

**ADDENDUM TO
Satellite Tracking of Sperm Whales in the Gulf of Mexico in 2011, a Follow-up to
the Deepwater Horizon Oil Spill:
ANALYSIS PLAN FOR YEARS 2010 /2011**

Prepared by:
Dr. Bruce Mate
Oregon State University
Marine Mammal Institute
Hatfield Marine Science Center

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Mississippi Canyon 252

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Approval of this work plan is for the purposes of obtaining data for the Natural Resource Damage Assessment. Each party reserves its right to produce its own independent interpretation and analysis of any data collected pursuant to the initial work plan, and any data interpretation and analysis produced pursuant to this Analysis Plan.

This plan will be implemented consistent with existing trustee regulations and policies. All applicable state and federal permits must be obtained prior to conducting work. A permit for the tagging, biopsy, photography, and close re-approach for visual assessments of sperm whales has already been issued by the National Marine Fisheries Service (NMFS) to Dr. Bruce Mate under the authority of the Marine Mammal Protection Act and Endangered Species Act. This cruise was conducted under Marine Mammal Protection Act Research Permit 369-1440-01

The trustees have developed a preliminary conceptual model of the DWH release, potential pathways and routes of exposure, and potential receptors. This preliminary model has informed the trustees' decision to pursue the studies outlined in the work plan. By signing this work plan and agreeing to fund the work outlined, BP is not endorsing the model articulated in the work plan.

<u>Jessica White For Lisa DiPinto</u>	<u>3/14/2012</u>
Department of Commerce Trustee Representative	Date
<u>[Signature]</u> FOR ROLAND GUIDRY	<u>3/29/2012</u>
Louisiana Trustee Representative	Date
<u>[Signature]</u>	<u>3-22-2012</u>
BP Representative	Date

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BACKGROUND:

Field investigations of the potential impacts of the *Deepwater Horizon*/Mississippi Canyon 252 Oil Spill and subsequent response efforts (the “MC252 Oil Spill”) on endangered sperm whales were performed in 2010 and 2011, in order to quantify potential injury for the purposes of a Natural Resource Damage Assessment (NRDA). The principal investigator successfully deployed satellite tags on 12 sperm whales from July 9–15, 2010¹, and 36 tags on 28 sperm whales from July 10 – August 4, 2011. Of the 28 whales tagged in 2011, 24 were tagged with ‘location only’ tags and 11 were tagged with MK-10 time-depth-recorder (TDR) tags capable of providing GPS-determined locations upon surfacing after dives >10 minutes in duration, as well as recording depth and three axis accelerometry every second. Tissue and blubber samples were collected by NOAA from 11 whales in 2010 and by Oregon State University (OSU) from 15 whales in 2011.

Previous satellite-tag location data are available for 52 sperm whales tagged from 2001-2005 during the Sperm Whale Seismic Study (SWSS) project funded by the Minerals Management Service (MMS) with many whale locations in the area of the MC252 Oil Spill. Home range areas have been calculated for all the SWSS animals.

PLANNED ANALYSES:

Tissue Samples:

Tissue samples from 2011-tagged whales will be analyzed to determine sex of individual whales by Dr. Scott Baker’s Cetacean Conservation Genetics Lab, within the Marine Mammal Institute at Hatfield Marine Science Center, Oregon State University, Newport, Oregon. Mitochondrial and nuclear DNA will also be examined to determine the genetic relatedness of the tagged whales. The sex determination of the 2010-sampled whales was made by NOAA labs. Sex and genetic relatedness information will be used to augment the satellite tag data analyses.

As part of the SWSS work, genetic relationship analysis was conducted (Ortiz et al, 2011), and verified that female sperm whales stay in long-term social units while males do not appear to.

¹ A total of 13 tags were deployed, but one tag bounced off the whale and was lost.

Satellite Data:

Using home-range modeling techniques, we will compute core areas, home ranges and site tenacity for 2010 and 2011 tagged sperm whales, and then compare between the two NRDA studies as well as to previous SWSS data (2001-2005, Jochens *et al.* 2008) to identify any differences in sizes and geographic areas.

We will characterize the water depth, sea surface temperature, chlorophyll, and sea surface height of home range and core areas for each whale. Distributions of the habitat characteristics of whales from the SWSS study and the two NRDA studies will be compared.

Locations will be classified as foraging or transiting (see Ortega-Ortiz *et al.* 2011). The proportions of location types, lengths of time and distances traveled during contiguous foraging and transiting sequences, and geographic areas encompassed by contiguous foraging locations will be compared between the SWSS study and the NRDA studies.

Habitat characteristics (water depth, sea surface temperature, chlorophyll and sea surface heights) will be determined for each location type and compared between the SWSS study and the two NRDA studies.

Diving behavior histograms from the Mk-10-tagged whales in 2011 will be examined to determine if the satellite-relayed dive profiles differ by region in dive depth, duration, frequency, and surface time within the northern Gulf of Mexico, as well as differences in response to time-of-day, bathymetric features and other possible oceanographic correlates. Three-axis accelerometry data from the one tag recovered to date will be examined to identify potential foraging attempts and determine if their frequency varies with any diurnal or bathymetric-related features.

Sample Preservation

All materials associated with the collection or analysis of samples under these protocols or pursuant to any approved work plan, including any remains of samples and including remains of extracts created during or remaining after analytical testing, must be preserved and disposed of in accordance with the preservation and disposal requirements set forth in Pretrial Orders ("PTOs") # 1, # 30, #35, # 37, #39 and #43 and any other applicable Court Orders governing tangible items that are or may be issued in MDL No. 2179 IN RE: Oil Spill by the Oil Rig "DEEPWATER HORIZON" (E.D. LA 2010). Destructive analytical testing of oil, dispersant or sediment samples may only be conducted in accordance with PTO # 37, paragraph 11, and PTO # 39, paragraph 11. Circumstances and procedures governing preservation and disposal of sample materials by the trustees must be set forth in a written protocol that is approved by the state or federal agency whose employees or contractors are in possession or control of such materials and must comply with the provisions of PTOs # 1, # 30, # 35, 37, #39 and #43.

Deliverables

OSU provided a preliminary field report on November 23, 2011.

OSU provided an interim report on the 2011 data, inclusive of data collected through November 1, 2011, on January 11, 2012.

OSU will provide a final report on the data collected through February 29, 2012 no later than June 29, 2012.

The measures taken to QA/QC satellite acquired data will be detailed in the final report from OSU. All reports will be provided simultaneously to the Trustees and to BP.

NOAA will also post the information on the NOAANRDA website as soon as possible after receiving the information and results from OSU.

Budget

The budget is established as per contract between OSU, BP, and NOAA.

REFERENCES

Jochens, A., D. Biggs, K. Benoit-Bird, D. Engelhaupt, J. Gordon, C. Hu, N. Jaquet, M. Johnson, R. Leben, B. Mate, P. Miller, J. Ortega-Ortiz, A. Thode, P. Tyack, and B. Würsig. 2008. Sperm whale seismic study in the Gulf of Mexico: Synthesis report. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2008-006. 341 pp.

Ortega-Ortiz, J. G., Engelhaupt, D., Winsor, M., Mate, B. R. and Rus Hoelzel, A. (2011), Kinship of long-term associates in the highly social sperm whale. *Molecular Ecology*. doi: 10.1111/j.1365-294X.2011.05274.x