

STRUCTURE OF THE BENTHIC DIATOM COMMUNITIES FROM THE ARIEȘ RIVER CATCHMENT AREA (TRANSYLVANIA, ROMANIA)

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Abstract: The present paper deals with the benthic diatom communities occurring in the Arieș River (Transylvania, Romania) and some of its tributaries. The samples were collected from 18 sampling sites in the spring, summer and autumn of 2008. Of the 214 diatom taxa identified, genera exhibiting the highest diversity were *Navicula* (40 taxa), *Nitzschia* (32 taxa), *Cymbella* (25 taxa) and *Gomphonema* (14 taxa). The authors' field measurements suggested that the expected changes in pH, salinity and conductivity of the waters due to geological substrate, geographical position, hydrographic features, climate, etc., might be affected by local pollution sources (industrial, agricultural, grazing, household human activities) determining the final water quality of the streams. The impact of anthropogenic factors could also be detected on the level of the structure of diatom communities inhabiting the Arieș River and its tributaries by using floristic similarity analysis. According to floristic similarity analysis, it was also possible to formulate preliminary conclusions upon the seasonal community dynamics: the tendency of community grouping is mostly seasonal and it is less affected by changes in water quality (variations in pH, salinity, organic loading, etc.).

Keywords: benthic diatom communities, Arieș River, Transylvania, Romania, human activities.

Introduction

The Arieș is a well-known Transylvanian river (the name Arieș derived from its gold content, gold extraction being practiced since ancient times) located in the north-west of Romania. The river is approximately 167 km long; it springs from the Bihor Massif, located in the central part of the Apuseni Mountains (Romanian Western Carpathians) and discharges its water into the Mureș River downstream from the town of Luduș. The Arieș, the second largest tributary of the Mureș River, exhibits a catchment area of 2970 km², the third by length, but the first by flow with 26 m³.s⁻¹ discharges. Approximately 60–65% of the Arieș River catchment area (2000 km²) covers the mountainous region and only its third part belongs within the Transylvanian Depression [2, 4, 11 and 13].

The stream crosses two Transylvanian counties – Alba and Cluj – and runs through two industrial towns – Turda and Câmpia Turzii. The catchment area of the Arieș is delimited in the west by the Bihor Mountains, consisting mainly of Permian conglomerates (verrucano-type), also cretaceous limestone with hippurites; in the south-east by the Metalifer Mountain, including cretaceous limestone with orbitolines; and in the southern part by the Trăscăului Mountains, consisting of both paleogenic and neogenic sediments. These mountains are composed of massive limestone, transgressive on a crystalline and Ophiolite base. In the north it is bordered by the Gilău Mountain, with limestone masses and dolomites, and in the east by the Transylvanian Depression, dominated by Sarmatian and Quaternary formations: sand, clay, breccia, etc. The altitude of the Apuseni Mountains rarely exceeds 1800 m in the central area, while in its northern and southern parts it ranges between 700 and 1000 m [4].

The catchment area of the river is polluted throughout the year, by mining, agriculture, zootechnology, household activities and increasing tourism. In spite of this, some sections from the upper and the middle region of the Arieș catchment area have been declared natural reserves (ice caves: Ghețarul de la Scărișoara, Ghețarul de la Vârtoș; basalt columns: Detunata Goală, Detunata Flocoasă; other interesting landscape elements: Dealul cu Melci, Poiana cu Narcise de la Negrișoara, Cheile Turzii [12]), the intense and careless tourism remains a permanent source of pollution (paper, plastic, etc). Human settlements together with domestic life have had the main impact on the whole Arieș catchment area. The upper part of the catchment area is influenced negatively by intensive grazing and the wood industry, the middle part mainly by the mining industry. The lower part of the Arieș catchment area is polluted by various chemicals resulting from wastes produced by nearby industrial activities, intensive agriculture and zootechnology.

In the present study the authors aimed to establish the floristic composition and seasonal dynamics of the benthonic diatom communities of the Arieș River and some of its tributaries. At the same time they tried to detect changes in water quality of the streams based on differences in community structure employing floristic similarity analysis.

Materials and Methods

The epilithic diatom communities were sampled in spring, summer and autumn 2008. Eighteen sampling sites were established (Table 1), ten in the Arieș River and eight on its main tributaries between Arieșeni-Vârtoș (ski track) and Lunca. When selecting the sampling sites the main pollution sources were considered: inflow of mining wastes, industrial pollution sources, agricultural waste waters, etc. The positions of the sampling sites (A1 – A18) are given in a sketch map (Fig. 1).

