Seventh Framework Programme Theme 6 Environment

Collaborative Project (Large-scale Integrating Project)

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Project title: **Marine Ecosystem Evolution in a Changing Environment**

D6.3 Ecosystem status website

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Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including the Commission)	
RE	Restricted to a group specified by the consortium (including the Commission)	
CO	Confidential, only for members of the consortium (including the Commission)	

D6.3 Ecosystem status website

Lead investigator: Yunne-Jay shin

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Summary

An Ecosystem Approach to Fisheries (EAF) has been adopted globally. To make progress towards implementing the EAF, the scientific community is challenged to provide a generic set of integrated indicators to accurately reflect the effects of fisheries on marine ecosystems, to discriminate these effects from other ecosystem drivers and to facilitate effective communication of these effects to managers, policymakers and the public. In conjunction with WP5 of MEECE project, the IndiSeas WG aims at "Evaluating the status of marine ecosystems in a changing world", using a set of different types of indicators to reflect the effects of multiple drivers on the states and trends of marine exploited ecosystems. The first phase of the WG has been finalized in 2010 with the publication of a suite of papers in ICES Journal of Marine Science (volume 67). It focused on the effects of fishing of the health of world's marine ecosystems and made use of ecological and biodiversity indicators. The second phase starts this year with inclusion of climate and socio-economic indicators. In addition, the selection of indicators will be reviewed and potentially revised in the light of the European Marine Strategy Framework Directive (WP5).

IndiSeas Website

The website www.indiseas.org is a result of the first phase of IndiSeas and has been developed as a platform to disseminate the results of the analyses beyond the scientific audience. The aim of the IndiSeas website is to inform fisheries scientists, managers, policy makers and the public at large of the state of the world's marine ecosystems as a result of fishing. A common protocol for representing and communicating a carefully selected suite of indicators needed to be established for a wide range of ecosystems. Information is provided at increasing levels of detail, starting with an overview of each ecosystem in a synthetic and digestible form, and progressively providing more detailed and technical information.

The front page of IndiSeas website gives access to a world map. Then, two options of navigation are provided: (a) accessing directly the results for a specific ecosystem or (b) choosing to compare ecosystem indicators (states and trends) across ecosystems (Figure 1).
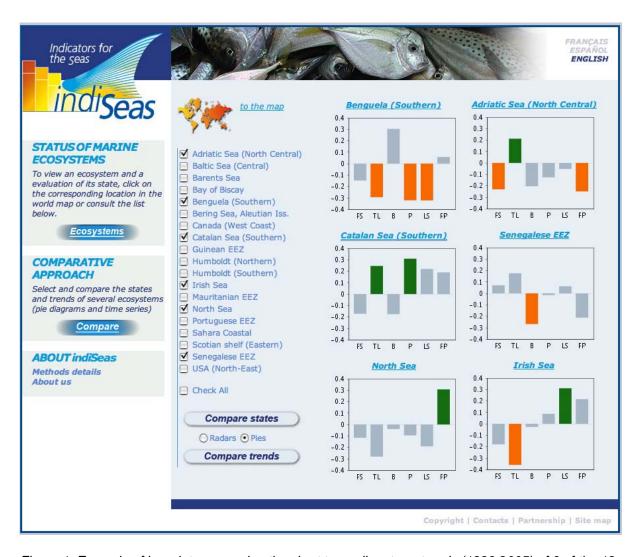

Figure 1. Example of bar plots comparing the short to medium term trends (1996-2005) of 6 of the 19 ecosystems of the IndiSeas project. Bars represent the slopes of the fitted linear trends. Green indicates a significant increase; red indicates a significant decrease. Grey bars indicate non-significant trends. FS=fish size, TL=trophic level, B=biomass, C=catch, P=% predators, LS=lifespan, FP=inverse fishing pressure.

