

ECOLOGY

Fauna, ecological and morphological characteristics of family *Sididae*, Baird, 1850 (*Crustacea: Cladocera: Ctenopoda*) of Ukrainian Roztocze

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Abstract. On the basis of analysis of modern literature and own data taxonomy, ecological and morphological characteristics of family *Sididae* of Ukrainian Roztocze are presented. 314 tests in 2008–2017 in Ukrainian Roztocze natural region were conducted. The research was conducted on living and fixed materials. In general 283 individuals of genus *Sida* and 157 individuals of genus *Diaphanosoma* had been examined. In reservoirs of the Ukrainian Roztocze *Sida crystallina crystallina* was identified. In the area of Ukrainian Roztocze were indicated three varieties of *Diaphanosoma brachyurum*: *D. b. leuchtenbergianum* Fisher, 1854; *D. b. megalops* Lilljeborg, 1900; *D. b. frontosa* Lilljeborg, 1900.

Keywords: zooplankton, *Cladocera*, *Sididae*, Ukrainian Roztocze.

Introduction. Roztocze is a transboundary region, it plays an important role in identifying regularities of standard hydroecosystems in the central and Eastern Europe, because on its territory passes a part of the main European watershed.

Here a biosphere reserve UNESCO «Roztocze» is founded which hydrological regime is occurred by the river Vereschycia.

For indicating structural and functional characteristics of hydrobiocenoses, according to recommendations of Directive 2000/60/EC the data of hydroecological monitoring are necessary, which are based on populative-faunistics investigations. At the same time, the regional characteristics of zooplankton groups are insufficiently studied.

The article aim is to investigate the faunal and ecological-morphological characteristics of the *Sididae* family, whose representatives play an important role in conducting hydroecological monitoring.

Material and methods. Zooplankton coenosis of the impoundments that make up the instream system of impoundment ponds of the river Vereshchitsa in the Ukrainian Roztocze have been studied.

In the upper reaches and in the coastal zone the ponds bed is overgrown with aquatic vegetation, shrubs and scattered trees. Capacity of bottom sediments is 0.3-0.5 m. Significant cause of siltation of these water bodies are the products of ruination of the coast, wave and wind erosion. The water temperature reaches the highest daily values (24-26°C) in July and the first half of August.

Taxonomic analysis of zooplankton groups were carried out using several identification keys [5, 6, 7, 8, 9].

The data were based on 314 gathered samples, collected in the instream ponds during 2008-2017 usually in three seasons: in spring, summer and autumn. Sampling and processing of samples were carried out by common methods in Hydrobiology [16]. For the sampling the Apstein mesh (length of the cone is 55 cm, the diameter of the inlet 25 cm, Cup diameter of 4 cm) had been used. As well for studying the horizons in deep waters the opened-water-sampler of Dr. Franz Ruttner was used. In such cases samples were taken at three horizons of the water column: the surface of the reservoir, middle level, and near bottom level. The collected material was fixed with 4% formaldehyde. For

quantitative processing of the samples the Bohorov's camera had been used.

The Research was conducted on living and fixed materials. In general 283 individuals of genus *Sida* and 157 individuals of genus *Diaphanosoma* had been examined.

The main attention was paid to such signs as sex structure of population, size of individuals, armament of postabdomen and antennas, biotopic delivering and features of the life cycle.

Results and their discussion. Zooplankton plays a very important role in the food base for fish, provides processes of water quality formation and bioproduction [2, 4, 8, 9, 10, 11]. We describe, with the use of our own researches and literary sources, faunal and morpho-ecological parameters of the *Sididae* family of Ukrainian Roztocze [1, 2, 5, 11, 12, 13, 14, 15].

The genus *Sida* (Fig.1) belongs to an order *Ctenopoda* and characterized by monotypy. In this genus there are three subgenus: *S. crystallina crystallina* (common in western Palearctic ecozone), *S. c. ortiva* (common in eastern Palearctic ecozone) i *S. c. americana* (common in Nearctic ecozone).

In reservoirs of the Ukrainian Roztocze lives *Sida crystallina crystallina* (O. F. Müller, 1776). Species are well adapted to life among the seaweed. On the dorsal side of *Sida* a special body develops by which organisms are attached to the surface of plants. This provides more effective filtering. The filter apparatus is represented by spikes that develop on the same type is built by six pairs of thoracic limbs. The diet is mainly represented by single-celled organisms and detritus particles. The length of females varies from 1.9 to 4.3 mm.

