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|---|---|
| **Name** | **AMBI** |
| **DPSIR classe** | Impact |
| **ECASA subgroups** | Benthos |
| **ECASA code** | AMBI |
| **Proposed by participant** | 13 – AZTI, Spain |
| **Definition, computation,** | AMBI = ((0 x %GI) + (1.5 x %GII) + (3 x %GIII) + (4.5 x %GIV) + (6 x %GV))/100<br>The result is a number in a range of 0-6 (7 for azoic sediments) that can be simplified into five classes from undisturbed communities to extremely disturbed communities (*sensu* Grall and Glémarec (1997)), or from High to Bad Status (*sensu* European Water Framework Directive (WFD), in the assessment of the Ecological Status).<br>There is a freeware tool at www.azti.es to calculate the AMBI automatically and visualize graphically the results |
| **Data required** | Input data are densities of macrobenthic species from soft-bottom samples (if possible, per replicate). |
| **Summary, scientific meaning, implementation** | The AMBI, as defined by Borja *et al.* (2000, 2003a), is a biotic index which provides a 'pollution classification' of a particular site, representing the benthic community 'health' (*sensu* Grall and Glémarec, 1997). The AMBI is based upon previous ecological models, such as those of Glémarec and Hily (1981) and Hily (1984). The theoretical basis is that of the ecological adaptative strategies of the *r*, *k* and T (McArthur and Wilson, 1967; Pianka, 1970; and Gray, 1979) and the ecological succession in stressed environments (Bellan, 1967; Pearson and Rosenberg, 1978; and Salen-Picard, 1983).<br>Taking into account the final objective of the proposal, several thresholds in the scale of the AMBI were established; those were based upon the distribution of the abundance of each species, to one of five ecological groups (sensitive to pollution, indifferent, tolerant, and second and first-order opportunistic species) (see Figure 2, in Borja *et al.*, 2000). These thresholds are coincident with the 'benthic community health' proposed by Grall and Glémarec (1997) (see Table 1, in Borja *et al.*, 2000), whose sources can be found in Reish (1959), Bellan (1967) and Pearson and Rosenberg (1976).<br>The thresholds are also closely related with the definitions of the WFD, for detecting disturbed and undisturbed locations (see Borja *et al.* (2003a), Muxika *et al.* (2003), Salas *et al.* (2004), Muxika *et al.* (2005), Muniz *et al.* (in press) for different case-studies; and Borja *et al.* (2003b,c), for equivalences with the WFD). |
| **Range of validity** | |

| AMBI | Disturbance Classification | EcoQ (*sensu* WFD) |
|---|---|---|
| 0.0<AMBI≤1.2 | Undisturbed | High Status |
| 1.2<AMBI≤3.3 | Slightly Disturbed | Good Status |
| 3.3<AMBI≤4.3 | Moderately Disturbed | Moderate Status |
| 4.3<AMBI≤5.0 | | Poor Status |
| 5.0<AMBI≤5.5 | Heavily Disturbed | |
| 5.5<AMBI≤6.0 | | Bad Status |

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| **Species concerned (fishes/molluscs)** | All Species |
| **Related type of aquaculture** | All types |
| **Relevant environments for this indicator** | All types of coastal and estuarine environments, including coastal lagoons. |
| **Geographic scale** | Local to regional |
| **Direct relevance to objectives** | – **A** (The AMBI is being used successfully in EIA, but it has also been proposed as one of the tools for the application of the WFD). |
| **Clarity in design.** | – **A** (There are many references on its use and, recently, we have submitted a guideline to Marine Pollution Bulletin). |
| **Realistic collection or development costs** | – **B** (It is very practical and it is based upon general ecological models, but benthos identification is always expensive in terms of the identification of species needed for the application. However, this is not a problem of the indicator, but a general problem in monitoring studies). |
| **High quality and reliability** | – **A** (We expected good results from aquaculture impact. We have previous information (see Muxika *et al*., 2005) and, taking into account that most of the cage impact comes from organic matter enrichment, we expect a good reliability) |
| **Appropriate spatial and temporal scale** | – **A** (The AMBI shows good reliability with spatial and temporal gradients (Borja *et al.*, 2000, 2003 and Muxika *et al.*, 2003, 2005). On the other hand, when there is not impact, the AMBI remains very stable, although there are strong changes in the population structure and abundance, due to seasonal variability). |
| **Obvious significance** | – **A** (It is very easy to understand by the stakeholders, as the output is a number in a range from 0 to 7 and the gradients can be illustrated in a Surfer type figure with different colours). |
| **advantages disadvantages** | |

**references**


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| **State of validation** | Related to aquaculture, we have checked it only with Greek data (Muxika *et al.*, 2005), but it has been tested under many other different impact sources (see references). |
| **recommendations** | |