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Benthos habitat quality assessment for the North Sea: joint GES assessment require a coordinated monitoring

Van Hoey Gert (1), Marco Francisco (2), Julia Wischnewski (2), Steven Degraer (3), Kris Hostens (1)

(1) Institute for Agricultural and Fisheries Research, Aquatic Environment and Quality, Ankerstraat 1, 8400 Oostende, Belgium; (2) Thünen Institute of Sea Fishery, Hamburg, Germany ; (3) Royal Belgian Institute of Natural Science – OD Nature, Vautierstraat 29, 1000 Brussel; Presenter contact details, gert.vanhoey@ilvo.vlaanderen.be; Tel. ++32 (0) 59 56 98 47

Summary

The Marine Strategy Framework Directive aims at joint assessments of the good environmental status (GES) of our seas. Since monitoring programs and indicators are performed and developed on a national scale, it is a key challenge to maximize the compatibility between the separate national MSFD assessments, requiring harmonization and inter-calibration. The existence of a wide variety of benthic indicators, should not hamper the harmonization of the monitoring. Analysis of a compiled North Sea benthos dataset showed that the highest confidence, i.e. the ability to detect changes, can be reached when collecting habitat stratified species-abundance data by means of harmonized protocols, with the effort per stratum related to the size of the stratum and the variance in benthic characteristics per stratum. Such a data collection design can be cost-effectively implemented when ongoing monitoring at the national scale becomes incorporated into joint/coordinated monitoring at EU level. However, ongoing monitoring often has a long tradition, which may lead to institutional and/or country specific reluctance (skills, expertise, technology) to deviate from business as usual. Nevertheless, the implementation of a North Sea wide minimum' benthic sampling design, which complement the national driven monitoring schemes, will inevitably lead to better integrated monitoring and allow for a thorough joint GES assessment.

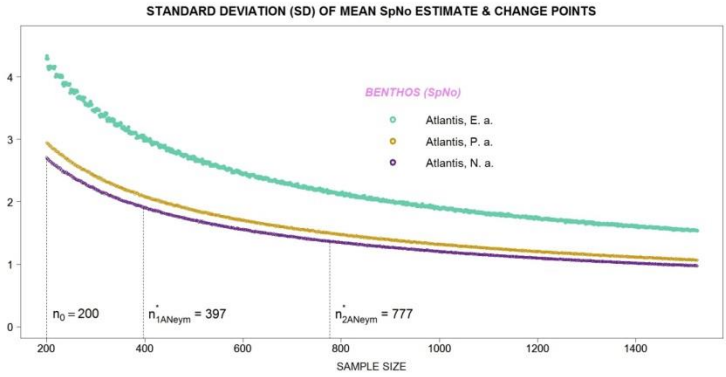
Introduction

An efficient monitoring program for benthic habitat condition on large scale has to be looked for to fulfill the MSFD requirements. This requires a policy that going beyond member states territorial borders. That such attempt can be successful is proved by the North Sea Benthos project actions of the ICES Benthos ecology working group of 1986 and 2000 (Heip *et al*., 1992; Künitzer *et al*., 1992; Rees et al., 2007) and can be in a modified way serve as an example of coordinated monitoring in function of the assessment of the benthic ecosystem on a large scale. This aspect is worked out within the project 'Towards a Joint Monitoring Program for the North Sea and Celtic Sea' and results were outlined in this contribution.

Material and Method

An appropriate collection of benthic species-abundance data is needed for a confident assessment of benthic habitat condition by any type of benthic indicator. Those indicators are

containing following type of parameters: an abundance related, a diversity measure (e.g. species richness, Shannon diversity, …) and a species sensitive/tolerance parameter (e.g. AMBI, Borja et al., 2000). All parameters can be calculated bases on a species-abundance dataset. Therefore, there is focused in this study on the underlying parameters of the benthic indicators (species richness, abundance and AMBI) for determining the monitoring needs. The analyses were executed on the data of the North Sea Benthos Survey of 1986 (NSBS 1986) (Heip *et al*., 1992; Künitzer *et al*., 1992) and the North Sea Benthos Project of 2000 (NSBP 2000) (Rees et al., 2007).
A proper determination of the strata is necessary. In this study, an ecosystem stratification is used, because it allow an application to various ecosystem components and standardize the sampling across the ecosystem. An appropriate allocation of the samples to these strata is necessary and three principals were tested (equal, proportional and Neyman allocation). To give guidance on the total sample effort needed, a change point analysis is applied to compartmentalize the variance-sample effort curve in parts that share "similar" quantity of variability.



Results and Discussion

The most optimal allocation is achieved when the samples were allocated regarding the Neyman allocation principle to the 'Atlantis' strata of the North Sea for species richness (see Figure). An equal allocation of your samples lead to a strong increase of the variance with the same sample effort, compared to proportional and Neyman allocation. The change point analysis revealed three different parts in the curve: 200 to 398, between 397 and 783, and after 783. The number of change points in the curve are calculated statistically by using the BIC. With this, we can conclude that there is not much difference doing 1525 stations (as in the 86 + 00 dataset) and doing 777 (lower part of the change point). The minimal effort needed seems to be 398. Collecting a set of 777 samples, optimal distributed over the strata in the North Sea, gives the necessary information to do a GES assessment of benthic habitat condition on large scale. Such a data collection design can be cost-effectively implemented when ongoing monitoring at the national scale becomes incorporated into joint/coordinated monitoring at EU level

References

Heip, C., Basford, D., Craeymeersch, J. A., Dewarumez, J. M., Dörjes, J., de Wilde, P., Duineveld, G., Eleftheriou, A., Herman, P. M. J., Niermann, U., Kingston, P., Künitzer, A., Rachor, E., Rumohr, H., Soetaert, K., and Soltwedel, T. 1992. Trends in biomass, density and diversity of North Sea macrofauna. ICES Journal of Marine Science, 49(1): 13–22.

Künitzer, A., Basford, D., Craeymeersch, J. A., Dewarumez, J. M., Dörjes, J., Duineveld, G. C. A., Eleftheriou, A., Heip, C., Herman, P., Kingston, P., Niermann, U., Rachor, E., Rumohr, H., and de Wilde, P. A. J. 1992. The benthic infauna of the North Sea: species distribution and assemblages. ICES Journal of Marine Science, 49(2): 127–143.

Rees, H. L., Eggleton, J. D., Rachor, E., and Vanden Berghe, E. (Eds). 2007. Structure and dynamics of the North Sea benthos. ICES Cooperative Research Report No. 288. 258 pp.