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On *Starengovia* Snegovaya, a genus of Asian nemastomatines (Arachnida: Opiliones: Nemastomatidae)

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Abstract: Two species of the genus *Starengovia* Snegovaya, 2010 from Kyrgyzstan and Pakistan are characterized; *S. kirgizica* Snegovaya, 2010 is redescribed and *S. ivanloebli* proposed as a new species. They belong to the easternmost representatives of the subfamily Nemastomatinae. Both species are separated by some 650 km in north to south direction; the Pakistan record extends nemastomatine distribution to the northwest of the Himalayas. *Mediostoma pamiricum* Staręga, 1986 probably belongs to *Starengovia* as well. Within Nemastomatinae *Starengovia* displays plesiomorphic characters (extremely short glans of penis, armed with inconspicuous robust spicules) and apomorphic ones (long, distinctly inflated base of penis; large lateral foliate wing-like structures on truncus penis). The foliate-wing character is unique among Nemastomatidae. *Starengovia* may represent a relict line in the early evolution of nemastomatine harvestmen.

Keywords: Relicts - taxonomy - new species - Kyrgyzstan - Tadjikistan - Uzbekistan - Pakistan - Himalayas.

INTRODUCTION

The subfamily Nemastomatinae of the family Nemastomatidae is an entirely Palaearctic group of small to minute, mainly soil-dwelling harvestmen. Their core distribution lies in western, central and southeastern Europe and extends to the Caucasus where a genera- and species-rich fauna occurs. At the eastern edge of the range, in Kyrgyzstan and the Tadjik Republic (Pamirs), currently only one species in each country is known. No nemastomatines from areas east of the Urals (Farzalieva & Esyunin, 1999) bordering western Siberia and eastern Kyrgyzstan (Snegovaya, 2010) and the Tadjik Pamirs (Staręga, 1986) were hitherto known. Surprisingly, the discovery of a single minute species in a genus of its own from the southwestern Chinese province of Yunnan extended nemastomatine distribution for some 3000 km to the southeast (Martens, 2016). The aim of this paper is to better characterize the genus *Starengovia* within the Nemastomatinae and to describe a new species from the Pakistani northwestern Himalayas.

MATERIAL AND METHODS

Original line drawings were produced using a camera lucida attached to a Carl Zeiss research microscope. Measurements were taken by means of a micrometer disc attached to a Leitz stereomicroscope. Measurements of the penis were taken from the original drawings. The automontage photographs were produced with a Leica Z6 APO A.

Abbreviations for morphological terms: Apo apophysis, Cx coxa, do dorsal, Fe femur, la lateral, Mt metatarsus, Op gen Operculum genitale, Pt patella, Ta tarsus, Ti tibia, Tu oc Tuber oculorum, ocularium, Tr trochanter, ve ventral. All measurements are given in mm.

Museum acronyms:

CJM	Working collection of J. Martens, Mainz, Germany
MHNG	Muséum d'histoire naturelle de Genève, Switzerland
SMF	Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt am Main, Germany
ZMMU	Zoological Museum of the Moscow State University, Moscow, Russia

TAXONOMIC PART

Family Nemastomatidae
Genus *Starengovia* Snegovaya, 2010

Type species: *Starengovia kirgizica* Snegovaya, 2010: 351 (by monotypy).

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Remarks: A genus of Nemastomatidae in the subfamily Nemastomatinae, presently comprising two species. Gender of genus name is female.

Emended diagnosis: Small species (up to 1.7 mm body length, females being larger than males), dorsal scutum with lines of anvil-shaped tubercles along margins of all scutal areas. Pairs of marked para-median tubercles on opisthosomal areas of dorsal scutum. Apophysis on basal cheliceral article of male well-marked but low, with a distad-directed hook, discharge area for secretion in a bowl-like excavation on medial side of apophysis. Its inner wall perforated by numerous minute pores, apparently the extrusion area for cheliceral gland secretion.
Genital morphology of males: Characterized by rather unspecialized truncus penis, moderately slender, not markedly inflated; muscle-containing inflated base of penis large, rather compact, deeply incised medially, occupying about one fourth to one third of truncus length, truncus in straight continuation of inflated base. Glans inconspicuous, small, short, not well differentiated from truncus; armament of glans simple, with few stiff spicules in a dorsally and ventrally symmetrical arrangement, stylus short, straight to slightly curved.

Distribution: Hitherto only two males of one species were known from Kyrgyzstan, a second species is here described from Pakistan. Staręga (1986) provisionally named a single female from the Tadjik Republic as "*Mediostoma*" *pamiricum* Staręga, 1986. The locality of this specimen is about half way between and approximately 360 km from *Starengovia* records in Kyrgyzstan and in Pakistan and thus this female may also belong to *Starengovia*. This assumption is backed by characters of external morphology (Fig. 6B; see Discussion).

Name: It refers to Wojciech Krzysztof Staręga (1939-2015), a distinguished Polish arachnologist who worked on systematics and taxonomy of European, Asian and African harvestmen (Żabka, 2015).

Relationships: Rows of anvil-like tubercles forming lines and encircling the dorsal scutum magnum or parts of it and all or some of the dorsal scutal areas (probably equivalents to "somites") are present in several nemastomatine genera and are documented for *Mitostoma* Roewer, 1951, *Carinostoma* Kratochvíl, 1958 (Martens, 1978a) and *Acromitostoma* Roewer, 1951 (Rambla, 1983). These structures are excessively developed in all New World ortholasmatines. According to the (still incomplete) molecular-based results of Schönhofer & Martens (2012), these dorsal ornaments developed independently in at least two different lineages. Two of the relevant genera analyzed, namely *Carinostoma* and *Mitostoma,* are placed on different branches of the molecular-based tree and are not closely related.
Alternatively, this dorsal armament may have been lost at various stages of nemastomatine evolution. This assumption is backed by the fact that nearly all ortholasmatine genera and species exhibit rich and elaborate scutal ornamentations. It is reduced in the few known Asian species (Shear & Gruber, 1983; Shear, 2010; Zhang & Zhang, 2013). Thus, lines of anvil-shaped tubercles may represent a plesiomorphic character within the Nemastomatidae, an element of the nemastomatid "Bauplan". In addition, equally shaped thorns turn up as coxal-rim denticles in most species of Nemastomatidae. If plesiomorphic, this character would not be useful to infer phylogenetic relationships.

Starengovia kirgizica Snegovaya, 2010

Figs 1-5, 7-17, 20-26

Starengovia kirgizica Snegovaya, 2010: 352 (types not examined). – Schönhofer & Martens, 2012: 410 (discussion of phylogenetic placement, molecular-based phylogenetic tree). – Martens, 2016: 449 (discussion of phylogenetic placement). – Schönhofer, 2013: 47 (species mentioned).

Material examined: CJM 7649; 2 males; Kyrgyzstan, Fergansky Mountain Ridge, Babush Ata Mountains, above Arslanbob, at and near Yarodar Research Station, *Juglans regia* woodland, path to ravine, 41°19'N 72°58'E, 1400 m; H. Read leg. 17.5.1993. – CJM 6576; 4 males, 8 females; same locality, 1440-1500 m; S. Dashdamirov leg. 8.5.1990. – CJM 7650; 15 males, 14 females; same locality; W. Schawaller & J. Martens leg. 16.-18.5.1993. – CJM 7651; 6 males, 4 females; SMF; 2 males, 2 females; same locality; W. Schawaller & J. Martens leg. 15.5.1993. – ZMMU;

Key to the currently known *Starengovia* species

Distributed in Kyrgyzstan (one record also in Uzbekistan), larger species (male 1.5-1.75 mm, female 1.6-2.2 mm body length), para-median tubercles of dorsal scutum conical, relatively high (Figs 1, 3, 5), sometimes present on first free opisthosomal tergite (Fig. 5); penis with alae of wings, their tips bent to ventral side (Figs 20-24) ..... *S. kirgizica*

Distributed in northwestern Pakistan, smaller species (male 1.3-1.5 mm, female 1.3-1.65 mm body length), para-median tubercles of dorsal scutum peg-like, low, slender (Figs 6, 27, 29), not present on first free opisthosomal tergite; penis with alae of wings straight, not bent to ventral side (Figs 38-41)..... *S. ivanloebli* sp. n.