Postabdomen is more than twice as long from abdominal claws, which are proximal to the upper edges are four spikes and small bristles. Postabdomen upper edge of each side bears spikes, the number of which varies from 18 to 22 in each row. The sizes of the male one ranges from 1.6 to 1.7 mm.

The eye of the male is bigger than the female eye. Front antennulas have a long thin flagellus with small hooks on the front edge of the end.

In conditions of the Ukrainian Roztocze species occur primarily in litoral zone of ponds, in floodplains of rivers with slow stream. *Sida* prefers thickets of *Potamogeton*,

young individuals sometimes occur in pelagic zone of reservoirs. The number of eggs in brood pouch varies from 53 to 72. Males and females with ephippium appear in populations in late October and November.

In waters of the Ukrainian Roztocze is registered speice *D. brachyurum* Lievin, 1848 (Fig. 2).

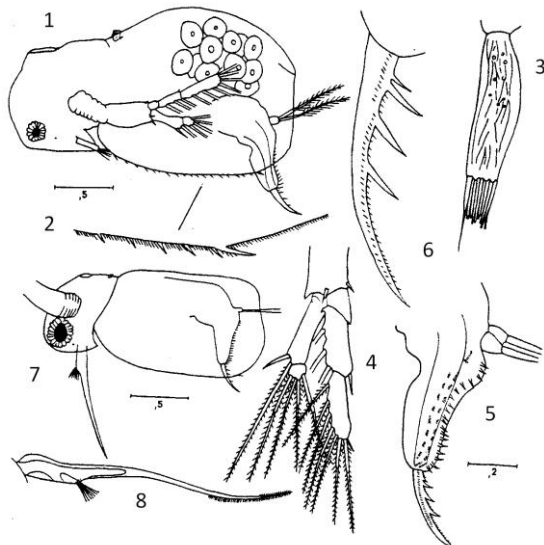


Fig. 1. *Sida crystallina* (O.F. Müller, 1776) [8]: 1 – female; 2 – carapace of female, ventral; 3 – antennule of female; 4 – second antenna of female; 5 – postabdomen of female; 6 - postabdominal claw of female; 7 - male; 8 – antennule of male

Female length changes in bounds of 0,71-1,21 mm. They have transparent, colorless shell leaves with high and straight rear edge, convex dorsal and ventral sides. Ventral edge of the leaves is armed with bristles (5-6 in medial part and 6-7 in the dorsal part of leaves, respectively). Between bristles and on the carapace of the rear edge there are numerous spines. Front antennules have a rod base with estetasks and one long bristle. Bristle and spike lie on the basis of rear antennules too, two-parted (top) and three-parted (bottom) branches of which carries 12 and 5 bristles, respectively.

Male length changes in scopes between 0,71 and 0,79 mm. Their front antennules have cylindrical basis, which proceeds into long flagellum, half-immersed into shell leaves. Estetasks are located in the medial part of this basis.

In the area of the Ukrainian Roztocze were indicated three varieties of *D. brachyurum*, judging from studying of features of brain department and organs of vision, namely: *D. b. leuchtenbergianum* Fisher, 1854; *D. b. megalops* Lilljeborg, 1900; *D. b. frontosa* Lilljeborg, 1900. *D. b. leuchtenbergianum* has elongated, narrowed in front part head and long swimming antennules, coming out from rear edge of shell leaves. This variety is the most common. *D. b. megalops* distinguishes with a big eye,

which covers approximately three fourth of front head part. *D. b. frontosa* is characterized by a short, nearly square head with convex bottom edge and comparatively small eye.

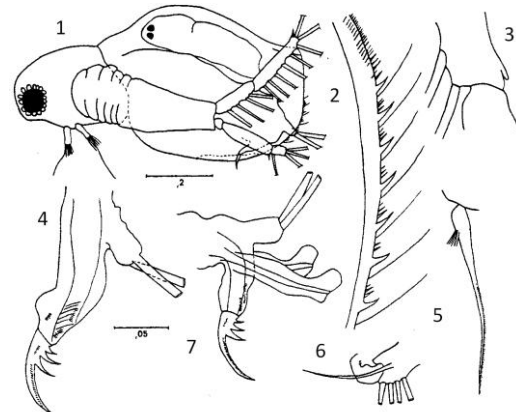


Fig. 2. *Diaphanosoma brachyurum* (Lievin, 1848) [8]: 1-female; 2 – carapace of female, rear edge; 3 - second antenna of female, first segment of ekzopodyt; 4 – postabdomen of female; 5 – antennule of male; 6 - phyllopods I of female; 7 - postabdomen of male

