

A description of the adult male *Baetis pentaphyllus* Tiunova et Semenchenko, 2019 (Ephemeroptera: Baetidae) from the Russian Far East

Описание имаго самца *Baetis pentaphyllus* Тиунова et Semenchenko, 2019 (Ephemeroptera: Baetidae) с Дальнего Востока России

Т.М. Тиунова
Т.М. Тиунова

Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far East Branch of the Russian Academy of Sciences, Prosp.100-letiya Vladivostoka 159, Vladivostok 690022 Russia. E-mail: tiunova@ibss.dvo.ru

Федеральный научный центр биоразнообразия наземной биоты Восточной Азии ДВО РАН, пр. 100-летия Владивостока 159, Владивосток 690022 Россия.

Key words: Ephemeroptera, mayfly, *Baetis*, description, male imago, Russia.

Ключевые слова: Ephemeroptera, подёнки, *Baetis*, описание, самец имаго, Россия.

Abstract. The mayfly *Baetis pentaphyllus* Tiunova et Semenchenko, 2019 was described in 2019 by T. Tiunova and A. Semenchenko by holotype mature larva from Far East of Russia (type locality Bolshoi Garmakan River, Amurskaya Oblast). In this paper, the adult male, collected at the same place and date together with mature larvae, is described. Comparison of the male imago with other known species of *Baetis* Leach is given. Male of *B. pentaphyllus* Tiunova et Semenchenko can be distinguished from the close related species by the venation of the hind wing, size of the body and shape of genitalia.

Резюме. *Baetis pentaphyllus* Тиунова et Semenchenko, 2019 описан в 2019 году Т. Тиуновой и А. Семенченко по зрелой личинке с Дальнего Востока России (типичное местонахождение: р. Большой Гармакан, Амурская область). В данной работе приводится описание имаго самца, который был собран вместе с половозрелыми личинками в том же месте и в то же время. Приведено сравнение самца с другими известными видами рода *Baetis* Leach. Самец *B. pentaphyllus* Тиунова et Semenchenko хорошо отличается от близких ему представителей по жилкованию заднего крыла, размерам тела и форме гениталий.

Introduction

Baetis pentaphyllus Tiunova et Semenchenko, 2019 was described in 2019 by larvae, collected in Zeya River basin of Amurskaya Oblast and two mature larva from Maly Keperveem River in Chukotkskii Autononnyi Okrug of Russian Far East [Tiunova, Semenchenko, 2019]. An adult male was collected together with two mature larvae of *B. pentaphyllus* Tiunova et Semenchenko, which makes it highly likely that it belongs to the same species. No other larvae of the genus *Baetis* Leach were found in the stream during the sampling period. Therefore, in this work, for the first time, a description of the male adult of *B. pentaphyllus* Tiunova et Semenchenko is given.

