**January 2013**

# Trip Report, September 2012 FIREX Marine Mammal Monitoring

# Jacksonville Range Complex

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## List of Acronyms and Abbreviations

| | |
|---|---|
| ° | degree(s) |
| BSS | Beaufort Sea State |
| CG | cruiser |
| CO | Commanding Officer |
| EDT | Eastern Daylight Time |
| ESA | Endangered Species Act |
| FIREX | Firing Exercise |
| ft | foot/feet |
| GPS | global positioning system |
| IMPASS | Integrated Maritime Portable Acoustic Scoring and Simulation System |
| JAX | Jacksonville |
| km | kilometer(s) |
| kts | knot(s) (nautical miles per hour) |
| MFAS | mid-frequency active sonar |
| min | minute(s) |
| MMO | marine mammal observer |
| MMPA | Marine Mammal Protection Act |
| nm | nautical mile(s) |
| NMFS | National Marine Fisheries Service |
| PMAP | Protective Measures Assessment Protocol |
| TTS | temporary threshold shift |
| U.S. | United States |
| XBT | expendable bathythermograph |
| XO | Executive Officer |
| yd | yard(s) |

# SECTION 1: INTRODUCTION

In order to train with explosives, the United States (U.S.) Navy must obtain a permit from the National Marine Fisheries Service (NMFS) under the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA). The Jacksonville (JAX) Range Complex Monitoring Plan (DoN 2009), finalized in June 2009, was developed with NMFS to comply with the requirements under the permits obtained for explosives training (NMFS 2012).

The JAX Range Complex Monitoring Plan is one component of the overall effort the U.S. Navy is undertaking to understand its potential effects and the biological consequences of those effects to protected marine species. The JAX Range Complex Monitoring Plan has been designed as a collection of focused "studies" to gather data that will allow the U.S. Navy to address the following questions:

1. What are the behavioral responses of marine mammals and sea turtles that are exposed to explosives at specific levels?

2. Is the U.S. Navy's suite of mitigation measures for explosives (e.g., Protective Measures Assessment Protocol [PMAP], major exercise measures agreed to by the U.S. Navy through permitting) effective at avoiding temporary threshold shift (TTS), injury, and mortality of marine mammals and sea turtles?

In order to answer these questions, data are to be collected through various means, including contracted vessel and aerial surveys, passive acoustics, and placing marine mammal observers (MMOs) aboard U.S. Navy assets.

As part of this data collection effort, three U.S. Navy MMOs (Ms. Sarah Bellau, Ms. Mandy Shoemaker, and Ms. Nancy Allen) participated in a Firing Exercise (FIREX) with Integrated Maritime Portable Acoustic Scoring System (IMPASS) on 7 September 2012. These MMOs were stationed aboard a cruiser (CG), the *USS PHILIPPINE SEA* (CG 58). The primary goal of the FIREX monitoring effort was to collect data on marine mammals and sea turtles observed during operations and to answer the follow questions:

1. Are marine mammals and sea turtles exposed to explosives?
2. If so, at what levels?
3. Did exposed marine mammals/sea turtles show a behavioral response?

A secondary goal for the monitoring was to familiarize the MMOs with at-sea U.S. Navy operations and to gather information to facilitate future MMO opportunities. This secondary goal is captured as "lessons learned" in **Section 5.2**.

# SECTION 2: FIREX WITH IMPASS DESCRIPTION

A FIREX involves bombardment of a target within an impact area by one or more ships. The scenario is as follows: the IMPASS is deployed by the firing ship and consists of five sonobuoys set in a pentagon-shaped arrangement at 1.3 kilometer (km) intervals, with an expendable bathythermograph (XBT) in the center of the pentagon. Within the ship's combat system, the

training system creates a virtual land mass that overlays the array and simulates land targets. The ship then positions itself about 4 to 5 nautical miles (nm) from the target area. The ship fires its ordnance into the target area; the sonobuoys detect the bearing to the acoustic noise resulting from the impact of a round landing in the water, and then transmit their global positioning system (GPS) position and their bearing information to the ship. From the impact location data collected, the training system computer triangulates the exact point of impact of the round and, from those data, the exercise may be conducted as if the ship were firing at an actual land target. When the training is complete, the IMPASS buoy system is recovered by the ship. Inert ordnance was used in this FIREX with IMPASS event.

