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A NEW SPECIES OF THE BRISTLETAIL GENUS *PETROBIUS* LEACH, 1809 (MICROCORYPHIA: MACHILIDAE) FROM CRIMEA

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Summary. A new species *Petrobius montanus* Kaplin, **sp. n.** is described from Grand Canyon of Crimea. A key to the eight species of the genus *Petrobius* is also given.

Key words: Petrobiinae, *Petrobius*, taxonomy, new species, distribution, key, Europe.

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Резюме. Из Большого Каньона Крыма описан новый вид щетинохвосток *Petrobius montanus* Kaplin, **sp. n.** Дана определительная таблица всех видов рода *Petrobius*.

INTRODUCTION

The European genus *Petrobius* Leach, 1809 includes seven described species, that differ from each other mainly in the structure of the urocoxites VIII and genital area of males. Among them, five species are common in the Mediterranean region. Two species distributed in Northern Europe have also been introduced to North America (Verhoeff, 1910; Reilly, 1915; Wygodzinsky, 1959; Wygodzinsky & Schmidt, 1980; Paclt, 1969; Mendes, 1980, 1990, 2013; Kaplin, 1983, 2010).

This paper is based on the bristletails collected by the author and preserved into 75% alcohol. Holotype and two paratypes specimen were dissected and mounted on glass microscope slides in the Berlese fluid. Figures were made using microscope and drawing tool. The holotype and paratypes of the new species are deposited in the collection of the All-Russian Institute of Plant Protection (VIZR), Pushkin, St. Petersburg.

TAXONOMY

Order Microcoryphia Verhoeff, 1904

Family Machilidae Grassi, 1888

Subfamily Petrobiinae Kaplin, 1985

Genus *Petrobius* Leach, 1809

Type species: *Petrobius maritimus* (Leach, 1809).

COMPOSITION. The European genus *Petrobius* consists of eight species: *P. maritimus* (Leach, 1809) (Britain, Ireland, French, Canary Is.), *P. brevistylis* Carpenter, 1913 (Northern Europe), *P. adriaticus* (Verhoeff, 1910) (Italy, Croatia); *P. ponticus* Wygodzinsky, 1959 (North-Western Turkey); *P. artemisiae* Mendes, 1980 (Italy, Malta); *P. crimaeus* Kaplin, 1983 (Crimea); *P. montanus* **sp. n.** (Crimea) and *P. caucasicus* Kaplin, 2010 (Russia, Krasnodar region), of them *P. maritimus* and *P. brevistylis* were introduced to USA and Canada (Verhoeff, 1910; Reilly, 1915; Wygodzinsky, 1959; Wygodzinsky & Schmidt, 1980; Paclt, 1969; Mendes, 1980, 1990, 2013; Kaplin, 1983, 2010).

NOTES. The main distinguishing features of the species of the genus *Petrobius* includes the structure of compound eyes and ocelli, mandibulae, urocoxites VIII and the genital area of male. A key to species of the genus is given below.

Key to the species of the genus *Petrobius*

1(2) Paired ocelli are noticeably spaced from each other; distance between their inner margins about 0.21 total width of compound eyes. Urocoxites VIII of male each with distinct lobe posteromedially. Distal portion of penis elongate, pear-shaped narrowest at base; ratio length to width of this portion of penis about 2.6 …..... ***P. brevistylis*** Carpenter, 1913

2(1) Paired ocelli close together; distance between their inner margins less than 0.09 total width of compound eyes.

3(4) Distal portion of penis short; ratio of its length to width about 1.0. Urocoxites VIII of male truncate posteromedially ……..……..……..... ***P. maritimus*** (Leach, 1809)

4(3) Apical portion of penis more long; ratio of its length to width more than 2.0. Urocoxites VIII of male with slightly, moderately or significantly protruding lobes between styli.

5(8) Compound eyes dilated or rounded. Paramera slightly longer than the basal portion of penis. – Apical portion of penis long, pear-shaped, ratio of its length to width about 3.0.

6(7) Compound eyes dilated, ratio of their length to width about 0.85. Paired ocelli close together, distance between their inner margins about 0.06 total width of compound eyes. Ratio of length to width of apical palpomere of labial palps 3.1–3.4. Ratio of lengths of apical and preapical palpomeres of maxillary palps about 0.56. Urocoxites VIII of male with slightly protruding lobes between styli ……...……. ***P. ponticus*** Wygodzinsky, 1959

7(6) Compound eyes rounded, ratio of their length to width 0.92–1.05. Paired ocelli almost touching. Ratio of length to width of apical palpomere of labial palps about 2.6. Ratio of lengths of apical and preapical palpomeres of maxillary palps about 0.70. Urocoxites VIII of male with significantly protruding lobes between styli ……..…….. ……..……..... ***P. artemisiae*** Mendes, 1980

8(5) Compound eyes elongated, ratio of their length to width 1.1–1.3. Paramera shorter than the basal portion of penis. – Paired ocelli close together, distance between their inner margins about 0.07 or 0.08 total width of compound eyes. Urocoxites VIII of male with slightly or moderately protruding lobes between styli.

