

# A baseline study of the soft-bottom macrofauna from the North Adriatic gas field, gas platform Ana

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Since 1973 and the discovery of gas field Ivana, northern Adriatic Sea has become an area of intense development of gas industry with increasing production/exploitation activities. Potential environmental impacts during developmental phase are associated with low-level operational waste discharge and the siltation, with drilling wastes (spent drilling mud and well cuttings) as the primary concern. Silt can cause a variety of effects on aquatic fauna varying from a simple increase in drift to interference in feeding patterns and to the complete burial and death of organisms (Olsen & Townsend 2005; Chambers et al., 2006). A major consequence of the siltation is the simplification of faunal communities followed by reduction of habitat complexity, heterogeneity and stability (Phillips, 1993; Palmer et al., 2000). The goal of this study was to: 1) assess the potential impact of developmental drilling on the soft-bottom benthic community and 2) provide a baseline for assessment of environmental impact related to the future gas exploitation.

Macrozoobenthos samples were taken with Van Veen grab (sampling area of 0.1 m<sup>2</sup>; four replicates per site) at eight sites situated within gas field ANA, in April and June, 2008. Sampling sites were arranged in two perimeters around the gas platform, four were on a 100 m and four on a 300 m perimeter (Figure 1). Sediment was sieved through 1 mm mesh size sieve and fixed in buffered 4% formaldehyde/sea water solution *in situ* and stored until laboratory processing. The analysis was carried out using the method of total census, applied both on higher taxa level (rank of phylum, class and/or order) and species level (only for dominant taxa: Polychaeta, Bivalvia, Gastropoda).

Granulometric composition of sediment is presented at Figure 2. At all sites sediment dominated by sand (81–86%) with low content of gravel (1–4 %) and silt-clay fraction (10–17%). The average grain size (Mz = 2.22 to 3.3) and medium grain size (Md = 2.1 to 3.2) at all stations belongs to the fine and/or very fine sand fraction. Using the Shepard's classification at all stations, sediment was characterized as the pure sand. Results suggested no siltation impact following developmental drilling operations. Total organic matter content was low and varied from 0.85% to 1.4%.



Figure 2. Granulometric composition of sediment on the sampling stations.

