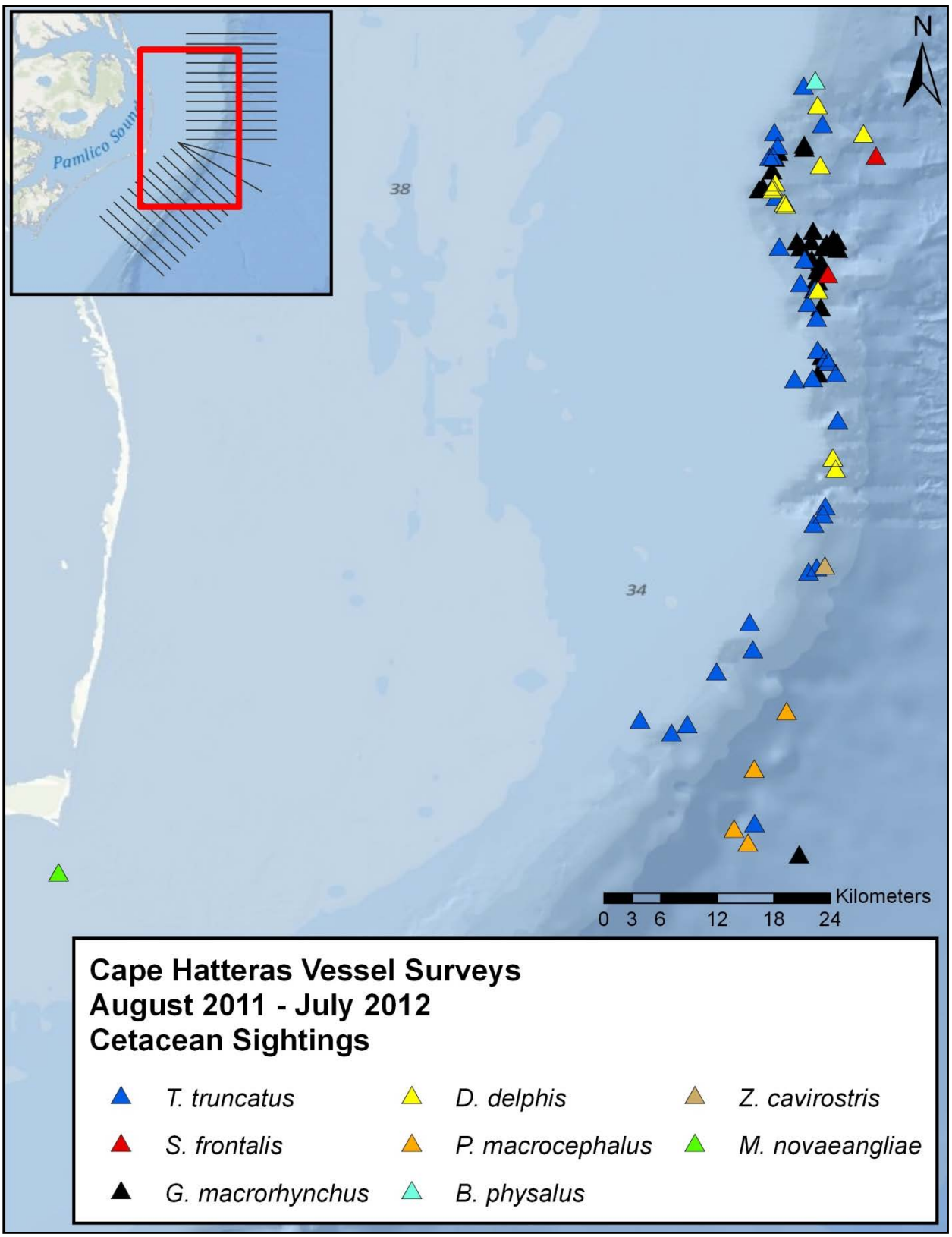

Figure 8. Locations of cetacean sightings from vessel surveys conducted in the Cape Hatteras survey area, August 2011 through July 2012.

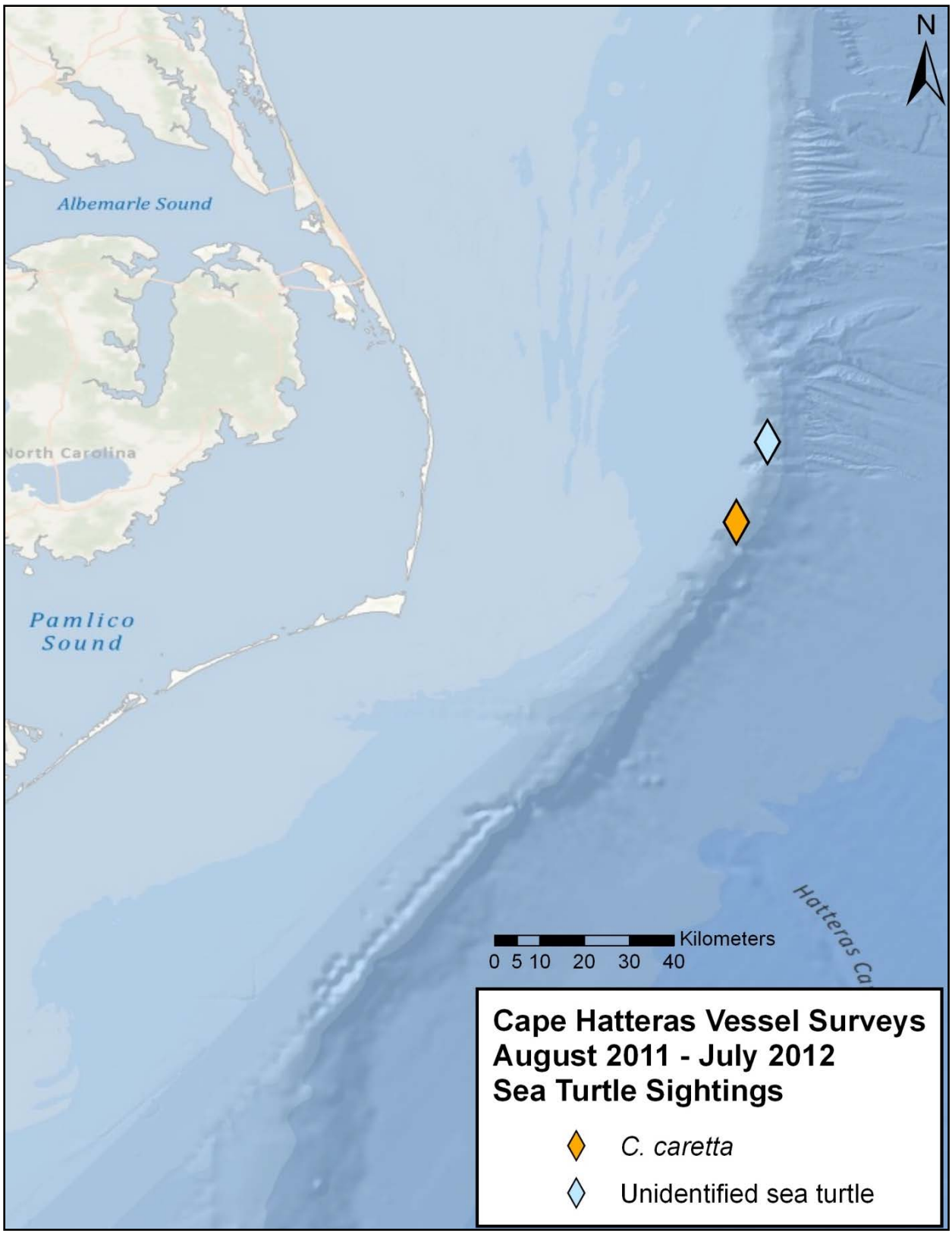

Figure 9. Locations of sea turtle sightings from vessel surveys conducted in the Cape Hatteras survey area, August 2011 through July 2012.

Forty-three biopsy samples were collected from three species during vessel surveys off Cape Hatteras: short-finned pilot whale (*n*=29), bottlenose dolphin (*n*=9), and common dolphin (*n*=5) (**Table 11**). A total of 3,453 photographs were taken of six species: short-finned pilot whale, bottlenose dolphin, common dolphin, sperm whale, humpback whale, and fin whale (**Table 12**).

Table 11. Biopsy samples taken from animals in the Cape Hatteras survey area, August 2011 through July 2012.

Common Name	Scientific Name	Samples
Short-finned Pilot Whale	*Globicephala macrorhynchus*	29
Bottlenose Dolphin	*Tursiops truncatus*	9
Common Dolphin	*Delphinus delphis*	5

Table 12. Photographs taken of animals in the Cape Hatteras survey area, August 2011 through July 2012.

Common Name	Scientific Name	Photos Taken	Catalog Size to Date	Matches to Date
Short-finned Pilot Whale	*Globicephala macrorhynchus*	2,370	n/a	n/a
Bottlenose Dolphin	*Tursiops truncatus*	458	n/a	n/a
Common Dolphin	*Delphinus delphis*	411	n/a	n/a
Sperm Whale	*Physeter macrocephalus*	171	n/a	n/a
Humpback Whale	*Megaptera novaeangliae*	39	n/a	n/a
Fin Whale	*Balaenoptera physalus*	4	n/a	n/a

3.2.2 Onslow Bay

Six biopsy and photo-identification sampling surveys were conducted from August 2011 through July 2012. No vessel surveys were conducted during August through October, and December 2011, and March through May and July 2012 due to unfavorable weather conditions. Some survey effort was conducted to the east of the original USWTR survey area, close to the 100-meter (m) isobath, to search for deep-diving odontocetes. This effort resulted in one confirmed sighting of a beaked whale. Sightings and effort are presented in **Tables 13 and 14,** and **Figures 10 and 11.**

Table 13. Sightings from vessel surveys conducted in the Onslow Bay survey area, August 2011 through July 2012.

Common Name	Scientific Name	# of Sightings	# of Individuals
Bottlenose Dolphin	*Tursiops truncatus*	4	42
Atlantic Spotted Dolphin	*Stenella frontalis*	2	45
Beaked Whale	*Mesoplodon* spp.	1	4
Loggerhead Turtle	*Caretta caretta*	1	1

Table 14. Effort details for vessel surveys conducted in the Onslow Bay survey area, August 2011 through July 2012.

