
INSTRUCTION AND REFERENCE MANUAL

PELAGIC BIRD SURVEYS
DEEPWATER HORIZON
(MC 252)

NATURAL RESOUCES
DAMAGE ASSESSMENT
AND RESTORATION
(NRDAR)

Bird Study No. 6

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INTRODUCTION AND BACKGROUND

The Deepwater Horizon (MSC 252) oil spill began April 22, 2010. Oil spill-related injury to wildlife is of major concern to the natural resource trustees and BP. Most of the oil that continues to flow from the ruptured pipe from the drilling rig has not yet come ashore, but large amounts of oil on and under the water in the vicinity of the accident pose a threat to seabirds such as gannets and boobies, storm-petrels, shearwaters, gulls, and terns.

While the distribution and density of birds at sea are being estimated by aerial surveys (Bird Study #2), it is not possible to evaluate bird oiling from the air and it may not be possible to identify bird carcasses. To evaluate the proportion of live oiled birds in the pelagic zone, Bird Study #6 will put bird observers on ships involved in sampling water quality, fish populations, marine mammals, or other natural resources in deep water in the vicinity of the spill and at locations where currents are likely to concentrate oil.

In addition, the Trustees have proposed collecting data on bird carcasses encountered at sea using the criteria developed for beached bird surveys. They have also proposed, given the expanding geographic extent of the spill zone, that the at-sea observers also collect data to estimate bird densities, which are intended to complement the aerial survey data.

This manual provides the protocols, methods, resource materials, and some overall context for Natural Resource Damage Assessment and Restoration Bird Study #6. In contrast to many offshore surveys of marine birds, most of which seek to obtain an accurate index of abundance, if not outright density, this study places its greatest priority on differentiating between oiled and un-oiled seabirds.

STUDY OBJECTIVES

1. Collect data describing the proportion of pelagic seabirds encountered along the ships path that are not visibly oiled, or that fall into pre-defined oiling categories.
2. Trustees propose collecting data to support an estimate of the density of seabirds along the ships path.
3. Trustees propose documenting the location and state of bird carcasses encountered along the ships path.

ACKNOWLEDGMENTS TO WORKING GROUP

The Trustee Pelagic Bird Technical Working Group compiled and prepared the work plan upon which this manual is based. Jennifer Boyce (NOAA Restoration Center), Vernon Byrd (U.S. Fish and Wildlife Service), and Veronica Varela (U.S. Fish and Wildlife Service) were the primary authors of the work plan. Other contributors included Sarah Allen (National Park Service), Lisa Ballance (NOAA Southwest Fisheries Science Center), Carol Beidleman (National Park Service), Joan Browder (NOAA Fisheries), Glenn Ford (R. G. Ford Consulting, Inc.), Chris Haney (Defenders of Wildlife), Karen Marlowe (U.S. Fish and Wildlife Service), Chuck Hunter (U.S. Fish and Wildlife Service), Clinton Jeske (U.S. Geological Survey), Kathy Kuletz (U.S. Fish and Wildlife Service), Brent Ortego (TX Parks and Wildlife Department), and Jennifer A. Wheeler (U.S. Fish and Wildlife Service)

SAMPLING DESIGN FOR ESTIMATING OILING RATES AMONG PELAGIC BIRDS USING SHIP-BASED SURVEYS IN THE VICINITY OF THE DEEPWATER HORIZON (MSC 252) OIL SPILL (BIRD STUDY #6)

SAMPLING DESIGN

Ships conducting sampling at set stations provide the opportunity to observe birds on strip transects between stations, or in the case of marine mammal surveys, on the same transects as are being navigated for the mammals surveys. Observers will collect transect data while the ship is in transit. However, if using research vessels with float plans that focus on stopping at sampling stations, bird observers could perform point surveys. When practical, observers will also collect point count data while the ship is on station.

Strip transects

Sample Units.—The sample unit is a strip of water within 300 m abeam of the ship in which all birds will be recorded along a length of transect.

Data Collection.—Surveys will be conducted from a viewing platform that is (1) elevated and (2) provides an unobstructed view of the water. Observations will be made when the ship is following a straight course for a set distance at a constant speed. Only seabirds within a 90° arc (between the bow and abeam) within 300 m of one side of the ship are considered “inside the transect” and relevant to this study for calculating a standardized density estimate. Density estimates will be collected and binned within temporal windows of no more than 10 minutes duration, some or all of which may be consecutive and continuous. Birds detected within 100 m of the ship will be observed with greatest priority for determining oil exposure. In addition, birds observed within the transect width, but more than 100 m ahead of the ship that dive or take flight from the transect, should be recorded for density estimates if it appears that the behavior occurred in response to the research vessel. Care will be taken to avoid double-counting flying birds.

Observers will use image-stabilizing binoculars with at least 10X magnification to locate live and dead birds, identify them to species (or nearest taxon), and to determine the bird’s oiling status using criteria developed for the beached bird surveys. “Big eye” optics will also be used to periodically evaluate the accuracy of 10X binoculars in determining the oiling status of birds within the transect width. To do this, a bird’s oiling status is determined with 10X binoculars first, then immediately evaluated with the “big eye.”

Observers will use the range finder provided to them to determine the distance between each bird and the observer. When two observers are present, one should focus on simple population counts within the strip-transect while the other focuses on confirmed observations of oiling status. However, priority should be given to oiling status observations if and when only a single observer is available.

