

Developing the Next Generation Marine Mammal Information Center for Integrated Ocean Observing: OBIS-SEAMAP 2.0

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LONG-TERM GOALS

Our ability to mitigate adverse interactions with marine mammals and other protected marine species is dependent on direct access to high-quality data sets, ecological models and expert knowledge. The OBIS-SEAMAP program (<http://seamap.env.duke.edu>) is designed specifically to make such information available to the research, education and management communities. Over the past four years, OBIS-SEAMAP has successfully developed a multi-function information system to provide critical data to scientists, managers and educators under the NOPP program.

OBJECTIVES

The central work-plan for this renewal is to conduct a strategic expansion of the OBIS-SEAMAP information system in depth, breadth, functionality and usage. In addition to maintaining the existing system on a growth trajectory, we are targeting five specific focal areas:

1. Data gap analysis and prioritized expansion of the marine mammal geodatabase;
2. Inclusion of new data types (acoustics, photo-ID, 4D telemetry, model outputs and turtle nesting);
3. Expanded functionality with mapping, species profiles, metadata, and web services;
4. Seamless interoperability with IOOS/GEOSS ocean observing community; and
5. Development of new partnerships focusing on data and technology.

APPROACH AND WORK PLAN

We are currently 1.25 years into our 3-year project, reporting here on November 2007 – October 2008. PIs Patrick Halpin and Andrew Read are overseeing all aspects of the work. Specific staff and students are further mentioned below.

The ongoing Data Gap Analysis/Targeted Data Acquisition is highlighting database gaps in time, space and species. Connie Kot and Lucie Hazen are still conducting a multi-step, detailed analysis, while focusing on identifying dedicated surveys currently not in OBIS-SEAMAP from 1983-2003. Key species within each taxa have been selected to serve as representatives, because of their broad extent and habitat range, to help narrow the analysis in taxa gaps. The comprehensive literature and online database review is continuously being updated, although much work is still needed for a complete inventory of potential high quality datasets and contributors which have not yet been targeted. Work for the next year involves a major push to acquire data while systematically cataloging existing datasets and submission of a synthesis manuscript. Identification and collection of datasets will continue throughout the life of the program.

Development of the five new data types requires domain-specific expertise working with the technical team (Ei Fujioka, Ben Best and Ben Donnelly) to implement the appropriate data structures and interfaces. For the (1) Acoustic Location Data type, we built great relationships with prominent acoustic researchers in the Passive Acoustic Monitoring Data Workshop held in Beaufort in April 2008. Thanks to these relationships, we will be closely collaborating with Sofie Van Parijs, NOAA Northeast Fisheries Science Center, and Len Thomas, University of St Andrews, to design a visualization method for these data. In addition, a dedicated acoustician is now being hired and will join the project in February 2009. The online applications for the (2) Photo-ID Data type are currently in a beta-testing phase joined by Todd Speakman, NOAA (Charleston, SC). A few other contributors have also expressed interest in joining the beta-testing, including the members of the Wild Dolphin Project. Researchers from Tagging of Pacific Predators Project (TOPP, <http://www.topp.org/>) will provide us their (3) Advance Telemetry Data as well as their expertise to implement telemetry data specific features on the OBIS-SEAMAP web site. Ben Best and Ei Fujioka are integrating (4) Model Outputs beginning with the predictive cetacean habitat models from Duke, Southwest Fisheries Science Center (SWFSC) and Geo-Marine, Inc. We are also planning to expand OBIS-SEAMAP's capability for a better handling of model outputs (with a dataset on dugong relative density and distribution provided by James Cook University, Australia as a case study). After launching a specialized online interface for the (5) Turtle Nesting Data provided by the Wider Caribbean Turtle Conservation Network (WIDECAST), we are now focusing on partnering with the State of the World's Sea Turtle (SWOT) initiative to expand the geographic coverage and collect recent data. An additional team member, Andrew DiMatteo, plays a central role of contacting data providers and organizing the nesting data. The technical team will improve the current online interface for WIDECAST to accommodate the SWOT data. The incorporation of these new data types into OBIS-SEAMAP will heavily utilize the knowledge and techniques obtained from the development of the OBIS-SEAMAP 2.0 interface and its backend systems along with the expertise from the collaborating researchers. These newly acquired techniques will be brought back to OBIS-SEAMAP 2.0 as a whole, completing the synergetic cycle.