9(12) Paramera slightly shorter than the basal portion of penis. Ratio length to width of distal portion of penis 2.0–2.3.

10(11) Urocoxites VIII of male with moderately protruding lobes between styli …...…… ……..…… ***P. caucasicus*** Kaplin, 2010

11(10) Urocoxites VIII of male with slightly protruding lobes between styli ……..……. ……...……. ***P. adriaticus*** (Verhoeff, 1910)

12(9) Paramera noticeable or significantly shorter than basal portion of penis. Ratio length to width of distal portion of penis 2.8–3.3. – Urocoxites VIII of male with slightly protruding lobes between styli.

13(14) Paramera significantly shorter than basal portion of penis. Ratio length to width of distal portion of penis about 3.3 …..…..……..…..…..... ***P. crimaeus*** Kaplin, 1983

14(13) Paramera noticeable shorter than basal portion of penis. Ratio length to width of distal portion of penis about 2.8 ……..……. ***P. montanus*** **sp. n.**

Petrobius montanus **Kaplin, sp. n.**

http://zoobank.org/NomenclaturalActs/2CD27A81-E0A2-4780-A5C9-8F9793BE2CE6

Figs 1–11

MATERIAL. Holotype – ♂, **Russia**: Crimea, Grand Canyon of Crimea, 44°31′40″N, 34°01′00″E, 500–600 m, 07.IX 2020, leg. V. Kaplin, (VIZR) (in slides). Paratypes – 7 ♂, 2 ♀, same locality, data and collector as for holotype (VIZR) (2 ♀ in slides; 7 ♂ in 75% alcohol).

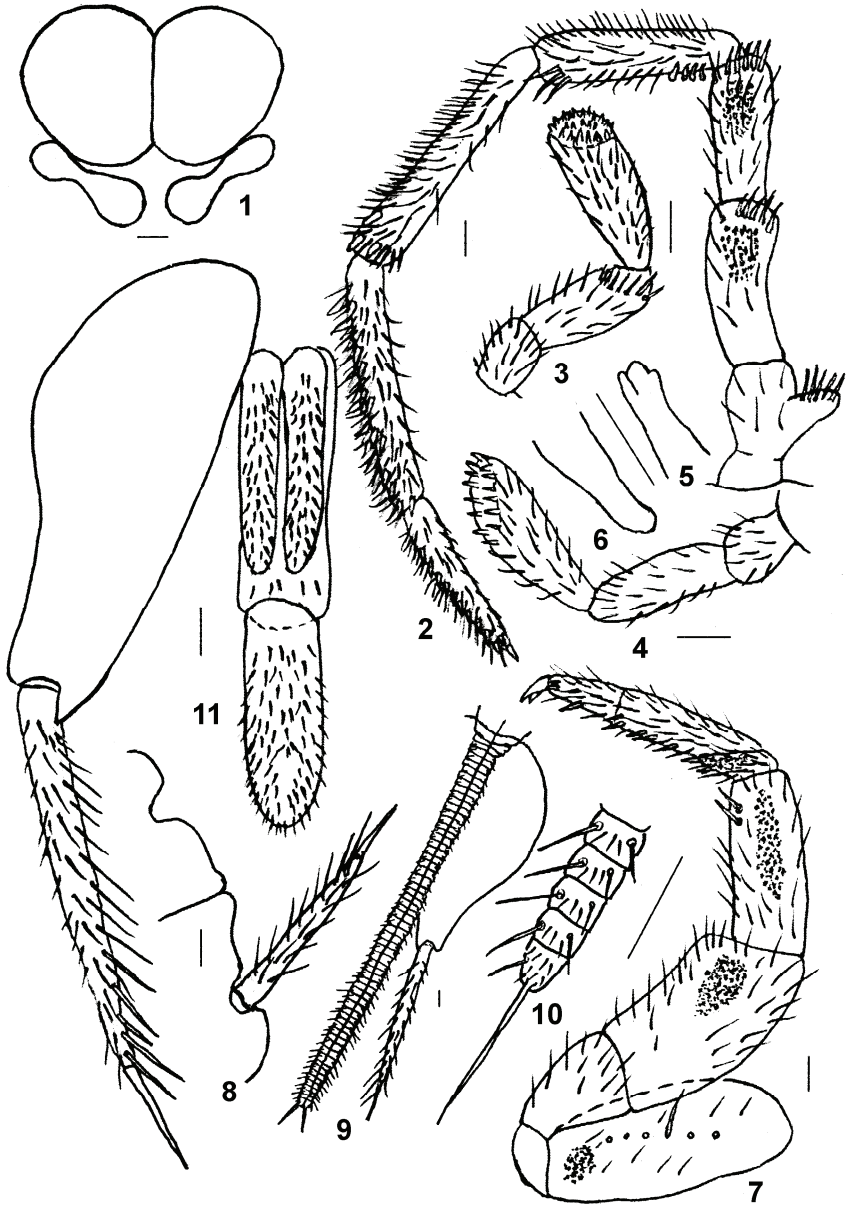
DESCRIPTION. Body length: male and female 8–11 mm. Body width: male and female 2.0–2.5 mm. Antennae length: about 10–15 mm. Cerci length: 2.9–3.5 mm. Total eyes width: 0.8–0.9 mm. Eye length: 0.46–0.53 mm. Paired ocellus width: 0.43–0.46 mm. Paired ocellus length: about 0.16 mm. Coxal styli length: about 0.5 mm in male and female. Ovipositor length: 3.2 mm.