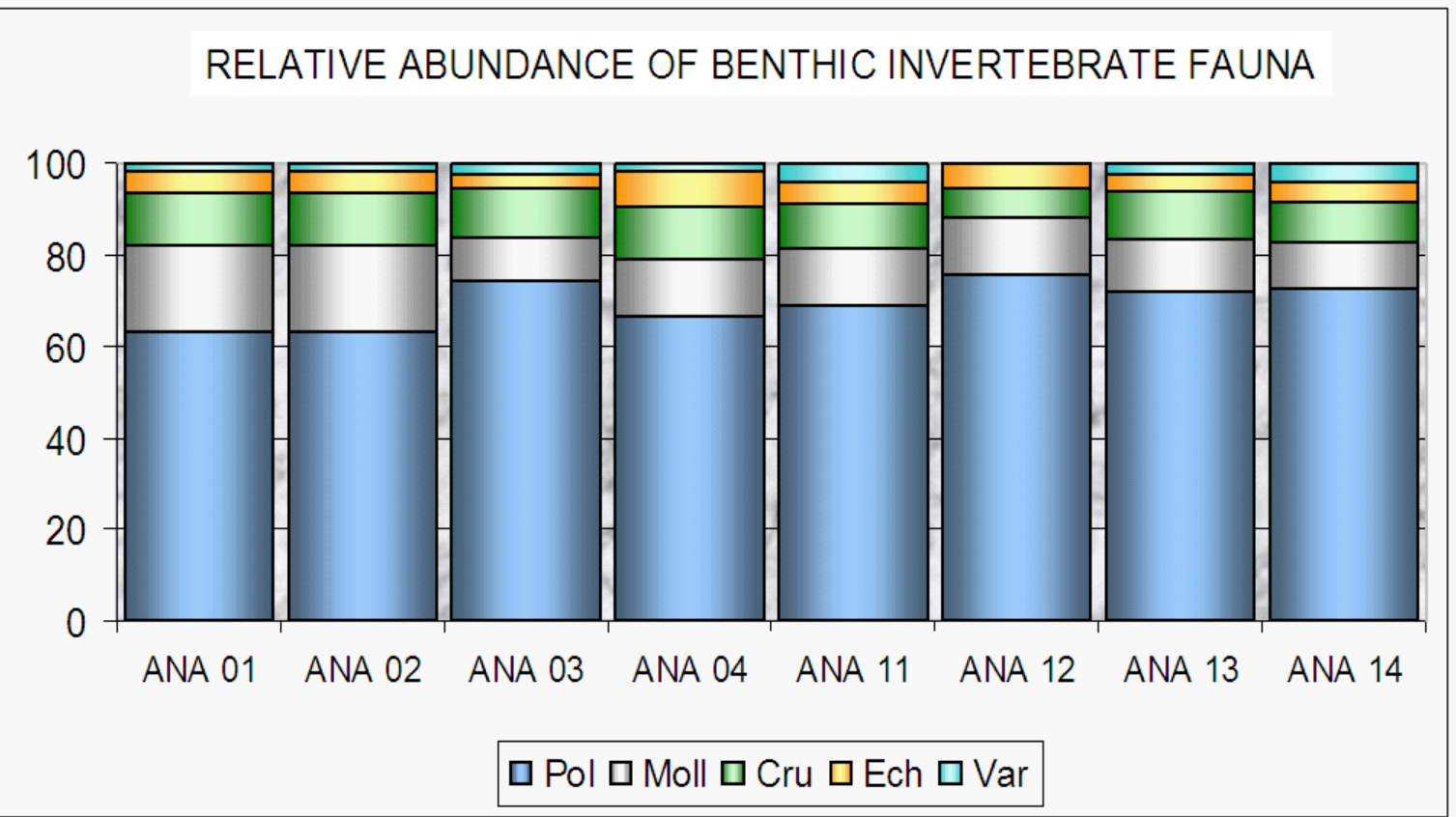


Figure 3. Relative abundance of four dominant groups: Polychaeta (Pol), Mollusca (Moll), Crustacea (Cru), Echinodermata (Ech), other taxa (Var).

