



ELSEVIER

Ecological Indicators 5 (2005) 19–31

ECOLOGICAL
INDICATORS

This article is also available online at:
www.elsevier.com/locate/ecolind

The suitability of the marine biotic index (AMBI) to new impact sources along European coasts

I. Muxika^a, Á. Borja^{a,*}, W. Bonne^{a,b}

^aAZTI Foundation, Marine Research Division, Herrera Kaia, Portualdea s/n, 20110 Pasaia, Spain

^bMarine Biology Section, Biology Department, Ghent University, Krijgslaan 281/S8, 9000 Ghent, Belgium

Accepted 19 August 2004

Abstract

In recent years, several benthic biotic indices have been proposed to be used as ecological indicators in estuarine and coastal waters. One such indicator, the AZTI Marine Biotic Index (AMBI), was designed to establish the ecological quality of European coasts. The index examined the response of soft-bottom benthic communities to natural and man-induced disturbances in coastal and estuarine environments. It has been successfully applied to different geographical areas and under different impact sources, with increasing user numbers in European marine waters (Baltic, North Sea, Atlantic and Mediterranean). The AMBI has been used also for the determination of the ecological quality status (EcoQ) within the context of the European *Water Framework Directive* (WFD).

In this contribution, 38 different applications including six new case studies (hypoxia processes, sand extraction, oil platform impacts, engineering works, dredging and fish aquaculture) are presented. The results show the response of the benthic communities to different disturbance sources in a simple way. Those communities act as ecological indicators of the 'health' of the system, indicating clearly the gradient associated with the disturbance.

© 2004 Elsevier Ltd. All rights reserved.

Keywords: AMBI; Biotic indices; Environmental quality assessment; Coastal waters; Estuaries; Macrozoobenthos; Soft-bottom; Anoxia; Sand extraction; Hydrocarbon pollution; Civil works; Aquaculture

1. Introduction

Recently, several benthic biotic indices have been proposed as ecological indicators in estuarine and

coastal waters (Hily, 1984; Washington, 1984; Rygg, 1985; Majeed, 1987; Codling and Ashley, 1992; Dauer, 1993; Engle et al., 1994; Grall and Glémarec, 1997; Weisberg et al., 1997; Roberts et al., 1998; Van dolah et al., 1999; Smith and Rule, 2001; and Eaton, 2001), to determine natural and man-induced impacts. One such indicator, the AZTI Marine Biotic Index (AMBI), which was developed by Borja et al. (2000) has been applied successfully to different geographi-

* Corresponding author. Tel.: +34 943 004800;
fax: +34 943 004801.

E-mail addresses: imuxika@pas.azti.es (I. Muxika),
aborja@pas.azti.es (Á. Borja), wbonne@pas.azti.es (W. Bonne).

cal areas and under different impact sources (Borja et al., 2003a,b, 2004a), with increasing user numbers within Europe (Table 1).

The AMBI was designed primarily to establish the ecological quality of European coastal and estuarine waters by examining the response of soft-bottom benthic communities to natural and man-induced disturbances in the environment. Hence, the AMBI offers a ‘disturbance or pollution classification’ of a

site, representing the benthic community ‘health’ (*sensu* Grall and Glémarec, 1997). Secondly, it has been used for the determination of the ecological quality status (EcoQ) within the context of the European *Water Framework Directive* (WFD) (Borja et al., 2003b, 2004a,b). The ultimate aim of the WFD is to achieve, by 2015, a good EcoQ within all the European waters, by the elimination of priority hazardous substances, and contribute to achieving

Table 1

Different impact sources and geographical areas for which AMBI has been applied, in recent years

