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Original Scientific Paper

On *Bangia atropurpurea* (Bangiales, Rhodophyta), the strictly protected red alga in Serbia

Aleksandra B. Mitrović* and Snežana B. Simić

University of Kragujevac, Faculty of Science, Department of Biology and Ecology, R. Domanovića 12, 34000 Kragujevac, Serbia
* Correspondence: aleksandra.mitrovic@pmf.kg.ac.rs

ABSTRACT:
The first observation of the red alga *Bangia atropurpurea* (Bangiales, Rhodophyta) in Serbia was in 1991 in the Trgoviški Timok River (Eastern Serbia). From 1991 to 2017, the species was sporadically observed at four more locations in three hill-mountain rivers in Southwestern (the Gvozdačka River and the Raška River) and Eastern (the Nišava River - two localities) Serbia. More intensive research on this alga was carried out from 2017 to 2020, and a total of 220 localities in 132 hill-mountain watercourses were studied. *Bangia atropurpurea* was recorded at six locations in Southwestern and Eastern Serbia. Five of these locations represent new *B. atropurpurea* localities in Serbia (the Brusnička River, the Golijska Moravica River, the Panjica River, the Resava River, and the second locality in the Trgoviški Timok River), while one of them is already known from previous studies (the Raška River). The species was found in running, moderately hard and very hard, well-oxygenated, slightly alkaline waters, mainly low in inorganic nutrients, and in highly variable values of temperature and conductivity. Despite the long period since its first observation in Serbian rivers, the species is still known in a small number of localities. The small number of localities, low relative abundance, and various anthropogenic influences affecting its habitats have led the species to be recognized as endangered and strictly protected in Serbia. The intensive development of small hydropower plants which have emerged in recent years may threaten *B. atropurpurea* habitats.

Keywords:
freshwater algae, morphology, ecology, river, threat factors

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INTRODUCTION

The red algal order Bangiales is represented by five genera: *Bangia* Lyngbye, *Dione* W. A. Nelson, *Minerva* W. A. Nelson, *Pseudobangia* K. M. Müller & R. G. Sheath, and *Porphyra* C. Agardh, almost exclusively marine (Kumano 2002; Müller *et al.* 2005; Nelson *et al.* 2005). Only the members of the genus *Bangia* have been recognized in freshwaters (Kumano 2002; Sheath & Sherwood 2002; Eloranta & Kwandrans 2004; Guiry & Guiry 2021).

Bangia atropurpurea (Mertens ex Roth) C. Agardh is the only freshwater member of the genus *Bangia* which can also be found in brackish water (Kumano 2002; Sheath & Sherwood 2002; Eloranta & Kwandrans 2004; Guiry & Guiry 2021). The geographical distribution and ecology of *B. atropurpurea* have been quite well studied by many authors. The species is common in European countries (Eloranta *et al.* 2011), but also occurs in North America (Wehr & Sheath 2003), Asia (Notoya & Iijima 2003; Barinova 2013; Chou *et al.* 2015; Xu *et al.* 2016), Australia (Woolcott & King 1998), and New Zealand (Boedeker *et al.* 2008). In Europe, it has been reported in Albania (Kashta & Miho 2016), Austria (Rott *et al.* 1999), Bosnia and Herzegovina (Mašić *et al.* 2020), the British Isles (Sheath & Sherwood 2002), Bulgaria (Vodeničarov *et al.* 1991), Croatia (Koletić *et al.* 2020), Finland (Eloranta & Kwandrans 2007), France (Verlaque 2001), Germany (Gutowski *et al.* 2004; Kusber *et* *al.* 2005), Italy (Ceschin *et al.* 2013), Montenegro (Petković 1980; Petković & Petković 1981), North Macedonia (Čado 1958, 1977), Poland (Siemińska 1992), Romania (Cărăuş 2002), Serbia (Simić 2008; Andrejić *et al.* 2010), Slovakia (Marhold & Hindak 1998), Slovenia (Vrhovšek *et al.* 2006), and Spain (Chapuis *et al.* 2014).

