

AIM, MATERIAL AND METHODS

The aim of the study was to analyze the variability of the zooplankton communities of the Łyna River (Northern Poland), under the influence of a diverse catchment. The research were conducted in the years 2019-2022 on the c.a. 200-kilometre river section, at **18 locations** (Fig. 1).

Locations **HEAD (1-4)** represented the **natural character** of the Łyna river catchment – headwaters, lakes and forests (Fig. 2A). The impact of the **urbanized areas** was assessed in the vicinity of five towns (Olsztyn, Dobre Miasto, Lidzbark Warmiński, Bartoszyce, Sępólno) were analyzed within tree locations: **UP (5, 11, 13, 15, 17)**, **CITY (6-9; Fig. 2B,C)**, and **DOWN (10, 12, 14, 16, 18)**. The impact of **heavy soils of the agricultural areas** was observed between sites 11-18 (Fig.1).

The characteristics of zooplankton communities were determined on the basis of abundance, biomass, number of species, and Margalef's species richness. Zooplankton indices were correlated with selected physicochemical parameters: chlorophyll fractions, nitrogen and phosphorus forms, turbidity, and ion concentration.

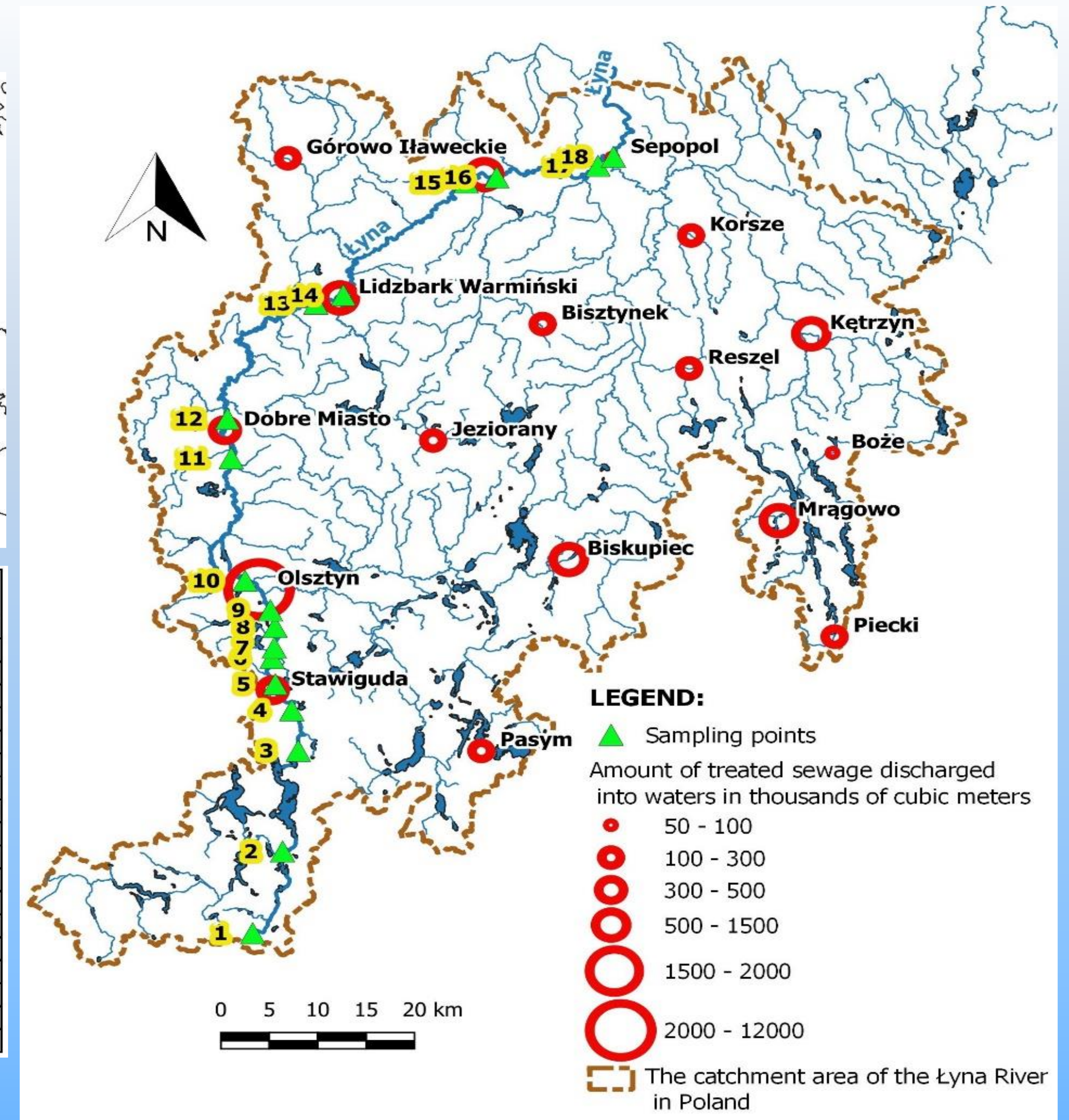


