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CYANOBACTERIA DIVERSITY IN KAMANOS RAISED BOG (NORTH-WEST LITHUANIA)

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Abstract

Koreivienė J., Kasperovičienė J., Karosienė J., 2015: Cyanobacteria diversity in Kamanos raised bog (north-west Lithuania) [Melsvabakterių įvairovė Kamanų aukštapelkėje (šiaurės-vakarų Lietuva)]. – Bot. Lith., 21(2): 139–149

The current study summarised the diversity of cyanobacteria found in various habitats of the second largest raised bog of Lithuania. A total of 56 cyanobacteria species that comprise 19% of all phycoflora diversity in Kamanos raised bog were recorded. Species from the *Chroococcales* (32 species) order and the *Chroococcus* (7), *Aphanothece* (7) genera were the most numerous. Twenty one cyanobacteria species were found in Lithuania for the first time. Most of species recorded in Kamanos raised bog were cosmopolite or distributed in temperate zone. One third of the species were characteristic particularly of the peat bogs. Thirty nine species of cyanobacteria were specific to the particular water body and occurred only in 1–3 of the studied localities. Only five species, i.e. *Chroococcus turgidus, Aphanocapsa grevillei, Aphanothece elabens, Cyanosarcina* sp. and *Hapalosiphon* sp. were common. Peculiarities of the habitat were the most important drivers determining species richness and composition of cyanobacteria in a particular locality.

Keywords: Central Europe, cyanoprokaryotes, peat bog, peat land, protected areas, species diversity.

INTRODUCTION

Peat bogs comprise more than half of the world's wetlands. They are the major contributors to the natural diversity, important sources of biological material and genetic richness (Bragg & Lindsay, 2003). Raised bogs are critical for carbon storage, global climate change regulation and flood prevention (Čivić & Jones-Walters, 2010). They provide a refuge for a rich diversity of animals, plants, microorganisms including cyanobacteria and algae.

Since 1800s, when the industrial revolution started, human negative impact on natural habitats has increased (Čivić & Jones-Walters, 2010). Agricultural and industrial pressure has intensified over the last fifty years due to the rise of human population leading to such dramatic changes as the global warming and eutrophication of aquatic ecosystems (Clark et al., 2010a, 2010b; Gallego-Sala & Prentice, 2013). Global warming reduces *Sphagnum* cover in bogs, alters regulatory role of this species on microbial community that lead shortening of microbial food chains and change of their composition (Jassey et al., 2013). According to Mieczan et al. (2015a, b), nutrient enrichment destabilises peat bog function by modifying interactions between microbial communities. Nevertheless, changes do not alter phycoflora species richness significantly, but influence the species composition within the same taxonomic group. In human impacted lakes, stenotype species usually are replaced by common species with a broad range of ecological requirements (Wilk-Woźniak et al., 2014).

Western and Southern European countries have lost 90% of their original natural peat bogs; fortunately the losses have been less severe in Central Europe (Wetlands International, 2003; Bragg & Lindsay, 2003). Therefore, peat bog habitats and species are protected under the Habitats (92/43/EC) and

Birds (2009/147/EC) Directives and usually belong to Natura 2000 sites in many European countries.

Inland wetlands occupy 26.7% of Lithuania's territory, while near-natural raised bogs cover only 0.76% (Taminskas et al., 2011). The number of wetlands exceeding 50 ha diminished twice throughout the last half of the 20th century and nowadays account for up to 800 (Švažas et al., 2000). All natural over 500 ha raised bogs (~19% of wetlands) are protected in the country. Kamanos is the second largest peat bog in Lithuania. It includes raised bog, fens, transition mires, the relict Lake Kamanos and more than 120 small pools; the waters altogether make up 21.5 ha (Švažas et al., 2000). In 1979, the Kamanos State Strict Nature Reserve, the wetland complex area exceeding 2000 ha, was established. It has been designated as Ramsar site since 1993.

A certain ecological group of algae and cyanobacteria adapted to the life in raised bogs is proposed to name as „sphagnum algae" (Jacuńska, 2010). The studies of autotrophic microorganisms in Lithuanian raised bogs, similarly to the investigations in other European countries, have mainly been focused on desmids, the most diverse group of green algae in such type of habitat. Desmids have been studied in Kamanos, Šepeta peat bogs (Vilkaitis, 1924–1926; 1936; 1940), Dubičiai bog lakes (Jakimavičiūtė et al., 2006), Girutiškis mire (Briškaitė et al., 2008) and overviewed in Kostkeviciene et al. (2003). However, almost no attention has been paid on cyanobacteria in these unique habitats. Cyanobacteria have been less involved into investigations in European countries as well. They have been investigated particularly in peat bogs of the Czech Republic, Hungary, Latvia, Poland, Slovakia and Slovenia (Matula, 1995; Pietryka, 2000; Nováková, 2002; Borics et al., 2003; Krivograd-Klemenčič & Vrhovšek, 2003; Owsianny & Gąbka, 2006; Piątek, 2007; Druvietis et al., 2010; Krivograd-Klemenčič et al., 2010; Jacuńska, 2010; Hindák, 2012a, b; Hindák & Hindáková, 2012; Grabowska et al., 2014).