Figs 1-4. *Starengovia kirgizica*. (1) Body of male in dorsal view. (2) Same in ventral view. (3) Body of female in dorsal view. (4) Same in ventral view. Scale: 0.5 mm.

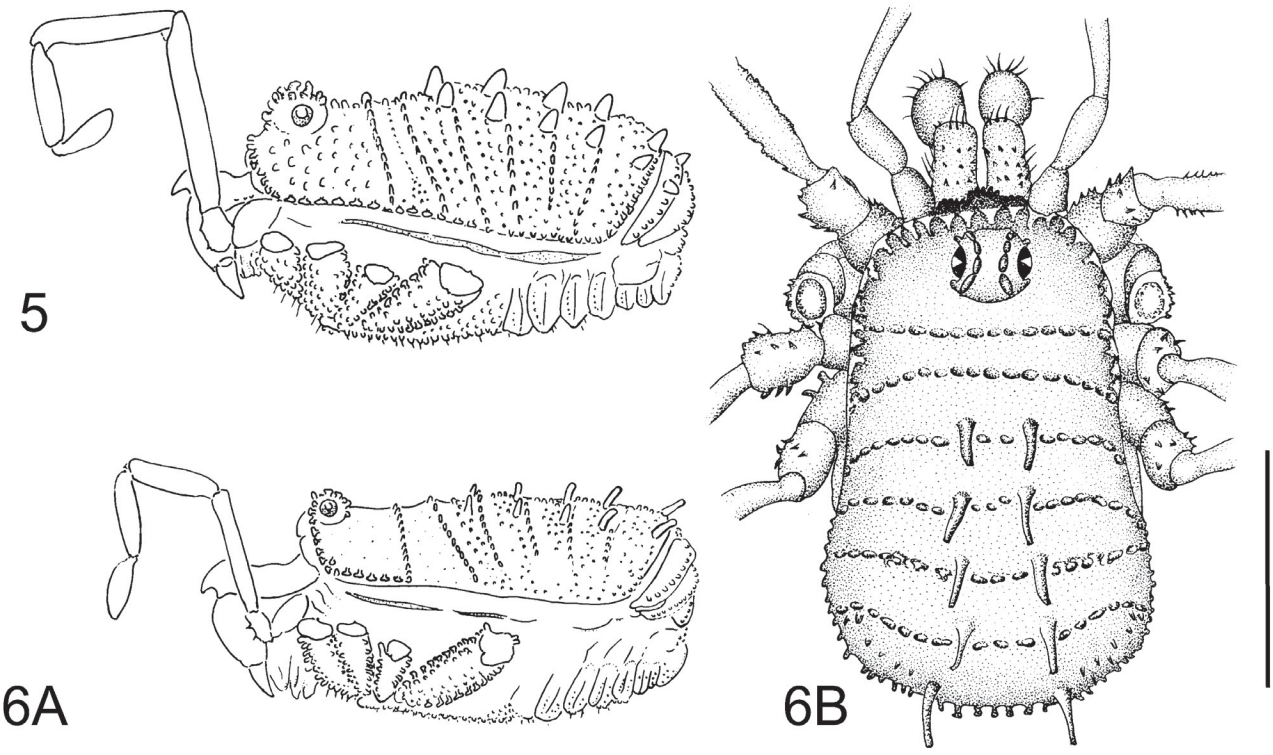
1 female; Kyrgyzstan, Chatkal Mt. Ridge, Sary Chelek Reserve, Suk-Bulak valley, litter, K. Mikhajlov leg. 7.7.1983. – CJM 7652; 1 male; Kyrgyzstan, Sary Chelek Nature Reserve, Tumanyak valley, open *Juglans regia* woodland, under stones and logs, 41°51'N 71°57'E, 1500 m; H. Read leg. 29.5.1993. – ZMMU; 2 females; same locality; K. Mikhajlov leg. 12.7.1983. – CJM 7653; 1 male, 1 female; same locality: Kodea Ata river valley, *Juglans*, *Malus*, *Picea*, under logs and stones, 71°57'E 41°51'N, 1500-1800 m; H. Read leg. 29.5.1993. – CJM 7654; 2 males, 5 females; MHNG; 5 males, 5 females; W. Schawaller & J. Martens leg. 29./30.5.1993. – ZMMU; 3 males, 3 females; same locality; W. Schawaller & J. Martens leg. 28.5.1993. – CJM 7655; 8 males, 3 females; same locality; W. Schawaller & J. Martens leg. 28.5.1993. – ZMMU; 1 male; same locality; D. Milko leg. 28.-31.5.1993. – ZMMU; 2 males, 8 females; same locality; S.I. Golovatch leg. 28.-31.5.1993. – ZMMU; 1 male, 1 female, same locality, Arkit, *Juglans regia* and *Acer turkestanica,* 1300 m; A.B. Ryvkin leg 3.7.1983. – ZMMU; 1 male, 1 female, same locality, Kil'tesay stream, *Juglans regia,* 1300 m; A.B. Ryvkin leg. 4.7.1983. – ZMMU; 1 female, same locality, Karatungun canyon, *Picea schrenkiana* stands, 1400 m; A.B. Ryvkin leg. 10.7.1983. – CJM 7660; 2 males, 3 females, same locality, Kil'tesay canyon, *Juglans regia* with Abies semenovi forest, 1300 m; A.B. Ryvkin leg. 17.9.1983. – CJM 7656; 1 male, 1 female; Kyrgyzstan, N. Sovetskoye S. Alash Mt. Ridge, *Juglans regia* and *Crataegus* woodland with grassy glades, in litter, 41°11'N 72°39'E, 1200-1550 m; H. Read leg. 26.5.1993. – CJM 7657; 2 males; same locality; W. Schawaller & J. Martens leg. 25.5.1993. – ZMMU; 1 male; same locality; S.I. Golovatch leg. 26.5.1993. – CJM 7658; 1 male; Uzbekistan, Uckargan; J. Martens leg. 27.5.1993.

Extended diagnosis: Characterized by genital morphology (form of wings of truncus penis, by size of inflated basal region of truncus), size (larger body than in *S. ivanloebli* sp. n.) and by armament of dorsal scutum and free opisthosomal tergites (large, conical para-median tubercles on opisthosomal areas I-V and on first free opisthosomal tergite in few specimens only).

Name: Named after the country in which the type specimens were collected.

