Algae in the Savica Waterfall, Slovenia

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Abstract. In 1998, 1999 and 2000, samples were taken seasonally in the Savica Waterfall in Slovenia. The purpose of the investigation was to establish qualitative species structure and relative abundance of the periphyton. In 1999 and 2000, some physical and chemical parameters were also measured. Altogether, 52 species and subspecies of algae were determined. Most of them belonged to Bacillariophyceae. *Phormidium setchelianum* Gomont and *Cymbella caespitosa* (Kütz.) Brun. were new species to Slovenia.

Key words: algae, periphyton, waterfalls, waterfall Savica

Izvleček. ALGE V SLAPU SAVICA, SLOVENIJA - V različnih letnih časih v letih 1998, 1999 in 2000 smo vzorčevali perifitonske alge v slapu Savica v Sloveniji. Namen raziskave je bil ugotoviti kvalitativno vrstno sestavo in relativno abundanco združb. V letih 1999 in 2000 smo merili tudi nekatere fizikalne in kemijske dejavnike. Skupaj smo določili 52 različnih vrst in podvrst alg. Po številu vrst in podvrst so prevladovale Bacillariophyceae. Phormidium setchelianum Gomont in Cymbella caespitosa (Kütz.) Brun. sta novi vrsti za Slovenijo.

Ključne besede: alge, perifiton, slapovi, slap Savica

Five samples of periphyton were taken seasonally in 1998, 1999 and 2000 in the Savica Waterfall, Slovenia. Coordinates of the sampling site according to Gaus-Krüger are: X = 5128125, Y = 5407750. The objective of the investigation was to establish the species structure and the abundance of the periphyton. The samples were brushed from the surface of stones and rocks as well as squeezed out of the water mosses. The samples were immediately bottled and preserved in a 4 % solution of formaldehyde. All samples were treated by concentrated HNO_3 to determine the species from the class Bacillariophyceae (American Public Health Association 1985).

The algal species and subspecies were determined by a light microscope (magnification 1000×) and the following determination keys: Lazar (1960), Starmach (1966, 1972, 1980), Krammer & Lange-Bertalot (1986, 1988, 1991a, 1991b), Hindak et al. (1978), Hindak (1996),

Cvijan & Blaženčić (1996). Their abundance was estimated by the numbers 1, 3 and 5 (1 - single, 3 - customary, 5 - dominant) (Grbović 1994).

Altogether, 52 algal species and subspecies were determined (Table 1). The most common were Bacillariophyceae, followed by Cyanophyceae and Chlorophyceae. Bacillariophyceae are known as the most common class of algae in various rivers in Slovenia (Vrhovšek et al. 1994, Krivograd 1997, Smolar 1997). *Hydrurus foetidus* from the class Chrysophyceae was present. High species richness was found in summer and spring samples.

In all five Savica samples, the following species were determined: *Gloeocapsa sanguinea*, *Cocconeis placentula*, *Cymbella minuta* and *Diatoma mesodon*. *Gloeocapsa sanguinea* is a typical species of the drizzle zone in waterfalls (Starmach 1966). The predominant species (relative abundance 5) were *Phormidium foveolarum* and *P. setchelianum* in the sample taken in august 1998. *P. foveolarum* is typical of eutrophic environments rich in nutrients. *Hydrurus foetidus* was common in spring samples, which can be explained by low water temperature (Ward 1974). In the Savica Waterfall, two species and subspecies new to Slovenia were determined: *Phormidium setchelianum* from class Cyanophyceae and *Cymbella caespitosa* from class Bacillariophyceae.

Table 1: Algal species list with estimation of relative abundance (1 - single, 3 - customary, 5 - dominant) in the Savica Waterfall during the years 1998, 1999 and 2000, with marked species new (*) to Slovenia.

