

Evaluation of diatom taxa in Alpin fresh water, Valbona River

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Abstract: The aim of this study is to determine the species of different diatoms genus and to evaluate the ecology status of the river. Samples were collected along the Valbona River during 2015 period. Diatoms have proven to be powerful indicators of environmental conditions with changes in species assemblages providing information on changes in environmental conditions. Many species are identified and the dominant taxa were: *Diatoma vulgare*, *Diatoma ehrenbergii*, *Diatoma mesodon*, *Meridion circulare*, *Fragilaria arcus*, *Fragilaria capucina*, *Cocconeis placentula*, *Cymbella affinis*, *Gomphonema tergestinum*, *Navicula tripunctata* etc. Diatom communities can be described by their species composition and diversity. Based on the type of taxa and the ecological values of species, Valbona river belong to oligo-saprobic state.

Key words: ALPINE RIVER, DIATOMS TAXA, SPECIES DIVERSITY.

1. Introduction

Valona River is located in Albanian Alps National Park, North of Albania. It is one of the main branch of Drini river and flow in north-east of Albanian Apls, in Tropoja district. It has a length of 50.6 km and an area of watershed 657 km² (Kabo et al., 1990-1991; Pano, 2015). In the Valbona River discharge two important branches: Gashi and Tropoja River. It discharges in HEC Komani Lake. This area is carbonaceous and formed by glaciers and tectonic detachments. During the summer, for a distance of 7 km, until the village of Valbona is reached, the riverbed is dry because the valley is a coarse. The permanent flow of river water continues again in the village of Valbona (Wolfgang Fremuth et al., 2000). Valbona River is very famous for its cold and crystalline waters as well as for the picturesque waterfalls and canyons. The water resources have all a good water quality. The surface waters are used as drinking water supply for the local and regional communities and for irrigation (Keci & Krog 2014). Until now there is not so much studies for Valbona river focused in algae. Previous studies by Kashta and Miho is focused in macroalage in Albanian running water (2016). In Valbona river they have identified only *Lemanea* spp.; *Hydrurus foetidus*, characterized by cold waters of very good quality; *Lemanea* spp. They are generally indicators of good water quality (Eloranta & Kwandrans, 2004). Kurteshi et al., 2012 focused their study in Algocenosis in Valbona River (2015). They have identified 24 diatoms species; 3 *Chlorophyta* species; 2 *Cyanoprokariota* species, while *Euglenophyta* and *Tribophyceae* with one species.

Our study is focused in evaluation of diatoms species along Valbona River. Diatoms fulfill these prerequisites, they are ubiquitous in lakes and rivers and frequent in the euphotic benthic zone throughout the year (Kupe et al., 2008). Diatoms are abundant and the most species-rich primary producers in rivers, living in almost all habitats from the source to the mouth (John, 2003; Round, 1991). They have a short lifecycle and rapidly follow environmental changes. Due to their siliceous cell wall, they are easily sampled and preserved, hence providing a permanent record which allows the assessment of short or long term changes (Kupe et al., 2008).

1. Materials and Methods

Diatom material was collected along Valbona river (Fig. 1) by scraping the upper surface of selected rocks from riffle sections of the river with a toothbrush and the resulting suspensions collected and preserved in 4% formaldehyde (Prygel 2002; Buwal 2007; Kelly 1998, Kupe, 2006; Kupe et al., 2008). The cleaning of diatom frustules from organic material and mounting the residues on slides was done as described by Krammer and Lange-Bertalot (1986-2001). About 500 valves per slide were counted using oil immersion, yielding a 95% confidence for the data on species composition (Prygel 2002; Kelly 1998, Lund et al., 1958). Diatoms were identified using standard literature (Krammer and Lange-Bertalot, 1986-2001; AlgaeBase, Guiry & Guiry, 2016).