Observer fatigue will be addressed by using two observers wherever possible, with each observer counting continuously for one hour before being replaced by the alternate. During periods of high seabird density, or whenever sufficiently rested, both observers may work jointly. However, in these circumstances only one observer may detect and record the observations used for seabird density; the second observer's role would be observing oiling status of birds. For research cruises in which space limits placement of only a single observer, this observer will detect and record for no longer than two continuous hours, with a 30 minute rest between additional observations. All observers will seek to use the ship's scheduled on-station research periods, meal times, and other opportunities to maximize coverage of the transit time devoted to recording seabird observations.

Data collected during the surveys will be recorded on the attached data sheets (Appendix A). For each bird, critical information includes: species (or closest taxon), whether the bird was confidently assessed for oiling, and whether the bird was oiled or not. For birds for which oiling status could not be confidently assessed, these observations will be noted for purposes of estimating population sizes, but they will not contribute to the determination of oiling rate. An oiling status is "confidently assessed" when the observer has undoubtedly observed oil on the bird or has undoubtedly observed the bird to be free of oil. In addition, to assess oiling detection probability, the distance to all confidently assessed birds will be measured using a range finder. Any birds for which oiling status could not be confidently determined due to issues with distance from observer, sea state, or weather limiting visibility should be noted as "undetermined" and the distance measured with the range finder.

Before each survey, surveyors should calibrate their visual, un-aided ability to estimate distance using a range finder on objects (e.g. buoys) at a variety of distances. Trackline/location should be tracked using a GPS recording position every 30 seconds (or greater if GPS memory will not be filled during a given survey). Ideally, all sightings will be entered into an onboard laptop computer running a tracking program such as dLog. If this is not possible, sightings can be recorded on tape or digital recorders (or potentially on paper) along with the exact time (calibrated to the GPS), and sightings can be meshed to GPS location post-hoc. GPS waypoints for the position of the ship should also be taken for each sighting of an oiled animal.

Transect surveys will be run only when the ship is underway on a straight course at a constant speed. If the ship changes course more than a few degrees, a new transect will be started. However, a standardized method for counting seabirds at a single location will also be designed and used when the ship is stopped (e.g., at a sampling location for reef fish). All the same data will be collected for these on-station methods as for the strip transect surveys, excluding the trackline of the ship.

Point Counts

Sample Units.—The sample unit is the area within a 90- to 360-degree arc with a radius of 300 m from the observer in which all birds will be recorded.

Data Collection.—Surveys will be conducted from an appropriate vantage point when the ship is stopped at a stationary location at sea for at least 30 minutes. The observer will identify birds within an angle arc appropriate for the vantage point (e.g., 90-degree arc if looking out one side of the vessel, 270-degree arc off the bowsprit, or 360-degrees from a crow's nest). The observational arc reaches 300 m away from the observer for purposes of density estimates and 100 m for observing degree of oiling. All birds within 300 m will be counted and identified to species; all birds within 100 m will be observed for oiling. Behavior will be recorded for each bird. Care will be taken to avoid double-counting flying birds.

Observers should ideally use image-stabilizing binoculars with at least 10X magnification to identify live and dead birds, identify them to species (or nearest taxon), and to determine the bird's oiling status. If the ship is equipped with "big eye" optics, observers should try to use these higher magnification optics to determine with confidence presence or absence of oil on a bird. "Big eye" optics can also be used to periodically evaluate the accuracy of 10X binoculars in determining the oiling status of birds within the transect width. To do this, a bird's oiling status is determined with 10X binoculars first, then immediately evaluated with the "big eye." For all dead birds and for live birds with a confirmed oiling status, observers will use a range finder (either incorporated in the binoculars or stand-alone hand-held range finders) to determine the distance between the bird and the observer. When two observers are present, during periods of high bird density, one should focus on simple population counts while the other focuses on confirmed observations of oiling status. However, priority should be given to oiling status observations if and when only a single observer is available.

Observer fatigue will be addressed by using two observers wherever possible, with each observer counting continuously for one hour before being replaced by the alternate. During periods of high seabird density, or whenever sufficiently rested, both observers may work jointly. However, in these circumstances only one observer may detect and record the observations used for seabird density; the second observer's role would be observing oiling status of birds. For research cruises in which space limits placement of only a single observer, this observer will detect and record for no longer than two continuous hours, with a 30 minute rest between additional observations. All observers will seek to use the ship's scheduled on-station research periods, meal times, and other opportunities to maximize coverage of the transit time devoted to recording seabird observations.

Data collected during the surveys will be recorded on the attached data sheets (Appendix A). For each bird, critical information includes: species (or closest taxon), whether the bird was confidently assessed for oiling, and whether the bird was oiled or not. For birds for which oiling status could not be confidently assessed, these observations will be noted for purposes of estimating population sizes, but they will not contribute to the determination of oiling rate. An oiling status is "confidently assessed" when the observer

has undoubtedly observed oil on the bird or has undoubtedly observed the bird to be free of oil. In addition, to assess oiling detection probability, the distance to all confidently assessed birds will be measured using a range finder. Any birds for which oiling status could not be confidently determined due to issues with distance from observer, sea state, or weather limiting visibility should be noted as “undetermined” and the distance measured with the range finder. Before each survey, surveyors should calibrate their visual, un-aided ability to estimate distance using a range finder on objects (e.g. buoys) at a variety of distances or use the dowel method of Heinemann (1981).

