ISSN 2070-1292

danube news

Bulletin of the International Association for Danube Research (IAD)
Informationsblatt der Internationalen Arbeitsgemeinschaft Donauforschung (IAD)

donau aktuell

Invertebrates and algae – small in size but an important component in ecosystem function and river basin management

Editorial

Dear Reader

Who is not familiar with fishes as obvious inhabitants of streams and rivers? Some like fish only to have a good meal, some are fishing professionally or as a hobby, others simply like to watch them when staying in the current. However, not so many people know how fish live, what habitats they use and what food they need. In this issue of DANUBE NEWS we deal with some fish food animals and plants. Since these are small in size and mostly living in the bottom of running waters, they usually are not seen. I invite you to follow a short introduction into the benthic life, and to read more about a few selected examples which elucidate the general picture.

Aquatic ecosystem function is mostly based on a large biodiversity, i.e., a great number of species and individuals with a specific function in the food chain or pyramid that starts with bacteria and algae at the bottom, continues through benthic animals like insect larvae, crustaceans, worms and molluscs and ends with top predators like fish, birds, mammals and humans. The key words are production (by algae), consumption (by animals) and decomposition (by bacteria) – life, growth and death interlinked in a very complex spatial network of longitudinal river continuum, lateral connectivity with riparian land and vertical gradients into the groundwater. According to the way how food is gathered and ingested by macro-invertebrates (benthos), we distinguish between "shredders", "filterer-collectors", "gatherers", "grazers", "scrapers", and "predators".

The contributions of this volume focus on the Danube (black flies, crustaceans, algae), the Tisza (mayflies) and a lake near Osijek (macrophytes) but address also the problems of reintroduction to and invasion from other rivers. This means that rivers such as the Danube are not closed systems, and that ecosystems are sometimes interlinked over long distance. In this respect, it is of utmost importance to prevent isolation of ecosystems, to open river corridors and to respect migration behaviour not only of fish, but also of benthos and plants. Restoration of morphological structures provides habitats. Reintroduction programs intend to restore ecosystems by increasing biodiversity. And combating neozoans (exotic species) protects the native flora and fauna and their intense functional network.

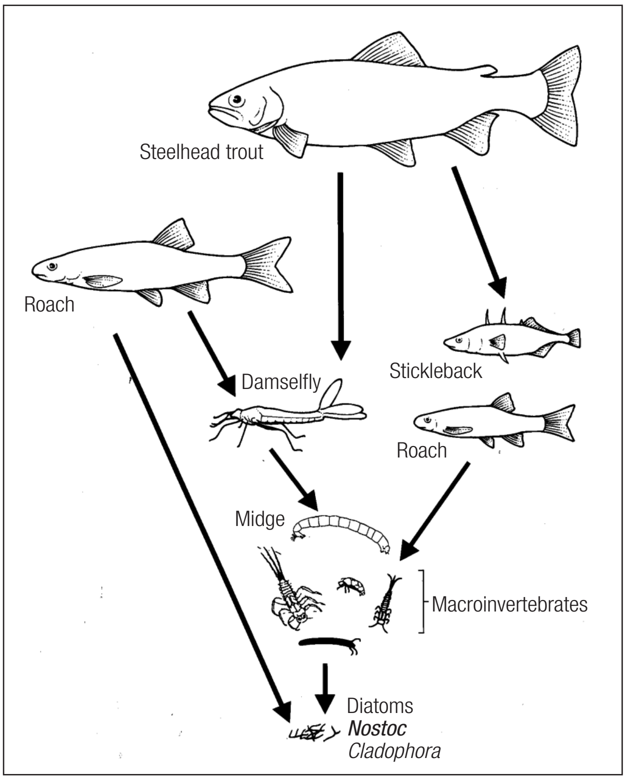


Figure 1. An illustration of the trophic cascade on boulder-bedrock substrates in riverine pools. Insect larvae graze on algae and are eaten by predators like damselflies and various fish. From J.D.Allan (1995): Stream Ecology. Chapman & Hall, London

Conservation can only be performed if we have scientific knowledge about biodiversity and ecosystem function, but similarly important is public awareness and a common interest for nature. I hope the presented articles can rise interest to explore nature and stimulate further reading and learning towards an understanding of our environment.

Jürg Bloesch, Editor
e-mail: bloesch@eawag.ch

Black Flies of the Danube (Diptera, Simuliidae)

Gunther Seitz: IAD, Expert Group Leader "Saprobiology", District Government of Lower Bavaria, Landshut, Germany, e-mail: gunther.seitz@reg-nb.bayern.de

Introduction - Biology of Black Flies

There is hardly any other group of insects that is better suitable for the biological indication of running waters than the black flies family comprising 2000 species worldwide. The aquatic life stages are strongly associated with running water habitats; the larvae's special way of living makes it possible to settle running waters of all geographical latitudes, whether polar brooks that are only ice free for a few weeks, subtropical wadies in desert regions or rivers of tropical rain forests. From high alpine springs and streams down to large lowland rivers, the preimaginal stages are an important part of the zoocoenosis of all running waters. An unpaired proleg at the larval thorax and a special posterior hook circlet at the abdomen allow the larvae of this morphologically homogeneous family to settle areas with highly variable currents including habitats with flow velocities of 2.5 m/s and more *(Figure 1)*. Here, where the current provides the food "free domicile", the larvae (except for very few specialised species without head fans) primarily feed on the ultrafine particulate organic matter (UPOM) consisting of bacteria, algae, detritus and other particles with a size < 50 µm using their head fans as passive filter feeders. With a density of up to 20,000 individuals per dm² they do not only make an important contribution to the self purification within the aquatic ecosystem but also to a considerable increase in food quality for other in-stream detritus feeders as during gut passage UPOM is converted into a coarse fine particulate organic matter (FPOM) that is now enriched with bacteria. Apart from this fact, both, the preimaginal stages *(Figure 1 and 2)* and the emerged imagos *(Figure 3)* constitute an important share of the food spectrum of all predacious aquatic invertebrates as well as of some vertebrates.

The larvae are able to reach their preferred aquatic habitat by moving like a looper and using a security thread of silk produced by the salivary glands. However, the adult females *(Figure 3)* determine the distribution pattern of single species in the different running water types. By seeking in a targeted and unerring way the breeding areas that will later offer the best development possibilities for the aquatic stages, the flying female insects (black flies) perceive the structure and quality of the riparian zone, the distribution of floodplain forest and open landscape structures and can "recognize" the variable current patterns in the stream or river.

Health Problems

Except for a few autogenous species, the females of many species demand a blood-meal for the oogenesis to cover the increased need for proteins. In this context the family has achieved a formidable notoriety on a world scale: While in our latitudes this may lead to annoyance for human beings and animals due to bites, in some cases, however, also to illness, death or mass mortality in cattle ("simuliotoxicosis") such as the event in the Middle and Lower Danube region caused by *Simulium colombaschense* in the 1920s and 1930s, the biting activities of certain species in the tropics have devastating effects on resident people. Due to the transfer of nematodes during blood sucking, millions of people suffer from river blindness (onchocercosis) that may cause dermatitis, nodular skin lesion and complete blindness. Thus, the WHO tries to reduce the populations of transfer species by means of onchocercosis abatement programmes in which Bacillus *thuringiensis israeliensis* preparations are spread into running waters. It is apparent that for medical and economic reasons the black flies belong to the best examined merolimnic insect families worldwide.

Figure 1. Simulium ornatum, larva (photograph: B. Eiseler)

Water Quality Indicator

In applied limnology, the indicator function of the pre-imaginal stages is especially important when assessing the biological water quality based on the saprobic system as distinct species tolerate different saprobic levels. This applies also for the biological classification of acidification of running waters in the soft water regions of the crystalline mountains. It could be proven empirically that only certain species of the hypocrenal and the epirhithral are able to tolerate the increase of acidity caused by air pollution. With the implementation of the Water Framework Directive of the European Union, the recording and description of natural or at least semi-natural coenoses in all macrozoobenthos groups becomes more important. Achieving "good ecological quality" of all water bodies is dependent on the composition of their aquatic communities. Due to their habitat preference within the longitudinal zonation of running waters and their preference for natural in-stream, riparian and floodplain structures, the black flies are good indicators of human-induced deviations from an undisturbed reference site.

Figure 2. Simulium (Wilhelmia) equinum, pupa (photograph: B. Eiseler)

A good example to demonstrate the indicator value of black flies is the Danube River. More than 80% of the length of the Danube are regulated for flood protection, and approximately 30% are additionally impounded for hydropower generation, mainly in the upper part where a total of 59 dams have been built along the river's first 1,000 kilometres. Whereas most of the aquatic fauna of the Danube is generally known over the past 40 years (e.g. Dudich 1967, Literáthy et al. 2002), up to now an apparent lack of data on black flies is evident. The aim of a recently arranged study was therefore to summarize the known and often scattered data on the black flies of the Danube, to complete this pool with actual own findings, to identify the gaps in our knowledge of the black fly fauna, and to stimulate further studies in this field (Jedlicka & Seitz 2008).