The aim of this study was to investigate diversity of cyanobacteria in various types of habitats of Kamanos raised bog.

Table 1. Physico-chemical characteristics of the studied water bodies of Kamanos raised bog

	Water body	Coordinates	Area, ha	pH	Conductivity, µS cm^{-1}	ORP, mV	T, °C
1	Lake Kamanos	56°18'34.9" 22°37'31.9"	5.6	4.67–4.82	37–38	121–128	14.9–25.2
2	Nimfėjos south (S) pool	56°18'33.1" 22°37'28.5"	0.4	5.34–5.54	21–24	77–93	14.6–22.3
3	Nimfėjos north (N) pool	56°18'39.2" 22°37'26.7"	0.3	5.34–5.48	21–24	76–89	14.7–23.5
4	Salos pool	56°18'33.0" 22°37'10.5"	0.2	4.64–4.82	31	122–130	14.5–26.1
5	Skendenis pool	56°18'18.3" 22°37'50.6"	–	5.15–5.35	21–25	84–102	15.3–24.5
6	Berželiai pool	56°17'35.6" 22°38'46.5"	–	4.25–4.99	34–43	112–146	15.4–29.1
7	Pool	56°17'25.1" 22°38'25.7"	–	4.98–5.28	19–25	93–117	13.1–24.3
8	Hollow 1	56°17'32.9" 22°38'49.2"	–	4.49	72	133	15.2
9	Hollow 2	56°17'33.6" 22°38'52.4"	–	4.26	48	144	12.6
10	Hollow 3	56°18'18.1" 22°37'51.5"	–	4.42	89	138	18.4
11	Hollow 4	56°17'27.0" 22°38'32.0"	–	3.90	66	164	13.0
12	Hollow 5	56°18'34.3" 22°37'47.3"	–	5.09	140	101	15.5
13	Hollow 6	56°17'23.7" 22°38'23.2"	–	4.39	75	138	14.0

"–" no data

MATERIALS AND METHODS

Samples for the investigation of algae and cyanobacteria diversity were collected from Lake Kamanos and six pools in May, July and September 2005 (Table 1, Figs 1–2). Additionally, six small shallow (water depth 10–15 cm) black hollows of Kamanos raised bog were sampled in September 2005. Plankton, metaphyton and periphyton samples were taken using plankton net (mesh 20 μm), squeezed from *Sphagnum* and scraped from different submerged surfaces. Algae and cyanobacteria were analysed in non-preserved and formaldehyde preserved (4% final concentration) samples using Motic B3 light microscope equipped with Moticam 2300 digital camera. Cyanobacteria were identified to the lowest possible taxonomic level using the manuals of Pascher (1925), Elenkin (1938), Gollerbakh et al. (1953), Starmach (1966), Komárek & Anagnostidis (1998, 2005), Komárek (2013). Water temperature, pH, oxidation reduction potential (ORP) and conductivity were measured *in situ* using a MultiLine F/Set-3 portable universal meter (Table 2).

