Occurrence of *Plumatella emarginata* Allman, 1844 and *P. casmiana* Oka, 1908 (Bryozoa, Phylactolaemata) in Lake Pamvotis (Ioannina, Greece)

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Abstract. In August 2007 colonies of *Plumatella emarginata* Allman, 1844 and *P. casmiana* Oka, 1908 (Bryozoa, Phylactolaemata) were found in Lake Pamvotis near Ioannina (Epirus, NW Greece).

Key words. Bryozoa, Phylactolaemata, *Plumatella emarginata*, *Plumatella casmiana*, Lake Pamvotis, Ioannina, Greece, first record.

1. Introduction

Most freshwater bryozoans belong to the exclusively freshwater-inhabiting class Phylactolaemata; they reproduce asexually by means of statoblasts (buoyant floatoblasts and fixed sessoblasts), which are very important for species identification. A small number of freshwater bryozoans belong to the essentially marine class Gymnolaemata (order Ctenostomatida).

The present distribution data of freshwater bryozoans in Europe are still fragmentary, there being quite a number of countries with practically no data available. One of these countries is Greece, where the gymnolaemate *Victorella pavida* occurring in the Aegian Sea has been recorded from littoral brackish water sites east of the Khalkidhiki peninsula (Limni Vistonida; mouth of the affluent of Lake Lafruda) and the north coast of the island of Thasos, in a trench filled with brackish water (Valkanov 1943, Carrada & Sacchi 1964). The phylactolaemate *Fredericella sultana* was recently reported from Crete (Massard & Geimer 2006, 2007), but at that moment there were no data available about the phylactolaemates of the Greek mainland (Fauna Europaea 2007).

2. Study site and methods

On August 15, 2007 we found numerous colonies of bryozoans in Lake Pamvotis (Lake Pamvotida, Limni Pamvotis, Lake Ioannina, Limni Ioanninon) near Ioannina (Epirus, NW Greece, 20°53'E, 39°40'N), an ancient Mediterranean shallow lake with a mean depth of about 4 m (maximum around 10 m), covering an area of 22.8 km^2 (maximum length: 8 km, maximum width: 5 km) and situated 470 m above sea level. The lake, which has no superficial outflow, is highly eutrophic, with macrophytes and abundant phytoplankton (frequent phytoplankton blooms) (Fels 1957, Anagnostidis & Economou-Amilli 1980, Kagalou et al. 2001a,b, Kagalou et al. 2003, Frogley & Preece 2004, Kagalou et al. 2006). The urban pollution of the lake is attested by its contamination with *Giardia* cysts and *Cryptosporidium* oocysts (Karanis et al. 2002).

The lake shores and the island coasts are covered with dense and extensive reed zones, either Phragmitetum with *Phragmites australis* or Scirpeto-Phragmitetum, that give shelter to a diverse avifauna, including many migratory species (natura.minenv.gr 2004).

Concerning the fauna of Lake Pamvotis, studies on the following topics may be mentioned: zooplankton (Serafimova-Hadzisce

1974, cited by Frogley et al. 2001), molluscs (Frogley & Preece 2004, 2007, Pavlidis 2005), ostracods (Frogley et al. 2001), macrobenthic fauna (Economidis 1999, Kagalou et al. 2001a, Kagalou et al. 2006), fish (Riedel 1975). The palaeoenvironmental conditions have been investigated by Frogley et al. (2001), Tzedakis et al. (2003), Lawson et al. (2004).

Lake Pamvotis is listed among the sites of Community importance for the Mediterranean biogeographical region (SCI code: GR2130005) adopted in 2006 by the European Commission (European Commission 2006).

The bryozoan colonies were collected on various substrates in the *Phragmites* zone of the NW shore region of Nisi Ioanninon (39°41'N, 20°53'E), the very touristic fishermen's islet with its small village (Kinotita Nisou Ioanninon, about 400 inhabitants) situated in the lake. The collection sites (Figs 1-2) were located on the part of the shore roughly delimited by the monasteries Philantropenoi (Monastery of Aghios Nikolaos Philantropenoi) and Stratigopoulos (St. Nicolas Stratigopoulos Monastery).

