

SHORT COMMUNICATIONS

***Pseudodiamesa nivosa* or *arctica*? A confounded story of a midge moustache and an attempt at some taxonomic orthodontics**

Endre Willassen

University Museum of Bergen, Postboks 7800, NO5020 Bergen, Norway.

E-mail: endre.willassen@zmb.uib.no

Midges of *Pseudodiamesa* are fascinating examples of insect adaptations to cold environments. Adults may be observed when they have emerged shortly after spring ice-thaw in mountain lakes and brooks. In extreme cases this may be as late as mid October in western Norwegian mountains when winter precipitation with snow has been particularly high. Adults may be swarming when temperature and wind allow them. Otherwise they will sit in the snow or some other substrate waiting for better times. The immature stages can also stand up against some rough treatment from the environment. I have seen larvae, deflated and looking like miniature sausage peels, trapped and completely surrounded by ice, when they recover from the melting ice and regain their body shape and vitality within minutes after the ice has thawed around them.

Oliver (1959) advanced the idea that the North American *Pseudodiamesa arctica* is so morphologically distinctive by comparison with the European *P. nivosa* that it qualified for a subgenus of its own which he called *Pachydiamesa*. In the larvae, the alleged exclusive possession of a pair of labral lamellae (Oliver 1959, 1983) has since figured in some papers as the key character to identify *P. arctica* from other *Pseudodiamesa* larvae.

It was particularly the observation of such labral lamellae (see Figure 1C) that led Schnell and Willassen (1991) in a technical report to literally follow Oliver (1959, 1983) with some hesitation and to identify *Pseudodiamesa arctica* in Norwegian mountains. Moreover, since we were unable to observe clear cut *D. nivosa* characteristics as laid out by Oliver (1959) in the details of wing morphology, leg ratio and male genitalia we even suggested that the two taxa might possibly represent the same species. These were arguments to back up our identification but they were never intended as a formal nomenclatorial act of synonymisation. We did not have N. American material available for comparison and we also pointed to the taxonomic challenge that the candidate senior synonym, *P. arctica*, was originally described from a female. Basically we simply applied the authoritative taxonomic identification literature of that time to conclude that *Pseudodiamesa arctica* in the sense of Oliver was also observable in Norway. The only problem was that we could not see the difference from *P. nivosa*. When I brought specially fixed larvae to Novosibirsk for karyotype identification, Dr. Irina Kerkis identified the species to *P. nivosa* from chromosome characteristics. It is still not clear to me whether there was also a karyotype characterisation of something called *P. arctica* in place to compare with, but the cytotaxonomic interpretation of *P. nivosa* (at least at the time) corresponded to a species that actually has the “moustache” we would call labral lamellae (Figure 1C), although according to Oliver (1959, 1983) *nivosa* was not supposed to have one.

Curiously, in another paper by Oliver (1976:1054) also including a record of *P. arctica* from Peary Land Greenland, there is no mention of labral lamella as a distinguishing character, - simply a statement about *nivosa* and *arctica* being very similar and that: “Based on a single larva of *nivosa* available for study, it may be possible to separate the larvae of the two species by the shape of the procercus.”.

In the description of *P. nivosa* larvae from the Alps, Schmid’s drawings (1993:49, fig.21D) clearly show the labral lamellae that *P. nivosa* is not supposed to have. Although Schmid refers to Oliver (1983) in his list of taxonomic literature he states, contrary to Oliver without further comment, that the labral lamellae are the character that separates *P. nivosa* from *P. branickii*. So how can we actually identify *arctica* and *nivosa* from *branickii* larvae?