Bangia atropurpurea is one of the lesser-reported members of the freshwater red algae in Serbia (Simić & Krizmanić 2018). The first observation of *B. atropurpurea* in Serbia was in 1991 in the Trgoviški Timok River (Simić 1995; Simić & Ranković 1998). From 1991 to 2017, the species was sporadically observed at four more locations in three hill-mountain rivers of Southwestern (the Gvozdačka River and the Raška River) and Eastern (the Nišava River - two localities) Serbia (Obušković & Obušković 1998; Simić 2008; Andrejić *et al.* 2010). These locations are characterized by similar specific environmental conditions, such as rocky substrate in cold and moderate running, slightly alkaline and well-oxygenated waters, low in inorganic nutrients (Simić 1995, 2008; Obušković & Obušković 1998; Simić & Ranković 1998; Simić *et al.* 2007; Andrejić *et al.* 2010).

According to many authors, it prefers running, cold, hard, slightly alkaline, and well-oxygenated waters, with high conductivity and a low content of inorganic nutrients (Sládeček 1973; Sheath 1987; Sabater *et al.* 1989; Dell'uomo 1991; Simić & Ranković 1998; Sheath & Sherwood 2002; Eloranta & Kwandrans 2007; Simić 2008; Andrejić *et al.* 2010; Barinova 2013; Ceschin *et al.* 2013). It is known to be stenovalent with regard to a large number of environmental parameters, so changes in water regime and ecological conditions in microhabitats can lead to its endangerment and disappearance (Eloranta & Kwandrans 2007; Simić *et al.* 2010).

Various human activities threaten the habitats of *B. atropurpurea*, such as deforestation, erosion, water turbidity, disturbances to water flow velocity, and pollution (Eloranta & Kwandrans 2007; Simić *et al.* 2010). The intensive development of small hydropower plants (HPPs) has emerged as a major problem of habitat degradation in the last few years. Their construction undoubtedly leads to environmental degradation and the destruction of natural resources, including river fragmentation, the inhibition of organism migration, changes in temperature and flow regimes, a reduction in resource transport through the river, the modification of downstream hydromorphology, interruptions to the watercourse, or its drainage in the months with low flow, various effects on primary production and changes in the benthic community structure (Wu *et al.* 2010; Liermann *et al.* 2012).

The study aimed to present a review of the research on *Bangia atropurpurea* in Serbian lotic ecosystems and to provide data on its morphology, distribution, and ecology, based on historical data and recent research. Possible threat factors of the species habitats are presented and discussed, including the mainly negative impact of small HPPs.

MATERIAL AND METHODS

Sample collection. The field research was carried out over a four-year period (2017-2020) at 220 localities of 132 springs, streams, and rivers in Western, Southwestern, Central, Eastern, and Southern Serbia. Red free filaments without a gelatinous matrix were torn from the stony substratum and instantly fixed with 4% formaldehyde solution. In addition to *B. atropurpurea*, thalli of other benthic macroalgae were also collected. The percentage cover was assessed according to Ramirez-Rodriguez *et al.* (2007). The collected algological samples were stored in the collection of the Department of Biology and Ecology, Faculty of Science, University of Kragujevac.

Environmental conditions. At each locality, the type of substrate, current velocity (m s^{-1}), depth (cm), and degree of shade (++ full sunlight, ++ partial shade, + full shade) were determined. The physical and chemical properties of the water were measured *in situ* according to the American Public Health Association (2005): the temperature (°C), pH, conductivity (m S^{-1}), and water hardness (mg L^{-1}) were measured using combined digital HANNA instruments (conductometer, pH meter, thermometer), the concentration of dissolved oxygen (mg L^{-1}) was measured with an oxymeter (Mettler toledo), while ammonia nitrogen NH_4-N (mg L^{-1}), nitrate-nitrogen NO_3-N (mg L^{-1}), and orthophosphate PO_4-P (mg L^{-1}) concentrations were determined in the Laboratory of the Center for Fishery and Biodiversity Conservation of Inland Waters - Aquarium, Faculty of Science, University of Kragujevac, immediately on return from the field, using a photometer (Aqualytic AL400) with appropriate reagents.

