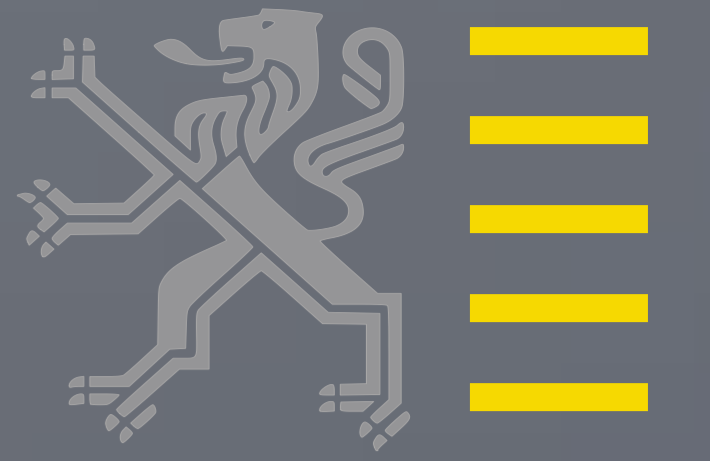


The use of benthic indicators for environmental state assessments



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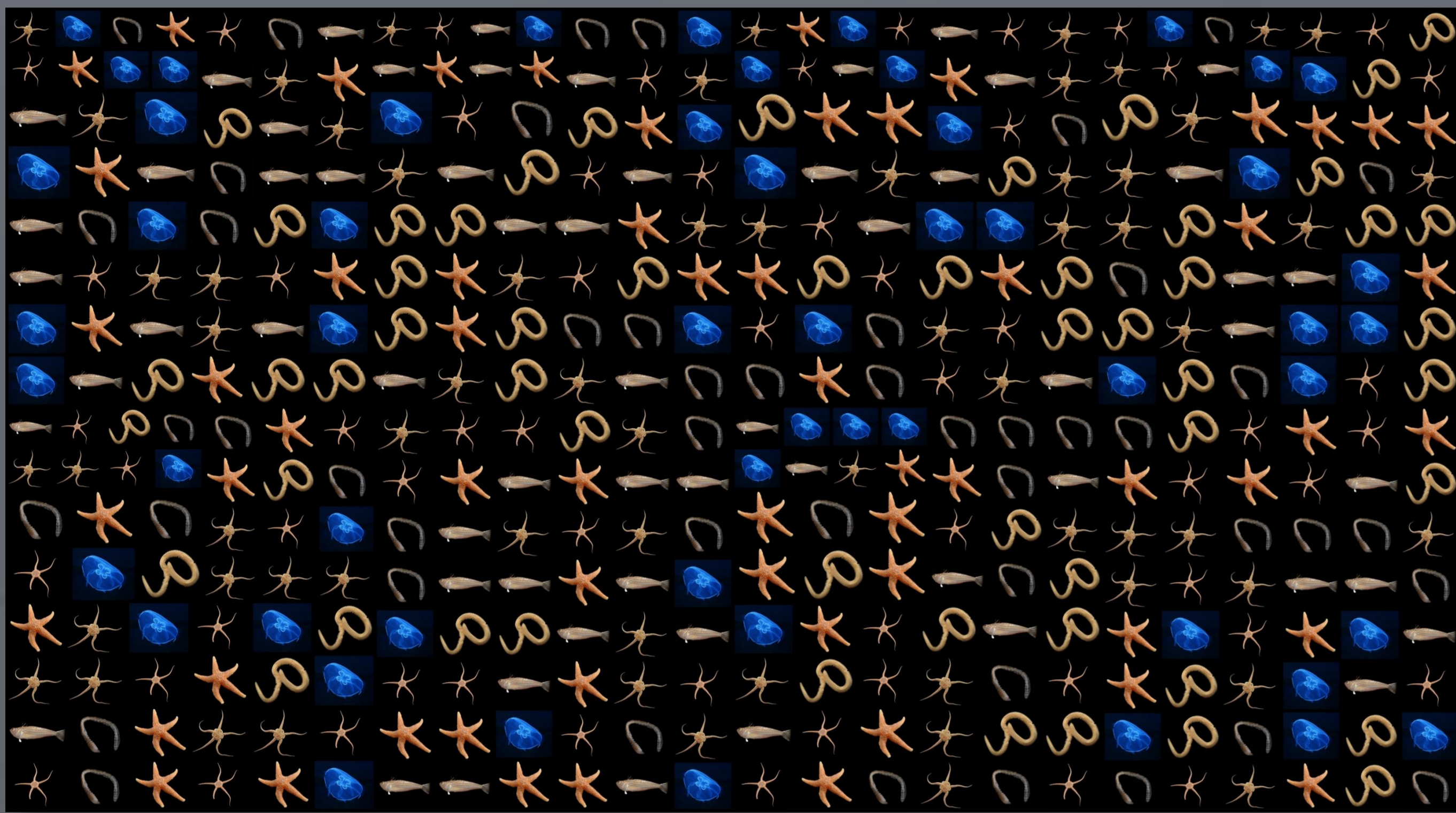