The position of the point survey will be recorded using GPS. Ideally, all sightings will be entered into an onboard laptop computer running a tracking program such as dLog. If this is not possible, sightings can be recorded on tape or digital recorders (or potentially on paper) along with the exact time (calibrated to the GPS), and sightings can be meshed to GPS location post-hoc. GPS waypoints for the position of the ship should also be taken for each sighting of an oiled animal.

Dead Birds

If a dead bird is encountered at sea, it will likely not be feasible to attempt to collect it, especially if encountered during strip transect studies. Therefore, any dead birds should be noted on the Live/Dead Birds Observed data sheet. Degree of oiling and other information will be evaluated visually using binoculars. If close enough, dead birds should be photographed.

LINE-BY-LINE AND BOX-BY-BOX INSTRUCTIONS FOR USING THE FORMS *PELAGIC BIRD SEARCH EFFORT* AND *LIVE/DEAD BIRDS OBSERVED* (APPENDIX A)

NOTE: Observers are not to fill out lines on the forms' footer sections that are indicated with the following designations: "Database Form ID: _____", "Data Entered Into Database by (print and sign): _____", and "Date Entered: _____"

PELAGIC SEARCH EFFORT FORM

- **Page ____ of ____:** Indicate the first page of all forms used, even if only one page used, and number the second, third, etc., pages for that particular transect if applicable.
- **Vessel Name:** Agency operator of vessel, and full name. E.g., NOAA *R/V Delaware II*, or UNOLS-NSF *Endeavor*.
- **Transect Number:** Four letter code for vessel, followed by date, and then ship time expressed by 24-hour clock. E.g., DEII.07Jul2010.08:40, or GOGU.23Aug2010.17:45. Codes for the vessel can be derived by taking the first four letters of a single-word vessel, or the first two letters of each word in double-word vessels. Common abbreviations would include: DEII (for *Delaware II*), GOGU (for *Gordon Gunter*), PISC (for *Pisces*), etc.
- **Date:** Expressed as 3-letter calendar month between calendar date and year. E.g., 07Jul2010.
- **Height of Observation Platform over Water (m):** estimated height above the water line with stable sea state.
- **Course:** direction of heading of vessel, taken with Control Movement Gyroscope, while underway for the transect, expressed in degrees.
- **Speed:** speed over ground of vessel (Speed Made Good) expressed in knots (nautical miles per hour).
- **Transect Beginning Lat/Long:** position of vessel at the outset of the transect, expressed in decimal degrees, e.g., 84.549237 W.
- **Transect Ending Lat/Long:** as for Transect Beginning.
- **Observer Name:** print full name of each observer (if 2).
- **Signature:** signature of each observer (if 2).

- **Contact info:** preferred email and/or telephone number of each observer (if 2).
- **Transect width:** 300 m, with a 100 m width used for the greatest priority to determine oil exposure for seabirds.
- **Optics:** the type of optic(s) used by each observer during the transect.
- **Side of vessel surveyed:** Either the starboard (S) or port (P) side used to observe seabirds during the transect.
- **Survey Type:** whether survey includes bird abundance, oiling rate, or both. Most surveys will be both, unless environmental conditions or exceptionally high seabird abundances require focus on oiling rates only.
- **Transect Position:** as for Transect Beginning and for Transect Ending.
- **Time:** ship time for transect start and end, expressed in 24-hour clock, e.g., 08:40 and 08:50. Ship time is the time used aboard the research vessel; it may be different from local time.
- **Sea state:** Use a single numerical code, ranging from “0” to “6”, as listed and described on form.
- **Clouds:** Use a single numerical code, ranging from “0” to “9”, as listed and described on form.
- **Visibility:** Use a single numerical code, ranging from “0” to “9”, as listed and described on form.
- **Barometric Pressure:** Record pressure, if available.
- **Weather:** Use a single numerical code, ranging from “00” to “07”, as listed and described on form.
- **Swell height:** estimate swell height, in meters.
- **Wind Direction:** True wind direction (not relative to the ship), expressed in cardinal directions.
- **Wind Speed:** Recorded wind speed, expressed in knots.
- **Photo (ID no.):** if a photograph (or photographs) is/are taken to elaborate or confirm any data on the transect, including photos of oiled and dead birds, then a numerical identifier, including one from the camera, should be recorded here.

- **Comments:** Any elaboration on behavior, inter-specific associations, oceanographic features, etc., observed during the transect can be included on these lines.

LIVE/DEAD BIRDS OBSERVED FORM

- **Page ____ of ____:** Indicate the first page of all forms used, even if only one page used, and number the second, third, etc., pages for that particular transect if applicable.
- **Hour:** Ship time for the individual bird recorded, expressed in 24-hour clock, e.g., 08:40. Ship time is the time used aboard the research vessel; it may be different from local time.
- **Species:** Seabird species recorded. Observers may use a four-letter abbreviation, termed an alpha code, using the conventions provided by the Institute for Bird Population Studies (see: <http://www.birdpop.org/alphacodes.htm>) Below is a list of many of the species that have been recorded in Gulf of Mexico waters (coastal, inshore, offshore, and pelagic) and their corresponding codes.

