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Aquatic Insects

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713817864>

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Online Publication Date: 01 December 2008

To cite this Article Brodin, Yngve, Lundström, Jan O. and Paasivirta, Lauri(2008)'Tavastia yggdrasilia, a new orthoclad midge (Diptera: Chironomidae) from Europe', Aquatic Insects, 30:4, 261 — 267

To link to this Article: DOI: 10.1080/01650420802448515

URL: <http://dx.doi.org/10.1080/01650420802448515>

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***Tavastia yggdrasilia*, a new orthoclad midge (Diptera: Chironomidae) from Europe**

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(Received 28 February 2008; final version received 26 August 2008)

A new species of the chironomid genus *Tavastia* was frequently collected in wetlands of the River Dalälven lowlands in central Sweden from 2002 to 2007. Unpublished data revealed that the species has been known from Finland since 1974. The new species *T. yggdrasilia* can be separated from other *Tavastia* species by the combination of a gonostylus with strong crista dorsalis in proximal half, AR 0.93–1.16, and wing veins M3 + 4 and Cu1 without setae. A description of the male and the female is included, as is also a key to the males of the four known species of *Tavastia*. All records of *T. yggdrasilia* are from sites with mesotrophic or eutrophic conditions.

Keywords: key; *Tavastia*; new species; Europe; aquatic and terrestrial

Introduction

The Chironomidae genus *Tavastia* was created by Tuiskunen (1986) for a new species, *T. australis*, found in a Finnish spruce mire. The typical hypopygium, bare squama, hairy wings and eyes make the species easily distinguishable from other genera and species of the subfamily Orthocladiinae.

Later two additional species of *Tavastia* have been identified. Sæther (1992) described *T. cristicauda* from swamps in the USA, and Stur and Wiedenbrug (2005) collected *T. alticrista* from groundwater springs in Germany.

Studies of the chironomid fauna in wetlands of the lower reaches of River Dalälven in central Sweden revealed a fourth species of *Tavastia* (Brodin and Petersson 2008). It turned out to be identical with *Tavastia* sp. 2 “Pihlava” (sp. 1 most probably only a variety of *T. australis*, Tuiskunen 1985) from southern Finland (Paasivirta 2007), first collected by B. Lindeberg in 1974.

The sampling of Chironomidae in the inundation wetlands of River Dalälven is part of a long-term study on the ecological effects of using *Bacillus thuringiensis* var. *israelensis* against larvae of the flood-water mosquito *Ochlerotatus sticticus* (Meigen 1838). An overview of the studied wetlands and catches of Nematocera from emergence traps is given in Hagelin et al. (2007).

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Material and terminology

A total of 136 males and 507 females of the new *Tavastia* species were identified among the insects sampled with emergence traps from 2002 to 2007 in six wetlands around Lake Färnebofjärden in the River Dalälven lowlands.

Additional material of adult males and females was collected with an insect net from seven sites around Färnebofjärden from early May to late September 2007.

The adults were stored in 70% alcohol. Thirty individuals were mounted in Euparal (e.g. holotype and paratypes) or Eukitt. Three males and four females were treated with KOH (10%) for eight hours at 20°C, followed by neutralising acetic acid treatment before mounting.

Adult males and females from Pihlava in southern Finland, Hvoensk in southern Belarus and Veenendaal in the Netherlands were also studied. These specimens were sampled with an insect net or gained from emergence traps and mounted in Euparal.