# SECTION 3: METHODS

## 3.1. SHIPBOARD MARINE MAMMAL MONITORING

MMO surveys were conducted on a not-to-interfere basis, which means that the MMOs would not replace required U.S. Navy Lookouts; would not dictate operational requirements/maneuvers; and would remove themselves from the bridge wing if necessary for *USS PHILIPPINE SEA* to accomplish its mission objectives. The only exception would be if a marine mammal or sea turtle was sighted by the MMO within the shut-down zones during the event (within 600 yards [yd] of the target for explosive rounds, within 200 yd of the target for inert rounds, and within 70 yd of the ship hull) and was not sighted by the Lookout, the MMO would report the sighting to the lookout for appropriate reporting and action.

The MMO survey was conducted on the bridge wing of *USS PHILIPPINE SEA*, with one MMO on each wing. During on-effort surveys, the MMOs would use the naked eye and 7x50 binoculars to scan the area from dead ahead to just abaft of the beam. In searching this area, the MMOs would start at the forward part of the sector and search aft. Binoculars were held so that the horizon was in the top third of the field of view. The field of view was scanned from the horizon towards the ship. Once the field of view was scanned, the binoculars were repositioned and the field of view was scanned again **(Figure 1)**. Once the scan with the binoculars was completed, the eyes were rested for a few seconds and the entire sector was scanned with the naked eye.

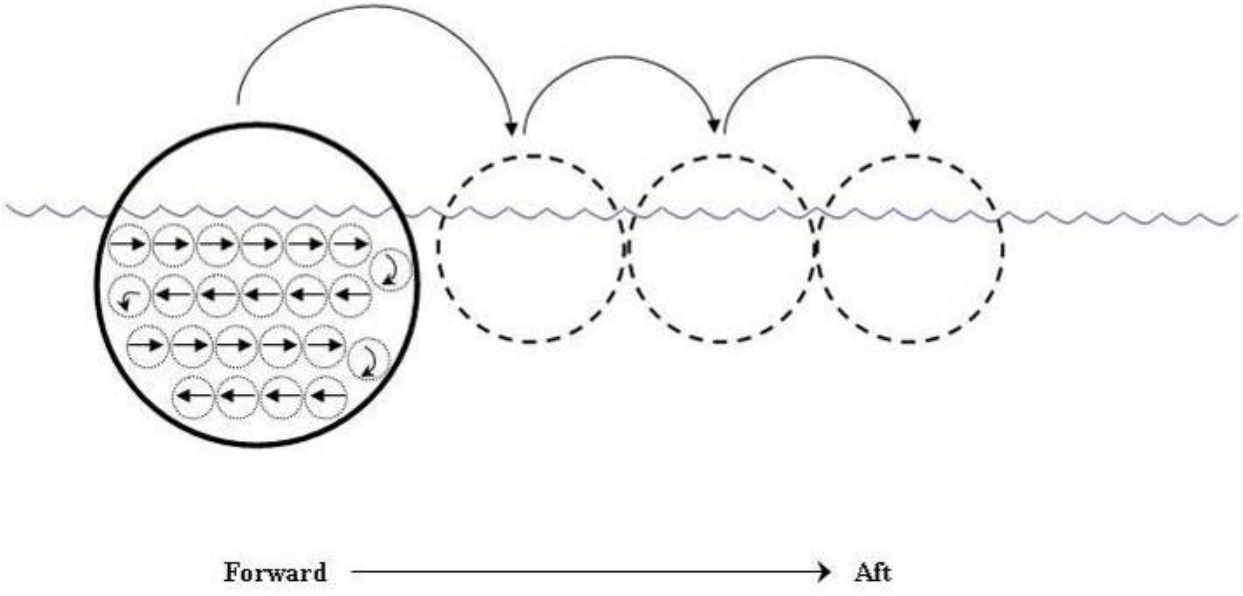


**Figure 1. MMO Surface Searching Procedure**

When an animal was visually detected the MMO would collect information on 23 sighting, environmental, and sonar parameters (**Table 1**). When practicable, still-photographs were obtained by the MMO.