The Danube Black Flies

In a nutshell: thirty one nominal black fly morphospecies have been recorded in the River Danube, including the headwaters Breg and Brigach *(Table 1).* The most comprehensive data are from the Slovac-Hungarian section (Middle Danube, 21 species before damming), the German stretches (Upper Danube, 19 agreed taxa), the Austrian and the Pannonian Plain section (Upper respectively Middle Danube, each with 10 species) and the Serbian-Romanian section (Middle Danube, 7 species before damming). Very little data are available from the Lower Danube with Bulgaria, Romania (including the Ukrainian part of the delta) as well as the Hungarian Danube Bend (Middle Danube). The species assemblages showed one phenomenon of the River Danube:

Figure 3. Simulium (Wilhelmia) equinum, imago female (photograph: B. Eiseler)

the usual typical longitudinal zonation of the river along the longitudinal gradient sensu Vannote et al. (1980) is not continuous but is interrupted by inversions of the rhithral and the potamal. This means that the rhithral and potamal stretches with their characteristic species assemblages alternate between lotic and lentic stretches, not as transition assemblages but as quite well differentiated units. A local inversion is found in the Bavarian stretch near Kelheim, where the Danube breaks through the Franconian Alb. The first major inversion is below the alpine Inn, resulting in a hyporhithral character. The second inversion is located below Bratislava, where the Danube breaks through the promontories of the West Carpathians, while the third inversion follows more than 600 km downstream of the Iron Gate.

Species	**Upper Danube** (sources to Krems, km 2001)	**Middle Danube** (Krems to Turnu Severin, km 931)	**Lower Danube** (Turnu Severin to Sulina, km 0)
Prosimulium hirtipes (Fries)		○	
Prosimulium rufipes (Meigen)		○	
Prosimulium tomosvaryi (Enderlein)	●	●/○	
Metacnephia danubica (Rubtsov)		○	
Simulium (Boophthora) erythrocephalum (De Geer)	●	●	
Simulium (Byssodon) maculatum (Meigen)		●	
Simulium (Eusimulium) angustipes Edwards		●	
Simulium (Eusimulium) aureum species-group	●		
[Simulium (Nevermannia) angustitarse (Lundström)] [1]	●		
Simulium (Nevermannia) carpathicum (Knoz)	●		
Simulium (Nevermannia) cryophilum (Rubtsov)	●		
Simulium (Nevermannia) lundstromi (Enderlein)	●		
Simulium (Nevermannia) vernum Macquart	●	●/○	
Simulium (Obuchovia) auricoma Meigen		○	
Simulium (Simulium) argenteostriatum Strobl		○	
Simulium (Simulium) argyreatum Meigen	●	○	
Simulium (Simulium) colombaschense (Scopoli)	●	●	●
Simulium (Simulium) degrangei Dorier & Grenier		○	
Simulium (Simulium) galeratum sensu Knoz	●	●	
Simulium (Simulium) monticola Friederichs		○	
Simulium (Simulium) morsitans Edwards	●	○	
Simulium (Simulium) noelleri Friederichs	●	●	
Simulium (Simulium) ornatum Meigen	●	●	
Simulium (Simulium) posticatum Meigen	●		
Simulium (Simulium) reptans (Linnaeus)	●	●	
Simulium (Simulium) variegatum Meigen	●		
Simulium (Simulium) voilense Sherban		●/○	
Simulium (S.) vulgare Dorogostaisky, Rubtsov & Vlasenko		●	
Simulium (Wilhelmia) balcanicum (Enderlein)	●	●	
Simulium (Wilhelmia) equinum (Linnaeus)	●	●	●
Simulium (Wilhelmia) lineatum (Meigen)	●	●	
[1] *probably a misidentification*			

Table 1. Species occurrence in the main Danube reaches (from Jedlicka & Seitz 08, simplified). Black circles indicate occurrence of species at any time and location; open circles indicate that the species was found only before damming, i.e., the loss through impoundment; a combination of both circles shows that the species is still present but has been lost in impounded stretches

As to the anthropogenic impacts the actual investigations showed that the second inversion is due to the construction and operation of the Gabčíkovo hydropower station, since 1992 a thing of the past: the species number declined from 21 to 9. The first to disappear were all the rhithral species; the community structure changed from the earlier rhithral to the potamal and the species composition shifted towards the fauna of the adjacent lowland flows with one dominant species with highest relative abundance. At the Iron Gate the situation changed to a lesser extent than it did at Gabčíkovo where about 80% of the discharge is diverted into the canal and the old channel receives some 20%. At the Iron Gate the water flow was not diverted, and the stream velocity did indeed decrease, but it remains up to 1 m per sec, which is suitable for rheophile species. Nevertheless, the dominant species before damming decreased substantially and the relative abundance of lowland species increased in the same way that one had found at Gabčíkovo more recently. One species was no longer found: the damming of Iron Gate has probably caused the global extinction of *Metacnephia danubica.*

The Danube catchment area is considered as a zone of zoogeographic interest, as it has contacts with the Quaternary refugia and was also crossed by postglacial colonization routes as the Balkans were apparently a source of colonization for all species in the east and for many species in the west for which the ice-capped Alps were an initial barrier to their northward expansion; at present, the Danube also remains the southern corridor of colonization routes for modern invasive species. Due to the fact that the Danube flows through four ecoregions the number of black fly species is – also beside investigation and taxonomic problems – surely not definitive. A higher number of species may be expected in the source rivers Breg and Brigach, where the occurrence of montane rhithral species can be anticipated by analogy with the rhithral stretches of other mountain headwaters. An increase in the species number is also to be expected in the reaches of the Lower Danube where actual investigations are needed that can help assessing and monitoring the possible influences of prospecting anthropogenic activities.

References

Dudich E (1967): Systematisches Verzeichnis der Tierwelt der Donau mit einer zusammenfassenden Erläuterung. In: Liepolt R (ed.), Limnologie der Donau – Eine monographische Darstellung. Kapitel V: 4–69 (Schweizerbart) Stuttgart

Jedlicka L, Seitz G (2008): Black flies of the River Danube (Diptera, Simuliidae). Lauterbornia 62: 93–119, Dinkelscherben

Literáthy P, Koller-Kreimel V, Liška I (2002) (eds.): Final Report of the Joint Danube Survey, 261 pp. (International Commission for the Protection of the Danube River, ICPDR) Vienna

Vannote RL., Minshall GW, Cummins KW, Sedel J R, Cushing CE (1980): The river continuum concept. Canadian Journal of Fishery and Aquatic Science 37: 130–137, Toronto

A „new home“ for the Tisza mayfly *Palingenia*

Thomas Tittizer: Appointed Professor to the University of Bonn Zoological Institute, Poppelsdorfer Schloss, D-53115 Bonn, Germany,
e-mail: tittizer@uni-bonn.de
† Sándor Andrikovics: Eszterházi Károly Föiskola, H-3300 Eger, Hungary

Palingenia longicauda is the largest mayfly (Ephemeroptera) species in Europe that is probably known for the longest time *(Figure 1)* as it appears in short and spectacular mass emergence in early summer *(Figure 2)*. *Palingenia* was mentioned in the professional literature already in the 17th century (Clutius 1634; Swammerdam 1752). Till the end of the 19th century it occurred in all Central Europe and parts of East and South Europe and colonized the middle and lower courses of medium sized and large rivers, with clay-silt bottom sediments (Rhine, Lippe, Maas, Waal, Lek, Ijel, Weser, Elbe, Odra, Weichsel, Memel, Dnjester and Danube, Tisza and its tributaries) (Andrikovics & Turcsányi 2001).

In the course of industrialization, pollution and morphological river alteration the populations of *Palingenia* decreased drastically since the beginning of the 20th century in most of these rivers and disappeared totally in the 1930s (Russev 1987). At present *Palingenia longicauda* occurs only in Hungary in the Tisza and some of its tributaries (Samos, Bodrog, Berettyó, Körös, Maros) as well as in the Rába River. This explains the popular name „Tisza mayfly“. In Germany some known former places where this Ephemeroptera species could be found are located at the Lippe, in the stretch between Lippspringe and Lünen as well as near Hamm (Cornelius 1848) and at the Odra, in a side-arm near Gartz (Triebke 1840).

