A "new home" for the Tisza mayfly Palingenia

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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 5. Reintroduction of young larvae of Palingenia longicauda into rivers



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





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

Paramotor (Min_ Max)	Unit	Tisza	Lippe
Falameter (win-wax)	Unit	Min - Max	Min - Max
Water temperature	[T°C]	4.7 - 24.0	4.6 - 23.8
Oxygen	02 [mg/l]	5.4 - 12.3	9.1 - 11.8
рН		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	CI- [mg/l]	7 - 85	35 - 81
Sulfate	SO4 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.

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

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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