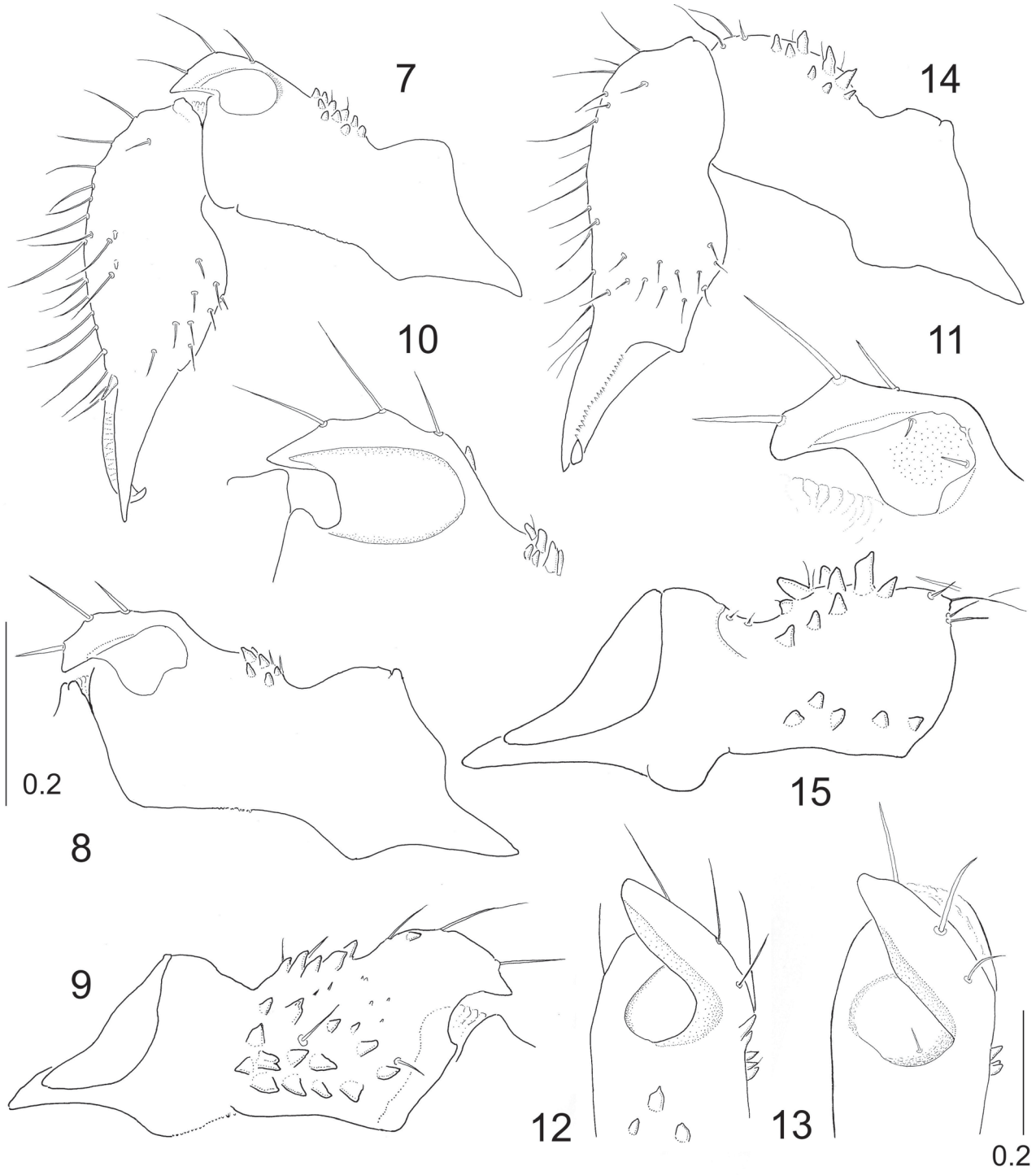
Description (male)

Body, dorsal side (Figs 1-5): Scutum uniformly light to dark brown (depending on time past final moult), without any golden or silver markings. Anterior and lateral margins of prosomal area I of dorsal scutum with a continuous line of closely spaced anvil-shaped tubercles of different sizes, largest on front of prosoma. Additional lines of anvil-shapes tubercles across the



Figs 5-6B. Body of male in lateral view (5-6A) and in dorsal view (6B). (5) *Starengovia kirgizica*. (6A) *S. ivanloebli* sp. n. (6B) *Mediostoma pamiricum* Staręga, 1986; reproduced from Staręga (1986). Scale: 1 mm.

scutum: First (anteriormost) straight, second bent forwards, third and fourth straight, fifth and sixth line bent backwards. Tubercles of fourth, fifth and sixth line smaller and more or less interrupted (only few low tubercles present) in median part only, nearly lacking laterally. Opisthosomal areas I-V each with a pair of quite large conical para-median tubercles; these tubercles posteriorly slightly further apart from each other than anteriorly. First free opisthosomal tergite in few specimens also carrying a pair of such tubercles. In addition, prosomal and opisthosomal areas with scattered low rounded tubercles.



Figs 7-15. *Starengovia kirgizica*. 7-13. Right chelicera of male. (7) Entire chelicera in prolateral view. (8) Basal article in prolateral view. (9) Same in retrolateral view. (10-11) Cheliceral apophysis in prolateral view. (12-13) Same in dorsal view. 14-15. Right chelicera of female. (14) Entire chelicera in prolateral view. (15) Basal article in retrolateral view. Scales: 0.2 mm (Figs 7-9, 14-15; Figs 10-13).

Tu oc relativey large, low, touching front margin of dorsal scutum, covered by few strong anvil-shaped tubercles.

Body, ventral side (Figs 2, 4-5): Cx I-IV pro- and retrolaterally with a line of strong anvil-shaped tubercles, rear and front line of consecutive Cx touching each other. Cx surface coarse, covered with relatively large and closely spaced tubercles. Op gen covered by much fewer, large, low, rounded tubercles; free sternites with few tubercles at rear margins; all light brown.

Legs: Quite different in some populations. Relatively short (but variation considerable; see below: Dimensions), male Fe I and III stout and markedly spindle-shaped, in females less pronounced (Sari Chelek, Alash), or Fe I and III slender, not spindle-shaped and whole leg considerably longer (Yarodar).

In all populations Tr with several large rounded tubercles; Fe, Pt and Ti of legs unarmed except for few minute light hairs on Mt, and Ta with few scattered long hairs. Coarse surface especially on Fe to Ti. No "comb-teeth" (Kammzähnchen) as illustrated by Gruber (1976) for *Mediostoma*. Variable numbers of pseudo-articulations on Fe of legs II-IV.

Pedipalp (Figs 16-17): Slender and relatively long (in terms of *Starengovia* morphology), no article noticeably inflated; all articles except Tr bearing clavate setae, these most conspicuous on Pt, Ti and Ta; distal end of male Ti slightly curved downwards. No article with special armament in males and females.

Chelicera of male (Figs 7-15): Rather stout; basal article with strong pointed tubercles laterally and dorsally, a bulky frontad-directed Apo distinctly surpassing front margin of proximal article; Apo with a broad basis, approximately as long as high (in lateral view), upper side smoothly rounded and dorso-distally projecting into a pointed hook. In dorsal view Apo inclined anteriorly, towards longitudinal axis of article. Prolaterally Apo excavated nearly over its total length, forming a bowl-like excavation or hole. 2nd cheliceral article moderately inflated, with few long scattered bristles mostly on frontal surface.

Male genital morphology (Figs 20-26): Truncus penis (Figs 20-22) moderately slender; basis forming a large inflated part (occupying slightly less than one third of whole penis length) well differentiated from rest of truncus; inflated part compact and deeply split medially, completely filled by two penial muscles, their tendons spanning hole truncus length up to glans. Truncus parallel-sided (in do/ve view), slightly enlarged at level of wings, beyond wings narrowing toward glans; in lateral view narrowest above inflated basal part, from there slightly widening toward wings. One thin, fine hyaline and triangular wing on each lateral side in distal part of truncus, totally flattened, lateral corners slightly curved to ventral side (Figs 20-24).

Glans (Figs 25-26) only inconspicuously oultined, short, starting where two tendons are attached to inner truncus wall; stylus short, a continuation of the glans, tapering to distal asymmetrical opening of seminal duct, slightly curved (in lateral view). Short, stiff and unspecialized spinules forming armament of glans, their arrangement symmetrical in ventral view.

Female (Figs 14-15): Characters largely as in male but lacking the dorso-distal cheliceral Apo.