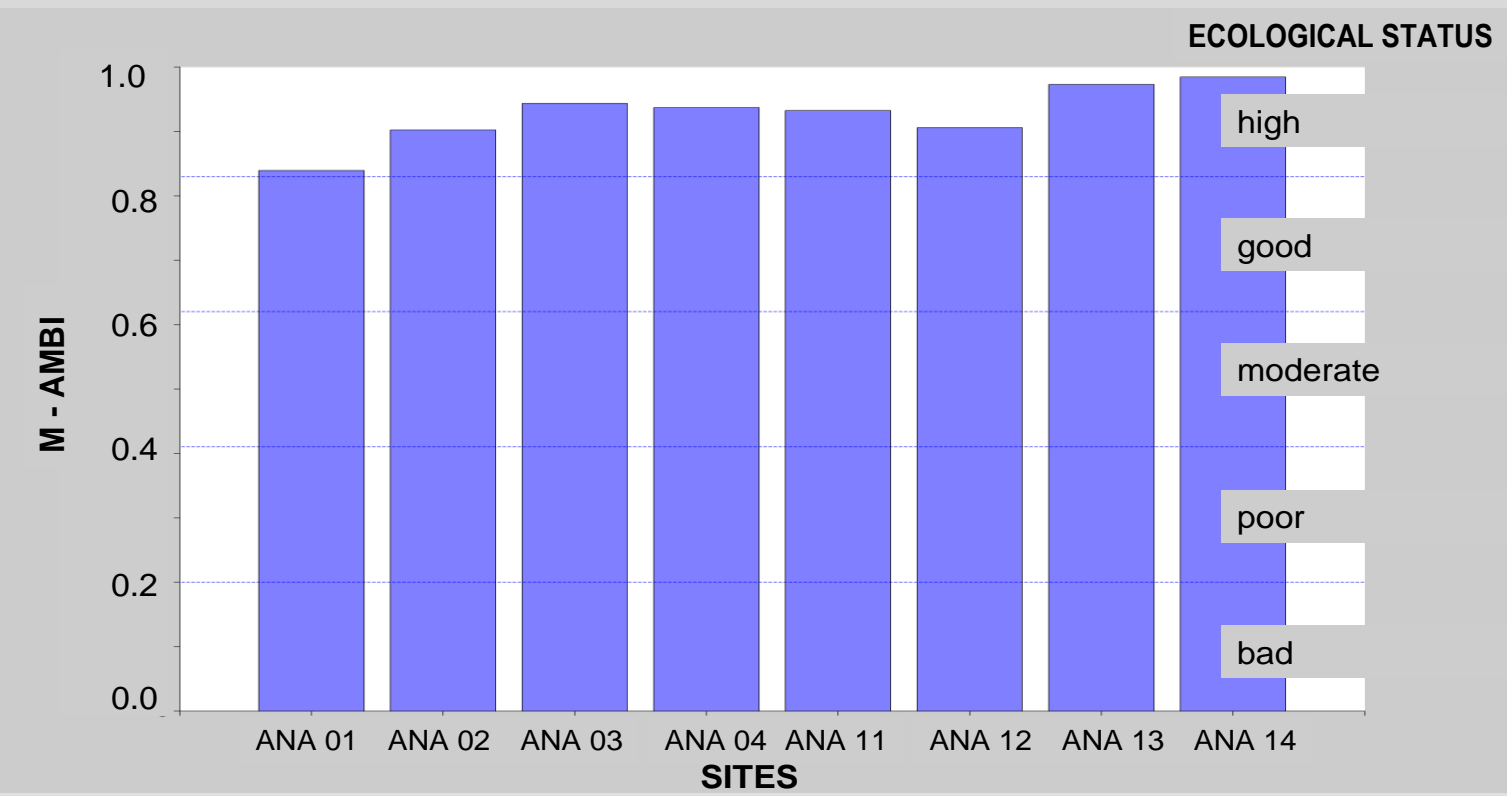


Figure 6. The assessment of ecological status at sampling sites from gas field ANA based on Ecological Quality Ratio (EQR), i.e. M-AMBI multimetric biotic index.