3. Results and discussion

From periphyton samples in Valbona river, we identified diatom species, which are presented in table 1. The most of dominant taxa are oligotraphent species by Rott et al., 1999, like as: *Cyclotella ocellata* (Tw_i, 1.5 and G_i, 1); *Achnanthes minutissima* Kützing agg. (Tw_i, 1.2 and G_i, 1; S_i, 1.7 and G_i, 1); *Achnanthes biasolettiana* Grunow (Tw_i, 1.3 and G_i, 1; S_i, 1.4 and G_i, 3); *Cymbella affinis* Kützing agg. (Tw_i, 0.7 and G_i, 4; S_i, 1.3 and G_i, 4); *Cymbella tumidula* var. *lancetula* Krammer (Tw_i, 0.3 and G_i, 2; S_i, 1 and G_i, 5); *Gomphonema olivaceum* var. *minutissimum* (Tw_i, 1.2 and G_i, 2; S_i, 1.5 and G_i, 3); *Gomphonema pumilum* (Grunow) Reichardt & Lange-Bertalot (Tw_i, 1.1 and G_i, 1; S_i, 1.6 and G_i, 3); *Meridion circulaire* (Grewille) Agardh var. *circulaire* (Tw_i, 1.2 and G_i, 2; S_i, 1.2 and G_i, 4) etc.

Most of the species in Valbona river are oligotraphentic, mainly present in periphyton samples, growing up only in oligotrophic waters with low nutrient level, like *Achnanthes minutissima* var. *gracillima*, *Fragilaria arcus* var. *arcues* (Ehrenberg) Cleve, *Fragilaria capucina* var. *rumpens* (Kützing) Lange-Bertalot, *Navicula angusta* Grunow, which are more dominant taxa (Tab. 1).

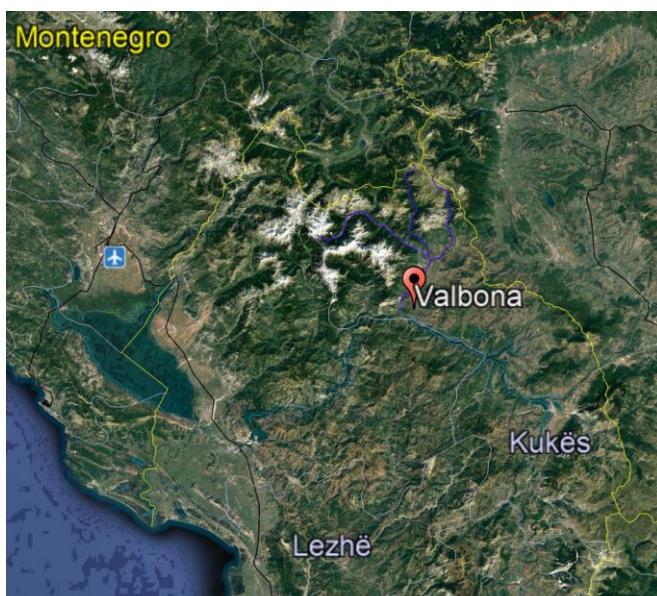


Fig. 1 Location of Valbona River

Table 1. Check list of diatoms in Valbona River.