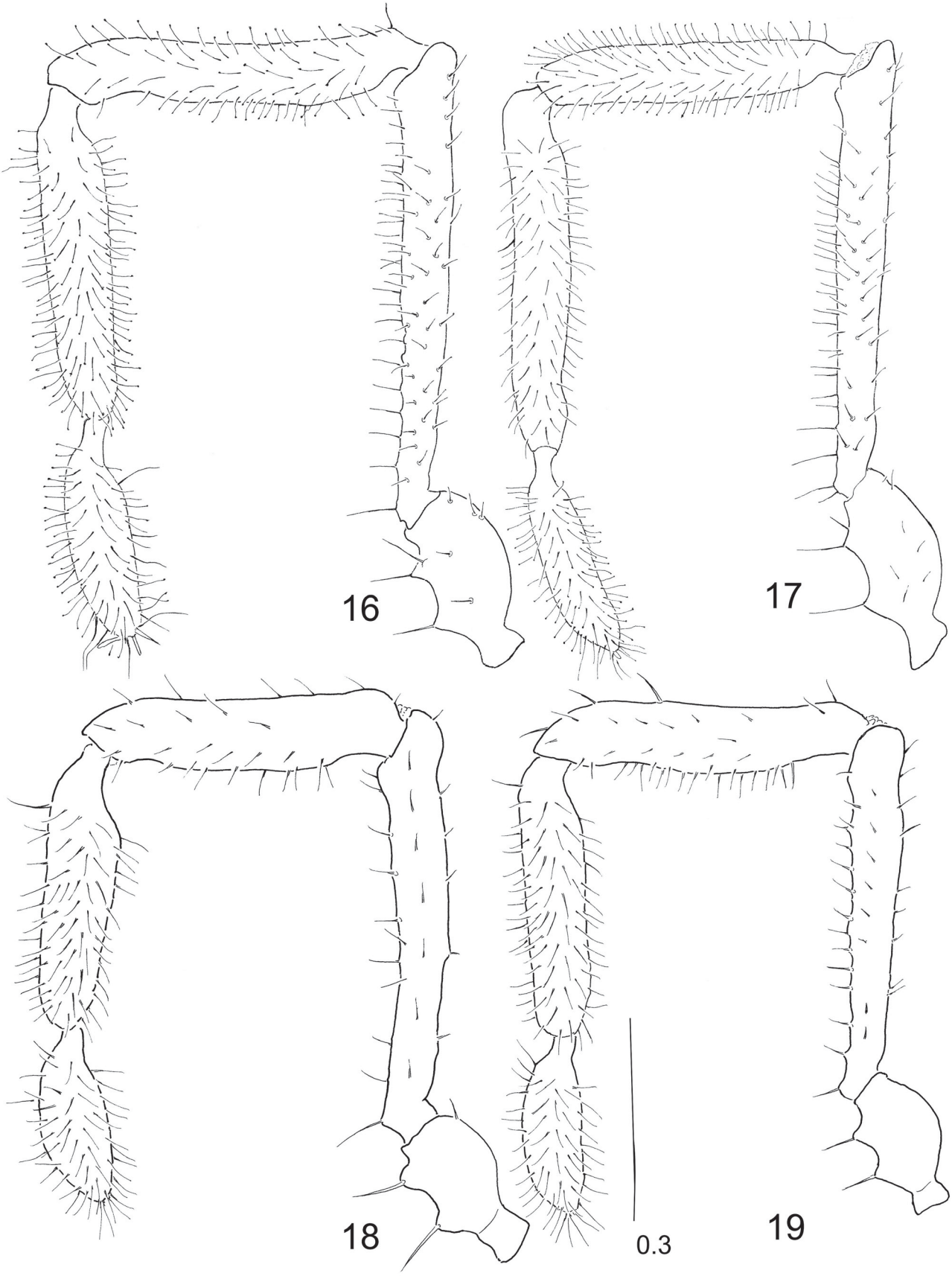
Measurements: Body length: Sary-Chelek and Alash: males: 1.5-1.75 (n=10), Uckargan male: 1.6. Females: 1.6- 2.2 (n=10). Leg II length, male, female in parentheses (two males from Yarodar and Uckargan, two females from Yarodar and Sari Chelek): Fe 1.1/1.5 (1.4/2.0) Pt 0.35/0.4 (0.5/0.5) Ti 0.75/1.2 (1.2/1.5) Mt 1.4/2.05 (1.75/2.4), Ta 1.1/1.6 (1.6/1.7). Pedipalp length (Sari Chelek): Fe 0.7 (0.9), Pt 0.6 (0.7), Ti 0.5 (0.6), Ta 0.3 (0.4). Penis length: 1.1.

Variation: The para-median tubercles of the dorsal scutum differ in size and shape in different populations. They are low and stout in individuals of short-legged populations (Sari Chelek, Alash), longer (up to twice as long) in long-legged populations (Yarodar). There is also variation within populations though to a generally much smaller extent. In addition, the dorsal scutum has either irregularly arranged anvil-shaped tubercles or these are partly arranged in transversal lines.

Distribution: The species is known from three localities in Kyrgyzstan and from one in Uzbekistan. The Kyrgyz specimens were collected at the Sary Chelek Biosphere Reservation about 60 km northwest of Tash-Kumyr, from the Fergansky Mountain Ridge in the Babush Ata Mountains above Arslanbob and from north of Sovetskoye in the Alash Mt. Ridge. The animals were collected in various habitats, mostly in open walnut (*Juglans regia*) forests, in riverine bushy stands, mostly under stones and old wood, and, mainly in the Sary Chelek area, also in various coniferous forest types. These opilionids were mostly sifted from soil litter and turned out to be quite common in all three areas. They were collected by different people independently from the same localities. Altitudinal records range from 1200 to 1800 m.

Type locality: Kyrgyzstan, Alash Mountain Ridge, Alash river valley, near Alash, 1550 m.

Remarks: *Starengvoa kirgizica* was originally described on the basis of two males. A more detailed description is presented here. Judging from the rich material available, *S. kirgizica* has considerable variation in the shape of the dorsal scutal armament and in the length of legs, which is pronounced in leg II and IV. This leg variation is not correlated with body size, which is homogeneous throughout all populations. Also genital and cheliceral morphology of males does not vary noticeably. A detailed genetic investigation should check if more than one species is involved.



Figs 16-19. Pedipalps in prolateral view. (16-17) *Starengovia kirgizica*. (18-19) *S. ivanloebli* sp. n. (16, 18) Male. (17-19) Female. Scale: 0.3 mm.

***Starengovia ivanloebli* sp. n.**
Figs 6A, 18-19, 27-43

Holotype: MHNG; male; Pakistan, Swat District, above Utrot, 35°30'N 72°28'E, 2500 m; C. Besuchet and I. Löbl leg. 13.5.1983.