Fig 2. Natural – headwaters no 1 (A), urbanized catchment – Olsztyn center no 8 (B) and Olsztyn city forest no 9 (C) on the Łyna River (photo A. Goździewska)



No.	Name of sampling points	Km of river flow
1	Headwaters	208+290
2	Kurki	194+818
3	Ustrych	178+420
4	Ruś	171+682
5	Olsztyn - upstream	166+429
6	Olsztyn - Brzeziny	162+485
7	Olsztyn - Tuwima	161+150
8	Olsztyn - center	157+919
9	Olsztyn - city forest	154+948
10	Olsztyn - downstream	149+303
11	Dobre Miasto - upstream	124+300
12	Dobre Miasto - downstream	114+962
13	Lidzbark Warmiński - upstream	75+263
14	Lidzbark Warmiński - downstream	70+605
15	Bartoszyce - upstream	42+310
16	Bartoszyce - downstream	36+945
17	Sępólno - upstream	19+154
18	Sępólno - downstream	15+653

Fig 1. Location of sampling sites on the Łyna River



Assemblages of species that best characterize individual types of sites were determined, and the indicator power of the species was measured using the **randomization method**, based on relative abundance and relative frequency of occurrence (Dufrene and Legendre, 1997).

Because indicator species confer ecological importance to site groups, this method provides criteria for comparing habitat typologies and classifying catchment impacts.

THE INFLUENCE OF CATCHMENT ON ZOOPLANKTON IN ŁYNA RIVER (NORTHERN POLAND)