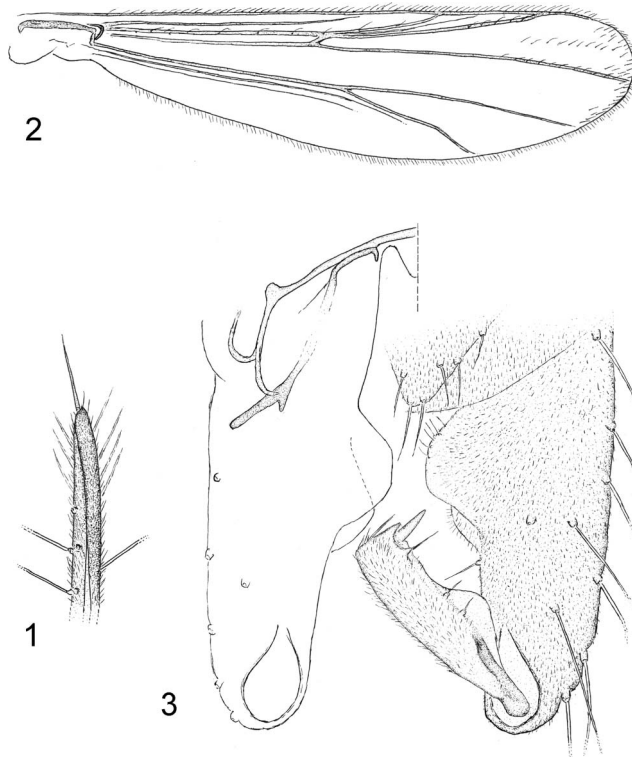
Terminology for males follows Wiederholm (1989) with same additional features mentioned in Langton and Pinder (2007). Terminology for females follows Saether (1977).

The holotype and paratypes are deposited at the Swedish Museum of Natural History (SMNH) in Stockholm, Sweden.

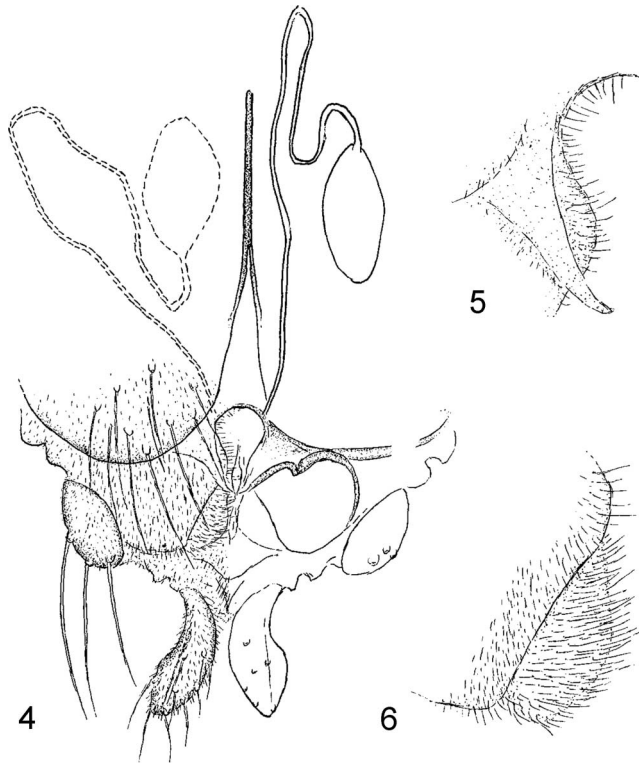
Taxonomy

***Tavastia yggdrasilia*, sp. n.** (Figures 1–6)

Material examined. Holotype: SWEDEN, ♂, eastern River Dalälven, Nordmyra wetland, Tärnsjö 16°52'46 E, 60°09'34 N, 55 m elevation, emergence trap, 30.7.2002 (leg. Björn Forsberg), (SMNH).



Figures 1–3. *Tavastia yggdrasilia* sp. n., male imago. (1) Apical part of antennae, (2) wing and (3) hypopygium dorsal view.



Figures 4–6. *Tavastia yggdrasilia* sp. n., female imago. (4) Genitalia ventral view, (5) gonapophysis VIII dorsomesal lobe, (6) gonapophysis VIII ventrolateral lobe.

Paratypes: SWEDEN, 3♂, 3♀, as holotype but 12.6.2003 (leg. Björn Forsberg), 4.6.2007 (leg. Anna Hagelin). BELARUS 2♂, 1♀, near Hvoensk south of Zhitkovichi, lagg zone of bog with *Equisetum fluviatile*, sweep net, 20.5.2004 (leg. Henk Moller-Pilot), (ZMB).