Number of Survey Days	6
Total Survey Time (hr:min)	62:00
Time On Effort (hr:min)	29:55
Total km Covered	421.9

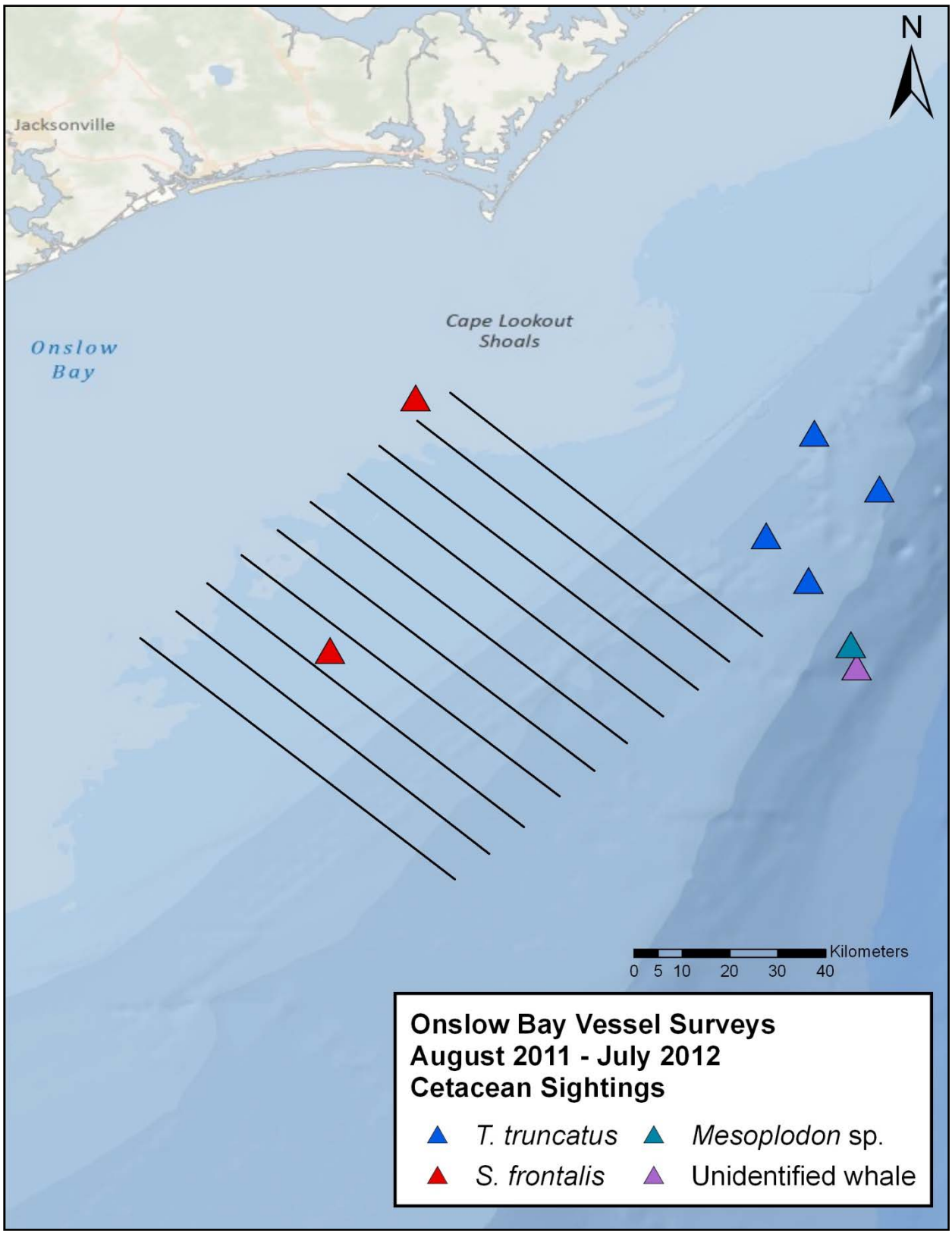

Figure 10. Locations of cetacean sightings from vessel surveys conducted in the Onslow Bay survey area, August 2011 through July 2012.

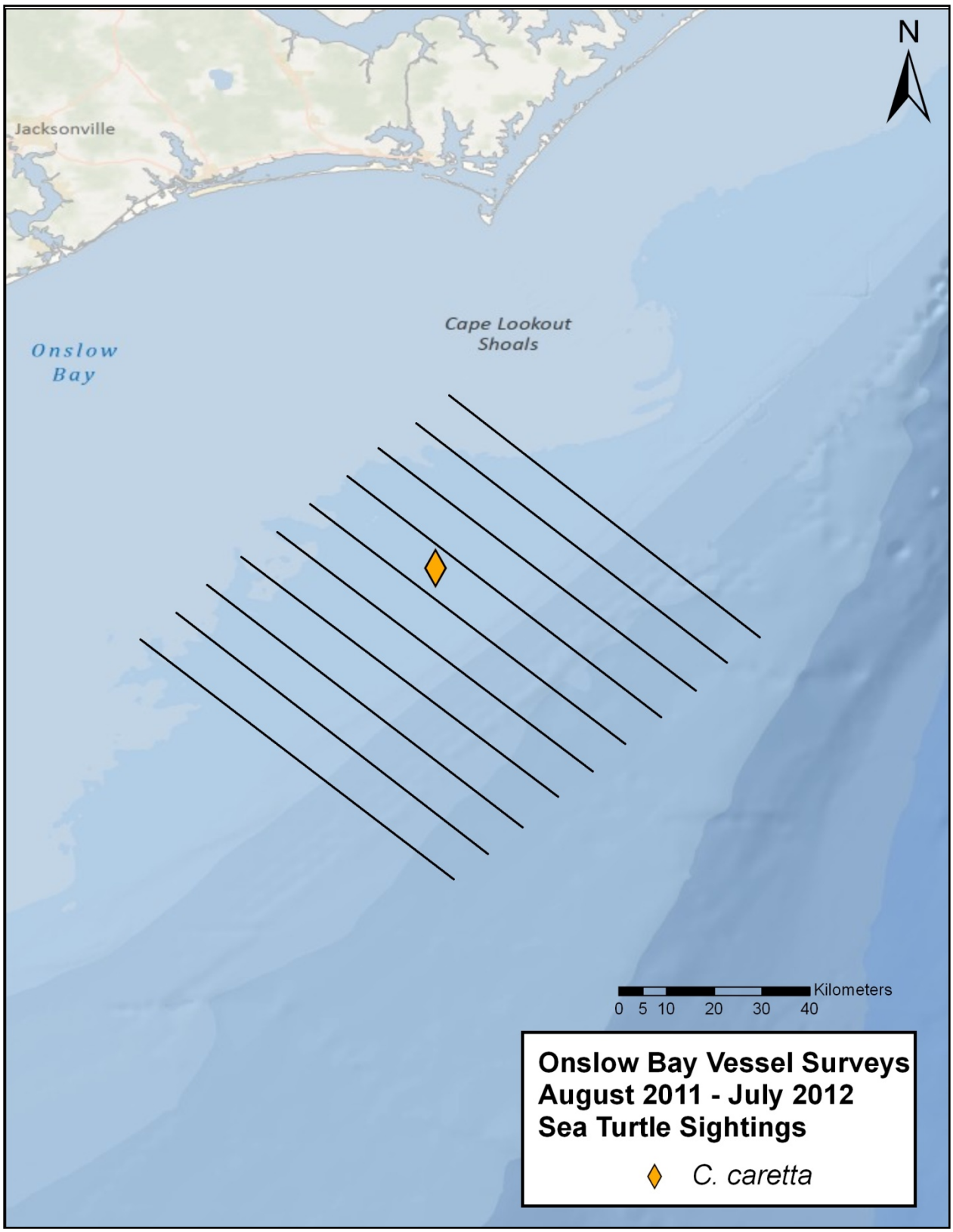

Figure 11. Locations of sea turtle sightings from vessel surveys conducted in the Onslow Bay survey area, August 2011 through July 2012.

Five biopsy samples were collected from two species during vessel surveys in Onslow Bay: bottlenose dolphin (*n*=3) and Atlantic spotted dolphins (*n*=2) (**Table 15**), and 489 photographs were taken of the same two species, with matches to the photo catalogs (**Table 16**). Information on the photo catalog sizes to date, for a total of five species, is found in **Table 16**. Photo-identification analysis conducted during February 2012 revealed that one of the Atlantic spotted dolphins biopsy-sampled in September 2011 was matched to an animal photographed on both 28 June 2001 and 24 June 2002 during surveys conducted in nearshore, coastal waters of Onslow Bay. In addition to the long-term match made in February 2012, several other re-sightings span periods of up to 4 years or more, suggesting at least some dolphin residency in the Onslow Bay survey area.

Table 15. Biopsy samples taken from animals in the Onslow Bay survey area, August 2011 through July 2012.

Common Name	Scientific Name	Number of Biopsies
Bottlenose Dolphin	*Tursiops truncatus*	3
Atlantic Spotted Dolphin	*Stenella frontalis*	2

Table 16. Photographs taken of animals in the Onslow Bay survey area, August 2011 through July 2012.

Common Name	Scientific Name	Photos Taken	Catalog Size to Date	Matches to Date
Atlantic Spotted Dolphin	*Stenella frontalis*	322	68	2
Bottlenose Dolphin	*Tursiops truncatus*	167	12	7
Short-finned Pilot Whale	*Globicephala macrorhynchus*	0	16	0
Risso's Dolphin	*Grampus griseus*	0	7	0
Rough-toothed Dolphin	*Steno bredanensis*	0	12	0

3.2.3 JAX

Eight biopsy and photo-identification surveys were conducted during this period. No vessel surveys were conducted in JAX during August through December 2011, and February and May through July 2012, due to unfavorable weather conditions. Two cetacean species (bottlenose dolphin and Atlantic spotted dolphin) and two sea turtle species (leatherback turtle and loggerhead turtle) were identified. Sightings and effort details are presented in **Tables 17 and 18**, and **Figures 12 and 13**.

Table 17. Sightings from vessel surveys conducted in the JAX survey area, August 2011 through July 2012.

Common Name	Scientific Name	# of Sightings	# of Individuals
Bottlenose Dolphin	*Tursiops truncatus*	19	85
Atlantic Spotted Dolphin	*Stenella frontalis*	12	128
Leatherback Turtle	*Dermochelys coriacea*	3	3
Loggerhead Turtle	*Caretta caretta*	37	39

Table 18. Effort details for vessel surveys conducted in the Jacksonville survey area, August 2011 through August 2012.

Number of Survey Days	8
Total Survey Time (hr:min)	85:46
Time On Effort (hr:min)	54:16
Total km Surveyed	853.4