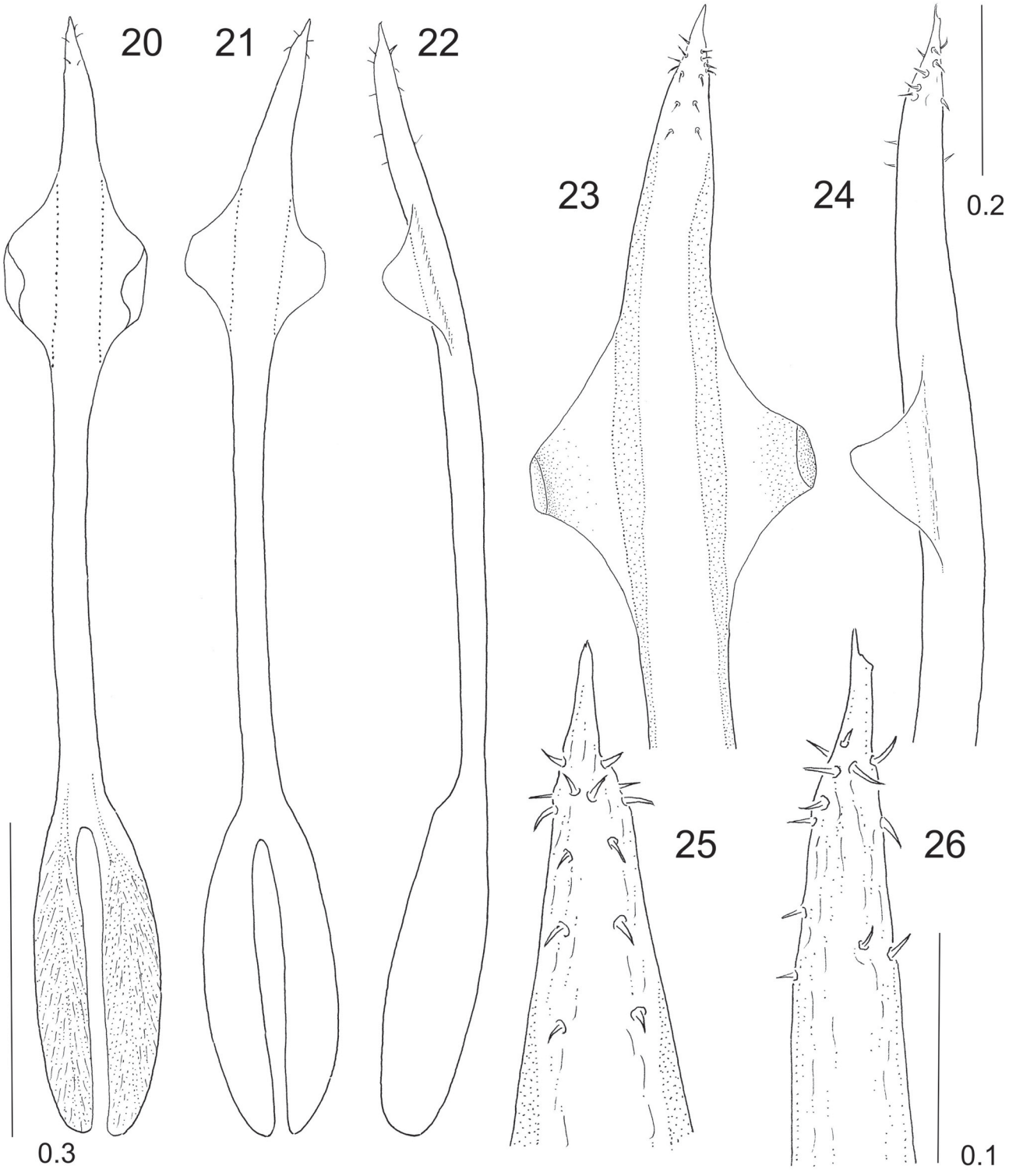
Paratypes: MHNG; 1 male, 2 females; same locality as for holotype. – MHNG; 4 males, 17 females; Swat, Malam Jabba, 34°48'N 72°35'E, 2300 m; 9.5.1983. – MHNG; 1 male, 1 female; Swat, above Miandam, 35°03'N 72°34'E, 2300 m; 10.5.1983. – MHNG; 1 male; Swat, above Utrot, 35°30'N 72°28'E, 2500-2600 m; 14.5.1983. – MHNG; 3 males, 11 females, 1 juvenile; Swat, valley of Ushu, ascent to Kalam, 35°27'N 72°34'E, 2300 m; 15.5.1983. – MHNG; 1 male, 5 females; SMF; 2 males, 2 females; Swat, above Miandam, 2400-2500 m; 17.5.1983. – MHNG; 1 male; Swat, Malam Jabba, 2500-2600 m; 18.5.1983. – MHNG; 1 male; Chitral, Lawarai Pass, 35°19'N 71°49'E, 2600 m; 23.5.1983. – MHNG; 3 males; CJM 7659; 3 males, 1 female; Hazara, above Naran, 34°54'N 73°39'E, 2600 m; 1.6.1983. All specimens leg C. Besuchet and I. Löbl.

Diagnosis: Characterized by genital morphology (form of alae and of inflated basal part of truncus), size (species smaller than *S. kirgizica*) and armament of dorsal scutum (para-median tubercles peg-like, low and slender, not present on first free opisthosomal tergite).

Name: The name is given in honour of Ivan Löbl who during numerous expeditions collected large numbers of soil arthropods, especially in the Himalayas and other parts of Asia. His contributions to entomology are striking.

Description (male)
Body, dorsal side (Figs 6A, 27-30): Scutum uniformly light brown to dark brown (depending on time since final moult), without any golden or silver markings. Anterior and lateral margins of prosomal area I of dorsal scutum with a continuous line of closely spaced anvil-shaped tubercles of different sizes, largest on front of prosoma. Additional lines of anvil-shaped tubercles across the scutum: First (anteriormost) in male more or less straight (in female straight), second line bent forwards, third line mostly straight but slightly bent backwards laterally, fourth straight, fifth and sixth line slightly bent backwards. Tubercles of fourth, fifth and sixth line smaller and more or less interrupted (only few low tubercles present) in median part only, nearly lacking laterally.
Median part of opisthosomal areas I-V with two slender and low, peg-like para-median tubercles slightly inflated distally and rounded at tip; distance between para-median tubercles slightly increasing posteriorly, all opisthosomal areas with several irregularly arranged low tubercles, very few on opisthosomal area I and on first free opithosomal tergite, absent on prosomal scutal area I around Tu oc. First free opisthosomal tergite without enlarged para-median tubercles.
Tu oc relatively small, low, touching front margin of scutum, densely covered with 10-12 anvil-shaped tubercles.
Body,ventral side (Figs 28, 30)*:* Cx I-IV pro- and retro-laterally with a line of strong anvil-shaped tubercles, rear and front line of consecutive Cx touching each other. Op gen covered with rather large low, rounded, irregularly arranged tubercles; free sternites with few tubercles at margins; all light brown.
Legs: Rather short and slender (in terms of nemastomatid morphology); Cx with several large tubercles; Fe, Pt and Ti of legs I, III and IV slightly inflated (less so in female), Fe, Pt and Ti of leg I unarmed except for few minute light hairs, less so on Mt and Ta, there few scattered long hairs. Surface rough, no denticulation and no "comb-teeth" (Kammzähnchen) as figured by Gruber (1976) for *Mediostoma*. Various numbers of pseudo-articulations on femora of legs II-IV.
Pedipalp (Figs 18-19): Robust and short (in comparison with other nemastomatids), shorter than in *S. kirgizica*, male Ti slightly inflated proximally; all articles except Tr bearing clavate setae, most conspicuous on Pt, Ti and Ta (not indicated in Figs 18-19). In male and female no article with special armament.
Chelicera (Figs 31-37): Rather stout; basal article with a bulky frontad-directed Apo distinctly surpassing front margin of article; Apo with a broad basis, approximately as long as high (in lateral view), upper side smoothly rounded and dorso-distally projecting into pointed hook. In dorsal view Apo markedly inclined towards midline. Apo medially excavated for nearly its total length, forming a bowl-like excavation or hole. 2nd cheliceral article moderately inflated, with few long scattered bristles, situated mainly frontally.
Male genital morphology (Figs 38-43): Truncus penis (Figs 38-39) moderately slender; basis forming a large inflated part (occupying about one third of whole penis length) well differentiated from rest of truncus; inflated part compact, deeply incised in the middle and completely filled by penial muscles, their tendons spanning hole truncus length up to glans. Truncus narrowest above inflated part (in do/ve view), slightly widening toward lateral wings, beyond wings successively tapering to glans. One thin, fine and hyaline wing (Figs 38-41) on each lateral side of distal part of truncus, totally flattened, rectangular, abruptly and widely truncate, not pointed.
Glans (Figs 42-43) only inconspicuously outlined, short, starting where tendons are attached to inner truncus wall; stylus short, a continuation of glans, tapering to distal asymmetrical opening of seminal duct, slightly curved (in lateral view). Short, stiff and unspecialized spicules forming armament of glans; their arrangement symmetrical in ventral view (Fig. 42).

Female (Figs 29-30, 36-37): Largely as male but lacking dorso-distal Apo of first article of chelicera. This



Figs 20-26. *Starengovia kirgizica,* male genital morphology. (20) Truncus penis in ventral view. (21) Same in dorsal view. (22) Same in lateral view. (23) Distal part of truncus in ventral view. (24) Same in lateral view. (25) Glans penis in ventral view. (26) Same in lateral view. Scales: 0.3 mm (Figs 20-22); 0.2 mm (Figs 23-24); 0.1 mm (Figs 25-26).

article armed with pointed tubercles laterally. Form of anvil-shaped lines of tubercles of dorsal side slightly different (Fig. 29 cf. Fig. 27, see also "Body, dorsal side").