3. Results

The following species were identified.

***Plumatella emarginata* Allman, 1844**

Numerous, often dense colonies on submerged branches, stems and stones, some even on young dreissenids (*Dreissena* sp.) attached to branches. Tubes crammed with floatoblasts; sessoblasts present, but not numerous. Dimensions of the floatoblasts: average 464 x 304 µm, minimum 434 x 291 µm, maximum 496 x 304 µm; sessoblast dimensions: 465 x 310 µm, 434 x 291 µm, 440 x 298 µm.

Concerning the identification of the dreissenids, Frogley & Preece (2007) assert that the *Dreissena* of Lake Pamvotis, formerly assigned to *Dreissena blanci* Westerlund, 1890, actually belong to *Dreissena (Dreissena) stankovici* L'vova & Starobogatov, 1982, a species also known from Lake Ohrid (Macedonia) and Lake Prespa (shared by Macedonia, Albania and Greece), whereas Albrecht et al. (2007) point out that *D. stankovici* is the most widespread species in the west-central Balkans, and that it occurs sympatrically with its southern sister taxon *Dreissena blanci* in Lake Pamvotis, as well as in Lake Prespa and Lake Mikri Prespa (Greece) (provided that *D. blanci* and *D. stankovici* represent two distinct species).



Fig. 1. View on Lake Pamvotis and Nisi Ioanninon from the road Metsovo-Ioannina.



Fig. 2. Collecting site on the NW coast of Nisi Ioanninon.

***Plumatella casmiana* Oka, 1908**

A few small colonies, with dark cystids, keeled tubes, some rare sessoblasts, some pycnoblasts (304 x 236 µm, 366 x 186 µm, 391 x 205 µm, 310 x 223 µm) and some typical, partially open leptoblasts on the outside of the tubes (366 x 180 µm, 366 x 180 µm, 347 x 186 µm).

***Plumatella* sp. sessoblasts**

Plumatella sessoblasts, probably *P. emarginata*, were found on a dead shell of *Viviparus mamillatus* (Küster, 1852), a gastropod distributed throughout the western Balkans from Croatia southwards into Epirus (Frogley & Preece 2007). The hitherto recognized *Viviparus mamillatus janinensis* (Mousson, 1859) = *Viviparus janinensis* (Mousson, 1859) (Frogley & Preece 2004), considered as an endemic of Lake Pamvotis, is no longer separated as a subspecies (Frogley & Preece 2007).

4. Discussion

It is likely that the freshwater bryozoan fauna of Greece is not restricted to the brackish water gymnolaemate *Victorella pavida* mentioned in the introduction and the three phylactolaemate species we have encountered:

Table 1. Distribution of freshwater bryozoans in Greece and the surrounding countries.

Species	GR1	GR2	BG	RO	YU	TR
Gymnolaemata						
Victorella pavida	+		+	?		
Paludicella articulata				+		
Phylactolaemata						
Fredericella sultana		+	+	+		+
Internectella bulgarica			+			
Hyalinella punctata			+	+		
Plumatella casmiana	+		+	?	+	
Plumatella emarginata	+		+	+		
Plumatella fruticosa			+	+	+	
Plumatella fungosa				+		
Plumatella repens			+	+		
Pectinatella magnifica				+		+
Cristatella mucedo			+	+		
Lophopus crystallinus			+	+		
Lophopodella carteri			+			

BG: Bulgaria (Fauna Europaea 2007, Pateev 1924, Valkanov 1934, 1936, 1943, Arndt 1943, Grancarova [Gruncharova] 1968a,b, 1971, 1977, Kovachev et al. 1999). GR1: Greece (mainland + Thasos) (Valkanov 1943). GR2: Greece (Crete) (Massard & Geimer 2006, 2007). RO: Romania (Fauna Europaea 2007, Chirica 1906, Arndt 1943, Prenant & Bobin 1956, Capuse 1962, Marinescu 1987). TR: Turkey. *Pectinatella magnifica*: Lake Egridir (Lacourt 1968, Rodriguez & Vergon 2002), *Fredericella sultana:* Tchoubouk dam and lake, Ankara (Lacourt 1968). YU: Serbia and Montenegro (Lacourt 1968, Velikonja 1992); *Plumatella casmiana* is known from Serbia.