For each ecosystem (option a), a synthetic overview is displayed (Figure 2) using the same template for all ecosystems.
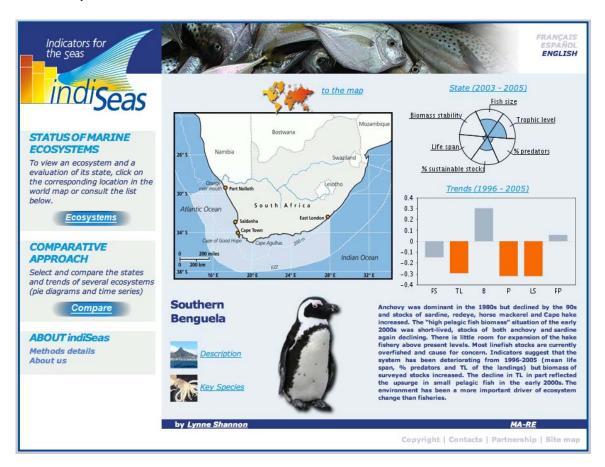

Figure 2: For each ecosystem (here the southern Benguela ecosystem), a synthetic overview is displayed: state indicators are summarized in the form of a pie diagram and short-term trends in indicators are depicted by means of bar graphs. All indicators are represented so that larger values or an increase signals a better (less degraded) ecosystem. A complementary summary diagnosis of the ecosystem status is provided by each ecosystem expert. Viewing options provide supplementary information, including: plots of time series (1980-2000) for each indicator, a detailed description of the ecosystem, and short descriptions of the key species.

The results of the state indicators averaged over the most recent period (2003-2005) are summarized in the form of a pie diagram, representing state indicators as a fraction of the maximum value observed across the 19 ecosystems for the same period. All indicators are represented so that larger values or an increase signals a less degraded or improving ecosystem, respectively. Trends in indicators are depicted by means of bar graphs of the short-term slopes of fitted linear trends (1996-2005), where an increase represents an improvement and vice-versa. Details on the graphical representations, choices of time frames, and standardisation procedures are provided by Shin et al. (2010a,b) and Blanchard et al. (2010). To complement the visual diagnosis suggested by pie and trends graphs, a summary text diagnosis of the ecosystem status is also provided by each ecosystem expert. This short text is crucial to reinforce the graphics' information, to report potential limits of the comparative approach for some specific ecosystems or potential biases in the calculation of some indicators, or to provide information on other drivers that could interact with fishing. Then, to access supplementary information on each ecosystem, viewing options include: plots of time series (1980-2000) for each indicator, a detailed description of the ecosystem and short descriptions of the key species, such as target species, habitat-linked species, charismatic species, vulnerable species, top predator species and forage species. In the framework of the comparative approach, the criteria used to select the key species/functional groups to be documented in the website must be generic enough to be applied in every ecosystem. The set of species to be monitored must significantly contribute to the trophic fluxes, and must help track the direct and indirect effects of fishing (Table 1).

Key species categories

Table 1: Key species categories selected in each ecosystem for documenting the IndiSeas website

Target species
Target species are those fished for commercial gain or subsistence (food). Fishers, managers and consumers are directly concerned by the state and the dynamics of these species. These species are those which may reflect direct effects of fishing, and those which are generally most heavily impacted in the foodweb.
Habitat-linked species
Species restricted to certain habitat types and therefore which are indicators of habitat quality, are categorized as habitat-linked species. These species participate to the functioning of identified subparts of the ecosystem (e.g. mangroves, rocky areas, pelagic water layer, etc.) that can usually be located spatially.
Charismatic species
Charismatic species evoke public emotion, are used to communicate to the public about the severity of the state of an ecosystem or environmental impacts, and are those species for which it is easier to obtain funding for conservation purposes. Marine examples often include turtles, whales and dolphins and certain species of seabirds. These species have been colloquially referred to as "cute and cuddly" species. There is strong pressure from the general public to monitor charismatic species.
Vulnerable species
These are species recognized as vulnerable with respect to their conservation status. They may be formally classified as vulnerable by a conservation body, and would ideally appear on the IUCN red list. Vulnerable species provide early warning signals of perturbations within the ecosystem.
Top predator species
Top predators are species which may have top-down effects on the rest of the trophic pyramid but also have high longevity so that they reflect long-term impacts. For example, in the Benguela ecosystem, birds and seals are top predators, feeding largely on small pelagic fish, and on squid and demersal fish, respectively.
Forage species
Forage species have clear bottom-up effects on predatory fish and top predators, and are usually present at high biomass levels. They have fast turnover rates and as a result, their dynamics may be closely linked to environmental variability. In addition, they may be highly responsive to changes in fishing mortality.

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