## Table 1. Shipboard MMO Data Category Descriptions

| Data Category | Description |
|---|---|
| **Sightings Information** | |
| Effort (on/off) | On effort means actively searching for marine mammals; time spent off effort could result from vacating the bridge wing for operational reasons. |
| Date | Format in mm/dd/yy. |
| Time | Time provided in Eastern Daylight Time (EDT). |
| Location | This is the location of the vessel at the time of the sighting, provided by monitors on the bridge. |
| Detection sensor | Either visual or aural (if detected passively by the sonar technician) and which MMO observed the animal. |
| Species/group | Determined by the MMO. |
| Group size | Estimated by the MMO. |
| # Calves | Estimated by the MMO. |
| Bearing (true) | Estimated by the MMO. |
| Distance (yd) | Estimated by the MMO using reticled binoculars. |
| Length of contact | Estimated by the MMO. |
| **Environmental Information** | |
| Wave height (ft) | Estimated by the MMO. |
| Visibility | Estimated by the MMO. |
| Beaufort Sea State (BSS) | Estimated by the MMO. |
| Swell direction (true) | Estimated by the MMO. |
| Wind direction (true) | Estimated by the MMO. |
| % glare | Estimated by the MMO. |
| % cloud cover | Estimated by the MMO. |
| **Operational Information** | |
| Active sonar in use? | Specifically refers to mid-frequency sonar (MFAS). |
| Explosives in use? | This refers to whether an explosive event occurred within the monitoring rotation, not necessarily whether an explosion occurred at the specific time of the sighting. |
| Direction of ship travel | Provided by monitors on the bridge. |
| Animal motion | Estimated by the MMO. |
| Behavior | Individual behaviors: breach, porpoise, spin, bowride, feeding, head slap, social, tail slap, pectoral fin slap, other.<br>Whale behaviors: blow, no blow rise, fluke up, peduncle arch, unidentified large splash.<br>Group behaviors: rest, mill, travel, surface active travel, surface active mill. |
| Mitigation implemented | If explosives in use, the measures implemented, if any, by the vessel. |
| Comments | Other comments as necessary. |

## 3.2. SCHEDULE OF EVENTS

*USS PHILIPPINE SEA* departed Mayport, Florida on 7 September 2012 at approximately 0730 Eastern Daylight Time (EDT). A FIREX with IMPASS using the 5-inch guns was conducted on 7 September 2012, using inert rounds only. Immediately following the exercise, the ship returned the IMPASS team and MMOs to Mayport, Florida. A detailed schedule of events is provided below in **Table 2**.

**Table 2. Schedule of Events**

| **7 September 2012** | |
|---|---|
| **Time** | **Notes** |
| 0730 | *USS PHILLIPINE SEA* underway |
| 1017 | MMOs on effort / Buoy deployment begins |
| 1103 | FIREX begins |
| 1113 | MMOs off effort / Firing suspended |
| 1209 | MMOs on effort |
| 1250 | Firing resumes |
| 1347 | MMOs off effort / Firing suspended |
| 1503 | MMOs on effort |
| 1600 | FIREX ends / Buoy recovery begins |
| 1614 | MMOs off effort |
| 2030 | IMPASS team / MMOs return to Mayport |

# SECTION 4: RESULTS

Three marine mammal sightings and four unidentified hardshell sea turtle sightings were recorded by the MMOs (**Table 3**). The sightings and IMPASS buoy field location are shown on **Figure 2**.