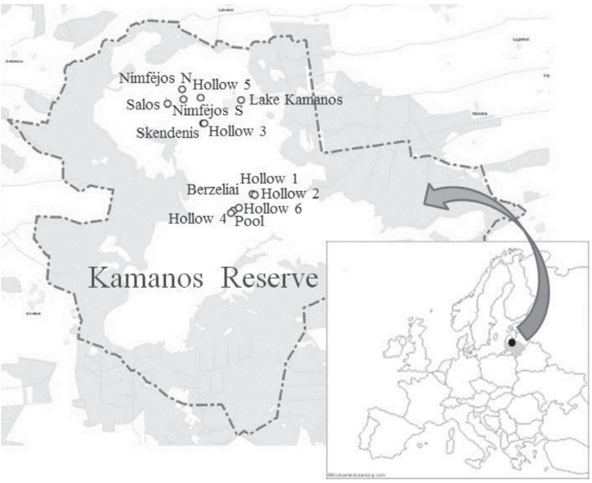

Fig. 1. Location of sampling sites in Kamanos raised bog

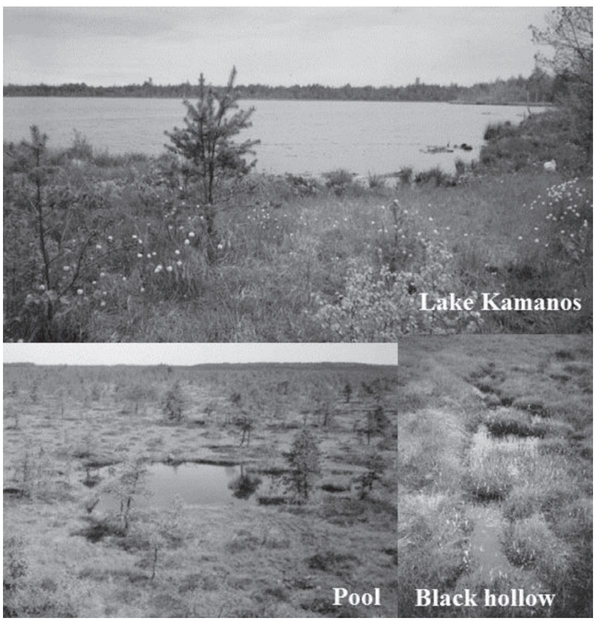

Fig. 2. Different types of water bodies sampled in Kamanos raised bog

Principal component analysis (PCA) was applied to reveal similarity of cyanobacteria flora in the raised bog. The relationship between environmental variables and cyanobacteria species diversity was evaluated by applying the Pearson correlation coefficient (at $p < 0.05$). Statistical analysis was performed using *STATISTICA* 7.0 software programme.

RESULTS AND DISCUSSION

Overall 298 microalgal species were recorded in Kamanos raised bog. Cyanobacteria comprising 19% (56 species) of the phycoflora diversity were one of the most diverse algal groups (Fig. 3). The most numerous in cyanobacteria species were the orders *Chroococcales* (32 species), *Oscillatoriales* (14) and the genera *Chroococcus* (7), *Aphanothece* (7) and *Aphanocapsa* (4) (Table 2). It is difficult to compare the obtained results with those of other European investigators due to unequal interest in various groups of algae and differences in physicochemical characteristics of peat bogs (Nováková, 2002). Nevertheless, the relative contribution of cyanobacteria in phycoflora of Kamanos raised bog was similar to that in peat bogs of Slovenia, Slovakia and the Czech Republic (14–21% of species diversity; Lederer, 1999; Krivograd-Klemenčič & Vrhovšek, 2003; Krivograd-Klemenčič et al., 2010; Hindák & Hindáková, 2012). Other researchers noted less importance of cyanobacteria (3.7–11.0%) in peat bogs (Pietryka, 2000; Nováková, 2002; Borics et al., 2003; Owsianny & Gąbka, 2006; Piątek, 2007; Druvietis et al., 2010; Wołowski, 2011).

Most of species recorded in Kamanos raised bog are cosmopolite or distributed in temperate zone (Table 2). One third of the species are characteristic

Table 2. The list of cyanobacteria found in Kamanos raised bog water bodies

Cyanobacteria	Records of the species in other peat bogs of Central Europe	Distribution in the world**	Habitat**	Lake Kamanos	Nimfėjos (south) pool	Nimfėjos (north) pool	Salos pool	Skendenis pool	Beržeiai pool	Pool	Hollow 1	Hollow 2	Hollow 3	Hollow 4	Hollow 5	Hollow 6
Chroococcales																
Aphanocapsa delicatissima W. et G.S.West	SK[1,2]	T c w	pl		+	+					+					
Aphanocapsa grevillei (Hassall) Rabenh.	CZ[1], PL[1], Sl[2]	T s	P bt ar	+	+		+			+		+		+	+	+
Aphanocapsa hyalina (Lyngbye) Hansgirg	CZ[1,2,5], Sl[2]	T o	P bt						+							
Aphanocapsa parasitica (Kütz.) Komárek et Anagnostidis	Sl[2]	T w	P M pr		+			+								
Aphanothece clathrata W. et G.S.West	ES, LV, PL[1]	T c	P M E		+		+			+						
Aphanothece elabens (Bréb.) Elenkin	Sl[1]	T P W	O mt	+	+			+	+	+			+	+		+
**Aphanothece floccosa* (Zalessky) Cronberg et Komárek		T	O M bt mt		+											
**Aphanothece microscopica* Nägeli	CZ[1,2,5], SK[1]	T	P O bt mt ar		+											
**Aphanothece nidulans* Richter et Nordst.	CZ[5], SK[1,2]	T c	P bt mt											+		
Aphanothece stagnina (Spreng.) Bréb.		T c	bt mt pl						+			+				
Aphanothece sp. (cell 1.7x1.2μm, with gas vesicle in the centre)									+					+		
Chroococcus aphanocapsoides Skuja	CZ[5]	T o	O M pl						+							
Chroococcus limneticus Lemmer.	Sl[2]	C	P L R pl	+	+				+	+		+				
Chroococcus minor (Kütz.) Nägeli	CZ[4], ES	T W s c	P R ar mt								+			+		
Chroococcus minutus (Kütz.) Nägeli		C	O E P pl mt	+			+			+						
**Chroococcus* cf. *quaternarius* Zalessky	Sl[2]	C s	O bt	+	+											
Chroococcus turgidus (Kütz.) Nägeli	BY, CZ[1,2,3,5], ES, LV, PL[1,2], Sl[2], SK[1,2]	T c C	P O bt mt	+		+	+	+	+		+	+	+	+	+	+
Chroococcus vacuolatus Skuja		T o	bt pl				+									
Cyanodictyon planctonicum Meyer		T o	E pl		+		+	+								
Cyanodictyon reticulatum (Lemmerm.) Geitler		T w	M E pl					+								
**Cyanodictyon turfosum* Lederer	CZ[1]	T o	P		+											
**Cyanosarcina* sp.				+	+	+	+	+	+			+	+	+		+
Cyanothece aeruginosa (Nägeli) Komárek	CZ[1,5], PL[3], SK[1]	C	P			+		+		+				+	+	+
Eucapsis alpina Clements et Shantz.	CZ[1,5], PL[4], SK[1,2]	T P	P O mt					+		+				+	+	+
Gloeocapsa sp. (cell diameter 6.5-10)	Sl[2]					+		+								
**Johanesbaptistia* sp.														+		
**Merismopedia angularis* Thompson	CZ[1,3,4,5]	T s P	P mt	+	+			+		+		+				
Merismopedia glauca (Ehrenberg) Kützing	CZ[2,4], PL[2], SK[2]	C c	P M mt bt	+	+	+		+		+				+		
*cf. *Pseudocapsa sphaerica* (Proškina-Lavrenko) Kováčik		To	B	+							+					
Rhabdoderma lineare Schmidle et Lauterborn		T c W o	O M pl		+					+	+		+	+		
**Rhabdogloea linearis* (Geitler) Komárek	CZ[1,5], SK[1,2]	T o	P					+		+	+					
Rhabdogloea planctonica (Teiling) Komárek		T o	pl		+											