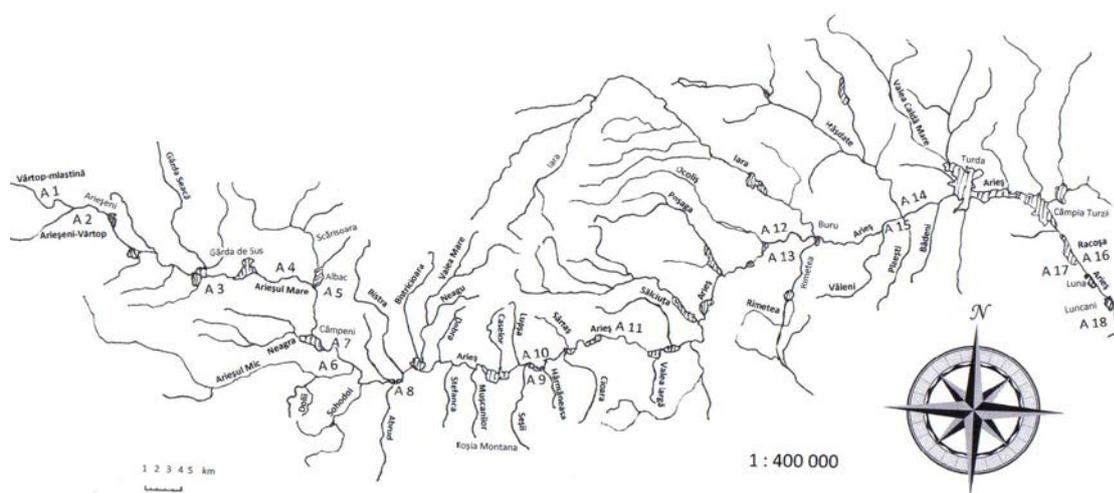


Fig. 1: Location of sampling sites in the Arieș River catchment area: A1 – Vârtoș-mlaștină (Boggy area); A2 – Arieșeni-Vârtoș; A3 – Gârda Seacă; A4 – Arieșul Mare upstream of Albac; A5 – Valea Albacului; A6 – Arieșul Mic; A7 – Arieșul Mare upstream of Câmpești; A8 – Abrud rivulet; A9 – Pârâul Seșii; A10 – Arieș at Valea Lupșii; A11 – Brăzăști; A12 – Valea Ocolîșului; A13 – Arieș upstream confluence with Valea Ocolîșului; A14 – Hășdate; A15 – Arieș downstream confluence with Hășdate; A16 – Arieș upstream confluence with Racoșă; A17 – Racoșă; A18 – Lunca.

Table 1: The sampling sites investigated in the Arieș River catchment area and their altitudes (modified from [6]).

Sampling sites	Name of sampling sites	Altitude (m)	Sampling sites	Name of sampling sites	Altitude (m)
A 1	Vârtop-mlaștină (Boggy area)	1149	A 10	Arieș at Valea Lupșii	495
A 2	Arieșeni-Vârtop	1134	A 11	Brăzești	462
A 3	Gârda Seacă	741	A 12	Valea Ocolişului	417
A 4	Arieșul Mare upstream Albac	592	A 13	Arieș upstream confluence with Valea Ocolişului	417
A 5	Valea Albacului	634	A 14	Hășdate	350
A 6	Arieșul Mic	590	A 15	Arieș downstream confluence with Hășdate	347
A 7	Arieș upstream of Câmpeni	560	A 16	Arieș upstream confluence with Racoșa	96
A 8	Abrud rivulet	543	A 17	Racoșa	296
A 9	Pârâul Sesii	497	A 18	Luncani	278

The epilithic diatoms were sampled by scraping the surface of stones and rocks with a knife or simply by brushing them, and were preserved in 4 % formalin. The samples were subsequently rinsed in distilled water to remove the fixative, treated with nitric acid or incinerated. The silica frustules were mounted in Colophony or StyraX and examined under a light microscope with oil immersion lens (numerical aperture: 1.32).

Some of the physical and chemical parameters of the water (pH, salinity, and conductivity) were also measured, hydrogen ion concentration with CONSORT model-P902, salinity and conductivity with CONSORT model-K911.

Results and Discussions

Physicochemical parameters

The main physical and chemical parameters measured in the field at the 18 sampling sites collected from the Arieș catchment area, are presented diagrammatically (Figs. 2 - 4).

The pH-values (Fig. 2) range roughly between 5 and 9, the stream water mostly being circum-neutral to slightly alkaline. The lowest pH was measured in Pârâul Șesii (sampling site A 9) in spring 2008 (pH= 3.3), possibly due to strong mining water pollution. However, in summer the same site exhibited less acidic water (pH= 4.9). At the first sampling site (A 1), the unexpectedly alkaline water (pH= 8.3) might be explained by allochthonous loading of minerals washed into the stream by the early snow melt flood from nearby construction sites (hotels, roads). In summer and autumn 2008 at Vârtop-mlaștină (sampling site A 1), the pH values were 6.0 and 5.1 respectively, expected hydrogen ion concentrations, due to the acidic characteristics of the mountain. Otherwise, the pH values along the main stream vary slightly between sampling sites, according to local substratum conditions (limestone, conglomerate) and local pollutants. Usually the pH of the water was somewhat alkaline, ranging between 8.0 and 8.8, except the autumn samples collected in the upper course of the stream (A 1 – A 6), characterized by slightly acidic waters, varying between pH = 5.0 and pH = 6.5.