General body color (in ethanol) whitish, or light yellow, without pigment. Antennal base, scapus, pedicellus, frons, occiput, mandibles, maxillae, hypopharynx, tarsi, tibiae, femora, 2–5th palpomeres of maxillary palps, 2nd and 3rd palpomeres of labial palps with brown-violet pigment of low or medium intensity. Tibia and first tarsomere are the most pigmented. Flagellum of antennae without scales. Scales color light brown, brown or dark brown on the upper surface of the body; light brown on the ventral side of the body. Antennae longer than body. Distal chains of flagellum divided into 12–16 annuli in male and 17–19 annuli in female. Apical annuli of distal chains with two “rosetenförmige” sensilla of A form (Notario-Muñoz *et al.* 1997). Cercus approximately 0.36–0.39 (male) or about 0.35 (female) body length, including about 16–17 articles. Apex of cerci with two well developed lateral spikes. Articles of cerci, except for apical two, with 1–4 colorless supporting macrochaetae on inner side.

Compound eyes dark with blue tint (in alcohol). Ratio of length to width of compound eye 1.14–1.19; ratio of length of contact line to length of eye 0.59–0.70 in both sexes. Paired ocelli whitish or light brown, shoe-shaped, subinferior to compound eyes. Frons slightly swollen between the paired ocelli. Distance between inner margins of ocelli about 0.08 and between their outer margins 0.92–0.95 total width of compound eyes in both sexes (Fig. 1).

Apical palpomere of maxillary palp 0.74 (male) or 0.62 (female) times as long as preceding one, ratio of lengths of 5th and 4th palpomeres 1.33 and 1.23, respectively. Dorsal surface of 7th, 6th and 5th palpomeres of maxillary palp with 12, 11 and 3 (male) or 13, 15 and 2 (female) hyaline spines, respectively (Fig. 2). Apical palpomere of labial palp triangularly oval, 2.8 (male) or 2.7 (female) times as long as wide, with about 22 and 14 sensorial cones, respectively (Figs 3, 4). Mandibles with one (female) or two (male) distal teeth (Figs 5, 6).

Fore and middle femur of male and female widened (Fig. 7). Hind tarsus longer than fore and middle tarsus 1.2 times. Ratios of length to width of femur, tibia and tarsus as shown in Table 1. Ratio of length of 3rd tarsomere of hind tarsus to its total length 0.31–0.33 in both sexes. Ventral surface of femora, tibiae and tarsi with hyaline spine-like chaetae in both sexes (Table 2). Ratio of length of coxal styli to width of middle and hind coxae about 1.32–1.34 in male, 1.48–1.55 in female.



Figs 1–11. *Petrobius montanus* Kaplin, **sp. n.**, holotype ♂ (1–3, 5, 7, 8, 11) and paratype ♀ (4, 6, 9, 10). 1 – compound eyes and paired ocelli; 2 – maxillary palpus; 3, 4 – labial palpus; 5, 6 – apex of mandible; 7 – fore leg; 8 – posterior portion of urocoxites VIII, with stylus; 9 – urocoxite IX, with anterior gonapophyses; 10 – distal part of anterior gonapophyse; 11 – urocoxite IX, with penis and paramera. Scale bars = 0.1 mm.

Table 1. Ratios of length to width of main leg segments of *Petrobius montanus* sp. n.

