Common Intercalibration Metrics

FACT SHEET

RESPONSE OF SINGLE METRICS

Introduction

An important aim of the WISER project is to support the intercalibration process. One of the first steps required by the intercalibration guidance[1] is to derive "common metrics", i.e. biological measures created for benchmarking[2] and comparison of national assessment systems. The WISER workpackages 3.1 to 4.4 have supported the development of common metrics according to the "Guidelines for indicator development"[3].

About common metrics

Common metrics are a common yardstick for comparing national assessment systems and their classification of ecological status. They quantify the structural or functional attributes of biological communities, allowing for an assessment of ecological quality.

Common metrics relate to the results of the national assessment methods used in the particular intercalibration exercise and respond to the stressor (or combination of stressors) addressed.

Common metrics are not meant as pan-European assessment systems replacing national methods, which are usually much better adapted to the regional situation.

[1] Schmedtje, U., Birk, S., Poikane, S., van De Bund, W., & Bonne, W. (2010). Guidance document on the intercalibration process 2008-2011. Guidance Document No. 14. Implementation Strategy for the Water Framework Directive (2000/60/EC).

[2] Definition of trans-national (absolute) reference points in intercalibration based on data from near-natural reference sites or sites impacted by similar levels of impairment.

[3] Hering, D., Birk, S., Lyche Solheim, A., Carvalho, L., Borja, A., Hendriksen, P., et al. (2010). Guidelines for indicator development. WISER Deliverable 2.2-2.

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GENERAL INFORMATION

BIOLOGICAL QUALITY ELEMENT

Macroinvertebrates

WATER CATEGORY

Coastal and transitional

MAIN STRESSOR

Urban and industrial pollution, dredging, mixed pressures

GEOGRAPHICAL INTERCALIBRATION GROUP

NEA, Mediterranean, Black Sea

COMMON INTERCALIBRATION TYPES

Coastal, estuary, lagoon, fjord

COUNTRIES PARTICIPATING IN INTERCALIBRATION EXERCISE

Norway, Spain, Portugal, Italy, Bulgaria

RESPONSE OF SINGLE METRICS

SPECIFICATION

COMMON METRIC DESCRIPTION (INCL. WFD'S INDICATIVE PARAMETERS)

Single metrics and multimetric methods to assess coastal and transitional benthic status along human pressure gradients have been compared in five distinct environments across Europe: Varna Bay (Bulgaria), Lesina lagoon (Italy), Mondego estuary (Portugal), Basque coast (Spain) and Oslofjord (Norway). Eight single metrics and eight of the most common indices used within the WFD for benthic assessment were selected. As single metrics, abundance, species richness (as number of taxa), Shannon's diversity, AMBI (AZTI's Marine Biotic Index), Margalef index, SN, ES100, and ES50, were calculated. As multimetric or multivariate methods ISS (Index of Size Spectra), BAT (Benthic Assessment Tool), NQI (Norwegian Quality Index), M-AMBI (multivariate AMBI), BQI (Biological Quality Index), BEQI (Benthic Ecosystem Quality Index), BITS (Benthic Index based on Taxonomic Sufficiency), and IQI (Infaunal Quality Index) were calculated. Within each system, sampling sites were ordered in an increasing pressure gradient according to a preliminary classification based on professional judgement, and the response of single metrics and assessment methods to different human pressure levels was evaluated.

COMBINATION RULE FOR MULTI-METRICS

Not applicable

SOFTWARE / (EXCEL) SPREADSHEET AVAILABLE FOR CALCULATING THE (INDIVIDUAL) COMMON METRIC(S)

Not available

AVAILABLE DOCUMENTS / ONLINE SOURCES REPORTING ON THE DEVELOPMENT OF COMMON METRIC(S)

Angel Borja, Brage Rygg, Enrico Barbone, Alberto Basset, Gunhild Borgersen, Marijana Brkljacic, Joxe Mikel Garmendia, João Carlos Marques, Krysia Mazik, Iñigo Muxika, João Magalhães Neto, Karl Norling, J. German Rodríguez, Ilaria Rosati, Heliana Teixeira, Antoaneta Trayanova (in preparation) Response of single benthic metrics and multimetric methods to anthropogenic pressure gradients, in five distinct European coastal and transitional ecosystems. To be submitted to Ecological Indicators.

RESPONSE OF SINGLE METRICS

DESCRIPTION OF DATA SET TO ESTABLISH RELATIONSHIP TO PRESSURE / NATIONAL ASSESSMENT SYSTEMS[1]

Pressures were evaluated using two approaches: quantitatively (by means of hydrodynamic models) and qualitatively (following the approach of Aubry, A., M. Elliott, 2006. The use of environmental integrative indicators to assess seabed disturbance in estuaries and coasts: Application to the Humber Estuary, UK. Marine Pollution Bulletin, 53: 175-185.

TYPE OF DOSE-RESPONSE-RELATIONSHIP[2]

Rank correlation

NATIONAL ASSESSMENT METHODS (OR PARTS THEREOF) RELATED TO THE COMMON METRIC(S)[3]

ISS (Index of Size Spectra): IT; BAT (Benthic Assessment Tool): PT; NQI (Norwegian Quality Index): NO; M-AMBI (multivariate AMBI): SP, FR, GER, BG, RO, SLO, IT; BQI (Biological Quality Index): SE, FI; BEQI (Benthic Ecosystem Quality Index): BE, NL
BITS (Benthic Index based on Taxonomic Sufficiency): IT; IQI (Infaunal Quality Index): UK, RoI

FEATURES OF THE RELATIONSHIP TO NATIONAL ASSESSMENT METHODS (OR PARTS THEREOF)[4]

This study gives the first attempt to show that the different indices are largely consistent in their response to a pressure gradient, except in some particular cases (i.e. BITS, in all cases, or ISS when a low number of individuals is present). Inconsistencies between indicator responses were mostly in TW (i.e. IQI, BEQI), highlighting the difficulties of the generic application of indicators to both TW (estuaries, lagoons) and marine (coasts, fjords) environments. However, some of the single (i.e. ecological groups, diversity, richness, SN) and multimetric methods (i.e. BAT, M-AMBI, NQI, and ISS, the latter accounting for the sample size cited restrictions) were able to detect such gradients both in TW and CW environments. This study highlights the importance of survey design and good reference conditions for some indicators and systems (i.e. estuaries and lagoons). The study indicates the importance of not only deriving generic and site-specific indices but also testing their performance and sensitivity, and the uncertainty in their use; these aspects have repercussions for the use of indices in a regulatory context, especially if (as has happened with other pieces of legislation) there are legal challenges because of the repercussions of quality assessments due to differing pressures in an area. In this context, the correct identification and quantification of pressures acting on a system are crucial to: (i) indices' calibration; and (ii) the establishment of successful monitoring and management actions.

RESPONSE OF SINGLE METRICS

REMARKS

CONCLUDING REMARKS[1]

In general, multimetric indices respond better to the pressure gradient than single metrics. Some multimetric indices (e.g. BEQI) seem to have some problems linked to the complexity of calculation and the need to an important amount of information. In other cases (e.g. IQI) the application to TW has been problematic, due to the absence of accurate reference conditions. Finally, some of them (e.g. ISS, but probably others) need clear guidelines in its application, related to the minimum sample required.