ENGLISH NAME	4-LETTER CODE	SCIENTIFIC NAME
Common Loon	COLO	<i>Gavia immer</i>
Pied-billed Grebe	PBGR	<i>Podilymbus podiceps</i>
Horned Grebe	HOGR	<i>Podiceps auritus</i>
Yellow-nosed Albatross	YNAL	<i>Thalassarche chlororhynchos</i>
Black-capped Petrel	BCPE	<i>Pterodroma hasitata</i>
Cory's Shearwater	COSH	<i>Calonectris diomedea</i>
Greater Shearwater	GRSH	<i>Puffinus gravis</i>
Sooty Shearwater	SOSH	<i>Puffinus griseus</i>
Manx Shearwater	MASH	<i>Puffinus puffinus</i>
Audubon's Shearwater	AUSH	<i>Puffinus lherminieri</i>
Wilson's Storm-Petrel	WISP	<i>Oceanites oceanicus</i>
Leach's Storm-Petrel	LESP	<i>Oceanodroma leucorhoa</i>
Band-rumped Storm-Petrel	BSTP	<i>Oceanodroma castro</i>
White-tailed Tropicbird	WTTR	<i>Phaethon lepturus</i>
Red-billed Tropicbird	RBTR	<i>Phaethon aethereus</i>
Masked Booby	MABO	<i>Sula dactylatra</i>
Brown Booby	BRBO	<i>Sula leucogaster</i>
Red-footed Booby	RFBO	<i>Sula sula</i>
Northern Gannet	NOGA	<i>Morus bassanus</i>
Brown Pelican	BRPE	<i>Pelecanus occidentalis</i>
Double-crested Cormorant	DCCO	<i>Phalacrocorax auritus</i>
Magnificent Frigatebird	MAFR	<i>Fregata magnificens</i>
Red-necked Phalarope	RNPH	<i>Phalaropus lobatus</i>
Red Phalarope	REPH	<i>Phalaropus fulicarius</i>

Sabine's Gull	SAGU	<i>Xema sabini</i>
Bonaparte's Gull	BOGU	<i>Chroicocephalus philadelphia</i>
Laughing Gull	LAGU	<i>Leucophaeus atricilla</i>
Franklin's Gull	FRGU	<i>Leucophaeus pipixcan</i>
Ring-billed Gull	RBGU	<i>Larus delawarensis</i>
Herring Gull	HERG	<i>Larus argentatus</i>
Great Black-backed Gull	GBBG	<i>Larus marinus</i>
Brown Noddy	BRNO	<i>Anous stolidus</i>
Sooty Tern	SOTE	<i>Onychoprion fuscatus</i>
Bridled Tern	BRTE	<i>Onychoprion anaethetus</i>
Least Tern	LETE	<i>Sternula antillarum</i>
Gull-billed Tern	GBTE	<i>Gelochelidon nilotica</i>
Caspian Tern	CATE	<i>Hydroprogne caspia</i>
Black Tern	BLTE	<i>Chlidonias niger</i>
Roseate Tern	ROST	<i>Sterna dougallii</i>
Common Tern	COTE	<i>Sterna hirundo</i>
Arctic Tern	ARTE	<i>Sterna paradisaea</i>
Forster's Tern	FOTE	<i>Sterna forsteri</i>
Royal Tern	ROYT	<i>Thalasseus maximus</i>
Sandwich Tern	SATE	<i>Thalasseus sandvicensis</i>
Black Skimmer	BLSK	<i>Rynchops niger</i>
South Polar Skua	SPSK	<i>Stercorarius maccormicki</i>
Pomarine Jaeger	POJA	<i>Stercorarius pomarinus</i>
Parasitic Jaeger	PAJA	<i>Stercorarius parasiticus</i>
Long-tailed Jaeger	LTJA	<i>Stercorarius longicaudus</i>

- **Side of vessel surveyed:** Either the starboard (S) or port (P) side, as used to observe seabirds during the transect counts.
- **Total numbers observed:** total number of individual birds for that species' entry, unless individuals of one species display different behaviors, in which case each individual or group of individuals exhibiting the same behavior will be entered (e.g., 40 SATE displaying Behavior 1; 30 SATE displaying Behavior 2.).
- **Oiling:** Use one of five (5) oiling categories for each seabird for which determination is possible. Illustrations, both ventral and dorsal views, for the oiling categories are found in Appendix B.
- **Distance:** Distance (in meters) at which bird(s) detected and recorded for a given observation.
- **Behavior:** Use a single numerical code, ranging from "1" to "6", included NE = not evaluated, as listed and described on form.
- **Direction of flight:** Degrees (°) relative to the ship's bow, estimated to the nearest 10°-15°.

- **Photo (ID no.):** if a photograph (or photographs) are taken to elaborate or confirm any data on the transect, including photos of oiled birds, then a numerical identifier, including one from the camera, should be recorded here (see attached instructions for Disposition of Electronic Data for FWS Employees or FWS Contractors) .
- **Comments:** Any elaboration on behavior, inter-specific associations, oceanographic features, etc., observed during the transect can be included on these lines.
- **Submission of Data Forms:** All original data forms must be checked for accuracy and immediately transferred to the Project Coordinator (Chris Haney, Defenders of Wildlife) upon completion of each cruise (see attached Instructions for Disposition of Data Forms).

INSTRUCTIONS FOR DISPOSITION OF DATA FORMS

Disposition of Data Forms

1. At the end of each day, check each data sheet to confirm that data fields are complete.
 - DO NOT LEAVE DATA FIELDS BLANK; WRITE N/A WHEN APPROPRIATE.
 - Make sure you sign and date all data sheets.

