

# DETERMINATION OF POLLUTION IN RIVER DRINI BARDHË DURING THE SUMMER SEASON 2010 THROUGH THE ALGAL BIOINDICATORS

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## Abstract

Algae a good bioindicator to determinate the level of pollution of waters.

During the investigation period we noticed 126 species of algae, which belongs 4 division: *Cyanophyta*(21 species), *Bacillariophyta* (77 species), *Euglenophyta* (10 species) and *Chlorophyta*(18 species). Based on the presence of indicator species, water of river Drini Bardhë belong first till second (II ) class of bonity respectively oligosaprob to betamesosaprob class.

**Key words:** *Algae, pollution, river, Drini Bardhë, Kosovo*

## Introduction

The study of algal biodiversity in the river Drini Bardhë gains importance in relation to the rapidly increasing pollution impact on aquatic ecosystems in this region.

Monitoring studies of aquatic systems in Kosovo are admittedly less advanced than on the European coast (Dell'Uomo 1999; Prygiel & Coste 1999).

The purpose of this study was to reveal the algal diversity and relate it to environmental variables in a protected river of north-west Kosovo. The bioindication methods are regularly utilized in the EU for evaluation of ecosystem responses to changes of major environmental variables, i.e. salinity, pH, and organic pollution. Here we apply these methods for assessment of the current state and potentials of aquatic ecosystems in the Drini Bardhë River, a larger river of Kosovo.

## Material and methods

The samples were collected at 4 sampling stations along the river Drini Bardhë in the summer of 2010.

Water samples were collected in 500 ml glass bottles, 10 cm beneath the water surface, using standard methods (Hindak,1978). Conductivity, pH, salts, TDS (Total Disolved Salts), were measured in situ using mobile instruments (HACH), O<sub>2</sub> were measured with mobile instrument such as oxygenometer (Hana Instrument) and nutrients (N, P, Si ) were analysed by standard methods (DEV,1981).

Epilithon was brushed from the stones with toothbrush and the upper layer of epipelon was pipetted off with a vacuum suction system (Sladeckova,1962). Epiphyton was sampled with the substrate and palced in the plastic bottles .

The algae were examined using a Leica microscope, with a digital camera Fujifilm, which filmed the algae directly from the sample.

### Diatoma cleaning

Cleaning of diatom frustules, preparation of permamnent slides and determinations follow Krammer & Lange-Bertalot (1986-2001).

**Algal identification** was done according to the keys:*Cyanophyta*: Elenkin 1938, 1949; Starmach 1966.*Bacillariophyta*: Kramer, Lange-Bertalot 1986, 1988, 1991a, 1991b

*Euglenophyta*: Starmach 1983; *Chlorophyta*: Komárek and Fott 1983; Pascher 1984,1985.

## Results and discussion

The composition of algoflora of river Nerodime it is to much diversified. We identified 116 taxa, which belongs to 4 divisions: *Cyanophyta*, *Bacillariophyta*, *Euglenophyta* and *Chlorophyta*.

Dominated the Bacillariophyta with 70 taxa, then Cyanophyta with 18 taxa, Chlorophyta with 18 taxa, Euglenophyta with 10 taxa.

Division Bacillariophyta is represented through its highest number of species and intraspecific taxonomic varieties, among which are *Nitzschia* – 12 species and *Navicula* – with 10 species.

From the representatives of filamentary Cyanophyta most rich in species is gender

*Oscillatoria*, with 4 taxa.

Algaeflora of the river is characterized by a big variety of Chlorophyta with 18 taxa, where dominating gender is *Cladophora* with 4 taxa.

At division Euglenophyta dominating gender is *Trachelomonas* with 3 species, followed by the representatives *Euglena* with 3 species.

It was determined 38 algal bioindicators in the river. Dominated the bioindicators species which belongs to betamesosaprob and oligosaprob class.

### Conclusions

Based in determined species of algae of the river Drini Bardhë, we can conclude:

-Higher diversity of algae in summer season (determined 126 taxa, which belongs to 4 divisions: Cyanophyta, Bacillariophyt, Euglenophyta and Chlorophyta).

-During the study period (summer season 2010) we identified 116 algal species.

-In river Drini Bardhë (during summer season 2010) dominate diatoms with 77 species.

-Bioindicator species are 38, dominate oligosaprob and betamesosaprob species with 11 taxa, followed by oligosaprob with 10 taxa.