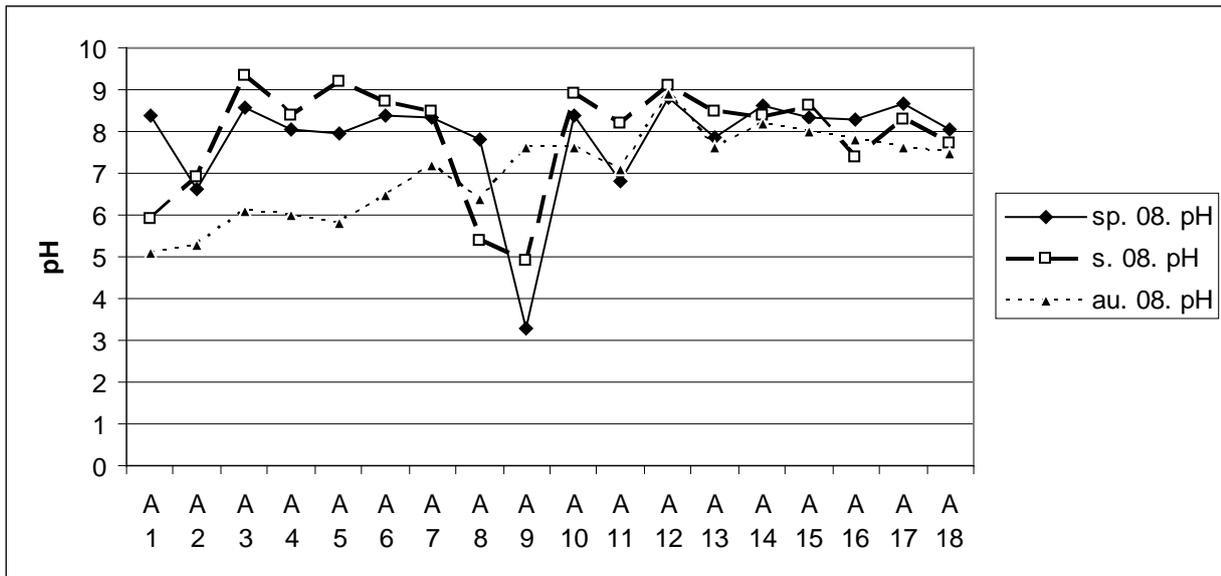


Fig. 2: The pH of water measured in the Arieş River and its main tributaries in 2008 (A1-A18 = sampling sites; sp. = spring, s. = summer, au. = autumn, 08 = 2008)

In spring 2008 the salinity of water (Fig. 3) exhibited an increasing tendency from upstream toward downstream, the values being distributed rather linearly in the upper course of the river (A 1 – A 8); the variations are more sinusoidal below, possibly due to local pollution sources and to the tributaries with different mineral loadings along the river. The highest salinity value 65.8 mg.l⁻¹ was measured in summer 2008 at Abrud (A 8) possibly due to the inflow of town wastes and mining waters from the local mining industry. Otherwise salinity is rather uniform, ranging between 9 and 15 mg.l⁻¹. In autumn the salinity exhibited almost similar values, all below 10 mg.l⁻¹.

The conductivity exhibits the same pattern as salinity in all seasons, the highest being in summer at sampling site A 8 (Abrud rivulet).