Many technical innovations are additionally planned to expand the functionality of the site, including: Web Services for Dataset Extraction; Environmental Sampling; Species Attributes; Populating Metadata Clearinghouses; Access Control; Background Layers; Non-Redundant Data Harvest from Portals; and Development Environment. All of these will be led by the technical team (Ben Best, Ei Fujioka, Ben Donnelly and new hire Jesse Cleary).

WORK COMPLETED

We held two workshops in early 2008: one for Photo-ID data and another for passive acoustic monitoring. The web-based system for the Mid-Atlantic Bottlenose Dolphin Photo-ID Catalog (MABDC) entered in a beta-testing phase and was presented in March 2008 at the annual Southeast Atlantic Marine Mammal Conference (SEAMAMMS). In April, we hosted a workshop attended by a diverse group of passive acoustic data experts/users to help us work towards the inclusion of such data into OBIS-SEAMAP.

Preliminary results from the Data Gap Analysis showed that OBIS-SEAMAP data coverage represents a small fraction of existing records globally with major gaps in the southern Pacific, southern Atlantic, and all of the Indian Oceans. External requests to experts in the fields of sea turtle, marine mammal, and seabird distribution did not elicit many positive responses. However, requests for potential datasets identified through published literature or conference proceedings have been more successful. As for targeted data acquisition, we have acquired 26 new datasets since November 2007 (Table 1). Significantly, a massive subset of European Seabirds at Sea (ESAS), which doubles the SEAMAP data holdings, was registered into the OBIS-SEAMAP database and is now published. We have also progressed substantially with sea turtle nesting data. The Wider Caribbean Sea Turtle Conservation Network (WIDECAST) data has been integrated successfully with support from Karen Eckert, Scott Eckert and Wendy Dow.

The new OBIS-SEAMAP 2.0 web interface was launched in October 2008 (Figure 1), the demonstration of which was presented on several occasions including the Census of Marine Life Mapping & Visualization Workshop (Durham, October 2008) and received highly favorable responses. The new interface coupled with the enhancement of the backend systems has greatly expanded the capacity and capability of OBIS-SEAMAP, allowing for more sophisticated, multi-faceted visualization of the existing and new data types. The new interface is now capable of overlaying three oceanographic data (sea surface temperature, sea surface height and sea surface chlorophyll).

New partnerships are being sought in various fields. We have already initiated and exchanged dialogue with (1) Avian Knowledge Network hosted by Cornell University (AKN, <http://www.avianknowledge.net/content/>) for potential data exchange between AKN and OBIS-SEAMAP, (2) Marine Wildlife Behavior Database organized by University of Rhode Island (<http://mwbd.edc.uri.edu/>) in anticipation of a new data type (animal behavior), and (3) Google to further innovate visualization of marine data.

RESULTS

The development of the SEAMAP 2.0 interface and its backend systems resulted in accumulation of the knowledge and techniques for better visualization of scientific data. The major advancements are 1) multi-resolution distribution map; and 2) spatially, temporally interactive interface, both of which will facilitate exploration of scientific data that are scale-dependent in time and space.

IMPACT AND APPLICATIONS

Science Education and Communication

The conservation of marine megavertebrates can be better achieved by considering spatial and temporal natures of focal species. Ecosystem based management as a part of the conservation efforts is also scale-dependent in space and time. The new OBIS-SEAMAP 2.0 interface, which is equipped with spatially, temporally interactive features, will better serve as fundamental tools for marine researchers, allowing them to pursue scientific inquiry from spatial and temporal perspective. The addition of oceanographic layers to the OBIS-SEAMAP 2.0 will encourage marine researchers to explore the association of marine megavertebrates with surrounding environment, which also has significant implications for marine conservation.