Microscopic observation and species identification. The morphological analysis of the collected material was performed using a Motic BA310 light microscope with up to 800x magnification and photographed using a Bresser (9MP) digital camera and MicroCamLab computer software. Filament height and diameter, as well as cell sizes, were measured so as to determine the species' morphological features. *Bangia atropurpurea* was confirmed according to Kumano (2002), Eloranta & Kwandrans (2007), and Eloranta *et al.* (2011), while other benthic macroalgae were identified according to John *et al.* (2002), Wehr & Sheath (2003), and Komárek (2013).

Threat factors. The potential threat factors were determined at each locality by visual analysis, as well as according to the Survey of Small Hydropower Plants in the Republic of Serbia (Ministry of Energy and Mining of Republic of Serbia): 1 - no negative impact, 2 - local population impact (wastewater, solid waste, traffic), 3 - small HPPs.

RESULTS

Distribution and ecology. During the four-year survey (2017-2020), at a total of 220 localities in 132 springs, streams, and rivers, thalli of *B. atropurpurea* were recorded at only five new locations: the Brusnička River (B), the Golijska Moravica River (GM), the Panjica River (P), the Resava River (RE), and the second locality in the Trgoviški Timok River (TT2), as well as at one previously known locality (the Raška River - RA) (Fig. 1). Some of these habitats are protected to varying degrees. The locality at the Brusnička River is within the Biosphere Reserve Golija, the locality at the Raška River is within the Golija Nature Park, while the locality at the Resava River is within the Vitanovača Nature Reserve. The geographical coordinates and environmental parameters of the *B. atropurpurea* localities in Serbia are summarized in Table 1.

We recorded the species at altitudes ranging from 331 to 787 m above sea level, in similar environmental conditions (Table 1). *Bangia atropurpurea* was found in running waters with a current velocity ranging from 0.7 m s^{-1} to 1.5 m s^{-1}, on the stony substrate at depths ranging from 0 to 20 cm, in full sunlight, and in partial or full shade (Table 1). At all sampling sites, the samples were found as monospecific populations colonizing relatively small areas of rocky substrates (Table 1). The species was recorded in moderately hard or very hard (water hardness ranging from 100 mg L^{-1} to 370 mg L^{-1}), well-oxygenated (from 8.6 mg L^{-1} to 10.6 mg L^{-1}), and slightly alkaline waters (pH from 7.53 to 8.02), low in inorganic nutrients (Table 1), and in highly variable values of temperature (from 8.8°C to 19.8°C) and conductivity (from 0.21 m S^{-1} to 0.78 m S^{-1}) (Table 1).

The filamentous green alga *Cladophora glomerata* (L.) Kützing was the most frequently associated alga which grew together with *B. atropurpurea* (Table 1, Fig. 2.1, 2.2). In some localities, *B. atropurpurea* also grew alongside the filamentous green algae *Microspora amoena* (Kützing) Rabenhorst (Fig. 2.2), the xanthophycean alga *Vaucheria* sp. (Fig. 2.3), the red alga *Hildenbrandia rivularis* (Liebmann) J. Agardh, cyanobacteria *Nostoc* sp., and microscopic diatom *Melosira varians* C. Agardh (Table 1).

