A framework for assessing the state of ecosystems based on some principles from IPCC

Per Arneberg
Institute of Marine Research, Norway

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Background

Develop a framework for assessing state of ecosystems in Norway

Shall reflect structure and function of ecosystems and take into account natural dynamics
State assessed for 7 ecosystem properties

1. Primary productivity
2. Distribution of biomass among trophic levels
3. Diversity of functional groups
4. Abundance of functionally important species
5. Landscape patterns (size of habitats etc)
6. Species and genetic diversity
7. Abiotic factors

Assessed against a background of minimal human impact

A set of indicators developed for each property
The way not to go

- Estimate reference values for each indicator
- Estimate threshold values for poor ecological state for each indicator

Toresen, R. & Østvedt, O.J. 2000. Variation in abundance of Norwegian spring-spawning herring (Clupea harengus, Clupeidae) throughout the 20th century and the influence of climatic fluctuations. Fish and Fisheries 1(3): 231-256
A way to go

• Describe how we expect each indicator to change under influence of important drivers in the system
• We term such a description a *phenomenon*
• An example: Increase in total primary production in the northern part of the Barents Sea
• The phenomena should be justified based in scientific literature.
• Then assess how confident we are in each phenomenon
• Through statistical analyses of indicator time series, assess for each phenomenon whether it has occurred, and if so to which extent.
Assessment of phenomena (expected changes)

<table>
<thead>
<tr>
<th>Evidence of occurrence of expected change</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment of confidence in expectation</td>
<td>Good</td>
<td>Medium</td>
<td>Limited</td>
<td></td>
</tr>
</tbody>
</table>
Overall assessment of state for each ecosystem property

- No deviations from good ecological state
- Limited deviations from good ecological state
- Considerable deviations from good ecological state
- Criteria + ecological intelligence

Legend:
- None
- Low
- Medium
- High

Degree of evidence that expected change has occurred

Degree of confidence in expectation
- Limited
- Medium
- High
Example for “abiotic factors”
Arctic part of the Barents Sea

<table>
<thead>
<tr>
<th>Degree of evidence that expected change has occurred</th>
<th>No</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp</td>
<td></td>
<td></td>
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<tr>
<td>Salinity</td>
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<tr>
<td>Ice</td>
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<td></td>
</tr>
</tbody>
</table>

Degree of confidence in expectation

- Limited
- Medium
- High
All ecosystem properties, Arctic part of the Barents Sea
Based on the assessment of the entire ecosystem, it is concluded that the state of the ecosystem in the Arctic part of the Barents Sea is not good. The most important change is that the climate, which is a part of the ecosystem, has warmed substantially, and that this is at least partly a result of greenhouse gas emissions greenhouse and other anthropogenic impact on the climate. The rest of the ecosystem exhibit changes that can be related to the climate warming, especially for the ecosystem properties with good indicator coverage.