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## CONTENTS

**Editorial**

Langton, P.H.L. Cool? 2

**Short Communications**

First record of *Parochlus kiefferi* (Garrett, 1925) in a sediment sequence from a Slovak mountain lake with notes on paleolimnological interpretation 4

Martin, J. The pupa of *Chironomus decorus* Johannsen, 1905 – additional description and an unusual sexual dimorphism 8

*Chironomus* (*Chaetolabis*) sp. from Minnesota, USA. Photo: Will Bouchard, 25 May, 2021

# *CHIRONOMUS Journal of Chironomidae Research*



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Would you like to see your picture on the front page? Please send us your favourite midge photograph or drawing (*torbjorn.ekrem@ntnu.no*).

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Front page layout: Chironomid in title from photograph by Steve Marshall, Graphic design by Kolbjørn Skarpnes, NTNU Information Division.

Front page photo: *Chironomus* (*Chaetolabis*) sp. from Minnesota, USA. Photo: Will Bouchard, 25 May, 2021

**Editorial**

# Cool?

The young boy one morning saw a large moth on the wall of his home. That visual experience led him to reach out a hand towards it and poke it with his finger. The moth flipped off the wall and flew into a nearby tree. First startled, then excited by the experience, he ran to the tree to find the moth, but it had disappeared. It led him to search everywhere he went for any creepy-crawlies he could find and observe their activities. Later schooling included biology as a whole organism subject and the school library had many books on animals including invertebrates and students were encouraged to use the library to research their favourite topics. His university course included whole animal studies, biodiversity and behaviour. His youthful experience led to a lifetime dedicated to entomology. Youthful experiences like his occur repeatedly all over the world, but very rarely now do they lead to a lifetime committed to entomology. The reason is without doubt the child's developmental environment.

Some years after retiring from full time biology teaching in a secondary school in England, I had the occasion to revisit the town of the school in which I had taught. I went into an inn for a meal. While I was awaiting the meal's arrival, I noticed that the young attractive blonde barmaid was looking at me intensely, unexpected taking into account our age difference, but even more surprisingly, she let herself out from behind the bar and came over to me. She said "It is Dr. Langton, isn't it? You won't remember me, but when I was 13 you taught me biology. Do you still have those two beetles I collected in the ditch between the playing fields?" During the summer term I used to take year 3 out of the classroom and row them out along the ditch with pond nets and dishes to see what they could find. I recollect that occasion well, because one very excited girl had collected a pair of *Dytiscus dimidiatus* Bergsträsser, a species I had not previously come across, nor since. Yes, I still did have them in my collection; happy, she returned to her place behind the bar.

When out collecting adults by sweeping vegetation, I always carry spare pooters. Sometimes my activities attract young children curious to know what I am doing. I lend them each a pooter and let them forage in my net for specimens. I then identify for them the various different insects in the tube. Invariably the answer is "Cool!" as they race off to show their parents their captures; in their efforts at naming the beasts the names get a bit mangled, but a small flame has been lit, unfortunately to be extinguished sooner or later by their educational environment. In these days, in the UK certainly, and elsewhere I believe, whole organism studies cease after primary school. I doubt that the barmaid I mentioned earlier would have been able to recount the workings of her kidneys or liver, but that which she saw and experienced had remained fresh in her memory for years. It is no surprise to me that recruitment into the study of insects is as low as it is. Morphological studies are unfashionable, even considered retro, but the esoteric and highly regarded studies in insects haven't the same eye-catching effect, certainly for the young, and have to rely on ready-made entomologists to recognize their value and join the elite.

Long may CHIRONOMUS depict upon its cover a whole specimen of a midge adult, larva or pupa. I have it on the best authority: they're "cool", and I couldn't agree more.

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I wonder what they look like
Does it matter?
YES!