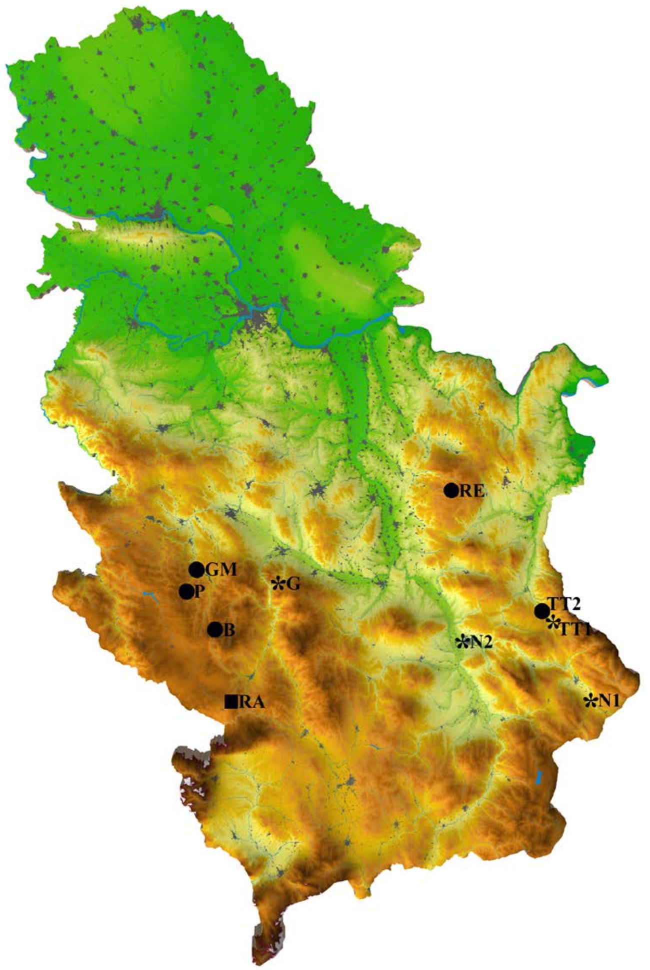

Fig. 1. The geographical distribution of *Bangia atropurpurea* in Serbia: (•) New findings: the Brusnička River (B), the Golijska Moravica River (GM), the Panjica River (P), the Trgoviški Timok River (TT2), the Resava River (RE) (our study); (▪) Confirmed previous findings: the Raška River (RA) (Simić 2008; our study); (*) Previous findings: the Trgoviški Timok River (TT1) (Simić 1995), the Gvozdačka River (G) (Obušković & Obušković 1998), the Nišava River (N1 – the Jerma estuary, N2 - the Sićevo Gorge) (Andrejić *et al.* 2010)

Morphological features. The thalli grow in the form of free filaments without a prominent gelatinous matrix, and range from pale red, to red, to dark red in colour (Figs. 2.4, 3.1-3.4). The length of the thalli ranged from 1.5 to 13.2 cm (Table 2). Several filaments grew from the same place on the substrate. Under the microscope, it was observed that the thalli were gelatinous and unbranched. The young filaments were uniseriate (diameter 25-75 µm) (Table 2, Fig. 3.2), while at maturity they were uniseriate in the basal parts and multiseriate in the upper parts (diameter 35-100 µm; diameter in the monosporangial plants 52-115 µm) (Table 2, Fig. 3.3, 3.4). The cells in the mature plants were spherical and cuboidal (8-30 µm long, 9-37 µm wide) (Table 2). Asexual reproduction by monospores was not observed. The morphological features of *B. atropurpurea* thalli found in Serbia are summarized in Table 2.

Threat factors. During the field research it was observed that only the Raška River and the Panjica River were not affected by negative anthropogenic influences (Table 1). The locality at the Trgoviški Timok River is endangered by local population impact, while that at the Resava River is threatened by the construction of the small HPP (Table 1). The localities at the Brusnička and the Golijska Moravica rivers are threatened both by local population impact and by the construction of small HPPs (Table 1).

Table 1. The geographical coordinates and environmental parameters of *Bangia atropurpurea* localities in Serbia.

