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National Marine Fisheries Service  
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27 January 2009 (AFAST Final Rule)

**Marine Species Monitoring  
For The U.S. Navy's  
Atlantic Fleet Active Sonar Training  
(AFAST)**



**Annual Report 2009**

**Final**

**04 January 2010**



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**List Of Acronyms**

AMR	Adaptive Management Review
ARP	acoustic recording package
AS	aerial survey
ASW	anti-submarine warfare
BiOP	ESA Biological Opinion
COMPTUEX	Composite Training Unit Exercises
CNO	Chief of Naval Operations
CREEM	Centre for Research into Ecological and Environmental Modeling
dB	decibel
EIS	Environmental Impact Statement
DoN	Department of the Navy
ESA	Endangered Species Act
ft	feet
FY	fiscal year
GUNEX	Gunnery Exercise, Surface-to- Surface
HARP	high-frequency acoustic recording package
HQ	headquarters
JTFEX	Joint Task Forces Exercises
ITA	Incidental Take Authorization
LOA	Letter of Authorization
M3R	Marine Mammal Monitoring on Navy Ranges
MFAS	mid-frequency active sonar
MMO	marine mammal observer
MMPA	Marine Mammal Protection Act
MMPI	marine mammal PhotoID
MTE	Major Training Exercise
nm	nautical mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NUWC	Naval Undersea Warfare Center
OEIS	Overseas Environmental Impact Statement
ONR	Office of Naval Research
PAM	passive acoustic monitoring
PMAP	Protective Measures Assessment Protocol
PTS	permanent threshold shift
R&D	research and development
RL	receive level
TTS	temporary threshold shift
VS	vessel survey

## INTRODUCTION

### ***Background***

The U.S. Navy developed Range Complex specific 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 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 Endangered Species Act (ESA) does not have specific monitoring requirements, recent Biological Opinions issued by National Marine Fisheries Service (NMFS) also have included terms and conditions requiring the Navy to develop a monitoring program. Therefore, as part of the issuance of an LOA in early 2009 (NMFS 2009), the Navy published a Monitoring Plan with specific monitoring objectives for the Atlantic Fleet Active Sonar Training (AFAST) (DoN 2009).

Based on discussions with NMFS, Range Complex Monitoring Plans were designed as a collection of focused “studies” to gather data that will attempt to address the following questions that 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, TTS, or 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 Navy’s suite of mitigation measures for MFAS (e.g., Protective Measures Assessment Protocol (PMAP), major exercise measures agreed to by the Navy through permitting) effective at avoiding TTS, injury, and mortality of marine mammals and sea turtles?

Monitoring methods proposed for the Range Complex Monitoring Plans include a combination of research elements designed to support both Range Complex specific monitoring, and contribute information to a larger Navy-wide science-based program. These research elements include visual surveys from vessels or airplanes, passive acoustic monitoring (PAM), and marine mammal observers (MMO). Each monitoring technique has advantages and disadvantages that vary temporally and spatially, as well as support one particular study objective better than another (DoN 2009). The Navy intends to use a combination of techniques so that detection and observation of marine animals is maximized, and meaningful information can be derived to answer the research questions proposed above. This also includes incorporation of new techniques (e.g. photo-ID) if warranted.

In addition to Fleet funded Monitoring Plans described above, the Chief of Naval Operations (CNO) Environmental Readiness Division (N45) and the Office of Naval Research (ONR) have developed a coordinated Science & Technology and Research & Development program focused on marine mammals and sound. Total investment in this program for fiscal year (FY) 2009 was approximately \$22 million, and continued funding at levels greater than \$14 million is foreseen in subsequent years. Several significant projects relative to Navy operational impact or lack of impact to marine mammals are currently funded and ongoing within some Navy Range Complexes.

***Report Objective***

Design of the Range Complex specific Monitoring Plans represented part of a new Navy-wide and regional assessment, and as with any new program, there are many coordination, logistic, and technical details that continue to be refined. The scope of the Range Complex Monitoring Plans was to layout the background for monitoring, as well as defines initial procedures to be used in meeting certain study objectives derived from NMFS-Navy agreements.

Overall, and in support of the above statement, this report has two main objectives:

- 1) Under the AFAST LOA, present data and results from the Navy-funded marine mammal and sea turtle monitoring conducted in the AFAST study area during the period from 27 January 2009 to 1 August 2009. Because one full year of monitoring has not occurred from the January 2009 promulgation of the AFAST LOA, this report is meant to be a status report on Navy's accomplishments over the past seven months of effort. Included in this assessment are reportable metrics of monitoring as requested by NMFS. Given the relatively new start of this ambitious program, this first report will focus mostly on summarizing collected data, and providing a brief description of the major accomplishments from techniques used this year.
- 2) Set the foundation for adaptive management review with NMFS for incorporation of proposed revisions to the Navy's FY 2010 AFAST Monitoring Plan based on actual lessons learned from FY 2009. This can include data quality in answering the original study questions, assessment of logistic feasibility, availability of monitoring resources, use of new techniques not originally incorporated in this year's Monitoring Plan, and any other pertinent information.



## SECTION I- ATLANTIC FLEET ACTIVE SONAR TRAINING (AFAST)

The AFAST study area consists of the range complexes' at-sea operating areas, and adjacent waters along the U.S. East Coast and Gulf of Mexico (**Figure I-1**).

There are forty-three species of marine mammals that may be observed either seasonally or year-round in the AFAST study area; seven are endangered. In addition, there are six species of threatened and endangered sea turtles that may occur either seasonally or year-round in parts of the AFAST study area (Reviewed in DoN, 2005, 2007, 2008a, 2008b, and 2008c).

### ***Part I- AFAST Monitoring Plan Accomplishments***

#### **AFAST STUDY QUESTIONS OVERVIEW**

The goal of the AFAST Monitoring Plan is to implement field methods chosen to address the long term monitoring objectives outlined in the Introduction. In the AFAST monitoring plan (DoN 2009), the Navy proposed to implement a diversity of field methods to gather monitoring data for marine mammals and sea turtles in Navy training areas. Specifically, the Navy proposed to use visual surveys (aerial and vessel), deploy passive acoustic monitoring devices, and put marine mammal observers aboard Navy vessels to meet its goals in FY09. Studies were specifically designed to meet the questions outlined in the Introduction section of this document. **Table I-1** from the final AFAST Monitoring Plan shows the FY 2009 monitoring objectives as initially agreed upon by the NMFS and Navy.

#### **LONGITUDINAL BASELINE MONITORING**

In June 2007 a protected marine species monitoring program was initiated in Onslow Bay off the North Carolina Coast. The Navy contracted with a consortium of researchers from Duke University, the University of North Carolina at Wilmington, the University of St. Andrews, and the NMFS Northeast Fisheries Science Center to conduct a pilot study analysis and subsequently develop a survey and monitoring plan that prescribes the recommended approach for data collection including surveys (aerial/shipboard, frequency, spatial extent, etc.), passive acoustic monitoring, photo identification and data analysis (standard line-transect, spatial modeling, etc.) necessary to establish a fine-scale seasonal baseline of protected species distribution and abundance.

The program now consists of year-round multi-disciplinary monitoring through the use of shipboard and aerial visual surveys (24 days each annually), photo identification studies, biopsy sampling, and passive acoustic monitoring. Passive acoustic monitoring is accomplished through use of a towed array during shipboard surveys as well as long-term deployment of High-frequency Acoustic Recording packages. Surveys are conducted year-round using established track lines and standard distance sampling techniques. The detailed plan for the Onslow Bay monitoring program is included as **Appendix A**. In addition, the Year 1 annual report for Onslow Bay is included as **Appendix B**. Although the plan and annual report pre-date the AFAST Letter of Authorization and specific monitoring requirements, they serve as important background information and set the stage for how AFAST requirements are currently being addressed.

The initial intent of the Onslow Bay monitoring program was to support development of an Undersea Warfare Training Range. However, this has evolved into providing a fixed site for the overall AFAST monitoring program designed to provide meaningful data on potential long-term effects to marine species that may be chronically exposed to training. In addition to the Onslow Bay site, an additional site was added off the coast of Jacksonville. The monitoring at these two sites provides a longitudinal baseline of marine species distribution and abundance in Navy training areas during periods when training is not occurring at the site. In addition, these sites are being used as areas to conduct coordinated ASW exercise monitoring when a training event occurs at the site(discussed below). Monitoring both during and outside of training events is intended to gathering important data that will begin to answer the questions outlined in the Introduction.