Through several demonstrations of the OBIS-SEAMAP 2.0 to various audiences, many researchers have showed interest in contributing their data to OBIS-SEAMAP. For example, a presentation at the Third Annual North American Sea Duck Conference solicited positive feedback from that research community. Most data holders agreed on the mutual benefits and expressed interest in contributing their sea duck tracking data. We expect to receive 1-2 datasets in the near future to serve as examples for the others. In August, we featured an OBIS-SEAMAP informational poster at a Duke Marine Lab Open House event. Members of the public visited and learned about this project among others, raising public awareness toward marine conservation.

TRANSITIONS

Science Education and Communication

A demonstration of OBIS-SEAMAP 2.0 at the Census of Marine Life Mapping & Visualization Workshop (where was this - Durham?) successfully delivered its concept and potentials of web-based scientific visualization tools and data archives to the Census researchers worldwide. The knowledge and techniques obtained throughout the development of OBIS-SEAMAP 2.0 will help the Census researchers visualize their data either through OBIS-SEAMAP or via their own methods toward a 2010 Census of Marine Life roll-out.

We are planning to incorporate selected data and contents now available on OBIS-SEAMAP into the next release of Google Earth. We will be collaborating with Google to envision story-based scientific data representation for broader audiences.

RELATED PROJECTS

Our complementary Census of Marine Life Mapping & Visualization (M&V) project is in full swing (<http://comlmaps.org>) with the hosting of a major workshop in October 2008. The technical and social lessons gained from OBIS-SEAMAP will contribute greatly to this project's success.

PUBLICATIONS

P.N. Halpin, A.J. Read, E. Fujioka, B.D. Best, B. Donnelly, L.J. Hazen, C. Kot, K. Urian, E. LaBrecque, C. Good, L.B. Crowder, and K.D. Hyrenbach. 2008. OBIS-SEAMAP: The world data center for marine mammal, sea bird and sea turtle distributions. Submitted. *Oceanography*.

Table 1. Datasets added since November 2007, bringing the total to 235 and over 2.2 million records.

Dataset name	Provider	#Records	Note
WIDECASST Sea Turtle Nesting Sites	WIDECASST	1,311	Published
European Seabirds at Sea - JNCC All Trips	European Seabirds at Sea	1,123,101	Published
Alnitak Cetaceans/sea turtles surveys (Spain)	ALNITAK	4,018	Published
Harbour seals in Republic of Ireland in Aug 2003	National Parks & Wildlife Service, Dept. of Environment, Heritage & Local Govt.	435	Published
Whale Watch Azores Bryde's whale 2004	Whale Watch Azores	24	Published
DUML Vessel-Based Surveys for monitoring of proposed Onslow Bay USWTR site	Duke University Marine Laboratory	35	Published
UNC WILMINGTON Aerial Surveys for monitoring of proposed Onslow Bay USWTR site - Left side -	UNC WILMINGTON	66	Published
UNC WILMINGTON Aerial Surveys for monitoring of proposed Onslow Bay USWTR site - Right side	UNC WILMINGTON	75	Published
Leatherback Tracking in South Africa	Islameta Group - Department of Biology, University of Pisa	3,635	Published
Juvenile Green Sea Turtles from the Southwestern Atlantic Ocean	Diego Albareda-PRICTMA	230	Published
Satellite Tracking of Olive's Ridley Turtles at Jamursba-medi, West Papua - Indonesia	WWF Indonesia	1,367	Published
Study of young rehabilitated harbour seal (France)	CHENE	1,486	Published
Netherlands Antilles Turtle Tracking 2007	Marine Turtle Program Coordinator/St. Eustatius National Parks Foundation	439	Published
Casey Key Loggerheads-2008	Mote Marine Laboratory	4,194	Published
Satellite tracking of nesting loggerhead turtles at Ningaloo Marine Park, Western Australia	WA Department of Environment and Conservation	1,006	Published
Satellite Tracking of Hawksbill Turtle in West Sumbawa, Indonesia	WWF Indonesia	200	Published
Henry the Sea Lion	Southern Australian Research & Development Institute	358	Published
Green Sea Turtles Tracking in Sukamade, Meru Betiri National Park-East Java	WWF Indonesia	936	Published
Mingan Island Cetacean Study 84-07	Richard Sears, Mingan Island Cet. Study	4,904	Published
Cetacean survey in Balabac Strait, Philippines	Louella Dolar	32	Published
Cetacean distribution around Mayotte Island	Jeremy Kiszka	434	Published
2008 UNC WILMINGTON Right Whale Aerial Surveys	UNC WILMINGTON	2,011	Published
Visual and genetic surveys for odontocete cetaceans in American Samoa 2003-06	Pacific Islands Fisheries Science Center & Humpback Nat'l Marine Sanctuary	59	Published
Cetaceans in the Southern Indian Ocean 2004	Central Marine Fisheries Research Inst.	13	Published
Understanding the effects of climate change on Caribbean hawksbill turtles: satellite tracking	World Wildlife Fund	201	Published
New England Aquarium Harbor Porpoise Tracking	Connie Merigo, New England Aquarium, Boston, MA USA	174	Published