# First record of *Parochlus kiefferi* (Garrett, 1925) in a sediment sequence from a Slovak mountain lake with notes on paleolimnological interpretation

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**Abstract**

Subfossil larval remains of a rare Podonominae, *Parochlus kiefferi* (Garrett, 1925), were identified in a sediment sequence from a mountain lake in the Low Tatra Mountains, Slovakia, and represent the first record of the species for Slovakia. The depth at which the *P. kiefferi* remains were found, along with the taxonomic composition of the corresponding chironomid assemblage dominated by cold-stenothermal taxa, indicate that the sample can be dated back to the Little Ice Age. Additionally, notes on the chironomid remains which appear in the sediment sample are provided here and can offer further insight into paleolimnological interpretation.

**Podonominae in a nutshell**

The subfamily Podonominae, whose species are generally considered rheophilic, cold-tolerant and polyoxybiontic, is noted for its patchy distribution and a marked bipolarity (Brundin 1966). Most genera occur in the higher latitude regions of the southern hemisphere, with a smaller number of taxa present in the northern hemisphere. Within the Podonominae subfamily, the species-rich *Parochlus* genus shows the widest distribution. *Parochlus* species are largely concentrated in the southern hemisphere, and only one, *Parochlus kiefferi* (Garrett, 1925), is present in the Holarctic region (Brundin 1966). In Europe, it is mostly confined to its northern, and central parts (Sæther and Spies 2004, Brooks et al. 2007). The larvae are easily recognisable due to the unique mentum shape, which consists of one median tooth and seven lateral teeth, where the third laterals are nearly as tall as the median tooth, first and second laterals are short, with the first partially fused to the median tooth; the remaining lateral teeth of the mentum gradually decrease in size. Mandibles of *P. kiefferi* have five inner teeth, and their ventromental plates are weakly developed (Brooks et al. 2007). Here, the first record of *P. kiefferi* in Slovakia, in a lake sediment sequence from a mountain lake, is presented.

**Studied material**

Lake Vrbické pleso (48°58'12.6"N, 19°34'38"E) (Fig. 1) is a permanent, moraine-dammed mountain lake of glacial origin, situated at 1113 m a.s.l. in the Demänovská dolina valley in the Low Tatra Mountains, central Slovakia. With a surface area of 0.73 ha and a maximum recorded depth of 8 m, it is the largest natural lake in the Low Tatras. Vrbické pleso is fed by groundwater, and it does not have surface water inflow other than from snowmelt and rainwater. The lake is currently surrounded by a Norway spruce (*Picea abies*) forest, following an artificial reforestation of the area in the 19$^{th}$ century. The primeval fir (*Abies alba*) forest was deforested, beginning in the 15$^{th}$ century onward (Hronček 2015). Presently, lake Vrbické pleso and the surrounding valley are large-scale tourist destinations.

The lake was sampled on 5 November 2021, using a Kajak gravity corer. A short sediment core, measuring 49 cm, was taken at a depth of 5.5 m and then subsampled on site into 0.5 cm wide sections. For chironomid analysis, 23 samples spread out evenly along the core were picked and subsequently washed with distilled water on a 50 µm - mesh sieve. Using a Motic SMZ-171 stereoscopic microscope (10–40× magnification), a minimum of 50 larval head capsules per sample were collected. Head capsules were then mounted on permanent slides using Berlese mounting medium. Chironomid remains were identified to the lowest possible taxonomic rank on a Nikon Eclipse LV100N POL compound microscope (100–500× magnification), according to Brooks et al. (2007) and Andersen et al. (2013). The microscope slides are deposited at the Department of Biology and Ecology, Matej Bel University, Banská Bystrica, Slovakia.

Figure 1. View of lake Vrbické pleso. Photo: Ladislav Hamerlík.