Oscillatoriales																
**Geitlerinema amphibium* (Agardh ex Gomont) Anagnostidis	CZ [2]	c	L bt pr	+	+	+	+	+		+		+				
Heteroleibleinia pusilla (Hansgirg) Compére		T c	P L R pr	+		+										
Heteroleibleinia ucrainica (Šišov in Elenkin) Anagnostidis et Komárek		T	R pr	+	+		+	+	+	+						+
cf. *Heteroleibleinia* sp. (cell width 1.8-2.8 length 2-2.5µm)	Sl[2]				+		+									
**Komvophoron pallidum* (Skuja) Anagnostidis et Komárek		T s	L bt pl		+			+								
Leibleinia epiphytica (Hironymus) Compère	Sl[1]	C	L R S pr		+	+		+								
Lyngbya sp. (cell 2-6×2-2.5)						+										
Oscillatoria tenuis Agardh ex Gomont	LV, PL[1] , Sl[2]	C s	bt mt ar	+	+	+		+		+		+				
Phormidium cf. *corium* Gomont		C	L R pr ar		+			+								
Leptolyngbya frigida (Fritsch) Anagnostidis et Komárek					+										+	+
Planktolyngbya limnetica (Lemmerm.) Komark.-Legner. et Cronberg		T c C	L pl		+											
Pseudanabaena sp.	CZ [2,5], Sl [2]			+												
**Romeria elegans* (Wołoszyńska in Koczwara) Wołoszyńska et Koczwara ex Geitler		T	L R pl													+
**Spirulina subtilissima* Kütz. ex Gomont		C	S L pr	+										+	+	+
Nostocales																
**Anabaena* cf. *augstumalis* Schmidle	CZ [1,3,5], PL[1,2,4], SK[1,2]	T	P bt		+											
**Anabaena* cf. *verrucosa* Boye-Petersen		T s	P	+	+	+	+	+	+						+	
Anabaena sp. (cells 5-7.5×4.5-5)									+							
**Calothrix* cf. *brevissima* G.S. West		C s	L pr	+												
**Calothrix elenkinii* Kossinskaja		T	R pr	+		+	+		+							
**Calothrix weberi* Schmidle	Sl[2]	T	P L mt				+	+	+							
**Cylindrospermum* cf. *marchicum* (Lemmerm.) Lemmerm.	Sl[2]	T	L pf ar								+					
Hapalosiphon sp.$_1$	CZ [5]	T s	L pf bt	+	+	+	+	+	+	+	+					+
Hapalosiphon sp.$_2$					+			+						+		
Nostoc sp.	SK[1,2]				+											
TOTAL				20	30	14	14	22	14	15	8	8	4	14	7	11

Abbreviations:

