



Mapping Tools: Where the Wild Whales Are

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Demo Theater

With great thanks to Dori Dick of Oregon State University as this is based on the first portion of her Ph.D. dissertation in preparation at Oregon State University.

Marine Ecosystem Decline

- Rapid, global
- Biodiversity loss
- Loss of ecosystem services

*Marine ecosystem-based management,
coastal and marine spatial planning*



<http://www.americanreef.org/marinedebris.html>



<http://thelibrary.com/articles/did-you-know-right>



<http://www.seaturtelfoundation.org/stf-current-projects/campaigns/marine-debris/>

To respond to this, some people are beginning to use a more holistic approach including marine ecosystem-based management and marine spatial planning

Whales & Dolphins (Cetacean) - Threats



- Fishery interactions (entanglement, by catch, change in food resources)
- Shipping (collisions, noise)
- Climate change (warming seas, acidification, change in prey distribution)

Habitat degradation

marinemammal.usg.edu

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They are threatened by ...

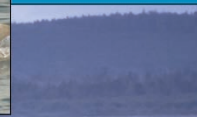
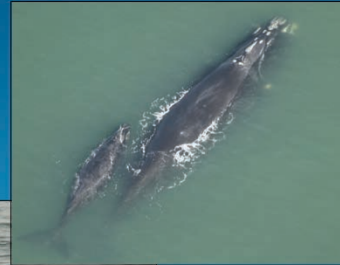
Ultimately, all of these threats can be considered habitat degradation

Whales & Dolphins – Conservation Priority

Knowledge needs:

- Species distribution
- Movement
- Habitat characteristics
- Population structure

Spatial Data!!



Limiting Factors for Cetacean Conservation

- Long-term, individual-based
- Use:
 - Photo-ID data – lots of data
 - Genetic ID data – few samples
- Databases often kept separate



Few tools exist to handle, explore or visualize the spatial patterns of such data

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Many whale and dolphin studies are long-term, individual-based and contain numerous re-sightings of known individuals

Such studies use photo-identification techniques in which some feature on the animal's body is used as a unique identifier. This is similar to human fingerprints, we all have a distinct set, but for cetaceans it is often the dorsal fin, the underside of the tail flukes or some other feature. This method generates a lot of data, especially now with the use of digital cameras

The other way individuals can be identified is through genetics in which a biopsy sample is collected from the individual and then through laboratory analysis a unique genetic code for each individual is determined. This is similar to what is done in police forensics to determine whether or not a suspect has in fact committed a crime, or in a paternity analysis to determine who is the father. The amount of data that results from this method is much less.

These databases are traditionally kept separate despite the fact that the integration of these 2 data sets would enriched the information available that can be used for conservation and management decisions.

Greatly Needed

A quantitative approach to conservation priorities by mapping spatial data and attributes of individuals to improve ability to study influence of seascape on population structure

Critical to understanding, minimizing and predicting impacts of anthropogenic seascape alteration and global climate change on marine biodiversity.



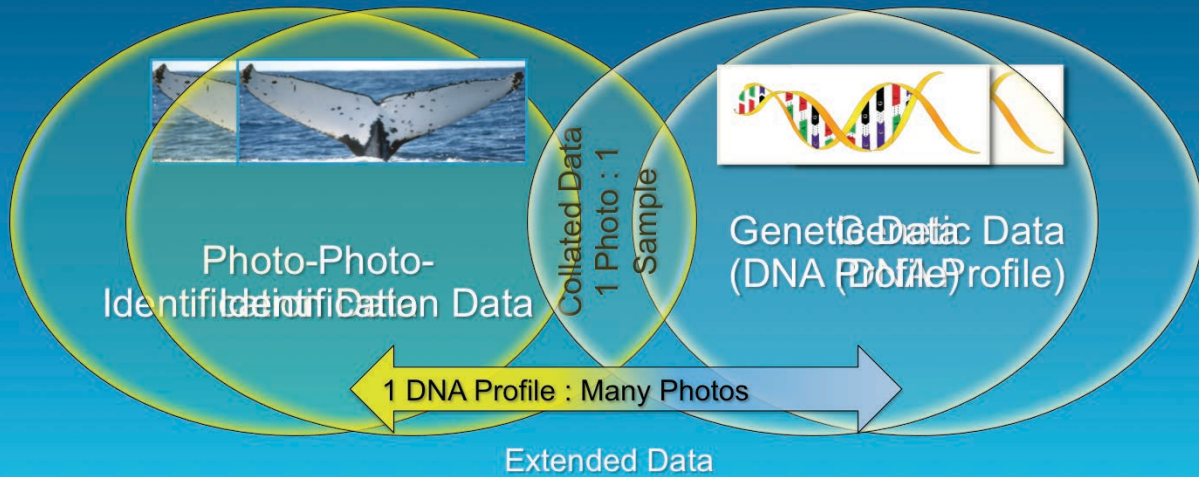
Earth 2014 | Ocean Threats | general

geneGIS

- A set of ArcGIS tools for use by researchers who have multiple types of individual level data (genetic, photo-ID, mark-recapture etc.) and want to:

1. **Visualize** data on a map
2. Spatially **explore, display, and select** data
3. Conduct **basic spatial analyses**
4. **Export** data to formats required by other genetic analyses software

Data Conceptualization



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As mentioned before, the two data bases are often kept separate.

They can only be combined when there is an encounter in which an individual has a photograph AND a sample taken simultaneously. At this point, the identity of the individual can be determine from either a photo and a sample. The data are now collated.

Once collated, the DNA profile can be extended to all other encounters of that individual in which only a photographic sighting exists.

geneGIS

genegis.org

Spatial analysis of individually linked
sighting records and genetic samples

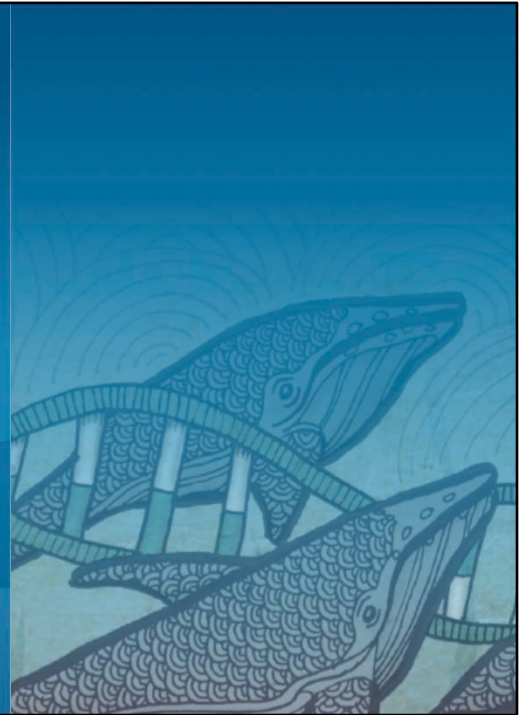


Introducing geneGIS, a collaboration with Scott Baker and students at the OSU Hatfield Marine Center, John Calambokidis et al of the Cascadia Research Collective, and Esri. Funding to OSU/Cascadia by the Office of Naval Research. Integrates the spatial and the genetic. The project is a useful illustration of how we can produce hybrid tools which use ArcGIS for its skills, but use other packages, such as the SPAGeDi genetic analysis package, for the scientific analysis that is useful.

geneGIS Demo

Shaun Walbridge

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OSU Cetacean Conservation Genetics Lab for genetic analyses

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Website

<http://genegis.org>

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