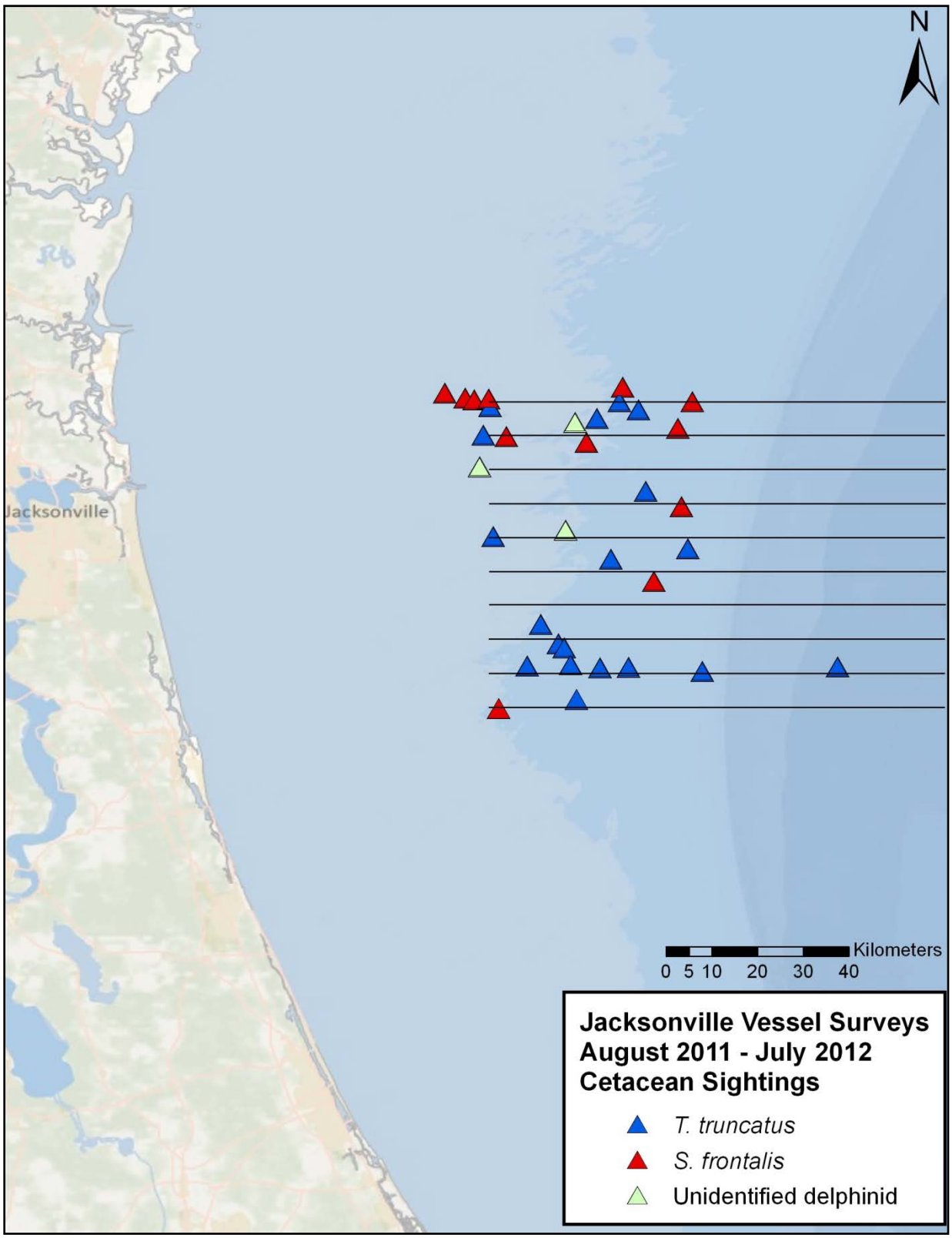

Figure 12. Locations of cetacean sightings from vessel surveys conducted in the JAX survey area, August 2011 through July 2012.

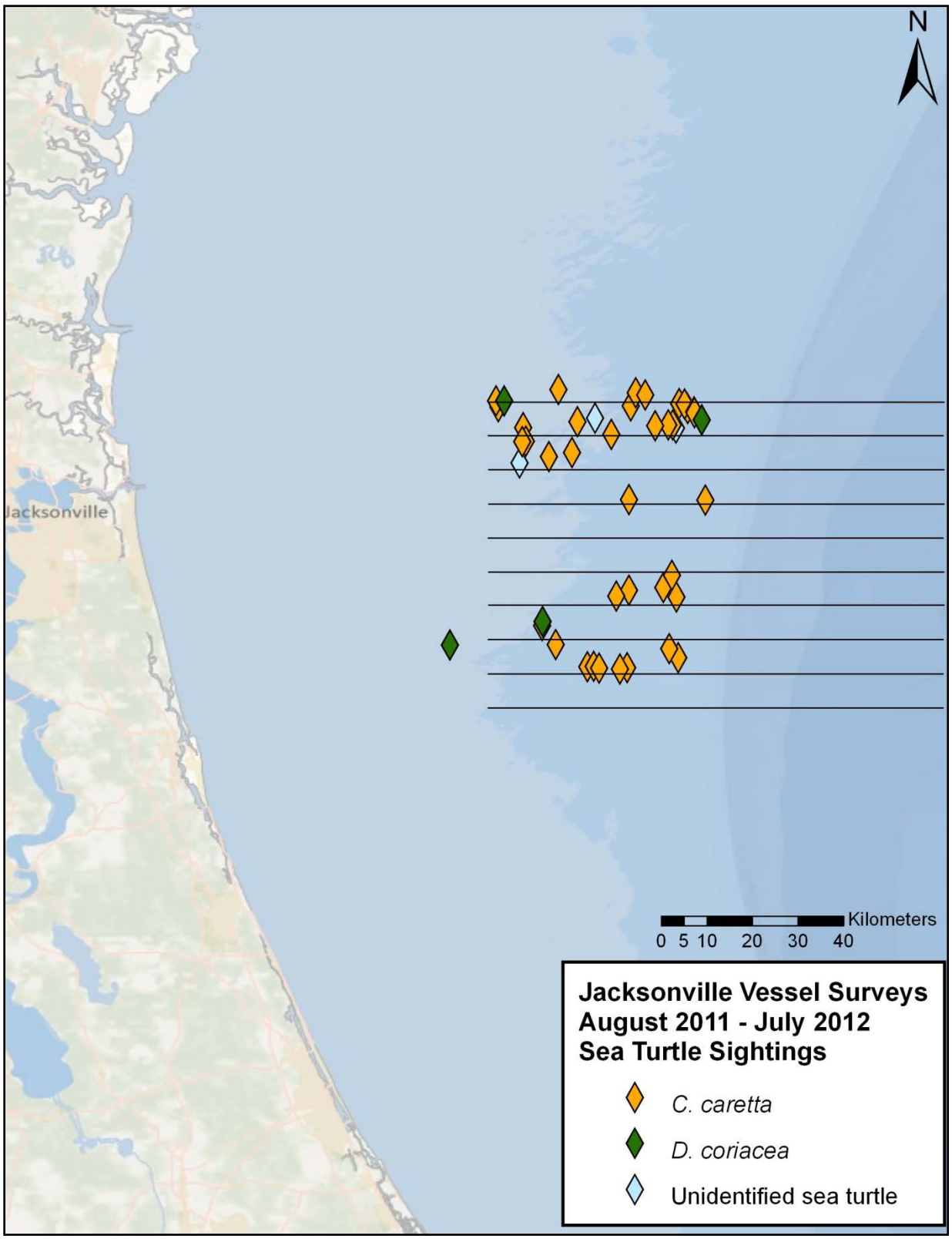

Figure 13. Locations of sea turtle sightings from vessel surveys conducted in the JAX survey area, August 2011 through July 2012.

Thirty-one biopsy samples were collected from two species: bottlenose dolphin (*n*=12) and Atlantic spotted dolphins (*n*=19) (**Table 19**). A total of 933 photographs was taken of these two species, with two matches found in the photo catalog for the Atlantic spotted dolphin (**Table 20**). Information on the photo catalog sizes to date for these two dolphin species is found in **Table 20.**

Table 19. Biopsy samples taken from animals in the JAX survey area, August 2011 through July 2012.

Common Name	Scientific Name	Samples
Atlantic Spotted Dolphin	*Stenella frontalis*	19
Bottlenose Dolphin	*Tursiops truncatus*	12

Table 20. Photographs taken of animals in the Jacksonville survey area, August 2011 through July 2012.

Common Name	Scientific Name	Photos Taken	Catalog Size to Date	Matches to Date
Atlantic Spotted Dolphin	*Stenella frontalis*	633	43	2
Bottlenose Dolphin	*Tursiops truncatus*	300	21	0

3.3 VACAPES/CHPT/JAX Passive Acoustic Monitoring

During this reporting period, bottom-mounted HARPs were employed in the Cape Hatteras, Onslow Bay, and JAX survey areas.

3.3.1 Cape Hatteras

One HARP was deployed in the Cape Hatteras survey area during the reporting period (**Table 21, Figure 14**). This is the first HARP to be deployed in the Cape Hatteras region and is scheduled to be retrieved, refurbished, and redeployed in October 2012.

Table 21. Deployment details for the Hatteras HARP, August 2011 through July 2012.

Site	Deployment Date	Retrieval Date	Latitude	Longitude	Depth (m)	Sampling Rate	Duty Cycle	Amount of Data
A	15-Mar-12	N/A	35.34054	-74.85761	950	200 kHz	Continuous	N/A

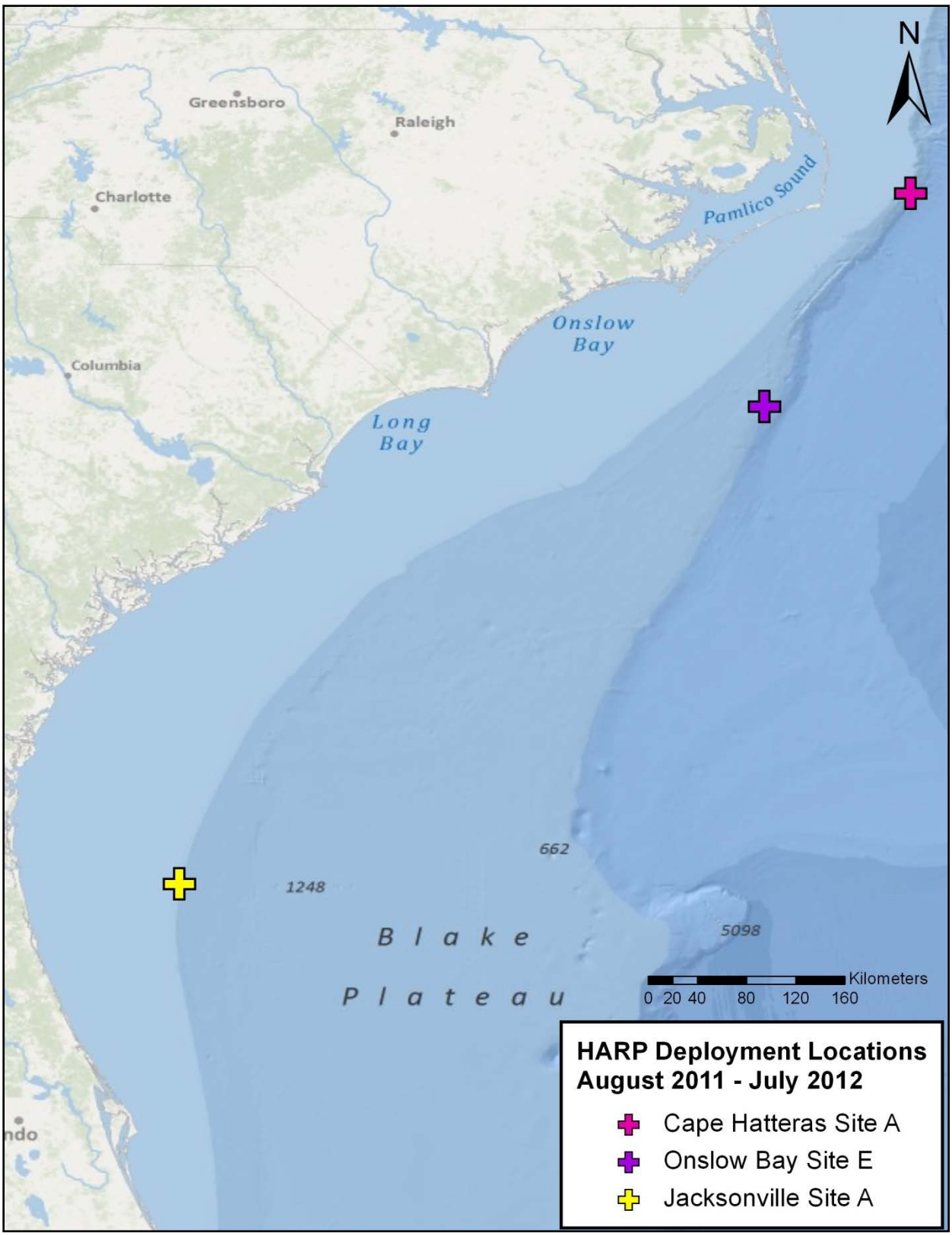

Figure 14. Location of all HARPs deployed in all survey areas, August 2011 through July 2012.