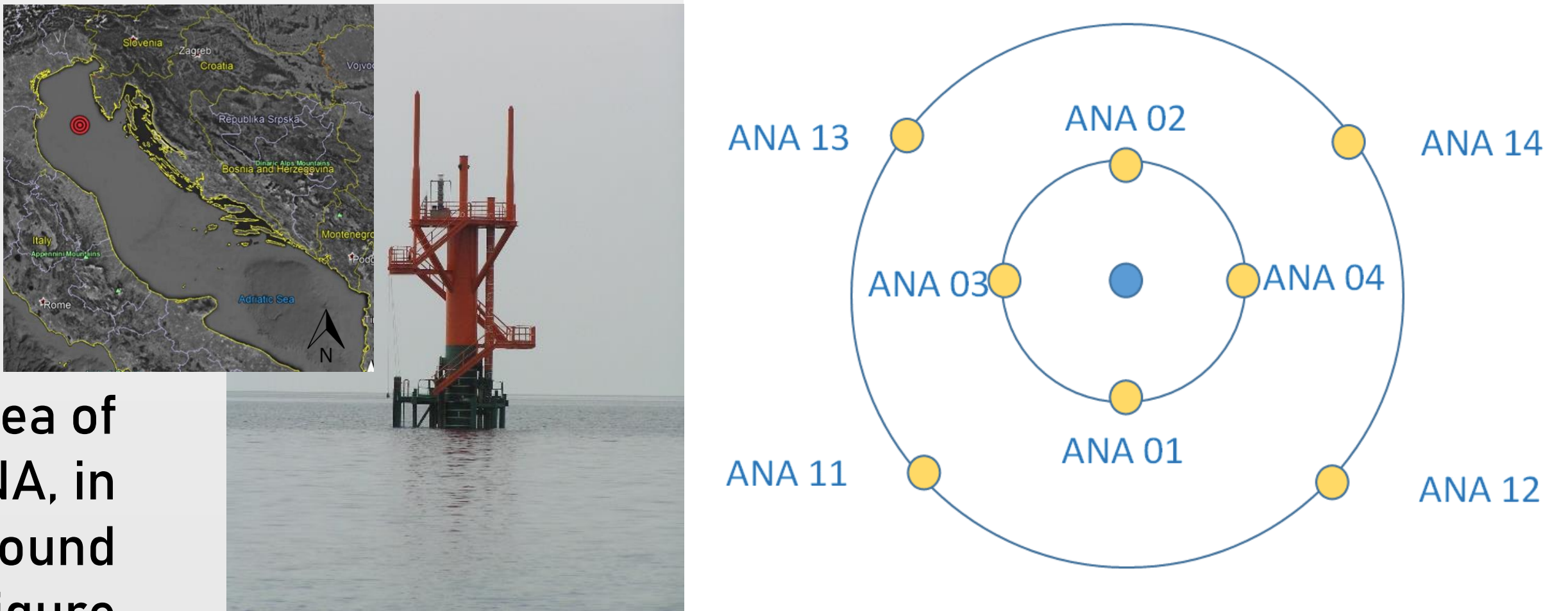


Figure 1. Map showing location of the platform Ana and a scheme of spatial arrangement of the sampling sites (not to scale).

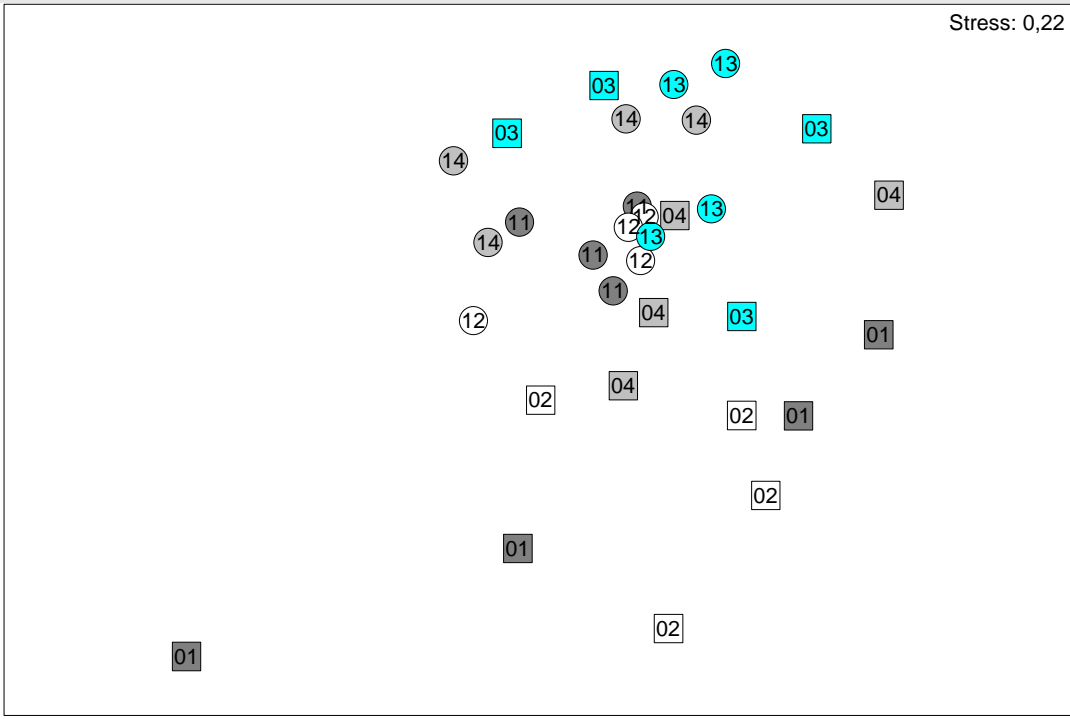


Figure 4. MDS based on composition and abundance of the constitutive macrobenthic taxa (raw data  $\sqrt{\phantom{x}}$  transformed).