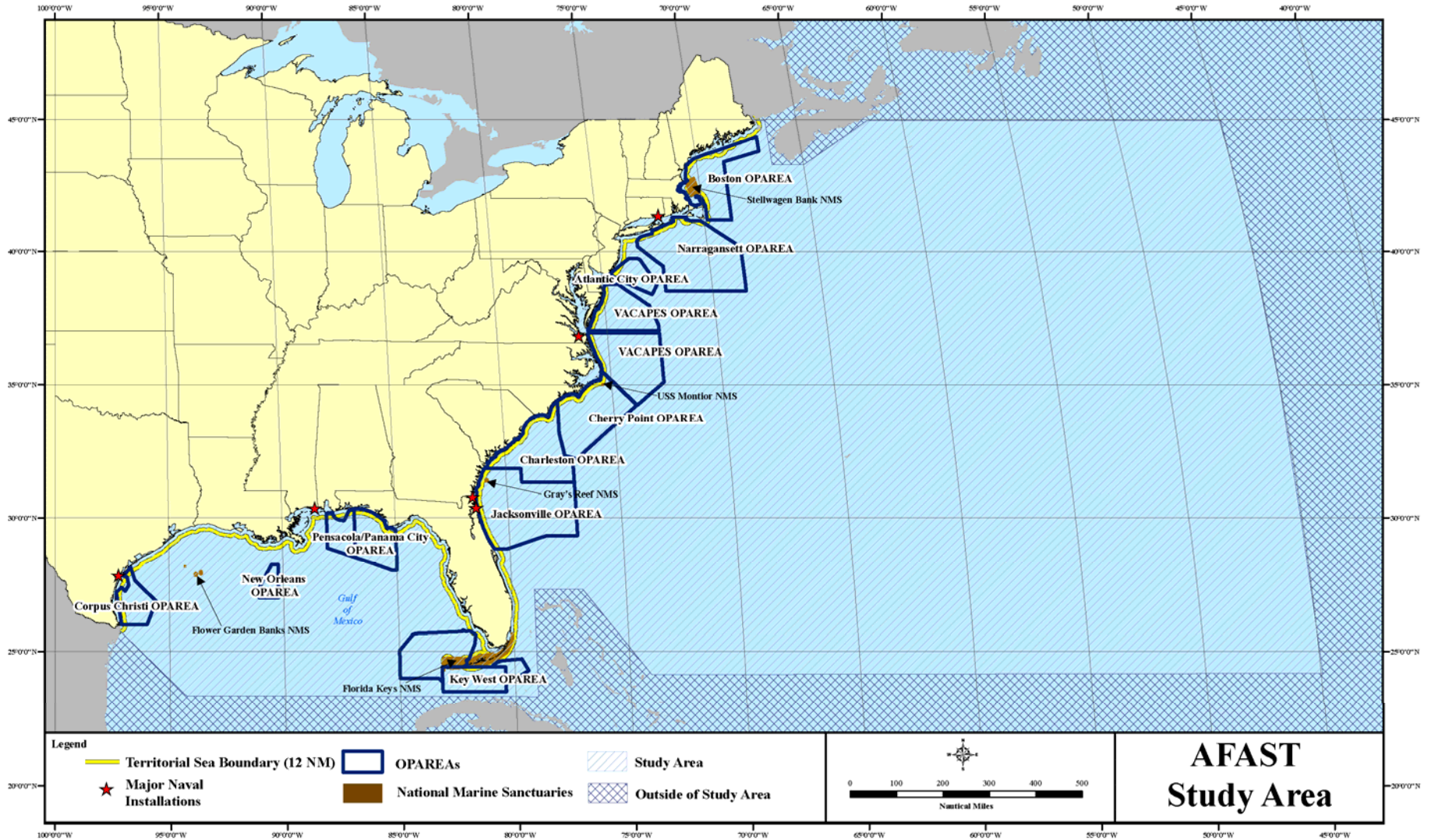


Figure I-1. AFAST Study Area.

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Table I-1. FY09 AFAST monitoring obligations under AFAST Final Rule, LOA and BiOP

<b>STUDY 1 and 3 (exposures and behavioral responses)</b>		
<b>Aerial Surveys During Training Events</b>	- 30 hours of active sonar during SEASWITI, shallow COMPTUEX, or ULT exercises.	Adaptive Management Review for FY10 (AMR)
<b>Marine Mammal Observers (MMO)</b>	- 60 hours during SEASWITI or ULT exercises.	
<b>Vessel surveys During Training Events (study 3 only)</b>	- 100 hours during SEASWITI, shallow COMPTUEX, or ULT exercises.	
<b>STUDY 2 (geographic redistribution)</b>		
<b>Aerial Surveys Before And After Training Events</b>	- 40 hours during SEASWITI, shallow COMPTUEX, or ULT exercises.	AMR
<b>Aerial Surveys Onslow Bay</b>	- 100 hours	
<b>Vessel Surveys Onslow Bay</b>	- 125 hours	
<b>Aerial Surveys Jacksonville</b>	- 100 hours	
<b>Vessel Surveys Jacksonville</b>	- 125 hours	
<b>Passive Acoustics</b>	Installation of a total of 4 HARPs and use of pop-up buoys for exercise monitoring. Begin recording and data analysis.	
<b>STUDY 4 (mitigation effectiveness)</b>		
<b>MMO/ Lookout Comparison</b>	- 40 hours during SEASWITI, shallow COMPTUEX, or ULT exercises.	AMR
<b>Aerial Surveys Before And After Training Events</b>	- 40 hours during SEASWITI, shallow COMPTUEX, or ULT exercises.	

## **AFAST MONITORING ACCOMPLISHMENTS FOR 2009**

During 2009, USFF implemented aerial and vessel surveys, deployed marine mammal observers on a Navy platform and deployed passive acoustic recording devices. The majority of monitoring effort for 2009 has been conducted in two locations, Onslow Bay and JAX. These locations serve as primary study areas for longitudinal baseline monitoring efforts discussed above. These sites will also be the primary locations for coordinated ASW exercise monitoring events, which are discussed below.

### **Major accomplishments from the U.S. Fleet Forces's FY 2009 compliance monitoring in the AFAST study area include:**

- Aerial Visual Surveys
  - Completed monthly aerial surveys at Onslow Bay and JAX (except April and May due to inclement weather) sites to obtain longitudinal data trends.
- Vessel Visual Survey
  - Completed monthly vessel surveys at Onslow Bay (except for May due to inclement weather). Vessel surveys began in July 2009 at JAX.
  - Obtained photo-ID and biopsy samples from the Onslow Bay site.
  - Conducted strip transect sea bird counts concurrent with the marine mammal surveys.
- Passive Acoustic Monitoring
  - Four HARPs were purchased and deployed (2 in Onslow Bay and 2 in Jacksonville).
  - Towed array was used during vessel surveys in Onslow Bay that allowed for visual species verification of acoustic detections.
- Marine mammal observers
  - MMOs were successfully deployed on a Navy cruiser involved in training events off the coast of Florida.

**Table I-2** presents a summary of the major accomplishments for Navy funded marine species monitoring within the AFAST study area. As briefly mentioned in the Introduction, because one full year of monitoring has not occurred from the January 2009 promulgation of the AFAST LOA, this report is meant to be a status report on Navy's accomplishments over the past seven months of effort. Monitoring is currently being planned for coordinated ASW exercises in September and December. These efforts will accomplish aerial surveys and vessel surveys before, during and after. In addition, the aerial and vessel surveys at Onslow Bay and JAX (study 2) will continue as scheduled.

**Table I-2. U.S. Navy funded monitoring accomplishments within the AFAST study area from January 2009 to August 2009.**

Study Type	Description of U.S. Navy EIS/LOA monitoring	Associated event type	Description of U.S. Navy R&D funded monitoring	MMPA/ESA requirement	Total accomplished
Aerial surveys –during training event (studies 1 and 3)	n/a	SEASWITI, shallow COMPTUEX, or ULT	n/a	30 hours	0 hours
Aerial surveys –before and after training event (studies 2 and 4)	n/a	SEASWITI, shallow COMPTUEX, or ULT	n/a	40 hours	0 hours
Aerial surveys –Onslow Bay and JAX (study 2)	1) Monthly surveys in Onslow Bay 2) Monthly surveys in JAX	n/a	n/a	100 hours (Onslow Bay) 100 hours (JAX)	91.2 hours (Onslow Bay) 53.9 hours (JAX)
Vessel surveys –during training event (study 3)	n/a	SEASWITI, shallow COMPTUEX, or ULT	n/a	100 hours	0 hours
Vessel surveys— Onslow Bay and JAX (study 2)	1) Monthly surveys in Onslow Bay 2) 4 days in Cape Hatteras 3) July surveys in JAX	n/a	n/a	125 hours (Onslow Bay) 125 hours (JAX)	66 hours (Onslow Bay) 26.5 hours (Cape Hatteras) 15 hours (JAX)
Marine Mammal Observers (studies 1 and 3)	60 hours from 27-30 April 2009	ULT	n/a	60 hours	60 hours
Passive Acoustic Monitoring (study 2)	1) Deployment of 4 HARPS (2 in Onslow Bay and 2 in Jacksonville) 2) Use of pop-up buoys for exercise monitoring 3) Use of towed array during vessel surveys	shallow COMPTUEX (pop-up buoys)	n/a	Deploy up to four devices and use pop-up buoys	Deployed four high frequency recording packages (HARPs) , used pop-up buoys in conjunction with exercise, and a total of ~20 hours of towed array recording effort in Onslow Bay and JAX

**AFAST AERIAL VISUAL SURVEYS**

Aerial surveys are planned monthly in both Onslow Bay and JAX. However, in JAX no surveys were flown during April and May due to adverse weather conditions. A summary of the results is presented below. For more detailed information, see **Appendix C** (Onslow Bay) and **Appendix D** (JAX), which are a compilation of the individual monthly trip reports.

**Onslow Bay January to August 2009:** surveys were conducted on 16 days during this period, representing 91.2 total survey hours and 130 tracklines surveyed. A summary of the sightings is presented in Table I-3 and Figures I-2, I-3, and I-4.

**Table I-3. Summary of marine species sightings seen from the observer aircraft in Onslow Bay during Jan to Aug 09.**

Common Name	Scientific Name	# of Sightings	# of individuals
Bottlenose Dolphin	<i>Tursiops truncatus</i>	26	456
Spotted Dolphin	<i>Stenella frontalis</i>	20	665
Unidentified Delphinid		4	41
Loggerhead Sea Turtle	<i>Caretta caretta</i>	173	196
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	1	1
Unidentified Sea Turtle		25	28
Unidentified Shark		14	18
Manta Ray	<i>Manta birostris</i>	19	24
Ocean Sunfish	<i>Mola mola</i>	6	6



