“OBIS is world's largest online system for absorbing, integrating, and accessing data about life in the ocean”

The Ocean Biogeographic Information System

Ward Appeltans
IOC-UNESCO/IODE

IODE-XXII Pre-conference Workshop, 8-9 March 2013, Ensenada, Mexico
Census of Marine Life (2000-2010)
Census of Marine Life (2000-2010)

- 2,700 scientists
- 80+ nations
- 540 expeditions
- US$ 650 million
- 2,600+ scientific publications
- 6,000+ potential new species
- 30 million distribution records and counting
OBIS Network

OBIS is a strategic alliance of hundreds of scientists and organisations who contribute data, information and expertise to OBIS.
OBIS nodes (bold = NODC status, green = Candidate node)

1. Antarctica/ AntOBIS
2. Arctic/ ArcOD/AOOS
3. Argentina/ArOBIS
4. Australia/ OBIS-Australia
5. Black Sea/ BlackSea-OBIS
6. Canada/ OBIS-Canada
7. China/ OBIS-China
8. Europe/ EurOBIS
9. India/ IndOBIS
10. Japan/ OBIS-Japan
11. Korea/ KOBIS
12. Mediterranean/ MedOBIS
13. South-East Pacific/ ESPOBIS
14. South-West Atlantic/ WSAOBIS
15. South-West Pacific/ NZOBIS
16. Sub-Saharan/ AfrOBIS
17. USA/ OBIS-USA
18. Global/ MicrOBIS
19. Global/ OBIS-SEAMAP
20. Global/ Hexacorals
21. Global/ FishBase
22. Global/ Seamounts
23. Gulf of Aden
24. South-East Asia
25. Caribbean
OBIS data growth: # records

35 million geo-referenced species observations (+ 5 million since Jan 2011)
OBIS data growth: # datasets

1,130 datasets (+ 219 since Jan 2011)
OBIS data growth: # records k/dataset
OBIS data growth: # marine species

120,000 marine species (+ 5,000 since Jan 2011)
Summary stats (1950-2004)

- Decline # species through the 1980s, but then an increase subsequently
- # records increases steadily, until it begins to level off around 1990
Very little historical data
# new species recorded in OBIS
Ocean Biogeographic Information System
http://www.iobis.org/

Search data based on
Taxonomy
Datasets
Geographical boundaries
Time, season, depth
Oceanographic variables
Association of observation points with oceanography

Environmental attributes from World Ocean Atlas

Observation data associated with
- Bottom depth
- Temperature
- Salinity
- Nitrogen / Oxygen
- Phosphate / Silicate

Visualized through interactive graphs
- Time-series graphs
- Histograms

OBIS allows extraction of observations based on environmental conditions

Example map #1
Cetacean species observations in LME region ‘Celtic-Biscay Shelf’
(no environmental conditions set)

Example map #2
Cetacean species observations in LME region ‘Celtic-Biscay Shelf’ filtered by a temperature range of 13 to 15 degrees
CBD-COP10 listed OBIS as a key source of information for the identification of Ecologically or Biologically Significant Areas (EBSAs) part of CBD.

- Areas of high biodiversity
- Areas of special importance for the life history of a species
- Areas of significant naturalness
- Areas of uniqueness or rarity
OBIS contributions to the CBD EBSA process

North Pacific regional EBSA workshop, Moscow,
25 Feb – 1 March 2013
OBIS contributions to the CBD EBSA process

examples

Marine Mammal Observations
Eastern Tropical & Temperate Pacific
EBSA workshop, Galapagos
Ecuador, August 2012

IUCN Red-List Species
Wider Caribbean and Western
Mid-Atlantic workshop, Recife,
Brazil, February 2012
OBIS contributions to the CBD EBSA process

Biological Diversity all taxa
Wider Caribbean and Western Mid-Atlantic workshop, Recife, Brazil, February 2012

Proposed site meeting EBSA criteria:
Abrolhos Bank & Vitoria-Trindade Chain
Described in-part due to high regional biodiversity as depicted using OBIS data.
Species distribution modeling (aquamaps)

Flathead mullet (point data)
Species distribution modeling (aquamaps)

Flathead mullet (native range)
Flathead mullet (Year 2050 range)
Summary Stats
Available through OBIS GeoServer: 10/5/1/0.5/0.1 degree grid maps
Summary Stats
Summary Stats
Completeness
The Unknown Ocean: A slice
Red = many records, dark blue none

Coastal areas > open waters;
Surface areas > the deep sea;
Vertebrates and other large animals > smaller invertebrates;
Northern hemisphere > southern.

The vast midwaters, Earth’s largest habitat by volume, mostly unexplored (~95%)
Very little historical data

Graph showing the number of records in OBIS from 1900 to 2020.
## Taxonomic bias

<table>
<thead>
<tr>
<th>Taxon</th>
<th># species</th>
<th># in OBIS</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cetaceans</td>
<td>133</td>
<td>117</td>
<td>88</td>
</tr>
<tr>
<td>Seals…</td>
<td>45</td>
<td>36</td>
<td>80</td>
</tr>
<tr>
<td>Fish</td>
<td>24139</td>
<td>21258</td>
<td>88</td>
</tr>
<tr>
<td>Echinoderms</td>
<td>6199</td>
<td>1624</td>
<td>26</td>
</tr>
<tr>
<td>Decapods</td>
<td>8227</td>
<td>3796</td>
<td>46</td>
</tr>
<tr>
<td>Bryozoans</td>
<td>6000</td>
<td>1096</td>
<td>18</td>
</tr>
</tbody>
</table>
Species richness vs sampling intensity, fish
Chao vs number of records, fish

Chao2 estimator vs Number of records
Number of records - fish
ES 50 Number of species - fish
Chao2 estimator Number of Species - fish
Data e-infrastructure Initiative for Fisheries Management and Conservation of Marine Living Resources (i-Marine)

- Research Infrastructures CP & CSA funded by the European Commission under the FP7 Capacities Programme - eInfrastructure Unit DG CONNECT (1 Nov 2011 - 30 April 2014)

- Launch an initiative aimed at establishing and operating an e-infrastructure supporting the principles of the Ecosystem Approach to Fisheries Management and Conservation of Marine Living Resources.
Trend Analysis and biodiversity assessments

- What are the most common species (10 - 25 or n) reported in OBIS (per taxon, region, period) and is this changing over time?
- Are we observing more or fewer species?
- Species Status:
  - Species with IUCN status per MPA
  - Endemic species per MPA (Nr and occurrences)
  - Species with IUCN status in < n MPA
  - Edge effect; MPA near species distribution extension
Conclusion/Contributions

• Total Species richness index/Diversity index (taxonomic distinctness index), per grid/region (LME) trends over time.
• A baseline to which future change can be measured.
• Projections of climate change impacts on biodiversity (Aquamaps, OpenModeller), using IPCC scenarios.
  – Subgroup on Ocean Acidification/Warming oceans
    • Impact on Pteropoda
    • Impact on coral reefs (what will be the impact of loss of coral reefs on biological diversity (how many reef species will be impacted))