3.3.2 Onslow Bay

Two HARP deployments were made in the Onslow Bay survey area during the reporting period (**Table 22, Figure 14**). The first deployment (August 2011) was recovered on 13 July 2012 at Site E (33.78666, -75.92915) in a depth of 914 m. This HARP contained just over 3 months of data, less than originally expected. Engineers at Scripps Institution of Oceanography are working to determine why this occurred, but it may be that cold water temperatures (due to the greater depth) and larger hard drives drained the batteries faster than expected. The HARP currently deployed at the same location in Onslow Bay (July 2012) will be retrieved in October 2012, at which time the replacement unit will be deployed with an extra battery pressure-case.

Table 22. Deployment details for the Onslow Bay HARPs, August 2011 through July 2012.

Site	Deployment Date	Retrieval Date	Latitude	Longitude	Depth (m)	Sampling Rate	Duty Cycle	Amount of Data
E	18-Aug-11	13-Jul-12	33.7779	-75.9264	952	200 kHz	5-min on/5-min off	0.7 TB
E	13-Jul-12	N/A	33.78666	-75.92915	914	200 kHz	5-min on/5-min off	N/A

3.3.3 JAX

One HARP was deployed in the JAX survey area during the reporting period (**Table 23, Figure 14**). This HARP is scheduled to be picked up in August 2012.

Table 23. Deployment details for the JAX HARP, August 2011 through July 2012.

Site	Deployment Date	Retrieval Date	Latitude	Longitude	Depth (m)	Sampling Rate	Duty Cycle	Amount of Data
A	24-Jan-12	N/A	30.2850	-80.2214	91	200 kHz	Continuous	N/A

3.4 Acoustic Analyses for VACAPES/CHPT/JAX

3.4.1 Acoustic Analyses

Since the 2011 AFAST Annual Report (DoN 2011b), data analyses have been underway on PAM data collected in Onslow Bay, off Cape Hatteras, and in JAX.

Onslow Bay Towed-Array Data

The towed-array data from Onslow Bay have been fully analyzed. Analysis of the whistles of four odontocete species (Atlantic spotted dolphin, bottlenose dolphin, rough-toothed dolphin, and short-finned pilot whale) recorded in Onslow Bay showed that species-specificity does exist, although more work needs to be done to increase the correct classification rates of Atlantic spotted dolphins and, in particular, rough-toothed dolphins (**Table 24**). The inclusion of whistles from additional species inhabiting Onslow Bay into the classification model, which will likely result in decreased correct classification rates due to a more complicated classification task, is also necessary in order to support identification all species in HARP recordings.

Table 24. Results of the eight-terminal-node classification tree examining interspecific differences in whistles of four species. The optimal tree was grown using seven variables (duration, third quartile frequency, maximum frequency, third quartile slope, end slope, first quartile slope, and mean frequency). The overall correct classification was 74.2 percent (*n* = 624 whistles). Individual correct classification rates are shown in bold. The percentage of correct classifications expected by chance is 25 percent for each species.

Actual Species	% Classified as			
	G. macrorhynchus	***S. frontalis***	***S. bredanensis***	***T. truncatus***
Short-finned Pilot Whale (*Globicephala macrorhynchus*)	**84.3**	6.7	3.4	5.6
Atlantic Spotted Dolphin (*Stenella frontalis*)	10.5	**63.0**	0.6	25.9
Rough-toothed Dolphin (*Steno bredanensis*)	51.4	8.6	**40.0**	0
Bottlenose Dolphin (*Tursiops truncatus*)	2.7	4.7	0.3	**92.3**

In April 2012, Bio-Waves, Inc. (Julie Oswald) began to look at species-specificity in whistles of several odontocete species in the western North Atlantic. Recordings from different species throughout this larger area were supplied by Sofie Van Parijs (Protected Species Branch, NMFS-NEFSC), Melissa Soldevilla and Lance Garrison (Protected Resources and Biodiversity Division, NMFS, Southeast Fisheries Science Center), and the Read Lab (Duke University Marine Lab–data from Hatteras, Onslow Bay, and JAX were supplied). If this effort (which has been successful in the Pacific) results in satisfactory species-classification rates, it will ultimately lead to a better understanding of the temporal and spatial patterns found in the HARP data.

Clicks recorded on the towed array in the Onslow Bay were also examined to determine if they could be used to distinguish species. This examination showed that the clicks of Risso's dolphins recorded in Onslow Bay contained spectral peak and notch features similar to those described by Soldevilla et al. (2008). These spectral structure values are consistent and seem to occur in Risso's dolphin clicks from other geographic areas as well (including JAX), indicating that these features might be a distinguishing characteristic for Risso's dolphins worldwide.

JAX Towed-Array Data

The towed-array data from JAX have not yet been fully analyzed. Risso's clicks have been examined as described above, and all data have been provided to Julie Oswald for the whistle analysis of Atlantic species.

Onslow Bay and JAX HARP Data

Analysis is currently underway for the Onslow Bay HARPs deployed at Onslow Bay sites A and D on 29 July 2010 and the Jacksonville HARPs deployed at JAX sites A and B on 26 August 2010. Analysis of minke whale pulse trains has been completed for all of these HARPs, as well as the units deployed in Jacksonville on 01 February 2011. For the Onslow Bay HARPs deployed on 29 July 2010, vocal events of

Risso's dolphins, probable pilot whales, sperm whales, fin whales, minke whales, and sei whales have been detected.

4. Pilot Whale Behavioral Response Study – Cape Hatteras

During the prior reporting period, controlled exposure playbacks were conducted with short-finned pilot whales in May and June 2011 off Cape Hatteras (DoN 2011b; **Appendix C**). Individual pilot whales were tagged with digital acoustic data-logging tags (DTAGs; Johnson and Tyack 2003). Pilot whales were exposed to the sounds of a 38-kilohertz (kHz) EK-60 scientific echosounder in an experimental protocol designed to determine whether the surface and foraging behavior of the whales was affected by the sounds produced by the echosounder. The echosounder system is used to map the prey of pilot whales and other odontocetes during surveys and behavioral studies off Cape Hatteras. The tags were programmed to stay on each whale for 4 hours (hr).

The 4-hr experimental periods consisted of the following: a 1-hr pre-exposure period, a 1-hr experimental or control period, a second 1-hr experimental or control period, and a 1-hr post-exposure period (**Figure 15**). Five additional short-finned pilot whales were equipped with DTAGs, but not exposed to the echosounder, to provide control data on surface and diving behavior.

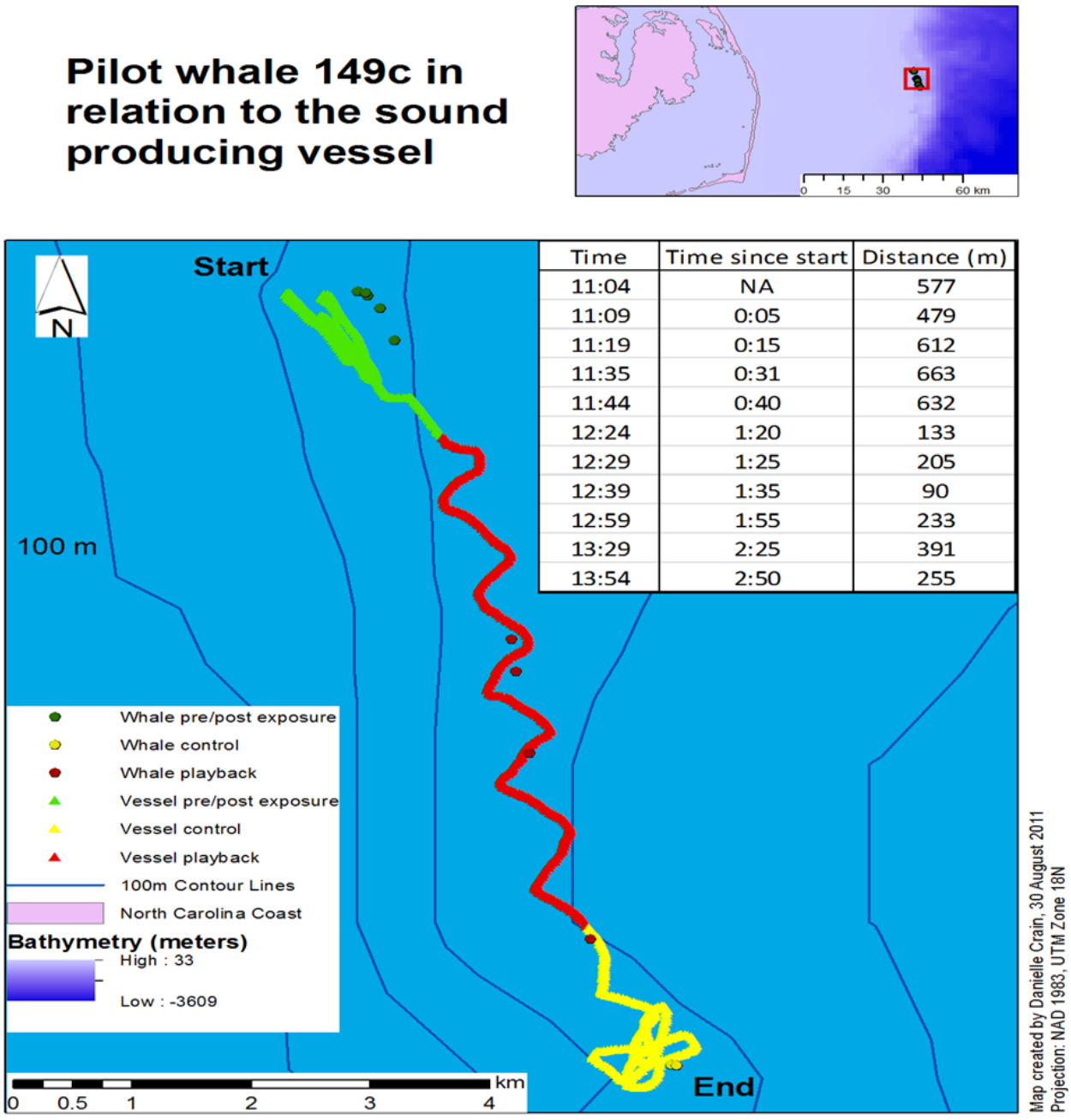

Figure 15. Example of behavioral response experiment with short-finned pilot whales off Cape Hatteras. The track of the observation vessel is indicated by a colored line: green represents periods of pre-exposure; red indicates periods of exposure; and yellow marks periods of post-exposure.

