3. Романов, В.П. Оценка поступления биогенных веществ в водоемы от купающихся / В.П. Романов // Водные ресурсы. – Минск: Минсктиппроект, 2006. – № 21. – С. 75–78.
4. Рутковский, П.П. Оценка антропогенной нагрузки на озерные экосистемы Витебской области / П.П. Рутковский, Л.Н. Шевелюк, Р.А. Юревич // Водные ресурсы. — Минск: Минсктиппроект, 2006. – № 21. – С. 21–30.

CARBON AND NITROGEN RATIO FOR SPRING SESTON IN PELAGIAL AND LITTORAL OF MESOTROPHIC LAKE

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Abstract: We estimated zooplankton composition and carbon and nitrogen ratio of spring seston **(**C, N) in different fractions of seston in mesotrophic Lake Obsterno (North of Belarus) at the end of May 2016 in four sub habitats of the lake – pelagial, clean littoral, rush beds and yellow lily zone with the measurement of hydrochemical parameters including T(C), TDS(μS/cm), pH, dissolved O_2 (mg/l), O_2 saturation (%), NO_3 (mg/l), NH_4 (mg/l) and PO_4 (mg/l). The results indicated *Bosmina crassicornis* as the dominant species of zooplankton in pelagial and *Ceriodaphnia pulchella* for the other sub habitats. Negative correlation of *B. crassicornis* abundance with temperature and positive correlation abundance of *Cer. pulchella* with NH_4^+were observed. In the other side, total organic carbon and nitrogen rates of seston in pelagial expressed the highest value comparison with clean littoral, rush bedsand yellow lily zone. The present study attempts to analyze the structure and organization of lake ecosystems, to reveal difference in elemental ratio regarding to dominant species richness.

Introduction: Zooplankton grazing on phytoplankton can transfer more than 50% of carbon fixed by primary production to higher trophic levels (Hart et al., 2000). Zooplankton excretion strongly influences trophic dynamics in freshwater ecosystems by contributing inorganic N and P for primary and bacterial production (Gilbert, 1998; Vanni, 2002; Wen and Peters, 1994). Estimates of the fraction of N and P regenerated by zooplankton and then utilized by phytoplankton range from 14 to 50% (Hudson and Taylor, 1996; Hudson et al., 1999; Urabe et al., 1995). The main factors controlling this fraction include temperature, zooplankton and phytoplankton biomass and species composition. Because these factors interact dynamically, it has been difficult to quantify the role of zooplankton in nutrient cycling. Ecological Stoichiometry deals with the patterns and processes associated with the chemical content of species. In this study we investigated zooplankton species composition of four sub habitats of the mesotrophic lake and measured elemental ratio of C and N in different fractions of seston.

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Material and Method. The zooplankton samples were collected from Lake Obsterno which is located in the North of Belarus (Miory district of Vitebsk region). The mentioned hydrochemical parameters, weather condition (sunny with no wind) and transparency (Secchi disk) were recorded. Zooplankton samples collection was performed by using a 100 μm mesh taw net diameter of 25 cm with the pulling race of 30 cm/sec (length of pulling was 21-30 meters for each sub habitat). For sestonic sample collection, 6 liters of integral sample from pelagial and the middle layer of water column in littoral biotopes were transferred to the lab for filtration procedure. Then GF/F and membrane filters were used in order to filter carbon/nitrogen further analyses. The CHN elemental analyzer (Flash EA 1112 NC Soil/MAS 200, ThermoQuest, Italy) was applied to carry out C and N analyses.

