Ecologically and biologically sensitive areas in the high seas North Pacific

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**Motivation:** Convention on Biological Diversity (CBD)
FAO Code of Conduct for Resp. Fishery Practices
Canada’s Oceans Act (1996)

- **EBSMAs.** Protect sensitive regions beyond national jurisdictions
- **VMEs.** Protect important areas from bottom fishing
- **EBSAs.** Guide selection of areas for enhanced protection

*Can existing marine classifications inform the delineation of such regions?*
High-seas classifications

• Physical
  – Interpreted; clustering (bottom or surface)

• Zoological
  – Focal species; habitat envelopes

• Synthetic
  – Biomes, provinces, and similar
Historic high-seas classifications

Dodimead 1963

Favorite 1976

Longhurst 1998

Sherman 1986
Clustering - surface

Devred, Sathyendranath, & Platt 2007

Gregr & Bodtker 2007
Clustering - Benthic

- Depth
- Slope
- Primary production
- Sediment thickness
- Temperature
- DO
- Geomorphology and sediment type

= 11 ‘seascapes’
Zoogeographical approaches

Species richness
115 cetacean and pinniped species

Optimization
35 pelagic species, plus static and dynamic features
Classification assessment

- 18 classifications
- 7 criteria

- Feasible with existing data
- Appropriate resolution
- Dynamic seasonality considered
- Reproducible
- Ecological physics & biology
- Parsimonious
- Applicable across realms
18 classifications considered

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<th>Analysis</th>
<th>Extents</th>
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<td>Major currents</td>
<td>Quantitative</td>
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UK Seamp program

- Piloted in 2002; UK SeaMap 2006; UK SeaMap 2010
- Labour intensive

**Benthic classification**
- Depth; bottom type; light attenuation; wave base; tidal current; temperature

**Pelagic classification**
- Salinity; temperature difference; frontal probability

*Validated* with 32,000 benthic samples and 6 plankton taxa

*Can they be EBSAs?*

| Rarity | Aggregation | Fitness |
EBSAs - a zoological approach

132 species or groups assessed

How to integrate?

Clarke and Jamieson 2006a
Canadian west coast EBSAs

- Concentration features
- Bottlenecks
- Sponge reefs

Clarke and Jamieson 2006b
<table>
<thead>
<tr>
<th>Rarity</th>
<th>estuaries; reefs; bottom types; canyons; seamounts; vents</th>
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<tr>
<td>Aggregation</td>
<td>bottlenecks; tidal rips; sills; ridges; meso-scale eddies; upwelling zones; shelf edge concentration areas; major convergence and divergence zones</td>
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<td>Fitness</td>
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<td>consequences</td>
<td>reefs; bottom types; canyons; migration routes; breeding grounds</td>
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EBSA guidelines

• Start with rare (static) physical features
• Add dynamic pelagic areas
• Identify representative taxa
• Assess contribution of defined physical features to taxa of interest
• Expand EBSAs to include ‘sufficient’ critical habitat as necessary
Advantages

- Fast
- Transparent
- Clarifies role of various disciplines
- Focuses on thresholds and adequacy
- Lends itself to adaptive management
Key challenge

Relating biology to physics
• Assign multiple biological attributes to EBSAs
  – Who?
  – Where?
  – When? (2 dim)
  – Why?
What about biodiversity?

• A multi-scale concept
• Difficult to reduce to a single index
• Treat as an attribute of defined EBSA system

• Support prioritisation for protection (along with naturalness and representativity)
Thank you!

Glen Jamieson, Cathryn Clarke-Murray, and the DFO working groups for doing the hard work.

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Questions, comments? ed@scitechconsulting.com