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BENTHIC FAUNA ASSOCIATED WITH ACTIVE METHANE SEEPS AT THE CRIMEAN COASTAL ZONE (BLACK SEA)

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INTRODUCTION

In the Black Sea, gas seeps were recorded by Polikarpov *et al.* (1991) in 1989. It was noticed that methane seeps are present in three characteristic zones of the Black Sea: oxygenated, transitional oxic/anoxic interface, and the deep-water hydrogen sulphide zones. At present, over 3000 sites of methane bubble seepages are known for the depth between 17 and 1800 m (Egorov *et al.*, 2003).

Location of 24 seepage sites was detected in the depth range between 1 and 445 m along the Kalamitian Ridge. In 2003, M.B. Gulin discovered high intensity methane seeps in vicinity of the Tarkhankut Cape at water depth 1-12 m (Gulin, 2004). The shallowest seeps were located in the southern sector of the Tarkhankut Cape.

METODOLOGY

It was shown that intensity of bubbles streams and temporal variability of free-gas fluxes from the seepage micro areas were very changeable. In 2004, the fluxes were 43; 5 and 62 $cm^3\ h^{-1}$ in July, August and September, respectively (Gulin, 2004; Sergeeva *et al.*, 2005).

The taxonomic composition and abundance of zoobenthos in sediments from two shallowest seep areas near the Tarkhankut Cape were analyzed. Several short cores (0-5 cm) were taken from seepages and background (control) sediments at water depth 1.1-4.8 m near Lazurnoe (May 2004) and Okunyovka (July-September). The cores were obtained by scuba divers using plastic core (37.4 cm^2). All samples were fixed with 75% alcohol, washed, fractionated using a set of sieves with the smallest pore size of 64 μm, and stained with Rose Bengal for further counts of organisms under a light microscope.

RESULTS

The seepage and control biota were shown to be highly diverse and abundant. The control samples contained 24 high taxa: Ciliophora, Coelenterata, Foraminifera, Rotatoria, Nematoda, Oligochaeta, Polychaeta, Nemertini, Turbellaria, Kinorhyncha, Bivalvia, Gastropoda, Loricata, Harpacticoida, Ostracoda, Cladocera, Amphipoda, Cumacea, juv. Decapoda, Izopoda, Tardigrada, Acarina, Pantopoda, Bryozoa. In seepage sites the number of taxa was 22.

At the two seepage stations off Lasurnoe, free-living nematodes were dominant, contributing 73% of the total community in terms of abundance. At the control station, free-living nematodes (58%) and harpacticoids (13%) were dominating and subdominating taxa, respectively (Figure 1).

At the two seepage stations the total abundance of benthos exceeded 354×10^3 ind.$\cdot m^{-2}$ and 745×10^3 ind.$\cdot m^{-2}$. At the control station, the benthic abundance reached 956×10^3 ind.$\cdot m^{-2}$. The free-living nematodes were dominating notably.

At Okunyovka region, the taxonomic composition and the numbers of the seepage benthic organisms varied considerably. In July, 120×10^3ind.$\cdot m^{-2}$ and 131×10^3 ind.$\cdot m^{-2}$ were found in the 0-5 cm layer at the two seepage stations 1 and 2, respectively, as compared to 1125×10^3 ind.$\cdot m^{-2}$ at the control station.

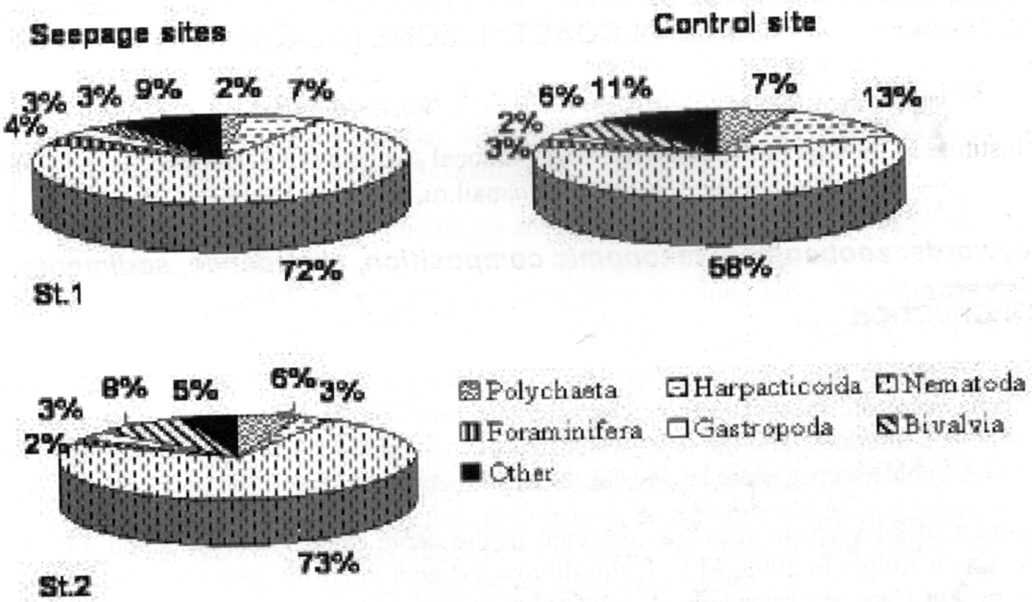

Figure 1. Percentage of zoobenthic taxa (Lazurnoe) in May.

