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# Re-appearance of *Palingenia longicauda* (Olivier, 1791) (Ephemeroptera, Palingeniidae) on the Hungarian Danube section – range recovery of the species at the Rába-district

Kristóf Málnás, András Ambrus, Zoltán Müller, Ádám Péter Tóth & Béla Kiss

**Abstract:** Swarming long-tailed mayflies (*Palingenia longicauda*) were observed above the former rehabilitated Gönyű-sidearm of the river Danube on the 12–13th of June 2015, which was the first observation of the species at the Hungarian Danube section, since its disappearance. Both subimago molts of the males, and females doing their compensation flight were observed, thus development of the long-tail mayflies seems to be locally certain. Description of the swarming and summarized evaluation of the conservation trends of the long-tailed mayfly at the Rába-district are added below.

## Introduction

*Palingenia longicauda* (Olivier, 1791) was a widespread mayfly species in the European lowland rivers, until at the end of the 19th century a significant area-contraction began. Thus, following the early 1900s, the long-tailed mayfly disappeared initially from the Great-European-Plain, followed by the Balkan, and its range receded to the Danube catchment area. Disappearance from the Danube was determined in 1974 (Russev 1987), but rarely specimens were collected even in the 80s (Krno 1990). For decades, long-tailed mayfly colonies were only known from some sections of the Tisza River and its tributaries (Andrikovics et al. 1992, Russev 1987).

The area-contraction of the long-tailed mayfly can be explained as a consequence of river degradation and water pollution (Tittizer et al. 2008), or as a result of climatic change (Haybach 2007).

However, at the beginning of the 2000s, records of long-tailed mayfly became more frequent at the Tisza catchment area (Bauernfeind et al. 2005, Kovács 2006b, 2009, Kovács et al. 2001, 2003, Petrović et al. 2015). Moreover, *Palingenia longicauda* turned up at different rivers where it was considered to be extinct. It was observed again, after about forty year's absence flying above the Rába River (Kovács & Ambrus 2001), and it was rediscovered at the Lower-Danube-area and in the Prut River (Soldán et al. 2009, Zubcov et al. 2014).

## Results

Several swarming adult specimens of *Palingenia longicauda* were observed above a sidearm of the Danube near the Hungarian village Gönyű at the 12–13th of June 2015, which was the first observation of the species at the Hungarian Danube section, since its assumed local extinction. Both male imagos and female subimagos were observed. To ascertain the origin

of the population here we introduce the localities where the long-tailed mayfly has been observed at the Rába-district.

The former published records are the followings: Babót: Kis-Rába – Kovács 2009; Győr: Rába – Pongrácz 1914; Rábca – Pongrácz 1914; Körmend: Rába – Vutskits 1902; Molnaszecsőd: Rába – Vutskits 1902; Rum: Rába – Bálint et al. 2012; Sárvár: Rába – Kovács & Ambrus 2001; Várkesző: Rába – Kovács & Ambrus 2001; Vasegerszeg: Rába – Bálint et al. 2012.

New records and observations at the Rába district: Babót: Kis-Rába, N 47.551216°, E 17.060430°, 03.06.2008, A. Ambrus, observed imagos; N 47.562196°, E 17.040822°, 03.06.2008, A. Ambrus, observed imagos; Beled: Kis-Rába, N 47.489490°, E 17.086170°, 06.10.2016, K. Málnás, 6 larvae; Gönyű: Duna, N 47.740428°, E 17.812970°, 13.06.2015, K. Málnás, Á. P. Tóth, observed imagos; Gönyű: Duna, N 47.741828°, E 17.805096°, 12.06.2015, K. Málnás, Á. P. Tóth, observed imagos; Győr: Rába, N 47.676526°, E 17.620082°, 09.04.2014, P. T. Nagy, K. Kovács, 1 larva; Kapuvár: Kis-Rába, N 47.576550°, E 17.034267°, 21.09.2004, K. Kovács, 1 larva; Nick: Rába, N 47.384658°, E 17.034502°, 09.06.2015, A. Ambrus, observed imagos; Rábapatona: Rába, N 47.620799°, E 17.488729°, 13.11.2014, K. Málnás, 1 larva; Répcelak: Kis-Rába, N 47.426376°, E 17.060602°, 08.06.2015, A. Ambrus, observed imagos; Rum: Rába, N 47.095731°, E 16.827359°, 03.07.2013, K. Málnás, 1 larva; N 47.126665°, E 16.848526°, 07.05.2015, P. T. Nagy, K. Kovács, 1 larva.

