

A new species of silverfish of the subfamily Ctenolepismatinae (Zygentoma: Lepismatidae) from southern Kazakhstan

Новый вид щетинохвосток из подсемейства Ctenolepismatinae (Zygentoma: Lepismatidae) с юга Казахстана

V.G. Kaplin* & G.V. Shakula

В.Г. Каплин, Г.В. Шакула

Vladimir G. Kaplin , All-Russian Institute of Plant Protection, 3 Podbelskogo St., St Petersburg–Pushkin 196608, Russia.
E-mail: ctenolepisma@mail.ru

Georgiy V. Shakula , “Wild Nature” Ecological Society, 14 Taldybulak St., Jabagly Vill., Turkistan Prov. 161310, Kazakhstan.
E-mail: 2005_shakula@mail.ru

Abstract. *Ctenolepisma (Ctenolepisma) turkestanicum* sp. nov. is described from southern Kazakhstan. It is the first species of the genus *Ctenolepisma* Escherich, 1905 with 2 + 2 bristle combs on urotergite II, whereas all described species of *Ctenolepisma* have 3 + 3 bristle combs on this urotergite. The new species is most close to *C. przewalskyi* Kaplin, 1982 described from Kyrgyzstan. In addition to chaetotaxy of urotergite II, the new species differs from *C. przewalskyi* in the distribution of hypodermal pigment and the number of bristle combs on the thoracic sternites.

Резюме. *Ctenolepisma (Ctenolepisma) turkestanicum* sp. nov. описан с юга Казахстана. Это первый вид рода *Ctenolepisma* Escherich, 1905 с 2 + 2 щетинковыми гребнями на втором тергите брюшка, в то время как у всех описанных видов рода *Ctenolepisma* 3 + 3 щетинковых гребня на этом тергите. Новый вид наиболее близок к *C. przewalskyi* Kaplin, 1982, описанному из Кыргызстана. Помимо хетотаксии второго тергита брюшка, новый вид отличается от *C. przewalskyi* распределением гиподермального пигмента и количеством щетинковых гребней на грудных стернитах.

Key words: distribution, biodiversity, morphological features, chaetotaxy of urotergites, subgenera, Lepismatidae, *Ctenolepisma*, new species

Ключевые слова: распространение, биоразнообразие, морфологические особенности, хетотаксия брюшных тергитов, подроды, Lepismatidae, *Ctenolepisma*, новый вид

ZooBank Article LSID: urn:lsid:zoobank.org:pub:8DC300D2-3957-422F-BC1A-8B4550A2D0C8

Introduction

The bristletail family Lepismatidae includes six subfamilies, about 40 genera and more than 300 described species (Mendes, 1991; Smith, 2017), with the subfamily Ctenolepismatinae comprising

17 genera and about 174 species. The members of Ctenolepismatinae are characterised by the pectinate macrochaetae and the thoracic sterna as large plates attached only at their anterior margins. These plates largely cover the inner anterior margins of coxae of all legs (Smith, 2017).

*Corresponding author

About 68% of species in *Ctenolepismatinae* (119 species in two subgenera) belong to the genus *Ctenolepisma* Escherich, 1905 (Smith, 2018). In Kazakhstan, the fauna of *Ctenolepisma* is poorly studied, with only four species recorded: *C. longicaudatum* Escherich, 1905 (cosmopolitan synanthropic species), *C. ciliatum* (Dufour, 1831) (holarctic species distributed in arid zone), *C. dzhungaricum* Kaplin, 1982 and *C. sergii* Kaplin, 1982 (described and known from southeastern Kazakhstan; Kaplin, 1982). *Ctenolepisma longicaudatum* and *C. ciliatum* belong to the subgenus *Ctenolepisma*, *C. dzhungaricum* and *C. sergii*, to the subgenus *Sceletolepisma* Wygodzinsky, 1955, which was originally established to include a single species, *C. arenicola* Wygodzinsky, 1955, based on having 2 + 2 combs on the first urotergite (Wygodzinsky, 1955). Irish (1987) rediagnosed the subgenus to include all species of *Ctenolepisma* bearing medial bristle combs on the urotergites.