Additional material. SWEDEN, eastern River Dalälven, 13 sites in or near wetlands around Lake Färnebofjärden, May to September 2002–2007 (leg. Kristina Beijer, Yngve Brodin, Gustav Carlander, Björn Forsberg, Anna Hagelin, Anna-Sara Liman, Thomas Persson Vinnersten, Martina Schäfer and Antti Vähäkari). FINLAND Punkaharju, Punkasalmi 5.7. and 10.8.1974 (leg. Bernhard Lindeberg), Hyvinkää, Keravanjoki 7.6.1983 (leg. Jari Tuiskunen), Joensuu 31.5.1975, Tampere, Iidesjärvi Malaise 31.5.- 25.6.2001, Pori, Pihlava 24.6.2003, Hamina, Pyhäntö 4.6. and 20.6.2006, Parikkala three sites 20.6 and 29.7.2006, Tohmajärvi 30.7.2006 (all leg. Lauri Paasivirta). THE NETHERLANDS, Veenendaal Blauwe Hel, marshland, emergence trap 8.5.- 15.5.1992 (leg. Henk Siepel).

Diagnostic characters for males

Crista dorsalis strongly bulging in proximal half of gonostylus, dorsal inferior volsella prominent, M3 + 4 and Cu1 without setae. Typical characters in common with other *Tavastia* are antennae with a strong apical seta, hairy or pubescent eyes and apically hairy wings, squama bare, no anal lobe on wing and inferior volsella double.

Diagnostic characters for females

Gonapophysis VIII with a rounded ventrolateral lobe and triangular dorsomesal lobe, hairy or pubescent eyes, wing hairy apically and along hind margin, Cu1 with 6–12 (8) setae, squama bare or rarely with one seta, last flagellum segment often with one strong apical or slightly preapical seta.

Etymology

The world tree Yggdrasil in the Nordic Æsir mythology has a remarkably capacity to survive strong pressures and changes. This is also the case for *T. yggdrasilia* with respect to hydrological conditions.

Male imago (n = 39)

Two rather distinct forms occur, one with uncoloured wings and one with brownish wings. Intermediate forms are infrequent. Body (without antennae) 1.4–1.9 (1.7) mm.

Head. Base colour dark brown. AR 0.93–1.16 (1.03) and flagellum 13 segments. Last segment (Figure 1) not or slightly expanded preapically and apex rather pointed. One strong apical or slightly preapical seta. Eyes pubescent or hairy, not or very slightly extended. Temporals 7–12 (9) in one row. Palp segments length in μm : 21–32 (25), 21–29 (24), 52–65 (58), 44–57 (20), 70–93 (80).

Thorax. Antepronotum usually without setae, in a few specimens with 1–2 dorsal and 1–2 ventral setae. Scutum mostly dark brown but sometimes brown. Vittae (scutal stripes) dark brown as scutum or slightly darker, sometimes blackish. Acrostichals 9–15 (11) in midscutum, small, hooked. Dorsocentrals 7–15 (12) strong and in one or two rows. Scutellars 4–7 (5). Humeral pit small and rounded. Scutellum brown to dark brown. Postnotum generally dark brown.

Wings (Figure 2). Length 1.1–1.6 (1.4) mm, punctuation fine, uncoloured (type A), brown (type B) or infrequently light brown. Wing setae 30–60 (45) in distal fourth only. Squama bare. Anal lobe absent. Brachiolum with 0–1 (1) usually strong seta. C strongly extended, ending about mid between apex of M3 + 4 and apex of M1 + 2 or slightly closer to M3 + 4 apex. R with 5–11 (8) setae, R1 with 1–4 (2) setae. R4 + 5 with 6–10 (8) setae in distal half, R4 + 5 ends clearly proximal of M3 + 4 apex. R2 + 3 without setae, end about mid between R1 and R4 + 5. M1 + 2 with 8–18 (14) setae in distal half. FCu somewhat distal of RM. M3 + 4 without setae, with rather diffuse end near wing margin. Cu1 without setae, distinctly bent in midsection and end sometimes bent distally. Postcubitus ends about mid of Cu1. An ends below or somewhat distal of FCu.

