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First Finding of Freshwater Bryozoans *Lophopodella carteri* Hyatt, 1866 in the Kylian Delta of the Danube River[1]

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Abstract—The freshwater bryozoan species *Lophopodella carteri* (Hyatt, 1866) new to Ukraine was found in the mouth of the Bystryi arm (Kylian delta of the Danube River) as a component of the fouling community.

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INTRODUCTION

The freshwater bryozoans of the *Lophopodella* genus were first described in fresh waters of India 144 years ago and assigned to the genus *Cristatella* (Cuvier, 1798). Later on, the separate genus *Lophopodella* was delineated (Rousselet, 1904). These freshwater bryozoans were also found in countries like Burma, Ceylon (Annandale, 1911), and Seistane (Annandale, 1919) at the border of modern Iran and Afghanistan. Afterward, several other findings of species belonging to the *Lophopodella* genus were reported: on Java Island, in Indonesia (Vorstman, 1928), in Sumatra—*Lophopodella pectinatelliformis* (Lacourt, 1959), in Japan (Toriumi, 1941), in China (Lee Lao-Yuing, 1936), in Michigan (USA) (Lauer and Barnes, 1997), and in several localities of tropical Africa (Borg, 1936). In Europe, *Lophopodella carteri* was first described by Abrikosov and Kosova (1963) in benthos, plankton, and phytophilous fauna in the submerged part of the Volga delta. These species were also found in Bulgaria (Gryncharova, 1968).

MATERIAL AND METHODS

Samples of epifauna were collected from the protective stone dike (45°20′02.43″N, 29°47′01.96″E) in the Bystryi arm (submerged part of the Danube delta) in summer–autumn 2010. The samples were scraped with a scraper with a 10-cm cutting edge. The material sampled was washed through mesh no. 23 and fixed with 4% formalin. The samples were further processed according to the conventional techniques (*Methodi* ..., 2006]. The bryozoans were identified according to the taxonomic key compiled in (Gontar and Vinogradov, 1994; Vinogradov, 2008) and then underwent laboratory analysis at the Hydroanalytical Center of the Hydrobiology Institute, National Academy of Sciences of Ukraine. The specimens were examined under an AXIO IMADGER A I microscope (Carl Zeiss), and microphotographs of *Lophopodella carteri* statoblasts were taken with an Axio Com (MRC 5) camera. Axiovisio 4.4 software was used for processing and morphometry of microphotographs. Materials (preparation no. 125) are kept in the Laboratory of Danube Hydroenvironmental Problems, Institute of Hydrobiology, National Academy of Sciences of Ukraine.

RESULTS AND DISCUSSION

Within the scope of the complex hydroecological survey of the water bodies in the Bystryi arm of the Kylian delta of the Danube, live spinoblasts (five specimens) and fragments of a *Lophopodella carteri* colony were found in the epifauna cenosis in the protective stone dike in the estuary of the arm (Fig. 1).

The Bystryi (Novostanbul) arm is a part of the complex dynamic system of the water streams in Kylian delta of the Danube. The length of the arm is 9.3 km, the width is 180 m, and the average depth is 7.7–7.9 m (*Gidrologiya* ..., 2004).

The water at the site where bryozoans were detected belongs to hydrocarbonate-calcium C_{II}^{Ca}, type with pH within 7.49–7.60 and concentration of dissolved oxygen within 7.10–7.20 mg O_2/L. The water temperature varies within 29–30°C in summer and 13–15°C in autumn. It should also be noted that this species was discovered by G.G. Abrikosov (Abri-