The aim of this article is to describe a new peculiar species of *Ctenolepisma* based on the material collected in southern Kazakhstan.

Material and methods

The bristletails were stored in 70% ethanol. The holotype and one paratype (males) were dissected and mounted in Berlese fluid on glass microscope slides. Each specimen was mounted on two slides: (1) antennae, mandibles, maxillae, maxillary and labial palps, cerci and caudal filament; (2) pro-, meso- and metanotum, urotergites, urosternites, and genital appendages. The drawings were made using a microscope and a drawing tool. The type specimens of the new species are deposited in the collection of the All-Russian Institution of Plant Protection, Pushkin, St Petersburg, Russia.

Nomenclature of sensory areas of thoracic terga follows Molero-Baltanás et al. (2010).

Taxonomy

Order **Zygentoma** Börner, 1904

Family **Lepismatidae** Latreille, 1802

Subfamily **Ctenolepismatinae** Mendes, 1991

Genus ***Ctenolepisma*** Escherich, 1905

Subgenus ***Ctenolepisma*** Escherich, 1905

Type species: *Lepisma lineatum* Fabricius, 1775

***Ctenolepisma turkestanicum* sp. nov.**

(Figs 1–21)

Holotype. Male, **Kazakhstan, Turkistan Prov.**, Turlanskiy Pass, 43°33'N 68°57'E, 949 m, under flat stones, 13.X.2020, G. Shakula leg.

Paratypes. 3 males, with same data as for holotype.

The holotype and one paratype are mounted on slides; two paratypes are kept in 70% ethanol.

Description. Male. Medium-sized silverfish. Body noticeably elongate, with thorax slightly wider than abdominal segment I.

Body length (including head): 10.1–10.8 mm. Ratio of head length to whole body length about 0.06–0.07, that of thorax to whole body about 0.32, abdomen to whole body about 0.61–0.62. Width of head 1.50–1.65 mm; width of thorax 2.25–2.50 mm; width of abdomen 2.0–2.3 mm; width of urotergite X 1.25–1.50 mm.