### *Parochlus kiefferi* occurrence and distribution

One of the analysed sediment core samples, from the depth of 42–42.5 cm, contained a particularly interesting find - that of the larval head capsule of a podonomine, *Parochlus kiefferi* (Fig. 2). This species was identified only in the aforementioned subsample, and not found in others. In the past, *P. kiefferi* has been recorded in the neighbouring Czech Republic, Poland and Austria (Sæther and Spies 2004, Syrovátka and Langton 2015). However, this finding represents the first record of the species in Slovakia, either in recent benthic fauna (Sæther and Spies 2004), or in lake sediment samples from paleolimnological studies (P. Bitušík, personal communication). Though it is not possible to identify the larval remains to species level, *P. kiefferi* is the only species of the genus known in Europe (Brundin 1966), therefore, the larval remains can confidently be attributed to *P. kiefferi*. It is a cold-stenothermal species which usually requires a constant flow of water, and so is typical of springs and fast-flowing brooks, streams and rivers (Brooks et al. 2007, Moller Pillot 2013 and references therein). However, *P. kiefferi* has also been found among mosses in a high-altitude glacial pond in the Italian Alps (Lencioni et al. 2009) and in cool Icelandic lakes (Brooks et al. 2007 and references therein). *P. kiefferi* is seemingly never abundant in the localities where it has been recorded, and is quite rarely found in lake sediments (Brooks et al. 2007, Hayford 2012 and references therein).

Including *P. kiefferi*, a total of 66 head capsules were found in the sample, and 19 chironomid taxa were identified, belonging to six subfamilies: Podonominae, Tanypodinae, Diamesinae, Prodiamesinae, Orthocladiinae and Chironominae, including the two tribes of Chironomini and Tanytarsini. The chironomid assemblage was dominated by the Tanytarsini, with *Tanytarsus lugens*-type making up 42% of all identified head capsules, followed by the Orthocladiinae, notably *Psectrocladius psilopterus*-type and *Limnophyes/Paralimnophyes* sp.; however, most orthoclad taxa were present in low abundances. A full list of all chironomid taxa recorded in the sediment sample, along with their relative abundances, is shown in Table 1.

Several other taxa like *P. kiefferi* were recorded in the sample, such as the similarly cold-stenothermal and rheophilic *Prodiamesa* sp. and *Pseudodiamesa* sp., although the latter genus can also be found in cold lakes and ponds. Additionally, the cold-stenothermal *Derotanypus* sp., *Paratanytarsus austriacus*-type and *T. lugens*-type, as well as the rheophilic *Chaetocladius piger*-type, and *Rheocricotopus effusus*-type were identified. Generally, the chironomid assemblage of the lake sediment sample is indicative of cold, oligotrophic conditions, and of the presence of an increased water flow. The sediment sequence has not yet


Figure 2. Detail of the head capsule of *Parochlus kiefferi* found in lake Vrbické pleso. Photo: Martina Jambrović.

Table 1. Relative abundances of all chironomid taxa identified from the 42–42.5 cm depth sample from the lake Vrbické pleso short sediment core.

| Taxon | Relative abundance [%] |
|---|---|
| **Podonominae** | |
| *Parochlus kiefferi* (Garrett, 1925) | 1.5 |
| **Tanypodinae** | |
| *Derotanypus* sp. | 4.5 |
| *Zavrelimyia* sp. | 7.6 |
| **Diamesinae** | |
| *Pseudodiamesa* sp. | 1.5 |
| **Prodiamesinae** | |
| *Prodiamesa* sp. | 1.5 |
| **Orthocladiinae** | |
| *Chaetocladius piger*-type | 1.5 |
| *Corynoneura lobata*-type | 1.5 |
| *Heterotrissocladius marcidus*-type | 3.0 |
| *Limnophyes/Paralimnophyes* sp. | 4.5 |
| *Orthocladius/Cricotopus* sp. | 1.5 |
| *Orthocladius* (*Euorthocladius*) sp. | 4.5 |
| *Psectrocladius psilopterus*-type | 6.1 |
| *Rheocricotopus effusus*-type | 1.5 |
| Orthocladiinae indet. | 3.0 |
| **Chironominae - tribe Chironomini** | |
| *Microtendipes pedellus*-type | 1.5 |
| **Chironominae - tribe Tanytarsini** | |
| *Micropsectra* sp. | 1.5 |
| *Paratanytarsus austriacus*-type | 1.5 |
| *Paratanytarsus* sp. | 3.0 |
| *Tanytarsus lugens*-type | 42.4 |
| *Tanytarsus pallidicornis*-type | 1.5 |
| Tanytarsini indet. | 4.5 |

been dated. However, owing to the depth of the sample within the sequence, and its comparison with other sequences from the Tatra Mountains (Stoklasa et al. 2017), we assume that the *P. kiefferi* head capsule can be dated back to the Little Ice Age.

