

# indiSeas – a Working Group and a website to help assess the exploitation status of the world’s marine ecosystems

## Background

In recent years there has been a strong global move towards expanding the management of fisheries, from its historical focus on the species targeted by a given fishery, to taking into account the whole ecosystem supporting target species. This approach has been labelled the Ecosystem Approach to Fisheries (EAF). To make progress towards implementing the EAF, carefully selected and appropriate indicators are required to describe the state, and the impact, of fishing on marine ecosystems. Indicators are then used to translate knowledge into management and policy measures that can be assessed for their effectiveness and to facilitate effective communication to the general public.

Under the auspices of the EUR-OCEANS European NoE (Network of Excellence), a working group was established to look at “EAF Indicators: a comparative approach across ecosystems” (indiSeas). A suite of ecosystem indicators were chosen and assembled for 20 exploited ecosystems (Figure 1), representing tropical, temperate, high latitude and upwelling systems. The results of the comparative statistical analyses were synthesized into a web-based indicators panel to inform the public and fisheries managers of the relative state and recent trends in the world’s exploited marine ecosystems.

## Assessing the exploitation status of world’s marine ecosystems

The goals of indiSeas were to gather and share expertise across marine ecosystems and EUR-OCEANS member institutions in order to (i) develop a set of synthetic ecological indicators of fishing effects, (ii) build a generic indicators-based panel using a common set of interpretation and visualisation methods, (iii) evaluate the exploitation status of marine ecosystems in a comparative framework.



Figure 1. The first 20 ecosystems considered in the indiSeas comparative approach.

Eight indicators\* were selected after careful consideration of several criteria, such as whether they encapsulated ecological processes adequately, the availability and/or cost of generating the data required, their sensitivity to fishing pressure and their ability to be understood and adequately interpreted by stakeholders and the general public. These were proposed as a minimum set of indicators for diagnosing the status of an ecosystem and measuring trends over time.

A prototype indiSeas website has been developed as a platform to disseminate the results of this analysis to stakeholders, scientists and the public (Figure 2). In its first inception, the website consists of a choice between (a) indicator analysis for a specific ecosystem and (b) a comparison of indicators across ecosystems (Figures 3 and 4). Under the option for a specific ecosystem the website provides a detailed description of the ecosystem; a list and description of target species, habitat-linked species, “charismatic” species, vulnerable species, top predators and “forage” (species that play a fundamental role in feeding other components of the ecosystem); results of the state and trend indicators; and a set of figures which show both short (1996-2005) and long-term trends over the whole time series. When comparing indicators across ecosystems the website provides similar information across user-selected ecosystems. Further information on the website will include diagnoses of the state of a given ecosystem and various expert reports.



Figure 2. Front page of indiSeas website ([www.indiseas.org](http://www.indiseas.org)), accessible to the public in January 2009.



## Why take a comparative approach?

- Comparisons of similar ecosystems can serve as replicates, mimicking an experimental set-up where common, unique and fundamental features, as well as important responses to fishing, can be explored.
- Given the difficulty in establishing baseline levels and reference points for most ecosystem indicators, the comparative approach across ecosystems will provide a range of reference values (min, max) against which each ecosystem can be assessed.
- Comparative analyses allow the opportunity for taking a broader ecosystem perspective, to avoid repeating the same fisheries management mistakes as may have been the case in some ecosystems in the set considered (i.e. provide early warning signals), and permit the ability to draw generalizations important to the successful implementation of EAF.
- The comparative approach between ecosystems and the communication of results to the public is also intended to encourage politicians to consider management options that take account of the ecological quality of marine ecosystems worldwide.

## Future research

A suite of papers is being prepared for "ICES Journal of Marine Science" which includes interpretations of combined sets of indicators representing ecosystem states, interpreting the trends in indicators, and transforming quantitative information into semi-quantitative and qualitative information for comparative and managerial purposes. Capturing signals from environmental variability and how they combine with fishing effects is also being addressed through empirical and modelling approaches.

## Action points

1. Expand the analysis to additional marine ecosystems.
2. Explore additional ecological indicators to add to the existing suite.
3. Expand the work to identify and consider conservation/biodiversity-focused indicators, as well as social, economic and environmental indicators.
4. Undertake performance testing to assess whether an indicator and accompanying decision rule actually guides decision-makers to make the "right" decision.
5. Explore whether limits and reference points for each indicator can be identified, and whether they can be implemented in management.
6. Undertake studies of the joint effects of climate and fishing changes on the selected indicators.

\* For the full table of indicators see Fact Sheet pages at [www.eur-oceans.org/KTU](http://www.eur-oceans.org/KTU)



Figure 3. Example of kite diagrams comparing the current state of four of the 20 ecosystems represented in the IndiSeas project. Each arm of the kite represents one indicator; minimum and maximum values are the same for all figures.

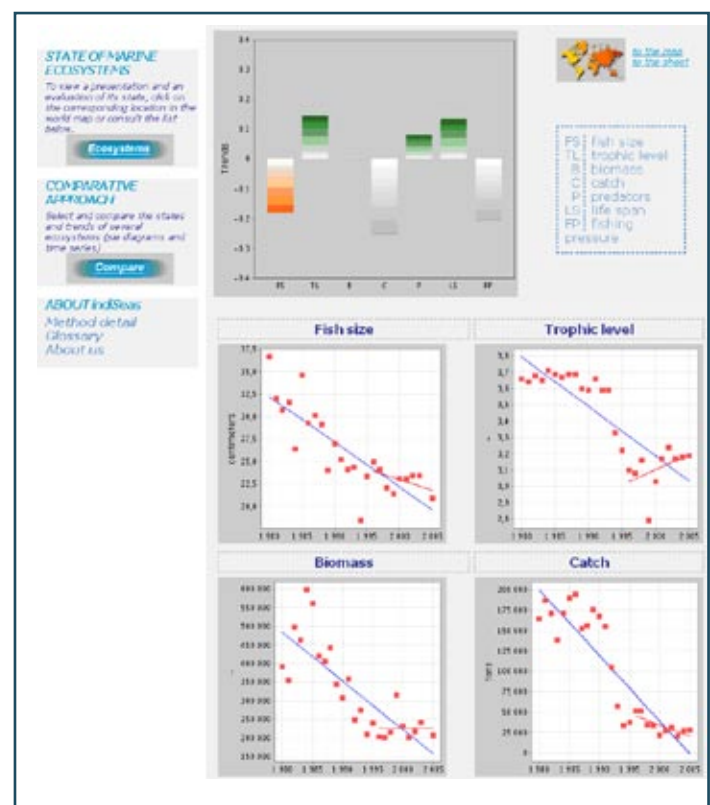


Figure 4. Results for the eastern Scotian Shelf, Canada. The significant short to medium term trends (1996-2005) are given in the bar plot at the top. The lower four plots show the original data, with two regression lines: blue for the whole time series and red for the period 1996-2005. Note that the negative gradient of the blue regression line is much steeper than the gradient of the regression line through the recent data. In the case of trophic level, the recent trend indicates that the severe reduction in fishing pressure since the collapse of groundfish in the early 1990s may have improved the ecosystem state.

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