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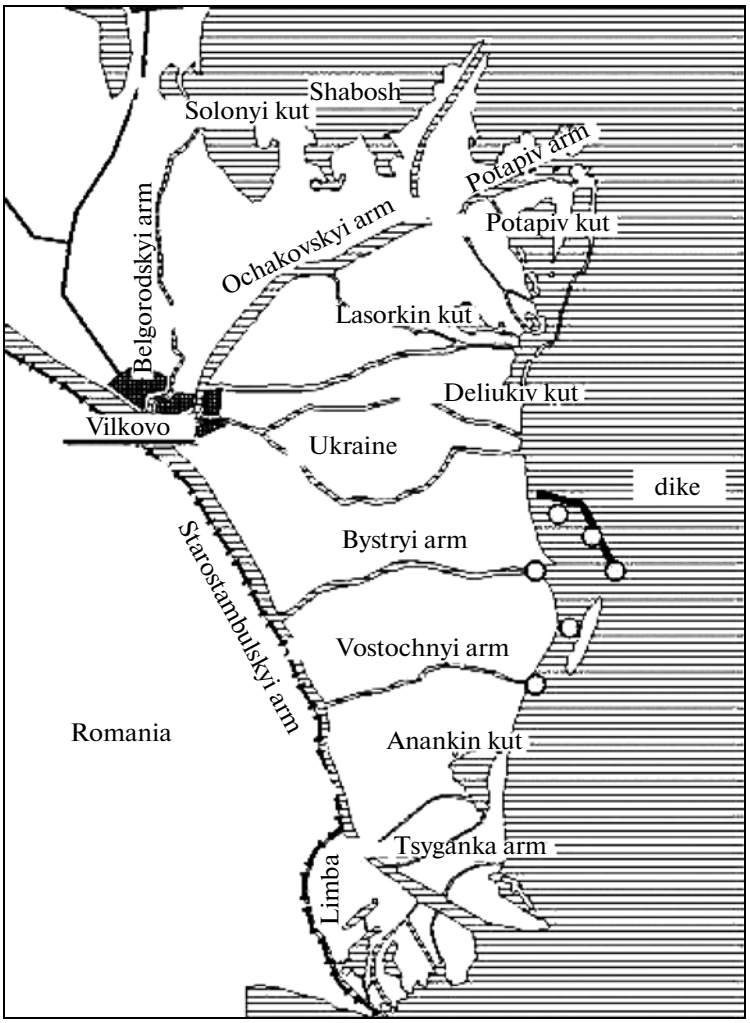

Fig. 1. Map of the Kylian delta of the Danube, Ukraine; the collection sites of samples are indicated.

kosov and Kosova, 1963) in the Volga delta and Timothy Wood (Wood and Marsh, 1996; Marsh and Wood, 2002) in the Great Lakes with similar parameters of the water masses.

The fragments of the colonies appeared like slimy transparent vertical lobulated sacs, several millimeters in height, with separate autozoids inside. Statoblasts (spinoblasts) are broad oval ones with rounded poles (Fig. 2) possessing 7–14 spines and hooks (Fig. 3).

The medial spines are longer than the lateral ones. The length (L) of statoblasts varied within 1070–1150 μm, and the width (B) varied within 705–784 μm with the L/B ratio being within 1.48–1.52. The length of the medial spines is within 65–78 μm, and lateral spines are within 44–52 μm.

Such taxonomic features are in line with the description of *Lophopodella carteri* species given in the taxonomic key compiled in (Gontar and Vinogradov, 1994; Vinogradov, 2008).

The shape of the statoblast, the number of spikes in the poles, and the statoblast index (L/B) represent the major taxonomic features distinguishing *Lophopodella carteri* from other species of the *Lophopodella* genus (Rousselet, 1904), such as *L. pectinatelliformis* (Lacourt, 1959) and *L. stuhlmanni* (Kraepelin, 1914). In *L. pectinatelliformis*, poles have up to 36 small spines with the statoblast index of 1.33. Furthermore, in *L. pectinatelliformis*, there is a specific outgrowth on the poles of statoblasts.

In *L. stuhlmanni*, statoblasts are round, almost square with 7–8 spines of equal length on their poles, and the statoblast index is 1.10 (Vinogradov, 2008). Therefore, it is impossible to provide an inaccurate species identification for our specimens (Gontar and Vinogradov, 1994; Vinogradov, 2008).