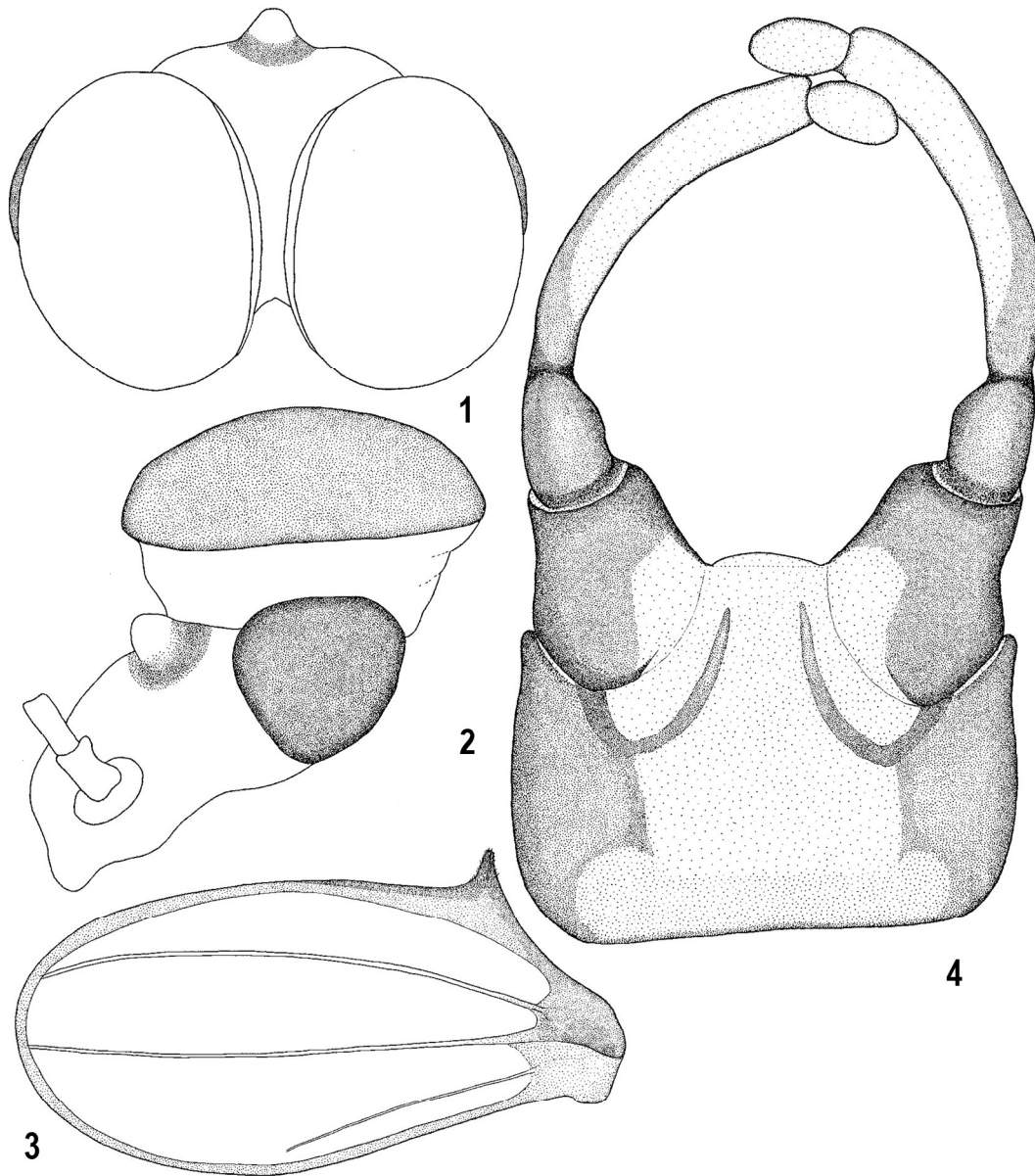
All material was preserved in 96 % ethanol. Administrative districts and geographical coordinates of localities are given according to «Google Earth» (<http://earth.google.com>). The material is deposited in the collection of the Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far Eastern Branch, Russian Academy of Sciences, Vladivostok.

The present work is registered in ZooBank (www.zoobank.org) under LSID urn:lsid:zoobank.org:pub:3AB27203-B7EB-45F3-9EAA-398F93611186.

Baetis pentaphyllus Tiunova et Semenchenko, 2019
Figs 1–9.

Material. Russia, *Amurskaya Oblast*: holotype, larva, Zeyskii Reserve, Zeya Reservoir Basin, Bolshoi Garmakan River, about 300 m above mouth, 53°53.148' N, 127°11.626' E, 2.VII.2015, T. Tiunova leg.; paratypes: 6 larvae — ibidem the holotype (BAE-BGAR1_110); 4 larvae — idem, 8.VII.2015, T. Tiunova leg.; 3 larvae — Malyi Garmakan River, about 500 m above mouth, 53°52.295' N, 127°10.459' E, 6.VII.2015, T. Tiunova leg.; 5 larvae — Shirokovka River, about 700 m above mouth, 7.VII.2014, T. Tiunova leg. *Chukotkskii Autononnyi Okrug*: 2 mature larvae, 1♂ adult — Kolyma River Basin, Malyi Keperweim River, 68°23.151' N, 166°80.348' E, 3.VIII.2016, A. Semenchenko leg.

Description. *Male imago* (in alcohol). Length (mm): body 5.2; forewings 5.1; cerci lost; femora 1.2; tibia 1.7. Head: brown. Antennae brownish. Eyes and basal part of ocelli black; apical part of ocelli grayish. Turbinate eyes oval in dorsal view, approximately 1.4 times longer than wide (Fig. 1), inner and external margins almost of the same counter; moderately high (Fig. 2), faceted surface eyes orange-brown, without light ring; shaft usually lighter than faceted surface (Figs 5–6). Thorax: Anterior phragma black. Anteronotal protuberance brown; anteronotal transverse impression dark brown. Medioscutum brown, submedioscutum lighter. Lateroparapsidal suture and median longitudinal suture dark brown. Posterior scutal protuberance dark brown. Scutellum grayish with dark lateral margins; scuto-scutellar impression brownish. Sublateroscutum dark brown. All legs brown or light brown. Femur and tibia brown, tarsus lighter (Fig. 5). Lengths ratio of individual foreleg segments: 1.2:1.7:0.7:0.7:0.4:0.2. Forewing transparent, all veins brownish; pterostigma milky. Hind wing hyaline, transparent, and approximately 2.3 times longer than wide, with rounded apex and three simple longitudinal veins;



Figs 1–4. Details of *Baetis pentaphyllus* Tiunova et Semenchenko adult male morphology: head (1, 2), hind right wing (3) and genitalia (forceps) (4). 1 — lateral view; 2, 3 — dorsal view; 4 — ventral view.