***** – new to Lithuania species; ****** – according to Komárek & Anagnostidis (1998, 2005) and Komárek (2013);

Records in Europe: **Belarus (BY)** – Micheeva (1999); **the Czech Republic (CZ)** – [1]Kaštovský et al. (2010); [2]Nováková (2002); [3]Lederer & Lukavský (2001); [4]Machová-Černá & Neustupa (2009); [5]Lederer (1995); **Estonia (ES)** – Karofeld & Toom (1999); **Latvia (LV)** – Druvietis et al. (2010); **Poland (PL)** – [1]Owsianny & Gąbka (2006); [2]Pietryka (2000); [3]Piątek (2007); [4]Grabowska et al. (2014); **Slovakia (SK)** – [1]Hindák (2012a, b); [2]Hindák & Hindáková (2012); **Slovenia (Sl)** – [1]Krivograd-Klemenčič & Vrhovšek (2003); [2]Krivograd-Klemenčič et al. (2010);

Distribution: C – cosmopolitan; P – polar, subpolar zones; T – temperate zone; W – tropical, warm climate zone; o – occasional (found in several localities); c – common; w – widespread; s – sporadic;

Habitat: L – lakes, pools; E – eutrophic lakes; M – mesotrophic lakes; O – oligotrophic lakes; R – rivers, streams; P – peat bogs, bogs, swamps; S – thermal springs; B – brackish or salty waters; bt – benthic; mt – metaphyton; pl – plankton; pr – periphyton, epiphyton; ar – aerophytic.

particularly of the peat bogs. Thirty species of cyanobacteria recorded in Kamanos were also detected in other peat bogs of Central Europe (Table 2). The investigations of cyanobacteria in Lithuanian peat bogs are very scarce in general, therefore, 21 species were found in Lithuania for the first time (Table 2). Based on the data obtained in this study and of other researchers, *Aphanocapsa grevillei*, *Chroococcus turgidus*, *Merismopedia angularis*, *M. glauca* could be distinguished as characteristic species of the peat bogs in Central Europe. Machová-Černá & Neustupa (2009) found *Merismopedia angularis* and *M. glauca* occurring within mosses or on fine detritus as specific species in the pools of the peat bog. Some common cyanobacteria in Kamanos (e.g. *Heteroleibleinia ucrainica*, *Anabaena* cf. *verrucosa*, *Cyanosarcina* sp.) were not recorded in the peat bogs of Central Europe (Table 2). Therefore, more studies should be conducted in Lithuania and other countries for the building up general conclusions concerning the characteristic cyanobacteria species in the raised bogs of this region.

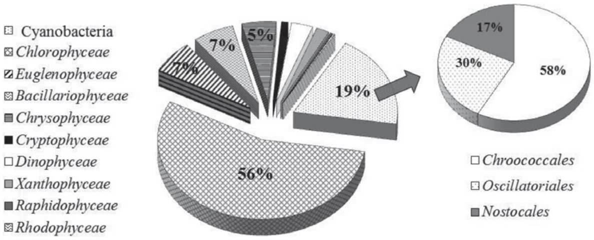

Fig. 3. Cyanobacteria and algae species diversity in the studied water bodies of Kamanos raised bog

According to Lederer (1999), variation of algal flora between particular biotopes is higher than between various peat bogs. Similarly, most of cyanobacteria recorded in Kamanos raised bog were specific to the particular water body and occurred only in 1–3 of the studied localities (Fig. 4). Nineteen species (34%) were found in a single locality. *Chroococcus vacuolatus*, *C. aphanocapsoides*, *Aphanothece floccosa*, *Cylindrospermum* cf. *marchicum* are among rarely occurring species in Kamanos (Fig. 5). Rather rare species such as *Heteroleibleinia ucrainica*, *Geitlerinema amphibium*, *Merismopedia glauca* and *Anabaena* cf. *verrucosa*, were recorded in 4–7 of the studied localities. Only five species, i.e. *Chroococcus turgidus*, *Aphanocapsa grevillei*, *Aphanothece*

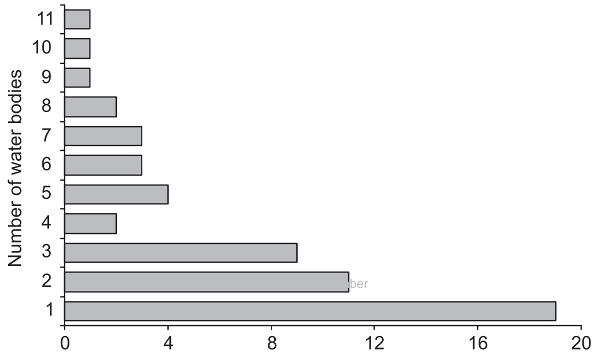

Fig. 4. The species distribution according to their occurrence frequency in the studied water bodies of Kamanos raised bog

elabens, *Cyanosarcina* sp. and *Hapalosiphon* sp.$_1$ (Fig. 5) were common and occurred in 8–11 of the studied water bodies. Nováková (2002) also noted that *Chroococcus turgidus* is the most frequent species in the raised bogs of the Czech Republic. The species is connected with sites situated near the water table among mosses or in highly hydrated nutrient poor habitats of low conductivity and pH (3.6–4.2) (Jacuńska, 2010).