Impact sources	Locations (countries)	Seas	Author
Various sources along UK	(United Kingdom)	Atlantic	A. Miles, A. Prior (p.c., 2003)
Outfall and harbour	Brittany (France)	Atlantic	Borja et al. (2003a)
Engineering works (dyke)	Basque Country (Spain)	Atlantic	Borja et al. (2000, 2003a)
Sewerage works	Basque Country (Spain)	Atlantic	Borja et al. (2000, 2003a)
Harbour construction	Basque Country (Spain)	Atlantic	This contribution
Submarine outfall	Basque Country (Spain)	Atlantic	Borja et al. (2000, 2003b)
Harbour and river inputs	Basque Country (Spain)	Atlantic	Muxika et al. (2003)
Various sources	Tejo estuary (Portugal)	Atlantic	M.J. Gaudencio (p.c., 2003)
Eutrophy	Mondego estuary (Portugal)	Atlantic	Salas et al. (2004)
River inputs	Guadalquivir (Spain)	Atlantic	AZTI (unpublished data)
Heavy metals	Huelva (Spain)	Atlantic	Borja et al. (2003a)
Estuarine inputs	Cádiz (Spain)	Atlantic	A. Rodríguez-Martín (p.c., 2003)
Various sources	(Morocco)	Atlantic	H. Bazairi (p.c., 2003)
Various sources	Latvia	Baltic	V. Jermakovs (p.c., 2004)
Anoxia-hypoxia	Sweden	Baltic	This contribution
Dredging mud disposal	Sweden	Baltic	S. Smith (p.c., 2003)
Various sources along Sweden	Sweden	Baltic	M. Blomqvist (p.c., 2003)
Various sources in a lagoon	Smir (Morocco)	Mediterranean	A. Chaouti (p.c., 2003)
Dredging in harbour	Ceuta (Spain)	Mediterranean	This contribution
Diffuse pollution (mines, agriculture, ...)	Almería and Murcia (Spain)	Mediterranean	Borja et al. (2003a)
Aquaculture cages	Murcia, Valencia (Spain)	Mediterranean	AZTI (unpublished data)
Mining debris	Mar Menor (Spain)	Mediterranean	L. Marín (p.c., 2004)
Submarine outfall	Catalonia (Spain)	Mediterranean	M.J. Cardell (p.c., 2003)
Marina	Catalonia (Spain)	Mediterranean	S. Pinedo (p.c., 2003)
Wastewater discharge in a lagoon	(France)	Mediterranean	G. Reimonenq (p.c., 2003)
Inputs to a coastal lagoon	Adriatic Sea (Italy)	Mediterranean	Casselli et al. (2003)
Various sources	Adriatic Sea (Italy)	Mediterranean	Forni and Occhipinti Ambrogi (2003)
Stagnation and industrial and urban pollution	Port of Trieste (Italy)	Mediterranean	Solís-Weiss et al. (2004)
Submarine outfall	Gulf of Trieste (Italy)	Mediterranean	Solís-Weiss (p.c., 2004)
Various sources	Adriatic Sea (Italy)	Mediterranean	R. Simonini (p.c., 2004)
Submarine outfall	Saronikos Gulf (Greece)	Mediterranean	Borja et al. (2003a)
Aquaculture cages	Three locations (Greece)	Mediterranean	This contribution
River inputs	Thames (United Kingdom)	North Sea	M. Davison (p.c., 2002)
Oil-based drilling muds (oil platforms)	Eleven locations (United Kingdom)	North Sea	This contribution
Impacts on sandy shores	(Netherlands)	North Sea	S. Mulder (p.c., 2003)
Ester-based drilling muds (oil platforms)	North Sea (Netherlands)	North Sea	Borja et al. (2003a)
Re-opening of a brackish lake to sea influence	Veerse Meer (Netherlands)	North Sea	V. Escaravage (p.c., 2004)
Sand extraction	Belgium	North Sea	Bonne et al. (2003); this contribution

Key: p.c., personal communication.

Download English Version:

<https://daneshyari.com/en/article/9443241>

Download Persian Version:

<https://daneshyari.com/article/9443241>

[Daneshyari.com](https://daneshyari.com)