River/Date	Geographical coordinates	Altitude (m)	Water depth (cm)	Current velocity (m s^{-1})	Temperature (°C)	pH	Conductivity (m S^{-1})	Hardness (mg L^{-1})	O_2 (mg L^{-1})	NH_4 (mg L^{-1})	NO_3 (mg L^{-1})	PO_4 (mg L^{-1})	Degree of shade	Coverage (%)	Associated macroalgal aggregations	Macroalgal coverage (%)	Protection degree	Threat factors	Reference
Trgoviški Timok River (TT1) VII 1991	N 43°27'36.2" E 22°23'20.2"	/	/	0.6	14	8.14	/	/	/	/	/	/	/	1	*Cladophora* sp.	/	/	/	Simić 1995
Trgoviški Timok River (TT2)* VII 2020	N 43°28'22.9" E 22°20'32.6"	331	5-10	0.7	15.8	8.02	0.23	120	10.6	<0.03	<4	<0.06	++	3	*Vaucheria* sp. *Cladophora glomerata*	5 5	/	2	this study
Raška River (RA) IX 2006	N 43°06'49.1" E 20°22'47.4"	/	/	0.7	12.4	7.98	0.38	/	/	/	/	/	/	10	*Cladophora* sp.	/	NP	/	Simić 2008
Raška River (RA) V 2017	N 43°06'49.1" E 20°22'47.4"	748	20	1.3	11.1	7.53	0.38	170	10.3	<0.03	<4	<0.06	+++	15	*Vaucheria* sp. *Cladophora glomerata* *Microspora amoena*	20 10 10	NP	1	this study
Gvozdačka River (G)	N 43°33'29" E 20°41'50"	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	SNP	/	Obušković & Obušković 1998
Nišava River (N1) (Jerma estuary) V 2008	/	/	/	/	14.2	6.69	0.38	400	/	0.18	/	/	/	/	/	/	/	/	Andrejić *et al.* 2010
Nišava River (N2) (Sićevo Gorge) XII 2008	/	/	/	/	3.5	6.37	0.29	90	/	0.17	/	/	/	/	/	/	NP	/	Andrejić *et al.* 2010
Brusnička River (B)* VIII 2019	N 43°25'00.8" E 20°22'13.1"	787	0	1.5	17	7.6	0.78	370	9.15	<0.03	<4	<0.06	++	<1	*Hildenbrandia rivularis* *Nostoc* sp.	3 5	BR	2/3	this study
Golijska Moravica River (GM)* VII 2020	N 43°40'06.6" E 20°06'05.6"	692	5-10	1.3	19.8	7.58	0.21	100	8.60	<0.03	<4	0.09	+++	3	*Cladophora glomerata*	5	/	2/3	this study
Panjica River (P)* XI 2020	N 43°39'04.0" E 20°02'03.7"	636	5-10	1.2	8.8	7.83	0.31	150	/	<0.03	7	0.52	+	5	*Cladophora glomerata*	5	/	1	this study
Resava River (RE)* VIII 2020	N 44°05'05.1" E 21°40'28.0"	448	5-10	1	14.3	7.81	0.26	130	/	<0.03	<4	<0.06	++	10	*Melosira varians* *Cladophora glomerata*	10 5	NR	3	this study

*new findings; +++ full sunlight; ++ partial shade; + full shade; BR - Biosphere Reserve; NP - Nature Park; NR - Nature Reserve; SNP - Special Nature Park; 1 - no negative influences; 2 - local population impacts (wastewater, solid waste, traffic); 3 - small HPPs

Table 2. The morphological features of *Bangia atropurpurea* from different locations in Serbia

Locality	Filament colour	Thalli length (cm)	Young filaments diameter (μm)	Mature filaments diameter (μm)	Monosporangial filaments diameter (μm)	Young filaments cell length (μm)	Young filaments cell diameter (μm)	Mature filaments cell length (μm)	Mature filaments cell diameter (μm)	Reference
Trgoviški Timok River (TT1)	dark purple tinged with brown	2-9	19-40	35-50	50-100	15-23	/	18-23	5	Simić 1995
Trgoviški Timok River (TT2)	pale red	1.9-4.2	40-52	50-67	/	10-18	35-42	13-16	16-20	this study
Raška River (RA)	dark purple tinged with brown	2-4	30-50	35-63	70-100	8-20	/	10-16	6-8	Simić 2008
	red	6.9-9	25-50	50-65	75-110	10-15	30-35	22-27	20-25	this study
Brusnička River (B)	red	2-2.5	25-50	/	/	9-16	35-46	/	/	this study
Golijska Moravica River (GM)	red	1.2-2	30-45	40-53	52-65	6-10	25-30	8-15	9-15	this study
Resava River (RE)	red	7.6-13.2	35-50	55-60	68-85	8-12	30-37	13-20	12-26	this study
Panjica River (P)	darkred	1.5-2.8	60-75	70-100	94-115	9-17	43-55	21-30	20-37	this study

Fig. 2. 1 - Macroalgal associations in the Raška River; **2** - *Bangia atropurpurea* (→B) growing among the filaments of *Cladophora glomerata* (→C) and *Microspora amoena* (→M); **3** - *Bangia atropurpurea* (→B) growing among the filaments of *Vaucheria* sp. (→V); **4** - habitus of *Bangia atropurpurea*