Plumatella emarginata and *P. casmiana* on the Greek mainland (this study) and *Fredericella sultana* on the isle of Crete (Massard & Geimer 2007).

A look at the species list from Bulgaria and Romania (Table 1) tends to indicate that more species are to be expected in Greece, in particular a number of species which are common elsewhere in Europe, such as *Fredericella sultana, Hyalinella punctata, Plumatella fruticosa, Plumatella fungosa, Plumatella repens, Cristatella mucedo.* It cannot be excluded that one or the other of these species has already been mentioned in local limnological or faunistic studies not easily accessible to bryozoologists, especially if written in Greek.

So Greece mostly remains a *terra incognita* as far as freshwater bryozoans are concerned (Massard & Geimer 2005), this being also true for Turkey (2 species reported in the literature; no freshwater bryozoan recorded in the European part of that country), Serbia and Montenegro (2 species recorded), Albania or Macedonia (no species recorded).

References

Albrecht, C. & R. Schultheiß, T. Kevrekidis, B. Streit & T. Wilke, 2007. Invaders or endemics? Molecular phylogenetics, biogeography and systematics of *Dreissena* in the Balkans. *Freshwater Biology* 52 (8): 1525–1536.

Anagnostidis, K. & A. Economou-Amilli, 1980. Limnological studies at Lake Pamvotis (Ioannina), Greece. *Archiv für Hydrobiologie* 89: 313-342.

Arndt, W., 1943. Beiträge zur Kenntnis der Süsswasserfauna Bulgariens (Ergebnisse eines Aufenthaltes in Bulgarien im Juli-August 1924). *Bulletin de l'Institut royal d'Histoire naturelle de Sofia* 16: 189-206.

Capuse, I., 1962. Contributii la cunoasterea Briozoarelor din R.P.R. [Contribution à la connaissance des Bryozoaires de la R.P. Roumaine, résumé français]. *Comunicarile Academici Republicii Populare Române, Bucuresti* 12 (2): 213-216.

Carrada, G.C. & Sacchi, C.F., 1964. Recherches écologiques sur le Bryozoaire cténostome *Victorella pavida* Saville Kent. *Vie et Milieu* 15: 389-427.

Chirica, C., 1906. Notes sur les Bryozoaires de Roumanie. *Annales Scientifiques de l'Université de Jassy* 3: 4-14.

Economidis, G., 1999. Seasonal variation of macrobenthic abundance of Lake Pamvotis (Ioannina). In: Fifth Hellenic Symposium on Oceanography and Fisheries, Kavala: 355-356.

European Commission, 2006. 2006/613/EC: Commission Decision of 19 July 2006 adopting, pursuant to Council Directive 92/43/EEC, the list of sites of Community importance for the Mediterranean biogeographical region (notified under document number C(2006) 3261). *Official Journal of the European Union*, vol. 49, L 259, 21.9.2006: 1–104.

Fauna Europaea, 2007. Bryozoa (Ectoprocta). Fauna Europaea version 1.3, URL: http://www.faunaeur.org.

Fels, E., 1957. Der Ioánnina-See in Griechenland. *Stuttgarter geographische Studien* 69: 247-252.

Frogley, M.R., H.I. Griffiths & T.H. Heaton, 2001. Historical biogeography and Late Quaternary environmental change of Lake Pamvotis, Ioannina (north-western Greece): evidence from ostracods. *Journal of Biogeography* 28: 745-756.