Рис. 1–4. Детали строения имаго самца *Baetis pentaphyllus* Tiunova et Semenchenko: голова (1, 2), правое заднее крыло (3) и гениталии (клещи) (4). 1 — вид сбоку; 2, 3 — вид сверху; 4 — вид снизу.

third vein ends at approximately half of wing length; cross veins absent; costal projection well developed (Figs 3, 7). Abdomen: terga I–II and VIII–X brown, other lighter; lateral margins with darker area (Fig. 5); in middle part of terga pair of dark spots not so good visible. Sternum I dark brown; sternum II–VII brown, sternum VII–IX darker; sternum II–VII with a pair of antero medial dark spots (Fig. 6, 8). Styliger with distinct central light spot, lateral area dark brown (Fig. 4, 8). Unistyliger dark brown with white area in first half; slightly elongated, almost 1.3 times as long as wide; apical part more slender than basal one; inner margin rounded apically (Figs 4, 9). Segment I of gonostylus cylindrical with parallel margins and truncated the upper inner edge; brown with darker anterior and posterior margins. Segment II is relatively narrow, slender at the base and slightly widening towards segment III, curved inwards;

white, with a brown base and a narrow brown stripe along the outer edge and reaching the middle. Segment III white, oval, length/width ratio 1.8 (Figs 4, 9).

Distribution. Known from two type localities in Far East of Russia: Amurskaya Oblast and Chukotkskii Avtonomnyi Okrug.

Diagnosis. Male imago. Hind wing with three simple longitudinal veins; third vein ends at approximately half of wing length; cross veins absent; costal projection well developed (Figs 3, 7). Segment I of gonostylus cylindrical with parallel margins and truncated the upper inner edge; segment II is relatively narrow, slender at the base and slightly widening towards segment III, curved inwards; segment III oval, length/width ratio 1.8 (Figs 4, 9).

Differential diagnosis. Male imago of *Baetis pentaphyllus* Tiunova et Semenchenko can be distinguished from all currently



Figs 5–9. Details of *Baetis pentaphyllus* Tiunova et Semenchenko adult male morphology: general appearance (5, 6), hind right wing (7), abdominal sterna (8) and genitalia (forceps) (9). 5 — lateral view; 6, 8, 9 — ventral view; 7 — dorsal view.

Рис. 5–9. Детали строения имаго самца *Baetis pentaphyllus* Тиунова et Семеченко: внешний вид (5, 6), правое заднее крыло (7), брюшко (8) и гениталии (клещи) (9). 5 — вид сбоку; 6, 8, 9 — вид снизу; 7 — вид сверху.

known species of the genus *Baetis* Leach, having costal projection, three simple longitudinal veins, and absence of cross veins by the following features: (1) Third vein ends at approximately half of hind wing length (Figs 3, 7). In *Baetis atlanticus* Soldan et Godunko, 2006:7, Fig. 6; *B. cyrneus* Thomas et Gazagnes, 1984 [Belfiore et Thomas, 1987:164, Fig. 2]; *B. meridionalis*, Iko-

nomov 1954 [Ikonov, 1962:97, Fig. 1]; *B. pseudothermicus* Kluge, 1983:66, Fig. 14; *B. punjabensis* Kapur et Kripalani, 1961:193, Fig. 3b; *B. shinanonis* Ueno, 1931:94, Fig. 2C; and *B. simplex* Kapur et Kripalani, 1961 [Kapur, Kripalani, 1963:190, Fig. 2j, third vein ends one third of wing length. In *B. javanicus* Ulmer, 1913 [Müller-Liebemau, 1981]; *B. petrovi* Tshernova,

