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# Mesofauna inhabiting algae in the tidal zone of the Barents Sea

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One of the most crucial problem in ecosystem functioning is the role of the invertebrates, especially mesofauna, in the mineralization and humification of organic matter. Although the role of the mesofauna is well known in the case of the soil system, the knowledge of the mesofauna inhabiting algae is still scarce, especially in the polar and sub-polar regions.The aim of our study was to determine communities of the invertebrates inhabiting algae in tidal zone, with special refer to mesofauna, Collembola and Acarina.


Fig. 1 Study bays: Zelenetskaya (1), Plohiye Tschervry (2), Yarnyshnaya (3, 5) and Medvezhia(4) and the experimental plots - E

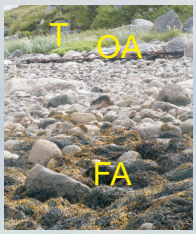



Fig. 2 Zones in the experimental transects: T-tundra, OA - 'old' algae, FA 'fresh' algae


Fig. 3 Experimental variants: FAS - 'freh' algae set on the stones, FAOA - 'fresh' algae set on the 'old' algae, FAT - 'fresh' algae set on the tundra

Our study was conducted in the field station of Murmansk Marine Biological Institute RAS at the Barents Sea. The study was carried out in July and August 2010 in 4 bays: Zelenetskaya (1), Plohiye Tschervry (2), Yarnyshnaya (3, 5) and Medvezhia(4) (Fig. 1). In each bay we chose transect with zones of the: 'fresh' algae (FA) exposed during low tide, 'old' algae (OA) - beyond the limits of the tidal zone, at least 3 weeks old, and tundra (T) (Fig. 2). In each bay and zone there were taken 10 samples usingframe of the area of 100cm$^2$ Moreover we took 5 samples in "central' tundra (CT), that means 1km from the sea-shore.
We also conducted an experiment to determine rate of the 'fresh' algae (FA, 100cm2) colonization by mesofauna.
We set out 'fresh' algae (FA) on stones (FAS),'old' algae (FAOA) and tundra (FAT) and took samples after 24 h, 72h, 144h, 216h and 288h (Fig. 3).
On every occasion we took 5 samples in each experimental plots.
For statistical analysis we used nonparametric tests. The significance of differences in the densities of invertebrates was analysed by using Wilcoxon's test of rank differences for pairs. The effect of experimental zones on invertebrates densities was analysed by using ANOVA Kruskal-Wallis nonparametric analysis of variance.

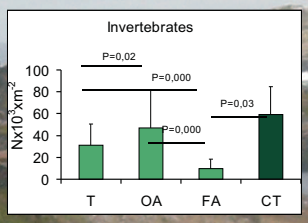
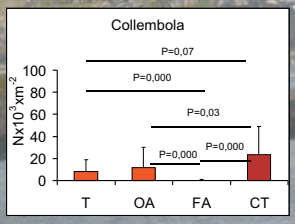



Fig. 4 Densities of the invertebrates along transects, in the experimental zones (T-tundra at the sea-shore, FA - 'fresh' algae, OA - 'old' algae, CT - 'central' tundra, 1km from the sea-hore).



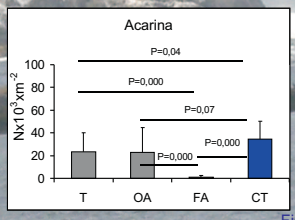




Fig. 5 Densities of the mesofauna: Collembola and Acarina along transects in the experimental zones (T-tundra at the sea-shore, FA - 'fresh' algae, OA - 'old' algae, CT - 'central' tundra, 1km from the sea-hore).

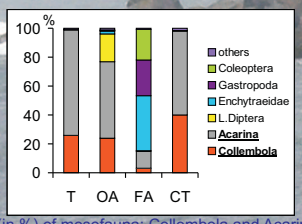
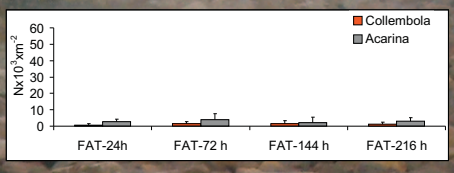



Fig. 6 Contribution (in %) of mesofauna: Collembola and Acarina and other taxons in the communities of the invertebrates along transects, in the experimental zones, (T-tundra at the sea-shore, FA - 'fresh' algae, OA - 'old' algae, CT - 'central' tundra, 1km from the sea-hore).