Observers in a rigid-hulled inflatable boat observed and recorded the surface behavior of the focal (tagged) whale and its group members. Data collected at the surface included behavioral state, group spread, synchrony of surfacing, synchrony of heading, and activity level. The occurrence of foraging behavior was identified by feeding echolocation buzzes in the DTAG acoustic record. Analysis of these data is now almost complete and shows no evidence of any response to the sounds of the echosounder, either in surface or foraging behavior. A manuscript describing the results of this experiment is being prepared for submission to a journal in 2013.

This behavioral response experiment was a critical precursor to an ongoing study of the response of short-finned pilot whales to the sounds of predators in the Cape Hatteras survey area. This follow-on study, funded by the Strategic Environmental Research and Development Program (SERDP), was initiated in 2011 and is designed to increase scientific understanding of the response of various odontocete species to aversive acoustic stimuli. The use of sounds from natural predators (mammal-eating killer whales [*Orcinus orca*]) is predicated on the assumption that some odontocetes may perceive the sounds produced by military sonars as similar to those of predators. Ongoing baseline visual surveys and HARP deployments in the Hatteras region will continue to provide important information on the occurrence and distribution of pilot whales as well as other species. In addition, because many of the scientific staff for the AFAST baseline monitoring program and the SERDP-funded pilot whale project are the same, there is a mutually beneficial opportunity for coordination between the complimentary efforts.

5. Coordinated ASW Exercise Monitoring

Monitoring of coordinated ASW exercises is one of the primary components being used to address specific monitoring questions posed in the AFAST Monitoring Plan (DoN 2009) and the NMFS-issued LOA (NMFS 2009). Scheduling of protected marine species monitoring that involves civilian aircraft and ships operating concurrently with multiple U.S. Navy aircraft and ships in the same area requires extensive pre-survey coordination between multiple U.S. Navy commands. The USFF operational community provides a critical interface and coordination that is instrumental in allowing for researchers to conduct monitoring in close proximity to U.S. Navy assets.

As in previous years, cancellations or major date shifts in U.S. Navy training events based on logistics, fiscal, or operational needs were challenging to overcome. These kinds of changes are difficult to predict and, more importantly, difficult to reschedule from a monitoring perspective on short notice when contracts have been awarded; survey equipment purchased, rented, or relocated; and personnel availability and transport arranged.

Both passive acoustic and visual (aerial and vessel survey) monitoring methods were employed to address before/after and before/during/after monitoring requirements. Coordinated ASW exercise monitoring components for this reporting period are presented below.

5.1 Passive Acoustics

This section includes information on PAM devices deployed during this reporting period, as well as results of analyses on deployments to monitor ASW training events during previous reporting periods.

2009 Deployments

A pilot project was conducted in July 2008 at the Onslow Bay site incorporating shipboard and vessel visual surveys and an array of PAM devices—MARUs referred to as "pop-up" buoys developed by Cornell University (www.birds.cornell.edu/brp/hardware/pop-ups). The pop-ups were deployed approximately 10 days prior to the planned 2-day ASW exercise and remained active for up to a week following the exercise.

Nine MARUs were deployed in September and December 2009 in JAX. The units were deployed in an array configuration to examine marine mammal vocal activity in relation to U.S. Navy sonar activity (see **Appendix F**). The goal was to establish intensive short-term (20–30 days) PAM before, during, and after two specific ASW events. MARUs were deployed in three depth ranges: on the shelf (44- to 46-m depth, referred to hereafter as 'shallow sites'), just beyond the shelf (approximately 183-m depth, referred to as 'mid-depth sites'), and offshore of the shelf break (approximately 305-m depth, referred to as 'deep sites'). Three recorders were deployed at each of the three depth ranges, for a total of nine MARUs during two deployment periods (fall and winter). Two types of MARUs were deployed: (1) units that recorded using a 32-kHz sampling rate (32-kHz recorders) and (2) units that recorded using a 2-kHz sampling rate (2-kHz recorders). The 32-kHz recorders were deployed at Sites 2, 4, 5, 6, 7, and 9 (**Figure 16**). The 2-kHz recorders were deployed at Sites 1, 3, and 8 (**Figure 16**).

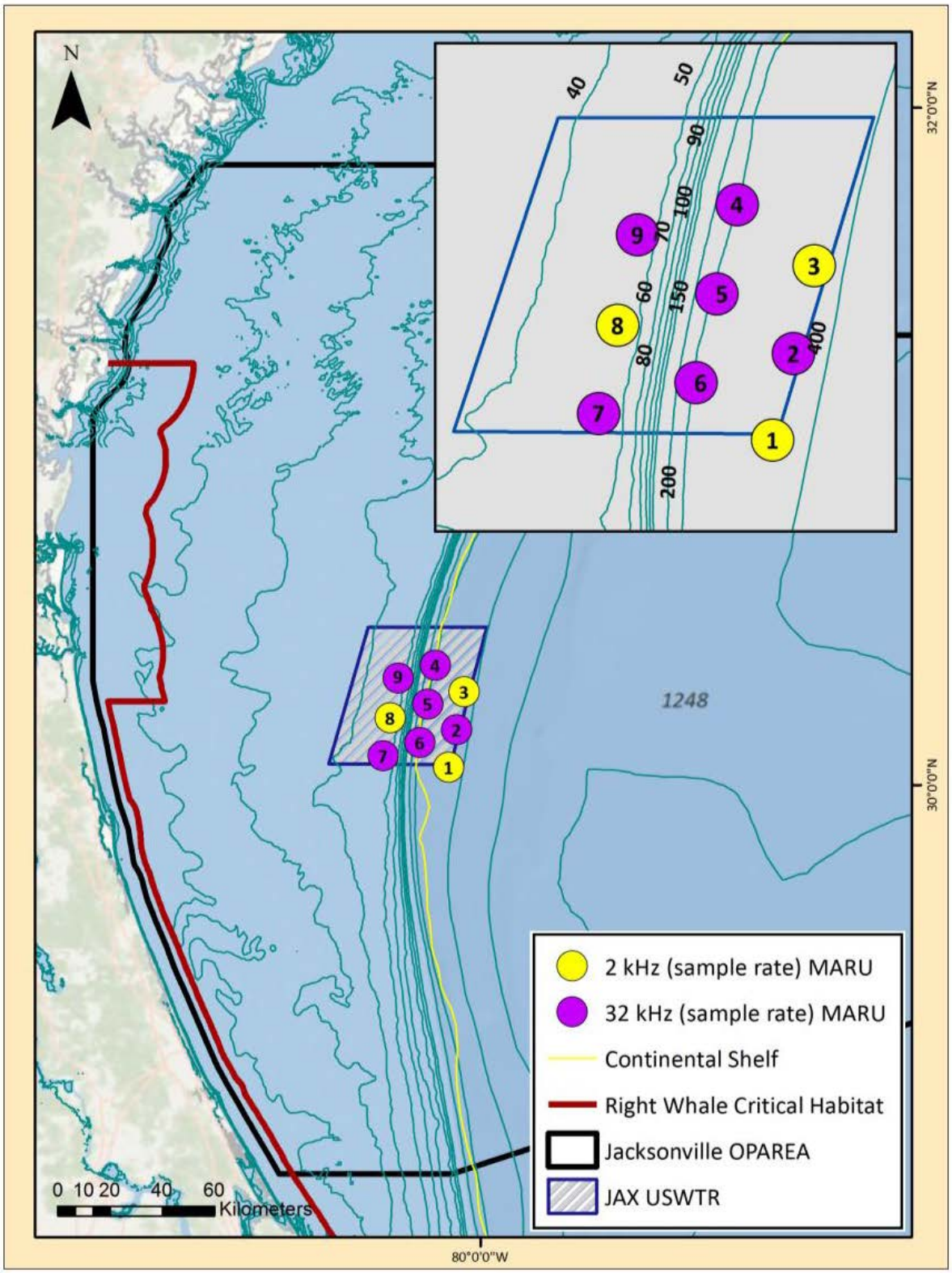

Figure 16. Location of 2-kHz and 32-kHz sample rate MARUs in the planned USWTR of the JAX OPAREA. MARUs include three recorders labeled 7, 8 and 9 at "shallow" sites, three recorders labeled 4, 5 and 6 at "mid-depth" sites and three recorders labeled 1, 2 and 3 in "deep" sites.

The 32-kHz units each recorded for approximately 21 days during both fall and winter (13 September–04 October and 04–26 December, respectively). The 2-kHz units each recorded for approximately 25 and 33 days during fall and winter (13 September–8 October and 5 December–8 January, respectively). A total of 16,118 hr of recordings was reviewed and analyzed. The percentage of total time during which events were detected for both deployments combined shows that minke whales were detected most frequently (approximately 31 percent) followed by ship events (approximately 26 percent), sperm whales (approximately 15 percent), and MFAS (approximately 14 percent), respectively (**Figure 17**).

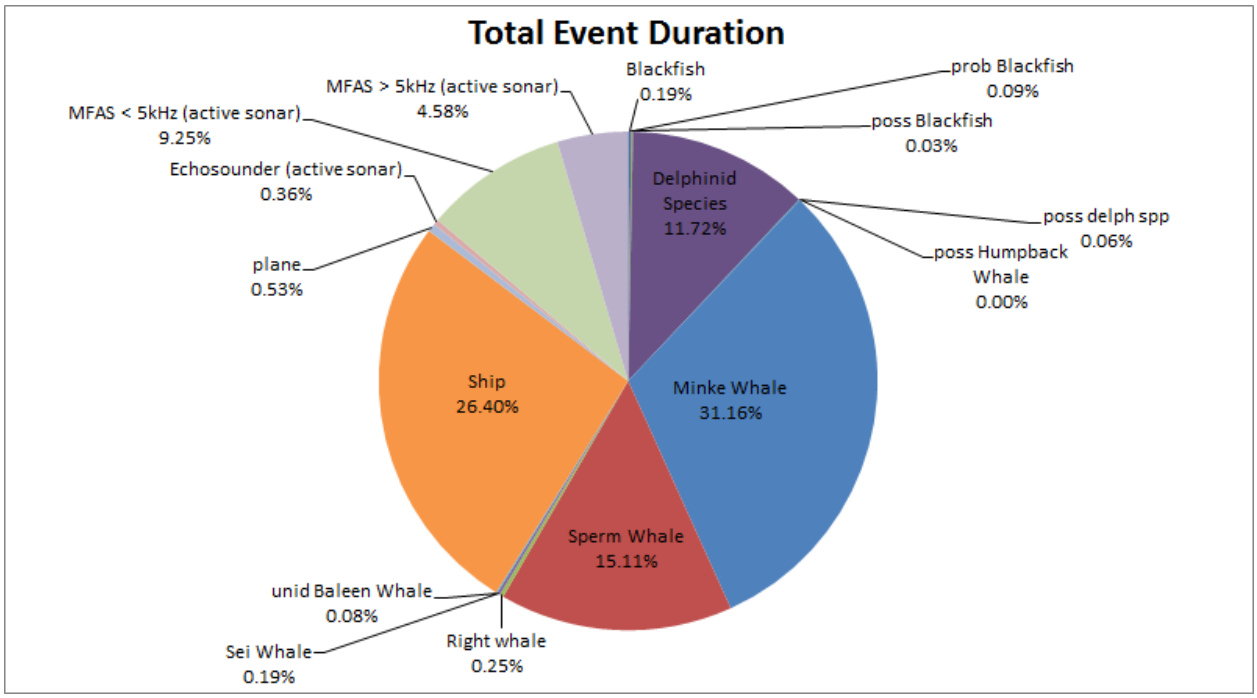

Figure 17. Both MARU deployments—total event durations by species. All events are shown as percentages of the total duration of logged events.