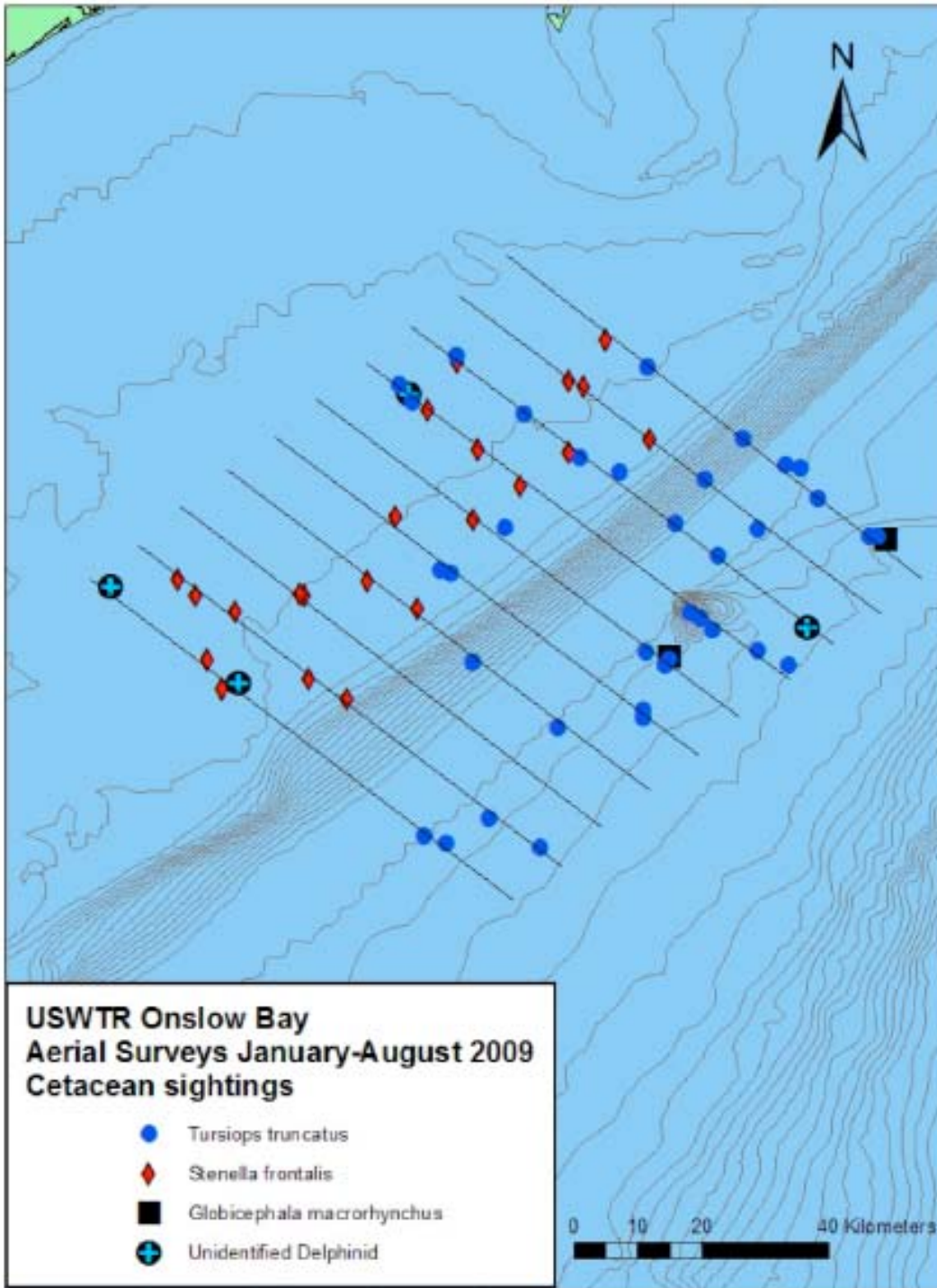


Figure I-2. Locations of cetacean sightings from aerial surveys conducted in Onslow Bay, January to August 2009.

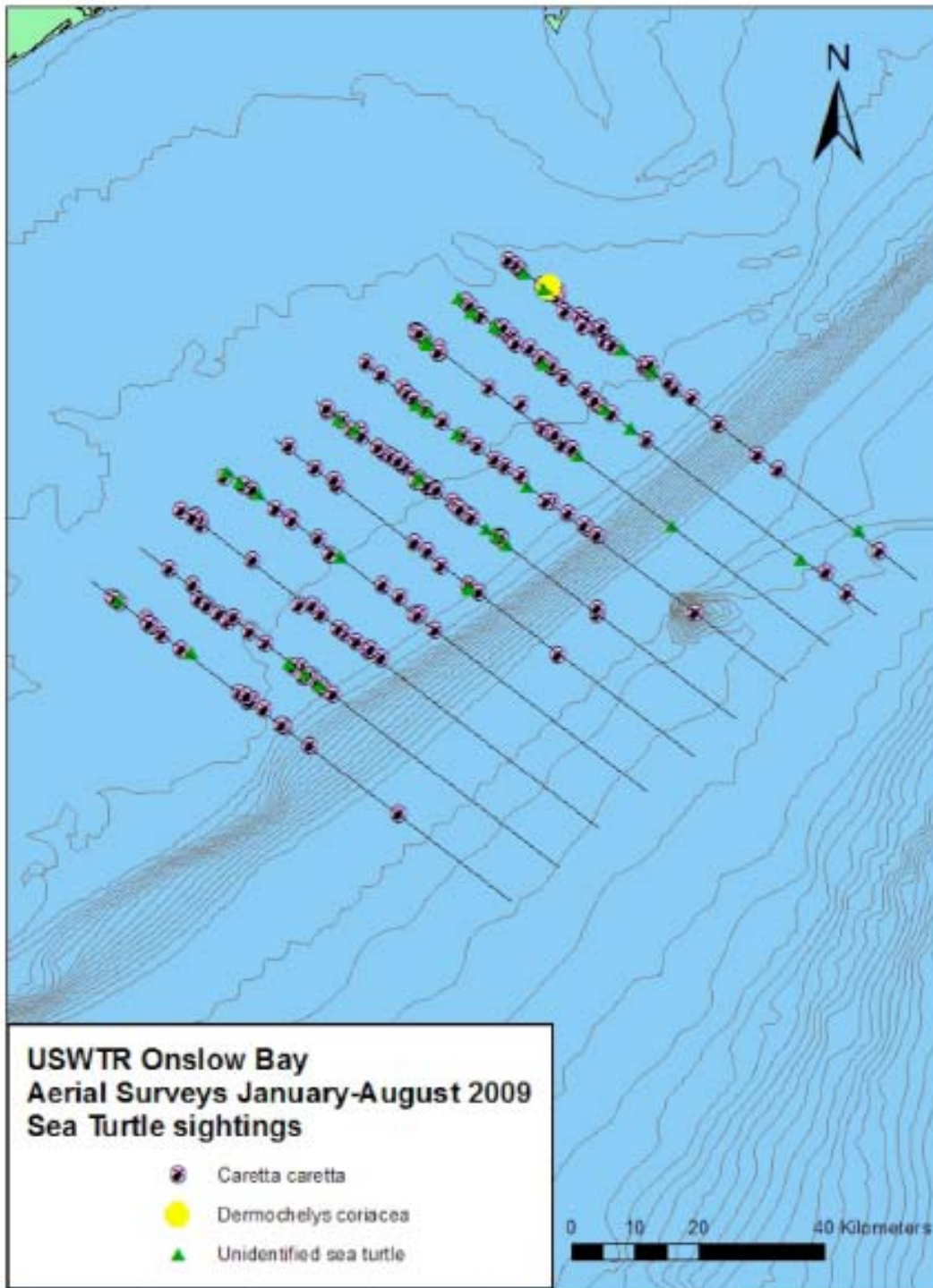


Figure I-3. Locations of sea turtle sightings from aerial surveys conducted in Onslow Bay, January to August 2009.

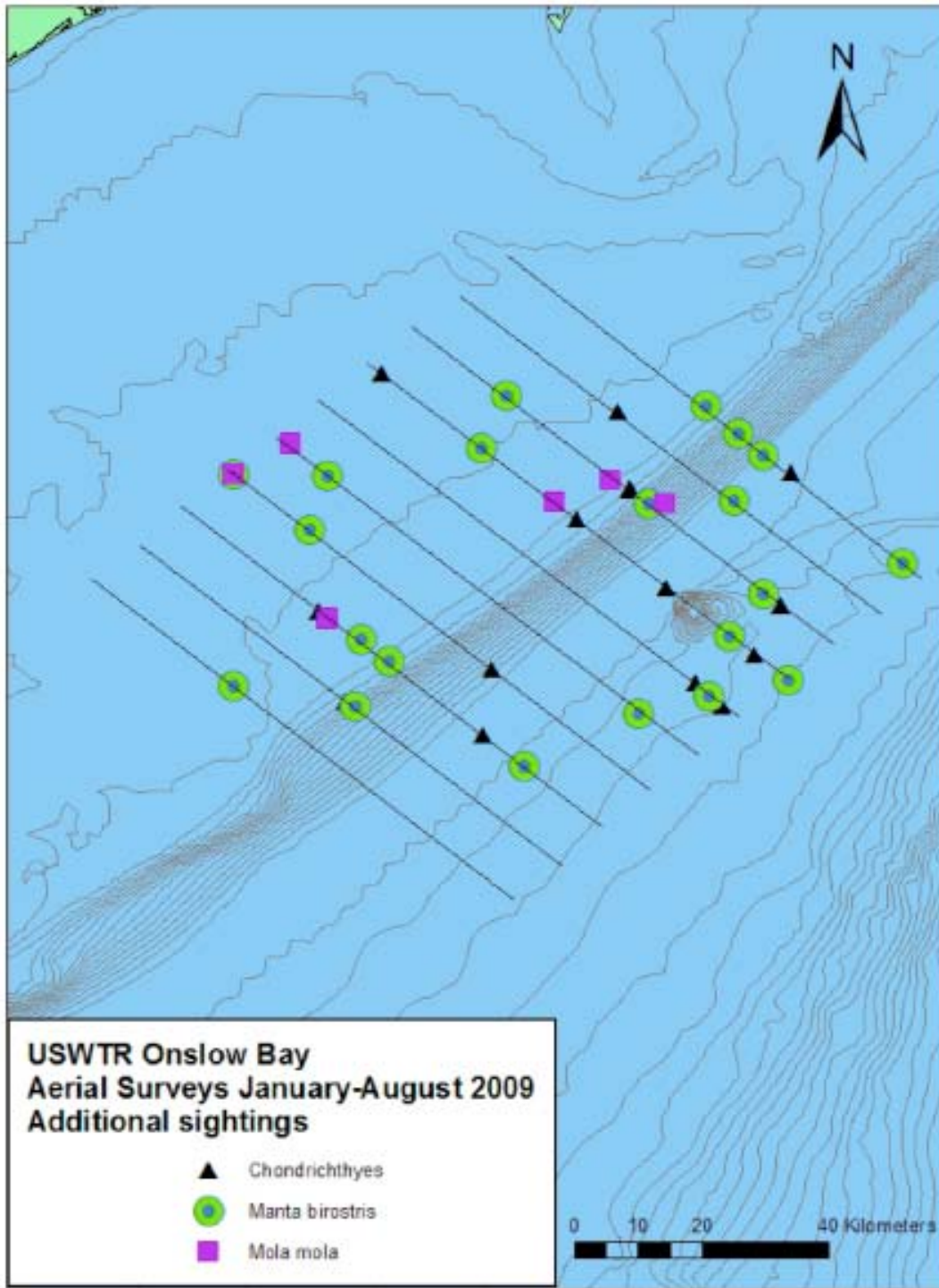


Figure I-4. Locations of additional sightings from aerial surveys conducted in Onslow Bay, January to August 2009.