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# The pupa of *Chironomus decorus* Johannsen, 1905 – additional description and an unusual sexual dimorphism

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**Abstract**

In his original description of *Chironomus decorus,* Johannsen included a brief description of the pupa but with insufficient detail to differentiate it from other North American species, particularly those of the decorus-complex. In this note, further information of pupal characters, mostly derived from specimens reared from egg masses, are given which allow separation of these pupae from those of some other species, e.g., presence of frontal warts, and in the case of the males, to permit accurate identification by the presence of a small secondary tubercle.

**Introduction**

In his original description of *Chironomus decorus,* Johannsen (1905) included some information on the pupa, e.g., length (7-8 mm), color (dusky greenish brown, the colors of the imago showing through the integument), black chitinised lateral spur prominent and without teeth (i.e., a single terminal spine). He also included a figure of a pupa, but not detailed enough to permit identification, and a figure of the shagreen pattern on abdominal segments five and eight. Wülker et al. (2009) noted the identity of species 3a of Martin et al. (1979) as *C. decorus* Johannsen and figured the frontal apotome of a female pupa in their figure 6b to contrast the presence of frontal warts (larger than normal for the species with height equal to width at base) in *C. decorus* in contrast to *C. bifurcatus* where they are lacking.

This account expands the description of the pupal exuviae of males and females, mainly reared from egg masses. One of these characters, the cephalic tubercles, which are usually larger in males of *Chironomus,* is further differentiated in *C. decorus* and allows identification of the male pupae as belonging to this species.

**Material and Methods**

The material examined here included 4 females and 2 males all reared from two egg masses collected in Madison, Wisconsin, USA in May 1978 (UWI.5.1 Em#1 and UWI.6.3 Em#1). The identity of these egg masses was confirmed from cytology and morphological features, and for the latter egg mass by the mtCOI barcode sequence of a female larva (BOLD CoTW079-20). Other specimens included a reared male from Belzoni, Humphries Co., Mississippi (UMS.2.1 reared male DNA1) for which a mtCOI sequence is also in the Barcode of Life Data Systems database (BOLD CoTW095-20). Both specimens are in BOLD BIN: BOLD:AAB7030.

In addition to the reared specimens, I also examined pupae in the collection of Jim Sublette in New Mexico, material that is now in University of Minnesota Insect Collection, but not yet curated. Specifically, I have photographs of pupal spurs of a female and an unsexed specimen from New Mexico, as well as the cephalic tubercles of a male specimen from Yankton, South Dakota which are illustrated below (Figure 1). I have photographs of pupal spurs of a female and an unsexed specimen from New Mexico, as well as the cephalic tubercles of a male specimen from Yankton, South Dakota which are illustrated below.

**Results and Conclusions**

Many of the morphological characters are summarized in Table 1. These data indicate that while many characters have different mean values between males and females (usually higher in males), there is considerable overlap of the ranges. The main exception is in the ratio of length to basal diameter of the cephalic tubercles where the males have a higher value. This difference is further reflected in the presence of a secondary tubercle, with a small seta, in males (see Figure 1), but not in females. Further, *C. decorus* is the only species from North America with such a secondary tubercle, permitting the male pupa to be readily identified.