2. At the end of each day, scan all signed data sheets and save as:
NRDA_mmddyyyy_TRANSECTNUMBER_USFWSteammemberlastname.pdf

Example: "NRDA_08232010_GOGU.23Aug2010.17:45_MATZ"

3. Email scanned .pdf file to: **fw4nrdabird@fws.gov**
4. Within 5 days of the end of each cruise, the observer(s) must provide all original signed data sheets, the camera, camera memory card, scanner, laptop and any other issued equipment to the Project Coordinator (Chris Haney, Defenders of Wildlife), using appropriate Receipt and Transfer of Property forms (DI-104 and DI-105) in person or via FedEx. The mailing address and contact information is as follows:

PROJECT COORDINATOR

J. Christopher Haney, Ph.D.
Chief Scientist
Defenders of Wildlife
1130 17th Street, NW
Washington, DC 20036
(202) 772-0292 (office)
(202) 680-2801 (cell)

5. Within 3 days of receipt of the original signed data sheets, electronic data, and equipment, the Project Coordinator will copy the photo and data sheet files from the laptop onto a CD and transmit the original data sheets, CD, and equipment to the Federal Trustees with the original, completed Receipt and Transfer of Property forms (DI-104 and DI-105) in person or via Federal Express to the following address:

U.S. Fish and Wildlife Service
NRDAR Planning Section – Birds
ATTN: Data Manager
29474 N. Main Street

Daphne, AL 36526
(251) 509-3565

The project coordinator will send a copy of the forms and a copy of the CD to Entrix at the following address: **ADDRESS TO BE PROVIDED BY E-MAIL ON A LATER DATE.**

DISPOSITION OF ELECTRONIC DATA FOR FWS EMPLOYEES or FWS CONTRACTORS:

These instructions are current as of 7/4/10; you will receive changed instructions via email when they are available.

PHOTOS

Legally Defensible Photos

There are two concepts that apply to creating a legally defensible photo record. First, maintain a complete photo record. Do not delete photos from the camera or from your computer before the official archive is created. Second, keep one set of photos that are never opened. In practice this means transferring one copy of the photos from the camera memory card to a computer, to other storage media such as a non-editable DVD-R or CD-R, and to the secure server without ever opening them. The resulting continuous set of photo files that have not been opened will demonstrate that that you have a full, un-edited, photo record for the court.

- Set camera to keep incrementing file names across multiple downloads. This avoids duplicate filenames.
- Do not delete photos in the field. Maintain a full photo record from the lowest to highest photo number.
- Return from field – download camera
 - ♦ Place one copy in the “*Working*” directory and one copy in the “*Archive*” directory – before reviewing on the PC (review = open)

Once procedures are developed for uploading of photos to a secure server, you will upload your photos to the secure server, following the instruction in “Data Entry Instructions: Uploading Bird Survey Photos.” TO BE DEVELOPED

In the meantime:

- Archive
 - ♦ Photos should be sortable by date, and you will not rename them. Label the archive directory using the following convention:
“ArchivePhotos_DHMC252_NRDA_ **Transect Number**_FWSteammemberlastname.”
 - Example: “ArchivePhotos_DHMC252_NRDA_GOGU.23Aug2010.17:45_Matz”
 - ♦ Never open the files stored in the “*Archive*” directory

- ♦ Additional back-up copies can be made to portable hard drives

Returning from field/Completion of Daily Surveys

Archive photos

Use the steps above to create an unopened, un-editable copy of all photos in the Archive Directory.

Process: Logging photos

Locating photos in space and time is a good first step to ensure that your photos become data and not useless files. The next step is to enter your photos in a log. Photo logs can take several forms. A log can be a simple spreadsheet that captures basic information about each photo. It can also be a photo database that stores more information and provides additional functionality. A photo log should include:

Photographer: e.g., Angela Matz

Date: 05/24/2010

Incident Name: Deepwater Horizon (MC252) Spill

Note/Caption: e.g., Photo from NRDA Segment ALBA1-1, May 24 2010, Carcasses

Camera Memory Cards, Laptop, and Camera

Save all full SD cards for archiving – do not reuse them. When a card is full, remove it from the camera, tape it to a 3x5 card with your name, date, “NRDA Beached Bird Survey Photos” or other descriptor written on it, and save for transfer to the PI along with your original Data Sheets, Laptop Computer, and Camera immediately upon completion of the cruise.

Appendix A. PELAGIC SEARCH EFFORT FORM (2 pages)

Deepwater Horizon (MC 252)

PELAGIC BIRD SEARCH EFFORT FORM

Please: Only one pelagic transect per form. Fill out form completely; indicate 'Unknown' or 'Not Evaluated' if applicable

Vessel Name: _____ Transect Number: _____ Date: _____

Height of Observation Platform over Water (m): _____ Transect Beginning Lat/Long¹: Lat: _____ Long: _____

Course (CMG: 0-359): _____ Speed (SMG: knots): _____

Transect Ending Lat/Long¹: Lat: _____ Long: _____

Observer	Observer Name (print)	Signature	Contact Info.	Transect Width (m)	Optics (10X Binoculars, "Big Eye" Spotting Scope, or Other (please specify))	Side of Vessel Surveyed (Port or Starboard)	Survey Type (Bird Abundance, Oiling Rate, or Both)
1							
2							