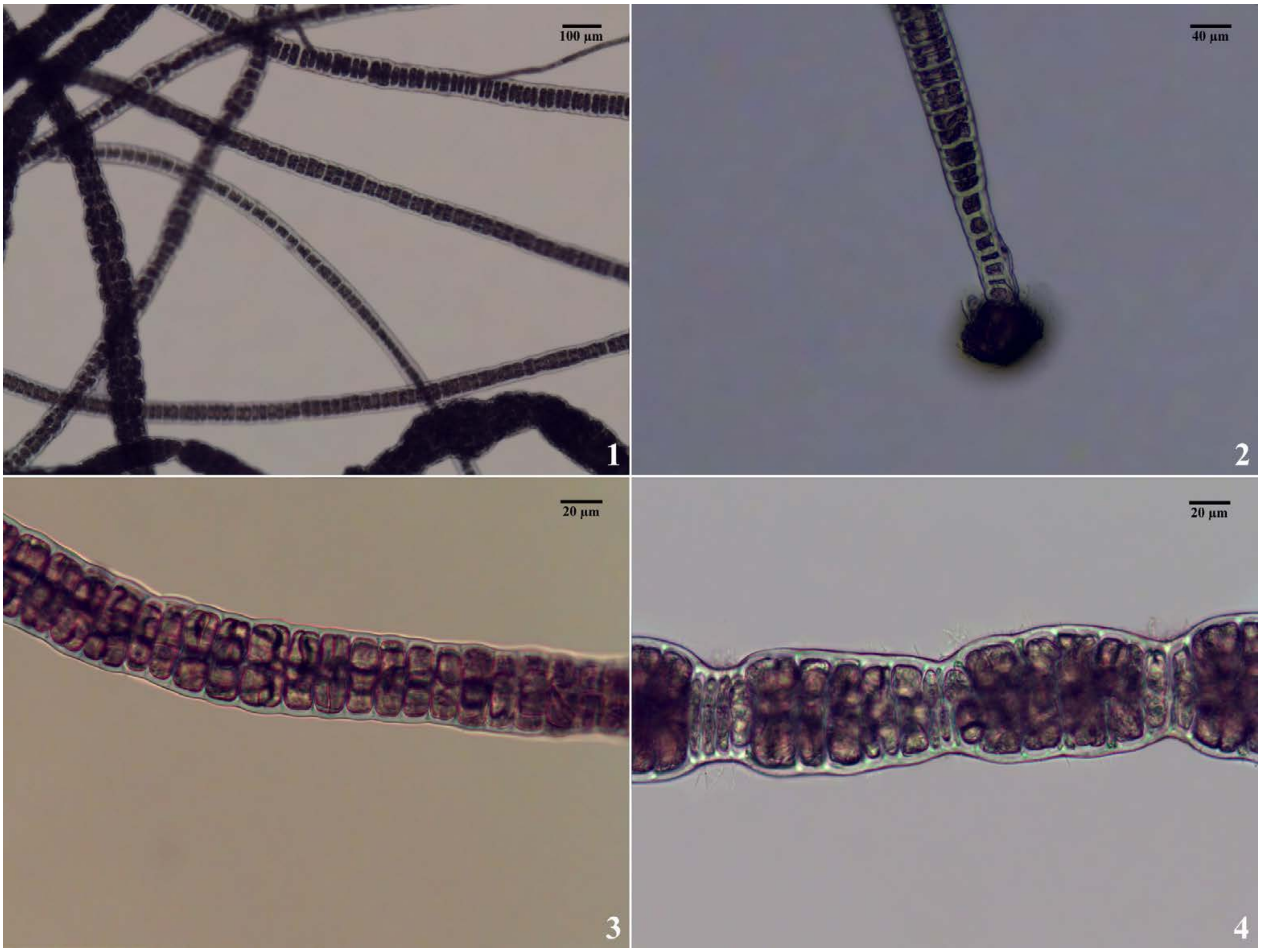

Fig. 3. The morphological features of *Bangia atropurpurea*: **1** - microscopic view; **2** - lower part of the filament; **3** - multiseriate filament; **4** - multiseriate filament with part of the monosporangia development