**Table 3. Marine Species Sightings Data**

| Data Category | Sighting 1 | Sighting 2 | Sighting 3 |
|---|---|---|---|
| **Sightings Information** | | | |
| Effort (on/off) | On | On | On |
| Date | 09/7/2012 | 09/7/2012 | 09/7/2012 |
| Time | 10:31:47 | 12:13:39 | 12:24:38 |
| Location | 30.66849<br>-80.424314 | 30.707589<br>-80.406144 | 30.750194<br>-80.330024 |
| Detection sensor | Visual - Sarah | Visual - Mandy | Visual - Mandy |
| Species/group | Unidentified hardshell turtle | Unidentified hardshell turtle | Unidentified. hardshell sea turtle |
| Group size (best/max/min) | 1/1/1 | 1/1/1 | 1/1/1 |
| # calves | 0 | 0 | 0 |
| Bearing (true) | 225° | 60° | 70° |
| Distance (yd) | 3 reticles (~690 yd) | 50 | 40 |
| Length of contact | < 1 min | < 1 min | < 1 min |
| **Environmental Information** | | | |
| Wave height (ft) | 0-3 | 0-3 | 0-3 |
| Visibility | excellent (>15 km) | excellent (>15 km) | excellent (>15 km) |
| Beaufort Sea State (BSS) | 2 | 2 | 2 |
| Swell direction (true) | ? | ? | ? |
| Wind direction (true) | W (12 kts) | W (7 kts) | W (7 kts) |
| % glare | 40% | 5% | 5% |
| % cloud cover | 60% | 15% | 15% |
| **Operational Information** | | | |
| Active sonar in use? | no | no | no |
| Explosives in use? | no | no | no |
| Direction of ship travel | ~120° (turning) | 60° | 50° |
| Animal motion | none | closing | parallel |
| Behavior | Traveling | Traveling | Traveling |
| Mitigation implemented | N/A | N/A | N/A |
| Comments | Sighted 32 min before 1st shot fired. | Sighted during malfunctioning buoy recovery, 37 min before next shot fired. | Sighted while steaming back to firing position after buoy malfunction, 26 min before next shot fired. |

**Table 3. Marine Species Sightings Data (Continued)**

| Data Category | Sighting 4 | Sighting 5 | Sighting 6 | Sighting 7 |
|---|---|---|---|---|
| **Sightings Information** | | | | |
| Effort (on/off) | On | On | On | On |
| Date | 09/7/2012 | 09/7/2012 | 09/7/2012 | 09/7/2012 |
| Time | 12:32:20 | 13:25:15 | 13:32:05 | 16:14:56 |
| Location | 30.742863<br>-80.315902 | 30.680576<br>-80.316469 | 30.672581<br>-80.316522 | 30.657726<br>-80.391287 |
| Detection sensor | Visual - Mandy | Visual - Lookout | Visual - Nancy | Visual - Sarah |
| Species/group | Unidentified hardshell turtle | Unidentified dolphin | Atlantic spotted dolphins | Unidentified spotted dolphins |
| Group size (best/max/min) | 1/1/1 | 1/1/1 | 2/2/2 | 2/2/2 |
| # calves | 0 | 0 | 0 | 0 |
| Bearing (true) | 270° | 270° | 0° | 180° |
| Distance (yds) | 30 | 200 | 30 | 10 |
| Length of contact | < 1 min | < 1 min | < 10 min | 5 min |
| **Environmental Information** | | | | |
| Wave height (ft) | 0-3 | 0-3 | 0-3 | 0-3 |
| Visibility | excellent (>15 km) | excellent (>15 km) | excellent (>15 km) | excellent (>15 km) |
| Beaufort Sea State (BSS) | 2 | 1 | 1 | 1 |
| Swell direction (true) | ? | ? | ? | ? |
| Wind direction (true) | W (7 kts) | W (7 kts) | W (7 kts) | SW (5 kts) |
| % glare | 5% | 5% | 5% | 5% |
| % cloud cover | 15% | 10% | 10% | 10% |
| **Operational Information** | | | | |
| Active sonar in use? | no | no | no | no |
| Explosives in use? | no | yes | yes | no |
| Direction of ship travel | 180° | 180° | 180° | 180° |
| Animal motion | parallel | closing | closing | parallel |
| Behavior | Traveling | Traveling | Traveling | Traveling |
| Mitigation implemented | N/A | No | Yes; firing delayed | N/A |
| **Comments** | Sighted 18 min before next shot fired. Ship travelling at 5 kts en route to firing position after checking buoy for malfunction. | Sighted during firing outside of mitigation zone. Surfaced once, then not resighted. | Sighted shortly after shot was fired. Firing was delayed until dolphins exited the mitigation zone around the ship hull. | Sighted 14 min after last shot fired while on the way to pick up the buoys. |