**JAX January to August 2009:** surveys were conducted on 11 days during this period, representing 53.9 total survey hours and 75 tracklines surveyed. A summary of the sightings is presented in **Table I-4** and **Figures I-5, I-6, and I-7**.

**Table I-4. Summary of marine species sightings seen from the observer aircraft in JAX during Jan to Aug 09.**

Common Name	Scientific Name	# of Sightings	# of individuals
Minke Whale	<i>Balaenoptera acutorostrata</i>	4	6
Risso's Dolphin	<i>Grampus griseus</i>	3	51
Bottlenose Dolphin	<i>Tursiops truncatus</i>	23	227
Spotted Dolphin	<i>Stenella frontalis</i>	9	173
Unidentified Delphinid		8	17
Loggerhead Sea Turtle	<i>Caretta caretta</i>	263	328
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	1	1
Unidentified Sea Turtle		29	34
Hammerhead Shark	<i>Sphyrna sp.</i>	13	14
Unidentified Shark		7	7
Manta Ray	<i>Manta birostris</i>	9	9
Ocean Sunfish	<i>Mola mola</i>	3	3

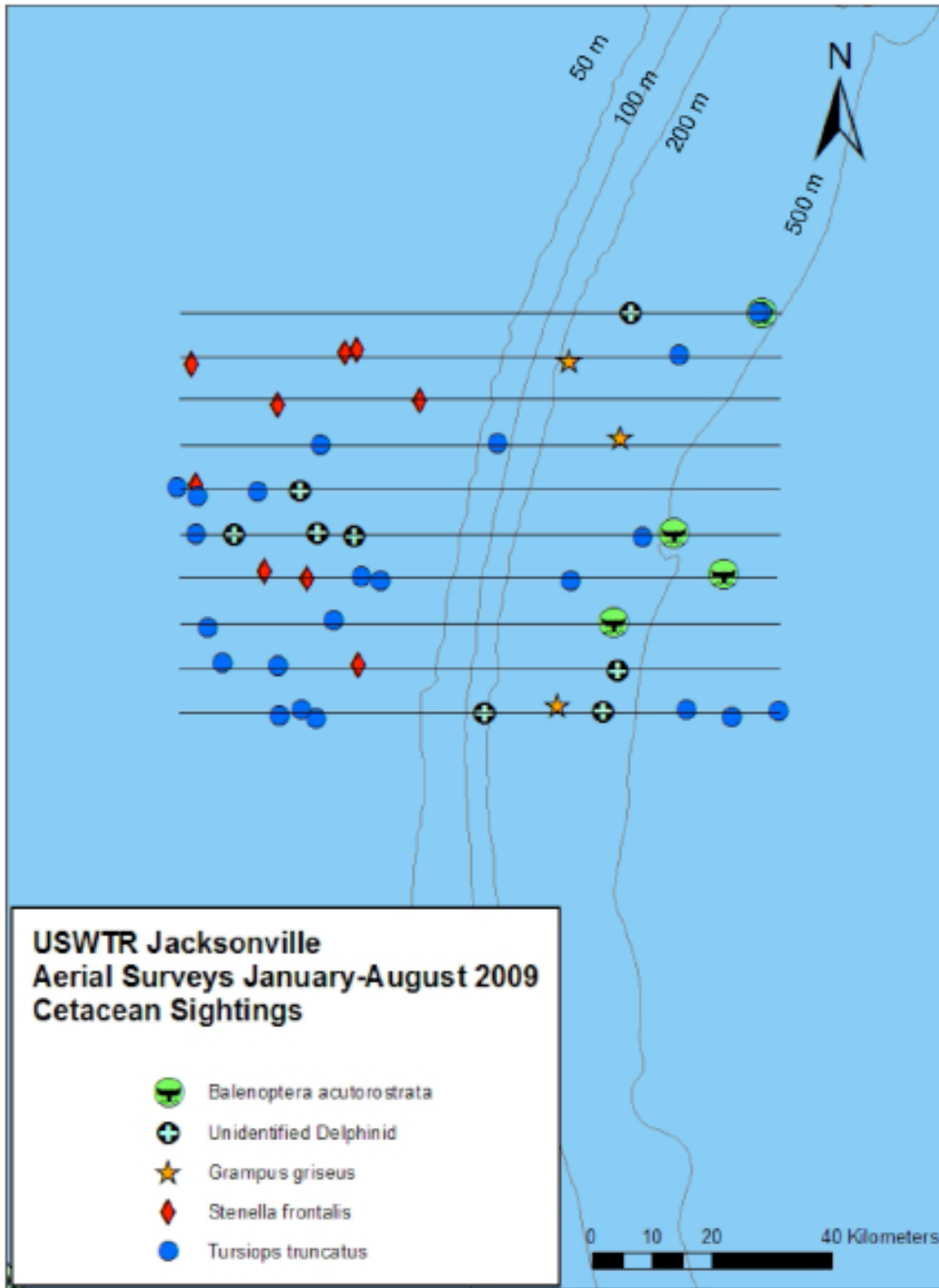


Figure I-5. Locations of cetacean sightings from aerial surveys conducted in JAX, January to August 2009.



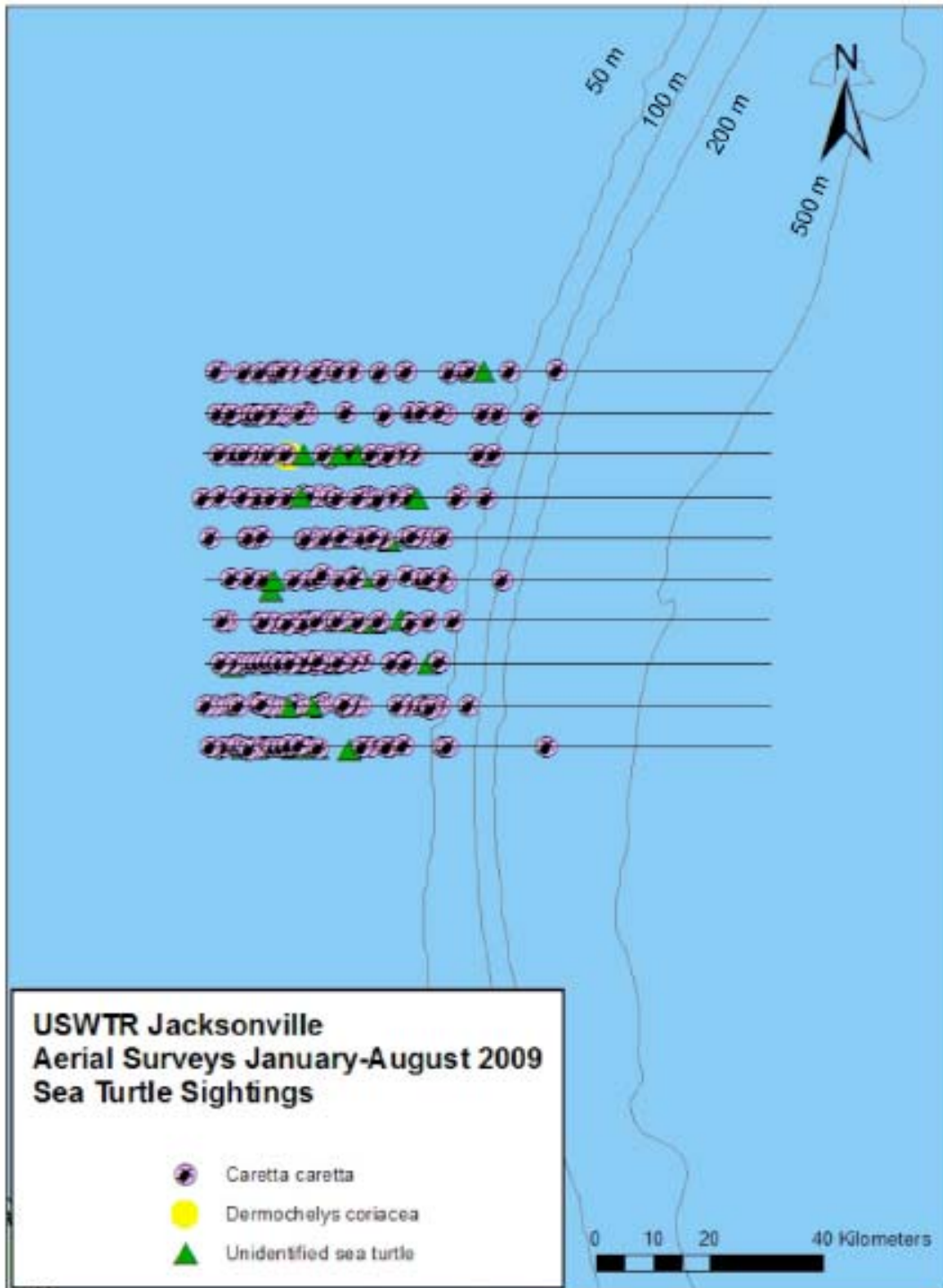


Figure I-6. Locations of sea turtle sightings from aerial surveys conducted in JAX, January to August 2009.