ENVIRONMENTAL VARIABLES

Transect Position	Time (24-hr clock)	Sea State ²	Clouds ³	Visibility ⁴	Barometric Pressure ⁵	Weather ⁶	Swell Height (m)	Wind Direction ⁷	Wind Speed (knots) ⁸	Photo (ID No.)	Comments
START											
END											

¹ All Lat/Long: Decimal degrees (dd.mmmmmmm°), WGS 84

² Sea State: 0 = Calm, glassy; 1 = Calm to rippled; 2 = Smooth to wavelet; 3 = Slight (1.25' - 4' waves); 4 = Moderate (4' - 8' waves); 5 = rough (8' - 13' waves);

6 = very rough (13' - 20' waves)

³ Clouds: 0 = no clouds; 1 = ≤ 1/10 cloud cover (cc); 2 = 2/10-3/10 cc; 3 = 4/10 cc; 4 = 5/10 cc; 5 = 6/10 cc; 6 = 7/10-8/10 cc; 7 = ≥ 9/10 cc; 8 = completely overcast;

9 = sky obscured

⁴ Visibility: 0 = < 50m; 1 = 50 - 200m; 2 = 200 - 500m; 3 = 500 - 1000m; 4 = 1 - 2km; 5 = 2 - 4km; 6 = 4 - 10km; 7 = 10 - 20km; 8 = 20 - 50km; 9 = > 50km

⁵ Barometric Pressure: If available

⁶ Weather: 00 = clear to partly cloudy, <50%; 03 = cloudy to overcast, >50%; 04 = Fog, Patchy; 05 = Fog, solid; 06 = rain, light; 07 = rain, heavy

⁷ Wind Direction: SW, W, NW, N, NE, E, SE, S

⁸ Wind Speed: 2 knots = 1 m/s

Database FormID: _____ Data Entered Into Database By (print and sign): _____ Date Entered: _____

[Continuation]

LIVE/DEAD BIRDS OBSERVED (Use additional sheets if necessary)[illegible]

⁹ *Port (P) or Starboard (S)*

^{10a}**Oiling:** **NONE** = not visibly oiled; **Trace** = ≤5% of body; **Light** = 6-20% of body; **Moderate** = 21-40% of body; **Heavy** = >40% of body

^{10b}Oiling will only be recorded for birds within 100m of the ship.

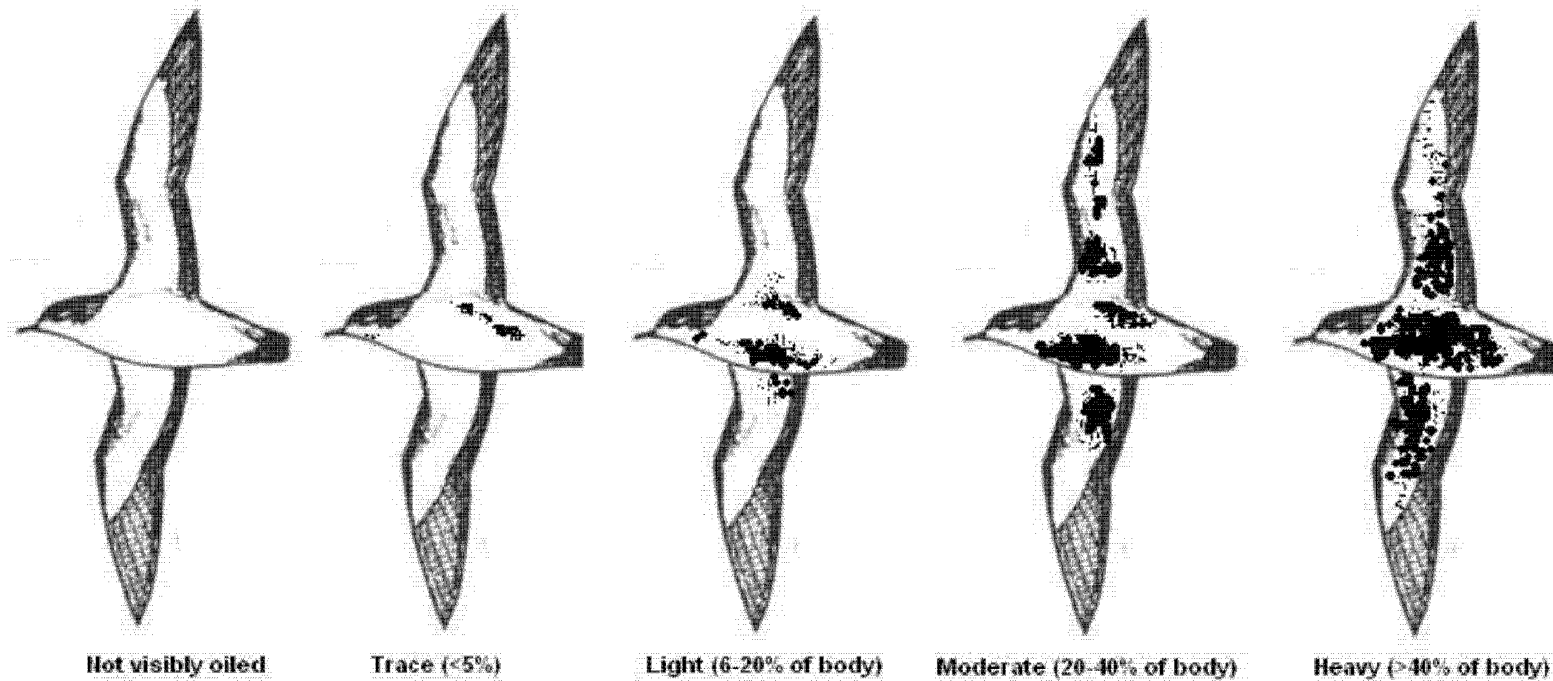
^{11a} **Behavior:** 1 = Flying; 2 = Sitting on the water; 3 = Feeding; 4 = Carrying a fish; 5 = Ship (attracted to the ship); 6 = Attracted to ship and following ship; NE = Not Evaluated