Legs. Rather uniformly brown or sometimes tibia of mid leg and hind leg with midsection somewhat paler brown. Pulvilli and pseudospurs absent. Foreleg LRI 0.55–0.65 (0.60), BRI 2–3 (3), tibia spur slender 1.2–1.5 (1.4) times longer than width of tibia apically. Mid leg LR II 0.47–0.51 (0.49), BR II 3–4 (3), tibia with two apical spurs of rather similar length, both shorter than width of tibia apically. Hind leg LR III 0.52–0.59 (0.57), BR III 3–5 (4), tibia with strong comb of 11–19 (15) spines, last or second last spine longer than the

others, tibia apex with one small spur shorter than comb spines and one long strong spur 1.2–1.4 (1.3) times longer than width of tibia apically.

Abdomen. Tergites rather uniformly brown to dark brown, sparsely hairy. Tergite hairs scattered or with a tendency of two or three transversal rows. Tergite VIII gradually broader from proximal end to distal end.

Hypopygium (Figure 3). Anal point quite variable with basis somewhat distal mid of tergite IX, usually broadly triangular, covered with microtrichia from base to apex and with 5–10 (8) long setae of which 1–3 (2) are placed on the distal end. The anal point is frequently bent downwards and then hardly seen in dorsal view. Gonocoxites each with 7–13 (11) long dorsal and lateral setae. Inferior volsella double, upper volsella prominent, rounded and covering lower somewhat smaller volsella but for its distal part. Gonostylus with strong rather hyaline bulge (crista dorsalis) mainly in proximal half. Megastylus strong and as long as width of apical part of gonostylus. Base of gonostylus strongly narrowed into a stalk. Transverse sternapodeme moderately convex, forming an angle to lateral sternapodeme. Coxapodeme strongly bent. Adeagal lobe sharply hooked proximally. Phallapodeme distal section straight and with a small projection in mid part. Virga absent.

Female imago ($n = 32$)

As for male, two distinct forms occur, one with uncoloured wings and one with brownish wings. Body (without antennae) 1.2–1.6 (1.3) mm.

Head. Head brown to dark brown. Flagellum of five segments length in μm : 61–78 (67), 34–45 (40), 39–49 (43), 44–53 (48), 59–72 (67). Last segment often with one strong apical or slightly preapical seta. Eyes pubescent or hairy, not or very slightly extended. Palp segments length in μm : 17–26 (22), 26–33 (29), 52–70 (62), 58–71 (65), 83–109 (96). Temporals 3–6 (5) in one row.

Thorax. Anteprenotum without setae. Scutum light brown to yellowish. Vittae (scutal stripes) brown to dark brown. Acristochals 4–9 (6) in midscutum, small. Dorsocentrals 6–13 (9), in one row or occasionally two, strong. Humeral pit small and rounded. Scutellars 3–8 (5) Scutellum light brown to brown. Postnotum brown.

Wings. Mostly darker, broader and more hairy than male wing. Length 1.0–1.5 (1.2) mm, punctuation fine, uncoloured (type A) or brown to strongly brown (type B), infrequently light brown. Wing with 80–270 (180) setae in apical half and all along hind margin of wing or more densely in anal cell. Squama bare or rarely with one seta. Anal lobe absent. Brachiolum usually with one strong, long seta. C strongly extended, ending closer to apex of M1 + 2 than apex of M3 + 4. R with 5–13 (10) setae, R1 with 2–12 (6) setae, R2 + 3 with 0–4 (1) setae, R4 + 5 with 12–22 (17) setae. M1 + 2 with 18–32 (26) setae. Cu with 0–6 (2) setae. FCu somewhat distal of RM. M3 + 4 with 10–20 (15) setae. Cu1 with 6–12 (8) setae, distinctly bent in midsection and end sometimes strongly bent distally.

Legs. Rather uniformly brown. Pulvilli absent. Pseudospurs usually absent, sometimes weak on tarsi 1–4 of all legs. Foreleg LRI 0.54–0.63 (0.59), BRI 1–3 (2), tibia spur slender

0.8–1.1 (1.0) times longer than width of tibia apically. Mid leg LR II 0.45–0.52 (0.48), BR II 2–4 (3), tibia with two apical spurs of rather similar length, both much shorter than width of tibia apically. Hind leg LR III 0.54–0.62 (0.58), BR III 2–3 (3), tibia with strong comb of 11–19 (14) spines, last or second last spine often longer than the others, tibia apex with one small spur shorter than comb spines and one long strong spur 1.0–1.4 (1.2) times longer than width of tibia apically.