D. brachyurum in the conditions of Ukrainian Roztocze is found in a pelagic and littoral zone among water vegetative. Mostly, it prefers surfaces of oxbows and ponds. Life cycle is characterized by monocycling. The species are thermophilic, male and ephippium female are developed in populations, starting from the point, when water is cooled to 17-16 degrees. The fecundity varies from 5 to 8 eggs.

Materials on the characteristic of *Cladocera* of Ukrainian Roztocze were taken into account in the preparation of a Key to species identification of freshwater plankton in Europe with an indication of the ecology and distribution of organisms [7].

Conclusion. The research of population *S. cristallina*, in view of their important role in phytophilous biocenoses, further requires the use of modern genetic and population methods to identify the polymorphism features, patterns subspecies structure, character of closely related links between different subgenus.

The internal population variability of *Diaphanosoma* is caused, first of all, by diversity of the shape and size of head, eye, dimensional characteristics of antennules and correlation between their length and carapace are important as well. Investigations in morphological and ecological features of genus *Diaphanosoma* take place in solving priorities of ecological safety, local monitoring, aquatorium compartmentalization of the Ukrainian Roztocze and require an integrated approach with the use of current methods of multidimensional statistic, factorial and dispersal analysis.

ЛИТЕРАТУРА

- Іванець О. Р. Фауна гиллястовусих раків (*Crustacea, Cladocera*) Українського Розточчя / О. Р. Іванець // Вісн. Львів. ун-ту. Сер. біол., 2013. - Вип. 63. - С. 110-117.
- Іванець О. Р. Таксономічна структура кладоцероценозів Українського Розточчя / О. Р. Іванець // Вісник Львівського національного університету. Серія біологічна. – 2014а. – Вип. 64. – С. 260-269.
- Іванець О. Р. Еколого-морфологічна характеристика роду *Daphnia* O.F. Müller, 1785 (*Crustacea, Cladocera* Українського Розточчя / О. Р. Іванець // Біологічні Студії / *Studia Biologica*, 2014б. Т. 8/№2. С. 169 – 186.
- Іванець О. Р. Таксономія та еколого-морфологічна характеристика роду *Graptoleberis* (Sars, 1862) (*Cladocera : Anomopoda : Chydoridae*) Українського Розточчя / О. Р. Іванець // Вісник Львівського ун-ту. Сер. біол. – 2017. – Вип. 75. – С. 99-106.
- Коровчинский Н.М. Ветвистоусые ракообразные отряда *Ctenopoda* мировой фауны (Морфология, систематика,