Two specimens of the *Hapalosiphon* genus were found in Kamanos raised bog. In the book of flora by Komárek (2013), four *Hapalosiphon* species (*H. intricatus*, *H. hibernicus*, *H. cossyrensis*, *H. pumillus*) separated by differences in the cell shape and size in the trichome and branches are listed. The common specimen in Kamanos *Hapalosiphon* sp.$_1$ resembled *H. intricatus* W. et G.S. West by the similar form and width of cells (6.7 ± 1.0 SD μm) in the main trichome and in the branches (Figs 5C, 6A–B), whereas the other specimen's *Hapalosiphon* sp.$_2$ cells were larger (width 8.1 ± 0.9 SD μm) in the main trichome compared to the cells in the branches (width 6.3 ± 0.4 SD μm) (Fig. 6E–G). Whitton (2005) noted that *H. intricatus* merges with *H. fontinalis* (Agardh) Bornet. High morphological variation of *H. fontinalis* in the cyanobacteria community of Klin raised bog was observed by Hindák (2012). He suggested that *H. intricatus* is a part of the life cycle of *H. fontinalis*. Komárek (2013) also indicated that the *Hapalosiphon* genus is very variable and the limits between various morphospecies are not clear. He regarded *H. fontinalis* as a taxonomic synonym of *H. pumilus* Kirchner ex Bornet et Flahoult. For the precise identification of species from Kamanos raised bog, the

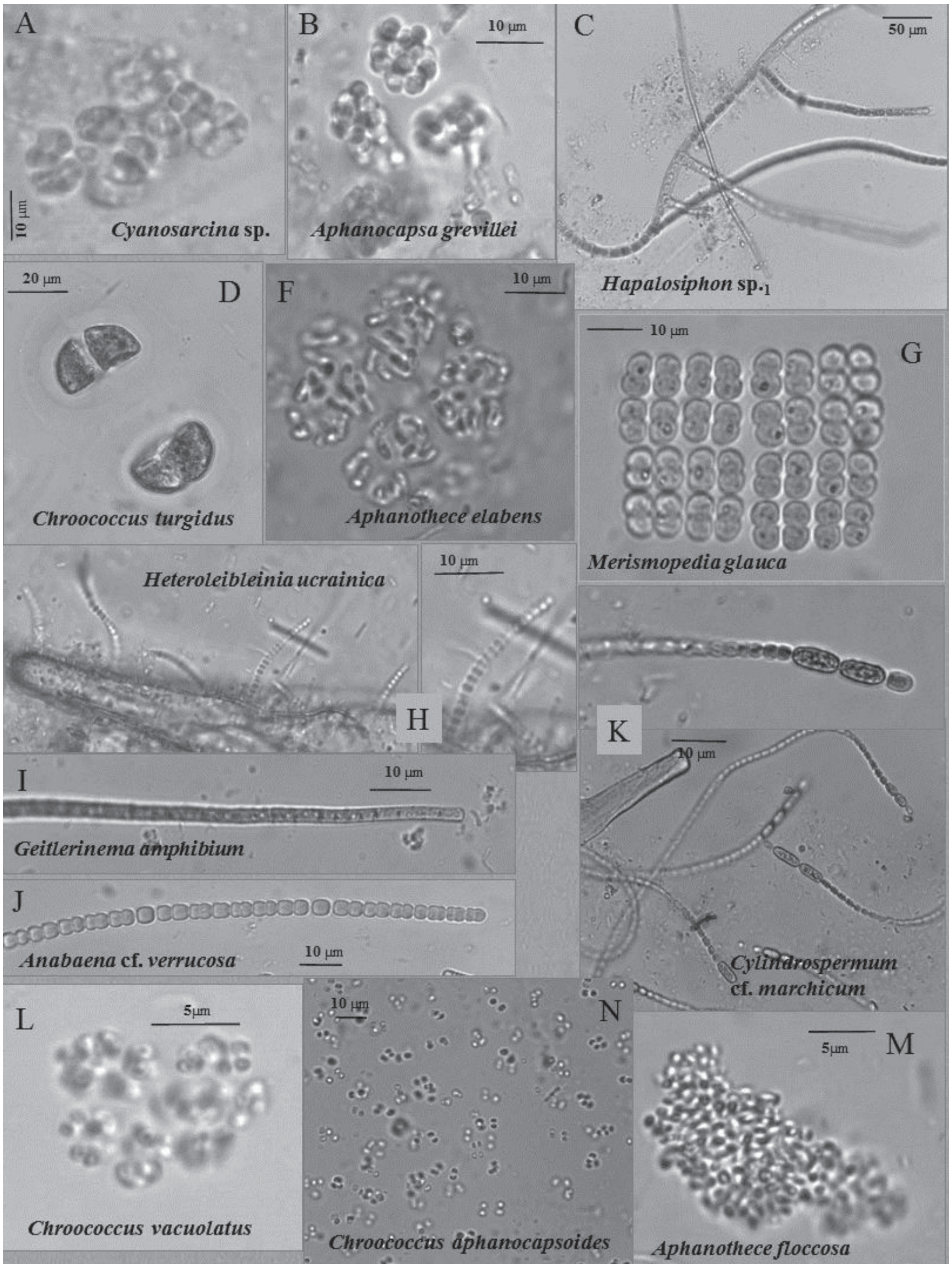

Fig. 5. Cyanobacteria species in Kamanos raised bog; common (A–F), rather rare (G–J) and rare (K–N) species