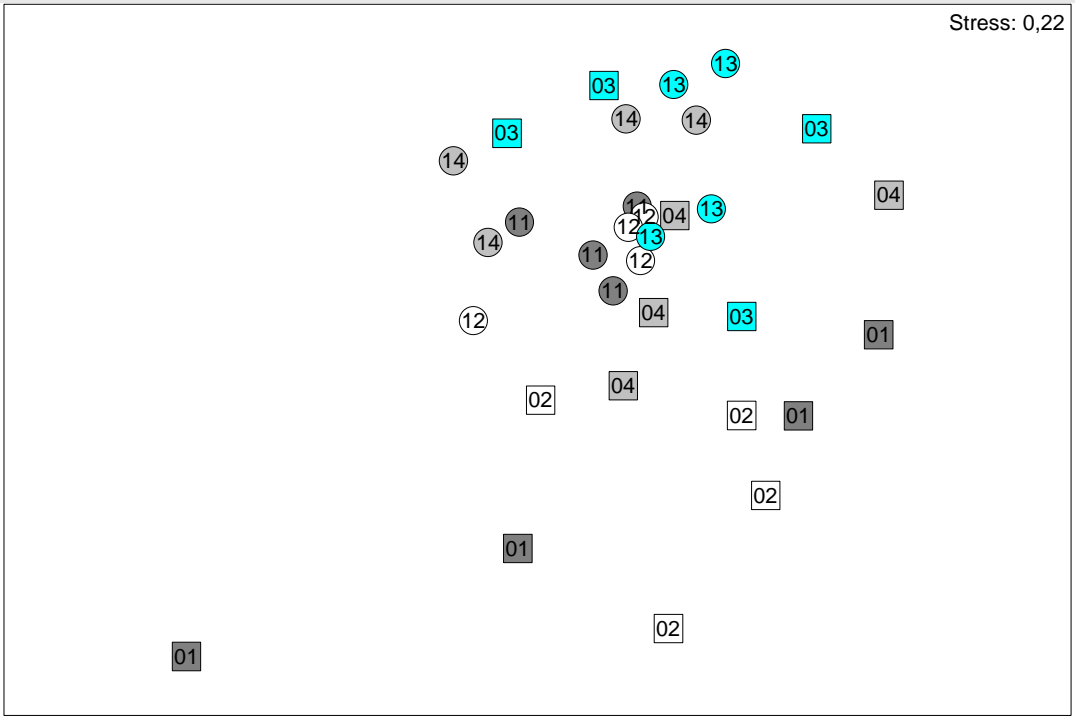


Figure 5. MDS based on composition and abundance of two numerically dominant taxa – Polychaeta and Bivalvia (raw data  $\sqrt{\phantom{x}}$  transformed).

Table 1. Univariate indices for macrozoobenthos, based on species composition and abundances of two numerically dominant taxa (Polychaeta, Bivalvia): no. of species (S), number of individuals (N), Margalef's diversity index (d), Pielou's index of equitability (J'), Shannon-Wiener diversity index (H'), and Hill numbers (N1, N21).

INDEX SITE	S	N	d	J'	H (log <sub>2</sub> )	N1	N21
ANA 01	52	191	9,71	0,82	4,65	25,15	0,51
ANA 02	55	188	10,31	0,88	5,10	34,24	0,68
ANA 03	66	334	11,19	0,85	5,17	35,92	0,64
ANA 04	60	272	10,52	0,90	5,31	39,54	0,74
ANA 11	62	382	10,26	0,83	4,94	30,70	0,62
ANA 12	63	397	10,36	0,82	4,90	29,81	0,58
ANA 13	71	476	11,35	0,83	5,12	34,77	0,59
ANA 14	71	463	11,40	0,82	5,06	33,28	0,58

Number of constituent groups ranged between 11 and 18 higher taxa per station. Composition and abundance off invertebrate fauna ranged within the limits common for open water communities of northern Adriatic. Polychaeta were a dominant group at all stations (relative abundance 59–76%, 107 species in total), followed by Mollusca (10–15%, dominated by Bivalvia with 35 species in total), Crustacea (7–13%) and Echinodermata (3–9%). All other determined groups constituted 0.2–4% of the total macrofauna (Figure 3). Multivariate analysis of macrofaunal community structure was performed at two taxonomic levels – higher taxa (Figure 4) and species level (Figure 5). The later involved representatives of Polychaeta and Bivalvia. Resulting plot indicates no spatial or temporal differences between sampling sites. Biodiversity was assessed by comparing diversity indices related to the most abundant taxa (Polychaeta and Bivalvia) that together comprised more than 70% of total macrofauna in the investigated area. Univariate indices were high and ranged within boundaries that are common for similar undisturbed habitats (Table 1).

Ecological status was assessed by calculating the AMBI and M-AMBI biotic indices. All sampling sites situated within gas field ANA can be ranked into the highest ecological status category (Figure 6). No negative impacts of drilling or other activities associated with platform placement on existing benthic community were observed.

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**References**

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