taxon	**date of sampling**				
	8.8.98	23.5.99	22.8.99	2.11.99	25.3.00
PROKARYOTA					
CYANOPHYTA					
CYANOPHYCEAE					
Gloeocapsa sanguinea (Ag.) Kütz.	1	3	3	1	1
Gloeocapsa turgida (Kütz.) Holl.		1			
Lyngbya sp.			1	1	1
Oscillatoria curviceps Ag.				1	
Phormidium corium (Ag.) Gom.		1			
Phormidium foveolarum (Mont.) Gom.	5				
Phormidium fragile (Menegh.) Gom.		1	1	1	1
**Phormidium setchelianum* Gom.	5		1		3
Phormidium sp.			1	1	1
Pleurocapsa minor Hansg.	1				
Pseudanabaena constricta (Sza.) Lauterb.				1	
EUKARYOTA					
HETEROKONTOPHYTA					
CHRYSOPHYCEAE					
Hydrurus foetidus Kirch.		1	1		3
BACILLARIOPHYCEAE					
Achnanthes delicatula (Kütz.) Grun.	1				3
Achnanthes lanceolata ssp. *lanceolata* var. *lanceolata* (Bréb.) Grun.	3		1		1

taxon	date of sampling				
	8.8.98	23.5.99	22.8.99	2.11.99	25.3.00
Achnanthes minutissima Kütz.	3	1	1		1
Achnanthes sp.					3
Amphora ovalis (Kütz.) Kütz.	1				
Amphora pediculus (Kütz.) Grun.					1
Cocconeis placentula Ehren.	1	1	1	1	1
Cymbella affinis Kütz.	1		1		
* *Cymbella caespitosa* (Kütz.) Brun.	1				1
Cymbella minuta Hilse	1	1	3	1	1
Cymbella silesiaca Bl.	1		1		1
Denticula tenuis Kütz.	1		1		
Diatoma vulgaris Bory					1
Diatoma mesodon (Ehren.) Kütz.	1	1	1	1	1
Eunotia exigua (Bréb.) Raben.			1	1	
Fragilaria capucina Desm.					1
Frustulia rhomboides (Ehren.) De Toni			1		
Gomphonema angustatum (Kütz.) Raben.			1		1
Gomphonema angustum Ag.	3	1	3		1
Gomphonema clavatum Ehren.			1	1	1
Gomphonema olivaceum (Horn.) Bréb.	1		1		1
Gomphonema parvulum Kütz.	1				
Gyrosigma acuminatum (Kütz.) Raben.	1				
Gyrosigma attenuatum (Kütz.) Raben.	1				
Melosira varians Ag.	1				
Meridion circulare (Grev.) Ag.				1	
Navicula capitatoradiata Germ.	1				
Navicula contenta Grun.				1	
Navicula cryptocephala Kütz.			1		
Navicula sp.	1				1
Navicula veneta Kütz.	1				1
Nitzschia dissipata (Kütz.) Grun.			1		1
Nitzschia fonticola Grun.	1	1	1		1
Nitzschia palea (Kütz.) W.Sm.	1				1
CHLOROPHYTA					
CHLOROPHYCEAE					
Dictyosphaerium pulchellum Wood.				1	
Klebsormidium flaccidum (Kütz.) Sil., Matt. & Black.				1	
Trentepohlia aurea (L.) Mart.				1	
Ulothrix variabilis Kütz.			1	3	1
Ulothrix zonata (Web. & Mohr.) Kütz.					1
ZYGNEMATOPHYCEAE					
Mougeotia sp.					1

Povzetek

V nalogi smo raziskovali perifitonske alge v slapu Savica v Sloveniji. Namen raziskave je bil ugotoviti kvalitativno vrstno sestavo in relativno abundanco združb v letih 1998, 1999 in 2000. Opravili smo pet vzorčenj v različnih letnih časih. V laboratoriju smo vzorce alg pregledali pod svetlobnim mikroskopom. Pri pregledovanju vzorcev smo ocenili pogostost posameznih vrst in podvrst alg s števili 1, 3 in 5 (1 - posamična, 3 - običajna, 5 - prevladujoča). V letih 1999 in 2000 smo merili tudi nekatere fizikalne in kemijske dejavnike.

Skupaj smo v slapu Savica določili 52 vrst in podvrst iz petih razredov alg. Po številu vrst in podvrst so prevladovale kremenaste alge, sledile so cianobakterije in zelene alge. V vseh petih vzorcih so bile prisotne naslednje vrste: *Gloeocapsa sanguinea*, *Cocconeis placentula*, *Cymbella minuta* in *Diatoma mesodon*. Najbolj pogosto sta se pojavljali vrsti *Phormidium foveolarum* in P*. setchelianum*.

Vrsti *Phormidium setchelianum* in *Cymbella caespitosa* sta novi za Slovenijo.

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