In the framework of a joint project between the Zoological Institute of the University of Bonn and the Chair of Zoology at the University in Eger the recolonization of *Palingenia longicauda* in its former places of occurrence in Germany was in focus. For this purpose it was first necessary to compare the climatic, hydrological and morphological conditions and the physical-chemical water quality of both rivers (Tisza and Lippe, respectively, Tisza and Odra). The results of these comparisons *(Table 1)* were promising and confirmed our assumption that a change of home may be successfully performed.

To achieve the change of home fertilized females were caught in the Middle Tisza (near Tiszafüred) during mass emergence (mid to end of June) of three consecutive years (2006-2008) with large nets and subsequently transferred into large buckets filled with water.

The eggs laid by the females were transported to Germany in cooling-boxes under steady aeration and breeded in the laboratory of the Zoological Institute in Bonn in an apparatus („Zuger“ glasses) specifically constructed for this purpose *(Figure 3)*. It was found that the embryonic development is dependent on temperature: at an average temperature of 21.4°C it lasts 26 days, while it is completed already after 18 days at 26.7°C *(Figure 4)*.

The young larvae hatched from the eggs after about four weeks were transported in cooling-boxes under constant aeration to the places of recolonization and introduced into the water. For the introduction of the young larvae a tech-

Figure 1. Imago (flying insect) of Palingenia longicauda

Figure 2. Mass emergence of Palingenia longicauda on the Tisza River near Tiszafüred

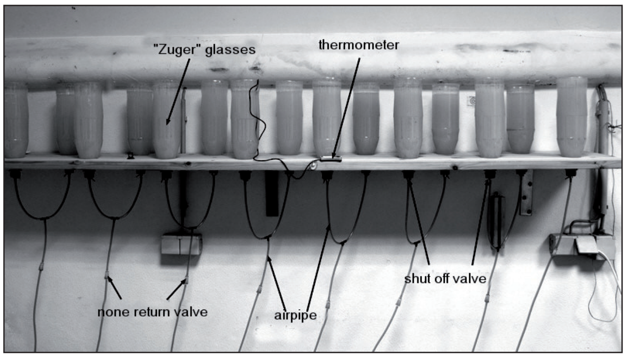


Figure 3. Hatching eggs of *Palingenia longicauda* in special „Zuger" glasses

Figure 5. Reintroduction of young larvae of Palingenia longicauda into rivers

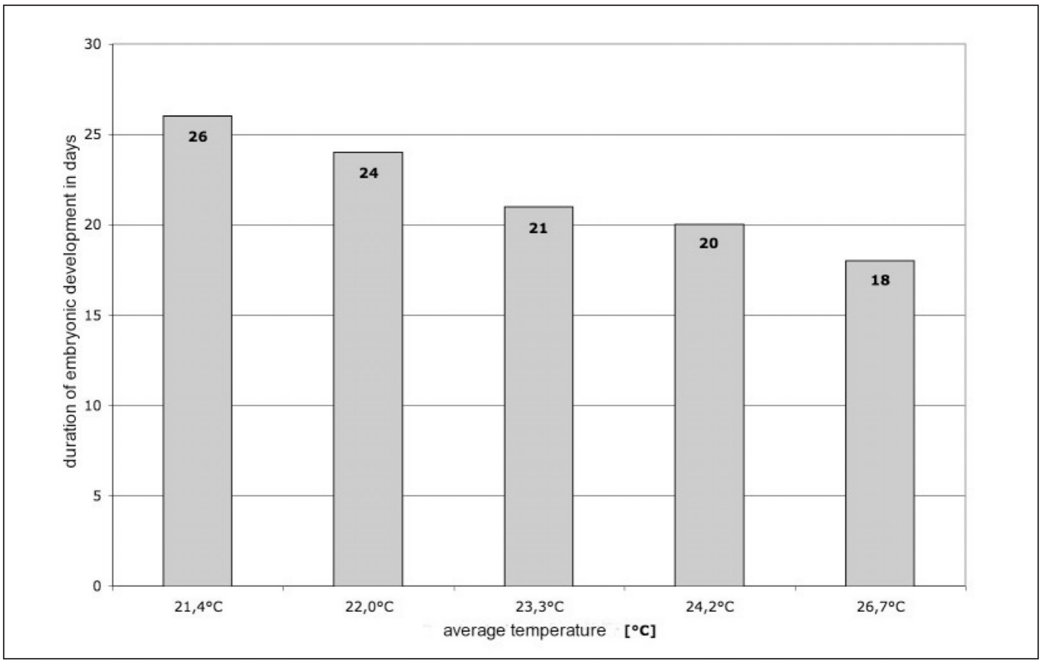


Figure 4. Correlation between hatching temperature and duration of embryonic development of Palingenia longicauda

Parameter (Min- Max)	Unit	Tisza	Lippe
		Min - Max	Min - Max
Water temperature	[T°C]	4.7 - 24.0	4.6 - 23.8
Oxygen	O_2 [mg/l]	5.4 - 12.3	9.1 - 11.8
pH		6.7 - 8.3	7.9 - 8.4
Conductivity	[µS/cm]	145 - 645	595 - 827
Total hardness	[German°]	3.2 - 8.2	16.3 - 17.9
Ferrous Iron	$Fe^{2}+$ [mg/l]	0.02 - 3.9	0.16 - 0.86
Ammonium	NH_4 -N[mg/l]	<0.1 - 3.8	<0.1 - 0.17
Nitrate	NO_3 -N[mg/l]	0.3 - 30	4.0 - 7.0
Phosphate	PO_4 -P[mg/l]	<0.05 - 1.0	0.05 - 0.15
Chloride	Cl- [mg/l]	7 - 85	35 - 81
Sulfate	SO_4^{2}- [mg/l]	0.9 - 65	30 - 47
Discharge	[m3/s]	107 - 2160	7.6 – 328
Water level	[cm]	280 - 687	58 - 400
Sediment, TOC	[%]	0.5	1.5
(Total Organic Carbon)			
Sediment, loss on ignition	[%]	3.2	1.7
[550°C]			

Table 1. Physical-chemical key parameters to rate water and sediment quality of Tisza and Lippe in the section of collection and reintroduction, respectively, of *Palingenia longicauda.* (Data from monthly water measurements during 2004–2007; sediment analysis was performed in 2007)

nique specifically developed for this purpose was applied (Tittizer et al. 2008). Plastic tubes with a diameter of 160 mm and a length of 60-120 cm (according to water depth) were used. The tubes were first pushed into the river sediment and then a defined number of young larvae were introduced *(Figure 5).* Since several (up to ten) tubes were used simultaneously they stayed at the same site for a while (ca. 15-20 min.), and during this time the young larvae could grab into the sediment. By using this technique a possible drift of the young larvae by currents could be avoided. After this procedure, the tubes were retrieved from the sediments and again positioned further downstream.

During three consecutive years (2006-2008) about 100 Mio. young larvae were introduced by this technique in the Lippe near Lippborg and about 25 Mio. in the Odra near Hohenwutzen. There is hope now that the introduced young larvae find suitable living conditions in both rivers in order to establish stable populations in the next years. In this way, our attempt of recolonization could contribute a little bit to the conservation of biodiversity and at the same time counteract the continuous reduction of species number in Middle Europe.

References

Andrikovics S & Turcsányi I (2001): Tiszavirág. Tisza Klub Füzetek 10: 1–69, Szolnok

Clutius A (1634): De hemerobio sive Ephemero insecto et majali verme: 96–104, Amsterdam

Cornelius C (1848): Beiträge zur näheren Kenntnis der *Palingenia longicauda* (Oliv.): 1–37. Büschler'sche Verlagsbuchhandlung, Elberfeld

Russev B (1987): Ecology, life history and distribution of *Palingenia longicauda* (Olivier) (Ephemeroptera). Tijd. Ent. 130: 109–127, Amsterdam

Swammerdam J (1752): Bibel der Natur (Haft, Uferaas): 100–114. J. F. Gleditschens Buchhandlung, Leipzig

Tittizer T, Fey D, Sommerhäuser M, Málnás K & †Andrikovics S (2008): Versuche zur Wiederansiedlung der Eintagsfliegenart *Paligenia londgicauda* (Olivier) in der Lippe. Lauterbornia 63: 57–75, Dinkelscherben

Triebke F (1840): Einige Bemerkungen über *Ephemera flos-aquae* Illiger. Stettiner Entomologische Zeitschrift 1: 54–58, Stettin

Myriophyllum spicatum L. and *Hydra oligactis* (Pallas, 1766) interactions in the small Lake Gornjogradsko in Osijek

Gabrijela Dakić: *Primary School Blago Zadro, Vukovar, Croatia, e-mail: gabidakic@gmail.com*

Irella Bogut: *Faculty of Teacher Education, Josip Juraj Strossmayer University, Osijek, Croatia, e-mail: ibogut@ffos.hr*

Dubravka Čerba: *Department of Biology, Josip Juraj Strossmayer University, Osijek, Croatia, e-mail: dcerba@gmail.com*

Jasna Vidaković: *Department of Biology, Josip Juraj Strossmayer University, Osijek, Croatia, e-mail: javidako@net.hr*

Edita Borić: *Faculty of Teacher Education, Josip Juraj Strossmayer University, Osijek, Croatia, e-mail: eboric@ffos.hr*

Željko Popović: *Faculty of Teacher Education, Josip Juraj Strossmayer University, Osijek, Croatia, e-mail: popovic@ffos.hr*

Introduction - Educational Methodology

At the beginning of the 20th century the City of Osijek had six artificial lakes. However, strong negative anthropogenic influence several decades ago reduced this number to three. For the purpose of this investigation, the most suitable research location was Lake Gornjogradsko *(Figure 1)* with its southern shallow littoral zone overgrown by macrophyte vegetation, a depth up to 0.60 m and a quite steep shore. The aim was to elucidate the relationship of submerged macrophytes with attached periphyton and microfauna.