Results and Discussion. The dominant species of zooplankton for pelagial was *B. crassicornis* (18045 ind/m^3) and for clean littoral, rush beds and lily zone was *Cer. pulchella* (8719, 14831, 16306 ind/m^3). In the other side, rate of carbon and nitrogen percent of zooplankton dried mass for pelagial were 43.25 and 10.13 respectively expressed the highest rate among clean littoral (31.79 and 7), rush bed (36.38 and 6.87) and yellow lily zone (33.15 and 5.20). Negative correlation of *B. crassicornis* with temperature and NH_4^+($r^2_{(t)}$= 0.90 and $r^2_{(NH4^+)}$ =0.97), positive correlation of *B. crassicornis* with nitrogen and carbon percent (r^2 = 0.90 and 0.83), positive correlation of *Cer. pulchella* with temperature and NH_4^+ ($r^2_{(t)}$= 0.83 and $r^2_{(NH4^+)}$ = 0.96) and negative correlation of *Cer. pulchella* with nitrogen and carbon percent (r^2 = 0.91 and 0.91 respectively) were observed. Our survey revealed that in pelagial zone where owns the highest zooplankton abundance of species especially *B. crassicornis*, TN and TC of zooplankton expressed the highest rate in comparison with the other habitat species. Zooplankton has a relatively constant, species-specific C:N ratio (Urabe 1993). Thus, the elemental composition of the algal food source will influence the elemental composition of zooplankton egestion products. In situations where nitrogen is limited, zooplankton will preferentially conserve more nitrogen in their biomass while excreting more carbon, resulting in zooplankton fecal matter that has relatively high C:N ratios (Urabe 1993; Ferrante and Parker 1977) which is in agreement with our results. In lakes where the size and depth will preclude abundant terrestrial organic contributions, bulk organic matter should be composed mainly of algal remains and zooplankton fecal material. In these cases, the C:N ratio should reflect the level of nitrogen limitation experienced by these pelagic organisms (Evans et al. 1998; Smith 1982).As a conclusion, the freshwater zooplankters occupy an important and strategic position within the trophic web of lakes ecosystem and are sensitive to anthropogenic impacts. The analysis of TC, TN and TP concentrations in world lakes suggests several hypotheses for further study. First, because TN : TP in lake water is closely correlated with that of nutrient sources, the ambient TN : TP in oligotrophic and mesotrophic lakes should vary with land use, basin morphometry, and

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predominant nutrient sources. Thus, an importance littoral morphometry and degree of macrophyte beds size may play a key role in C:N:P ratio of seston.

References

1. Evans, M. S., B. F. Eadie, and R. M. Glover. 1998. Sediment trap studies in southeastern Lake Michigan: Fecal pellet express or the more traveled route? J. Great Lakes Res. 24: 555–568.
2. Ferrante, J. G., and J. I. Parker. 1977. Transport of diatom frustules by copepod faecal pellets to the sediments of Lake Michigan. Limnol. Oceanogr. 22: 92–97.
3. Gilbert, P.M., 1998. Interactions of top-down and bottom-up control in planktonic nitrogen cycling. Hydrobiologia 363, 1–12.
4. Hart, D.R., Stone, L., Berman, T., 2000. Seasonal dynamics of the Lake Kinneret food web: the importance of the microbial loop.Limnol. Oceanogr. 45, 350–361.
5. Hudson, J.J., Taylor, W.D., 1996. Measuring regeneration of dissolved phosphorus in planktonic communities. Limnol. Oceanogr. 41, 1560–1565.
6. Hudson, J.J., Taylor,W.D., Schindler, D.W., 1999. Planktonic nutrient regeneration and cycling efficiency in temperate lakes. Nature 400, 659–661.
7. Smith VH. 1982. The nitrogen and phosphorus dependence of algal biomass in lakes: an empirical and theoretical analysis. Limnol Oceanogr. 27:1101–1112.
8. Urabe, J. 1993. N and P cycling coupled by grazers' activities: Food quality and nutrient release by zooplankton. Ecology 74: 2337–2350.
9. Urabe, J., Nakanishi, M., Kawabata, K., 1995. Contribution of metazoan plankton to the cycling of nitrogen and phosphorus in Lake Biwa. Limnol. Oceanogr. 40, 232–24.
10. Vanni, M.J., 2002. Nutrient cycling by animals in freshwater ecosystems. Annu. Rev. Ecol. Syst. 33, 341–370.
11. Wen, Y.H., Peters, R.H., 1994. Empirical models of phosphorus and nitrogen excretion rates by zooplankton. Limnol. Oceanogr. 39, 1669–1679.

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