1938:56 (lacking figures); *B. sahoensis* Gose, 1980:123, Fig. 46; *B. sulphurosus* Day, 1954:31, fig. 8; *B. thermophilus* McDunnough, 1926:189 [figure absent], and *B. tigroides* Gillies, 1949, third vein ends far from middle of hind wing length; (2) Hind wing not hairy (Figs 3, 7) in contrast to *B. septemmenes* Dubey, 1971: 538, Fig. 98; (3) Body size of male imago about 6 mm, in *B. longistylus* Kaul et Dubey, 1970 is 10 mm; (4) Inner margin of unistyliger apically rounded (Figs 4, 9), while in *B. canariensis* Müller-Liebemau, 1971; *B. numidicus* Soldan et Thomas, 1983: 209, Fig. 18; *B. persecuta* McDunnough, 1939: 51, Fig. 4; *B. rusticans* McDunnough, 1925: 225, Fig. 9; *B. yamatoensis* Gose, 1965: 219, Fig. 4, and *B. ussuricus* Kluge, 1983: 69, Fig. 40, inner margin with well developed projection apically; (5) Length/width ratio of segment III is 1.8 (Figs 4, 9). In *B. chelif* Soldan et al., 2005: 157, Fig. 1; *B. milani* Godunko et al., 2004: 235, Figs 5–6, and *B. tsushimensis* Gose, 1980: 123, Fig. 51, is about 1.0; in *B. cyrneus* Thomas et Gazagnes, 1984 [Belfiore et Thomas, 1987: 164, Fig. 3] is 2.3, in *B. taldybulaki* Sroka et al., 2012: 51, Figs 11a, 11b — from 2.10 to 2.25, and in *B. moffati* Dodds, 1923: 116, Fig. 37 is 2.7; (6) Segment I of the gonostylus cylindrical with parallel margins (Figs 4, 9), the same structure in *B. chelif* Soldan et al., 2005: 157, Fig. 1 and *B. longistylus* Kaul et Dubey, 1970: 147, Fig. 21 segment I with distinctly concave inner margin; (7) Segment II slender at the base and slightly widening towards segment III, in *B. palisadi* Mayo, 1952: 101, Pl. III, Fig. 6 and *B. taldybulaki* Sroka et al., 2012: 51, Fig. 11a, segment II substantially equal width over the entire length.

Acknowledgements

The authors are grateful to Dr. Aleksandr A. Semenchenko (Federal Scientific Center of the East Asia Terrestrial Biodiversity Far Eastern Branch, Russian Academy of Sciences, Vladivostok) for the collected material.

The research was carried out within the state assignment of Ministry of Science and Higher Education of the Russian Federation (theme № 124012400285-7).