molecular studies combined with the life cycle analysis of *Hapalosiphon* strains should be performed. The formation of hormogonia in these nostocalean cyanophytes is one of the important stages of the life cycle. According to Hindák (2012), hormogonia of *H. fontinalis* resembled *Trichodesmium lacustre* Klebahn species. Similarly, *Trichodesmium*-like filaments (Fig. 6C–D) were observed in 80% of Kamanos samples, where *Hapalosiphon* sp.$_1$ was also found.

The importance of habitat-forming function for algae communities' structure in raised bogs was shown by Owsianny & Gąbka (2006). It is likely that higher diversity of habitats determined more diverse cyanobacteria populations in the studied larger water bodies: Nimfėjos south pool (32 species), Skendenis

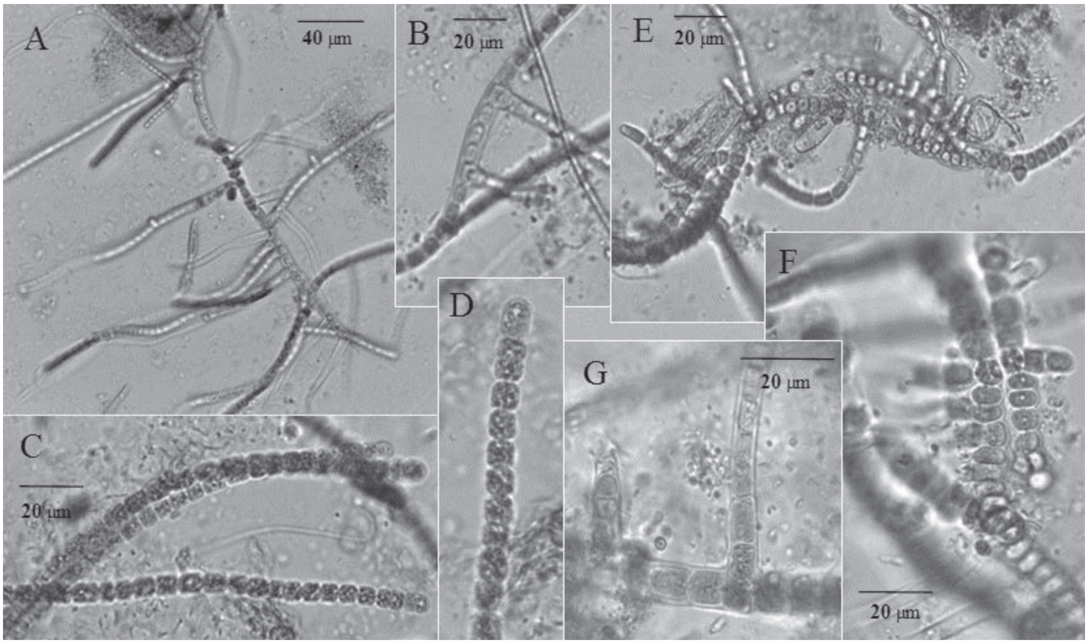

Fig. 6. *Hapalosiphon* sp.$_1$ (A–B), *Hapalosiphon* sp.$_2$ (E–G) and *Trichodesmium*-like hormogonia (C–D) of *Hapalosiphon* from Kamanos raised bog

pool (25), and Lake Kamanos (21) (Fig. 7). PCA analysis also distinguished the lake/pools into separate group I due to the highest number of taxa, especially benthic species that belong to the families *Oscillatoriales* and *Nostocales* (Fig. 8). *Geitlerinema amphibium*, *Calothrix elenkinii*, *C. weberi*, *Chroococcus minutus*, *C. limneticus*, *Merismopedia angularis*, *M. glauca*, *Cyanodictyon* spp. were characteristic of this group of species.

In the hollows, cyanobacteria diversity was up to three times lower compared to larger water bodies (Fig. 7). Four distant by location hollows comprised a separate group II (Fig. 8). The average number of taxa in this group was nine species, much lower compared to group I. The limited number of species may specialise to specific environmental conditions in small shallow hollows, particularly low pH, wide variations of temperature on the daily scale and intense lightning. On the other hand, non-equal frequency of sampling in hollows and larger water bodies probably was the main reason of differences in the number of species.

