An Update on Work Related to Biogeographic Criteria for the Classification of Open and Deep Ocean Areas

– A joint expert effort under the co-sponsorship of University of Mexico, UNESCO, IOC, IUCN, Australia, Canada, Mexico and the J.M. Kaplan Fund –

Side Event at ICP 8
27 June 2007

Structure of presentation

- Background
- Conceptual aspects
- Pelagic aspects
- Benthic aspects
- Next steps

Background
History and Context

- Biogeographic classification systems as essential tools for integrated oceans management

- Used for understanding how and where taxa are distributed and in marking the boundaries between oceanographic regimes

- Allow us to spatially delineate separate areas that have recognizably different and predictable taxonomic and habitat compositions

- Essential component of representative marine protected area networks, which seek to encompass the full range of habitats and ecosystems

History: World Summit on Sustainable Development, 2002

31(c): Develop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive fishing practices, *the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012* and time/area closures for the protection of nursery grounds and periods, proper coastal land use and watershed planning and the integration of marine and coastal areas management into key sectors

59. The establishment of area-based management measures, *including representative networks of MPAs* ...was identified by most delegations as a key tool....

60. ...noted that further cooperation was necessary to further develop criteria for the identification of ecologically and biologically significant areas, the development of systems of marine protected areas and *biogeographic classification systems.*

8th Conference of Parties to the Convention on Biological Diversity, March 2006

46…*decides* to convene a scientific expert workshop, for the purpose of informing the UN Informal Working Group on BBNJ

47. *Welcomes* the offer by Portugal to host the workshop mentioned in paragraph 46 above, in 2007.

TERMS OF REFERENCE FOR CBD EXPERT WORKSHOP ON ECOLOGICAL CRITERIA AND BIOGEOGRAPHIC CLASSIFICATION SYSTEMS

1. Refine and develop a *consolidated set of scientific criteria* for identifying ecologically or biologically significant marine areas in need of protection, in open ocean waters and deep sea habitats, building upon existing sets of criteria used nationally, regionally and globally;

2. *Compile biogeographical and ecological classification systems for delineating ocean regions and ecosystems, building on existing broad classification systems*, and including more detailed sub-regional classification systems where they exist in a nested approach, and initiate future development by making recommendations for further work to fill gaps;

3. *Compile a consolidated set of scientific criteria for representative networks of marine protected areas, including in open ocean waters and deep sea habitats*.

Mexico offer at CBD COP8

- Urgent need to have scientific criteria for establishing MPA BNJ

- Workshop to look into biogeographical classification systems

- To feed into both the CBD and the UN processes

- The workshop will be before the Portugal one, and the results will feed into the Portugal workshop

Mexico Workshop
January 2007

Goal: *To define a set of basic principles and a framework for the recognition and classification of coherent biogeographic regions of the high seas, where no such agreed system has been developed*

Focus

- High seas and deep seabed beyond national jurisdiction,
  - recognizing linkages to waters under national jurisdiction

- This approach to a classification system for supporting the selection of Representative Areas, does not consider or include:
  - distinctive (unique) areas
  - hotspots (of whatever kind including areas of high species diversity)
  - ecologically and biologically significant areas
  - current environmental conditions or 'naturalness'
  - threats to marine environments, habitats, or their communities
  - current or potential 'end-uses' of marine environments

Workshop objectives:

1. Reporting and evaluating on progress to date in developing and applying biogeographic classification systems;

2. Identifying basic principles for the choice, adoption and application of biogeographic classification systems where no such generally agreed system has been developed;

3. Discussing methods to describe and delineate distinct areas of the deep seabed;

Workshop objectives (cont.)

4. Developing preliminary maps depicting potential boundaries for biogeographic realms, provinces and 'ecological regions' in the open ocean, and, to the extent possible, for the deep seabed, through the use of GIS and other mapping tools;

5. Prioritizing relevant research and practical needs to further advance work on biogeographic classification systems for the deep seabed and open ocean; and

6. Promoting information exchange and capacity development among scientists working on similar projects within national and regional waters.