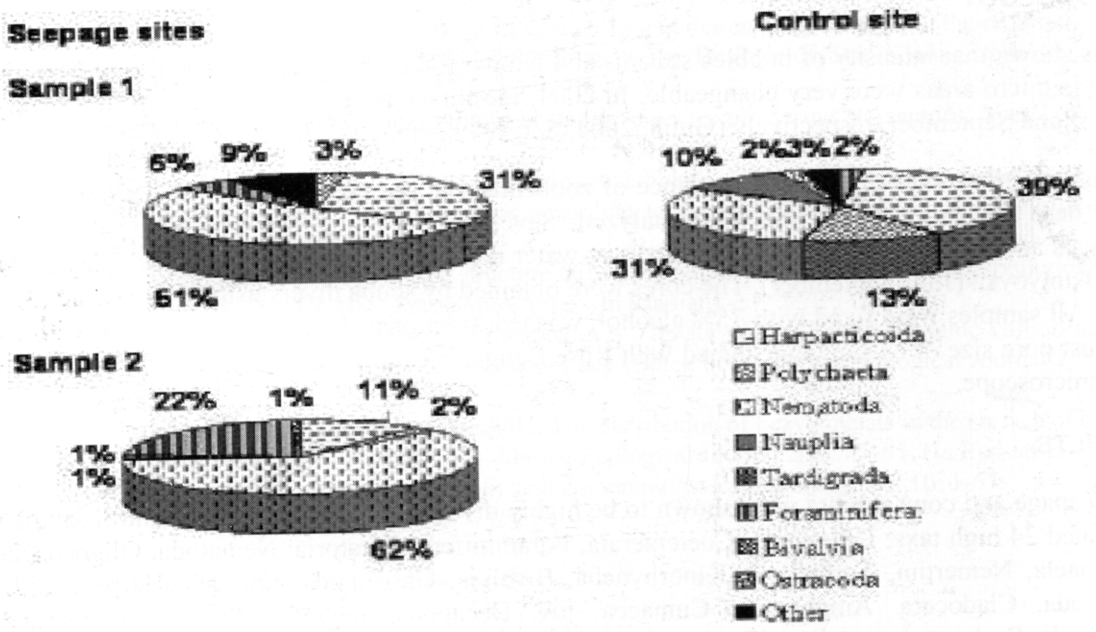

Figure 2. Percentage of zoobenthic taxa (Okunyevka) in July.

In August and September, a sharp distinctive oxidized and reduced layers were discovered in the cores at seeps site.

In August the total abundance of benthos was about 554×10^3 ind.·per m^{-2} and 1043×10^3 ind.·m^{-2} at seep and and control station, respectively. Under methane condition, nematodes dominated while harpacticoids and polychaetes were less abundant. At the control site, harpacticoids were more abundant that nematodes (Figure 3).

The lowest abundance (about 48×10^3 ind.·m^{-2}) of benthic organisms was present at seepage site in September (Figure 4).

In contrast, the control community number was 1237×10^3 ind.·m^{-2}. Nematodes were shown to dominate at both the seepage and control sites. Ciliophora and Harpacticoda were subdominant at the seepage and control stations, respectively.

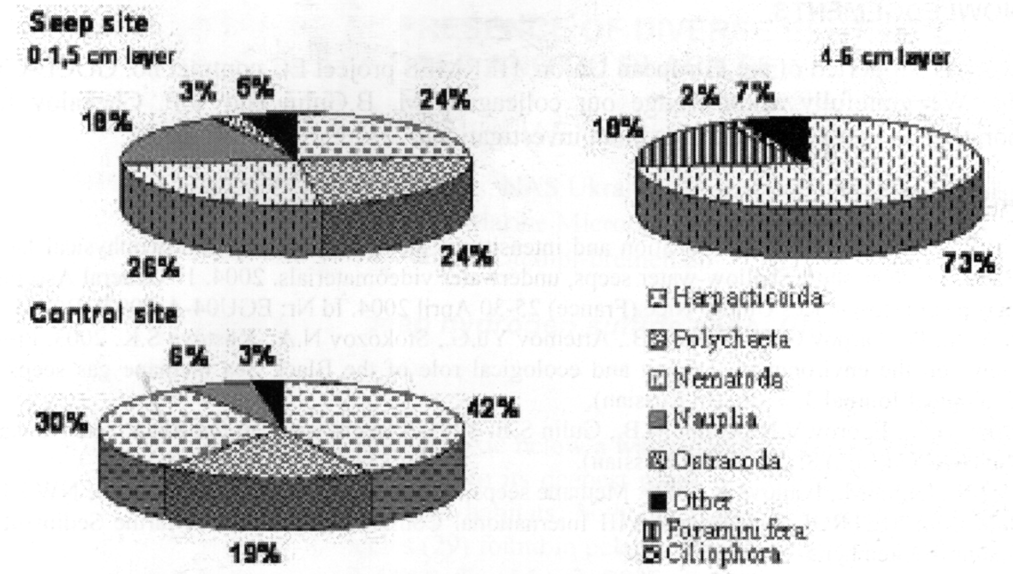

Figure 3. Percentage of zoobenthic taxa (Okunyevka) in August.