Segments	Sex, pair of legs					
	Male			Female		
	fore	middle	hind	fore	middle	hind
Tarsus	6.06	6.60	7.56	6.44	6.06	7.47
Tibia	3.38	2.45	2.90	2.82	2.06	2.50
Femur	1.94	2.12	2.46	1.92	1.91	2.53
Coxa	2.59	2.64	2.73	2.28	2.87	2.95

In both sexes, urocoxites I and VI–VII with 1 + 1 eversible vesicles, but urocoxites II–V with 2 + 2 eversible vesicles. Posterior angle of urosternites II–VII approximately 110–112°, VIII about 130°. Ratios of lengths of urosternites and urocoxites II–VII, on the one hand, and urostyli (without apical spine) and urocoxites II–VII, on the other hand, 0.52–0.63 and 0.56–0.65, respectively, in both sexes. Ratios of lengths of urostyli and urocoxites VIII 0.73 in male and 0.75 in female, IX 0.77 and 0.64, respectively. Ratios of lengths of apical spines and urostyli II–VIII 0.36–0.40, in both sexes. Thoracic tergites, urosternites, urocoxites I, IV–IX; urotergites I–IV and X without macrochaetae. Urocoxites II–III with 1 + 1, urotergites V–VIII with 1+1, IX with 2 + 2 sublateral macrochaetae. Urocoxites VIII in male with slightly protruding lobes between styli (Fig. 8).

Table 2. Number of hyaline spines on the legs of female *Petrobius montanus* sp. n.

Segments		Sex, pair of legs					
		Male			Male		
		fore	middle	hind	fore	middle	hind
Tarsomeres	**1st**	1-2	2-3	3	2	2-3	3-4
	2nd	5	7-8	7-8	6	6	6-7
	3rd	1	2	0	1-2	1-2	1-2
Tibia		2	2-3	4	2	5	2-3
Femur		0	1	0	0-1	1	1

Ovipositor slender, elongate, visibly surpassing apex of styli IX (Fig. 9). Anterior and posterior gonapophyses with approximately 61 and 62 divisions, respectively. About forty basal divisions of posterior gonapophyses glabrous. All divisions of anterior gonapophyses with chaetae. Apical spines of gonapophyses as long as about 4.5 apical divisions combined. Distal divisions of anterior and posterior gonapophyses with 9 and 6 chaetae, respectively (not counting sensory setae and apical spines) (Fig. 10).

Male genitalia with one pair entire paramera with numerous short bristles on abdominal segment IX (Fig. 11). Parameres noticeable shorter than the basal portion of penis. Ratio length to width of distal portion of penis about 2.8. Penis relatively long, significantly exceed level of the apex of urocoxites IX. Terminal portion of penis covered with bristles, longest in the apical part. Ratio lengths of basal and terminal portions of penis about 1.2.

HABITATS. All specimens of *Petrobius montanus* sp. n. were collected in the forest (*Carpinus* sp., *Fagus* sp., *Fraxinus excelsior*, *Quercus robur*) among the stones.

DIFFERENTIAL DIAGNOSIS. *Petrobius montanus* sp. n. with the antennal flagellum devoid of scales belongs to the subfamily Petrobiinae; with 2 + 2 eversible vesicles on urocoxites II–V, obtusangle urosternites, shoe-shaped paired ocelli, entire paramera on the IXth abdominal segment, molar area of mandible with 1 or 2 inconspicuosus teeth to the genus *Petrobius*. Among the described species *Petrobius montanus* sp. n. is most similar to *P. crimaeus*. Main morphological differences between these species are given in Table 3.

ETYMOLOGY. The new species is named after the predominant habitat type.

Table 3. Main differences between *Petrobius montanus* sp. n. and *P. crimaeus* Kaplin, 1983

Morphological characters	***P. montanus* sp. n.**	***P. crimaeus***
Length ratio of cercus and body	0.35–0.39	0.41–0.46
Color of paired ocelli	Whitish or light brown	Purple-brown
Number of annuli in distal chains of flagellum	12–19	22–25
Ratio length to width of compound eye	1.1–1.2	1.2–1.3
Number of hyaline spines on dorsal surface of 5th palpomere of maxillary palp	2–3	6
Ratios of lengths of 5th and 4th palpomeres of maxillary palps	1.23–1.33	1.40–1.55
Number of teeth in distal part of mandible	2 (male), 1 (female)	2 in male and female
Ratio length to width of apical palpomere of labial palp	2.7–2.8	2.5–2.6
Number of spines on middle and hind tibiae	2–5	4–9
Posterior angle of urosternites II–VII	110–112°	100–105°
Ratio length to width of apical portion of penis	2.9	3.4
Parameres of male	Slightly shorter than basal portion of penis	Significantly shorter than basal portion of penis

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