Frogley, M.R. & R.C. Preece, 2004. A faunistic review of the modern and fossil molluscan fauna from Lake Pamvotis, Ioannina, an ancient lake in NW Greece: implications for endemism in the Balkans. In: H.I. Griffiths et al. (eds), Balkan biodiversity: 243-260.

Frogley, M.R. & R.C. Preece, 2007. A review of the aquatic mollusca from Lake Pamvotis, Ioannina, an ancient lake in NW Greece. *Journal of Conchology* 39: 271-295.

Grancarova, T., 1968a. Prinos kam izucavane na sladkovodnate briozoina fauna v Balgarija [Beitrag zur Erforschung der briozoischen Süsswasserfauna in Bulgarien, dtsch. Zusammenf.]. *Bulletin de l'Institut de Zoologie et Musée, Académie Bulgare des Sciences* 26: 39-46.

Grancarova, T., 1968b. Novi briozoi za faunata na Balgarija. I. *Urnatella gracilis* Leidy (Bryozoa Entoprocta); *Hyalinella punctata* (Hancock) (Bryozoa Ectoprocta) [Neue Bryozoen in der bulgarischen Fauna, dtsch. Zusammenf.]. *Bulletin de l'Institut de Zoologie et Musée, Académie Bulgare des Sciences* 28: 197-204.

Grancarova, T. [Gruncharova], 1971. *Internectella bulgarica* nov. gen., nov. sp. A new Bryozoa species (Bryozoa, Phylactolaemata). *Comptes rendus de l'Académie bulgare des Sciences* 24 (3): 361-364.

Grancarova, T. [Gruncharova], 1977. Fouling in the Liman of Ropotamo River. II. Bryozoan fauna. *Hydrobiology* 6: 89-100, Sofia [in Bulgarian, English summary].

Kagalou, I., G. Economidis, I. Leonardos & C. Papaloukas, 2006. Assessment of a Mediterranean shallow lentic ecosystem (Lake Pamvotis, Greece) using benthic community diversity: response to environmental parameters. *Limnologica* 36: 269-278.

Kagalou, I., E. Papastergiadou, G. Tsimarakis & D. Petridis, 2003. Evaluation of the trophic state of Lake Pamvotis (Greece), a shallow urban lake. *Hydrobiologia* 506 (1): 745-752.

Kagalou, I., G. Tsimarakis, S. Karkabounas & L. Natsis, 2001a. An integrated water quality assessment of the Lake Pamvotis: restoration and management scenarios. 7th International Conference on Environmental Science and Technology, Ermoupolis, Syros Island, Greece, Sept. 2001: 166-171.

Kagalou, I., G. Tsimarakis & I. Paschos, 2001b. Water chemistry and biology in a shallow lake (Lake Pamvotis - Greece): present state and perspectives. *Global Nest: the International Journal* 3 (2): 85-94.

Karanis, P., C. Papadopoulou, A. Kimura, E. Economou, C. Kourenti & H. Sakkas, 2002. *Cryptosporidium* and *Giardia* in natural, drinking, and recreational water of Northwestern Greece. *Acta hydrochimica et hydrobiologica* 30: 49-58.

Kovachev, S., S. Stoichev & V. Hainadjieva, 1999. The zoobenthos of several lakes along the Northern Bulgarian Black Sea Coast. *Lauterbornia* 35: 33-38.

Lacourt, A.W., 1968. A monograph of the freshwater Bryozoa: Phylactolaemata. *Zoologische Verhandelingen* 93: 1-159.

Lawson, I., M. Frogley, C. Bryant, R. Preece & P. Tzedakis, 2004. The Lateglacial and Holocene environmental history of the Ioannina basin, north-west Greece. *Quaternary Science Reviews* 23: 1599-1625.