Figure 1. Lake Gornjogradsko in Osijek

Since this lake is located in the city itself and easily accessible, it is a favourable place for a “natural classroom” where pupils and students of the Faculty of Teacher Education can observe, investigate, study and teach science. A visit to Lake Gornjogradsko can serve as an ideal exchange of cross-curricular activities and provide a great possibility for future teachers and pupils to perform a joint creative work since they are involved together in preparation and performance of tuition in a natural environment.

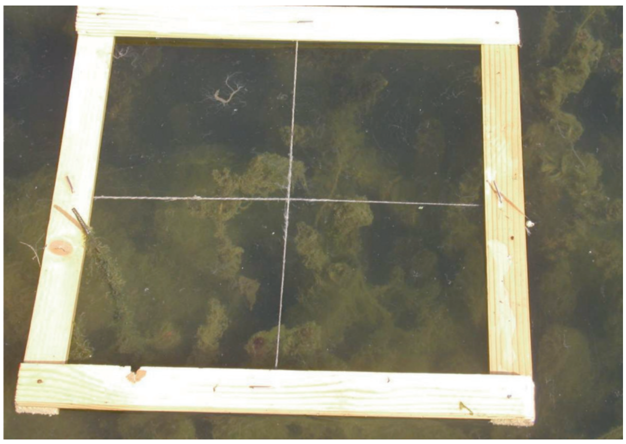
Methods

During March 2007, water milfoil *(Myriophyllum spicatum)* samples were taken every second day in 4 L plastic bags using scissors. At each sampling, five replicates were taken together with attached periphyton and microfauna *(Figure 2).* During the sampling, physical and chemical parameters of water (temperature, dissolved oxygen, pH and conductivity) were analyzed using the field lab (Multi set 340i WTW). After counting brown hydra *(Hydra oligactis)* in each sample on *M. spicatum,* the periphyton was rinsed from a plant and assembled with the rest of the filtered (60 µm pore size) sample in a bottle for later analysis. Macrophyte branches length was measured using millimetre paper and ruler and then summed up for each plant. Macrophyte and periphyton fresh weight was measured with 0.01 g accuracy. Prior to weighing, the periphyton samples were filtered through a paper filter (Whatman GF/C). Total biomass (macrophyte + periphyton) was calculated for each replicate. Correlation analysis was made for the number of brown hydras and macrophyte length, macrophyte biomass, periphyton biomass and total biomass.

Results and discussion

The physical and chemical parameters measured in the water (mean temperature 11.4°C, mean dissolved oxygen concentration 12.9 mg/L and conductivity 1201 µS/cm, *Table 1)* reflected typically the late winter/early spring season. Similar conditions were reported by Bogut (2005) in Kopački rit.

Figure 2. *Periphyton sampling with Myriophyllum spicatum*



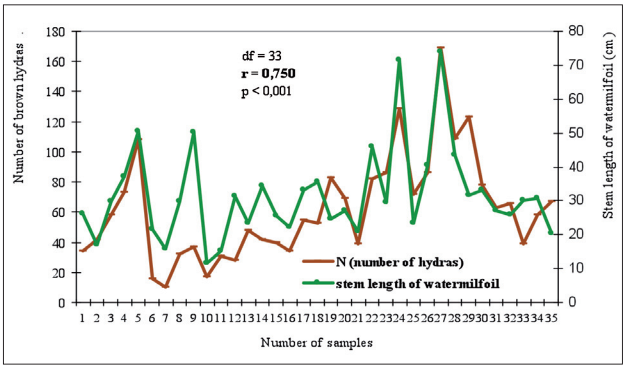


Figure 3. Correlation between the number of brown hydras (Hydra oligactis) and stem length of eurasian water milfoil (Myriophyllum spicatum)

Oxygen oversaturation and pH measurements (8.5-8.8) indicate eutrophication which is a suitable condition for the invasive *Myriophyllum spicatum* (www.wapms.org/plants/milfoil.html, 18th March 2007).

In addition to *Hydra oligactis,* the invertebrate fauna associated with *Myriophyllum spicatum* was composed of representatives of Ciliata *(Vorticella* sp., *Stentor* sp.) and Crustacea. *Daphnia* sp. was the main genus from Cladocera, and in subclass Copepoda *Cyclops* sp. was predominant. In addition to these micro- and meso-zooplankton, macrozoobenthos representatives were also registered: Chironomidae larvae and very abundant Nematodes. The stem length of *M. spicatum* varied from 11.5 to 74 cm with an average value of 31.7 cm. The mean fresh weight was 5.6 g (range 2.4 – 12.8 g). Periphyton biomass varied between 3.1 and 6.6 g (average 4.0 g). The highest value of total biomass (macrophyte + periphyton) was 17.0 g and the average was 9.6 g. The number of brown hydras counted on one water milfoil plant ranged between 10 and 169 with an average of 62 organisms.

As was expected, the highest statistical correlation was found between the number of brown hydras and stem length of water milfoil: $r = 0.750$; $p<0.001$ *(Figure 3).* Other correlations were also of statistical significance: between the number of brown hydras and total biomass: $r = 0.661$; $p<0.001$, between the number of brown hydras and water milfoil biomass: $r = 0.624$; $p<0.001$. The lowest significance in correlation was found for the relationship between the number of brown hydras and periphyton biomass: $r = 0.316$; $p = 0.05$ which is reasonable because hydras are attached to the plant surface.

Variables	MIN.	MAX.	Mean ± SD
Water temperature (°C)	9.4	13.1	11.4 ± 1.4
Dissolved oxygen (mg/L)	9.8	14.7	12.9 ± 2.1
Oxygen saturation (%)	89.0	144.0	120.0 ± 21.5
pH	8.5	8.8	8.7 ± 0.1
Conductivity (µS/cm)	1194.0	1209.0	1201 ± 5.6

Table 1: Physical and chemical parameters of water in Lake Gornjogradsko in Osijek during March 2007

Hann (1995) investigaed the invertebrate association on *Ceratophyllum demersum, Potamogeton zosteriformis* and *Chara vulgaris.* Predominant were Cladocera, Copepoda, Rotifera, Chironomidae and Ostracoda. Most Cladocera preferred *C. demersum* and *P. zosteriformis which was un*-expected because *C. demersum* and *Ch. vulgaris* are morphologically similar. Hann presumed that alelochemical characteristics were the reason for that. Hydra was mostly found on *C. demersum* and *P. zosteriformis* but it did not prefer any particular macrophyte species.

Macrophyte morphology can have a certain influence on invertebrate colonization (Dvořak 1996; Cheruvelil et al. 2000, 2002). Abundance of invertebrates is higher on plants with dissected leaves (Rooke 1984). These plants have a higher surface/biomass ratio and at the same time, they provide better shelter to invertebrates against predators and periphyton as available food resource. Hence, *Myriophyllum spicatum* L. is a suitable environment for brown hydra as proven by the maximum of 169 organisms on just one plant.

Elliott et al. (1997) investigated the predation of hydra to juvenile fishes in Opinicon Lake in Canada. Hydras were collected from *M. spicatum* where an average number of 63 organisms were found on about 20 cm long stems, which corresponds to our results. The authors concluded that as *M. spicatum* are more spread, the population of hydra is more numerous and the number of juvenile fishes is decreasing. They evidenced 26 % of larval mortality as many larvae died by the poison of hydras although they could escape from their stinging tentacles.