To date, *Lophopodella carteri* is prevalent in almost all zoogeographical regions (Fig. 4), except for the Neotropical and Antarctic regions and the Pacific islands (Wood and Marsh, 1996; Wood et al., 2006).

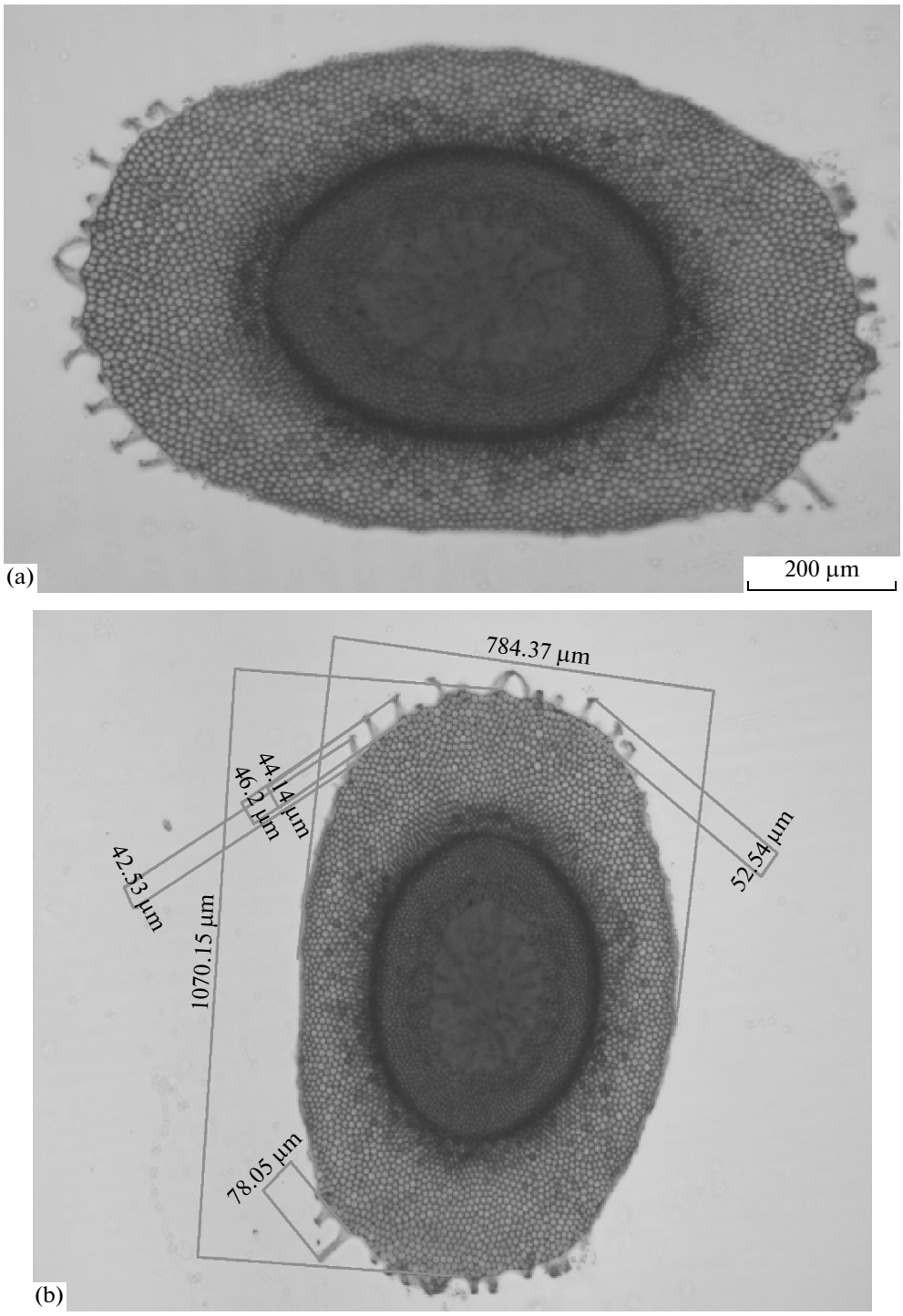

Fig. 2. (a) Statoblast of *Lophopodella carteri* from the dorsal side; (b) parameters of statoblast.