^{11b} If species exhibits more than one behavior, record the number of birds for each behavior (e.g., 25 flying / 10 feeding)

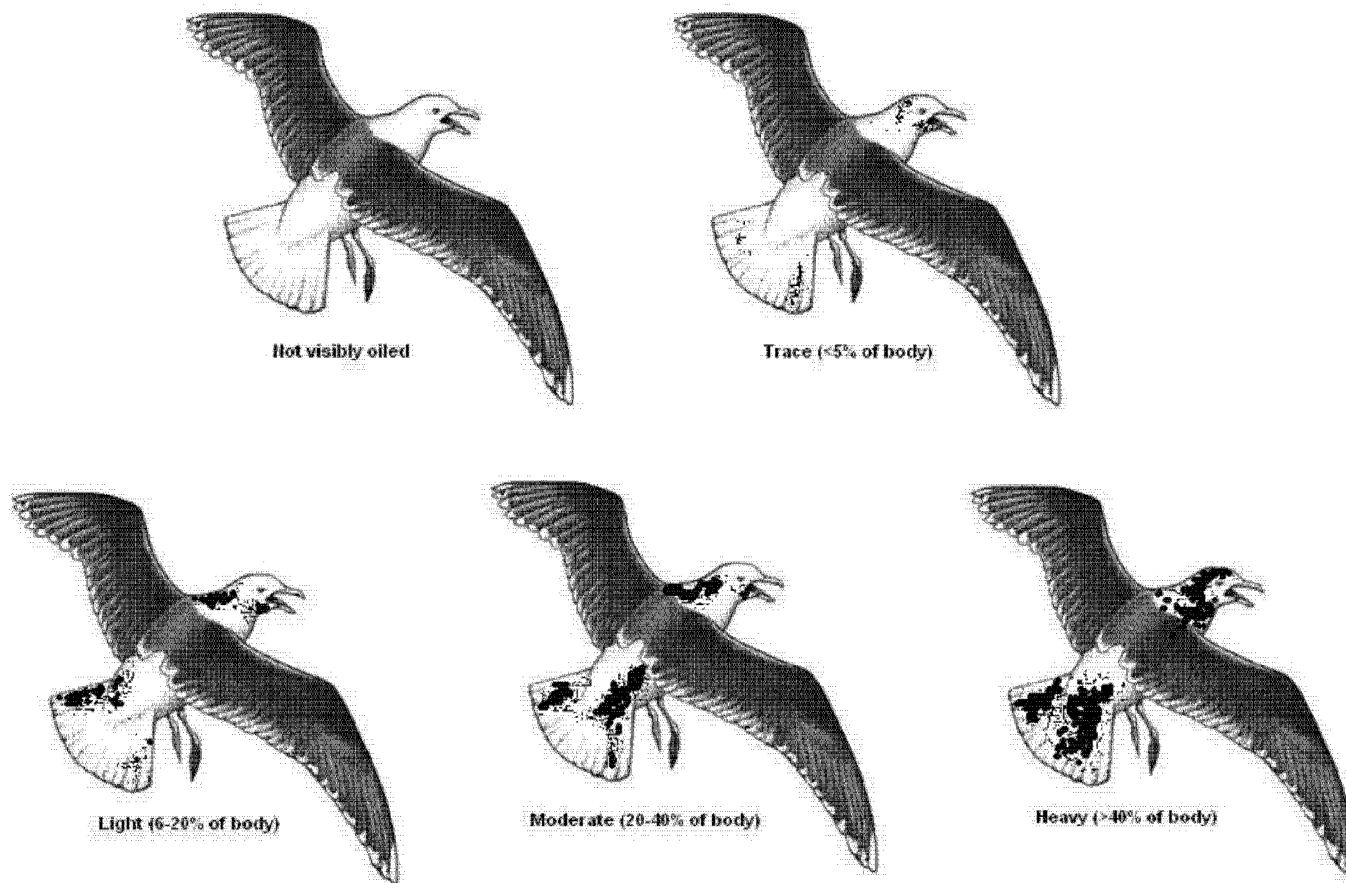
¹² **Direction of Flight:** Degrees (°) relative to ship's bow

¹³**Scavenging:** **F**= freshly dead whole carcass with little or no scavenging, **L** - lightly scavenged, **H** = heavily scavenged, **M** = mummified or skeletal, **X** = not evaluated

Appendix B. CATEGORIES FOR RECORDING EXTENT OF OILING ON FLYING SEABIRDS



Diagrams (ventral view) for oiling categories to be used for *Deepwater Horizon* MC252 pelagic waterbird surveys. These diagrams depict a flying seabird (Audubon's Shearwater *Puffinus lherminieri*).