Individual pools located even in a close proximity in the same peat bog can show very different chemical features (Mataloni et al., 2015). Nováková (2002) found that location of pools in a particular bog is less important for algal species composition than the characteristics of the pools; pH affected especially the

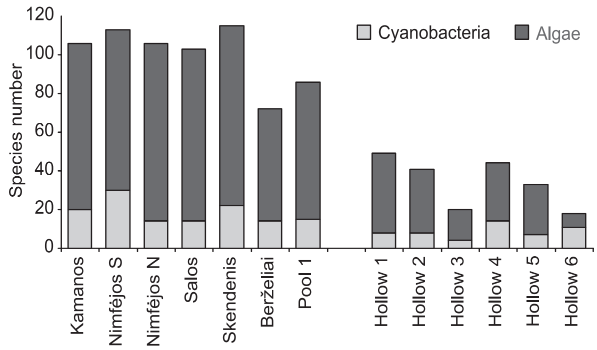

Fig. 7. The number of cyanobacteria and algae species in the studied water bodies of Kamanos raised bog

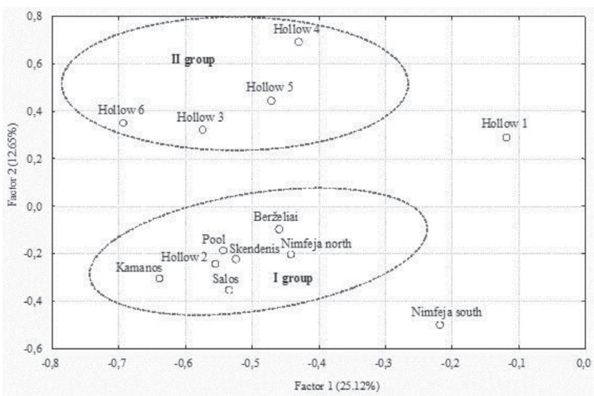

Fig. 8. Grouping of cyanobacteria assemblages from Kamanos raised bog, based on PCA

species composition. Similarly, Owsianny & Gąbka (2006) showed that water pH and to lesser extent conductivity were the factors most responsible for metaphyton spatial distribution in Polish peat bogs. Water pH in all studied localities of Kamanos raised bog was acidic and slightly higher in the lake/pools (5.0 ± 0.4 SD) compared to the hollows (4.4 ± 0.4 SD) (Table 2). Meanwhile, the conductivity was 2–3 times lower in the pools (28.6 ± 7.6 SD µS cm^{-1} on average) compared to the studied hollows (81.7 ± 31.5 SD µS cm^{-1}). Only conductivity was significant factor for cyanobacteria species diversity in Kamanos water bodies ($r = -0.74$, $p < 0.05$; Fig. 8). However, despite the similarity of the water pH in the localities of Hungarian bogs, there were observed large differences in their algal flora suggesting that other environment parameters are also significant (Borics et al., 2003). Krivograd-Klemenčič et al. (2010) found that shading was the most important parameter for cyanobacteria species distribution in Slovenian peat bogs.

In conclusion, the flora of cyanobacteria in peat bogs is very specific, unique and needs more detailed studies. In many countries most of peat bogs are already under protection and more joint efforts of researchers from various countries to identify the biological and genetic richness in these endangered ecosystems are necessary in the future.

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MELSVABAKTERIŲ ĮVAIROVĖ KAMANŲ AUKŠTAPELKĖJE (ŠIAURĖS-VAKARŲ LIETUVA)

Judita KOREIVIENĖ, Jūratė KASPEROVIČIENĖ, Jūratė KAROSIENĖ

Santrauka

Straipsnyje aptariama melsvabakterių rūšių įvairovė vienoje didžiausių Lietuvos aukštapelkių. Aptiktos 56 rūšys, kurios sudarė apie 19 % pelkės algofloros įvairovės. *Chrococcocales* (32 rūšys) eilė ir *Chroococcus* (7), *Aphanothece* (7) gentys buvo skaitlingiausios rūšimis. Dvidešimt viena melsvabakterių rūšis aptikta pirmą kartą Lietuvoje. Dauguma pelkėje rastų melsvabakterių paplitusios kosmopolitiškai ar vidutinio klimato zonoje, trečdalis iš aptiktų rūšių yra būdingos pelkių bendrijoms. Trisdešimt devynios rūšys buvo retos, aptiktos 1–3 tirtų vandens telkinių. Penkios rūšys *Chroococcus turgidus*, *Aphanocapsa grevillei*, *Aphanothece elabens*, *Cyanosarcina* sp. ir *Hapalosiphon* sp. buvo dažnai aptinkamos Kamanų pelkėje. Vandens telkinių ypatumai ir fiziko-cheminės charakteristikos galimai lėmė melsvabakterių rūšių ir jų įvairovės pasiskirstymą pelkėje.