

STUDY TITLE: Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States.

REPORT TITLE: Compendium of Avian Occurrence Information (Database Section – Seabirds) for the Continental Shelf Waters along the Atlantic Coast of the United States.

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SPONSORING OCS REGION: Atlantic

APPLICABLE PLANNING AREA(S): North Atlantic, Middle Atlantic, and South Atlantic

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BACKGROUND: Offshore development proposed for U.S. Atlantic waters requires that regulatory agencies such as the Minerals Management Service and the U.S. Fish and Wildlife Service assess the effects of activities such as the building and operation of wind turbines on marine bird populations. Information on the occurrence, distribution, and behavior of seabirds and factors influencing their distribution is needed to adequately assess the potential for impacts, especially for species considered threatened, endangered, or in decline. Unfortunately, sampling of seabirds in this region has been haphazard over the last several decades and species information is disparate, but the need to quickly consider alternative energy options leaves little time to establish new region-wide sampling programs that compile effects data over many years. Furthermore, sampling of the marine environment is difficult and therefore approaches such as predictive population modeling have been recommended to provide some guidance to agencies in assessing potential impacts of development on wildlife. Before such work begins for marine birds in the Atlantic, however, appropriate data first need to be retrieved, reconfigured, and synthesized so that it can be effectively used in mathematical modeling and mapping activities as part of a geographic information system (GIS).

OBJECTIVES: This project listed 4 objectives: (1) augment ongoing effort to retrieve, compile, and organize seabird data for the Atlantic OCS region; (2) model seabird distribution and evaluate importance of various biological and biophysical factors on select species populations; (3) make seabird and

shorebird data available in an electronic database and useable in a GIS (i.e., ArcGIS); (4) place both seabird and shorebird data into a GIS database.

This summary and the associated report (i.e., Database Section - Seabirds) fulfill portions of objectives #1, 3, and 4. Due to the fact that shorebird occurrence information is currently being compiled as part of an ongoing agreement between the USGS and FWS, and that datasets continue to become available over time, additional data that we acquire will be appended into this database as we acquire it through to the project's completion. A separate report focusing on the compilation of shorebird data and inclusion of that information into this database will be prepared at a later date. Although this database report finalizes our work on the development of this database, the database itself should be viewed as something that continues to be refined and expands over time as new information is added.

The second objective that involves modeling will also result in a separate report at a later date, as will a separate report on the shorebird occurrence information.

DESCRIPTION: We retrieved and compiled datasets from a variety of sources including government agencies, academic scientists, non-government organizations, and private individuals. We first created a dataset catalog to contain metadata (compliant with federal standards) for each dataset. Datasets were then processed to re-organize and standardize data fields, and transferred to GIS databases to generate distribution maps. Data were standardized primarily for species codes, dates, times and data types (e.g., text fields converted to numbers or vice versa) and re-organized to have consistent fields and field ordering among datasets.

We developed 12 computer programs to facilitate data processing and comparisons between historical and recent surveys (i.e., data collected with or without a geographic positioning system [gps] device). We also created two computer programs to 1) discretize continuous survey tracks into fixed distance or time transects and 2) use these discrete-distance or -time transects to calculate relative seabird densities. Finally, we used this last program to standardize sampling effort among all datasets by discretizing effort data into a common distance unit. We then summarized and mapped the quantity of sampling effort for each grid within the study area.

To refine our modeling efforts, we also gathered biophysical data such as sea surface temperature, chlorophyll, ocean depth, and ocean bottom substrate. Most of these datasets also required some form of data manipulation and formatting to make them usable for mapping and in our modeling efforts.

SIGNIFICANT CONCLUSIONS: We have acquired over 85% of the seabird occurrence information for the U.S. Atlantic (Figure 1) currently known to exist (N datasets = 65). A few datasets remain outstanding and it is unknown if they will ever become available for use in the public domain, some are still works in progress, and proprietary restrictions on some datasets may also limit access to others. Significance of the data in this compendium almost certainly increases when datasets are viewed collectively rather than individually. These data can now be used to produce mappable products in an ArcGIS environment and the records are being organized into a single relational database (see final report for details). Maintenance of the current data and future expansion of the database as new surveys are conducted will require commitment and communication on the part of responsible and interested agencies and organizations. Given the complexity of the data, we suggest that the best way to understand the distribution of seabirds is to develop multi-scale (spatial and temporal) hierarchical models that include environmental covariates.