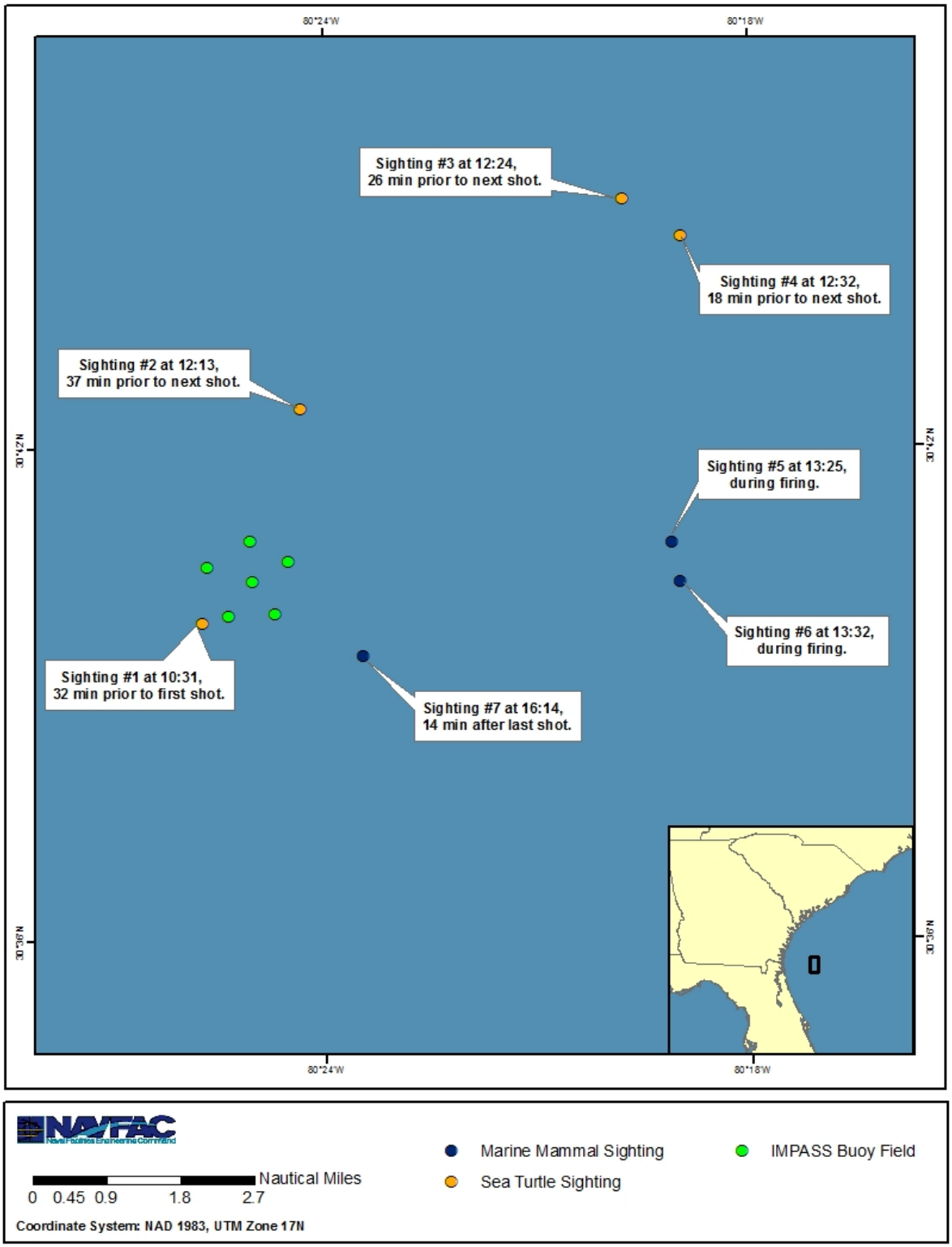


**Figure 2. Sightings and IMPASS Buoy Field Location**

# SECTION 5: CONCLUSION

## 5.1. MARINE MAMMAL MONITORING

The goal of the FIREX with IMPASS monitoring effort is provided below, with a conclusion regarding each of the specific questions that were asked:

1. Are marine mammals and sea turtles exposed to explosives?

   Because inert ordnance was used in this FIREX with IMPASS event, there was no potential for exposure of marine mammals and sea turtles to explosives. A 200-yd mitigation zone was implemented around the target to avoid direct strike of an animal; however, no animals were sighted within the mitigation zone around the target. Sighting #1 was observed the closest, estimated at over 1,500 yd away from the target.

   One sighting of two Atlantic spotted dolphins, obtained by *USS PHILIPPINE SEA* MMOs, occurred during the FIREX and within 30 yd of the vessel.

2. If so, at what levels?

   The two Atlantic spotted dolphins sighted within 30 yd of the vessel may have been exposed to weapons firing noise.

3. Did exposed marine mammals/sea turtles show a behavioral response?

   Mitigation was implemented (firing was delayed) as soon as the sighting was reported. The dolphins followed the ship for a short period of time (~5-10 min), then swam underneath the vessel towards the non-firing side of the ship, and were lost aft of the vessel. No unusual behavior was observed. The ship continued traveling away from the sighting at ~ 4 knots (kts) and did not recommence firing until the ship was a minimum distance of 70 yd from the last known observation location.

## 5.2. LESSONS LEARNED

A few lessons learned were noted for the FIREX with IMPASS event, and are separated into those for shipboard monitoring and operational information below.