Species and species groups detected included minke whale, North Atlantic right whale, sei whale, (probable) humpback whale, sperm whale, blackfish (melon-headed whale, pygmy killer whale [*Feresa attenuata*], false killer whale [*Pseudorca crassidens*], killer whale [*Orcinus orca*], short-finned pilot whale), and unidentified delphinids (see **Appendix F**). Results indicated that minke whales were present almost continuously during the winter deployment period. Right whale vocalization events were much shorter in duration and less frequent than those of minke whales. Right whale vocalizations were most concentrated during winter, as expected, but were also detected at deep sites, which was somewhat unexpected. Sperm whales occurred exclusively at mid-depth sites (i.e., near the continental shelf break), and showed a strong diel pattern with almost all vocalization events occurring at night from dusk until dawn. There were less obvious patterns for delphinid vocalization events, possibly because we were not able to identify detections to species, and thus multiple species were grouped into one category. Blackfish were detected relatively infrequently but were most common at the shallow-water sites. There was only one possible vocalization event of a humpback whale, and none identified for fin or blue whales. Minke whales showed the strongest relationship between sonar events and vocalizations. The probability of minke whale vocalization events occurring in the presence of sonar was much lower

than in the absence of sonar. A preliminary review of two extended periods of delphinid whistles that occurred simultaneously with sonar revealed that call-matching (i.e., mimicry) was likely occurring.

2011 Deployment

Twelve JASCO Autonomous Multi-channel Acoustic Recorders (AMAR; www.jasco.com) were deployed in conjunction with an ASWEX in September 2011. The AMARs were deployed as three individual arrays of four units each (**Figure 18**). Each array included a pinger located at the approximate middle for synchronization of each sub-array. The AMARs were programmed to continuously record for 27 days before, during, and after the ASWEX. Data were recorded to memory modules at a sampling rate of 128 kHz with 24-bit resolution. The AMAR units were recovered at the end of the data-collection period. Due to the synchronization of the units, and therefore ability to locate and track both individual vocalizing animals as well as ships, submarines, and other tactical assets, these data sets are classified and involve additional complexity and coordination for analysis. A detailed classified analysis of this data set has been funded through a collection of researchers, including Brandon Southall, Christopher Clark, and Marine Acoustics, Inc. Unclassified results of this analysis will be made available as appropriate in the future.

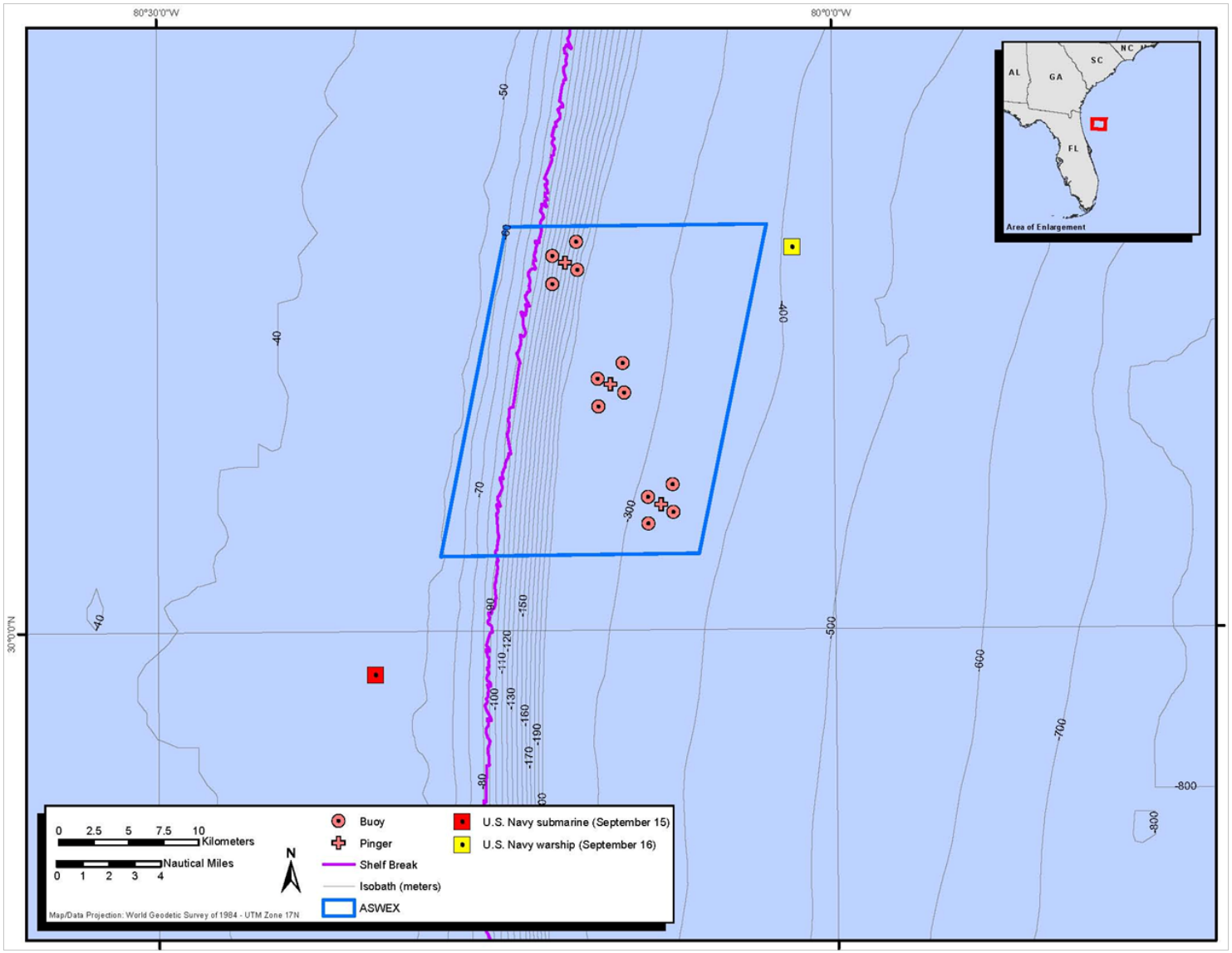

Figure 18. Locations of deployed AMARs and U.S. Navy vessels and submarines sighted in conjunction with the September 2011 ASWEX training in JAX.

5.2 Aerial Surveys

Aerial surveys were coordinated before/after two ASW training events during the reporting period—one in VACAPES and one in JAX. A summary of survey effort and sightings is provided in **Table 25**. Complete survey and sighting details for each training event are included in **Appendix G** and **Appendix H**.

Table 25. Visual aerial survey effort and marine mammal observation summary for coordinated ASW exercise monitoring.

Date[1]	OPAREA	Survey Effort		Cetaceans		Turtles	
		Km	Hr	Sightings	Animals	Sightings	Animal
31-Aug-11	VACAPES	540	2.7	1	60	2	2
10-Sept-11	VACAPES	350	1.7	15	307	37	49
15-Sept-11	JAX	627	3.1	0	0	3	3
16-Sept-11 (AM)	JAX	637	3.1	2	32	1	1
16-Sept-11 (PM)	JAX	330	1.7	1	16	2	2
18-Sept-11	JAX	283	1.4	0	0	0	0
20-Sept-11	JAX	579	2.9	0	0	1	1

[1] Monitoring scheduled for 17 and 19 September was cancelled due to low visibility ceiling associated with poor weather conditions.

Aerial monitoring was conducted on 31 August and 10 September 2011 for an ASWEX, off the coast of Virginia in VACAPES (**Appendix G**). Sighting conditions were good to fair. Observers visually surveyed 481 nautical miles (NM) (890 kilometers [km]) of systematic transects and 931 NM (1,724 km) of combined trackline (including systematic transects and crosslegs between transects) during 2 days for 7.6 hr of total on- and off-effort. Sightings over the 2-day period included 1 sighting of Atlantic spotted dolphins, 12 sightings of pilot whales, 2 sightings of Risso's dolphins, 1 sighting of unidentified marine mammals (likely a mix of common and bottlenose dolphins, or common and Atlantic spotted dolphins), 35 loggerhead sea turtles, 4 sightings of unidentified sea turtles, 1 sighting of manta rays, 11 sightings of unidentified rays, and 1 sighting of an ocean sunfish. Focal-follow behavioral data were collected during six separate sightings.

Aerial monitoring was conducted during 15–20 September 2011 in association with an ASWEX that occurred in JAX (**Appendix H**). There were 4 survey days (five surveys total) over a 6-day period for approximately 12.3 hr of on-effort status. Observers visually surveyed 2,456 km of on-effort tracklines and an additional 666 km off-effort (connector lines and circling for focal follow or species ID). Three sightings of cetaceans and six sightings of sea turtles were made throughout the 4-day during-ASWEX survey period. One sighting of a sea turtle was made during the post-ASWEX survey on 20 September. Focal-follow behavioral data were collected during one sighting.

6. AFAST Marine Mammal Observers (MMOs)

Vessel surveys were conducted in association with an ASWEX training event off the coast of Virginia. Three MMOs were stationed aboard the *USS Halyburton* (U.S. Navy vessel). Surveys were conducted on 29 May–01 June 2012 in association with the training event. Thirteen marine mammal and 11 sea turtle

sightings were recorded by the U.S. Navy MMOs during the 4-day monitoring trip (**Table 26, Figure 19**). Additionally, one marine mammal sighting was provided by the lookout. Marine mammal species groups observed during the ASWEX included spotted dolphins and pilot whales. Most of the sea turtle sightings were of loggerhead turtles. For additional details, refer to **Appendix I** for the U.S. Navy's ASWEX MMO Trip Report.

Table 26. Summary of marine species sightings recorded by MMOs while conducting monitoring from a U.S. Navy vessel off the coast of Virginia during the 29 May-01 June 2012 ASWEX training event.