STUDY RESULTS: The database currently includes 65 datasets and >400,000 seabird occurrence records from 64 datasets for the northwest Atlantic from Florida to Maine and one from Atlantic Canada.

The datasets vary greatly in spatial and temporal scale. Several large datasets were acquired that date back to the 1970's and 1980's, along with more recent smaller regional datasets compiled as part of efforts to assess proposed offshore development. This assemblage varies widely in quality, ranging from those surveys that used rigorous scientific methods to collect data to those that can be defined as casual or undertaken strictly for recreation. The latter were conducted with little or no attention to the rigors of scientific sampling. As part of this project we have mapped species-specific distributions using simple occurrence data (example, Fig. 2), and where possible, the variation in sampling effort across the study area (Fig. 3).

STUDY PRODUCT(S): O'Connell, Jr., A. F., B. Gardner, A. T. Gilbert, and K. Laurent. Compendium of Avian Occurrence Information for the Continental Shelf Waters along the Atlantic Coast of the United States. A final report for the U.S. Department of the Interior, Minerals Management Service Atlantic OCS Region, Herndon, VA. 50pp. Contract No. M08PG20033.

* P.I.'s affiliation may be different than that listed for Project Manager(s).

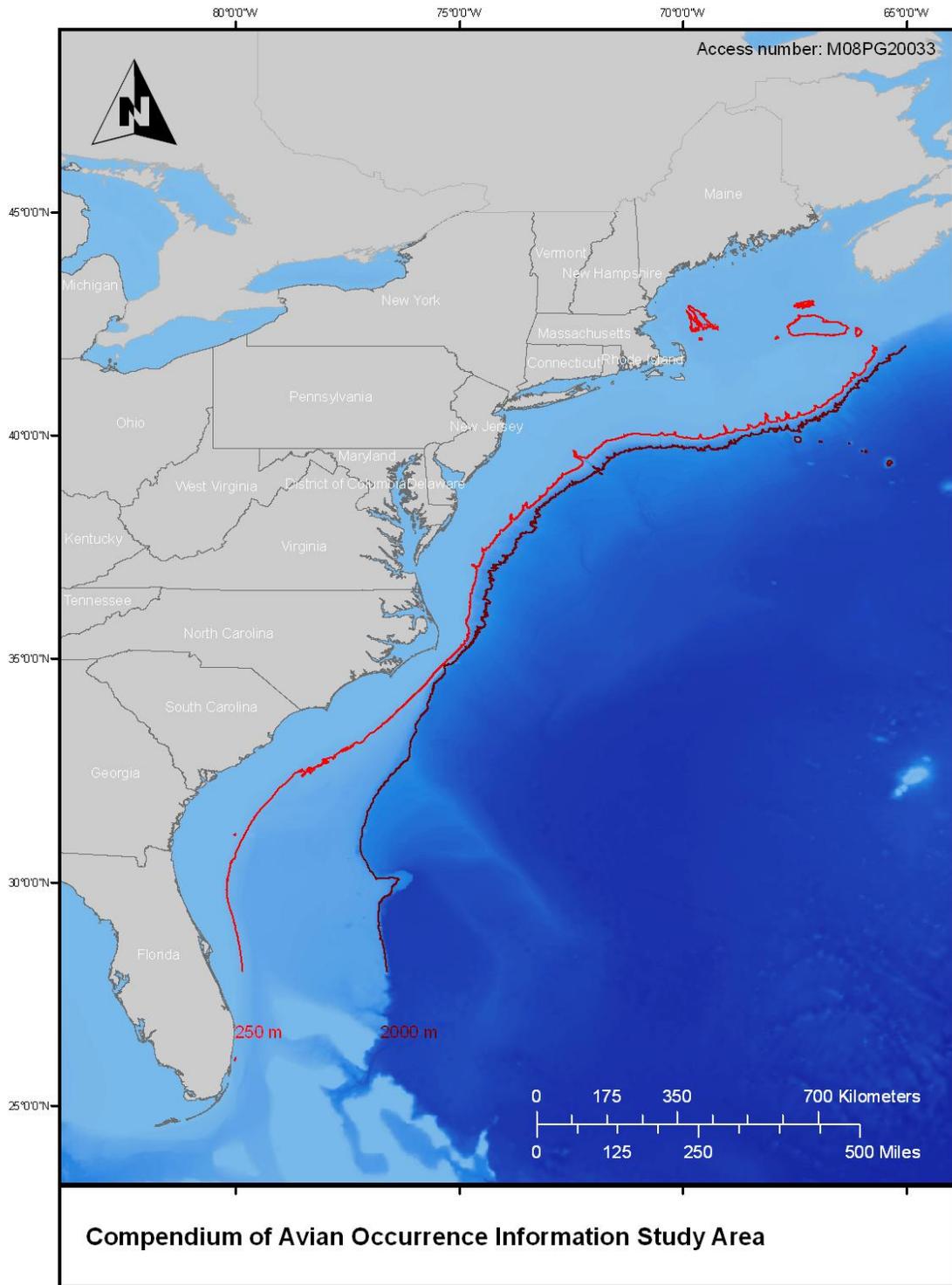


Figure 1. Compendium of avian occurrence information study area.

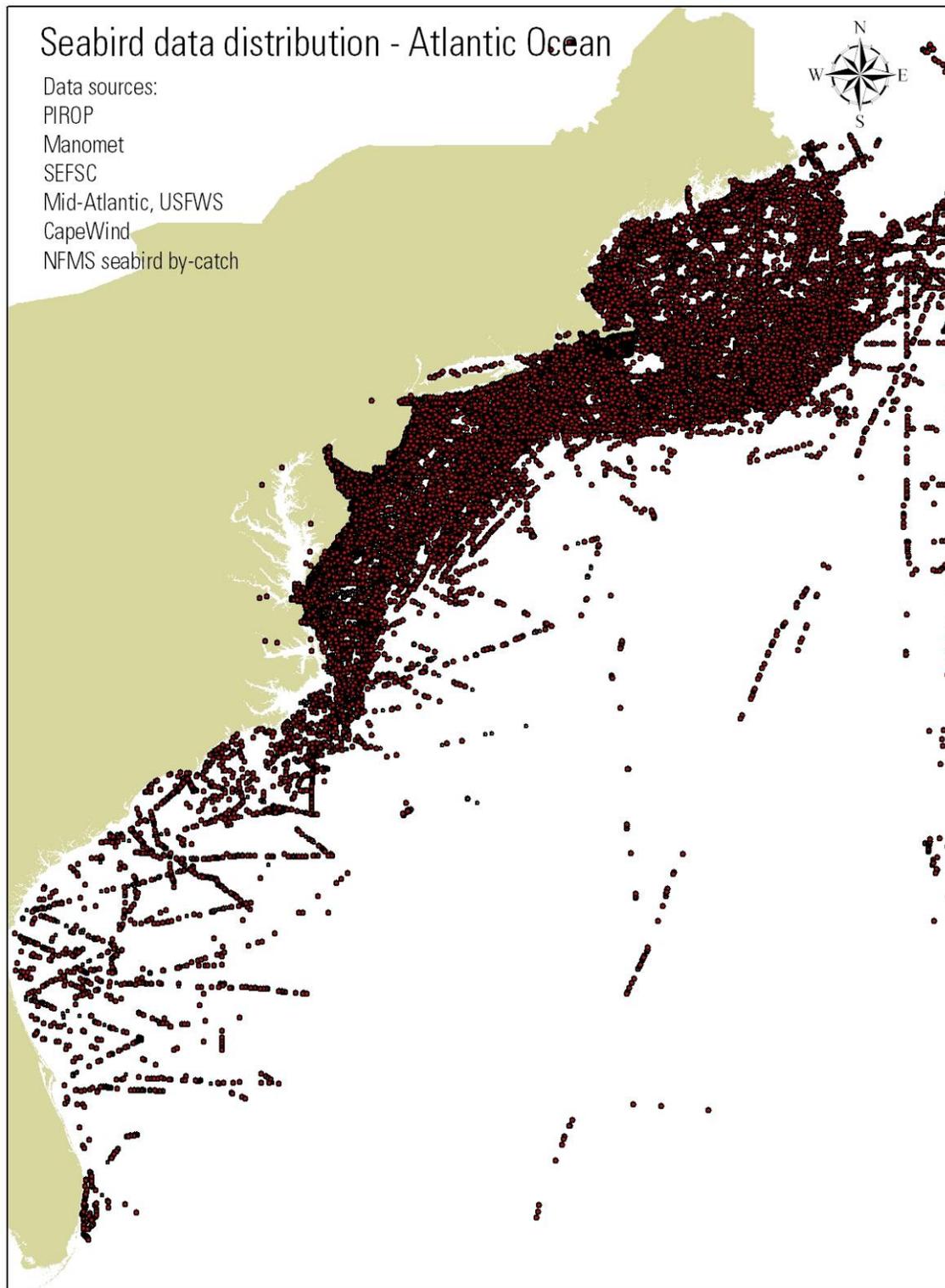


Figure 2. Seabird occurrences based on data from Programme Integre Recherches sur les Oiseaux Pelagiques (PIROP), Southeast Fisheries Science Center (SEFSC), Computer Data Analysis System (CDAS) designed for MMS, Cape Wind and others.