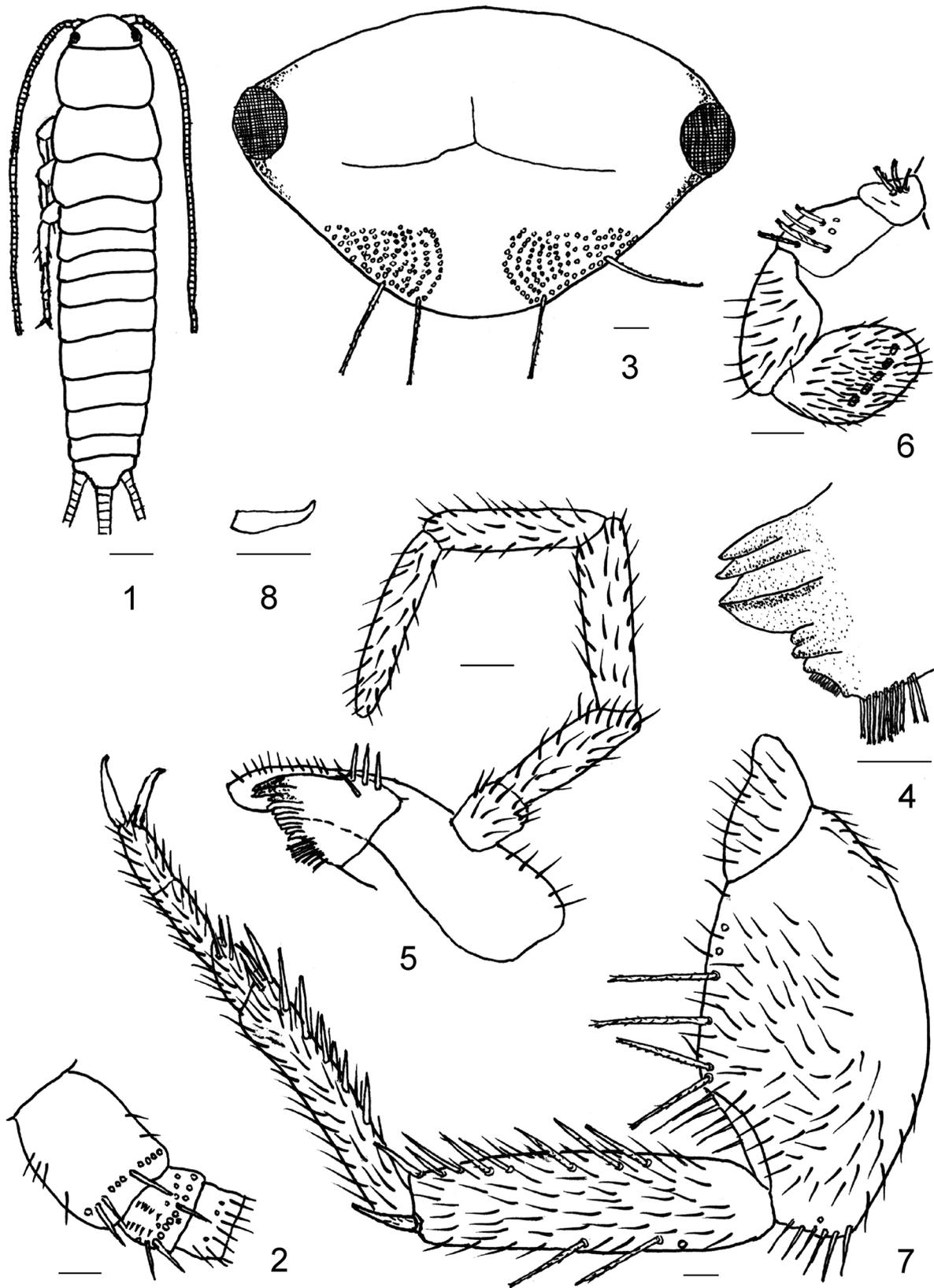
General body colour (in ethanol-preserved specimens) whitish with purple pigment being stronger on head around eyes and at bases of following appendages: antennae, paraprocts, epiproct, cerci and median dorsal appendage. Weaker pigment extending on occiput, vertex, frons, scapus and pedicellus, urotergites I–X, and male genital appendages. Scales on upper side of body brownish ginger, on lower side light brown.

Macrochaetae pectinate, bifid apically. Scales multiradiate of variable shape, rounded, oval, and suboval.