Diagrams (dorsal view) for oiling categories to be used for *Deepwater Horizon* MC252 pelagic waterbird surveys. These diagrams depict a flying seabird (Great Black-backed Gull *Larus marinus*).

**Appendix C. COLOR PHOTO EXAMPLES OF OILED WATER
BIRDS (in flight and at rest)**



Oiled (moderate, 20-40%) Royal Albatross *Diomedea sanfordi*



Oiled (light, 6-20%) gull in flight, Alaska



Oiled (light, 6-20% top; moderate, 20-40% bottom) Northern Gannets in flight, Iceland



Oiled Forster's Tern in flight (light oiling, 6-20%)



Oiled Herring Gull in flight (moderate oiling, 20-40%)



Oiled Herring Gull in flight (moderate oiling, 20-40%)



Unoiled sub-adult Great Black-backed Gull. Special care should be taken when scrutinizing seabirds for oiling in the Gulf of Mexico when species have normal ‘dusky’ plumage patterns. These would include, for example: Cory’s Shearwater, Greater Shearwater, jaegers and skuas, and most sub-adult gulls. In such cases, the more orangish, reddish hues (less grayish tint) of the oil can be one good indicative difference.



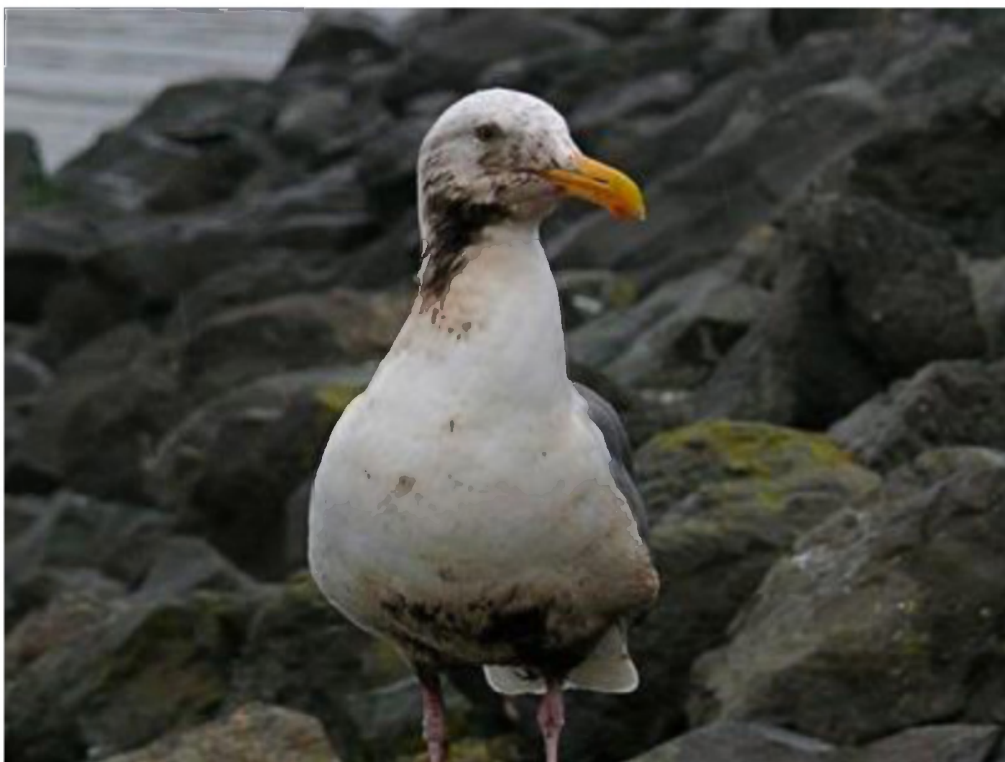
Unoiled sub-adult gulls with “muddy” plumage. Special care should be taken when scrutinizing seabirds for oiling in the Gulf of Mexico when species have normal ‘dusky’ plumage patterns. These would include, for example: Cory’s Shearwater, Greater Shearwater, jaegers and skuas, and most sub-adult gulls. In such cases, the more orangish, reddish hues (less grayish tint) of oil can be one good indicative difference.



Oiled sub-adult gull (about 3% - head and face)



Oiled adult gull (~10%)



Oiled adult gull (light, 6-20% category)



Oiled sanderling, left (6-20% light category; *cf.* normal sanderling to right. This photo is useful for evaluating potential oiling to phalaropes)



Oiled adult gull (about 45% - ventrally and face)



Oiled scoter and grebe (about 95% - note the soggy-appearing plumage with oil-matted feathers evenly-spread on body)



Oiled grebe (100% debilitated)



Oiled coot.

Note the substantially greater difficulty of determining extent of oiling on dark-plumaged birds. Rather than relying upon contrasting hues of the oil on lighter plumage, the best indication is a “wet” appearing plumage, with separated and un-groomed feathers. Such considerations may be the only obvious indication for dark-plumaged seabirds expected in the Gulf of Mexico, including Brown Booby, Magnificent Frigatebird, storm-petrels, Sooty Shearwater, and Brown Noddy.

**Appendix D. OVERVIEW OF NATURAL RESOURCE DAMAGE
ASSESSMENT AND RESTORATION, WITH EXAMPLE (10 pages
PowerPoint slides)**