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Tabl.1 Determined species of algae in river Nerodima during summer season 2011

	Division CYANOPHYTA	Level of Saprobity	LOCALITIES			
			1	2	3	4
<b>131</b>	<b>Total number of alga</b>					
1	Anabaena plantonica Brunth.		1			
2	A.constricta W.West.	p			1	
3	Chroococcus varius Al.Br.		1			
4	Dactylococcopsis acicularis Lemm				1	
5	Gloetrichia echinulata (G.S.Smith).P.Richt.	$\beta$				
6	G. natans (Hedw.)Rabenh.	$\beta$				
7	Gloeocapsa sp.					1
8	Lemanea annulata (Rotalge)Vergr.		1			
9	Microcystis grevillei f.grevillei (Hass)Elenk.					
10	Nodularia spomigena Mert.		1			
11	Oscillatoria chlorina Vaucher (Agardh)	$\rho$		1	1	
12	O.formosa Bory	$\alpha$				
13	O.limosa Vaucher	$\alpha - \beta$			1	1
14	Oscillatoria mirabilis Böcher		1	3	3	
15	O.nitida Schkord					1
16	O.plangtonica Wolosz.					
17	O.princeps Vaucher	$\alpha$				1
18	O.rupicola Hansg.					
19	Phormidium automnale (Ag.) Gom.	$\beta - \alpha$				
20	Ph. fovelarum Gom.	$\alpha$	1	1		
21	Ph. molle Kützing	$\beta - \alpha$		1		
				1		
	<b>Division BACILLARIOPHYTA</b>					
1	Achnanthes hungarica (Grunow) Grunow	o		1		1
2	Achnanthidium minutissimum(Kütz.)Czarneck		1	1	1	1
3	Amphora lybica Ehrenberg		1			
4	Amphora normani Rabenhorst	o	1	3	3	
5	Aneumastus stroesei (Ostrup) Mann					
6	Cocconeis pediculus Ehrenberg	o- $\beta$			3	3
7	Cocconeis placentula Ehrenberg	$\beta$	3			
8	C. placentula var. lineata (Ehrenberg) Cleve		3	5	3	3
9	Craticula accomoda (Hustedt) Mann				3	
10	Cyclotella ocellata Pantocsek				1	
11	Cymatopleura solea (Brébisson) W.Smith	$\beta - \alpha$		1	1	1
12	Cymbella affinis Kützing	o- $\beta$	3	3	3	3
13	Cymbella helvetica Kützing	o	3	3	3	3
14	Cymbella minuta Hilse ex Rabenhorst		1	3		
15	Cymbella naviculiformis (Auerswald) Cleve	$\beta$	3	3		
16	Diatoma ehrenbergii Kützing		3	5	3	3
17	Diatoma moniliforme Kützing			3		
18	Diatoma vulgare Bory	$\beta$		3	3	3
19	Epithemia adnata (Kützing) Brébisson			3		
20	Fragilaria capucina Desmazières	o- $\beta$	3			
21	Fragilaria ulna (Nitzsch) Lange-Bertalot					
22	F. ulna complex oxyrhynchus Lange-Bertalot					
23	Frustulia vulgare (Thwaites) De Toni	o	1	1		
24	Gomphonema carolinense Hagelstein			1		1
25	G.grovei M.Schmidt			1	1	
26	G. micropus Kützing			1		1