Common Name	Scientific Name	Sightings	Individuals
Spotted dolphin		4	25
Pilot whale	*Globicephala* spp.	2	5
Unidentified blackfish		1	2
Unidentified dolphin		6	36
Unidentified whale		1	1
Loggerhead turtle	*Caretta caretta*	6	6
Unidentified hardshell turtle		3	3
Unidentified juvenile turtle		2	2

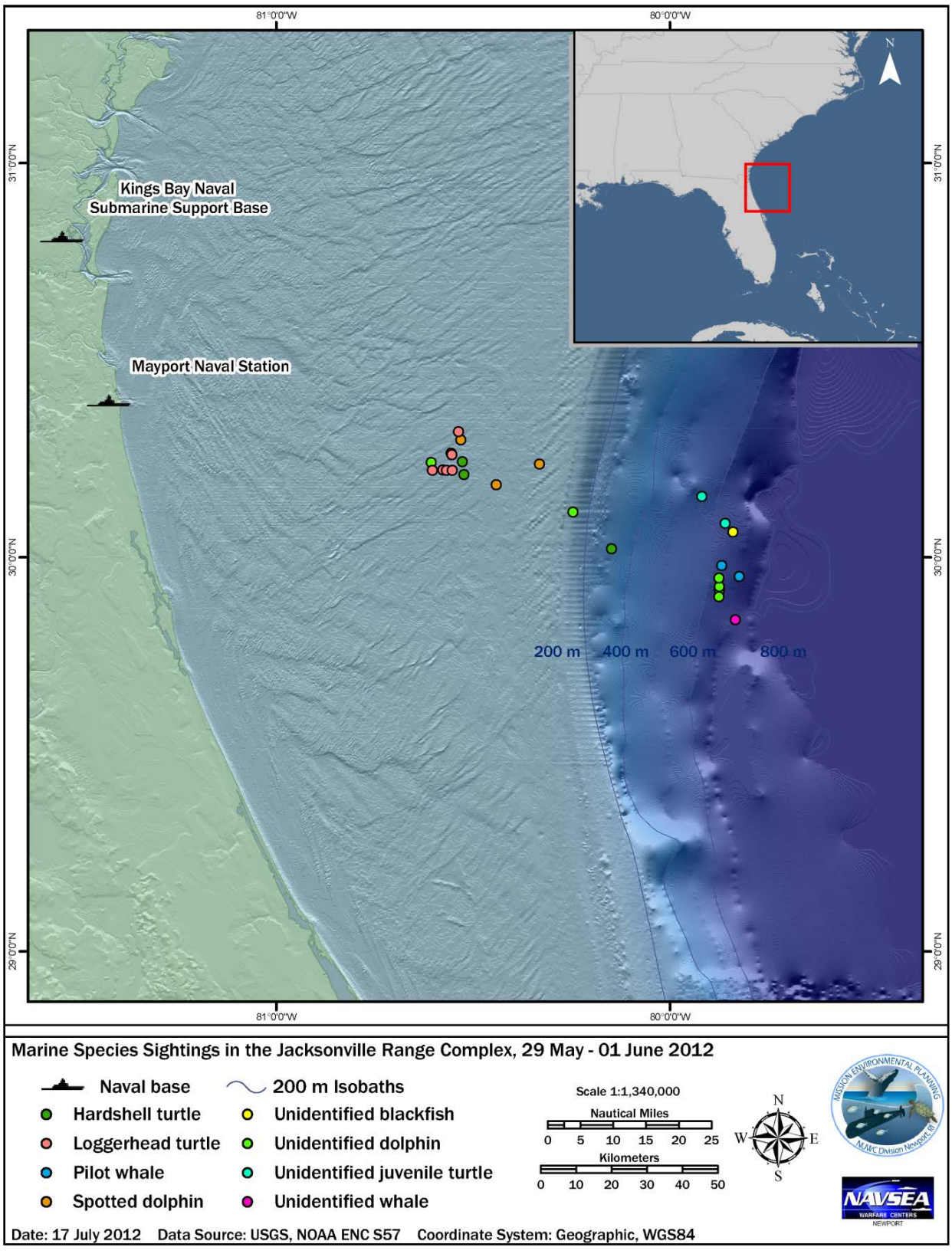

Figure 19. Marine mammal and sea turtle sightings made by U.S. Navy MMOs during ASWEX monitoring in the JAX Range Complex.

During the brief period of MFAS use, no marine mammals or sea turtles were observed, and therefore were not expected to be exposed to MFAS. No injuries or mortalities of marine mammals or turtles were observed during the ASWEX training event.

6.1 U.S. Navy Lookout Effectiveness Study

The U.S. Navy undertakes monitoring of marine mammals during naval exercises and has mitigation procedures designed to minimize risk to these animals. One key component of this monitoring and mitigation is the shipboard lookouts (LOs, also known as watchstanders), who are part of the standard operating procedure that ships use to detect objects (including marine mammals) within a specific area around the ship during events. The watchstanders are an element of monitoring requirements specified by NMFS in the MMPA LOAs. The goal is to detect mammals entering ranges of 200, 500, and 1,000 yards around the vessel, which correspond to distances at which various mitigation actions should be performed. In addition to the LOs, officers on the bridge search visually and sonar operators listen for vocalizations. We refer to all of these observers together as the observation team (OT). The aim of this study is to determine the OT effectiveness in terms of detecting and identifying marine mammals. Of particular interest is the probability of an animal getting within a defined range of the vessel without being observed by the OT, as well as determining the accuracy of the OT (primarily the LO) in identifying the species group (whale, dolphin, etc.), assessing group size, and estimating their position. In order to achieve this, experienced MMOs search and collect information on marine mammals that are detected by themselves and/or the OT.

Work was previously conducted to design and test a protocol for determining the effectiveness of the LOs in visually detecting marine mammals. The field protocol for the experiments was developed in consultation with members of the Naval Undersea Warfare Center Division, Newport (NUWCDIVNPT); USFF; Naval Facilities Engineering Command; Commander, U.S. Pacific Fleet; and NMFS. The basic concept is that trained MMOs are situated onboard a vessel during daylight at-sea exercises, in locations where they can watch for marine mammals and communicate with one another, but not cue the LO. The MMOs then conduct opportunistic trials where they detect a surfacing of a marine mammal at a measured location and record whether that surfacing was also detected (a successful trial) or not (an unsuccessful trial) by the LO.

It was found to be necessary to have an additional "liaison" MMO (LMMO) stationed with the LO, and in communication with the other MMOs, to help report when and where LOs detected surfacings. It was also necessary to have an additional team member tasked solely with data recording. In addition to recording surfacing events, MMOs attempted to keep track of which surfacings belonged to the same school or animals. The revised protocol (**Appendix J**; Burt and Thomas 2010) was applied to one further at-sea exercise (off Southern California), making four datasets in total.

In parallel with field protocol development, methods have been developed for using the data generated by these experiments to estimate the probability of animals entering the standoff range undetected. Intermittent availability models are necessary because many marine mammals remain below the surface for significant periods during dives. The extended methods currently only use information about the location of LO detections, but could conceivably be extended further to use information from the MMO/LO trials. During this reporting period, a new analysis method has been developed and tested that allows estimation of the probability of animals approaching to within a specified stand-off range without being detected (the "sneak-up probability"). The method is flexible in allowing for a variety of animal surfacing behaviors: "clustered instantaneous," where animal surfacings last just for an instant, but

where these surfacings are clustered together in time, interspersed between extended periods underwater; “intermittent,” where animals are at the surface for longer periods between dives; and “continuous,” where one or more member of each animal group is always at the surface. The method models detection probability in two dimensions (forward of and perpendicular to the vessel), and can model both LO and MMO detections, although it is also possible to focus just on the LO detection probabilities. This method has been tested on simulated data and found to perform satisfactorily for large sample sizes, however the sample size of real data collected from trials to date is insufficient for reliable inferences to be drawn at this time.

Recommendations for future data-collection efforts are to focus on a single vessel type and an area where the number of trials-per-cruise is likely to be maximized. Resources would be devoted to extending the intermittent-availability models so that they use both the locations of observed animals and the outcomes of the MMO trials, thereby unifying the models developed to date for instantaneous and intermittent availability.

Major accomplishments related to this project to-date include initial development of data collection-protocols and analytic methods, data-collection trials, completion of a proof-of-concept for detection functions, consultation with NMFS technical staff for input on analysis methods, and investment in continued refinement of the analytic methods and focus on additional data collection in 2011/2012.

U.S. Navy Fleet training organizations are currently evaluating the preliminary results from the proof-of-concept phase to determine if improvements in lookout training programs are warranted. Initial steps in progress include evaluating incorporation of marine mammal survey techniques into watchstander training and revision of Marine Species Awareness Training. As more data become available, other options for improving lookout training will be evaluated as appropriate.

7. Summary

The U.S. Navy has developed and followed a suite of requirements and techniques identified in the MMPA and ESA permits for AFAST activities. These activities included collecting longitudinal baseline data on marine species; analysis of data collected previously during a behavioral response study and from PAM devices; monitoring immediately before, during, and after ASW training events; and evaluating the effectiveness of the mitigations implemented such as the use of LOs during U.S. Navy training exercises.

Through the implementation of numerous research methods established for the Cape Hatteras, Onslow Bay, and JAX sites, collection of critical baseline information for the AFAST Study Area is well underway. Data collected to date will allow researchers to examine potential effects, if any, from exposure to ASW training. Longitudinal studies contribute invaluable data to understanding marine mammal and sea turtle species diversity and their distribution, abundance, and residency in the AFAST Study Area. Detecting the responses of protected marine species to human activities (including naval training events) can be difficult without pre-exposure baseline information as a basis for comparison. Not only can the collected data aid scientists in examining the short-term effects of U.S. Navy training on marine species, but potential long-term effects from ASW training exercises will be assessed through a comparison of baseline data and information collected during training exercises.

During this reporting period, research at Cape Hatteras utilized both vessel and aerial platforms for 24 days. Collectively, 14 cetacean and 2 sea turtle species were identified within the survey area,

including bottlenose dolphin, short-finned pilot whale, sperm whale, common dolphin, Atlantic spotted dolphin, striped dolphin, spinner dolphin, Risso's dolphin, Clymene dolphin, fin whale, minke whale, humpback whale, melon-headed whale, Cuvier's beaked whale, loggerhead turtle, and leatherback turtle. Photographs of six species were taken for photo-identification purposes and three species were biopsy-sampled. Initial results from the behavioral response study that took place in May 2011 (and were reported in last year's annual monitoring report) off Cape Hatteras were included. Analysis of these data are now almost complete and shows no evidence of any response by the tagged short-finned pilot whales to the sounds of the echosounder, either in surface or foraging behavior.

In Onslow Bay, 6 days of vessel surveys were conducted; no aerial surveys were conducted during this reporting period. Three cetacean and one sea turtle species were identified: bottlenose dolphin, Atlantic spotted dolphin, beaked whale, and loggerhead turtle. Photographs of bottlenose dolphins and Atlantic spotted dolphins were taken for photo-identification purposes and individuals from these two species were biopsy-sampled.

During this reporting period, research at JAX utilized both vessel and aerial platforms for 23 days. Collectively, six cetacean and two sea turtle species were identified within the survey area: bottlenose dolphin, Atlantic spotted dolphin, Risso's dolphin, short-finned pilot whale, rough-toothed dolphin, humpback whale, leatherback turtle, and loggerhead turtle. Photographs of bottlenose dolphins and Atlantic spotted dolphins were taken for photo-identification purposes and individuals from these two species were biopsy-sampled.

PAM is an important tool to assist our understanding of cetacean occurrence in the AFAST Study Area. During this reporting period, longitudinal monitoring continued the use of HARPs, this year in the Hatteras, Onslow Bay, and JAX sites. Analyses of data retrieved from this reporting period will be presented in a future report. Findings from previously deployed HARPs were reported, with notable acoustic detections of sei whales from Onslow Bay HARPs deployed in July 2010. The towed-array data from Onslow Bay have been fully analyzed. Analysis of the whistles of four odontocete species recorded in Onslow Bay (Atlantic spotted dolphin, bottlenose dolphin, rough-toothed dolphin, and short-finned pilot whale) demonstrate species-specificity.