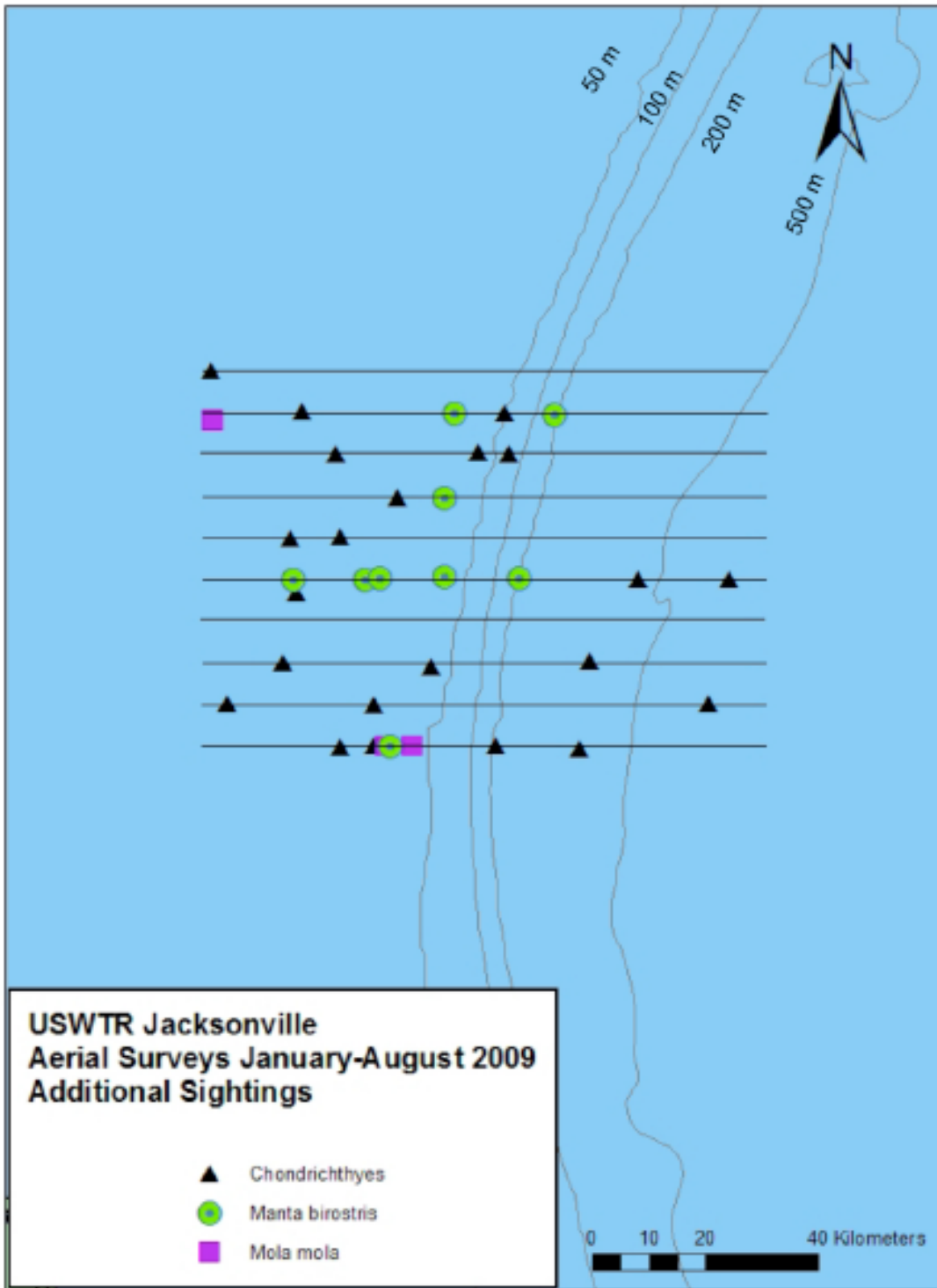


Figure I-7. Locations of additional sightings from aerial surveys conducted in JAX, January to August 2009.

**AFAST VESSEL VISUAL SURVEYS**

Vessel surveys were conducted monthly in Onslow Bay (except for May due to adverse weather conditions). In addition, surveys were conducted during July in Cape Hatteras to gather additional sighting data in order to improve the probability of detection function being used to calculate marine mammal densities in Onslow Bay. Vessel surveys were conducted in JAX during the month of July. There was a delay in beginning the JAX surveys due to finding an appropriate vessel. A summary of the results is presented below. For more detailed information, see **Appendix C** (Onslow Bay) and **Appendix D** (JAX), which are a compilation of the individual monthly trip reports.

**Onslow Bay January to August 2009:** surveys were conducted on 15 days during this period, representing 66 total survey hours and 15 tracklines surveyed. A summary of the sightings is presented in **Table I-5** and **Figure I-8**.

**Table I-5. Summary of marine species sightings seen from the observer vessel in Onslow Bay during Jan to Aug 09.**

Common Name	Scientific Name	# of Sightings	# of individuals
Bottlenose Dolphin	<i>Tursiops truncatus</i>	9	49
Spotted Dolphin	<i>Stenella frontalis</i>	13	147
Rissos Dolphin	<i>Grampus griseus</i>	1	24
Unidentified Delphinid		1	
Loggerhead Sea Turtle	<i>Caretta caretta</i>	41	41



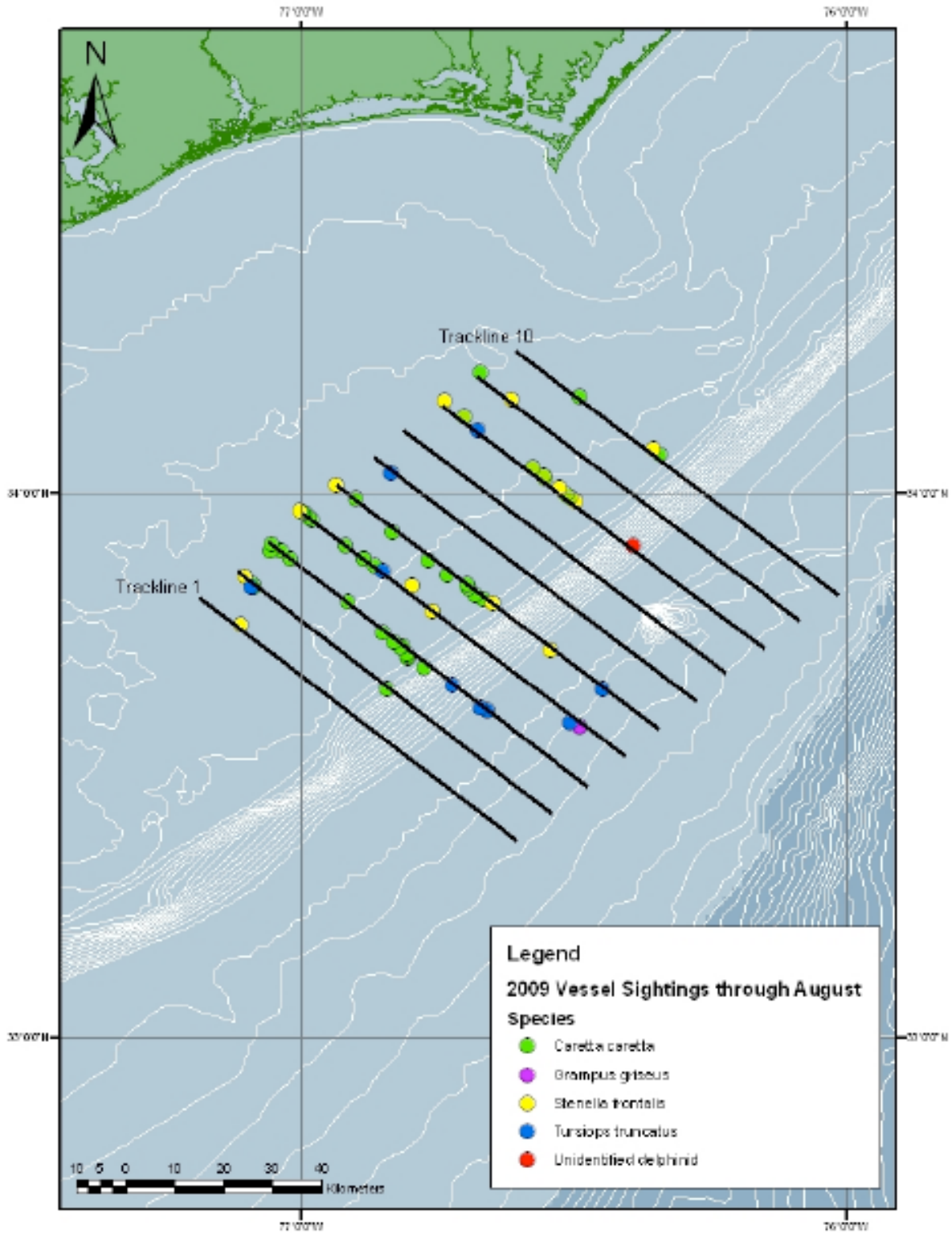
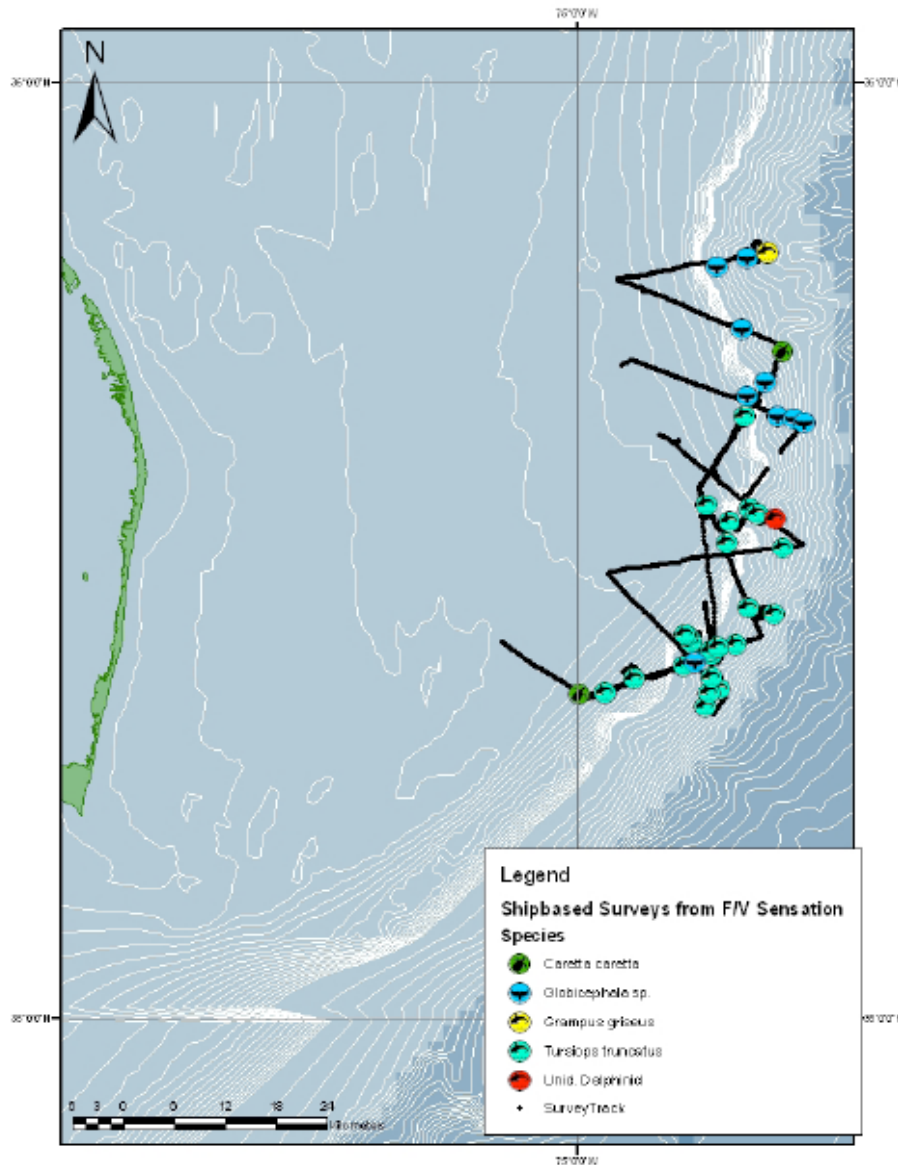


Figure I-8. Locations of sightings from vessel surveys conducted in Onslow Bay, January to August 2009.