Hydras are certainly causing fish death especially of those which spawn in littoral lake zones (Elliott et al. 1997). The question how *Hydra oligactis* influences the fish population in Lake Gornjogradsko in Osijek is open for future investigation.

References

Bogut I (2005): Funkcionalna struktura makrofaune i meiofaune u makrofitskim zajednicama Kopačkog rita. Disertacija. Sveučilište u Zagrebu, Prirodslovno-matematički fakultet.136 pp. *[in Croatian]*

Cheruvelil KS, Soranno PA, Serbin RD (2000): Macroinvertebrates associated with submerged macrophytes: sample size and power to detect effects. Hydrobiol. 441, 133–139

Cheruvelil KS, Soranno PA, Madsen JD, Roberson MJ (2002): Plant architecture and epiphytic macroinvertebrate communities: the role of an exotic dissected macrophyte. N. Am. Benthol. Soc. 21(2), 261–277

Dvořak J (1996): An example of relationship between macrophytes, macroinvertebrates and other food resources in a shallow eutrophic lake. Hydrobiol. 339, 27–36.

Elliott JK, Elliott JM, Leggett WC (1997): Predation by Hydra on larval fish: Field and laboratory experiments with bluegill *(Lepomis macrochirus).* Limnol. Oceanogr. 42(6), 1416–1423

Hann BJ (1995): Invertebrate associations with submersed aquatic plants in a prairie wetland. UFS (Delta Marsh) Annual Report, 30, 78–84

Rooke JB (1984): The invertebrate fauna of four macrophytes in a lotic system. Freshwat. Biol. 14, 507–513

Microphytobenthos in large rivers – living on the edge

Elisabeth Bondar-Kunze: University of Natural Resources and Applied Life Sciences, Institute of Hydrobiology and Aquatic Ecosystem Management, Department of Water, Atmosphere and Environment, Vienna, Austria & WasserCluster Lunz – Interuniversity Center for Aquatic Ecosystem Research, Lunz am See, Austria, e-mail: elisabeth.bondar@boku.ac.at

Michael Tritthart: University of Natural Resources and Applied Life Sciences, Institute of Water Management, Hydrology and Hydraulic Engineering, Department of Water, Atmosphere and Environment, Vienna, Austria, e-mail: michael.tritthart@boku.ac.at

Friedrich Schiemer: University of Vienna, Faculty of Life Sciences, Department of Limnology and Hydrobotany, Vienna, Austria, e-mail: friedrich.schiemer@univie.ac.at

Thomas Hein: University of Natural Resources and Applied Life Sciences, Institute of Hydrobiology and Aquatic Ecosystem Management, Department of Water, Atmosphere and Environment, Vienna, Austria & WasserCluster Lunz – Interuniversity Center for Aquatic Ecosystem Research, Lunz am See, Austria, e-mail: thomas.hein@boku.ac.at

Introduction

Rivers, especially their near bank zones and backwaters, are hot spots for biogeochemical processes (McClain et al. 2003) and represent functional retention areas, which are important for the control and maintenance of river water quality. Especially during low flow periods the importance of zones along banks for the aquatic productivity and therefore for the carbon supply increases along regulated rivers such as the Danube downstream of Vienna. These zones along banks provide essential flow reduced and shallow areas, important for zooplankton, juvenile fish and also the development of phytoplankton and microphytobenthos (Hein et al. 2005, Schiemer et al. 2007), which provide the basis for higher trophic levels. Studies from the Elbe show for example that the conditions in groin fields for planktonic primary production are much better than in the main channel. These boundary areas provide the main source for oxygen, organic matter and algal biomass for the whole river ecosystem (Böhme 2006). In the Danube River downstream of Vienna the formation of gravel structures along the riverbank allow the occurrence of microphytobenthos and support an increased emergence, although stabilisation measures and steep embankments have reduced these optimal growth zones *(Figure 1).* Bank restoration and embankment removal will improve the environmental conditions for microphytobenthos and therefore the basic supply for the riverine food web. Anthropogenic changes in bank morphology are therefore reflected in the production potential and biomass development of benthic algae and can be used as an indicator for the quality of bank structures. Beside this indicative value, they have been identified together with macrophytes as one of four biological quality elements for the assessment of the ecological status of surface waters.

Figure 1: Bank zone along the Danube near Hainburg. The front of the picture shows a shallow area with coarse gravel and characteristic phytobenthos development. In the back a steep embankment for bank stabilization is seen

Therefore phytobenthos is also a key element for the implementation of the EC water framework directive (WFD).

In addition to their use for international ecological assessment methods a better understanding of phytobenthic control factors and their ecological requirements is essential. Several control factors for microphytobenthos are known, but less on their impacts for these benthic algal communities in large rivers and their adjacent aquatic areas. General factors are light availability, nutrient availability, temperature and water velocity (Stevenson et al. 1996). In large rivers also water level fluctuations modify the development of microphytobenthos. Lowering of the water level causes desiccation stress for phytobenthic communities and suppresses growth and increases mortality. The impact of this environmental condition depends on the community structure and the duration of desiccation (Wetzel 2001). Turbulence has also an effect on the development of phytobenthos communities: for example ship induced waves are occurring frequently, but short lasting and increase the turbulence and resuspension of fine sediments at the habitat scale.

Therefore we identified three main control factors for the development and production of benthic algae in near bank zones:

- water level fluctuation
- fine sediment accumulation
- light availability

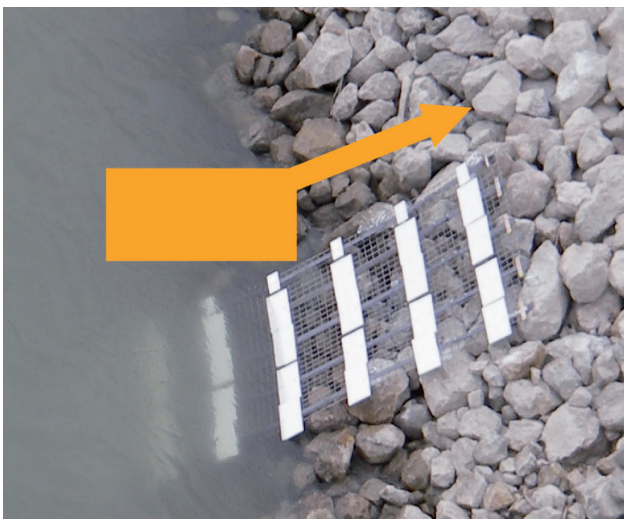
The aim of our study was to show how light limitations and risk of desiccation impact the development of benthic algae in the Danube River. We expected close to the water surface a better light availability, but also a higher risk of desiccation and fine sediment accumulation, while deeper areas are expected to be primarily light limited. More stable conditions result in a higher biomass development and a better light availability in shallow areas induces a positive effect on the productivity.

Phytobenthos depth distribution and fine sediment accumulation

Within a pre-impact monitoring program in the frame of the "Integrated River Engineering project" (IREP, Schabuss & Schiemer 2007) the depth distribution of phytobenthos and short term desiccation tolerance was investigated. An in-situ experiment consisting of the incubation of racks with artificial substrata (etched glass slides) exposed for a maximum of one month was conducted. Sampling took place in the free-flowing Danube section of the Austrian Alluvial Zone National Park at five dates in August / September 2006. Sets of etched glass plates were exposed along a water level gradient (MW ± 1.5m) to investigate the development of the community *(Figure 2)*. Algal biomass, primary production and fine sediment accumulation were regularly measured.

The depth distribution of phytobenthos (average development time about one month) shows increasing chlorophyll a concentration to a depth of 61.6 cm with a maximum biomass of 16.0 ± 2.3 g/cm^2. With increasing depth the phytobenthos biomass decreased to a fourth of the maximum biomass *(Figure 3)*. Reasons for this pattern are as follows: Close to the water surface water level fluctuations such as wave action represent high physical stress and decreases phytobenthos biomass. Short term desiccation stress, which can be caused by daily water level fluctuations, also suppresses phytobenthos development. At a water depth of 33.8 cm the risk of desiccation is low, but a high inorganic fine sediment accumulation (53.9 ± 31.4 mg/cm^2) controls and reduces the light availability. At a water depth of 61.6 cm the highest phytobenthos biomass was measured. Daily water level fluctuations and desiccation play no significant role and also the fine sediment accumulation is lower. In this depth zone optimum growth conditions were observed.