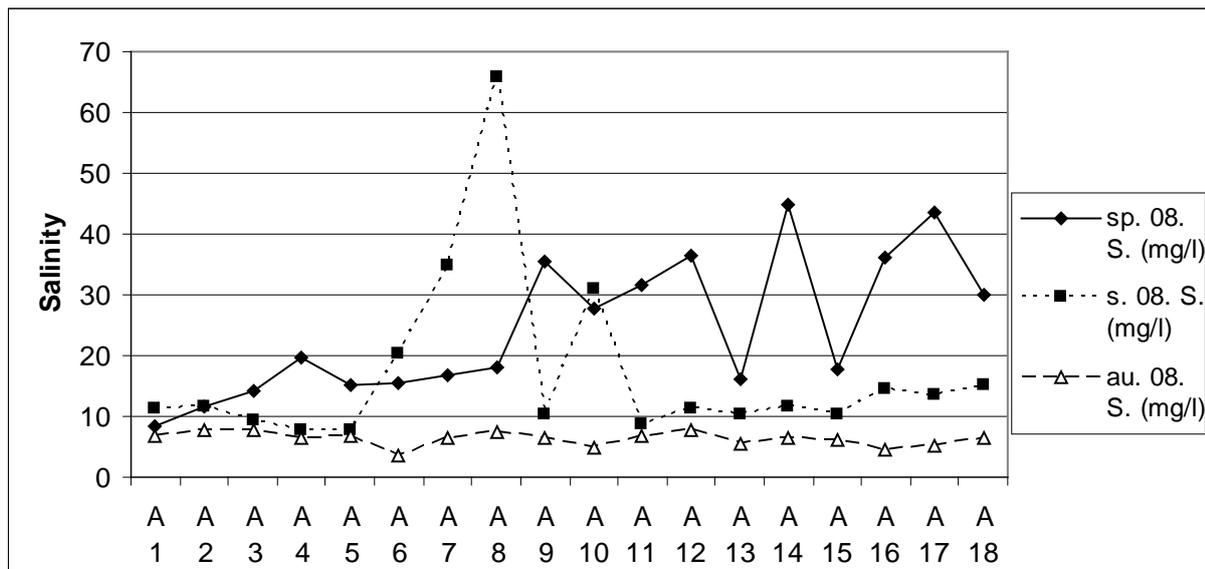


Fig. 3: Salinity of water in the Arieş River and its main tributaries, measured in 2008 (A1-A18 = sampling sites; sp. = spring, s. = summer, au. = autumn, 08 = 2008, S = salinity)

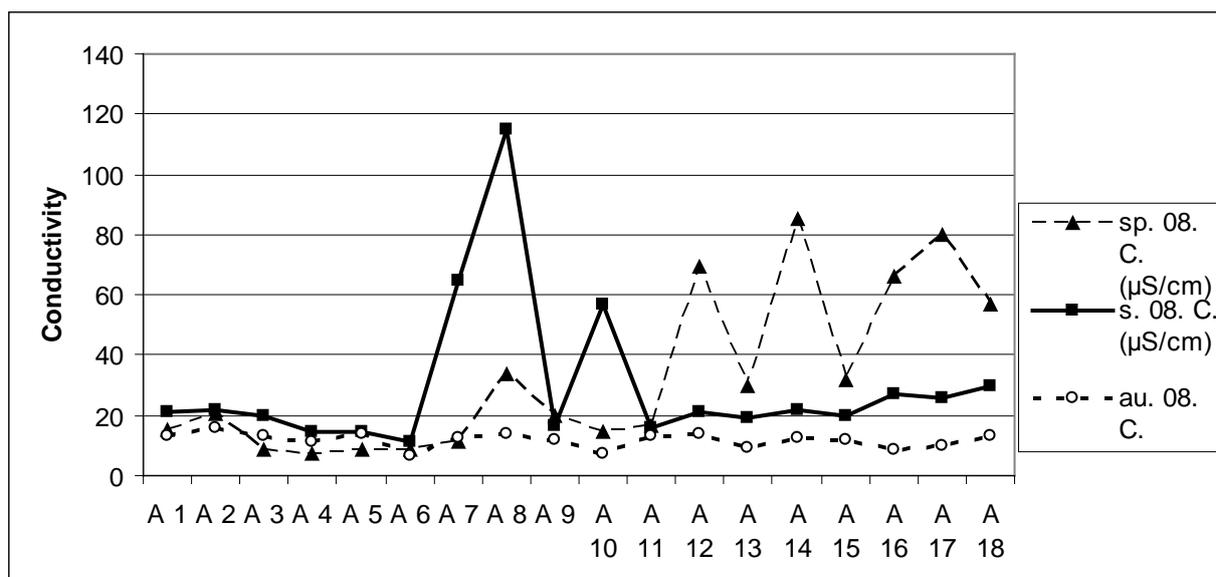


Fig. 4: Conductivity of water in the Arieș River and its main tributaries, measured in 2008 (A1-A18 = sampling sites; sp. = spring, s. = summer, au. = autumn, 08 = 2008, C = Conductivity).

Diatom flora

We have identified 214 diatom taxa at the 18 sampling sites (Table 1) from the Arieș catchment area, over three seasons (spring, summer, autumn) in 2008. The genera with the highest number of taxa were *Navicula* (40 taxa), *Nitzschia* (32 taxa), *Cymbella* (25 taxa) and *Gomphonema* (14 taxa), *Fragilaria* (13 taxa), and *Achnanthes* (10 taxa). The other genera were represented by <10 taxa: *Pinnularia* (9), *Surirella* (7), *Amphora* (6), *Diatoma* (6), *Stauroneis* (4), *Caloneis* (4), *Neidium* (4), *Gyrosigma* (4), *Eunotia* (4), *Frustulia* (2), etc. (Tab. 2).

The qualitative dynamics of diatom communities of the Arieș River exhibit the seasonal pattern of lotic ecosystems from temperate regions [8].