In a more recent taxonomic review of *Pseudodiamesa* Ilyashuk *et al.* (2010) refer to Makarchenko’s (1985

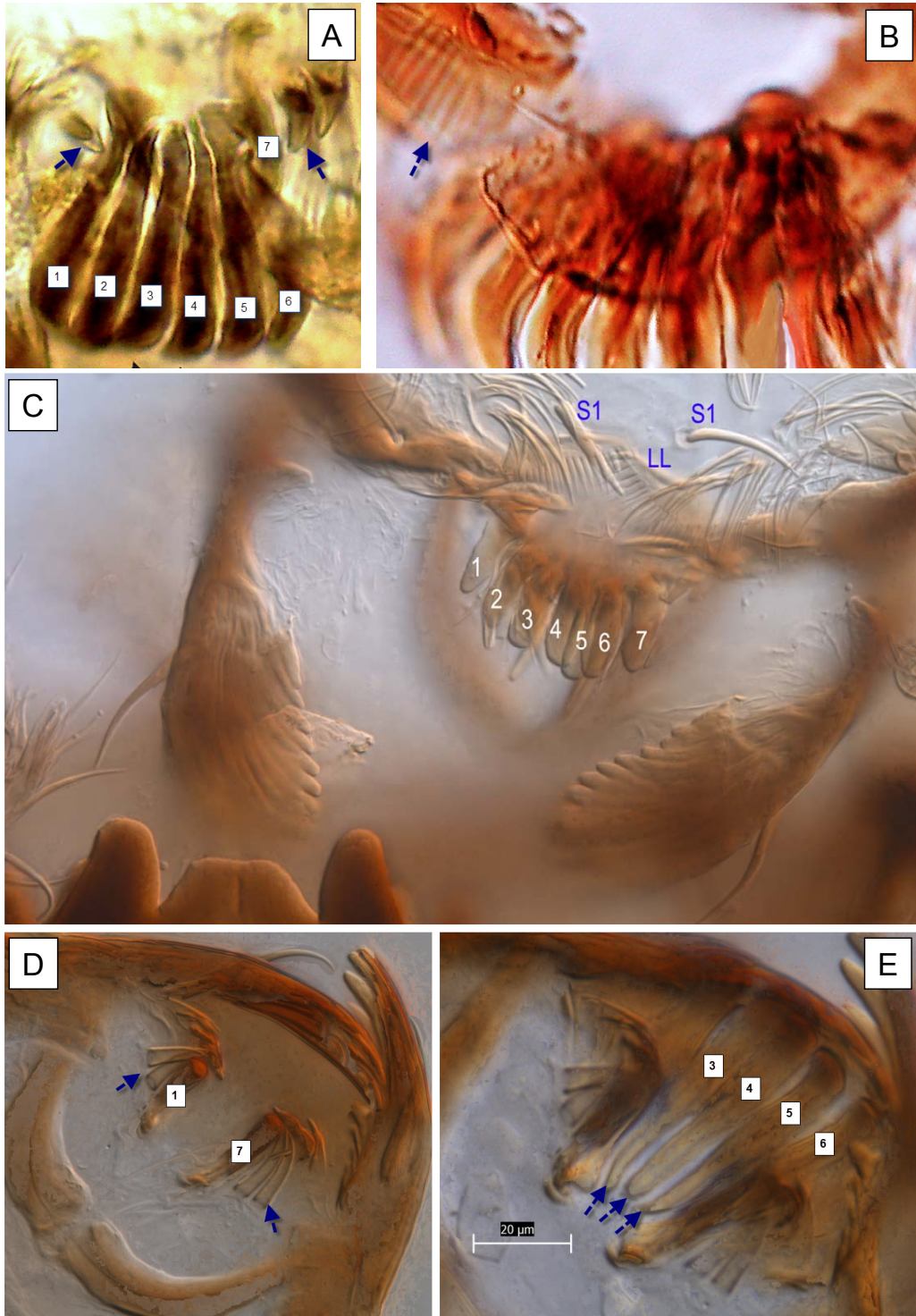


Figure 1. A) Epipharynx of *Pseudodiamesa nivosal* larva as pictured by Ilyashuk et al. (2010: fig. 1C). The present author has added arrows to indicate the two pairs of chaetulae basales flanking seven scalelike teeth (also marked by the present author). B) Detail of *Pseudodiamesa nivosal* larva according to Ilyashuk et al.'s (2010) fig. 1D. The present author has pointed an arrow to the labral lamella which according to Ilyashuk *et al.* is absent in *P. nivosal*. Details of *Pseudodiamesa* larva from Norway that would key out to *P. arctica* from Oliver (1983) and to *P. nivosal* from Schmid (1993) Epipharynx has seven scale like teeth (1-7) and a pair of comb shaped labral lamellae (LL). Notice also that the right sensilla S1 is apically bifid while the left is simple. D) Photostack of the ventral part of epipharynx showing chaetulae laterales, the two pairs of chaetulae basales (arrows, also see Figures 1A, D, E) and teeth number 1 and 7. E) The same as D but with focus constrained more dorsally showing odd number symmetry of (totally 7) teeth next to tooth number 4 (Photos: C-E by E. Willassen)

et seq.) studies of the pecten epipharyngis stating that: “The pecten epipharyngis of the