Measurements: Body length, male 1.3-1.5 (n=10), female 1.3-1.65 (n=10). Leg II length: male, female in parentheses: Fe 1.25 (1.25), Pt 0.35 (0.4), Ti 0.9 (0.9), Mt 1.5 (1.45), Ta 1.25 (1.2). Pedipalp length: male, female in parentheses: Fe 0.5 (0.5), Pt 0.45 (0.4), Ti 0.4 (0.35), Ta 0.2 (0.2). Penis length: 1.0.

Variation: One of the peg-like para-median tubercles on opisthosomal area V of the dorsal scutum may lack (Fig. 27); on the first free opisthosomal tergite (corresponding to opisthosomal tergite VI) such tubercles are absent (Fig. 6).

Distribution: Known from eight localities in northwestern Pakistan, close to the northwestern fringes of the Himalayan chain. The species was found in three major administrative units of the country, Swat and Chitral Districts and Hazara Division, all mountainous areas in the northwest of the country, just west of the upper reaches of the Indus river.

Detailed habitat descriptions by the collectors refer to soil litter in open pine (*Pinus*), fir (*Abies*), spruce (*Picea*) and cedar (*Cedrus*) forests, in moist grassy glades, under stones and rotten wood and at moist riverine localities. Near Naran animals were found on June 1, under stones close to the actual snow line at 2600 m. Altitudinal records stretch from 2100 m (Murree) to 2600 m (Utrot, Malam Jabba, Naran, Lawarai Pass) and indicate occurrence of this species in a narrow altitudinal belt of just 500 m.

Most remarkably, *S. ivanloebli* sp. n. was collected together with two undescribed species of *Biantes* Simon, 1885 (Biantidae, a truly tropical family) at Malam Jabba, Naran to Kaghan, above Naran. One Kaghan series contained only five *Biantes* specimens, no *Starengovia*. The genus *Biantes* has undergone a tremendous radiation in the Himalayas; from Nepal alone 18 species were described (Martens, 1978b). Nearly all altitudinal zones there are inhabited by species in mostly narrow altitudinal belts stretching from the Terai lowlands to above 4000 m near the timberline. Many additional Biantidae species from Nepal and the Indian Himalayas await formal description. The Pakistani records of *Biantes* are the northwestern-most known within Asia. There they meet nemastomatines near their southeastern border.

DISCUSSION

Genus level systematics

Nemastomatidae are divided into two subfamilies, Nemastomatinae in the West Palaearctic, with hitherto only three outlying species in Central Asia and southwestwern China, and Ortholasmatinae in North and Central America, with few outlying species with a narrow geographical distribution in East Asia (Shear & Gruber, 1983; Shear, 2010; Schwendinger & Gruber, 1992). Nemastomatine generic division is mainly based on male genital and cheliceral morphology, and presently displays a relatively high degree of stability. Successively, papers of Kratochvíl (1958), Šilhavý (1966), Martens (1978a, 2006), Staręga (1976), Gruber & Martens (1968) and Gruber (1976, 1979, 2007) contributed much to our understanding of this subfamily. A first, still incomplete molecular-based analysis corroborated the present taxonomy and systematics and underlines that characters hitherto used are suitable for generic division and placement of species (Schönhofer & Martens, 2012). Presently, the subfamily comprises 17 genera (Schönhofer, 2013; Martens, 2016) with a strong presence in the western Palaearctic, especially in mountainous areas in southwestern, central and southeastern Europe. Most species there are known from the Iberian Peninsula with the Pyrenees (Prieto, 2008), from the Alps (Martens, 1978a) and from the Balkan Peninsula (Kratochvíl, 1958; Staręga, 1976). Also the Caucasus is a centre of nemastomatine diversity (Martens, 2006). It harbors endemic genera and, additionally, several of them display remarkable radiation into small-range species (Martens, 2006; Schönhofer, 2013).

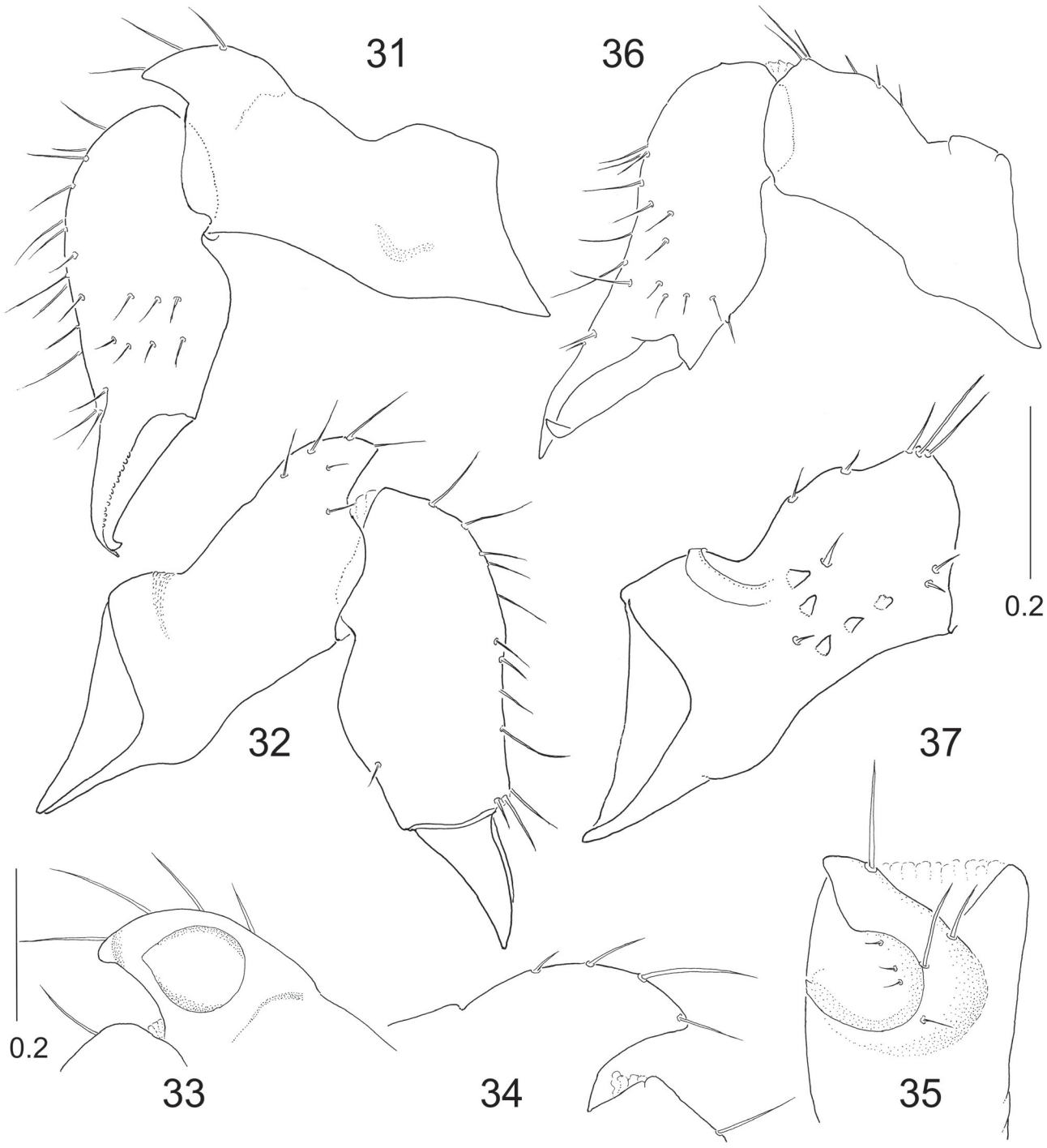
Taxonomic characters

The species of *Starengovia* presented here are typical representatives of Nemastomatinae, which lack the ortholasmatine hood projecting from the anterior margin of the dorsal scutum and which are characterized by a number of specific traits in their genital morphology. In *Starengovia* the large pair of membrane-like flaps of the distal part of the truncus penis is diagnostic. Though within nemastomatines wing-like penial structures occur in different genera (Martens, 2006; Schönhofer & Martens, 2012), this structure is unique and remarkable by its size and thin but robust hyaline appearance. Another genital character is also characteristic, the short glans penis. Generally, the proximal part of the glans is differentiated by the insertion of the penial tendons (Martens, 1976). These extend from the two basal muscles through the truncus to the glans. The glans is recognizable by the sparse but obvious presence of robust spicules. A similar short glans is also characteristic of the genus *Sinostoma* Martens, 2016; in that genus it is thicker and the stylus is rather short. *Sinostoma* also represents an East Palaearctic genus in southwestern China, the easternmost one in the Nemastomatinae.