Figure 2: Exposition of sets of etched glass plates along a water level gradient. The water level gradient included mean water conditions ± 1.5m. The construction was 3m long and was exposed at mean flow conditions. This construction included a total of 7 depth levels. The orange arrow indicates the water level fluctuations



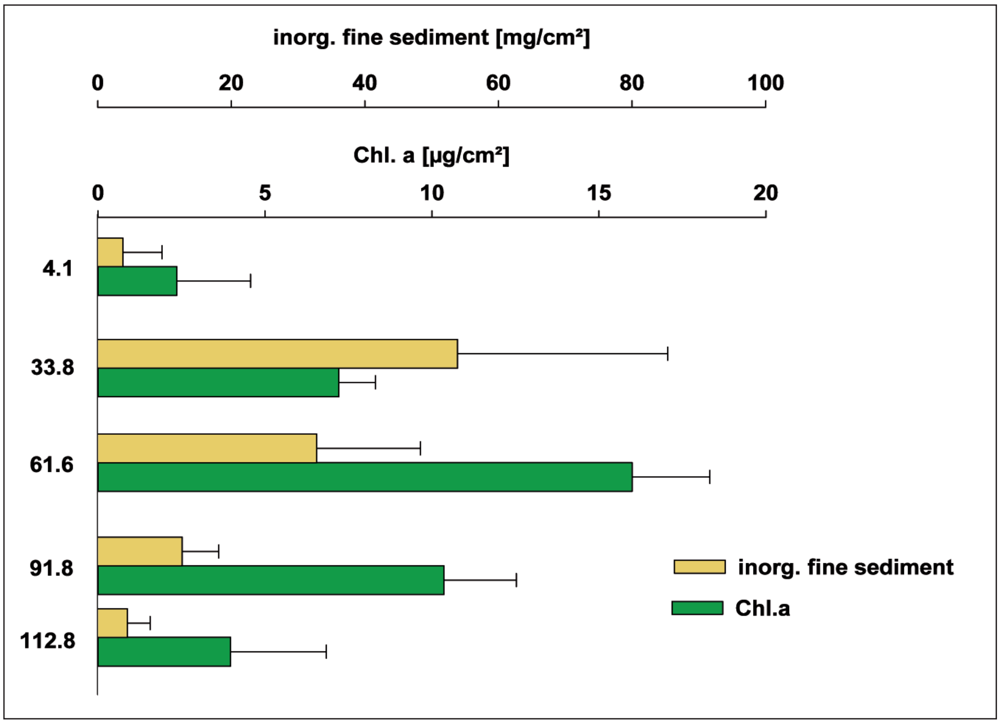


Figure 3: Mean phytobenthos biomass development and inorganic fine sediment accumulation (one month average and standard deviation). Highest biomass was found in a depth of 61.6 cm. Inorganic fine sediment accumulation decreases with depth

Considering the specific primary production (production related to biomass) it is notable that near the water surface the phytobenthic community has a higher specific primary production than the community in the optimal growth zone *(Table 1).* This indicates a high regeneration potential close to the water surface.

Mean water depth (cm)	Chlorophyll a Mean ± standard deviation	Specific primary production Mean ± standard deviation
4.1	2.4 ± 2.2 µg/cm²	17.3 ± 13.9 02/Chla/h
61.6	16.0 ± 2.3 µg/cm²	3.8 ± 0.8 02/Chla/h

Table 1: Chlorophyll a content and specific primary production of two selected depth levels

Summary and future aspects

Benthic algae provide an important nutrient source for higher trophic levels and support also the self purification potential in fluvial landscapes. These algal communities are confronted with various physical pressures such as wave action and long- and short-term desiccation stress. At longer dehydration periods a large part of the algae dies, or cysts for survival are generated. During these phases benthic algae play no significant role for the riverine production. Therefore measurements to determine the effects of short term desiccation stress on benthic algae are essential to obtain basic knowledge about the efficiency and development strategy as well as the sensitivity of this community to environmental changes. Bank reconstructions which create a close to nature morphology with various shallow and deep areas, can have positive effects on the production potential. A higher spatial distribution of microphytobenthos will be provided and result in a better and guaranteed supply for the food web at different hydrological conditions (low to mean flow). The understanding of the regulating processes for benthic algae will therefore provide a scientific basis for management decisions in the future, such as bank restoration measures and backwater reconnections in terms of combined effects of hydromorphological changes and is indicative to the effects of increased water level variability.

Acknowledgement

This study was funded by the Austrian Federal Ministry of Transport, Innovation and Technology and via donau, the former Austrian waterways authority and was conducted within the monitoring task of the Integrated River Engineering Project on the Danube East of Vienna.

References

Böhme M (2006): Wechselwirkungen zwischen den Gewässerkompartimenten. In: Stoffdynamik und Habitatstruktur in der Elbe (Eds M. Pusch & H. Fischer), pp. 209–217. Konzepte zur nachhaltigen Nutzung einer Flusslandschaft Bd. 5. Weißensee Verlag, Berlin

Hein T, Reckendorfer W, Thorp J, Schiemer F (2005): The role of slackwater areas for biogeochemical processes in rehabilitated river corridors: examples from the Danube. Arch. Hydrobiol., Large Rivers 15, 425-442

McClain ME, Boyer EW, Dent CL, Gergel SE, Grimm NB, Groffman PM, Hart SC, Harvey JW, Johnston CA, Mayorga E, McDowell WH, Pinay G (2003): Biogeochemical hot spots and hot moments at the interface of terrestrial and aquatic ecosystems. Ecosystems 6(4), 301-312

Schabuss M, Schiemer F (2007): Key threats to the Danube in the IAD perspective. No.1, Navigation: is there a potential for compromising the contradictory stakeholder interest? IAD Danube News 15, 2-4

Schiemer F, Hein T, Reckendorfer W (2007): Ecohydrology, key-concept for large river restoration. In: Ecohydrology and Hydrobiology 7 (2), 101-111; ISSN 1642-3593

Stevenson RJ, Bothwell ML, Lowe R (1996): Algal Ecology Freshwater Benthic Systems. Academic Press, Inc. San Diego, California

Wetzel RG (2001): Limnology. Lake and River Ecosystems. Third Ed. Academic Press, San Diego. xvi, 1006 pp. ISBN 0-12-744760-1

Alien Species and their evaluation according to the European Water Framework Directive (WFD)

Franz Schöll, Bernd König: Federal Institute of Hydrology, Am Mainzer Tor 1, 56068 Koblenz, Germany; e-mail: schoell@bafg.de, koenig@bafg.de

Introduction

There is growing evidence world-wide that alien species constitute a major threat to native biota and habitats, with many well-documented cases of alien species becoming established both in marine and freshwater systems. The impacts of alien species on native biodiversity are many and varied, including displacement of indigenous species through competition or predation, structural damage to (aquatic) habitats, and loss of genetic integrity. In addition to the threat posed by alien species to native biodiversity, there may often be severe economic impacts, although these are often difficult to quantify.

Aliens and WFD

The Water Framework Directive (WFD, European Community 2000) focuses to a large extent on environmental pressures, their impacts on biological communities and the associated hydromorphological and water quality characteristics. Neobiota are not specifically mentioned in the WFD text and only some indirect references are given. In two Common Implementation Strategy (CIS) Guidance Documents, however, aliens are mentioned inter alia as "biological pressure".

Alien species and ecological status classification

Within the EU, there are two main approaches.

(1) *Neobiota-Index:* This approach involves a separate, specific metric for assessing alien species in their own right.

(2) *Integrative evaluation:* Undertakes the classification process for each biological quality element as normal, and assumes that the classification tools will have detected any impacts caused by alien species.

Figure 1: The invasive Ponto-Caspian crustacean amphipod Dikerogammarus villosus

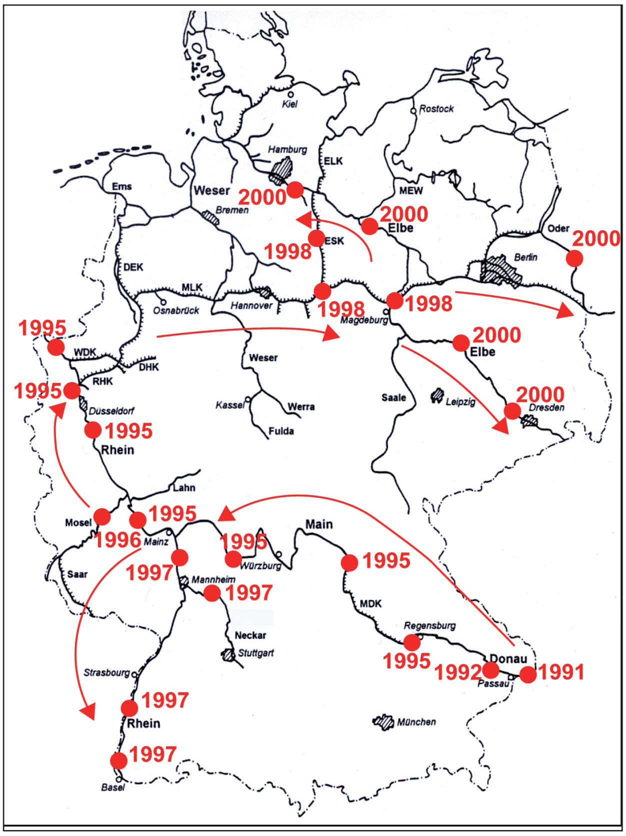
The situation in Germany

In Germany, the invasion of new animal species (neozoa) has notably modified the species spectrum of large watercourses repeatedly over the past years. An example is *Dikerogammaus villosus (Figure 1).* Its dispersion was fast – it spread out from the River Danube via the Main-Danube-Canal (finished 1992) into the German and European river systems and is now among the dominant species in most samples collected from these waterways *(Figure 2).* There is development and interaction between the invaders and the native fauna, and there is a continual restructuring of the species community within the River Rhine and of course other rivers as well.