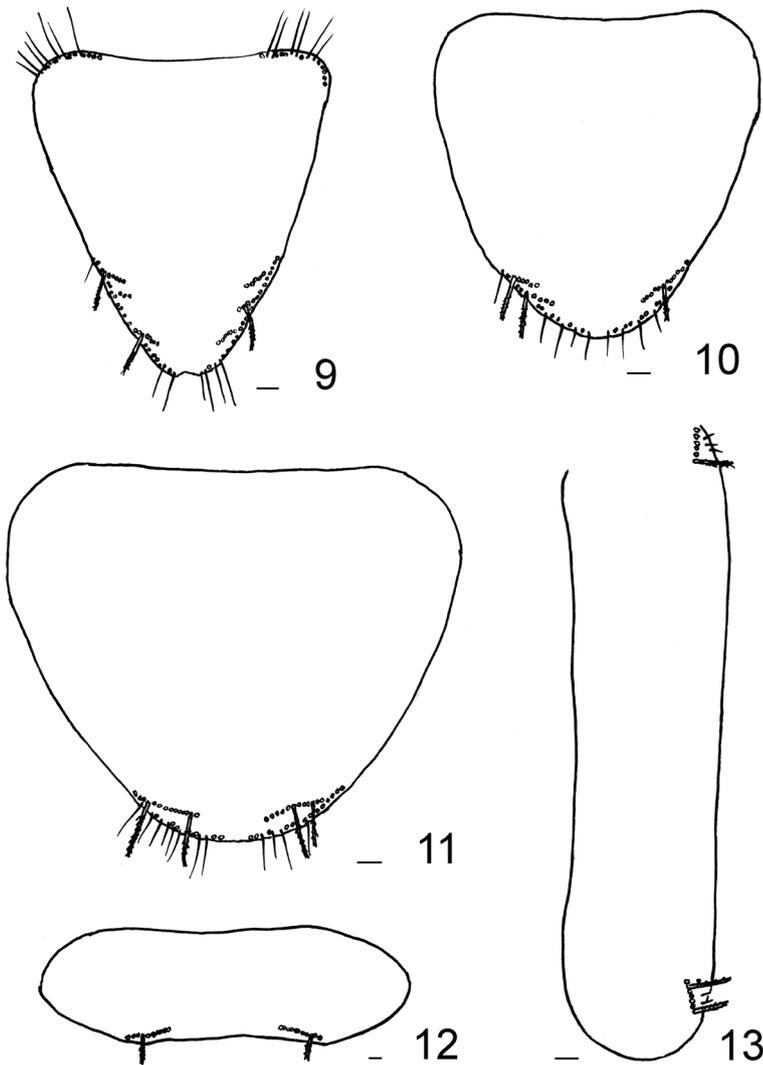
Antennae damaged in all specimens; maximum length of preserved part of antenna 8.5–9.5 mm (or 0.82–0.88 of body length); terminal filaments damaged in all specimens. Distal preserved segments of flagellum divided into six annuli. Ratio of length to width of scapus about 1.3–1.4. Ventral side of pedicellus with two longitudinal rows of short sensory chaetae (Fig. 2).

Head 2.0–2.3 times as wide as long. Eyes black, well-developed; eye diameter about 0.20–0.22 mm. Macrochaetae well-developed along anterior and lateral margins of head, relatively large, pectinate, bifid apically (Fig. 3). Frons, gena, clypeus and labrum in anterolateral and lateral parts with numerous large pectinate apically bifid macrochaetae; middle parts of frons, gena, clypeus and labrum without macrochaetae.

Mandible with well-developed molar and incisor areas, with five strong chitinised teeth: two



Figs 1–8. *Ctenolepisma turkestanicum* sp. nov. (male). 1, general view (from dorsal side); 2, scapus and pedicellus of flagellum; 3, head capsule; 4, distal part of mandible; 5, maxilla with maxillary palp; 6, labial palp; 7, hind leg (partim); 8, lateral claw of middle tarsus (1, 3, 6–8, holotype; 2, 4, 5, paratype). Scale bars: 0.1 mm.



Figs 9–13. *Ctenolepisma turkestanicum* sp. nov. (male, holotype). 9, prosternum; 10, mesosternum; 11, metasternum; 12, urosternite III; 13, urotergite I. Scale bars: 0.1 mm.

Legs fairly long, running (Fig. 7). Hind legs about 1.2 times as long as fore and middle legs. Coxae, femora and tibiae covered with scales. Ratios of total lengths: P I to P II about 1.02, P III to P II 1.19, P III to P I 1.16. Ratios of length to width in leg segments as in Table 1. Middle and hind femora and coxae most widened. Ratio of length of first tarsomere of hind tarsus to total length of hind tarsus about 0.60. Pretarsus with lateral claws relatively long, slightly curved (Fig. 8). Fore tarsus and middle tarsus 1.40 times as long as respective tibia; hind tarsus 1.25 times as long as hind tibia.

