CHEMICAL AND BIOLOGICAL CHARACTERISTICS OF FECAL PELLETS OF *EUPHAUSIA SUPERBA* DANA (EXTENDED ABSTRACT)

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Fecal pellets produced by *Euphausia superba* DANA were analyzed for organic materials as well as for electron microscopic observations to elucidate its ecological significance in the Antarctic Ocean. Through the chemical and biological analyses, a particluar interest was paid to clarify food organisms of *E. superba* in the natural environment.

Fecal pellet of *E. superba* collected from laboratory culture on land and its food alga, *Dunaliella tertiolecta*, were analyzed for organic carbon, total nitrogen, fatty acids and amino acids including free and combined amino acids to evaluate changes in organic compositions between the food organism and the fecal pellet.

Percentages of fatty acids and amino acid-carbons to organic carbon accounted for 20.3 and 30.1% in the food alga, while the values decreased to 7.5 and 19.8% in the fecal pellet respectively. Fatty acids and amino acids were more digestive than the other organic constituents of the food organism. In the fatty acid composition, unsaturated fatty acids with carbon atoms of 16 and 18 were digested preferentially and these acids accounted for more than 80% of the total loss of fatty acids. In the amino acid composition, essential amino acids tended to decrease selectively during the digestive process. Essential amino acid index (EAAI) calculated in the present study decreased from 52.2 for the food alga to 39.2 for the fecal pellet.

Furthermore, fecal pellet was collected from the shipboard culture of *E. superba* in the pack ice area (65°50.6′S; 155°16.0′E) of the Antarctic Ocean. *E. superba* was kept in the running seawater which was pumped up from the bottom of the ship (*ca.* 5 m depth), whithout any addition of food organisms except the natural plankton population in the seawater. In the same area, a plankton sample was collected by Norpac net (net material, XX13) towing and the particulate matter was also collected onto a precombusted glass fiber filter (Whatman, GF/C) by filtration of the subsurface seawater (*ca.* 5 m depth).

Morphological and taxonomical observations on the fecal pellet revealed that there were many costal strips of Choanoflagellate, *Parvicorbicula socialis*, in the fecal pellet together with fragments of diatom frustules of genera *Chaetoceros*, *Rhizosolenia*, *Thalassiosira*, *Fragilariopsis* and *Nitzschia*.

Organic carbon and total nitrogen of the fecal pellet were 14.7 and 1.96% of dry weight respectively. The values were almost comparable to those of plankton and higher than those of particulate matter. Carbohydrate and amino acid contents of the fecal pellet were measured to be little lower than those of plankton but higher than

those of particulate matter. The percentage of fatty acid carbon to organic carbon of the fecal pellet accounted for 8.5% which was higher than those of both the plankton and the particulate matter. Although the fatty acids, especially unsaturated fatty acids, were found to be the most digestive organic constituents in the fecal pellet from the laboratory experiment, the sum of unsaturated fatty acids with carbon atoms of 16 and 18 in the fecal pellet from the shipboard experiment amounted to more than 50% of total fatty acids and the ratios of unsaturated to saturated fatty acids were higher than those of both the plankton and the particulate matter. The fecal pellet collected from the shipboard experiment was rich in either the total or unsaturated fatty acids as compared with the plankton and the particulate matter. Seventeen amino acids and two aminosugars were quantified upon acid hydrolysates of the fecal pellet, the plankton, the particulate matter and the molt of *E. superba*. Glutamic acid, alanine and glucosamine were the predominant components in the fecal pellet, while the aspartic acid, glutamic acid, glycine and alanine were found to be the predominant components in the plankton and the particulate matter. The EAAI of the fecal pellet was calculated to be 60.6 which was the same value of the plankton and higher than both the particulate matter and the molt. Fatty acid and amino acid compositions of the fecal pellet suggested that *E. superba* cultured on board fed on some plankters which were rich in both unsaturated fatty acids and essential amino acids rather than fed on the whole plankton population collected by the net.

The plankton collected by the net was separated into five fractions by sieving and centrifugation methods. Two larger size fractions, larger than 100 μm and 40–100 μm which were mainly consisted of diatoms and the smallest size fraction, 3500 rpm supernatant in which amorphous-shaped materials were scarcely observed, were determined to have low contents of unsaturated fatty acids and low values of EAAI as compared with the fecal pellet. Only two intermediate size fraction, 1500 and 3500 rpm precipitates which were mainly consisted of the lorica of *P. socialis* together with some amounts of small-sized diatoms showed higher values of EAAI and higher contents of unsaturated fatty acids than the fecal pellet. It was concluded that *E. superba* in natural environment preferably fed on Choanoflagellate, *P. socialis*, in the presence of diatom population because the organic matter of *P. socialis* (two intermediate fractions mentioned above) could answer the characteristic chemical compositions of the fecal pellet from the shipboard experiment. The importances of the nanozooplankter as the food organism of *E. superba* were discussed in relation to the recycling of organic matter in the Antarctic Ocean.

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