P. nivosa-group larvae consists of an even number, namely 3–4 pairs, of broad, elongate, apically blunt scales (fig. 1c, d), but that of the *P. branickii*-group larvae is characterized by an odd number, namely seven scales (fig. 1e, f)”. However, a closer look at their fig. 1c (see Figure 1A) shows that there are indeed seven epipharynx teeth (my numbering) in the specimen they identified as *P. nivosa*. There is no doubt that the counting of these structures can sometimes be a challenge, particularly in somewhat squashed microslide preparations. But in this case it seems pretty obvious to me. If we use the pairs of distinctive chaetulae basales as landmarks to define the outer margins of the pecten (Figures 1A, D), we see that there is symmetry around only one median tooth, the one which is numbered 4 in Figures 1 C-D. In other words, the assertion by Ilyashuk *et al.* (2010) stating that all previous authors (including Oliver, Schmid, Janecek) were wrong when counting seven epipharynx scales in species other than those of the *branickii* – group does not seem justified.

Ilyashuk *et al.* (2010) are also maintaining the notion that the labral lamellae are a unique feature of *P. arctica* larvae. If so, we should conclude that Schmid also has documented presence of *P. arctica* in the Alps, but then what should we do with *P. nivosa*? I find it intriguing that while Ilyashuk *et al.* (2010) repeatedly state that *P. arctica* is the only species with labral lamellae, they also show a photo (Ilyashuk *et al.* 2010:fig.1D) of what they call *P. nivosa* in which the specimen clearly seems to possess a labral lamella (Figure 1B). Was this taxonomically important detail (as this paper testifies) overlooked by the authors or was it perhaps being interpreted as another type of structure? It is tempting to suspect that when Oliver (1983) described some *Pseudodiamesa* larvae (other than *arctica*) as having lamelliform SI setae, he may perhaps actually have referred to labral lamellae. Could this be one of the loose ends of the confounding problems with the taxonomy of *Pseudodiamesa*? With admittedly limited experience with *Pseudodiamesa* larvae from other parts of the world I have never come across what I would describe as lamelliform SI setae in *Pseudodiamesa*. What I have seen, however, is that the apically bifid SI claimed to be unique (Ilyashuk *et al.* 2010) to the American endemic *P. pertinax* may also be observed in Norwegian larvae with labral lamellae (Figure 1C). The specimen pictured here actually has a split on the right SI only. It is a sort asymmetry that is not uncommon in setae of immature Diamesinae so I would be sceptical to use it a litmus test of species identity.

The observation that Ilyashuk *et al.* (2010) may have got the numbers of epipharynx teeth wrong in what they call *nivosa* unfortunately also leaves their claim that *arctica* has eight epipharynx teeth somewhat suspect. So are *arctica* and *nivosa* really separable as larvae? In his key to subgenera Oliver (1983) also included eight anal setae on the procercus as a distinctive feature for *arctica*. Figure 2A shows a specimen from Norway that would key out to *Pachydiamesa arctica* because it has 8 anal setae and labral lamellae. So why is it a problem with this record of *P. arctica* from Europe? Obviously because the differences between the larvae of *arctica* and *nivosa* described by Oliver (1983) and recently reiterated by Ilyashuk *et al.* (2010) don't appear to hold up and the relationship between the two nominal taxa is still in need of critical review.