	Division CYANOPHYTA	Level of Saprobity	LOCALITIES			
			1	2	3	4
27	<i>G. minutu</i> (C.Agardh) C.Agardh			1	1	3
28	<i>G. olivaceum</i> (Hornemann) Brébisson	β	1	1	1	
29	<i>Gyrosigma acuminatum</i> (Kützing) Rabenhorst	β	1	1		
30	<i>Gyrosigma attenuatum</i> (Kützing) Rabenhorst	β	1	1	1	1
31	<i>Gyrosigma scalproides</i> (Rabenhorst) Cleve			1	1	1
32	<i>Hantzschia amphioxys</i> (Ehrenberg) Grunow	α	1			
33	<i>Hippodonta capitata</i> (Ehrenbg.)Lange-Bertalot				1	1
34	<i>Luticola goeppertiana</i> (Bleish) Mann					
35	<i>Luticola mutica</i> (Kützing) D.G. Mann			1		
36	<i>Melosira varians</i> Agardh	β		1	1	1
37	<i>Meridion</i> <i>circulare</i> var. <i>constrictum</i> (Ralfs)V.Heurck			1		1
38	<i>Navicula capitatoradiata</i> Germain				1	1
39	<i>Navicula cryptotenella</i> Lange-Bertalot			3	3	
40	<i>Navicula lanceolata</i> (Agardh) Ehrenberg		3	3	3	
41	<i>Navicula rhynchocephala</i> Kützing	α		3		
42	<i>Navicula tripunctata</i> (O.F.Müller) Bory		3		3	3
43	<i>Navicula trivialis</i> Lange-Bertalot		3	3		3
44	<i>Navicula viridula</i> (Kützing) Ehrenberg	α	3	5	3	3
45	<i>Navicula viridula</i> var. <i>rostellata</i> (Kützing) Cleve		3	3		3
46	<i>Nitzschia acula</i> Hantzsch in Rabenhorst					3
47	<i>Nitzschia capitellata</i> Hustedt		3	3		3
48	<i>Nitzschia constricta</i> (Kützing)Ralfs				3	3
49	<i>Nitzschia closterium</i> ( Ehrenberg)W.Smit				1	
50	<i>Nitzschia dissipata</i> (Kützing) Grunow	o- β		3	3	
51	<i>Nitzschia elegantula</i> Grunow in Van Heurck				3	
52	<i>Nitzschia eglei</i> Lange Bertalot					1
53	<i>Nitzschia fonticola</i> Grunow	o- β		3		
54	<i>Nitzschia levidensis</i> (W.Smith) Grunow		3			
55	<i>Nitzschia litoralis</i> Gruow				1	
56	<i>Nitzschia linearis</i> (Agardh) W.Smith	o- β				3
57	<i>Nitzschia pusilla</i> Grunow				1	1
58	<i>Nitzschia sigmoidea</i> (Nitzsch) W.Smith	β			3	
59	<i>Nitzschia umbonata</i> (Ehrenberg)Lange-Bertalot				3	3
60	<i>Pinnularia microstauron</i> (Ehrenberg) Cleve	o	3			
61	<i>P.microstauron</i> var. <i>brebissonii</i> (Kützing)Mayer	β	3			
62	<i>Planothidium ellipticum</i> (Cleve) Round		3			
63	<i>Planothidium lanceolatum</i> (Brébisson) Round		3			3
64	<i>Reimeria sinuata</i> (Greg.) Kociolek & Stoermer				3	3
65	<i>Rhoicosphaenia abbreviata</i> (Ag.)Lange-Bertalot	β	1	1	1	1
66	<i>Sellaphora pupula</i> [Kützing] Mjereschowsky			3	3	3
67	<i>S. pupula</i> fo. <i>rostrata</i> (Hustedt) Bukhtiyarova			3		
68	<i>Stauroneis smithii</i> Grunow		1		1	
69	<i>Surirella angusta</i> Kützing					3
70	<i>S. brebissonii</i> var. <i>kuetzingii</i> Krammer & L-B.				3	3
72	<i>S. linearis</i> W.Smith	β		3	3	
73	<i>S. minuta</i> Brébisson in Kützing			3	3	
74	<i>S.patella</i> Kützing			1		1
75	<i>Synedra acus</i> Hustedt		1		1	
76	<i>S.nana</i> Meister					
77	<i>S.ulna</i> Kützing		1		1	1

		LOCALITIES				
<b>Division CYANOPHYTA</b>		Level of Saprobity	1	2	3	4
<b>Division EUGLENOPHYTA</b>						
1	<i>Euglena acus</i> Ehrenb.	$\beta$				1
2	<i>E.oblonga</i> Lemm.					
3	<i>E. viridis</i> Ehrenbeg	$\rho$ - $\alpha$		1		
4	<i>Phacus orbicularis</i> Hübn.	$\beta$				
5	<i>Phacus suesica</i> Dujardin	$\beta$	1	1		
6	<i>Trachelomonas affinis</i> Lemm.		1		1	
7	<i>T. bituricensis</i> Ehrenberg					
8	<i>T.caudata</i> Stein	$\beta$				
9	<i>T.hispida</i> (Perty)Stein.	$\beta$		1		
10	<i>T.volvocina</i> Ehrenb.	$\beta$			1	
<b>Division CHLOROPHYTA</b>						
1	<i>Cladophora glomerata</i> Kützing	$\beta$		1	1	1
2	<i>Closterium moniliferum</i> Nitzsch	$\beta$			1	
3	<i>C.praelongum</i> Bréb.		1			
4	<i>C.pronum</i> Bréb.					
5	<i>C. venus</i> Kützing	$\beta$	1			
6	<i>Microspora flocosa</i> (Vauch)Thuret.					
7	<i>M.elegans</i> Hansg.					
8	<i>Pleurococcus naegeli</i> Chod.		1			
9	<i>Scenedesmus quadridens</i> Meyen	$\beta$				
10	<i>Stigeoclonium tenue</i> Kützing	$\alpha$				