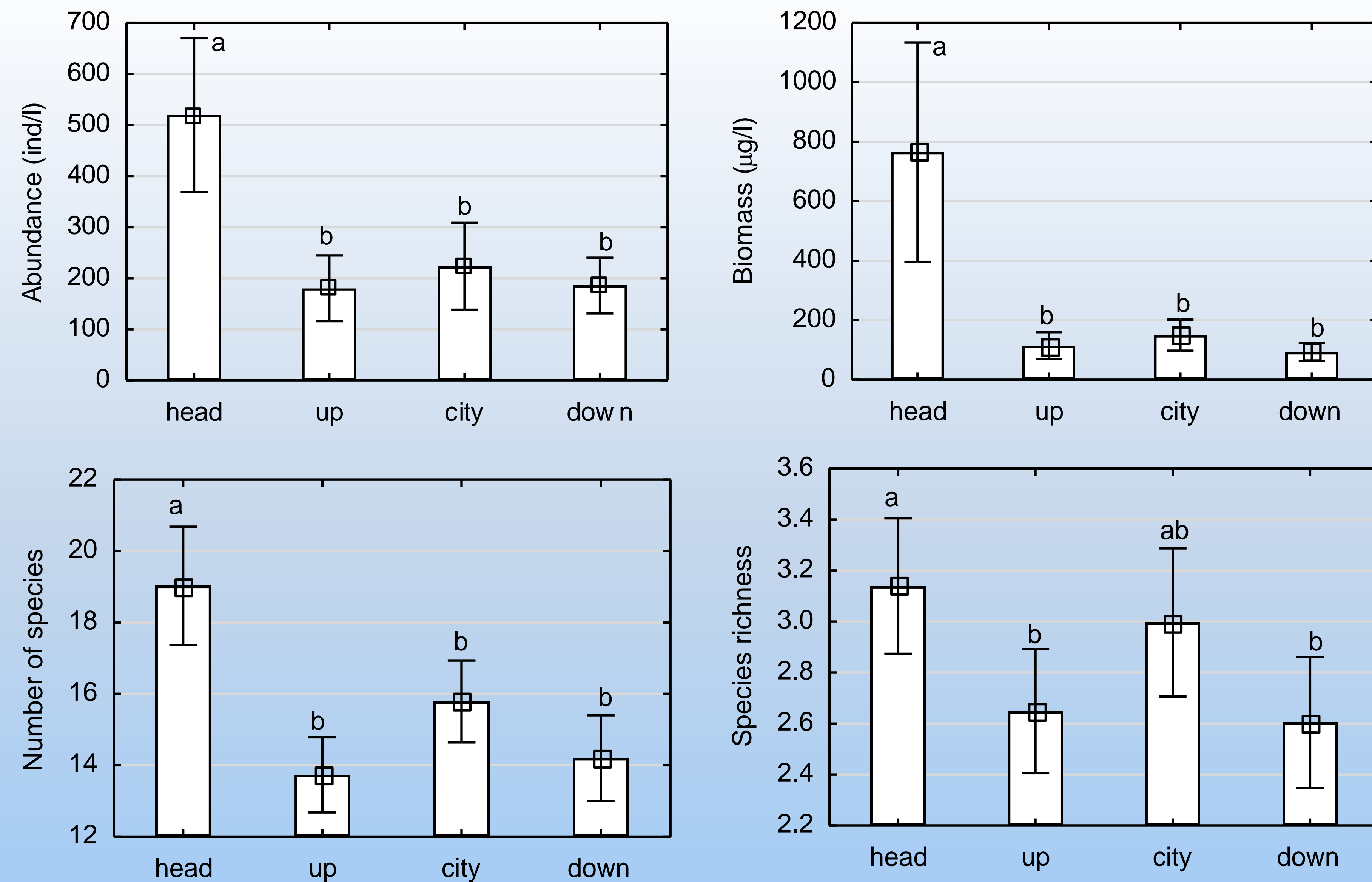


Fig 3. Measures of zooplankton diversity at individual locations

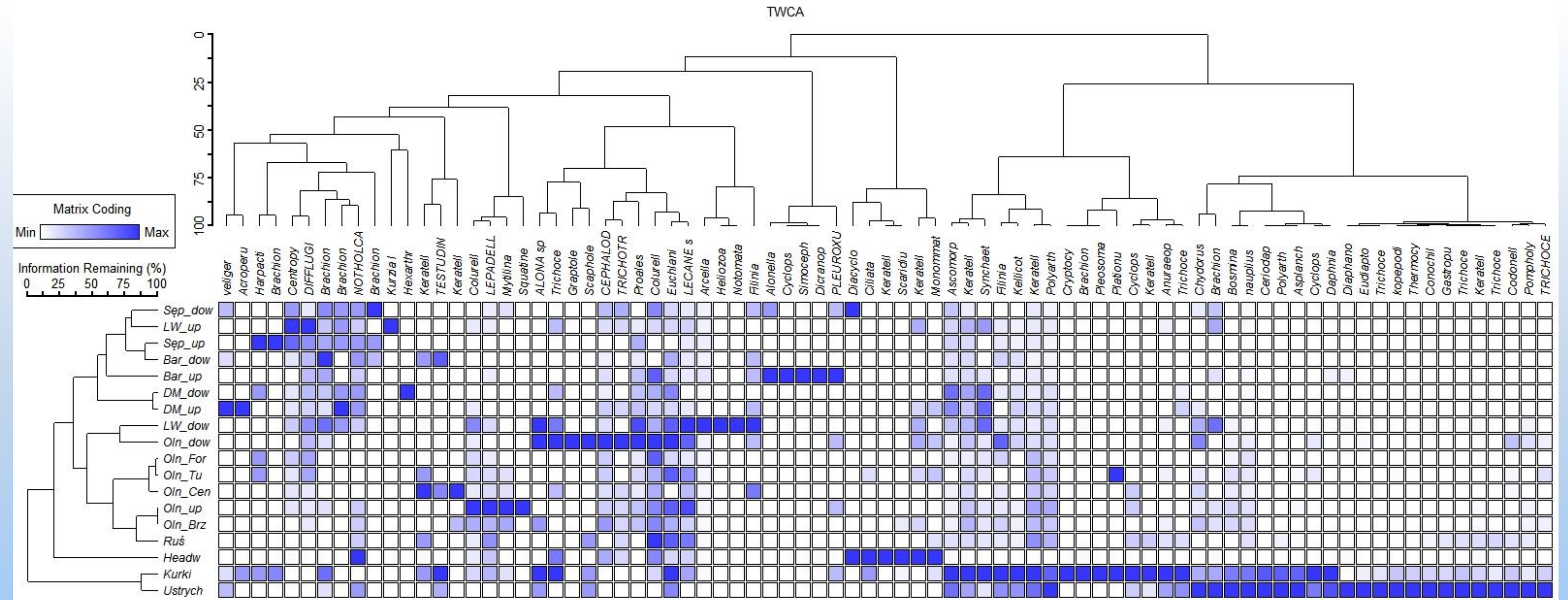


Fig 4. The TWCA dendrogram comprehended the distribution of 81 zooplankton taxa and forms at various sampling sites based on the Jaccard distance and the Ward association method