In the Palaearctic region, *Lophopodella carteri* was found both in the Asian part—China, Japan, Afghanistan, and Iran (Annandale, 1919; Lee Lao-Yuing, 1936; Toriumi, 1941; Wood and Marsh, 1996; Wood et al., 2006; Massard and Geimer, 2008)—and in European part—Russia, Bulgaria, and Ukraine (Abrikosov and Kosova, 1963; Gryncharova, 1968). In the Oriental region, this species, according to the literature, is known from India, Indonesia, Thailand, Sumatra, and Ceylon (Annandale, 1911; Vorstman, 1928; Lacourt, 1959; Massard and Geimer, 2008). In the Nearctic region, *Lophopodella carteri* was noted

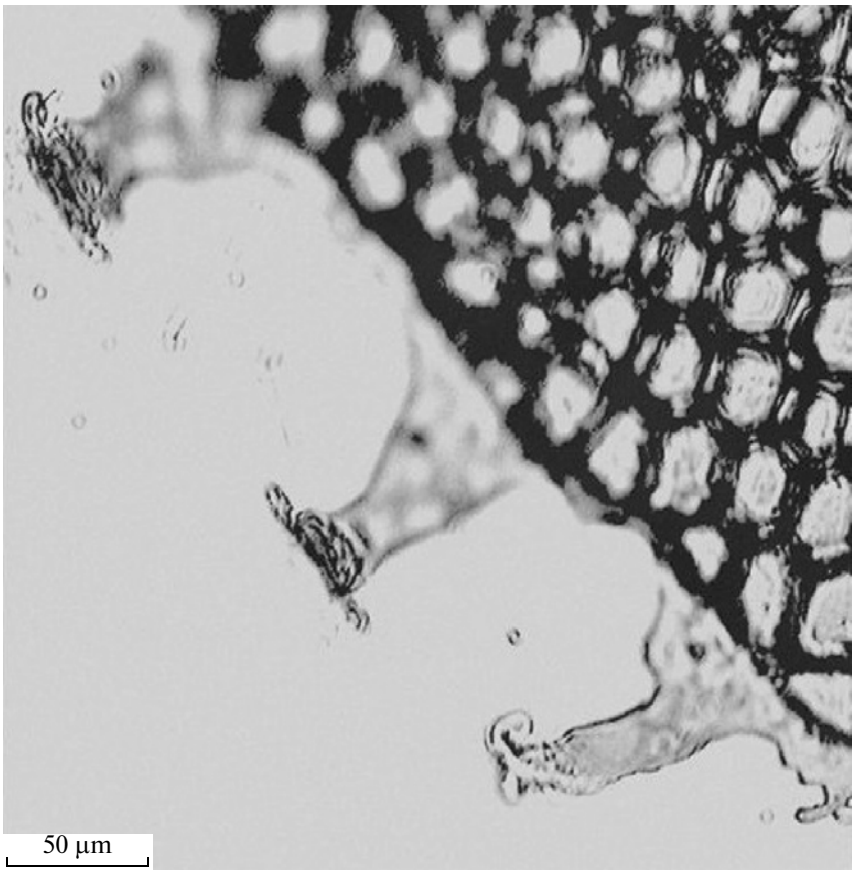

Fig. 3. Spines with hooks at high magnification.