But *Pseudodiamesa arctica* and *P. nivosa* could of course be inseparable in the larval stage and still be different species if we could observe distinctive and consistent differences in the adults. Ilyashuk *et al.* (2010) refer to a poster presentation by Makarchenko (2009) in which the statement is that *P. arctica* differs from *P. nivosa* by a more finger like distal part of the gonostylus and a posterolateral projection of the ninth tergite. However, the latter feature (Figure 2C) is also observable in specimens from Norway (Figure 2B) and does not seem to be a consistent difference although a few idiosyncratic drawings in the taxonomic literature could perhaps leave that impression. Moreover, when comparing Oliver's (1959) drawing of *P. arctica* (Figure 2C) with specimens from Norway (Figures 2B) I am unable to see that *P. arctica* in the sense of Oliver (1959) is strikingly different and more finger like in the shape of the gonostylus. Is *P. arctica* sensu Oliver (1983) actually the same as *P. arctica* sensu Makarchenko (2009) and how do they relate to *P. arctica* sensu Malloch and to *P. nivosa* sensu authors?

I am probably contributing my share to what seems to be a present state of chaos in *Pseudodiamesa* taxonomy by maintaining that I still cannot see the difference between the species that European workers have called *P. nivosa* and *P. arctica* in the sense of Oliver (1959). In anticipation of a more substantial documentation than a conference abstract I would also feel uncomfortable by having to choose between *arctica* and *nivosa* based on a critical value of 0.56 in leg ratio (Makarchenko 2009). It seems to me that molecular data could help in getting us out of some of the troubled waters that *Pseudodiamesa* taxonomy appears to be in these days. But even more so important is it that we try to resolve the taxonomic problems that may