References

- Belfiore C., Thomas A.G.B. 1987. Description de l'imago mâle de *Baetis cyrneus* Thomas et Gazagnes, 1984 (Ephemeroptera) // Annales de la Société des Sciences Naturelles et d'Archéologie de Toulon et du Var (S.S.N.A.T.V.). Vol.39. No.3. P.163–164.
- Day W.C. 1954. New species of California mayflies in the genus *Baetis* (Ephemeroptera) // Pan-Pacific Entomologist. Vol.30. No.1. P.29–34.
- Dodds G.S. 1923. Mayflies from Colorado. Descriptions of certain species and notes on others // Transaction of the American Entomological Society. Vol.49. P.93–114. Pls 8–9.
- Dubey O.P. 1971. Torrenticole insects of the Himalaya. VI. Description of nine new species of Ephemera from the Northwest Himalaya // Oriental Insects. Vol.5. No.4. P.521–548.
- Edmunds G.F.Jr., Allen R.K. 1957. A new species of *Baetis* from Oregon (Ephemeroptera: Baetidae) // Journal of the Kansas Entomological Society. Vol.30. No.2. P.57–58.
- Gillies M.T. 1949. Notes on some Ephemeroptera Baetidae from India and South-East Asia // Transactions of the Royal Entomological Society London. Vol.100. No.6. P.161–177. <https://doi.org/10.1111/j.1365-2311.1949.tb01429.x>
- Gose K. 1965. Description of two new species of Baetidae from Japan (Ephemeroptera) // Kontyû. Vol.33. No. 2. P.218–220.
- Gose K. 1980. The mayflies of Japanese. Part 6 // Aquabiology. Vol.2. No.1. P.76–79 [In Japanese].
- Godunko R.J., Prokopov G.A., Soldán T. 2004. Mayflies of the Crimean Peninsula. III. The description of *Baetis milani* sp. n. with notes on taxonomy of the subgenus *Rhodobaetis* Jacob, 2003 (Ephemeroptera: Baetidae) // Acta Zoologica Cracoviensia. Vol.47. Nos 3–4. P.231–248. <https://doi.org/10.3409/173491504783995799>
- Ikonomov P. 1954. Über eine neue Larve der Gattung *Baetis* (Ephem.) aus Mazedonien // Fragmenta Balcanica. Vol.1. No.11. P.95–105.
- Ikonomov P. 1962. Baëtidae (Ephemeroptera) на Македонија. // Faculté des Sciences Naturelles de l'Université de Skopje, Biologie. Vol.13. P.83–140.
- Kapur A.P., Kripalani M.B. 1961(1963). The mayflies (Ephemeroptera) from the north-western Himalaya // Records of the Indian Museum. Vol.59. Nos 1–2. P.183–221. Pl.7.
- Kluge N.J. 1983. Novie i maloizvestnie podenki cem. Baetidae (Ephemeroptera) iz Primorya [New and little known mayflies of the family Baetidae (Ephemeroptera) from Primorye Territory] // Entomologicheskoe Obozrenie. Vol.61. No.1. P.65–79 [In Russian, with English summary]
- Kaul B.K., Dubey O.P. 1970. Torrenticole insects of the Himalaya. I. Two new species of Ephemera // Oriental Insects. Vol.4. No.2. P.143–153.
- Mayo V.K. 1952. New western Ephemeroptera III // Pan-Pacific Entomologist. Vol.28. No.2. P.93–103.
- McDunnough J. 1925. The Ephemeroptera of Covey Hill, Que // Transactions of the Royal Society of Canada. Ser.3. Vol.19. No.5. P.207–223.
- McDunnough J. 1926. Notes on North American Ephemeroptera with descriptions of new species // The Canadian Entomologist. Vol.58. No.8. P.184–196.
- McDunnough J. 1939. New British Columbian Ephemeroptera // The Canadian Entomologist. Vol.71. No.2. P.49–54.
- Müller-Liebenau I. 1969. Revision der europäischen Arten der Gattung *Baetis* Leach, 1815. (Insecta, Ephemeroptera) // Gewässer und Abwasser. Vol.48/49. P.1–214.
- Müller-Liebenau I. 1971. Ephemeroptera (Insecta) von den Kanarischen Inseln // Gewässer und Abwasser. Vol.50/51. P.7–40.
- Müller-Liebenau I. 1981. Review of the original material of the baetid genera *Baetis* and *Pseudocloeon* from the Sunda Islands and the Philippines described by G. Ulmer, with some general remarks (Insecta: Ephemeroptera) // Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut. Bd.78. S.197–208.
- Soldán T., Godunko R.J. 2006. *Baetis atlanticus* n. sp., a new species of the subgenus *Rhodobaetis* Jacob, 2003 from Madeira, Portugal (Ephemeroptera: Baetidae) // Genus. Vol.17. No.1. P.5–17.
- Soldán T., Godunko R.J. 2008. Two new species of the genus *Baetis* Leach, 1815 (Ephemeroptera: Baetidae) from Cyprus // Annales Zoologici Vol.58. No.1. P.79–104.
- Soldán T., Godunko R.J., Thomas A.G.B. 2005. *Baetis chelif* n. sp., a new mayfly from Algeria with notes on *B. sinospinosus* Soldan & Thomas, 1983, n. stat. (Ephemeroptera: Baetidae) // Genus. Vol.16. No.2. P.155–165.
- Soldán T., Thomas A.G.B. 1983. New and little-known species of mayflies (Ephemeroptera) from Algeria // Acta Entomologica Bohemoslovaca. Vol.80. P.356–376.
- Sroka P., Godunko R.J., Novikova E.A., Kluge N.J. 2012. Contribution to the knowledge of the subgenus *Rhodobaetis* Jacob, 2003 (Ephemeroptera: Baetidae: *Baetis*) from Central Asia. Part 1 // Zootaxa. Vol.3311. No.1. P.42–60. <https://doi.org/10.11646/zootaxa.3311.1.2>
- Tiunova T.M., Semenchenko A.A. 2019. *Baetis pentaphyllus* sp. nov., a new species of mayfly (Ephemeroptera: Baetidae) from the Russian Far East // Zootaxa. Vol.4679. No.2. P.341–352. <https://doi.org/10.11646/zootaxa.4679.2.7>
- Thomas A.G.B., Gazagnes G. 1984. *Baetis cyrneus* n. sp., Epheméroptère nouveau de Corse (Baetidae) // Annales de Limnologie. Vol.20. No.3. P.199–202.
- Tshernova O.A. 1938. [Zur Kenntnis der Ephemeropteren Ost-Transkaukasien] // Trudy Azerbajdzhanskogo Filiala AN SSSR, Baku. Vol.7. No.42. P. 55–64. [In Russian].
- Uéno M. 1931. Einige neue Ephemeropteren und Plecopteren aus Mittel-Japan // Annotationes Zoologicae Japonenses. Vol.13. No.2. P. 91–104.
- Ulmer G. 1913. Ephemeren aus Java, gesammelt von Edw. Jacobson // Notes from the Leyden Museum. Bd.35. N.2. S.102–120.