Almost all the diatom species were benthic forms, except for a few allochthonous planctonic species such as *Fragilaria acus*, *F. crotonensis* and *Asterionella formosa*.

Most diatoms from the Arieș catchment area are cosmopolitan, eurybiont elements: *Achnanthes minutissima*, *Cocconeis placentula*, *Cymbella affinis*, *C. minuta*, *C. silesiaca*, *C. sinuata*, *Diatoma vulgare*, *Fragilaria capucina*, *Gomphonema parvulum*, *Nitzschia palea*, *Surirella brébissonii*, etc. Many diatoms identified by the authors were benthic forms, mostly epilithic elements, attached to hard substrates in the riverbeds: rocks, stones, boulders, etc. (such as members of *Fragilaria*, *Gomphonema*, *Navicula*, *Didymosphenia* and other genera). We have also found in the Arieș River catchment area many preferentially epipellic diatoms (various taxa of *Caloneis*, *Gyrosigma*, *Cymatopleura*, *Nitzschia* and *Navicula*). But some species are epiphytic: *Meridion circulare*, *Epithemia sorex* and some *Eunotia* species [8].

The present findings agree with the results of previous observations carried out in the same area [3, 5–7, 9, 10], while providing some additional data concerning the qualitative composition of benthic diatom communities. Of the diatom taxa recorded, 63 have not previously been recorded in the Arieș River catchment area and 10 are new records for the Romanian flora. These will be presented separately in a later paper.

The diatom flora is mainly represented by cosmopolitan or widely distributed, ubiquitous or rather indifferent diatoms such as *Achnanthes minutissima*, *A. lanceolata*, *A. conspicua*, *Amphora ovalis*, *A. veneta*, *Cocconeis placentula*, *Cymbella affinis*, *C. minuta*, *C. silesiaca*, *C. sinuata*, *C. turgidula*, *Diatoma vulgare*, *Fragilaria capucina*, *Gomphonema angustatum*, *G. parvulum*, *Hantzschia amphioxys* etc. However, in the upper course of the river there appear more frequently the acidophilous forms of the genera *Cymbella*, *Eunotia*, *Frustulia*,

Neidium and *Tabellaria* (*Cymbella gracilis*, *C. helvetica*, *C. subequalis*, *Eunotia exigua*, *E. pectinalis*, *Frustulia rhomboids* var. *saxonica*, *Navicula angusta*, *Pinnularia brébissonii*, *Tabellaria flocculosa* and others). By contrast, the lower courses of the river are characterized by the occurrence of basiphilous elements such as *Achnanthes delicatula*, *A. hungarica*, *Fragilaria acus*, *F. capucina*, *F. fasciculata*, *F. pinnata*, *Gomphonema olivaceum*, *Navicula leptostriata*, *N. oblonga*, *N. rhynchocephala*, *N. tripunctata*, *N. trivialis*, *Nitzschia acicularis*, *N. communis*, *N. dissipata*, *N. filiformis*, *N. intermedia*, *N. frustulum*, *Surirella ovalis*, etc. The most drastic effect was caused by the low pH values measured in all seasons, at sampling site A9, where the diatom community almost disappeared, except for a few acidophytes belonging to the genera *Eunotia*, *Pinnularia*, *Frustulia*, *Tabellaria* and *Neidium* which survive in small numbers.

The salinity and conductivity values exhibited an increasing tendency along the Arieş river, from the upper region toward the lower ones; therefore the communities of the upper course of the river include several oligotrophic or oligo-mesotrophic species (*Cymbella minuta*, *C. simonsenii*, *Eunotia exigua*, *Gomphonema gracile*, *Pinnularia subcapitata* etc.), which are less frequent in its middle or lower courses. In the lower course of the river the preferentially eutrophic species were more frequently recorded, such as *Cymbella prostrata*, *Gyrosigma acuminatum*, *G. nodiferum*, *G. scalproides*, *Navicula atomus*, *Surirella linearis*, etc.

According to the diatom composition of the communities, the water of the Arieş River exhibits an equally growing tendency downstream concerning its organic loading, changing from oligosaprobic into β -mesosaprobic or even α -meso – polisaprobic. In the lower river sectors the frequency of some diatom species such as *Caloneis amphisbaena*, *Achnanthes hungarica*, *Diatoma tenuis*, *Fragilaria capucina* var. *vaucheria*, *Navicula accomoda*, *N. goeppertiana*, *N. slesvicensis*, *N. veneta*, *Nitzschia communis*, *N. hungarica*, etc., indicate critical saprobic level.

Sampling carried out in spring, summer and autumn 2008 allowed some preliminary estimates on seasonal dynamics of benthic diatom communities, exhibiting similar qualitative changes at a community level as reported in the Arieş river catchment area in an earlier paper [1]. The present authors' new findings are summarized diagrammatically in Figure 5.