Marinescu (Popescu-Marinescu), V., 1987. Die Entwicklung der Benthos-Zoozönose in der Donau im Bereich des Stausees Eisernes Tor II. In: Internationale Arbeitsgemeinschaft Donauforschung der Societas Internationalis Limnologiae (Hrsg.), Wissenschaftliche Kurzreferate, 26. Arbeitstagung, 14.-18. September 1987, Passau: 152-155.

Massard, J.A. & G. Geimer 2005. Die Süßwasserbryozoen in der Fauna Europaea 2004: Karten und Kommentare. *Denisia* 16: 167-174.

Massard, J.A. & G. Geimer, 2006. A bryozoological by-product of tourism: first record of *Fredericella sultana* (Blumenbach, 1779) in Crete. Abstracts of contributions to the Bryozoan-Workshop, 8th-10th September 2005, Biology Center of the Upper Austrians Museums, 4040 Linz-Dornach, Austria. *Linzer biologische Beiträge* 38/1: 12.

Massard, J.A. & G. Geimer, 2007. First record of *Fredericella sultana* (Blumenbach, 1779) (Bryozoa, Phylactolaemata) in Crete (Greece). *Bulletin de la Société des Naturalistes luxembourgeois*, 108: 45-46.

natura.minenv.gr, 2004. GR2130005, Limni Ioanninon. URL: http://natura.minenv.gr/natura/server/user/biotopos_info.asp?siteCode=GR2130005 [download 22.1.2008]

Pateev, P., 1924. Mitteilungen über die Süsswasser-Bryozoen Bulgariens. *Arbeiten der Bulgarischen naturforschenden Gesellschaft* 11: 119-121.

Pavlidis, N., 2005. Exhibition of fresh water and land shells of mountainous Epirus. Personal collection of Nicholas Pavlidis. Ioannina, 6 pp.

Prenant, M. & G. Bobin, 1956. Bryozoaires. Première partie. Entoproctes, Phylactolèmes, Cténostomes. *Faune de France* 60: 1-398.

Riedel, D., 1975. Greece: a survey on carp and eel culture fisheries in Lake Ioannina. A report prepared for the Study of Fishery Methods and Requirements in Epirus Project. FAO Corporate Document Repository, originated by: Fisheries and Aquaculture Department. URL: http://www.fao.org/docrep/field/003/F9266E/F9266E00.HTM

Rodriguez, S. & J.P. Vergon, 2002. *Pectinatella magnifica* Leidy 1851 (Phylactolaemates), un bryozoaire introduit dans le nord Franche-Comté. *Bulletin Francais de la Pêche et de la Pisciculture* 365-366: 281-296.

Serafimova-Hadzisce, J., 1974. Zooplankton in some lakes of Aegean lake zone. *Fragmenta Balcanica* 9: 165-168.

Tzedakis, P.C., M.R. Frogley & T.H.E. Heaton, 2003. Last Interglacial conditions in southern Europe: evidence from Ioannina, northwest Greece. *Global and Planetary Change* 36: 157-170.

Valkanov, A. 1934. Beitrag zur Hydrofauna Bulgariens. Sofia, 32 pp. (in Bulgarian).

Valkanov, A., 1936. Notizen über die Brackwässer Bulgariens. II. Versuch einer hydrographischen und biologischen Erforschung derselben. *Godishnik na Sofiyskiya Universitet, Fiziko-matematicheski Fakultet (Annuaire de*

l'Université de Sofia, Faculté des sciences physiques et mathématiques) 32: 209-341.

Valkanov, A., 1943. Beitrag zur Kenntnis der Bryozoengattung *Victorella* S. Kent. *Arbeiten aus der biologischen Meeresstation in Varna* 12: 1-8.

Velikonja, M., 1992. Prispevek k poznavanju sladkovodnih mahovnjakov (Bryozoa) Slovenije. A contribution to the knowledge of the freshwater Bryozoa of Slovenia. *Bioloski Vestnik* 40 (1992) 2: 83-88 (summary in English).