The Potamon-Type-Index (PTI) – an example for the integrative evaluation of large rivers

Because of the long-lasting anthropogenic utilization of large rivers, sometimes over centuries, it is hardly possible to describe pristine reference biocoenoses. The PTI approach is model-based and pursues the principle of the open list of taxa, i.e. the reference status for Class II "good ecological status" is generally a biocoenosis characterized by lotic potamon-typical species. Species occurring in the potamal of

Figure 2: Dispersion of Dikerogammarus villosus in German waterways



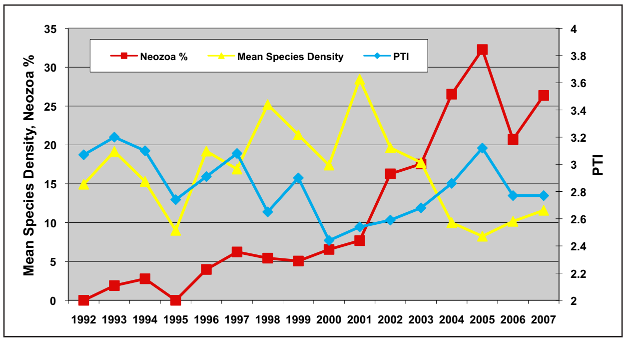


Figure 3: River Elbe, 1992-2007: Relative abundance (%) of neozoa in the whole biocoenosis, mean species density and PTI values. Class boundaries of ecological status: PTI "high": 1 – 1.9, "good": 1.91 – 2.6; "moderate": 2.61 – 3.4; "poor": 3.41 – 4.1; "bad": 4.11 – 5

Central European rivers are rated for their potamal-linkage in five classes, ranging from (1) = weak linkage on the potamal (euryocious species) to (5) = strong linkage on the potamal (stenoceous species). Neozoa are included and are mostly rated as euryocious species. (Full particulars of computing the PTI are given in Schöll et al. 2005).

Long-term investigation of the ecological status

The results of the ecological evaluation of long-term investigation of the River Elbe are given in *Figure 3.* Due to the rising oxygen content in the River Elbe induced by wastewater treatment plants constructed in the catchment after 1990, the ecological status improved from "moderate" (1992) to "good" (1999). The mean species numbers increased, too. Single species were considered extinct in the River Elbe for decades; however, some species re-established themselves such as the mayflies *Oligoneuriella rhenana* and *Potamanthus luteus.* Since 2001, the increasing immigration of neozoa *(D. villosus, Jaera sarsi, Chaetogammarus trichiatus, Corbicula fluminea)* has diminished the average number of species, and the ecological status has impaired from "good" to "moderate". In the Rivers Rhine and Danube we can notice similar effects (not shown here). It is a fact that the assessment tool for large rivers, the PTI, was successful to detect the impacts caused by alien species.

Conclusions

In certain types of waters and for certain biological quality elements neobiota have a major impact on the ecological assessment according to the WFD. Neobiota can lead to the assignment of a lower ecological status, regardless of anthropogenic interference. To visualize the influence of neobiota in the ecological assessment, neobiota-dominated waters should therefore be particularly marked. We propose to assign such a mark for the macrozoobenthos in large rivers of more than 30 % neozoa-dominance in the whole biocoenosis (calculated after abundance-classes).

References

European Community (2000): Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. Official Journal of the European Communities L327: 1-72

Schöll F, Haybach A, König B (2005): Das erweiterte Potamontypieverfahren zur ökologischen Bewertung von Bundeswasserstraßen (Fließgewässertypen 10 und 20: kies- und sandgeprägte Ströme, Qualitätskomponente Makrozoobenthos) nach Maßgabe der EU-Wasserrahmenrichtlinie. Hydrologie und Wasserwirtschaft 49 (5), 234 – 247

In brief information

37th IAD Conference Oct 29 - Nov 1, 2008, in Chisinau, Moldova

Jürg Bloesch: *Stauffacherstrasse 159, CH-8004 Zürich, Switzerland,*
e-mail: bloesch@eawag.ch

The 37th IAD Conference was entitled "The Danube River Basin in a Changing World". This is true in many respects. Global climate change and global political change provide the scientific and real background of our work and problems. However, IAD as the oldest Danubian NGO is also affected on a smaller scale. For the first time in the 52 years long history of IAD we met in Moldova. And for the first time, the conference was not organized by local IAD or associated organisations, but as a joint effort of IAD General Secretariat, National Committee of IAD Serbia, IAD/ENVIRES Romania and Free International University of Moldova, co-ordinated by co-chairpersons of the Organizing Committee – *Ivana Teodorovic,* President of IAD and *Dumitru Drumea,* Country Representative of Moldova in IAD. The following persons involved in the organization are greatly acknowledged: *Cristina Sandu, Ivana Planojevic, Emilia Radu, Ioan Paceşila* and *Djore Kasimir.*

The Conference was financially supported by IAD, National Committee of IAD Serbia and Provincial Secretariat for Environmental Protection and Sustainable Development of Autonomous Province of Vojvodia (Serbia).

The actual focus of IAD research was presented in several keynote lectures. They encompassed, together with oral and poster presentations, the major research topics of IAD such as hydromorphology and floodplains, sturgeons (and other fishes), potamoplankton and macrophytes, biomonitoring (ecotoxicology), and last but not least the applied side with sustainable development and implementation of measures to achieve and fulfill „good ecological status of surface waters" in the context of the EU Water Framework Directive (WFD).

Figure: The conference participants during the conference excursion, which lead to the cave Monastery Butuceni (15th century) carved into the high cliffs of the meandering River Răut (Photo: Harald Kutzenberger)

In the view-point of IAD, one of the main tasks in the Danube River Basin, at present, is the implementation of the Sturgeon Action Plan (SAP 2006) by the urgent reopening of the Iron Gate Dams for migrating sturgeons (and other fishes) and mitigating the impact of navigation *(Bloesch et al.).* The latter is supporting the ISPA 1 and ISPA 2 projects along the Green Corridor in the framework of the European TEN-T Programme that promotes transport by navigation across Europe. The conflict of interest focuses on the "bottlenecks" and floodplains that are hotspots of biodiversity. The basic plan of hydro-engineers to regulate main flow by damming side arms and to conduct local dredging and bank enforcement in order to allow the passage of larger vessels is in sharp contrast to ecosystem function such as sturgeon migration and floodplain connectivity and dynamics, and hence the overall demands of the WFD. Together with WWF and other NGOs, IAD is trying hard to achieve at least a sound Environmental Impact Assessment (EIA) to keep morphological river alteration at minimum.

The plants are also dependent on the river continuum and river modification. Phytoplankton biomass and production are mostly limited by light and reduced by large tributary influence (with high turbidity), and show a remarkable peak in the stretch of the Hungarian plain *(Dokulil & Kaiblinger).* Macrophytes react to flow and are most abundant in lentic environments such as backwaters and oxbows of the Tisza River disconnected by man-made river regulation in the 19th century *(Janauer).* Reconnecting these oxbows to the main river in the framework of river restoration would mean, therefore, a drastic decrease and loss of macrophytes due to increasing flow. Other examples of changes along the river corridor were presented for habitats and hydromorphology *(Schwarz & Krainer),* fish *(Wiesner et al.)*, and radionuclides *(Rank & Papesch)* in the framework of the Joint Danube Survey (JDS) 2 organized by the ICPDR during 2007. Although such investigations provide only a short portion of the hydrological year, it gives insight to various impacts disturbing the longitudinal riverine processes and features.