DISCUSSION

Bangia atropurpurea generally occurs in moderately fast waters, colonizing small areas of rocky substrates, in full sunlight, and in partial or full shade (Simić & Ranković 1998; Sheath & Sherwood 2002; Simić 2008; Ceschin *et al.* 2013). According to Charnofsky *et al.* (1982), light is one of the major environmental factors affecting the growth and development of *B. atropurpurea* in terms of the filament length and diameter. In this research, the species was collected from rocky substrates, at river locations characterized by moderate or high flow rates (from 0.7 m s^{-1} to 1.5 m s^{-1}). Thalli were found in a variety of light conditions.

Although our findings confirm that *B. atropurpurea* prefers well-oxygenated, slightly alkaline, moderately hard, or very hard waters, low in inorganic nutrients (Sládeček 1973; Dell'Uomo 1991; Gutowski *et al.* 2004; Ceschin *et al.* 2013), it has also been noticed in waters rich in nutrients (Sabater *et al.* 1989; Rott *et al.* 1999; Eloranta & Kwandrans 2002, 2004). In our research, only the concentration of orthophosphates was slightly increased at the localities in the Golijska Moravica River and the Panjica River. Previous ecological notes concerning the species' adaptations to temperature are contradictory. Some authors believe that the species prefers cool waters (Sabater *et al.* 1989; Simić & Ranković 1998; Simić 2008; Andrejić *et al.* 2010; Ceschin *et al.* 2013), while other authors hold that it usually tolerates warm water, and its survival can vary in a wide temperature range, from 3.5°C to 35°C. In our study, we recorded it in the temperature range from 8.8°C to 19.8°C. However, the best growth is achieved at temperatures ranging from 5°C to 15°C (Notoya & Iijima 2003; Barinova 2013; Kipp *et al.* 2021). *Bangia atropurpurea* has a great capacity to grow over a wide conductivity range (Sheath & Cole 1980; Simić & Ranković 1998; Simić 2008; Andrejić *et al.* 2010; Barinova 2013; Ceschin *et al.* 2013). However, some authors state that lower conductivity is not suitable for the species and that its best growth occurs for conductivity values higher than 0.18 m S^{-1} (Sheath 1987), which was supported by our research (water conductivity ranging from 0.21 m S^{-1} to 0.78 m S^{-1}).

The species is most frequently noticed growing among filamentous green algae, particularly *Cladophora glomerata* (Ceschin *et al.* 2013; Shea *et al.* 2014), which was also confirmed in our research. The greatest coverage of macroalgal aggregations (almost 50% of riverbeds), observed at the Raška River, was formed by *B. atropurpurea*, *Vaucheria* sp., *C. glomerata*, and *Microspora amoena*. For the first time in Serbia, *B. atropurpurea* was found growing among the filamentous green alga *M. amoena*. This alga usually occurs as short filaments, but at the Raška River, macroalgal aggregations formed by very long filaments (>10 cm) were noticeable. *Microspora amoena* is an indicator of xenosaprobic and oligosaprobic water (Pál 1998).

Since *B. atropurpurea* is adaptive to specific ecological conditions, excluding temperature, any direct or indirect negative anthropogenic influences may affect its survival in microhabitats. In Serbia, some of *B. atropurpurea's* habitats are exposed to the impact of the local community (wastewater, solid waste, traffic), and a few of them may be threatened by the development of small HPPs, usually of the derivative type. Although some locations are protected to varying degrees, they remain exposed to negative anthropogenic influences, primarily the construction of small HPPs. The construction of the small HPPs on the Brusnička River, the Resava River, and the Golijska Moravica River may negatively affect the *B. atropurpurea* populations in these habitats. These constructions have been proven to affect the benthic algal community in terms of different physical and chemical conditions between control and dam stations (Wu *et al.* 2010).