## Discussion

The observed swarming started before sunset after 7 pm which would be a quite late swarming time at the Tisza drainage but it is regular at the Rába-district. Actually, the sunset time swarming could be the main explanation why the colonies at the Rába River were unnoticed for almost four

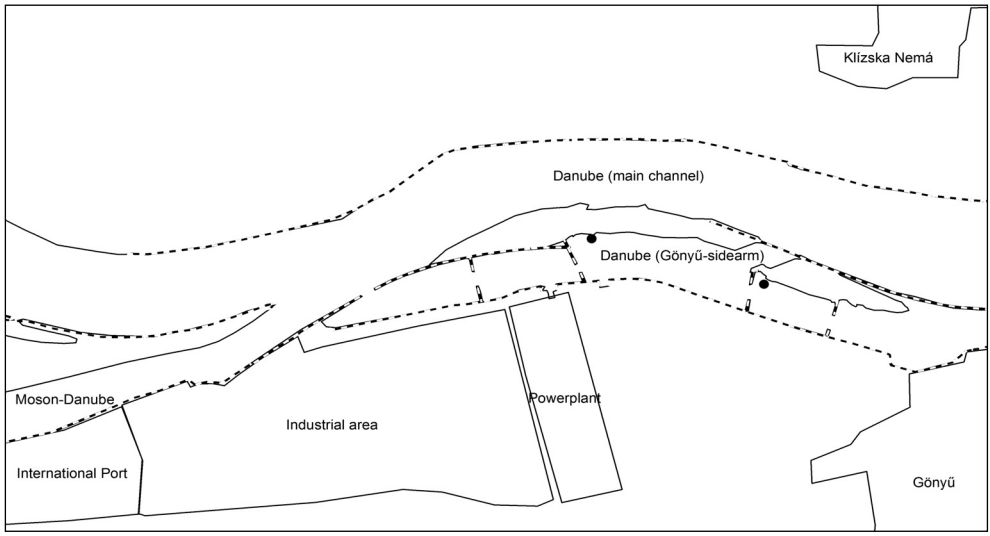


**Fig 1.** Occurrence of the long-tailed mayflies on the Danube; ● = assumed location of the colonies, broken line = rip-rap cover or wing-dams

decades. At first some adult females were noticed above the lowest section of the Moson-Danube. Most adult females doing the compensation flight flew upward on the Moson-Danube. A single specimen was followed upward on the main channel of the Danube, and some other specimens flew along the Danube flow-direction (Fig. 1). The male imagos doing the nuptial flight gathered along the shore of the reefs below the wing-dams of the side-arm. The subimago molts were also observed at the reef's shore, so supposedly the larvae developed at these river sections.

The Gönyű side-arm is divided from the main channel of the Danube by two reefs at the right side directly under the inflow of the Moson-Danube. It is a rehabilitated side-arm, former which it was formerly artificially blocked from the main channel of the Danube. Thus, before the rehabilitation the Gönyű-side-arm was an intermittent side arm of the Danube fragmented by cross dams. The riverbed had been filled up with sand and silt dominated sediment through the lack of permanent drift. In the course of the rehabilitation in 2010–2011, the cross dams were cut through at their middle sections, and transformed into paired wing-dams, also the riverbed was dredged, thus restoring the drift in the side-arm. Later probably the whirls aroused below the wing-dams hindered the sandy sediment on the adjacent reef-shore sections from re-subsiding. Thus, clay dominated river-substrate appeared below the wing-dams which is appropriate to the *Palingenia longicauda* larvae. So the local long-tailed mayfly colonies at the Gönyű side-arm developed on a newly established habitat.

Exciting question is where these colonies stem from. One possible explanation is that the small population of *Palingenia longicauda* had always been at that Danube section, so it is also a case of cryptic persistence like in the case of the Rába River or the Lower-Danube (Soldán et al. 2009, Bálint et al. 2012). Considering the low abundance of the local population and the late timing of swarming it can have some probability that long-tailed mayflies survived at the Danube undetected in the last 40 years approximately. So we checked the nearest riverbank sections which seemed appropriate for the *P. longicauda* but no specimens were found there. Another possible explanation is that the long-tailed mayflies migrated from the Rába River through the Moson-Danube to the Gönyű side-arm. Although apart from the females doing the compensation flight no long-tailed mayflies were observed on the Moson-Danube. The nearest known long-tailed mayfly record was arose from the Rába River near Győr, which is about 26 kilometres far from the Gönyű side-arm. Thus, unknown colonies can be closer, where the specimens or the eggs can drift by the current or migrate to the Danube.