A glance into the future was provided by *Teodorovic* in her overview about ecotoxicology. The big step forward from traditional toxicity tests with various test animals investigating survival rates and reproduction (LC/EC 50) was made by application of various histological, biochemical and physiological biomarkers (e.g., tissues damage, enzymes and hormone effects). Nowadays, gene technologies are used as a promising tool for understanding modes of action of single toxicants and mixtures. Ecotoxicogenomics is the magic word of the scientific community. The mortality of aquatic organisms such as fish kills is usually a matter of accidental spills (such as Baia Mare and Baia Borsa in the Tisza River, 2000). However, the chemical cocktails (hormone active, toxic and priority substances) presently polluting our waters have sublethal effects that must be considered also with regard to human health as we are end-users by eating fish. Hence, bio-availability, bio-accumulation and community/ecosystem response are a hot scientific topic not only in the Danube River Basin.

Basic and applied research will always be a prerequisite of political decisions for environmental protection and development. *Kutzenberger* provided an overview on "sustainable development" and interdisciplinary approaches to find optimal win-win solutions, such as in the ISPA conflict. The transdisciplinary aspect was even more stressed by presentations on "nature and landscapes - important for cyclists?" by *Miglbauer*, "environmental history in view of long-term socio-ecological research" by *Schmid & Haidvogl*, and "ecological education" by *Radu.*

The Conference hosted about 70 participants presenting 26 talks and some 30 posters. The Book of Abstracts (47 pp.) contains 70 short abstracts of all presentations accepted for the conference (available as booklet and CD). The Limnological Reports 37 (259 pp., ISBN 978-86-911997-0-8) with 46 papers (extended abstracts) is available in CD form and will be printed as a book by the end of 2008. It must be emphasized that the reviewing procedure within IAD, introduced eight years ago, is now widely accepted and has gradually improved the scientific quality of papers. The prompt and excellent reviews of the Scientific Committee and the positive responsiveness of most authors to the reviews are appreciated. The Proceedings containing more detailed information about the abovementioned topics can be ordered at the IAD General Secretary (address, see last page).

Obituary of Prof. Dr. Vlasta Pujin (1929–2008)

Milan Matavulj, University of Novi Sad, Serbia

† – Vlasta R. Pujin

Vlasta R. Pujin died on August 29, 2008. She was 79. She was one of latest alive representatives from the Danube River Basin countries who were present at the event of foundation of the "The International Association for Danube Research" (IAD) in 1956 at the XIII Congress of the Societas Internationalis Limnologiae (SIL) in Helsinki.

From 1961 to 1966, she was employed as a research and teaching assistant at the Faculty of Agronomy of the University of Novi Sad. Upon finishing her doctoral studies at the Bavarian Institute of Biology in Munich (1963-1964) and defending her Ph.D. at the University of Novi Sad in 1966 she was elected as the Assistant Professor at the Faculty of Agriculture of the University of Novi Sad. From 1976 to 1991, she was member of the scientific team of the Institute of Biology of the Faculty of Science of the University of Novi Sad. Although she officially retired in 1991, she remained, until her recent illness, very active in research, consultancy and educational work.

During her many years with the University she served as chairwomen of the Institute of Plant Pathology of the Faculty of Agronomy, Institute of Biology of the Faculty of Sciences and as member of innumerable Faculty and University Committees and other management bodies for many years.

Professor Pujin was Europe-wide known for her teaching and hydro-biological research on Yugoslav waters, especially rivers, lakes, canal network and artificial reservoirs in the Danube River Basin. She organized and taught the Yugoslav first University course in Freshwater Biology, later known as the Novi Sad Hydrobiology School. She published over 200 articles in former Yugoslav and foreign professional journals. Her three books, written with coworkers: "Hydrobiology, student manual", "Eutrophication of stagnant waters of Voyvodina", and "Agricultural Zoology" are widely used as text-references in the Danube River Basin countries. The first one is still used as a text book by the students of the University of Novi Sad Faculty of Sciences.

She was active in 14 professional national and international societies (IAD, SIL, etc.) and served as president of three of them. Her name is found in many European biographical directories. At various times she served as editorial consultant or on the editorial board of five different scientific journals.

For more than 50 years, from the very first day of its foundation, she was member of IAD, and for 12 years she was the Country Representative of former Yugoslavia in IAD of SIL. Her commitment to IAD is testified by the fact that during her leadership (1984-1996) she did not miss one single annual IAD Conference, as well as her activity in organizing IAD conferences in Belgrade (1969) and Novi Sad (1979). Her dedication to the idea that the Danube River Basin is a unique ecological space contributed to keep the IAD's door open for everyone who was seriously concerned with the conservation of the Danube River when this cooperation seemed to be impossible; but through the nongovernmental and especially personal enthusiastic commitment these merits turned out to be possible and successful.

Vlasta Pujin presented more than 50 research papers at scientific confernces, many of them at the IAD annual meetings, and more than 20 lectures as invited speaker at scientific meetings. Besides numerous Diploma students, she directed the work of 11 M.Sc., and 10 Ph.D. students.

During her years of retirement, Vlasta Pujin's services as a freshwater biology consultant were widely in demand by many research institutes and universities, but public, fisheries and conservation agencies as well.

Prof. Dr. Vlasta Pujin will continue to inspire her colleagues and her "children in science" with her humanity, personal modesty, unselfishness and generous aid to whoever needed it. Teacher, Thank You!

References

Matavuly M (1998): The International Association for the Danube Basin Research (IAD). - Good Example of the Fruitful Regional Scientific Cooperation. Proc. 3rd ISIRR - International Symposium Interdisciplinary Regional Research, Novi Sad, September 24–25, 1998, Book II, pp 777–780

Matavuly M (1999): The work of Prof. Dr. Vlasta Pujin in International Scientific Institutions. "Our Vlasta" – 70 years of life and 50 years of work, Monograph. Ed. by Ecological Movement of Novi Sad, Edition: Documents, Book 2, pp. 21–23

Pujin V, Dyukicy N, Maletin S, Milyanovicy B, Ivanc A (1995): Investigations of The Danube Basin in the Frame of International Cooperation. Proc. Sci. Meeting "Povratak zhivota rekama" Kladovo, 12–15. 10. 1995, pp. 148–152

Wachs B (1996): The International Association for Danube Research (IAD) and its relevance to the Danube Basin. Arch. Hydrobiol. Suppl. 113, Large Rivers, 1–4: 229-236

ISSN 2070-1292

danube news

Bulletin of the International Association for Danube Research (IAD)
Informationsblatt der Internationalen Arbeitsgemeinschaft Donauforschung (IAD)

donau aktuell

International Association for Danube Research (IAD)

Presidium

President	General Secretary
PD Dr. Ivana TEODOROVIC	Dr. Harald KUTZENBERGER

Member Country Representatives

D	CH	A	CZ	SK	H	HR
Dr. Fritz KOHMANN	Dr. Felix KELLER	Dr. Maria LEICHTFRIED	Dr. Peter PÖSINGER	Dr. Eva BULANKOVA	Prof. Dr. Arpàd BERCZIK	Dr. Goran KLOBUCAR

SLO	BiH	SRB	RO	BG	MD	UA
N.N.	N.N.	Dr. Snezana RADULOVIC	Prof. Dr. Marian Trajan GOMOIU	Dz. Dr. Konstantin TZANKOV	Dr. Dumitru DRUMEA	Dr. Artem LYASHENKO

Expert Groups

Chemistry/Physics	Biotic processes	Microbiology / Hygienics	Phytoplankton / Phytobenthos	Macrophytes	Floodplain-ecology
Dipl.-Ing. Miklós PANNONHALMI	Dr. Thomas HEIN	Dr. Gerhard KAVKA	Dr. Katrin TEUBNER	Prof. Dr. Georg JANAUER	Dr. Ulrich SCHWARZ

Zoobenthos	Fish Biology / Fishery	Saprobiology	Ecotoxicology	Delta / Fore-Delta	Sustainable Development & Public Participation
Dr. Nàndor OERTEL	Dr. Mirjana LENHARDT	Dr. Gunther SEITZ	Dipl.-Biol. Willi KOPF	Dr. Julian NICHERSU	Dr. Harald KUTZENBERGER

Hydrological catchment of the River Danube

Address / General Secretary:

International Association for Danube Research
Internationale Arbeitsgemeinschaft Donauforschung (IAD)
Am Zunderfeld 12, A-4073 Wilhering
Tel.: 0043 727478881 Fax: 0043 727478884
E-mail: kutzenberger@iad.gs

IAD-Homepage: http://www.iad.gs

Editor:

Dr. Jürg Bloesch
Stauffacherstrasse 159
CH-8004 Zürich
Tel. 0041 (0)44 823 51 88
E-mail: bloesch@eawag

Layout:
Diener + Bachmann GmbH
Nordstrasse 108, 8037 Zürich
Tel. 0041 (0)44 440 11 50

Printing:
FUTURA – Petrovaradin, Serbia