Prosternum (Fig. 9) subtriangular. Mesosternum (Fig. 10) and metasternum (Fig. 11) semioval, rounded apically. Pro-, meso- and metasternum almost reaching apex of coxae of fore, middle and hind legs, respectively. Ratio of length to width of thoracic sterna about 1.05–1.10, 0.95–1.05 and 0.75–0.90, respectively. Distal parts of sterna

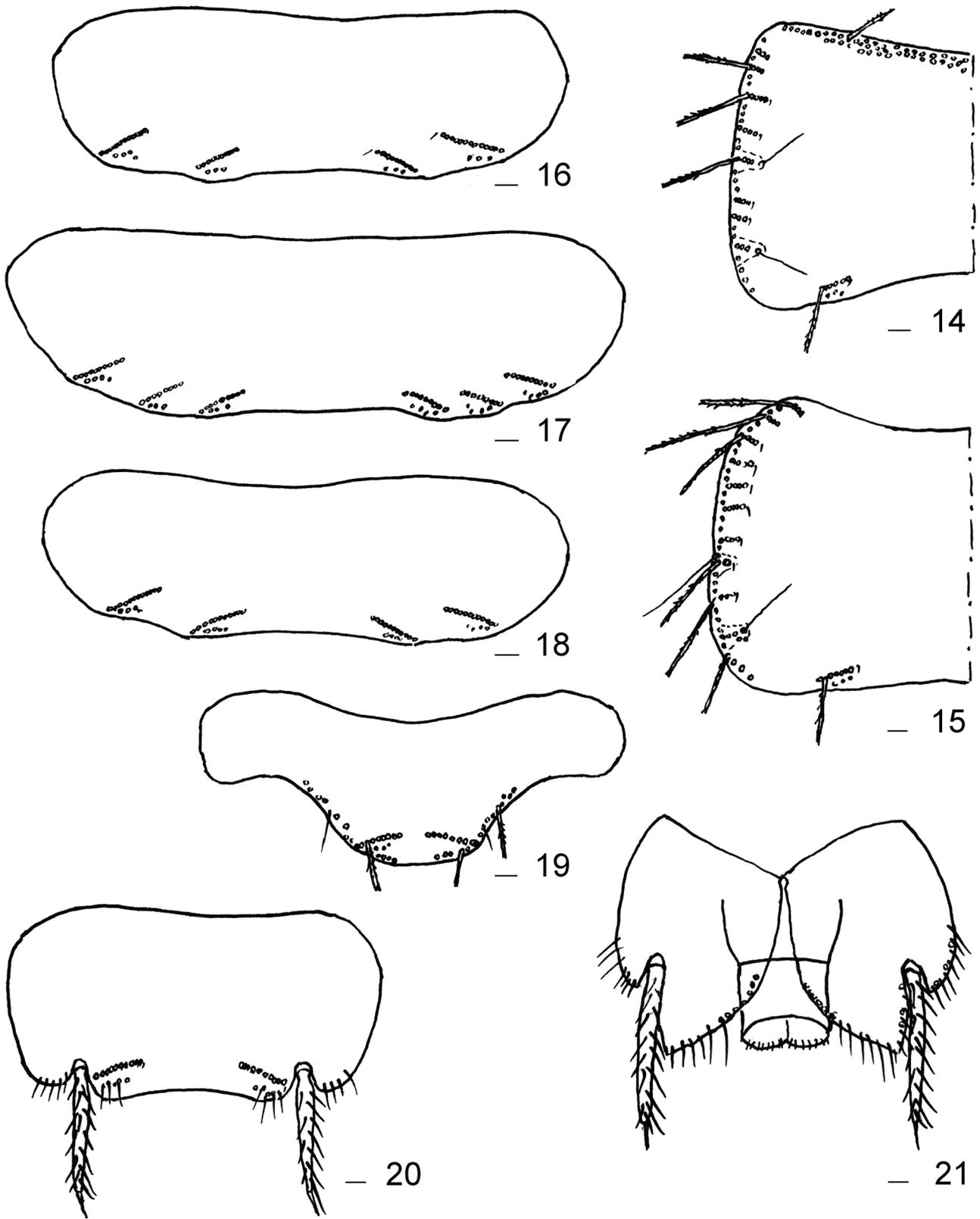
smaller and three larger ones, of which two sharp and one wide (Fig. 4); mandible with numerous relatively long setae being bifid apically; molar area of mandible with macrochaetae and with a row of shorter lateral chaetae including about 11–14 smooth, apically bifid chaetae near incisor area.