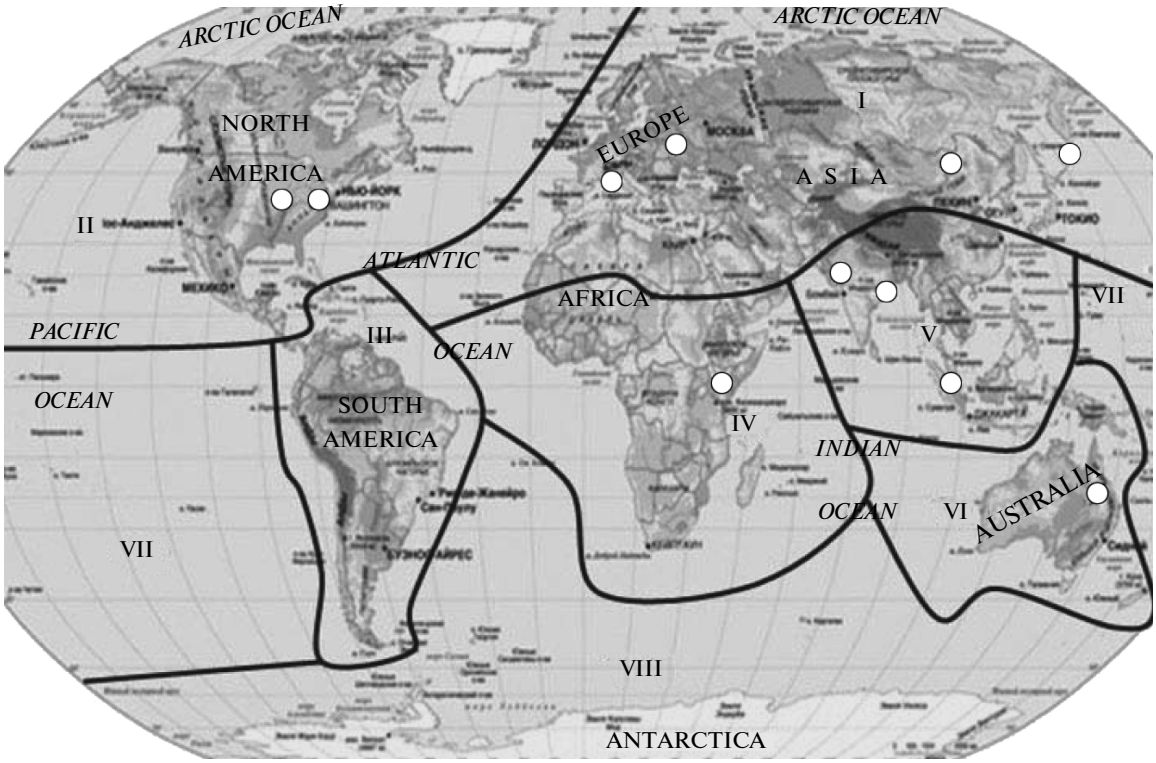

Fig. 4. Zoogeographical distribution map of *Lophopodella carteri*: (I) Palaearctic region; (II) Nearctic region; (III) Neotropical region; (IV) African tropical region; (V) Oriental region; (VI) Australian region; (VII) Pacific islands; (VIII) Antarctic region (according to Massard and Geimer, 2008).

only in the United States—in the Great Lakes (Wood and Marsh, 1996; Lauer and Barnes, 1997; Wood et al., 2006; Massard and Geimer, 2008). According to (Borg, 1936; Brettnal, 1920), this pearlwort was recorded in Australia and many places in tropical Africa (see Fig. 4).

The settlement of *Lophopodella carteri* in the Kylian delta seems to be associated with the passive transfer of statoblasts of the species with the migratory birds flying over the Danube delta. The transfer of statoblasts with ships also cannot be ruled out, since the Danube is a gateway to Europe. At present, it is too early to predict the further development of the species in the Danube delta. Perhaps in time, *Lophopodella carteri* will become a typical companion of the fouling, or, perhaps, this is just a rare find.

In summary, it should be noted that the fact of *Lophopodella carteri* settlement in the Danube delta supports the hypothesis of Abrikosov (1959), stating that spinoblasts represent the highest evolutionary form of the bryozoan statoblasts by not only ensuring protection of the species in an unfavorable environmental setting but also supporting expansion of the species.

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