Overall Conceptual Conclusions

Possible Approaches

- TAXONOMIC APPROACH – organize areas by similarity in species
  - The central property of interest (+)
  - High seas surveys few and incomplete (-)
- PHYSIOGNOMIC APPROACH – organize areas by similarity in depth, water masses, seabed features, etc
  - Better known and quantified on High Seas (+)
  - "Habitat" properties are more dynamic so community dependence on habitat features is more fluid

Preferred Approach

- Taxonomic approach with Physiognomic Approach as validation step
  - Use the biological information as far as it goes, looking for GROUPS of species with common distributions
    - Common range discontinuities
    - Common responses over time
  - then ask if boundaries make sense given the oceanography and bathymetry of the areas

Principles

1. DO BENTHIC AND PELAGIC SYSTEMS SEPARATELY
   - Pelagic systems 3-dimensional and dynamic
   - Benthic systems have a stable 2-D foundation
   - Benthic-Pelagic coupling is follow-up work
2. Do NOT use "diagnostic species" concept –
   - goes counter to goal of representative areas
3. Terrestrial "biome" concept not appropriate because species composition matters
4. Reflect PROCESSES not just patterns
5. Systems will be hierarchical / nested

Practical Issues

- Unequal availability of data by global regions
- What level of biodiversity as start – Species, Genera, family?
- How to weight plankton, invertebrates, fish, mammals, etc (data unequal – should influence be unequal too)
- What to do with transition zones
- How to deal with variation over time
- What scale is core for hierarchical system

Pelagic Group

Important Properties of a System for the Pelagic component

- Capture unique ecological and taxonomic systems
- Capture species and processes that could not be protected through conservation measures in other places
- As compatible as possible with Benthic system (following) and Marine Ecoregions of the World
  - system for shelf seas within EEZs

Important FEATURES to capture

- Core areas of gyres
- Equatorial upwelling systems
- Upwelling zones at edges of basins
- Transitional areas –
  - both <u>Con</u>vergence and <u>Di</u>vergence zones
  - Some abrupt boundaries, some gradients with mixing of communities
  - Some stable over time, some move over 100's of km
- Hence need for "fuzzy" boundaries –
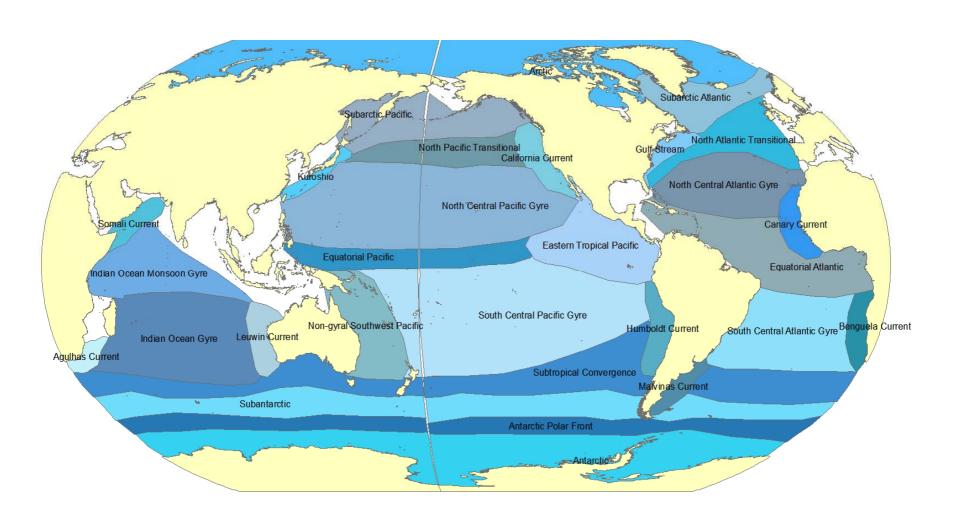 - Differentiate real transitions from lack of knowledge

WHY are these zones?