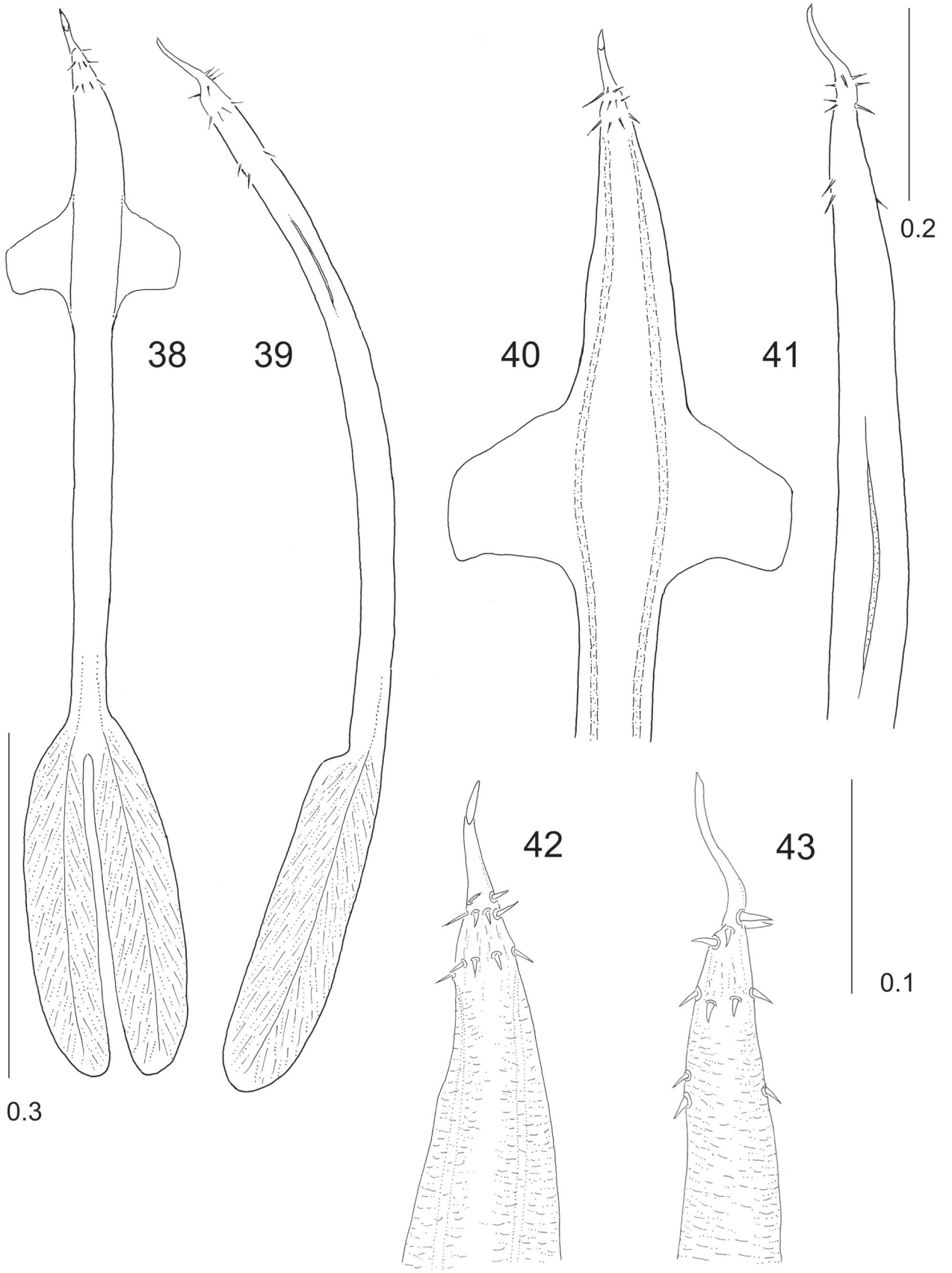
Both genera may represent a common isolated evolutionary line within the Nemastomatinae. *Starengovia* is unique by its broad foliate alate distal part of the truncus penis (Snegovaya, 2010) which is lacking in *Sinostoma.* In an evolutionary tree based on molecular genetics as

Figs 27-30. *Starengovia ivanloebli* sp. n. (27) Body of male in dorsal view. (28) Same in ventral view. (29) Body of female in dorsal view. (30) Same in ventral view. Scale: 0.5 mm.

published by Schönhofer & Martens (2012) *Starengovia* appears close to the basis of the tree. Unexpectedly, the genus *Mitostoma* Roewer, 1951, with a highly complicated male genital morphology, forms the sister group to all other nemastomatine genera screened so far. A bowl-like medial excavation of the cheliceral apophysis in males, a quite distinct character, is present in several nemastomatine genera and may have developed independently several times. This is to be inferred from the placement of the relevant genera on the molecular-based tree (Schönhofer & Martens, 2012). *Nemastomella* Mello-Leitão, 1936 and *Mediostoma* Kratochvíl, 1958, two of the genera screened so far, are not closely related. They are restricted to the Iberian Peninsula, and range from the Balkans to the Caucasus, respectively. The very similar apophysis form in *Sinostoma* and *Starengovia*



Figs 31-37. *Starengovia ivanloebli* sp. n. (31) Right chelicera of male in prolateral view. (32) Same in retrolateral view. (33) Cheliceral apophysis in prolateral view. (34) Same in retrolateral view. (35) Same in dorsal view. (36) Entire female chelicera in prolateral view. (37) Basal article of female chelicera in retrolateral view. Scale: 0.2 mm (Figs 31-32, 36-37; Figs 33-35).



Figs 38-43. *Starengovia ivanloebli* sp. n., male genital morphology. (38) Truncus penis in ventral view. (39) Same in lateral view. (40) Distal part of truncus penis in ventral view. (41) Same in lateral view. (42) Glans penis in ventral view. (43) Same in lateral view. Scales: 0.3 mm (Figs 38-39); 0.2 mm (Figs 40-41); 0.1 mm (Figs 42-43).

may indicate a close relationship in accordance with the common occurrence at the eastern margin of the subfamily distribution. However, very different male genital characters of *Starengovia* and *Sinostoma* contradict this. Generally, the position of extrusion areas for the secretion on the male cheliceral apophysis differs among species and strongly varies among genera of nemastomatines. The secretion plays a role during courtship (Martens, 1969; Martens & Schawaller, 1977). Thus, alongside male genital morphology, the shape of this apophysis and the structure of the internal gland, which discharges its secretion via the cheliceral apophysis (Martens & Schawaller, 1977) plays a major role in systematics of Nemastomatinae.