In addition to the incremental contribution of baseline data, efforts have continued to support the requirements outlined in the AFAST LOA with regards to monitoring during U.S. Navy training exercises. Visual monitoring occurred during three ASW events: two aerial monitoring surveys conducted by a contractor during August/September 2011 in VACAPES and September in JAX, and one vessel survey utilizing U.S. Navy MMOs in JAX in July 2012. The aerial survey conducted in VACAPES was hindered at times by low cloud ceilings (305 m or lower) restricting both visibility and safe flying conditions. Species sighted were consistent with those observed during longitudinal studies in those two areas. No visible evidence of unusual behavior by observed species was observed for the during-ASWEX or post-ASWEX surveys. MARUs (i.e., pop-ups) were deployed for the ASW training event in JAX in September 2011 to collect an acoustic dataset to initially assess responses of marine mammals to naval activities. After the data are analyzed, findings will be published. Analyses of acoustic data collected by pop-ups deployed during fall and winter 2009/2010, to examine marine mammal vocal activity in relation to naval sonar activity, revealed minke whale, North Atlantic right whale, sei whale, (probable) humpback whale, sperm whale, blackfish, and unidentified delphinids. Results indicated that minke whales were present almost continuously during the winter deployment period. Minke whales showed the strongest relationship between sonar events and vocalizations. The probability of minke whale vocalization events occurring in the presence of sonar was much less than in the absence of sonar. A preliminary review of

two extended periods of delphinid whistles that occurred simultaneously with sonar revealed that call-matching (i.e., mimicry) was likely occurring.

Finally, the U.S. Navy has completed a portion of the initial work required to execute an LO effectiveness study. The field data collection protocol has been developed (Burt and Thomas, 2010) and recent work has focused on developing additional novel analysis methodologies and conducting a proof of concept analysis. Although methods have been developed and tested, it is important to note that the quantity of field trial data collected to date is insufficient for reliable inferences to be drawn. Efforts will continue to collect field trial data as opportunities arise in order to support a statistically valid analysis of U.S. Navy LO effectiveness.

SECTION III – AFAST ADAPTIVE MANAGEMENT RECOMMENDATIONS

Adaptive management is an iterative process of optimal decisionmaking in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring and feedback. Within the natural resource management community, adaptive management involves ongoing, real-time learning and knowledge creation, both in a substantive sense and in terms of the adaptive process itself. Adaptive management focuses on learning and adapting, through partnerships of managers, scientists, and other stakeholders. Adaptive management helps managers maintain flexibility in their decisions, knowing that uncertainties exist, and provides managers the latitude to change direction so as to improve understanding of ecological systems to achieve management objectives. Taking action to improve progress toward desired outcomes is another function of adaptive management.

A 2010 U.S. Navy-sponsored monitoring meeting in Arlington, Virginia initiated a process to critically evaluate the current U.S. Navy monitoring plans and begin development of revisions/updates to both existing region-specific plans and the ICMP. Discussions at that meeting, and at the U.S. Navy/NMFS annual adaptive management meeting in October 2010, established a way forward for continued refinement of the U.S. Navy's monitoring program. This process included establishing a SAG composed of leading marine mammal scientists, with the initial task of developing recommendations that would serve as the basis for a Strategic Plan for U.S. Navy monitoring. The Strategic Plan (in development) is intended to be a primary component of the ICMP and to provide a "vision" for U.S. Navy monitoring across geographic regions—serving as guidance for determining how to most efficiently and effectively invest the marine species monitoring resources to address ICMP top-level goals and satisfy MMPA (LOA) regulatory requirements. The objectives of the Strategic Plan will be to continue the evolution of U.S. Navy marine-species monitoring toward a single integrated program, incorporating SAG recommendations, and to establish a more transparent framework for soliciting, evaluating, and implementing monitoring work across the Fleet Range Complexes. The Strategic Plan is currently being developed in coordination with input from NMFS Headquarters and the Marine Mammal Commission and will establish the process for soliciting, reviewing, and selecting the most appropriate monitoring projects to invest in across the U.S. Navy. It is anticipated that some current efforts will continue, but the level of effort and investment may be allocated differently across U.S. Navy ranges.

Originally, five study questions were developed between NMFS and the U.S. Navy as guidance for developing monitoring plans (as presented in **Section I**), and all existing range-specific monitoring plans attempted to address each of these study questions. However, the state of knowledge for the various Range Complexes is not equal, and many factors, including level of existing information, amount of training activity, accessibility, and available logistics resources, all contribute to the ability to perform particular monitoring activities. In addition, the U.S. Navy monitoring program has historically been compartmentalized by Range Complex and focused on effort-based metrics (survey days, trackline covered, etc.).

The U.S. Navy established the SAG in 2011 with the initial task of evaluating current monitoring approaches under the ICMP and existing LOAs to develop objective scientific recommendations that would form the basis for the Strategic Plan. While recommendations were fairly broad and not prescriptive from a Range Complex perspective, the SAG did provide specific programmatic recommendations that serve as guiding principles for the continued evolution of the U.S. Navy Marine

Species Monitoring Program and provide a direction for the Strategic Plan development. Key recommendations that have direct bearing on future AFAST monitoring include:

1. Dispensing with the previous broad "study questions" and instead working within a conceptual framework of knowledge, from basic information on the occurrence of species within each Range Complex, to more specific matters of exposure, response, and consequences.
2. Striving to move away from a "box-checking" mentality and to design monitoring studies according to scientific objectives rather than cataloging effort expended.
3. Approaching the U.S. Navy Marine Species Monitoring Program holistically and selecting projects that offer the best opportunity to advance understanding of the issues, as opposed to establishing range-specific requirements.

Specific to AFAST, the SAG noted that the combination of line-transect aerial surveys, photo-identification, and PAM has proven particularly useful. There are several other important monitoring opportunities, including: exposure-response studies, the use of satellite tags to characterize medium-term response to exposure, and the use of digital, acoustic data-logging tags (e.g., DTAGs) to monitor acute response to exposure. In addition, there is a unique opportunity for addressing potential stock- or population-level consequences, specifically at the planned USWTR site in the JAX OPAREA before and after concentration of sonar activities occur. The SAG recommended that the spatial coverage for monitoring within AFAST be expanded to sample the full range of marine mammal habitats that are exposed to U.S. Navy training activities.

In June 2011, the U.S. Navy hosted a Marine Mammal Monitoring Workshop with guidance and support from NMFS, which included scientific experts and representatives of environmental non-governmental organizations. The purpose of the workshop was to present a consolidated overview of monitoring activities accomplished in 2009 and 2010 pursuant to the MMPA Final Rules currently in place, including outcomes of selected monitoring-related research and lessons learned, and to seek feedback on future directions. A significant outcome of this workshop was to continue consolidating monitoring efforts from individual Range Complex plans and to develop a single Strategic Plan for U.S. Navy Monitoring that will improve the return on investment by focusing on specific objectives and projects where they can most efficiently and effectively be addressed throughout the U.S. Navy's Range Complexes. The Strategic Plan is currently in development, although some specific changes in the monitoring approach were implemented through the 2012 AFAST LOA renewal process and will continue to be incorporated as appropriate under the current monitoring plan through the existing LOA period ending January 2014. The Strategic Plan will be incorporated as a primary component of the ICMP.

Results of recent meeting and recommendations from the SAG, as well as successes and challenges in the field, continue to feed the AMR process. In 2012, the U.S. Navy proposed to allow for increased flexibility under the AFAST LOA within the VACAPES, CHPT, and JAX OPAREAs in order to allow continued input and guidance from the SAG and research community. **Table 27** summarizes proposed monitoring activities for 2013-2014 under the AFAST LOA for 2012-2014. Emphasis on before, during, and after visual surveys was decreased and more resources are directed to PAM of ASW exercises and the associated data analysis in particular. This evolution will continue through 2013 in order to focus resources on methods and projects proposed by the scientific community through the Strategic Planning process that offer the best opportunity for advancing our knowledge and addressing ICMP top-level goals U.S. Navy-wide.

Table 27. U.S. Navy's proposed 2013-2014 annual monitoring commitments for AFAST.

Marine Mammal Observers (MMOs)	2 events in conjunction with exercises.
MMO/Lookout Comparison Study	40 hr data-collection trials.
Aerial Surveys – VACAPES/CHPT/JAX OPAREAs	36 days.
Vessel Surveys – VACAPES/CHPT/JAX OPAREAs	24 days.
Marine Mammal Tagging	-Field work and data analysis in the JAX OPAREA in coordination with vessel surveys. -Initiate tagging project in Hatteras survey area.
Passive Acoustics – Baseline	Continue recording and data analysis for 3 strategically located HARPs.
Passive Acoustics – Exercise Monitoring	Deployments of pop-up buoys in conjunction with ASW exercises.

Specific to the VACAPES/CHPT/JAX baseline monitoring projects, the methods have been modified in response to recommendations from the SAG, as well as the increasing level of knowledge within these regions since beginning this effort over 4 years ago. The modifications include:

- Discontinuing standard line-transect shipboard surveys in Onslow Bay and JAX and replacing them with photo-identification and biopsy sampling effort.
- Adding a photo-identification and biopsy-sampling component off Cape Hatteras.
- Significantly reducing aerial line-transect survey effort in Onslow Bay and re-allocating this survey effort to Cape Hatteras.
- Reducing the number of HARPs from two to one in both Onslow Bay and JAX and adding a HARP off Cape Hatteras. All three of these HARPs will monitor year-round.

As a result, the survey area is expanded to include Cape Hatteras, based on the overlap of high marine mammal densities and U.S. Navy training activity in that region. Shipboard surveys were also refocused on residency and population structure because: (1) adequate data are being obtained with which to estimate density from aerial line-transect sampling; (2) limited photo-identification data from Onslow Bay suggest considerable residency in that area despite minimal sampling; and (3) deep-diving marine mammal species in Onslow Bay and JAX are likely to be missed during aerial surveys because of long dive times and associated availability bias (i.e., animals available at the surface to be observed infrequently). Finally, we are reducing the number of HARPs deployed from four to three to reduce the incoming data stream that has been too voluminous to analyze given existing resources. Despite reducing the number of HARPS, the geographic coverage has been expanded to include an area off Cape Hatteras coincident with the expansion of visual surveys.

A new component of the AFAST monitoring program in 2012 is the addition of an odontocete tagging project within the planned USWTR range boundary in the JAX OPAREA. The initial year of this project will focus on documenting movement and diving patterns of small whales (pilot whales, Risso's dolphins, *Kogia* spp., beaked whales, etc.) with the expectation of potentially addressing behavioral response to U.S. Navy training activities in the future.

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Appendix A

Integrated Comprehensive Monitoring Program
(Updated 2010)

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Appendix B

Publications and Presentations Resulting from AFAST-related Monitoring Efforts

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Appendix C

Hatteras/Onslow Bay/JAX Baseline Monitoring Report: July 2010 – December 2011

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Appendix D

Hatteras/Onslow Bay/JAX Baseline Monitoring Annual Review Presentations

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Appendix E

Hatteras/Onslow Bay/JAX Monthly Progress Reports

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Appendix F

JAX Marine Autonomous Recording Unit Analysis Report

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Appendix G

August/September 2011 VACAPES ASW Monitoring: Aerial Survey Report

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Appendix H

September 2011 JAX ASW Monitoring:
Aerial Survey Report

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Appendix I

May/June 2012 JAX ASW Monitoring:
JAX Marine Mammal Observer Report

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Appendix J

Navy Lookout Comparison Study Data Collection Protocol

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