- ALL have distinct ASSEMBLAGES
- SOME have distinct SPECIES
- Clear links with functional / productivity units (in best studied cases, not known in others) –
- Reassuring compatibility with other taxonomic and biome-like systems
- THERE IS IMPORTANT NESTING OF SUBSYSTEMS YET TO BE ADDRESSED

Caveats and Challenges

- Core areas – critical for functioning and stability
- Edges of regions – dynamic transitions may be ecologically important
- Some processes will require taxonomic perspective as well as general bio-geographic one
- Taking account of dynamic nature of pelagic systems, especially boundaries, is crucial
- Accommodating migratory species
- We will continue boundaries of regions into EEZs
- We are leaving "orphans" (deep and within EEZs)
- Capture bits of sea < than 200 m but outside EEZs

TWENTY-NINE Provinces

- GYRES: Indian O, Indian O monsoon, NC Atlantic, NC Pacific, SC Atlantic, SC Pacific, (O=Ocean N=North, S=South, C=Central)
- Currents: Agulhas, Benguela, California, Canary, Gulf Stream, Humboldt, Kuroshio, Leuwin, Malvinas, Somali,
- Transitional and Convergence Zones: N Atlantic, N Pacific, Antarctic Polar front, Subtropical Convergence,
- Other High Latitude: Antarctic, Arctic, Subantarctic, Subarctic Atlantic, Subarctic Pacific
- Other Low Latitude: E Tropical Pacific, Equatorial Atlantic, Equatorial Pacific, Non-Gyral SW Pacific, (E=Eastern, W=Western

Benthic Group

Benthic Group: Approaches

- Begin with a one-level classification system (provinces), based on a province definition developed at the workshop that allowed to capture biota with shared evolutionary history and some levels of endemism with provinces

- Use habitat/functional classification systems and then overlay available taxonomy on habitat patterns.

Benthic factors likely to be related to biogeography (provinciality)

- Depth zones:
  - Upper bathyal
  - Lower bathyal
  - Abyssal
  - Hadal

- Hydrographic settings:
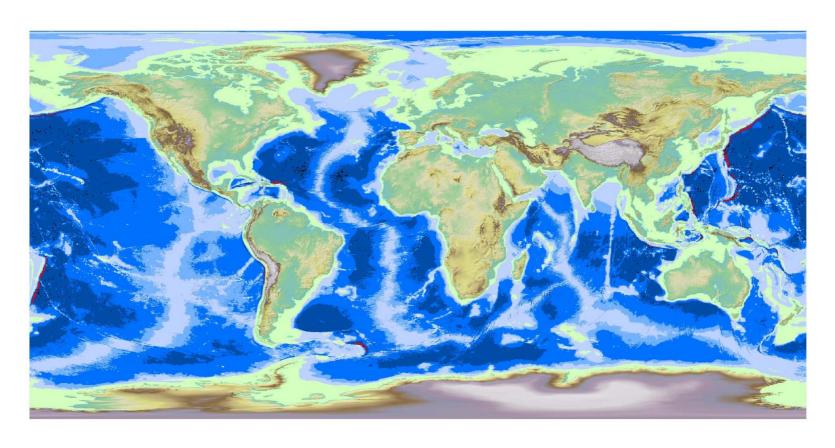 - Water mass
  - Transport pathways

- Geomorphology:
  - Trenches and troughs
  - Abyssal basins
  - Topographic highs (seamounts, ridges, plateaus, islands)
  - Slopes
  - Shelves

- Chemosynthetic ecosystems:
  - Vents
  - Seeps
  - Whale falls

Focus on cores of provinces because boundaries were likely to be poorly known and controversial
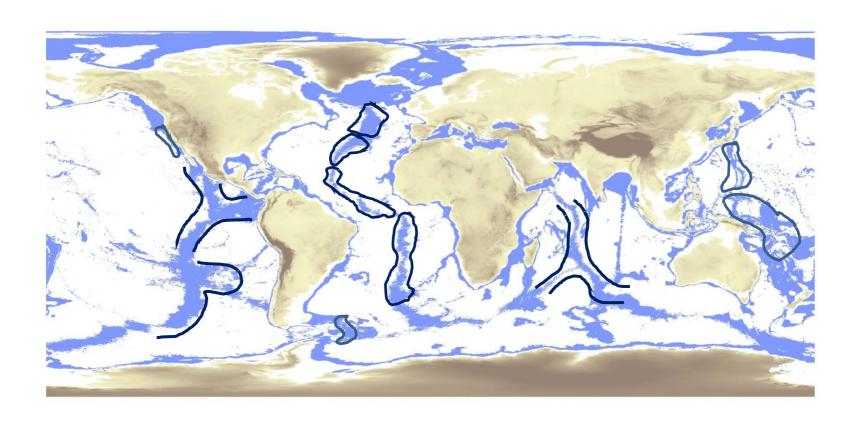
- Abyssal basins
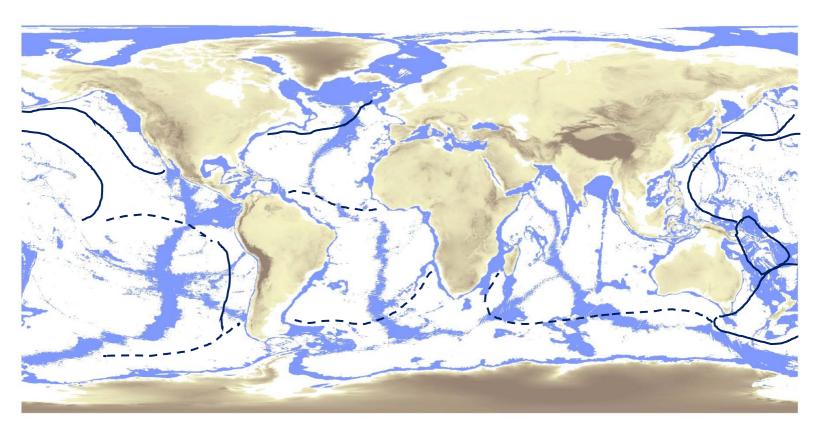
- Hydrothermal vents