Name of species	Frequency	TIDIA		Ecological level (Rot et al., 1999)	SI		Ecological level (Rott et al., 1997)
		Tw _i	Gi		Si	Gi	
<i>Cyclotella ocellata</i> Pantocsek	+++	1.5	1	oligo-mesotraphent	-	-	
<i>Cyclotella pseudosetiligera</i> Hustedt	+	-	-		-	-	
Pennates							
<i>Achnanthes hungarica</i> (Grunow) Grunow	+	3.4	2	eu-politraphent	2.7	3	a-mesosaprob
<i>Achnanthes minutissima</i> Kützing agg.	+++	1.2	1	oligo-mesotraphent	1.7	1	oligosaprob deri β-mesosaprob
<i>Achnanthes lanceolata</i> ssp. <i>frequentissima</i>	+	2.8	3	eutraphent	2.5	0	β-mesosaprob deri a-mesosaprob
<i>Achnanthes minutissima</i> var. <i>gracillima</i>	+++	0.6	3	oligotraphent	1	5	oligosaprob
<i>Achnanthes biasolettiana</i> Grunow	+++	1.3	1	oligo-mesotraphent	1.4	3	oligosaprob
<i>Aneumastus stroesei</i> (Østrup) D.G.Mann in Round	+	1.8	1	mesotraphent	1.4	4	oligosaprob
<i>Amphora montana</i> Krasske	+	2.9	2	eutraphent	1.6	0	oligosaprob deri β-mesosaprob
<i>Cocconeis pediculus</i> Ehrenberg	+	2.6	2	eutraphent	2	3	β-mesosaprob
<i>Cocconeis placentula</i> var. <i>lineata</i> (Ehrenberg) Van Heurck	++	2.3	2	meso-eutraphent	-	-	
<i>Cymbella aspera</i> (Ehrenberg) Cleve	+	1.7	1	mesotraphnet	1	5	oligosaprob
<i>Cymbella affinis</i> Kützing agg.	+++	0.7	4	oligotraphent	1.2	4	oligosaprob
<i>Cymbella caespitosa</i> (Kützing) Brun	++	2.1	0	meso-eutraphent	1.6	2	oligosaprob deri β-mesosaprob
<i>Cymbella cistula</i> (Ehrenberg) Kirchner agg.	++	2.3	1	meso-eutraphent	1.4	3	oligosaprob
<i>Cymbella tumidula</i> var. <i>lancetula</i> Krammer	+++	0.3	2	ultraoligotraphent	1	5	oligosaprob
<i>Cymbella helvetica</i> Kützing	+++	1.4	2	oligo-mesotraphent	1.8	3	β-mesosaprob
<i>Diatoma ehrenbergii</i> Kützing	++	1.6	3	mesotraphnet	1.3	3	oligosaprob
<i>Diatoma mesodon</i> (Ehrenberg) Kützing	+++	0.7	4	oligotraphent	1.3	4	oligosaprob
<i>Diatoma vulgare</i> morphotyp <i>linearis</i>	+++	2	0	mesotraphnet	2.1	4	β-mesosaprob
<i>Encyonema minuta</i> Hilse ex Rabenhorst	++	2	1	mesotraphnet	1.6	2	oligosaprob deri β-mesosaprob
<i>Fragilaria arcus</i> var. <i>arcus</i> (Ehrenberg) Cleve	+++	1	3	oligotraphent	1.5	2	oligosaprob deri β-mesosaprob
<i>Fragilaria capucina</i> var. <i>rumpens</i> (Kützing) Lange-Bertalot	+++	1	2	oligotraphent	1.6	3	oligosaprob deri β-mesosaprob
<i>Fragilaria capucina</i> var. <i>vaucheria</i> (Kützing) Lange-Bertalot	++	1.8	1	mesotraphnet	2.5	2	β-mesosaprob deri a-mesosaprob
<i>Fragilaria nana</i> Steemann-Nielsen	+++	1.2	2	oligo-mesotraphent	1.1	4	oligosaprob
<i>Fragilaria pinata</i> var. <i>pinata</i>	++	2.2	1	meso-eutraphent	1.4	3	oligosaprob
<i>Fragilaria ulna</i> (Nitzsch) Lange-Bertalot agg.	+	3.5	4	polytraphent	2.7	0	a-mesosaprob
<i>Gomphonema olivaceum</i> var. <i>olivaceum</i>	+++	1.5	2	oligo-mesotraphent	2.1	4	β-mesosaprob
<i>Gomphonema olivaceum</i> var. <i>minutissimum</i>	+++	1.2	2	oligo-mesotraphent	1.5	3	Oligosaprob deri β-mesosaprob
<i>Gomphonema pumilum</i> (Grunow) Reichardt & Lange-Bertalot	+++	1.1	1	oligo-mesotraphent	1.6	3	Oligosaprob deri β-mesosaprob
<i>Gomphonema tergestinum</i> Fricke	+++	1.4	1	oligo-mesotraphent	1.9	4	β-mesosaprob
<i>Meridion circulaire</i> (Grewille) Agardh var. <i>circulaire</i>	++	1.2	2	oligo-mesotraphent	1.2	4	oligosaprob
<i>Navicula angusta</i> Grunow	+++	0.6	2	oligotraphent	1	5	oligosaprob
<i>Navicula capitatoradiata</i> Germain	+	3.3	4	eu - polytraphent	2.3	3	β-mesosaprob deri a-mesosaprob
<i>Navicula cincta</i> (Ehr.) Ralfs in Pritchard	+	3.4	2	eu - polytraphent	2.6	2	β-mesosaprob deri a-mesosaprob
<i>Luticola goeppertiana</i> (Bleisch)	+	3.6	5	polytraphent	3.3	2	a-mesosaprob deri polisaprob
<i>Navicula splendidula</i> VanLandingham	+	1.5	2	oligo-mesotraphent	-	-	
<i>Geissleria deccusis</i> (Østrup) Lange-Bertalot	+	1.2	1	oligo-mesotraphent	1.7	3	oligosaprob deri β-mesosaprob
<i>Nitzschia capitellata</i> Hustedt	+	3.8	5	polytraphent	3.4	2	a-mesosaprob deri polisaprob