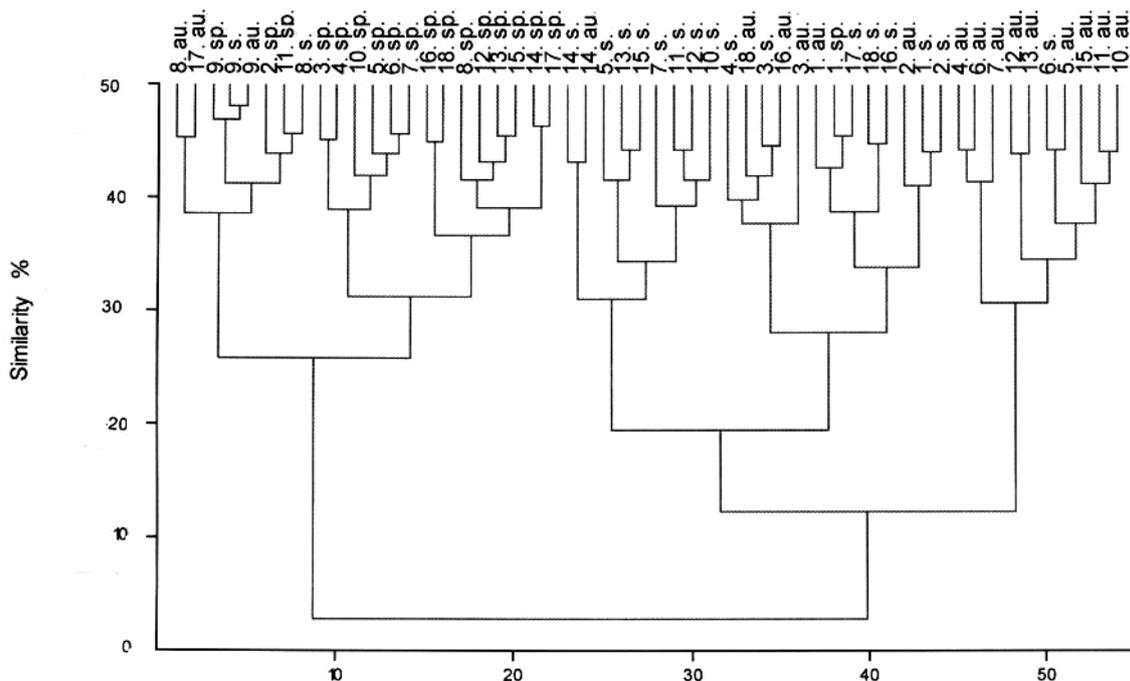


Fig. 5: Floristic similarity among the benthic algal communities occurring seasonally in 2008 in the streams from the Arieş catchment area (1-18 = sampling sites; sp. = spring, s. = summer, au. = autumn)

Table 2: Distribution of diatoms inhabiting the 18 sampling sites investigated in 2008 from the Aries River and its tributaries

D i a t o m t a x a	S A M P L I N G S I T E S																	
	(Explanations according to table 1)																	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18
<i>Achnanthes brevipes</i>	+					+				+								
<i>Achnanthes clevei</i>			+											+		+	+	
<i>Achnanthes conspicua</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Achnanthes dauui</i>								+			+	+	+				+	
<i>Achnanthes delicatula</i>	+		+	+	+					+	+	+	+	+	+	+	+	
<i>Achnanthes hungarica</i>								+				+				+		+
<i>Achnanthes lanceolata</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Achnanthes minutissima</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Achnanthes subatomoides</i>		+		+		+				+	+						+	+
<i>Actinocyclus nomanii</i>		+		+	+	+			+	+	+	+		+	+			+
<i>Amphora ineriensis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Amphora libyca</i>		+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+
<i>Amphora montana</i>		+	+	+	+		+					+	+	+	+	+		
<i>Amphora ovalis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Amphora pediculus</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Amphora veneta</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Asterionella formosa</i>									+			+	+			+		
<i>Aulacoseira ambigua</i>								+					+		+	+	+	
<i>Aulacoseira distans</i>		+		+	+	+		+		+		+		+		+	+	+
<i>Aulacoseira granulata</i>	+	+				+	+	+		+	+	+	+	+	+	+	+	+
<i>Bacillaria paradoxa</i>		+	+	+		+	+	+		+			+	+		+	+	+
<i>Caloneis amphisbaena</i>														+				
<i>Caloneis molaris</i>														+				
<i>Caloneis schumanniana</i>														+				
<i>Caloneis silicula</i>												+		+	+			+
<i>Cocconeis pediculus</i>	+		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cocconeis placentula</i> var. <i>placentula</i>			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cocconeis placentula</i> var. <i>lineata</i>			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Cyclostephanos dubius</i>	+			+	+						+				+			+
<i>Cyclostephanos invisitatus</i>		+	+							+				+		+	+	+
<i>Cyclotella atomus</i> var. <i>gracilis</i>	+	+	+	+	+		+			+	+		+	+	+	+	+	+
<i>Cyclotella meneghiniana</i>														+		+		