### 5.2.1. Shipboard Marine Mammal Monitoring

- Methods are needed to continue to improve the close aboard distance estimation by MMOs. Reticled binoculars are used for longer distance sightings; this method is not useful for close aboard sightings. Suggest that MMOs practice close aboard distance estimation if possible.

### 5.2.2. Operational Information

- MMOs attended the pre-exercise brief with the IMPASS team, which eliminated confusion regarding timing and sequence of events. MMOs presented the purpose of their monitoring during the brief and cleared up confusion about their intentions. MMOs explained the JAX MMPA and ESA permit requirements and importance of environmental compliance as rationale for the MMO embark. This information was received well by the Commanding Officer (CO) and Executive Officer (XO). It is recommended that this continue to be done in the future.

- Coordination for this event went fairly smoothly, and we were able to work out getting on the ship for the necessary time to complete the monitoring associated with the event. We need to continue to improve pre-planning coordination between operators and MMOs to ensure that monitoring opportunities and data gathering is maximized.

# SECTION 6: ACKNOWLEDGEMENTS

We thank the officers and crew of *USS PHILIPPINE SEA* (CG 58) for their outstanding support and hospitality during this cruise and Mr. Dennis Emhoff (RCST) for pre-planning coordination.

# SECTION 7: REFERENCES

DoN. 2009. Jacksonville (JAX) Range Complex Monitoring Plan-Final 15 June 2009. Department of the Navy, Commander. U.S. Fleet Forces Command.

NMFS. 2012. Letter of Authorization, Taking Marine Mammals Incidental to U.S. Navy Training in the Jacksonville Range Complex, valid June 5, 2012 to June 4, 2013.