Abdomen. Tergites rather uniformly brown to dark brown, sparsely hairy. Tergite hairs scattered or with a tendency of two or three transversal rows.

Genitalia (Figures 4–6). Tergite IX undivided with 7–14 marginal setae in midsection and laterally, usually none in between. Sternite VIII each side with 8–16 (12) strong setae. Seminal capsules oblong or ovoid with ducts about twice as long as length of ramus and notum together. Vagina semicircular. Gonapophysis VIII with a rounded ventrolateral lobe and triangular dorsomesal lobe. Apodeme lobe not visible. Gonocoxite IX ovoid with 2–5 (4) strong setae. Coxasternapodeme divided into two joint sections, distal section semicircular. Postgenital plate narrowly triangular. Cerci diverging apically with 8–15 (11) strong setae.

Pupae and larvae

Not known.

Key to the known males of *Tavastia*

1. Gonostylus slender without pronounced bulging crista dorsalis (LRI 0.46, AR 0.98–1.02, wing length 1.4–1.6 mm, anal point with basal mid ridge)..... *T. cristicauda* Sæther, 1991
- Gonostylus with a pronounced bulging crista dorsalis (not seen in all angles)..... 2
2. Anal point narrowly triangular and apically bare with a strongly chitinised structure proximal of anal point (LRI 0.51–0.58, AR 0.69–0.81, wing length 1.4–1.5 mm)..... *T. australis* Tuiskunen, 1985
- Anal point broadly triangular covered with microtrichia, no strongly chitinised structure proximal of anal point. 3
3. AR 0.42–0.49, crista dorsalis of gonostylus very bulging and mainly in distal half, M3 + 4 and Cu1 with setae (LRI 0.50–0.53, wing length 1.2–1.4 mm, Costa ending close to apex of M1 + 2)..... *T. alticrista* Stur and Wiedenbrug, 2005
- AR 0.93–1.16, crista dorsalis of gonostylus less bulging and mainly in proximal half, M3 + 4 and Cu1 without setae (LRI 0.55–0.65, wing length 1.1–1.6 mm, Costa ending closer to M3 + 4 apex than M1 + 2 apex)..... *T. yggdrasilia* new species

Ecological notes

Tavastia yggdrasilia emerged from very variable hydrological conditions in the inundation wetlands of River Dalälven. Most individuals emerged during weeks with terrestrial to

semiterrestrial conditions (humid soils), but some emerged during truly aquatic conditions. The records from Belarus and the Netherlands are also from wetlands. The species seems to thrive well in nutrient-rich environments. All records from Finland have been netted from vegetational zones of eutrophic lakes. The Färnebofjärden wetlands can be classified to be mesotrophic to eutrophic.

Tavastia yggdrasil emerges throughout the studied period in the Färnebofjärden wetlands, thus from early May to late September in 2002 to 2007. More generations than one per year may be expected. June and July are major months of emergence. The numbers of emerging individuals were low, mostly only 1–12 individuals per week and m². The species emerged from 13 sites during the period 2002 to 2007 in the Färnebofjärden wetlands. It is thus common in the area. Only about five of those around 130 chironomid species found in the wetlands during 2002–2007 were more frequently caught. Males made up 21% (13–35%) of the emerged individuals from the period 2002 to 2007.

Acknowledgements

We wish to thank Kristina Beijer, Axel Berglund, Gustav Carlander, Björn Forsberg, Anna Hagelin, Jan Landin, Anna-Sara Liman, Thomas Persson Vinnersten, Martina Schäfer and Antti Vähäkari for all help (project planning, field sampling, laboratory sorting, hydrological characterisation, valuable comments on the manuscript etc.). We also wish to express our gratitude to Jari Tuiskunen for preparations of the Finnish material and valuable sketches of wings and hypopygium, and to Elisabeth Stur for loans of material from Belarus and the Netherlands. The study was financed by a grant from the Swedish Environmental Protection Agency to the author J. O. Lundström.

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