<i>Diploneis marginestriata</i>	+	+		+	+	+	+			+		+	+	+	+	+	+
<i>Epithemia sorex</i>										+				+			
<i>Eunotia bilunaris</i>	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
<i>Eunotia exigua</i>	+	+	+	+	+	+	+			+	+	+		+	+	+	+
<i>Eunotia minor</i>	+	+	+	+	+	+	+		+	+	+	+		+	+		+
<i>Eunotia pectinalis</i>	+			+				+			+	+	+		+	+	+
<i>Fragilaria acus</i>	+	+		+	+	+	+	+		+	+		+	+	+	+	+
<i>Fragilaria arcus</i>	+		+	+	+	+	+	+		+	+	+	+	+	+	+	+
<i>Fragilaria bidens</i>	+	+	+	+	+	+	+			+	+	+	+	+	+	+	
<i>Fragilaria brevistriata</i>	+		+	+	+	+	+	+		+	+	+	+	+		+	+
<i>Fragilaria capucina</i> var. <i>capucina</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Fragilaria capucina</i> var. <i>gracilis</i> et var. <i>vaucheriae</i>	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+
<i>Fragilaria</i> cf. <i>crotonensis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Fragilaria fasciculata</i>								+		+	+	+	+	+	+	+	+
<i>Fragilaria mesolepta</i>				+	+	+	+			+	+		+	+	+	+	+
<i>Fragilaria pinnata</i>	+	+	+		+	+	+	+		+	+	+	+	+		+	+
<i>Fragilaria pulchella</i>	+		+		+	+	+	+		+	+	+	+	+	+	+	+
<i>Fragilaria robusta</i>				+													
<i>Fragilaria virescens</i>	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	
<i>Frustulia rhomboides</i> var. <i>saxonica</i>	+	+					+			+		+	+				
<i>Frustulia vulgaris</i>	+	+		+	+	+	+	+		+	+	+	+	+	+	+	+
<i>Gomphonema acuminatum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Gomphonema angustum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+
<i>Gomphonema augur</i>	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
<i>Gomphonema clavatum</i>	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
<i>Gomphonema clevei</i>				+	+											+	
<i>Gomphonema constrictum</i>	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+
<i>Gomphonema gracile</i>	+	+		+				+		+	+			+			+
<i>Gomphonema micropus</i>	+										+				+	+	
<i>Gomphonema minutum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Gomphonema olivaceoides</i>																	+
<i>Gomphonema parvulum</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Gomphonema pseudoaugur</i>	+	+	+	+											+	+	+
<i>Gomphonema pumilum</i>	+	+	+			+	+				+				+		
<i>Gomphonema truncatum</i>					+	+				+	+	+	+	+	+	+	+
<i>Gyrosigma acuminatum</i>										+		+		+			+

<i>Navicula reinhardtii</i>	+	+	+	+	+		+	+	+	+	+		+	+	+	+	+	+
<i>Navicula rhynchocephala</i>	+		+	+	+	+	+			+	+		+		+			
<i>Navicula salinarum</i>	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+	+
<i>Navicula slesvicensis</i>				+	+	+	+					+			+		+	+
<i>Navicula splendicula</i>				+		+												
<i>Navicula tripunctata</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Navicula trivialis</i>		+	+	+	+	+	+			+	+	+	+	+	+	+		+
<i>Navicula veneta</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Navicula viridula</i>		+	+	+	+	+	+			+	+	+	+	+	+	+	+	+
<i>Neidium apiculatum</i>	+						+											
<i>Neidium dubium</i>		+		+			+	+				+	+					
<i>Neidium iridis</i>				+			+											
<i>Neidium productum</i>												+						
<i>Nitzschia acicularis</i>							+			+		+	+	+		+		
<i>Nitzschia amphibia</i>		+								+	+		+		+		+	
<i>Nitzschia bergii</i>		+	+	+		+		+		+	+		+	+	+	+	+	
<i>Nitzschia capitellata</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Nitzschia communis</i>		+		+													+	
<i>Nitzschia dissipata</i>	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+	+
<i>Nitzschia dubia</i>												+	+					+
<i>Nitzschia fasciculata</i>	+						+								+			
<i>Nitzschia filiformis</i>	+			+		+	+			+	+	+	+	+	+		+	+
<i>Nitzschia flexa</i>		+	+	+	+		+			+		+	+	+	+		+	+
<i>Nitzschia fonticola</i>	+	+	+	+	+		+	+		+				+			+	+
<i>Nitzschia frustulum</i>	+		+	+	+	+				+	+	+		+	+	+	+	+
<i>Nitzschia fruticosa</i>	+	+	+	+		+	+	+	+	+	+	+	+		+	+	+	+
<i>Nitzschia gessneri</i>	+	+		+	+	+	+			+	+	+	+	+	+	+		+
<i>Nitzschia gracilis</i>	+		+	+				+		+		+	+	+	+	+	+	+
<i>Nitzschia heufleriana</i>				+			+			+	+		+		+			+
<i>Nitzschia hungarica</i>							+											+
<i>Nitzschia inconspicua</i>			+														+	
<i>Nitzschia intermedia</i>	+	+	+	+	+	+	+			+	+	+	+	+	+	+	+	+
<i>Nitzschia levidensis</i>					+	+	+				+			+				
<i>Nitzschia linearis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Nitzschia paleaeformis</i>	+			+			+					+	+	+	+	+	+	
<i>Nitzschia palea</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Nitzschia perminuta</i>	+	+	+		+	+	+			+				+	+	+	+	+