The fact that Danube-dwelling colonies were only found on the newly established habitat under the Moson-Danube inflow suggests that the second explanation has higher probability. In 1962, one long-tailed mayfly specimen was collected from the Rába River, which was deposited in the collection of the Hungarian Natural History Museum (Bálint et al. 2012). Since this specimen, no other records were known for decades from the area, so the long-tailed mayfly was regarded to be extinct from the Danube and the Rába. However, since its rediscovery at the Rába in 1999 (Kovács & Ambrus 2001), the long-tailed mayfly was found at longer and longer sections of the river (Fig. 2). Moreover, swarming long-tailed mayflies are observed regularly on the upper section of the Kis-Rába near Babót. Before 1990, the water was annually drained for the wintertime from this section of the Kis-Rába, thus this section could not be appropriate for the long-tailed mayfly. The annual water depletion had been ceased only after 1990, so these colonies also live on a newly established habitat. Thus it is assumable, that after about four decades of cryptic persistence, the long-tailed mayfly started to recover its former range at the Rába-district. In the last fifteen years it spread along the Rába, it colonised the Kis-Rába

and presumably reached the Danube at the Gönyű side-arm. The range recovery at the Rába-district can be explained with the improving quality of the concerned river sections (Sallai & Mándoki 2009). However, this observed area recovery at the Gönyű side-arm could provide some possibility to the recolonization of the Hungarian Danube section. The reappearance of such highly sensitive insect species in the Danube as *Ephoron virgo* (Olivier, 1791), *Brachyptera* sp. or *Xanthoperla apicalis* (Newman, 1836) (Kovács 2006a, unpublished data of BioAqua Pro Ltd.) give ground for optimism.

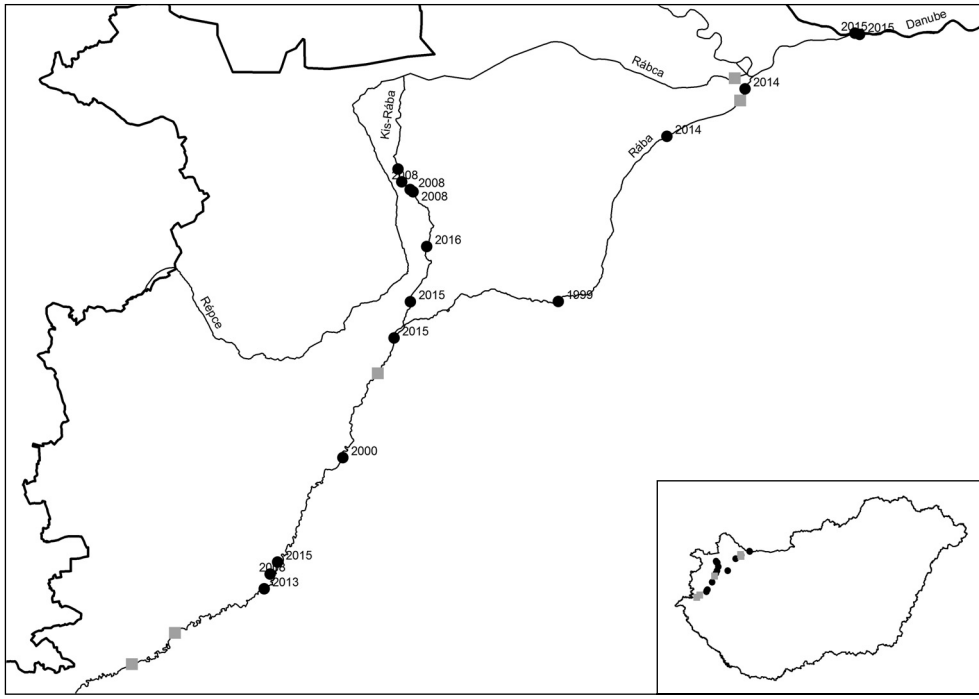


**Fig 2.** Records of the *Palingenia longicauda* at the Rába-district;
grey squares = old records, black dots = records since the rediscovery

**Acknowledgement:** We would like to say thank you to Eszter Á. Krasznai (Danube Researche Institute, Department of Tisza River Research, Debrecen) for the linguistic support and to Krisztián Kovács (Northern Transdanubian National Inspectorate for Environmental Protection and Nature Conservation Laboratory, Győr) for delivering the *Palingenia longicauda* records of the Northern Transdanubian National Inspectorate for Environmental Protection and Nature Conservation Laboratory.

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