Frequency: +, rarely presence; ++, medium presence; +++ high presence; **TIDIA:** TW_i - trophic value of *i* species (1-3); G_i - indicative weight of *i* species (1-5), (by Rott et al., 1999); **SI:** S_i - saprobes value of *i* species (1-3); G_i - indicative weight of *i* species (1-5), (by Rott et al., 1997).

However, in periphyton, upper the stones, there have been observed high presence of tolerant species that grow up to a wide range, from oligo to mesotrophic waters, like *Cyclotella ocellata* Pantocsek, *Achnanthes minutissima* Kützing agg., *Achnanthes biasolettiana* Grunow, *Cymbella helvetica* Kützing, *Fragilaria nana* Steemann-Nielsen, *Gomphonema olivaceum* var. *minutissimum*, *Gomphonema pumilum* (Grunow) Reichardt & Lange-Bertalot etc.

Low presence of taxa are observed for meso-eutraphent species like *Fragilaria pinata* var. *pinata*, *Cymbella cistula* (Ehrenberg) Kirchner agg. etc., and very low presence is observed for eutraphent and polytraphent species like *Nitzschia capitellata* Hustedt, *Navicula capitatoradiata* Germain, *Luticola goeppertiana* (Bleisch), *Navicula cincta* (Ehr.), etc., which show low to medium level of inorganic matter, especially low level of phosphorous, it is impact from activities and business in watershed of Valbona river.

Based on saprobic value, about 26 taxa belong oligosaprob (SI=1) to oligo to β -mesosaprob (SI = 1.7) level with high presence of diatoms (Tab.1). Only two species *Luticola goeppertiana* (Bleisch) and *Nitzschia capitellata* Hustedt, belong α -mesosaprob to polisaprob level, which show a very low level of organic matter. From our results, in general, we conclude that Valbona River has clean water.

4. Conclusions

Based on diatom taxa and their ecological value, Valbona River is considered as a natural ecosystem with cold water, high biodiversity and low level of inorganic matter and very low level of organic matter. *Achnanthes minutissima* var. *gracillima*, *Fragilaria arcus* var. *arcus* (Ehrenberg) Cleve, *Fragilaria capucina* var. *rumpens* (Kützing) Lange-Bertalot, *Navicula angusta* Grunow are considered as oligotraphent and oligosaprob species. Based on these data, Valbona is classified as oligotroph water.

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