**Cape Hatteras July 2009:** surveys were conducted on 4 days during the month of July, representing 26.5 total survey hours. A summary of the sightings is presented in **Table I-6** and **Figure I-9**.

**Table I-6. Summary of marine species sightings seen from the observer vessel in Cape Hatteras during July 09.**

Common Name	Scientific Name	# of Sightings	# of individuals
Bottlenose Dolphin	<i>Tursiops truncatus</i>	23	497
Rissos Dolphin	<i>Grampus griseus</i>	1	34
Unidentified Delphinid		1	2
Pilot Whale	<i>Globicephala sp.</i>	9	213
Loggerhead Sea Turtle	<i>Caretta caretta</i>	2	2

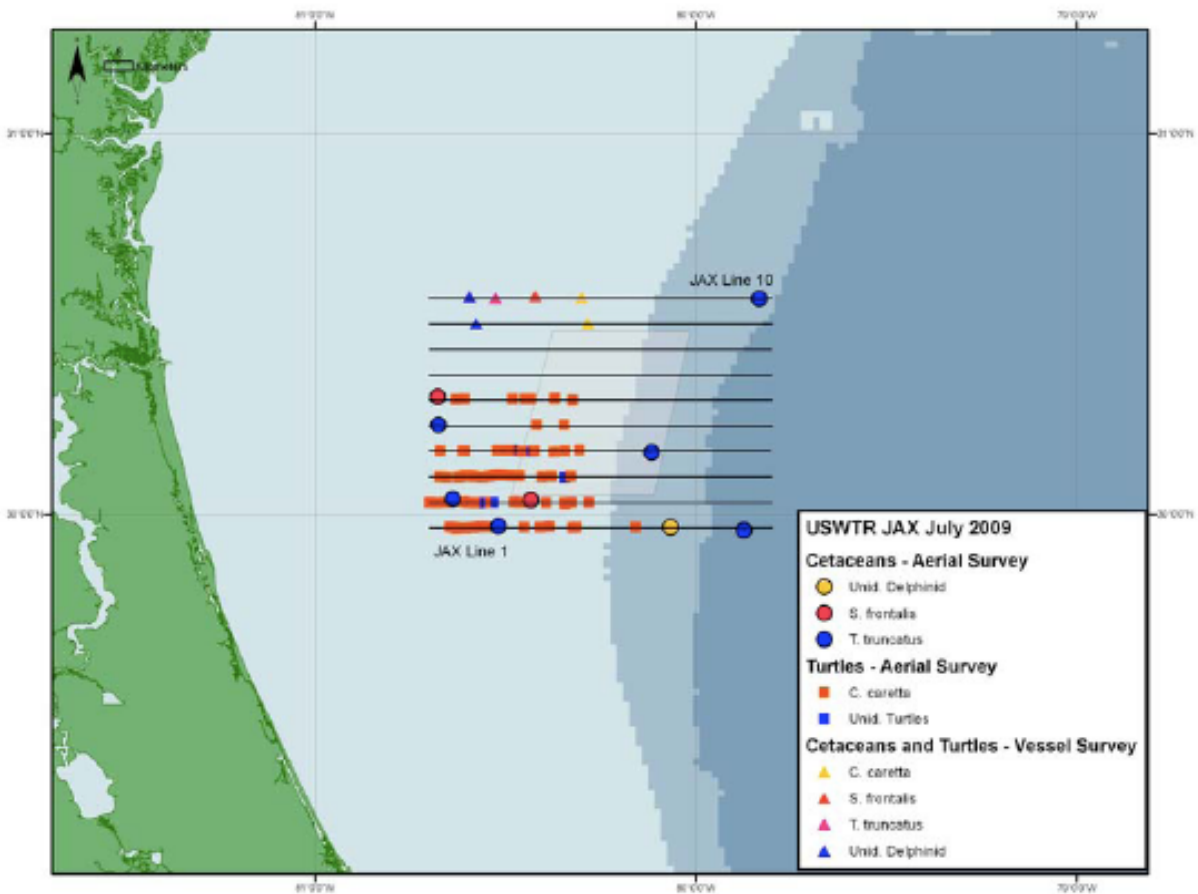


**Figure I-9. Locations of sightings from vessel surveys conducted in Cape Hatteras, July 2009.**

**JAX July 2009:** surveys were conducted on 2 days during the month of July, representing 15 total survey hours and 2 tracklines surveyed. A summary of the sightings is presented in **Table I-7** and **Figure I-10**.

**Table I-7. Summary of marine species sightings seen from the observer vessel in JAX during July 09.**

Common Name	Scientific Name	# of Sightings	# of individuals
Bottlenose Dolphin	<i>Tursiops truncatus</i>	1	6
Spotted Dolphin	<i>Stenella frontalis</i>	1	4
Unidentified Delphinid		2	5
Loggerhead Sea Turtle	<i>Caretta caretta</i>	2	2



**Figure I-10. Locations of sightings from aerial and vessel surveys conducted in JAX, July 2009.**

### **AFAST MARINE MAMMAL OBSERVERS (MMOs)**

Two Navy marine mammal biologists embarked on the *USS HUE CITY* during UNITAS GOLD in April 2009. MMOs both embarked and returned to Mayport, FL on the HUE CITY, observing transit and training within the Jacksonville Range Complex from 27-30 April 2009. For additional details see **Appendix E** for the UNITAS 09 trip report.

MMOs conducted visual observations from the bridge wings of the *USS HUE CITY* during daylight hours. They worked alongside the Navy lookouts, conducting visual searches for marine species. Twenty marine mammal and fifteen sea turtle sightings were recorded by the MMOs (**Table I-8**). **Figure I-11** shows a generalized ship track and the sightings that were made. All of the marine mammal sightings were of dolphins, primarily bottlenose and spotted. Most of the sea turtle sightings were of unidentified hardshell sea turtles, although there were two confirmed sightings of loggerhead sea turtles and one confirmed sighting of a leatherback sea turtle. On 28 April at ~1420, one of the helicopters reported back to the *USS HUE CITY* that they sighted a pod of whales more than 5 nautical miles away from the ship. However, due to the distance and the time lag in the reporting, the sighting was unable to be confirmed by the MMOs.

**Table I-8. Marine Mammal Observer Sighting Data from UNITAS 09.**

<b>Common Name</b>	<b>Scientific Name</b>	<b># of Sightings</b>	<b># of individuals</b>
Bottlenose Dolphin	<i>Tursiops truncatus</i>	2	11
Atlantic Spotted Dolphin	<i>Stenella frontalis</i>	5	12
Spotted Dolphin	<i>Stenella spp.</i>	2	7
Bottlenose/Atlantic Spotted Dolphins	<i>Tursiops truncatus</i> <i>Stenella frontalis</i>	2	14-24
Unidentified Delphinid		9	59
Loggerhead Sea Turtle	<i>Caretta caretta</i>	2	2
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	1	1
Unidentified Sea Turtle		12	14

The Navy sought expert advice on how to go about assessing lookout effectiveness and received feedback cautioning that it is not a difficult task, but that it is easy to do incorrectly. Therefore, it was determined that in order to address the question correctly, it was necessary to spend some time designing a proper study that would allow the Navy to collect the right type of data. Navy has begun the process of involving scientists from NMFS and researchers from the Center for Research in Ecological and Environmental Modelling (CREEM) to design a study to answer the question.