- Topographic highs

Bathymetric map of the ocean, contoured to illustrate major geomorphological features. Contour intervals, from light to dark, are 1 500, 3 500, 4 000, 5 000, and 6 500 m.
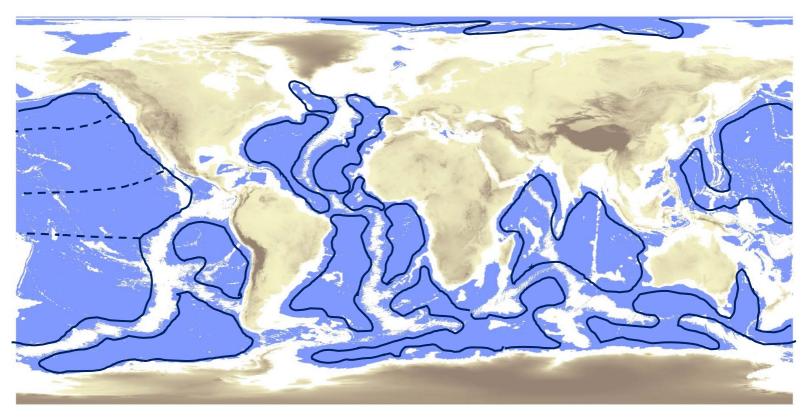
Map prepared by K. Scanlon.

Known hydrothermal vent provinces (information from C.L. Van Dover)
Base map with showing only 800-3 500 m bathymetry
Map prepared by L Watling and K. Scanlon.

Bathyal provinces based on information from Zezina (1997), M. Clark, and L. Watling. Only 800 – 3 500 m bathymetry is plotted. Dashed lines indicate significant uncertainty and lack of data for this layer.
Map prepared by L. Watling and K. Scanlon.

Abyssal Province centers (approx. 3 000 – 6 000 m) based on information from Vinogradova (1997) and Smith (unpublished). Base map showing 3 500- 6 500 m bathymetry (blue). Areas in the Pacific delimited by dashed lines indicate likely province changes due to changes in surface primary production.
Map prepared by L. Watling and K. Scanlon.

Hadal provinces of the world based on information from Vinogradova (1997), using base map showing only depths > 6 500 m.

Map prepared by L. Watling and K. Scanlon.

Next Steps

- Biogeographic classification is an important tool for management

- Findings based on biogeographic classification, combined with other relevant information, such as ecological criteria, can provide important information for policy-making as well

- The Group will continue its work towards the production of maps and articles

Upcoming meetings

- ✓ FAO Committee on Fisheries, Rome, March 2007
- ○ CBD Experts Workshop on Criteria and Biogeographic Classification Systems, 2 - 4 October 2007 S. Miguel Island, Azores, Portugal
- ○ CBD Subsidiary Body on Scientific, Technical and Technological Advice 18 - 22 February 2008 FAO, Rome, Italy
- ○ UN Informal Working Group on Biodiversity in Areas beyond national jurisdiction, New York, early 2008
- ○ CBD 9th Conference of the Parties, Germany, 19-30 May 2008

Thank you.