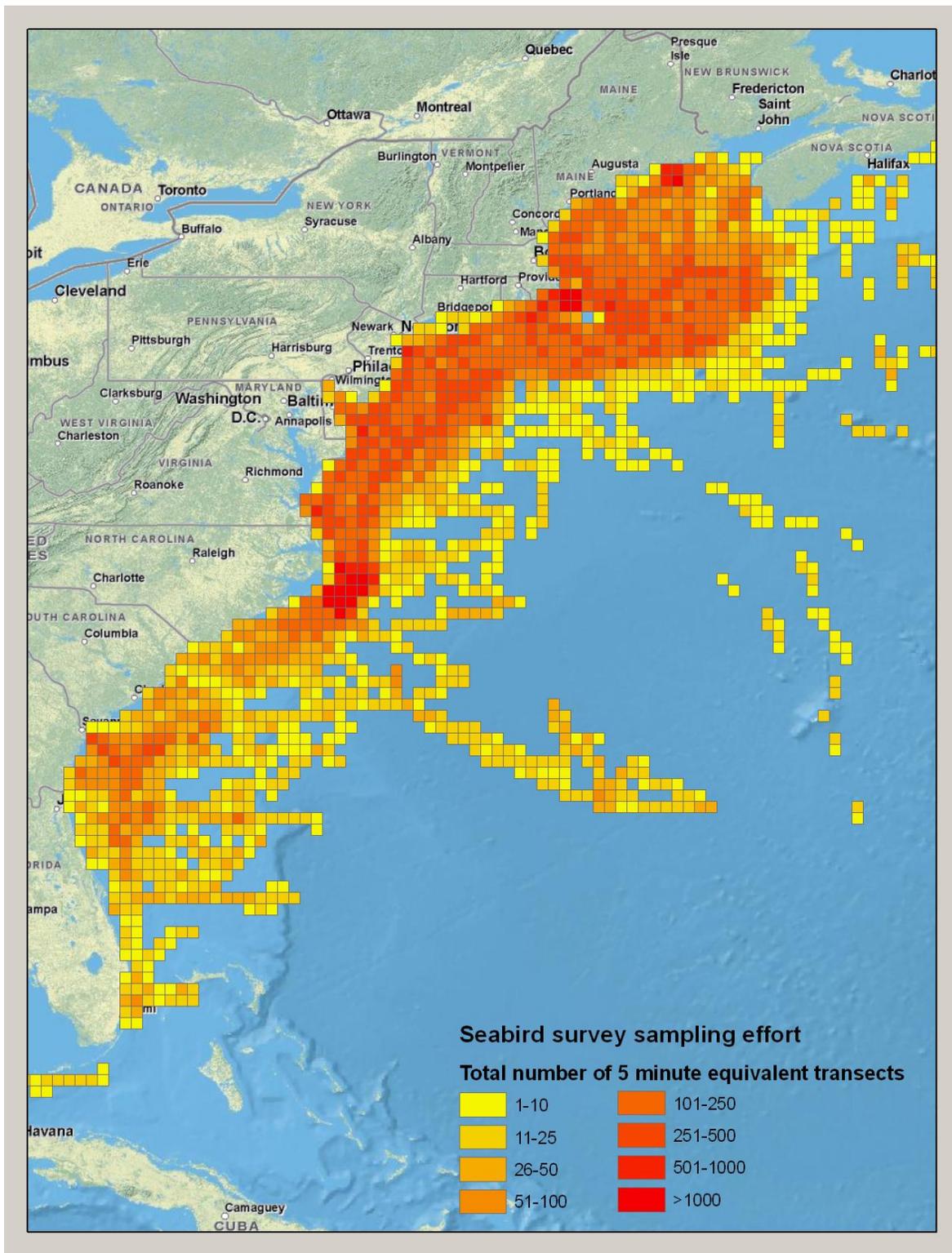


Figure 3. Sampling effort for seabirds along the Atlantic coast of the U.S during 1978-2009. Color schemes represent a standardized range of the number of surveys conducted in each grid cell.