Maxilla without peculiar characters; lacinia with three strong teeth (two large and one more smaller), seven lamellate processes and a row of seven simple chaetae; galea laterally with 11–14 small and 4–5 longer chaetae. Apical segment of maxillary palp 1.01–1.16 times as long as penultimate segment (Fig. 5).

Labium broad; postmentum with a row of relatively large, smooth, apically bifid chaetae. Labial palp well-developed; apical palpomere oval, with five papillae, ratio of its length to width approximately 1.6–1.7 (Fig. 6).

with bristle combs: they located in about one-third of prosternum length, in about one-quarter of mesosternum length and in one-tenth part of metasternum length. Distal part of prosternum with 3 + 3 bristle combs, that of mesosternum with 1–2 + 1–2 combs, preapical part of metasternum with 1 + 1 combs, including 3–8, 5–11 and 11–14 large pectinate macrochaetae, respectively. All thoracic sterna with hyaline scales.

Anterior margin of pronotum with interrupted chaetal collar. Lateral margins of thoracic nota with 8–10 + 8–10 bristle combs, including 3–5, less often 2 or 6, long, pectinate, apically bifurcate macrochaetae and with 2 + 2 open trichobothrial areas with one thin, very long trichobothrium in lateral combs (Figs 14, 15). Posterior trichobothrial areas associated with posterior combs on all thoracic nota. Anterior trichobothrial areas



Figs 14–21. *Ctenolepisma turkestanicum* sp. nov. (male, holotype). 14, pronotum; 15, metanotum; 16, urotergite II; 17, urotergite III; 18, urotergite VIII; 19, urotergite X; 20, urosternite VIII; 21, urocoxites IX with penis. Scale bars: 0.1 mm.

Table 1. Ratios of length to width of main leg segments in the male (holotype) of *Ctenolepisma turkestanicum* sp. nov.

Segments	Pair of legs		
	fore	middle	hind
Tarsus	7.3	9.6	12.5
Tibia	3.0	3.3	3.8
Femur	2.2	1.8	1.9
Coxa	2.1	1.7	1.7

Table 2. Numbers of macrochaetae in abdominal bristle combs in the male (holotype) of *Ctenolepisma turkestanicum* sp. nov.

Segment	Urotergite			Urosternite
	Lateral	Sublateral	Submedial	Sublateral
I	6–9	–	–	–
II	11–12	–	9–10	–
III	8–11	7–9	9–12	10–13
IV	9–10	8–9	7–9	12–16
V	9–11	8–10	7–9	15–16
VI	8–10	8	7–9	13–16
VII	10–11	7–9	9–10	12–14
VIII	11–13	–	9–11	10–12
IX	–	–	–	–
X	8–9	–	–	–

associated with comb N-4 from posterior margin of pronotum, N-2 of mesonotum and N-3 of metanotum. Posterior margins of pro-, meso- and metanotum with 1 + 1 sublateral bristle combs including 6–7 pectinate macrochaetae.

Numbers of macrochaetae in abdominal bristle combs as in Table 2. Urosternites I and II without bristle combs. Urosternites III–VIII with 1 + 1 sublateral bristle combs of 10–16 pectinate macrochaetae (Fig. 12). Urotergite I with 1 + 1 bristle combs (Fig. 13), urotergites II and VIII with 2 + 2, urotergites III–VII with 3 + 3, urotergite X with 1 + 1 combs including 6–9, 9–13, 7–13 and 8–9 pectinate macrochaetae, respectively. Urotergite IX without bristle combs. Urotergite X trapezoidal (Figs 16–19).