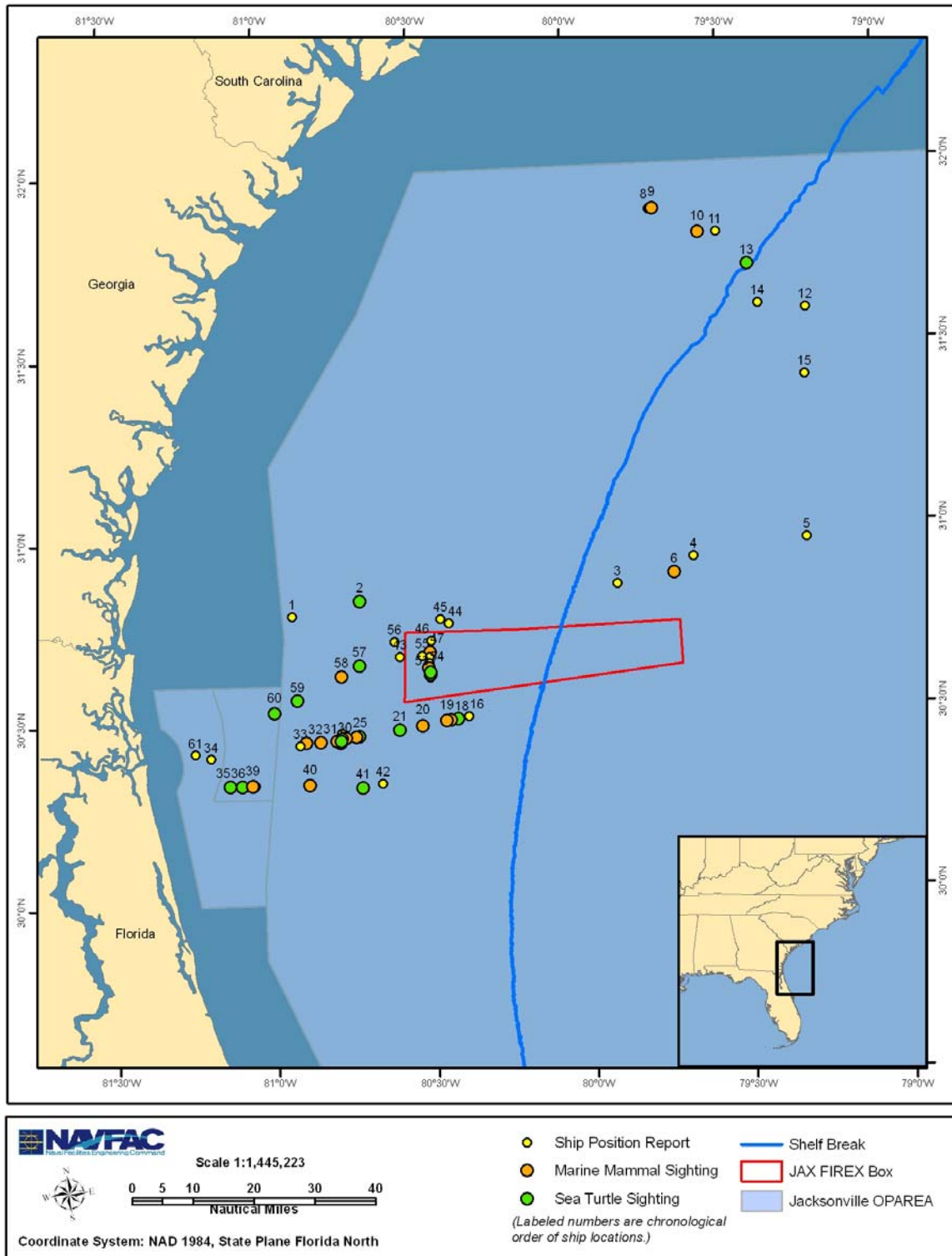


Figure I-11. Vessel locations at sighting and position reports during UNITAS 09.

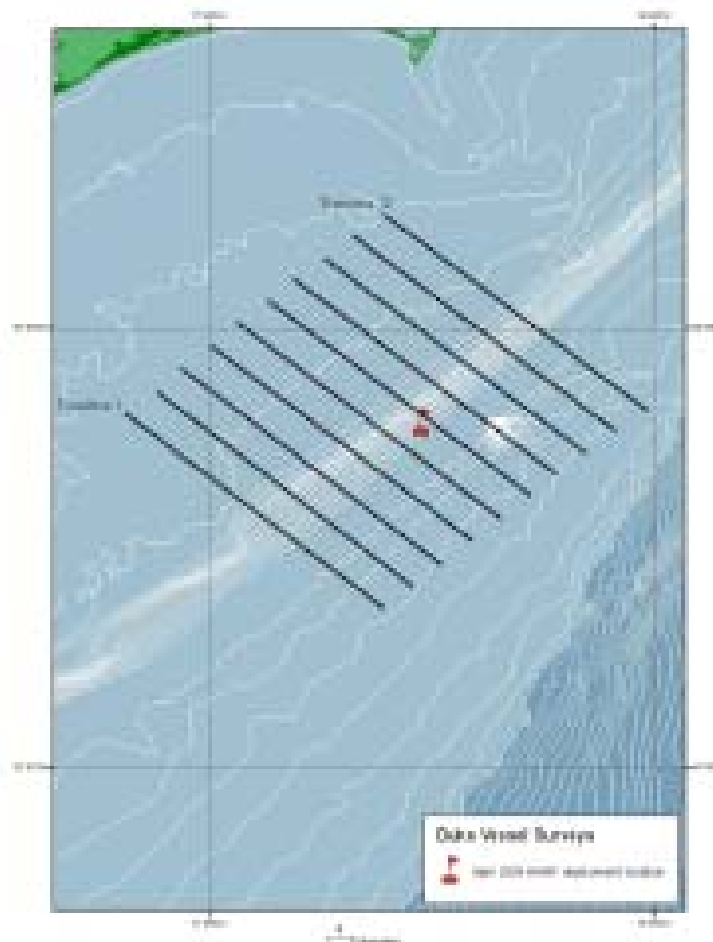
**AFAST PASSIVE ACOUSTIC MONITORING (PAM)**

Two passive acoustic systems are used during monitoring in Onslow Bay and JAX - a multi-element towed array used during vessel surveys and bottom mounted high frequency acoustic recorders. Analysis of all the acoustic data has not been completed.

**Onslow Bay:** the towed array was deployed on 14 days of surveys in Onslow Bay during the months of Feb, March, April, June and July for a total of 15 hours of recording effort. A total of 37 acoustic detections were made, 19 of which were identified to species (*Tursiops truncatus*, *Stenella frontalis*, and *Physeter macrocephalus*). A single HARP was redeployed in Onslow Bay for the reporting period (**Table I-9, Figure I-12**), previous deployments were made on 09 Oct 2007 and 28 May 2008.

**Table I-9. Deployment details for the Onslow Bay HARP, April 2009.**

Deployment Date	Retrieval Date	Latitude	Longitude	Depth	Sampling Rate	Duty Cycle	Expected data
24-Apr-09	Early Sept 2009	33.78951	-76.5192	570 ft	200 kHz	5-min on/ 5-min off	~2tb

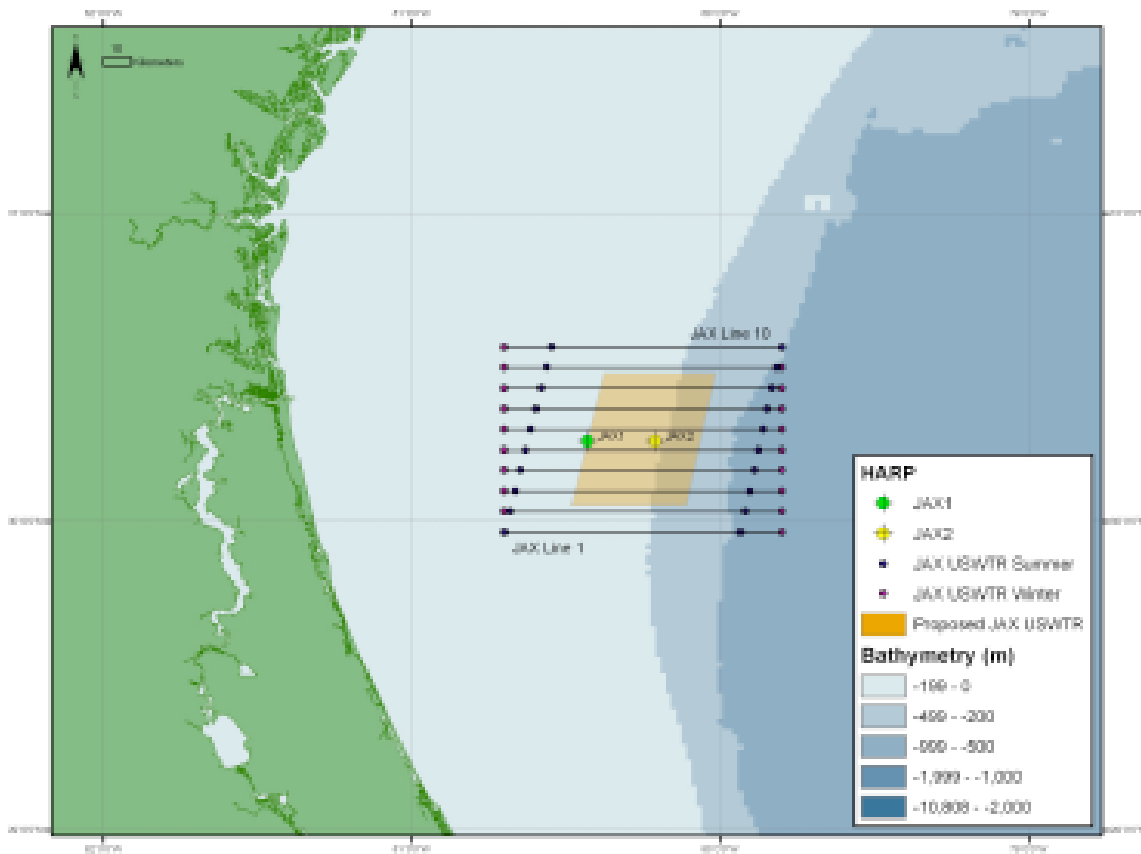


**Figure I-12. Location of HARP deployment in Onslow Bay, April 2009.**

**JAX:** the towed array was deployed on 2 days of surveys in JAX during the month of July for a total of 4.9 hours of recording effort. A total of 4 acoustic detections were made, 2 of which were identified to species (*Tursiops truncatus* and *Stenella frontalis*). Two HARPs were deployed in JAX during the reporting period (Table I-10, Figure I-13).

**Table I-10. Deployment details for the JAX HARPS, March 2009.**

	Deployment Date	Retrieval Date	Latitude	Longitude	Depth	Sampling Rate	Duty Cycle	Expected data
JAX 1	30-Mar-09	Sept 14-23	30.2582	-80.4280	40m	200 kHz	5-min on/ 10-min off	~2tb
JAX 2	30-Mar-09	Sept 14-23	30.2784	-80.2164	80m	200 kHz	5-min on/ 10-min off	~2tb



**Figure I-13. Location of HARPS deployed in JAX, March 2009.**



## COORDINATED ASW EXERCISE MONITORING

Coordinated ASW exercise monitoring events are one of the primary components being used to address specific monitoring questions posed in the AFAST monitoring plan and Letter of Authorization. A pilot project was conducted in July 2008 at the Onslow Bay location incorporating shipboard and vessel visual surveys and an array of passive acoustic monitoring “pop-up” buoys developed by Cornell University. 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. **Figure I-14** shows the locations of the pop-ups relative to the exercise box as well as the long-term HARP deployment.