- экология, зоогеография) / Н.М. Коровчинский // М.: КМК. - 2004. - 410 с.
6. Мануйлова Е. Ф. Ветвистоусые рачки (*Cladocera*) фауны СССР. / Е. Ф. Мануйлова // Л.: Наука, 1964. 327 с.
 7. Błędzki L. A. Freshwater Crustacean Zooplankton of Europe: *Cladocera & Copepoda (Calanoida, Cyclopoida)*. Key to species identification, with notes on ecology, distribution, methods and introduction to data analysis / L. A. Błędzki, J. I. Rybak // Switzerland: Springer International Publishing Switzerland. 2016. 918 p.
 8. Flössner D. Die *Haplopoda* und *Cladocera* (ohne *Bosminidae*) Mitteleuropas / D. Flössner // Backhuys Publishers, Leiden, 2000. 428 s.
 9. Hudec I. Fauna Slovenska III. *Anomopoda, Ctenopoda, Haplopoda, Onychopoda (Crustacea: Branchiopoda)* / I. Hudec // Bratislava: Veda, 2010. 496 p.
 10. Ivanets O. Small storages of the western Ukraine: hydrobiological characteristics and Peculiarities of the waterfowl (Ornithofauna) / O. Ivanets, I. Gorban // Limnology and waterfowl. Monitoring, modeling and management. Sandor Farago, Josef Kerekes. Sarrod-Sopron 21- 23. November, 1994. Societas Internationalis Limnologiae (SIL), Working Group on Aquatic birds, 1994. - P. 26.
 11. Ivanets O. R. Zooplankton of the water vegetation in the ponds of the west forest-steppe of Ukraine / O. R. Ivanets // Вісн. Львів. ун-ту. Сер. біол. Вип. 56. 2011. С. 148–156.
 12. Korovchinsky N. M. A new species of the genus *Diaphanosoma* Fischer, 1850 (Crustacea: Cladocera: Sididae) from Japan / N. M. Korovchinsky // Limnology, 2013 (14). P. 13–18
 13. Korovchinsky N. M. A new species of *Diaphanosoma* Fischer, 1850 (Crustacea: Branchiopoda: Sididae) inhabits lakes of the western United States of America / N. M. Korovchinsky // J. Limnol., 2016; 75(1). P. 52–61.
 14. Kotov A. A. Comparative analysis of the late embryogenesis of *Sida crystallina* (O.F. Muller, 1776) and *Diaphanosoma brachyurum* (Lievin, 1848) (Crustacea: Branchiopoda: Ctenopoda) / A.A. Kotov, O.S. Boikova // Hydrobiologia 1998, 380(1–3):103–125.
 15. Kovalchuk A. A. The impact of damming and water pondage on the formation and structure of zooplanktocoenoses in the conditions of rivers in the Ukrainian Roztocze (the “outer” or “chunk” Carpathians) / A. A. Kovalchuk, O. R. Ivanets // Issues and challenges of small hydropower development in the Carpathians region (hydrology, hydrochemistry, and hydrobiology of watercourses). Monograph. Uzhgorod-L'viv-Kyiv : Biological Faculty of L'viv National University & Hydroecological society “Uzh”, 2016. – P. 138-151.
 16. Wetzel R., Likens G. Limnological Analyses / R. Wetzel, G. Likens // Philadelphia; London; Toronto: W.B. Saunders Company. 1979. 357 p.

REFERENCES

1. Ivanets O. R. The fauna of cladocerans (Crustacea, Cladocera) of Ukrainian Roztochya / O. R. Ivanets // The Bulletin of the Lviv University. Series Biology, 2013. 63, 110–117.
2. Ivanets O. R. The taxonomic structure of cladocerenoses of Ukrainian Roztochya / O. R. Ivanets // The Bulletin of the Lviv University. Series Biology, 2014a, 64, 260–269.
3. Ivanets O. R. Ecological and morphological characteristics of genus *Daphnia* (Crustacea, Cladocera) Ukrainian Roztochia / O. R. Ivanets // Studia Biologica, 2014b, 8 (2), 169–186.
4. Ivanets O. R. Taxonomy, ecological and morphological characteristics of genus *Graptoleberis* (Sars, 1862) (*Cladocera* : *Anomopoda* : *Chydoridae*) of Ukrainian Roztocze / O. R. Ivanets // The Bulletin of the Lviv University. Series Biology, 2017, 75. - P. 260–269.
5. Korovchinsky N. M. Cladocerans of the order Ctenopoda of the world fauna (Morphology, systematics, ecology, zoogeography) / N. M. Korovchinsky // М.: КМК - 2004. - 410 p.
6. Manujlova E. F. *Cladocera* fauny SSSR / E. F. Manujlova // L.: Nauka, 1964. 327 s.

Фауна и морфо-экологическая характеристика семейства *Sididae*, Baird, 1850 (*Crustacea: Cladocera: Ctenopoda*) Украинского Расточья

О. Р. Иванец

Аннотация. На основании анализа современной литературы и собственных исследований подана фаунистическая и морфо-экологическая характеристика семейства *Sididae*, Baird, 1850 (*Crustacea: Cladocera: Ctenopoda*) Украинского Расточья. Основой работы послужили 314 проб, собранных в 2008-2017 г.г. на Украинском Расточье. Исследования проводились на живом и фиксированном материале. В целом исследовано 283 особи рода *Sida* и 157 особей рода *Diaphanosoma*. В водоемах Украинского Расточья выявлена *Sida crystallina crystallina* и зарегистрированы три варианта *Diaphanosoma brachyurum*: *D. b. leuchtenbergianum* Fisher, 1854; *D. b. megalops* Lilljeborg, 1900; *D. b. frontosa* Lilljeborg, 1900.

Ключевые слова: зоопланктон, *Cladocera*, *Sididae*, Украинское Расточье.