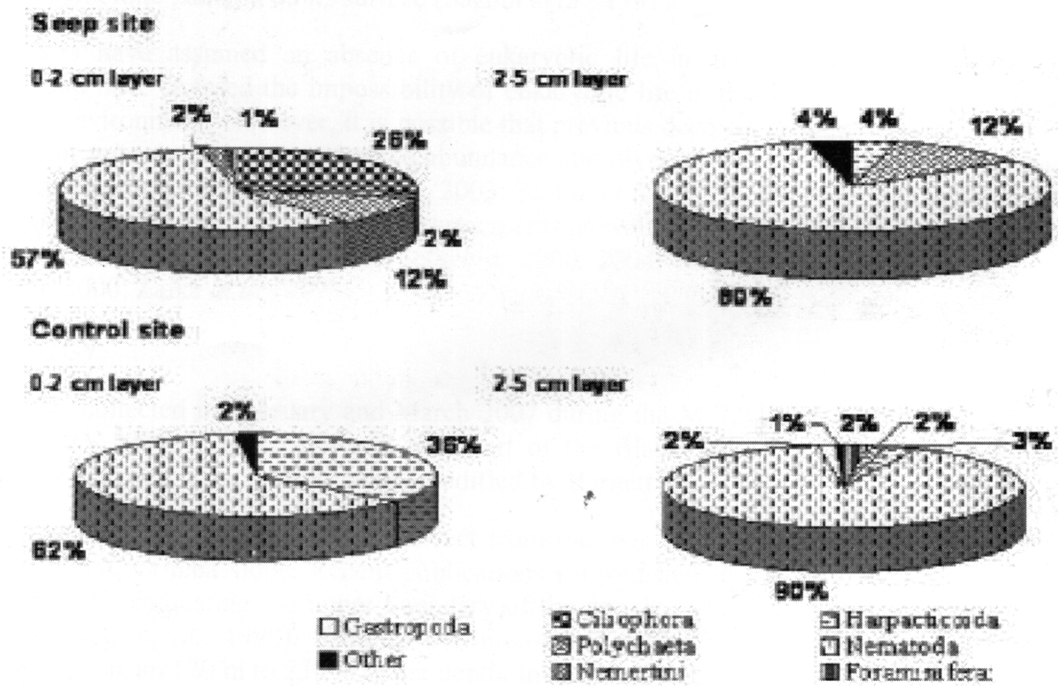

Figure 4. Percentage of zoobenthic taxa (Okunyevka) in September.

CONCLUSIONS

Zoobenthos from shallowest (1.1 m-4.8 m) seep areas near the Tarkhankut Cape was diverse with Nematoda *being the dominant* group, Harpacticoida and Foraminifera were the subdominant groups.

The abundance of zoobenthos varied between 48 $\times 10^3$ ind.$\cdot$m^{-2} and 745 $\times 10^3$ ind.$\cdot$m^{-2} at studied time intervals.

The flux of free-methane venting was highly variable in July, August and September most probably affecting the abundance and taxonomic composition of zoobenthos. Further investigationa are needed to provide more information on behaviour of zoobenthos in the methane seepage areas.

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REFERENCES

Gulin M.B. 2004. Dependens of location and intensity of methane cold seeps on geophysical factors: the Black Sea near-shore shallow-water seeps, underwater videomaterials. 2004. 1st General Assemly of the European Geosciences Union: Nice (France) 25-30 April 2004. Id Nr: EGU04-A-00976 BG 25.

Egorov V.N., Polikarpov G.G., Gulin S.B., Artemov Yu.G., Stokozov N.A., Kostova S.K. 2003. Present-day views on the environment-forming and ecological role of the Black Sea methane gas seeps. Marine Ecological Journal 3: 5–26. (In Russian).

Polikarpov G.G., Egorov V.N., Gulin M.B., Gulin S.B. 1991. The gas seeps in the Black Sea. Nauka i Zhizn (Science and Life) 8: 28–31. (In Russian).

Sergeeva N., Gulin M., Ivanova K. 2005. Methane seeps and associated benthos fauna in the NW Black Sea, data from METROL expeditions. VIII International Conference on Gas in Marine Sediments, Vigo-Spaine, September 5-10, 2005.