Biogeography

Beside *Sinostoma yunnanicum* Martens, 2016 of southwestern China, the two *Starengovia* species are the easternmost representatives of Nemastomatinae. The nemastomatine locality nearest to the localities of the two *Starengovia* species lies in the Central Asian Tadjik Pamir. There occurs "*Mediostoma*" *pamiricum* Staręga, 1986, apparently a rather localized endemic, known from only a single locality. This species, too, may belong to *Starengovia.* The easternmost *Mediostoma* species are known from the Caucasus and from northern Iran (Martens, 2006); occurrences further east are not likely. In addition, the illustration of the dorsal side of *M. pamiricum* by Staręga (1986) corresponds well with the two *Starengovia* species by possessing short to medium-sized peg-like para-median tubercles and lines of anvil-shaped denticles on scutal areas, the latter being most prominent on the prosoma (Fig. 6B).

The Pakistan localities of *S. ivanloebli* sp. n. reduce the distance to the *Sinostoma* population in Yunnan, China to about 2700 km. Despite intensive sampling of small soil arthropods by researchers of the Geneva Natural History Museum and of the (former) Mainz Institute of Zoology in many parts of the western and central Himalayas, no nemastomatids turned up except for the isolated Pakistan locations. The only previous record of nemastomatids on the Indian Subcontinent was presented by Roewer (1959), but that is false (Schönhofer, 2013). Though more Nemastomatinae species will hopefully be discovered in China, the group seems to be rare and local there, probably confined to (already rare) primeval montane forests, and the only species known today may represent a relict (Martens, 2016).

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REFERENCES

Farzalieva G.S., Esyunin S.L.L. 1999. The harvestman fauna of the Urals, Russia, with a key to the Ural species (Arachnida: Opiliones). *Arthropoda Selecta* 8(3): 183-199.

Gruber J. 1976. Ergebnisse zoologischer Sammelreisen in der Türkei. Zwei neue Nemastomatidenarten mit Stridulationsorganen, nebst Anmerkungen zur systematischen Gliederung der Familie (Opiliones, Arachnida). *Annalen des Naturhistorischen Museums in Wien* 80: 781-801.

Gruber J. 1979. Ergebnisse zoologischer Sammelreisen in der Türkei. Über Nemastomatiden-Arten aus der Verwandtschaft von *Pyza* aus Südwestasien und Südosteuropa (Opiliones, Arachnida). *Annalen des Naturhistorischen Museums in Wien* 82: 559-577.

Gruber J. 2007. Nemastomatidae Simon, 1872 (pp. 148-151). *In*: Pinto-da-Rocha R., Machado G., Giribet G. (eds). Harvestmen. The Biology of Opiliones. *Harvard University Press, Cambridge,* 597 pp.

Gruber J., Martens J. 1968. Morphologie, Systematik und Ökologie der Gattung *Nemastoma* C.L. Koch (s. str.) (Opiliones, Nemastomatidae). *Senckenbergiana biologica* 49: 137-172.

Kratochvíl J. 1958. Höhlenweberknechte Bulgariens (Palpatores - Nemastomatidae). *Práce Brněnské základny Československé akademie věd, Brno* 30(12): 523-576.

Martens J. 1969. Die Sekretdarbietung während des Paarungsverhaltens von *Ischyropsalis* C. L. Koch (Opiliones). *Zeitschrift für Tierpsychologie* 26: 513-523.

Martens J. 1976. Genitalmorphologie, System und Phylogenie der Weberknechte (Arachnida: Opiliones). *Entomologica Germanica* 3: 51-68.

Martens J. 1978a. Spinnentiere, Arachnida: Weberknechte, Opiliones. *Die Tierwelt Deutschlands* 64: 1-464.

Martens J. 1978b. Opiliones aus dem Nepal-Himalaya IV. Biantidae (Arachnida). *Senckenbergiana biologica* 58: 347-414.

Martens J. 2006. Weberknechte aus dem Kaukasus (Arachnida, Opiliones, Nemastomatidae). *Senckenbergiana biologica* 86: 145-210.

Martens J. 2016. *Sinostoma yunnanicum*, the first nemastomatine harvestman in China (Arachnida: Opiliones: Nemastomatidae). *Zootaxa* 4126(3): 444-450.

Martens J., Schawaller W. 1977. Die Cheliceren-Drüsen der Weberknechte nach rasteroptischen und lichtoptischen Befunden (Arachnida: Opiliones). *Zoomorphologie* 86: 223-250.

Mello-Leitão C. de 1936. Les Opilions de Catalogne. *Treballs del Museu de Ciéncies Naturals de Barcelona* (*série entomologica*) 11(9): 3-18.

Prieto C. E. 2008. Updating the checklist of the Iberian opiliofauna: corrections, suppressions and additions. *Revista Ibérica de Aracnología* 16: 49-65.

Rambla M. 1983. Sobre los Nemastomatidae (Arachnida, Opiliones) de la Península Ibérica. VI. *Acromitostoma rhinocerus* y *Acromitostoma hispanum* (nueva combinación). *Speleon* 26/27: 21-27.

Roewer C.-F. 1951. Über Nemastomatiden. Weitere Weberknechte XVI. *Senckenbergiana biologica* 32: 95-153.

Roewer C.-F. 1959. Die Araneae, Solifuga und Opiliones der Sammlung des Dr. K. Lindberg in Griechenland, Kreta, Anatolien, Iran und Indien. *Meddelanden fran Göteborgs Kungliga Vetenskaps- och Vitterhets- Samhälles Handlingar, sjätte följeden* (serie B) 8(4): 1-47.

Schönhofer A.L. 2013. A taxonomic catalogue of the Dyspnoi Hansen and Sørensen, 1904 (Arachnida: Opiliones). *Zootaxa* 3679: 1-68.

Schönhofer A.L., Martens J. 2012. The enigmatic Alpine opilionid *Saccarella schilleri* gen. n., sp. n. (Arachnida: Nemastomatidae) - isolated systematic placement inferred from comparative genital morphology. *Organisms Diversity and Evolution* 12(4): 409-419.

Schwendinger P.J., Gruber J. 1992. A new *Dendrolasma* (Opiliones, Nemastomatidae) from Thailand. *Bulletin of the British arachnological Society* 9: 57-60.

Shear W.A. 2010. New species and records of ortholasmatine harvestmen from México, Honduras, and the western United States (Opiliones, Nemastomatidae Ortholasmatinae). *ZooKeys* 52: 9-45.

Shear W.A., Gruber J. 1983. The opilionid subfamily Ortholasmatinae (Opiliones: Troguloidea, Nemastomatidae). *American Museum Novitates* 2757: 1-65.

Šilhavý V. 1966. Über die Genitalmorphologie der Nemastomatidae (Arach., Opiliones). *Senckenbergiana biologica* 47: 67-72.

Simon E. 1885. Matériaux pour servir à la faune arachnologique de l'Asie Méridionale. I. Arachnides recueillis à Wagra-Karoor près Gundacul, district de Bellary, par M.M. Chaper. *Bulletin de la Société Zoologique de France* 10: 1-26.

Snegovaya N. Y. 2010. New harvestman genus and species from Kyrgyz Republic (Kyrgyzstan) (Arachnida: Opiliones: Nemastomatidae). *Acta Zoologica Bulgarica* 62(3): 351-354.

Staręga W. 1976. Weberknechte (Opiliones, excl. Sironidae) Bulgariens. *Annales Zoologici* 33(18): 1-433.

Staręga W. 1986. Eine neue Art der Nemastomatidae (Opiliones) aus dem Pamir, nebst nomenklatorisch-taxonomischen Anmerkungen. *Bulletin of the Polish Academy of Sciences, Biological Sciences* 34: 301-305.

Żabka M. 2015. Prof. dr hab. Wojciech Krzysztof Staręga (1939-2015). *Arachnologische Mitteilungen* 50: vi-viii.

Zhang C., Zhang F. 2013: Description of a new *Cladolasma* (Opiliones: Nemastomatidae: Ortholasmatinae) species from China. *Zootaxa* 3691(4): 443-452.