Abdominal segments VIII and IX with two pairs of styli (urostyli). Stylus of segment IX 1.3 times as long as stylus of segment VIII. Ratio of lengths of coxites to styli of segment IX about

1.5–1.6. Penis typical of genus *Ctenolepisma*. Male parameres absent (Figs 20, 21).

Etymology. The species name is an adjective referring to the region of Turkestan in southern Kazakhstan, where the type specimens were collected.

Comparison. *Ctenolepisma turkestanicum* sp. nov. is the first species of the genus *Ctenolepisma* with 2 + 2 bristle combs on urotergite II. All described species of this genus have 3 + 3 bristle combs on urotergite II. The new species is most close to *C. przewalskyi* Kaplin, 1982 described from the lower belt of the Kyungei-Ala-Too Ridge in Kyrgyzstan (Kaplin, 1982). Both species are characterised by 3 + 3 bristle combs on urotergites III–VII, 1 + 1 bristle combs on urosternites III–VIII, two pairs of the urostyli, and five sensory papillae on the apical segment of labial palp. However, in addition to the number of bristle combs on urotergite II, these species differ from each other in the distribution of hypodermal pigment and the number of bristle combs on the thoracic sternites. The body of *C. przewalskyi* is strongly pigmented, vs. mostly whitish in *C. turkestanicum* sp. nov. The prosternum of the new species has 3 + 3 combs, the mesosternum, 1–2 + 1–2 combs, and the metasternum, 1 + 1 combs, while *C. przewalskyi* has 3–4 + 3–4, 2–3 + 2–3 and 2 + 2 bristle combs, respectively.

Acknowledgements

The authors are much obliged to the referees Dr Graeme Smith (Australian Museum) and Dr Rafael Molero (University of Cordoba, Spain) for valuable comments and corrections.

References

- Irish J.** 1987. Revision of the genus *Ctenolepisma* Escherich (Thysanura: Lepismatidae) in southern Africa. *Cimbebasia, Series A*, 7(11): 147–207.
- Kaplin V.G.** 1982. New data on the fauna of Thysanura of Mongolia, Kazakhstan and Middle Asia. *Nasekomye Mongolii* [Insects of Mongolia], 8: 16–61. Leningrad: Nauka. (In Russian).
- Mendes L.F.** 1991. 1.1. On the phylogeny of the genera of Lepismatidae (Insecta: Zygentoma). In: **Veeresh G.K., Rajagopal D. & Viraktamath C.A.** (Eds). *Advances in management and conservation of soil fauna*: 3–13. New Delhi, Bombay & Calcutta: Oxford & IBH Publishing Co.

- Molero-Baltanás R., Gaju-Ricart M., Bach de Roca C. & Mendes L.F.** 2010. On *Ctenolepisma ciliata* and a new related species, *Ctenolepisma armeniaca* n. sp. (Zygentoma, Lepismatidae). *Deutsche entomologische Zeitschrift*, **57**(2): 243–252. <https://doi.org/10.1002/mmnd.201000021>
- Smith G.B.** 2017. The Australian silverfish fauna (Order Zygentoma) – ancient, abundant, diverse and largely ignored. *General and applied Entomology*, **45**: 9–58.
- Smith G.B.** 2018. Checklist of the World Zygentoma fauna. In: **Smith G.B.** The contribution of silverfish (Insecta: Zygentoma) to Australian invertebrate biodiversity and endemism: 65–75. Submitted in fulfilment of the requirement of the degree of Doctor of Philosophy (by publications). Ballarat: Federation University Australia.
- Wygodzinsky P.** 1955. Thysanura. In: **Hanström B., Brink P. & Rudebeck G.** (Eds). *South African animal life*, **2**: 83–190. Uppsala: Almqvist & Wiksells Boktryckeri AB.

Received 17 January 2022 / Accepted 11 June 2022. Editorial responsibility: A.A. Przhiboro