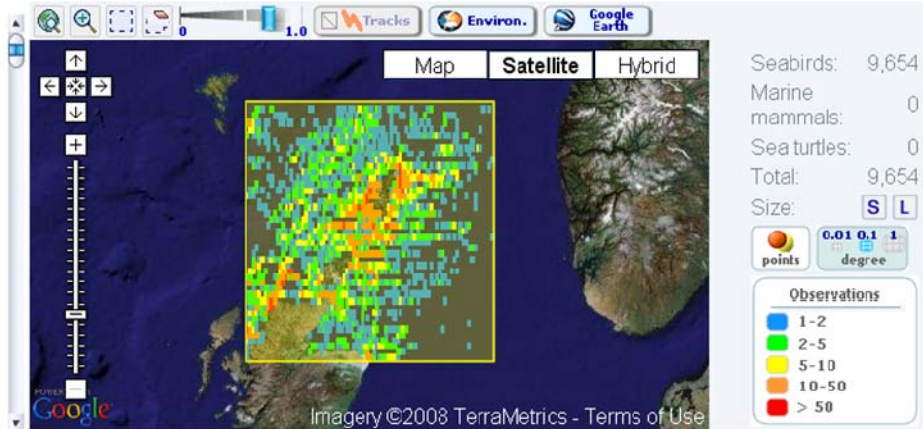


European Seabirds at Sea - JNCC All Trips



European Seabirds at Sea

- All species
- Marine mammals
- Balaenoptera
- Balaenoptera acutorostrata
- Balaenoptera borealis
- Balaenoptera physalus
- Caniformia
- Cetacea
- Cetacea
- Cetacea
- Cetacea
- Cetacea
- Cetacea
- Cetacea
- Cetacea



Information	Species	Environment	Attributes	Mapping	ESAS Summary	Download	Help
	Falco peregrinus	Peregrine Falcon	Species	3200	175604	1	
	Falco tinnunculus	Common Kestrel	Species	3040	175620	4	
	Ficedula hypoleuca	European Pied Flycatcher	Species	13490	560081	1	
	Fratercula arctica	Atlantic Puffin	Species	6540	177025	48,561	
	Fringilla coelebs	Common Chaffinch	Species	16360	179168	6	
	Fringilla montifringilla	Brambling	Species	16380	179167	2	
	Fulica atra	Eurasian Coot	Species	4290	176290	4	

Figure 1: The new OBIS-SEAMAP 2.0 interface showing “European Seabirds at Sea” dataset, the biggest dataset among the OBIS-SEAMAP data holdings. The new interface provides a spatially and temporally interactive way to explore the whole OBIS-SEAMAP data.