We noticed the significant impact of the experimental zones on invertebrates' densities (H=54,7; P=0,000). The highest densities were observed in the zone of the 'old' algae (OA) and they were similar to these noticed in 'central' tundra CT)(Fig. 4). The lowest densities were observed in the zone of the 'fresh' algae (FA)(Fig. 4). The same effect we observed in the case of mesofauna, Collembola (H=57,2; P.=0,000) and Acarina (H=77,4; P=0,000). Densities of the mesofauna were similar in zones of the 'old' algae (OA) and tundra nearby sea-shore (T) (Fig. 5). The highest densities of the mesofauna were notice in the 'central' tundra (TC) (Fig. 5). The lowest densities were observed in the zone of the 'fresh' algae (FA) (Fig. 5).Among invertebrates we found 12 taxons. Mesofauna was the most numerous in the zones of tundra (T),'old' algae (OA) and 'central' tundra (CT) (Fig. 6).



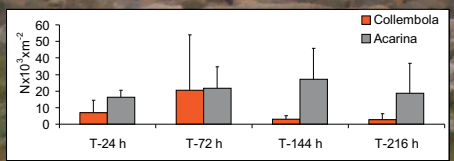
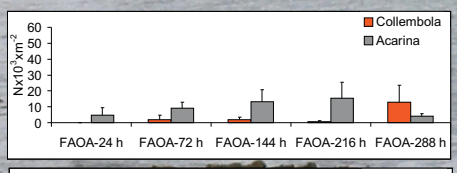




Fig.7 Densities of Collembola and Acarina in particular experimental time points observed in 'fresh'algae (FAT) and under them in tundra (T).

Colonization of the 'fresh'algae by mesofauna differed in particular, experimental zones. We did not notice any significant changes in the rate of the colonization of the 'fresh' algae (FAT) by mesofauna in tundra (Fig. 7). But densities of Collembola and Acarina under the 'fresh' algae (T) differed in particular time points. The highest density of Collembola was observed after 72 hours from the algae exposing (Fig. 7). The highest density of Acarina was found after 72-144h from the beginning of the experiment (Fig. 7). We noticed the highest densities of Collembola in 'fresh' algae exposed on the 'old' algae after 288 hours from the beginning of the experiment and in the case of Acarina after 144 hours (Fig. 8). But we noticed the highest densities of the mesofauna in the 'old' algae under 'fresh' algae earlier (for Collembola after 24hours, for Acarina after 72 hours from the beginning of the experiment) (Fig. 8). We did not notice any significant changes in the rate of the colonization of the 'fresh' algae (FAS) ,exposed on the stones, by mesofauna (Fig. 9).



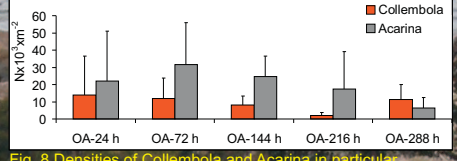




Fig. 8 Densities of Collembola and Acarina in particular experimental time points observed in 'fresh'algae (FAOA) and under them in 'old' algae (OA).

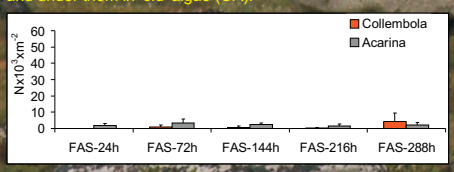



Fig.9 Densities of Collembola and Acarina in particular experimentaltimepoints observed in 'fresh'algae on the stones (FAS).

Our results suggest that colonization of the 'fresh' algae by mesofauna is due to many factors, including presence of other plants, humidity, dispersal possibilities, life cycles and tolerance to the salinity of the mesofauna. Probably mesofauna acts as a "bridge" between following groups of invertebrates.
Our experiment showed that the highest densities of mesofauna were noticed on the "fresh' algae after 72-144 hours from the beginning of the experiment. This phenomenon could be connected with the salinity and humidity of the algae.