Table 1. Summary of the mean and range of some morphological characters of the pupae of *Chironomus decorus*.

| | Females (5) | | Males (3) | |
|---|---|---|---|---|
| | Mean | Range | Mean | Range |
| Length (mm) | 8.17 | 7.4 - 9.3 | 9.36 | 8.13 - 10.2 |
| Inner margin wing case (mm) | 1.77 | 1.57 - 1.89 | 1.76 | 1.57 - 1.90 |
| Length/width frontal warts | 0.73 | 0.33 - 1.0 | 0.85 | 0.51 - 0.81 |
| Cephalic tubercles (µm) | 134.6 | 65 - 185 | 174.3 | 150 - 196 |
| Length/width Cephalic tubercle | 1.29 | 1.03 - 1.44 | 1.87 | 1.5 - 2.36 |
| Frontal setae (µm) | at least 73 | 53+ - 105 | at least 96 | 96+ |
| Length/width secondary tubercle | absent | absent | 1.33 | 1.1 - 1.6 |
| Hooks on abdominal segment II | 82 | 71 - 100 | 85 | 77 - 99 |
| Appressed spines on spur | 4.4 | 1 - 6 | 4.36 | 4 - 6 |
| Swim fin taeniae (one side) | 105 | 80 - 138 | 106 | 83 - 122 |

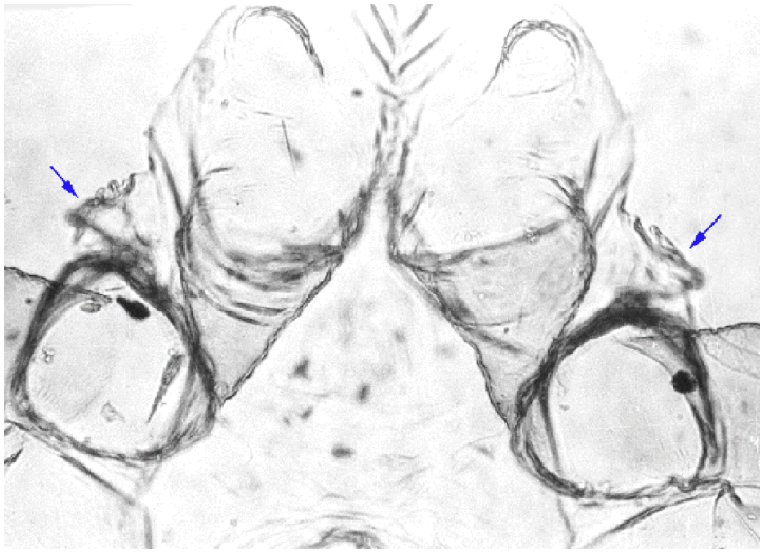

Figure 1. Cephalic tubercles and frontal warts of a male pupa of *C. decorus* from Yankton, South Dakota. The small secondary tubercles, with a small subapical seta, are indicated by arrows.

For females, only the presence of frontal warts provides a potential means of eliminating a number of species where frontal warts are known to be absent. The difficulty is that very few pupal descriptions make any mention of them. This may be in large part due to the statement in the Holarctic pupal diagnosis of the genus *Chironomus* (Pinder and Rice 1986) that frontal warts are absent in the genus. Aside from the present species, there are only two species for which their presence is confirmed: *C. melanescens* (Keyl 1962) (Martin 2015, Fig. 1b), where their length of about 55 µm will probably identify the pupae of that species, and *C. decorus* group species 2 of Butler *et al*. 1995 in which they are slightly larger in the females but largely overlap with the size range in *C. decorus* and can only be separated if there are more than 6 spines (up to 11) on the spurs. The pupal key of Langton and Visser (2003) makes it clear that they are commonly present in the subgenera *Chaetolabis* and *Einfeldia,* but that pupae of those subgenera have other differences to those of *Chironomus* (s.s.). A further impediment to clearly identifying, particularly the female pupae, is that there is no description of the pupae of at least 12 Nearctic species, and only a note of the number of spines on the pupal spur for a further 11 species – of which only *C. crassicaudatus* (9-19 spines, Sublette & Sublette 1971) does not overlap with the number in *C. decorus*. However, they can be separated from *C. anonymus*, *C. bifurcatus*, *C. blaylocki*, *C. staegeri*, *C. stigmaterus*, *C. dilutus*, and *C. pallidivittatus*, which are confirmed to lack frontal warts.

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