Is the state of the North Sea environment GOOD, following your best professional judgment?

NO

Please stick a post-it with your name to the most appropriate choice

YES



An initial assessment of the North Sea environmental status under the Marine Strategy Framework Directive is expected in 2012. Such an assessment should be based on objective approaches. How can your best professional judgment be fitted in this process?

- **DRIVER:** Many European environmental Directives are to be implemented (Marine Strategy Framework Directive, Habitat- and Bird Directive, Water Framework Directive, ...).
- **CONCEPT:** Comparing the current state of an area with the state that is expected under minimal or sustainable human pressures, and—in case of degradation—intervening to bring it back to the desired good status.
- **PRINCIPLES:**
 - Filling-in the ecosystem approach: selection of elements and indicators
 - Need for indicators: objective scoring tools for evaluating the state of the ecosystem
 - Definition of reference conditions: 'pristine' or 'sustainable'
 - Detection and quantification of pressures
 - Development of integrated monitoring programs.
- **WAY FORWARD** from a benthic ecosystem perspective (Van Hoey *et al.*, 2010):

Ecosystem approach	Benthic indicators	Reference conditions	Pressures	Monitoring programs
Scientific selection of elements/indicators in relation to their sensitivity, robustness and confidence	Selection of appropriate indicators, with complementary properties, related to the Directive objectives	Use of clear stressor-response data to indicate the turning point of degradation	Accurate and detailed quantification of the pressure types in the marine systems	Adaptation of national monitoring programs towards cost-effective, integrative strategies
Integration of indicators based on a decision tree process, with a clear transparency of the integration at indicator and descriptor level	Integration of single univariate indicators required to detect the complex response of the benthos	Defining the 'naturalness' of the system	Marine Protected Areas (MPA's)	Switch from 'station oriented monitoring' towards 'basin or system oriented monitoring'
			Precautionary principle	Use of standard quality assurance guidelines

- **CONCLUSION:**
 - Due to the spatial extent of European marine areas and ecosystem complexity, the scope for identifying universal indicators is limited.
 - Indicators deliver evidence-based information for status evaluation, but the ideal approach does not exist.
 - The implementation of integrated sampling strategies and spatially defined pressure gradients are indispensable prerequisites for a reliable state assessment.
 - Despite the existence of objective approaches, *your* best professional judgment is still of vital importance, since many steps rely on scientific expertise (e.g. decision making processes, knowledge gaps).

Van Hoey, G., Borja, A., Birchenough, S., Buhl-Mortensen, L., Degraer, S., Fleisher, D., Kerckhof, F., Magni, P., Muxika, I., Reiss, H., Schröder, A., Zettler, M.L., 2010. The use of benthic indicators in Europe: From the Water Framework Directive to the Marine Strategy Framework Directive. *Marine Pollution Bulletin* 60(12):2187-96

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