The locality at the Brusnička River was where the pipelines for supplying water to the powerhouse were situated. The riverbed on this location was constricted, devastated, the minimum sustainable flow was discharged into the river, and the relative abundance of *B. atropurpurea* was very low. We found only four thalli of the species. Thalli of *B. atropurpurea* were not observed either upstream or downstream of this locality. The locality at the Golijska Moravica River is endangered by the construction of two small HPPs, which will undoubtedly destroy the *B. atropurpurea* habitat in this river. The small HPP built on the Resava River has not affected the *B. atropurpurea* population in this river yet, so future research will show whether the small HPP has any impact on the benthic algal community.

During a three-decade period, *B. atropurpurea* was found at only ten locations in Serbia. Despite such a long research period, the species is still known from a small number of localities. The small number of localities, low relative abundance, and various anthropogenic influences affecting its habitats has resulted in the species being classified as endangered (EN) and thus strictly protected in Serbia (Simić & Simić 2009; SGRS 2010-2016). *Bangia atropurpurea* is also one of the several red algal species included in the Red Lists of several European countries. It is considered as Extinct (EX) in Poland (Siemińska 1992), Endangered (EN) in Slovenia (Marhold & Hindak 1998), and as Least Concern (LC) in Germany (Kusber *et al.* 2005). In Finland, *B. atropurpurea* was found at one locality (Eloranta & Kwandrans 2007), but during the latest investigation, its presence was not confirmed (Hyvärinene *et al.* 2019).

The thalli of *B. atropurpurea* collected during this research were morphologically comparable to the typical form described by Kumano (2002), Eloranta & Kwandrans (2007), and Eloranta *et al.* (2011). Small variations in diacritic features may represent the variation in the age and maturity of the thalli. However, for more accurate identification, molecular phylogeny in combination with morphological and cytological analysis is required.

CONCLUSION

This study represents a significant contribution to the knowledge of the ecology and distribution of *B. atropurpurea* in Serbian rivers. *Bangia atropurpurea* is still one of the most rarely recorded freshwater red algae in Serbia. Since the species was found at only six locations, mainly affected by the above-mentioned threat factors, and with relatively small population densities, further monitoring of its populations is necessary.

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REZIME

Botanica SERBICA

O *Bangia atropurpurea* (Bangiales, Rhodophyta), strogo zaštićenoj crvenoj algi u Srbiji

Aleksandra B. Mitrović i Snežana B. Simić

Crvena alga *Bangia atropurpurea* (Bangiales, Rhodophyta) u Srbiji je prvi put zabeležena 1991. godine u Trgoviškom Timoku (Istočna Srbija). Od 1991. do 2017. godine, vrsta je sporadično zabeležena na još četiri lokaliteta u tri brdsko-planinske reke jugozapadne (Gvozdačka reka i Raška reka) i istočne (Nišava - dva lokaliteta) Srbije. Intenzivnije istraživanje ove alge sprovedeno je u periodu od 2017. do 2020. godine na ukupno 220 lokaliteta u 132 brdsko-planinska vodotoka Srbije. Tokom ovog istraživanja, vrsta je zabeležena na svega 6 lokaliteta jugozapadne i istočne Srbije. Lokaliteti na Brusničkoj reci, Golijskoj Moravici, Panjici i drugi lokalitet na Trgoviškom Timoku predstavljaju nove lokalitete *B. atropurpurea* u Srbiji, dok je lokalitet na Raškoj reci poznat iz prethodno publikovanih studija. Vrsta je pronađena u tekućim, dobro aerisanim, slabo alkalnim, srednje tvrdim i veoma tvrdim vodama, uglavnom siromašnim neorganskim nutrijentima, ali u širokom opsegu temperature i provodljivosti. Uprkos dugom periodu proteklom od njenog prvog nalaza, vrsta je u Srbiji i dalje zabeležena na malom broju lokaliteta. Mali broj nalaza, mala relativna brojnost populacija i različiti negativni antropogeni uticaji doveli su do toga da je ova vrsta prepoznata kao ugrožena i strogo zaštićena u Srbiji. Staništa vrste *B. atropurpurea* značajno su ugrožena u poslednjih nekoliko godina usled intenzivirane izgradnje malih hidroelektrana.

Ključne reči: slatkovodne alge, morfologija, ekologija, reka, faktori ugrožavanja