The dendrogram exhibits two main aggregations. The first includes all the spring communities; the second incorporates both summer and autumn samples irrespective of sampling sites. The spring aggregation has three subunits, the first includes the low pH values sampling sites (affected by mine water inflow), the second subunit the upper region of the river and the third the lower region sampling sites.

The second main aggregate includes the samples from summer and autumn and has equally three subunits. One of these subunits comprises the summer floristic lists of the lower region of the Arieș, a second one incorporate the summer samplings of the upper region of the river. The third subunit includes mainly autumnal communities of both middle and lower parts of the river.

Human activities might have a marked impact on the aquatic habitats of the Arieș catchment area, reflected in water salinity, conductivity, acidity variation, etc. These changes have seemingly influenced the species diversity of the benthic diatom community structure.

Conclusions

We have identified 214 diatom taxa in the Arieș catchment area during the year of 2008. Genera represented by more than ten taxa were *Navicula*, *Nitzschia*, *Cymbella*, *Gomphonema*, *Fragilaria* and *Achnanthes*.

The main part of the diatom flora is represented by cosmopolitan or widely distributed and more or less ubiquitous or indifferent elements such as *Achnanthes minutissima*, *Cocconeis placentula*, *Cymbella affinis*, *C. minuta*, *C. silesiaca*, *C. sinuata*, *Diatoma vulgare*, *Fragilaria capucina*, *Gomphonema parvulum*, etc.

There were also some diatoms of restricted distributional area and rather special ecological requirements: acidophilous, oligotrophic or oligo-mesotrophic, such as *Cymbella gracilis*, *Eunotia exigua* and *Pinnularia subcapitata*, or by contrast basiphilous elements, usually frequent in the lower course of the river and in some tributaries from the limestone area such as *Fragilaria capucina* var. *vaucheriae*, *Navicula accomoda*, *N. slevicensis*, *N. veneta*, *Nitzschia communis* and *N. hungarica*.

Most diatoms are β -mesosaprobic, being characteristic of the upper and middle courses of the river and of the tributaries; the α -meso-polisaprobic diatoms are more frequently found in the lower river sectors.

The annual distribution of the diatom communities in the Arieș catchment is mostly seasonal and less affected by environmental conditions or changes in water quality.

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STRUCTURA COMUNITĂȚILOR DE DIATOMEE DIN BAZINUL DE DRENAJ AL RÂULUI ARIEȘ (TRANSILVANIA, ROMÂNIA)

(Rezumat)

Lucrarea de față prezintă primele rezultate din cadrul unui studiu recent privind comunitățile de diatomee bentonice din râului Arieș (Transilvania, România) și principalii săi afluenți. Eșantioanele au fost prelevate în 18 stații de colectare în trei sezoane ale anului 2008: primăvara, vara și toamna. Au fost identificate 214 unități taxonomice de diatomee; genurile cu diversitate maximă au fost *Navicula* (40 taxoni), *Nitzschia* (32 taxoni), *Cymbella* (25 taxoni) și *Gomphonema* (14 taxoni).

Măsurătorile efectuate la fața locului asupra parametrilor fizico-chimici ai apei au sugerat că schimbările pH-ului, salinității și conductivității apei, dependente de substratul geologic, poziția geografică a bazinului, particularitățile hidrografice, ale climatului etc., pot fi afectate și de surse locale de poluare (industrială, agricolă, zootehnică etc.), care împreună determină starea ecologică a apelor. Impactul factorilor antropogeni se reflectă și poate fi urmărit la nivelul structurii comunităților de diatomee, care vegetează în bazinul hidrografic al Arieșului și afluenților, pe baza analizelor de similaritate floristică ale acestora.

Analiza similarității floristice a comunităților a permis, de asemenea, formularea unor concluzii preliminare privind dinamica sezonieră. Comunitățile au tendința de a se grupa în primul rând în funcție de sezon, fiind mai puțin afectate de schimbările în calitatea apei (pH, salinitate, încărcătură organică etc.).