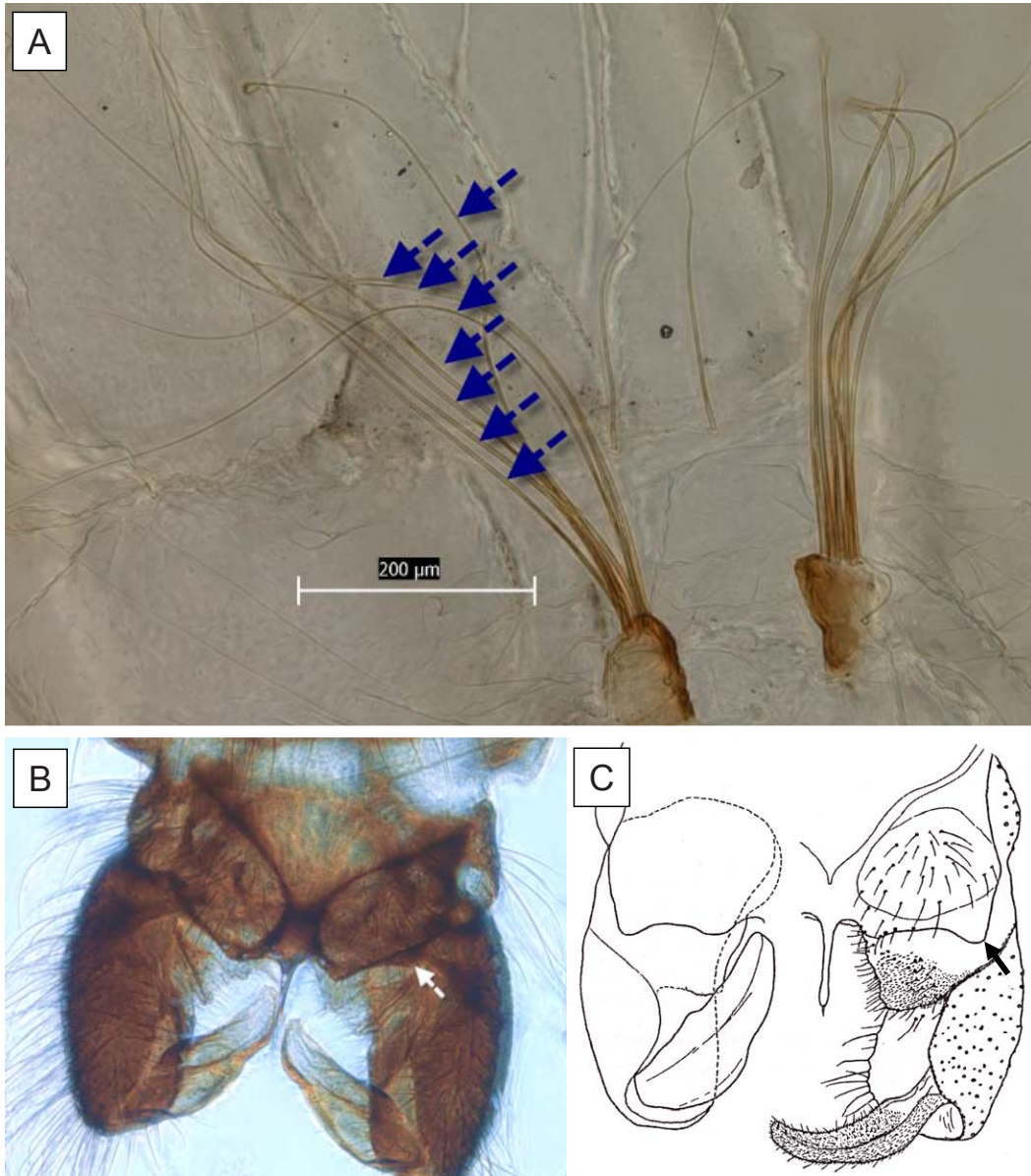


Figure 2. A) Procerci of *Pseudodiamesa* larva from Norway that would key out to *P. arctica* from Oliver (1983). Arrows point to eight anal setae. B) Male hypopygium of *Pseudodiamesa* from Norway with arrow pointing to caudolateral projection of tergite which according to Makarchenko (2009) is a key character to separate *P. arctica* from *P. nivosa*. C) Drawing of *P. arctica* hypopygium from Oliver (1959). The present author disputes that the gonostyli are conspicuously more fingerlike than in the species that has been known as *P. nivosa* in Europe. (Photos: A,B by E. Willassen)

be rooted in ill-defined characters, misconceptions based on mismatching terminologies and particularly from blind acceptance of old taxonomic decisions that did not seem to stand the test of additional material and new observations. We have never been better equipped technologically and electronic pictures are a blessing.

References

Ilyashuk, B.P., Ilyashuk, E.A., Makarchenko, E.A., Heiri, O. 2010. Midges of the genus *Pseudodiamesa* Goetghebuer (Diptera, Chironomidae): current knowledge and palaeoecological perspective. - *Journal of Paleolimnology* 44: 667-676. DOI: 10.1007/s10933-010-9446-0. (For higher resolution pictures see: http://www.springerimages.com/img/Images/Springer/JOU=10933/VOL=2010.44/ISU=2/ART=9446/MediaObjects/LARGE_10933_2010_9446_Fig1_HTML.jpg)

Makarchenko, E.A. 1985. *Chironomids of the Far East of USSR. The subfamilies Podonominae, Diames-*

- inae, and Prodiamesinae (Diptera, Chironomidae)*. DVNC AN SSSR, Vladivostok.
- Makarchenko, E.A. 2009. *Pseudodiamesa nivosa* (Goetghebuer, 1928) is not synonym of *Pseudodiamesa arctica* (Malloch, 1919) (Diptera: Chironomidae). *XVII International Symposium on Chironomidae, July 5–10, 2009, Nankai University, Tianjin, China. Program and Abstracts*, p 71. http://entomology.nankai.edu.cn/17chiro/program_abstr_Ver.6.30.pdf
- Oliver, D.R. 1959. Some Diamesini (Chironomidae) from the Nearctic and Palearctic. - *Entomologisk Tidsskrift* 80:48–64.
- Oliver, D.R. 1976. Chironomidae (Diptera) of Char Lake, Cornwallis Island, N.W.T., with descriptions of two new species. - *Canadian Entomologist* 108:1053–1064.
- Schmid, P.E. 1993. *A key to the larval Chironomidae and their instars from Austrian Danube Region streams and rivers. Part I, Diamesinae, Prodiamesinae and Orthoclaadiinae*. Federal Institute for Water Quality of the Ministry of Agriculture and Forestry, Wien, Austria.
- Schnell, Ø.A., Willassen, E. 1991. Fjærmyggarten *Pseudodiamesa arctica* (Malloch) i to høvfjellsreservoarer (The chironomid species *Pseudodiamesa arctica* (Malloch) in two high mountain reservoirs). *Report No 76, Freshwater Ecology and Inland Fisheries Laboratory, Department of Zoology, University of Bergen, Bergen, Norway*.
-