Despite some challenges this was a successful pilot study and the design and coordination has been refined based on lessons learned from the experience. This early pilot study not only provided data points that will be used in future analysis, but also provided proof-of-concept data for determining the feasibility of using diverse field methods in the AFAST study area. Based upon lessons learned from these surveys and input from NMFS, the Navy shaped the studies in the AFAST monitoring plan with proven field methods that would provide visual and acoustic data to support scientific assessment on the potential effects from Navy training on marine species.

A similar effort is currently underway at the Jacksonville USWTR location in conjunction with a Sept 2009 ASW training exercise and we anticipate conducting focused intensive monitoring efforts like this approximately twice per year.

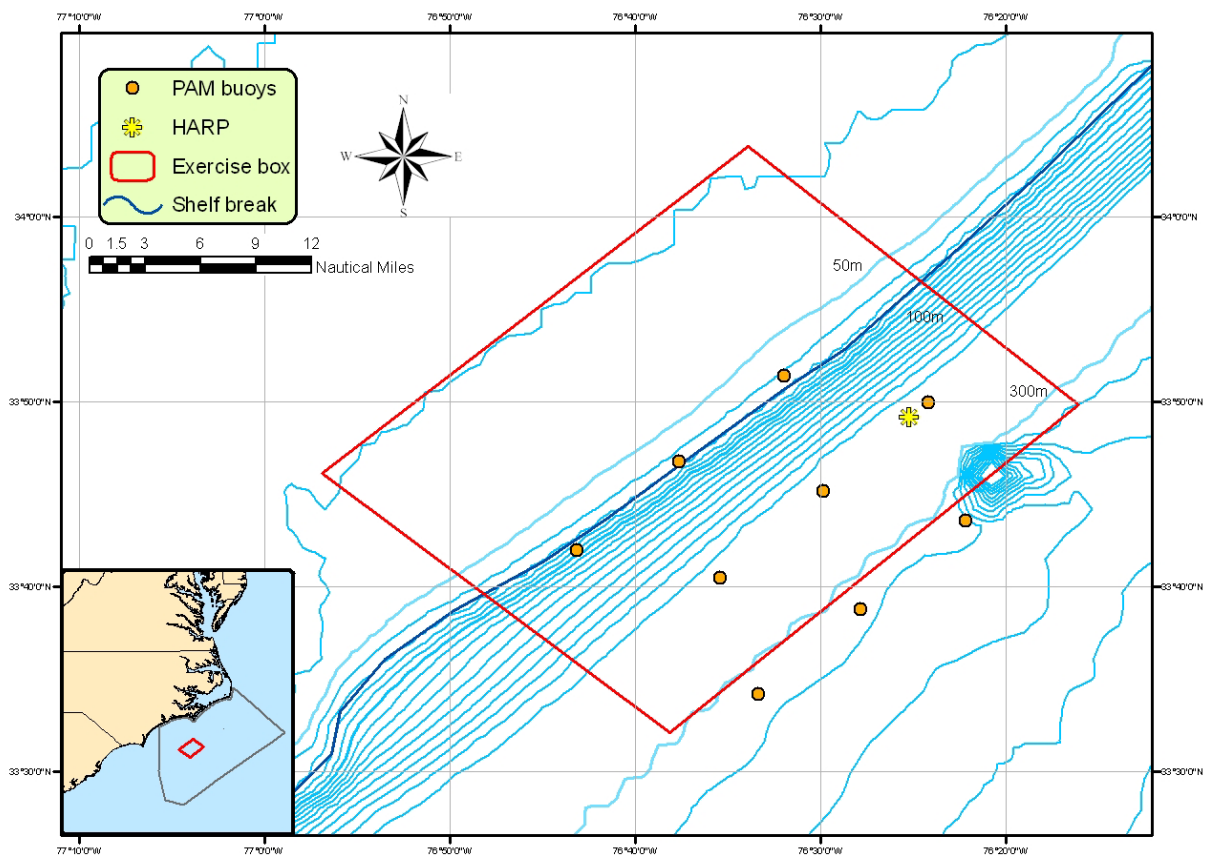


Figure I-14. Location of Onslow Bay exercise monitoring, July 2008.



## ***Part II- AFAST Adaptive Management Recommendations***

Adaptive management is an iterative process of optimal decision making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring. 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 who learn together how to create and maintain sustainable ecosystems. Adaptive management helps science managers maintain flexibility in their decisions, knowing that uncertainties exist and provides managers the latitude to change direction will improve understanding of ecological systems to achieve management objectives; and is about taking action to improve progress towards desired outcomes.

In March, 2009, the Navy convened government and academic researchers to review the Navy's range complex monitoring plans. This diverse group of experts reviewed the methods that currently exist for monitoring, methods expected to be available in five years and the Navy's current plans. The team reinforced that the current methods being used by the Navy for monitoring were robust and strongly recommended that Navy continue to use a diversity of methods simultaneously. For AFAST monitoring, as well as monitoring conducted in other range complexes, the Navy was successful in using a diversity of field methods to gather visual and acoustic data towards answering the questions posed by Navy and NMFS.

The Navy's adaptive management of the AFAST Monitoring Plan will involve close coordination with NMFS to align marine mammal monitoring with the Plan's overall objectives as stated within earlier sections of the Plan and in the Introduction of this report.

Scheduling monitoring, that involves civilian aircraft and ships operating concurrently with multiple Navy aircraft and ships in the same area, requires extensive pre-survey coordination between multiple Navy commands. The USFF operational community provided critical interface and coordination that was instrumental in allowing for researchers to conduct monitoring in close-proximity to Navy assets. The USFF operational community also provided berthing for Navy MMOs on surface vessels.

Cancellations or major date shifts in Navy training events based on logistics, fiscal, or operational needs were challenging to overcome. These kind of changes are difficult to predict and more importantly, more difficult to reschedule from a monitoring prospective when contracts have been awarded, survey equipment has been purchased, rented or relocated; personnel availability and transport arranged; and fixed date contracts put into place.

Specific challenges faced were: 1) low densities of animals precluded large sample sizes; 2) weather delays and/or cancellations; 3) Navy operational delays and/or event cancellations; and 4) and the number of monitoring hours are difficult to predict and manage vice monitoring a set number of events.

In view of lessons learned during implementation of the FY09 AFAST Monitoring Plan, and as part of the Navy's adaptive management review for AFAST, a modification of the FY09 Plan is shown in **Table I-11**. **Table I-12** shows the revised proposed AFAST monitoring plan for 2010.

**Table I-11. Navy’s adaptive management review for AFAST showing edits to FY09 monitoring and proposed 2010 monitoring** (strike through are deletions and red font are additions).

STUDY 1 and 3 (exposures and behavioral responses)		
Aerial Surveys During Training Events	- <del>30 hours of active sonar during 1 event in conjunction with a</del> SEASWITI, shallow COMPTUEX, or ULT exercise.	Adaptive Management Review for FY10 (AMR)
Marine Mammal Observers (MMO)	- <del>60 hours during 2 events in conjunction with</del> SEASWITI or ULT exercises.	
Vessel surveys During Training Events (study 3 only)	- <del>100 hours during 2 events in conjunction with</del> SEASWITI, shallow COMPTUEX, or ULT exercises.	
Passive Acoustics	- <del>2 deployments of pop-up buoys in conjunction with</del> SEASWITI, shallow COMPTUEX, or ULT exercises.	
STUDY 2 (geographic redistribution)		
Aerial Surveys Before And After Training Events	- <del>40 hours during 1 event in conjunction with a</del> SEASWITI, shallow COMPTUEX, or ULT exercise.	AMR
Aerial Surveys Onslow Bay	- <del>100 hours</del> <b>24 days</b>	
Vessel Surveys Onslow Bay	- <del>125 hours</del> <b>24 days</b>	
Aerial Surveys Jacksonville	- <del>100 hours</del> <b>24 days</b>	
Vessel Surveys Jacksonville	- <del>125 hours</del> <b>24 days</b>	
Passive Acoustics	FY 09: Installation of a total of 4 HARPs and use of pop-up buoys for exercise monitoring. Begin recording and data analysis. FY10: Continue recording and data analysis <b>for the 4 HARPS.</b>	
STUDY 4 (mitigation effectiveness)		
MMO/ Lookout Comparison	- <del>40 hours during SEASWITI, shallow COMPTUEX, or ULT exercises.</del>	AMR
Aerial Surveys Before And After Training Events	- <del>40 hours during 1 event in conjunction with a</del> SEASWITI, shallow COMPTUEX, or ULT exercise.	

**Table I-12. Navy’s final proposed 2010 monitoring plan for AFAST.**

<b>STUDY 1 and 3 (exposures and behavioral responses)</b>		
<b>Aerial Surveys During Training Events</b>	- 1 event in conjunction with a SEASWITI, shallow COMPTUEX, or ULT exercise.	Adaptive Management Review for 2011 (AMR)
<b>Marine Mammal Observers (MMO)</b>	- 2 events in conjunction with SEASWITI or ULT exercises.	
<b>Vessel surveys (study 3 only)</b>	- 2 events in conjunction with SEASWITI, shallow COMPTUEX, or ULT exercises.	
<b>Passive Acoustics</b>	- 2 deployments of pop-up buoys in conjunction with SEASWITI, shallow COMPTUEX, or ULT exercises.	
<b>STUDY 2 (geographic redistribution)</b>		
<b>Aerial Surveys Before And After Training Events</b>	- 1 event in conjunction with a SEASWITI, shallow COMPTUEX, or ULT exercise.	AMR
<b>Aerial Surveys Onslow Bay</b>	- 24 days	
<b>Vessel Surveys Onslow Bay</b>	- 24 days	
<b>Aerial Surveys Jacksonville</b>	- 24 days	
<b>Vessel Surveys Jacksonville</b>	- 24 days	
<b>Passive Acoustics</b>	Continue recording and data analysis for the 4 HARPS.	
<b>STUDY 4 (mitigation effectiveness)</b>		
<b>MMO/ Lookout Comparison</b>	- 40 hours	AMR
<b>Aerial Surveys Before And After Training Events</b>	- 1 event in conjunction with a SEASWITI, shallow COMPTUEX, or ULT exercise.	

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