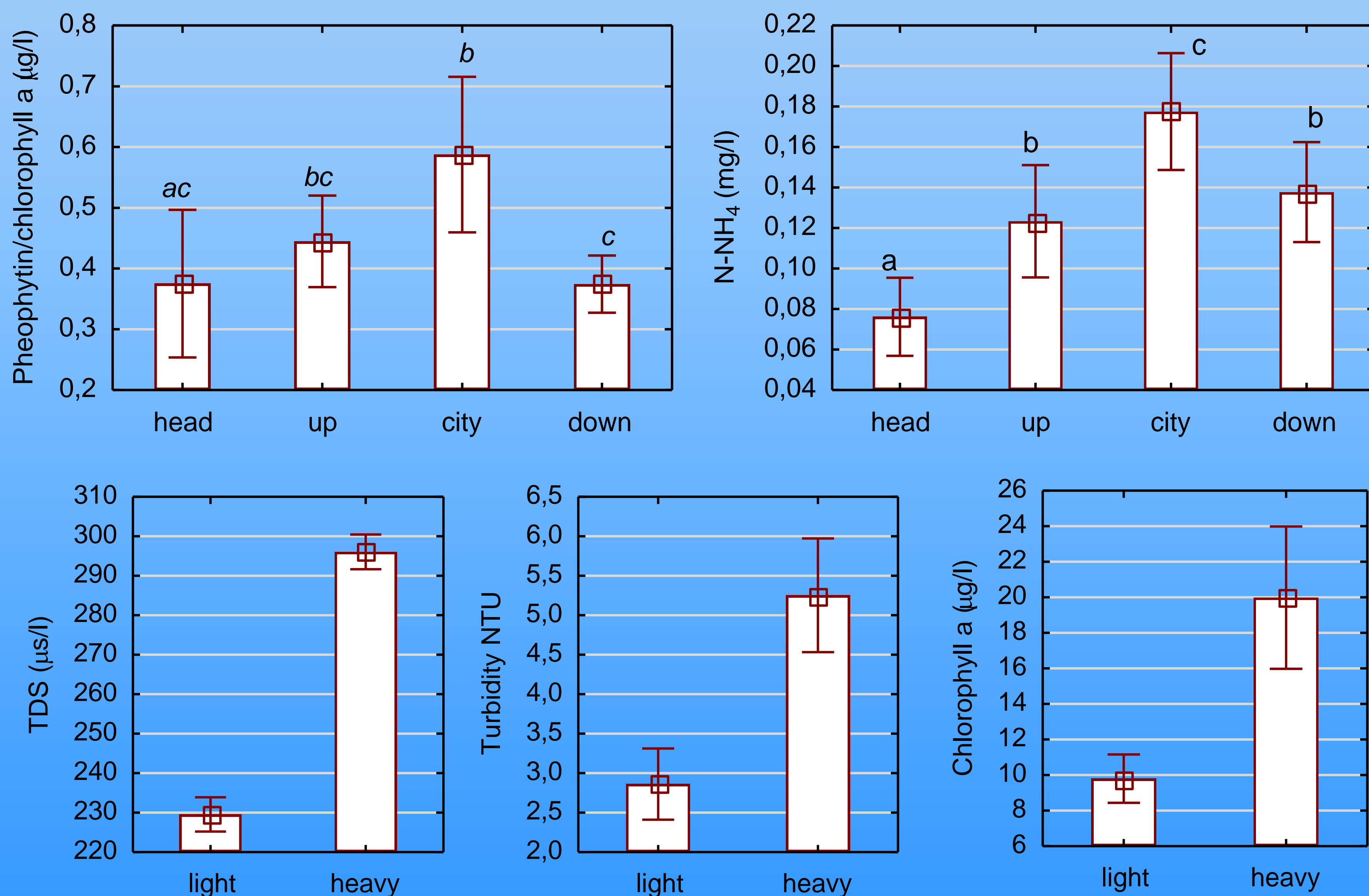


Fig 5. Variability of physical and chemical parameters of water in individual groups of sites.



Fig 2 continued (photo A. Goździejewska)

RESULTS AND CONCLUSIONS

The highest abundance, biomass, and the number of species of zooplankton was in the area of influence of the Łyna river's **natural catchment (HEAD)**. The highest species richness index of headwaters also reflected the **highest crustacean** species richness (**Fig. 3**). This section abounded in a rich community of Crustacea and Rotifera species with highly significant indicative values of the impact of the lake basin (Kurki, Ustrych; **Fig. 4**).

Urbanized areas (CITY: Oln Brz, Oln Cen, Oln Tu, Oln Cit) contributed to the increase in the concentration of ammonium nitrogen and pheophytin in the water (**Fig. 5**), the increase in the importance of **small phytophilic and detritophagous rotifers** (*Colurella*, *Lepadella*, *Keratella*) and **protozoa**, as well as the general decrease in zooplankton species diversity (**Fig. 4**).

The lowest abundance, biomass and species diversity of zooplankton (*H'*) were found at **downstream** sites (**DOWN**). There, the share of Protozoa increased.

The **agricultural catchment on the heavy soils** of the lower section of the Łyna resulted in an increase in salinity, turbidity, and primary production (chlorophyll a) of water, (**Fig. 5**) and impoverished the taxonomic structure of zooplankton, with an increase in the **importance indicator of Protozoa** (*Arcella discoides*, *Centropyxis aculeata*) (**Fig. 4**).

The pattern of spatial distribution of taxa and forms of zooplankton formulates groups of sites, which may indicate similar habitat conditions shaped mainly by the influence of catchment factors (**Fig. 4**).