Himachalus pradeshicus, an unusual new harvestman genus and species from the Indian Himalayas of Himachal Pradesh (Arachnida, Opiliones, Phalangiidae)

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Himachalus pradeshicus, an unusual new harvestman genus and species from the Indian Himalayas of Himachal Pradesh (Arachnida, Opiliones, Phalangiidae)

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Abstract: *Himachalus pradeshicus* gen. et sp. nov. is described from mountainous areas in Himachal Pradesh in north-western India. The new genus and species is characterized by small body size, long legs and marked sexual dimorphism with an elaborate armament of the pedipalpal tibia and tarsus in the male (absent in the female). The male possesses a stout, dorso-ventrally flattened penis and a spherically inflated basal part of the glans; the distalmost pair of sensorial setae of the glans is situated close to the insertion of the stylus. Related genera cannot be recognized at present, which is certainly due to the nearly complete lack of faunal investigations in the north-western Himalayas west of Nepal and in the Indian Peninsula in general. A brief overview of our knowledge about Himalayan genera of Phalangiidae is presented.

Keywords: Endemic species - generic systematics - high altitudes - north-western Himalayas - sexual dimorphism - unrecorded fauna.

INTRODUCTION

The harvestman fauna of the Indian subcontinent is very poorly known. Only about one hundred species have been described from this vast area, first by Carl Johannes With (1903) and subsequently for decades by Carl-Friedrich Roewer (1912, 1935, 1940, 1954a, b, 1955a, b), who contributed the bulk of the descriptions of new Indian species although he published only species of Gagrellinae within the Sclerosomatidae and a few species of Assamiidae. Species of small body size, which preferably live in the soil or in forest litter, are nearly absent from the currently known Indian species list. Only Nepal is an exception. From there about 150 species were described in accordance with modern taxonomic standards mostly by Seisho Suzuki and Jochen Martens from 1968 to the present. However, also the Nepalese fauna has not at all been fully explored. Thus, it is not surprising that Opiliones collected in remote areas by sampling soil and litter tend to yield new and unexpected taxa. In this context, we report on a small ground-dwelling representative of the Phalangiidae, a predominantly Palearctic family with the southernmost biogeographical records at the southern macro-slopes of the Himalayas, generally at high elevations. The new genus and species presented here fits in well with this known pattern.

MATERIAL AND METHODS

All specimens were collected by pitfall traps during a period of ten days at each site. The traps were set up at 9:00 AM daily and the captured organisms were removed after 24 hours on the following day. The dates given in the material section refer to the dates on which harvestmen were removed from the traps.

Original line drawings were produced using a camera lucida attached to a Carl Zeiss research microscope. The photographs (Figs 1-6) were taken with a video camera attached to a Zeiss SV 6 stereomicroscope and stacked with the Automontage©System. Measurements were taken by means of a micrometer disc attached to a

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Leitz stereomicroscope. Measurements of the pedipalps and the penis were taken from the original drawings. All measurements are given in mm.

Abbreviations of morphological terms:

Apo	apophysis, apophyses
Cx	coxa, coxae
Fe	femur
Mt	metatarsus
Op gen	operculum genitale
Pt	patella
Ta	tarsus
Ti	tibia
Tr	trochanter
Tu oc	tuber oculorum, ocularium

Museum acronyms

CJM	Private collection of J. Martens, Mainz, Germany; to be transferred to the SMF
MHNG	Muséum d'histoire naturelle de la Ville de Genève, Geneva, Switzerland
SMF	Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt am Main, Germany

TAXONOMIC PART

Suborder Palpatores Thorell, 1876
Family Phalangiidae Latreille, 1802
Subfamily Phalangiinae Latreille, 1802

Himachalus gen. nov.

Figs 1-19

Type species: *Himachalus pradeshicus* sp. nov., by monotypy and present designation.

Included species: Only the type species.

Diagnosis: The genus (and its only species) is characterized by small body size, by male genital morphology and by male pedipalp morphology. Penis stout and wide (in dorsal and lateral view), widest in mid-section, lateral sides in distal third with fissure-like concavity; proximal part of glans distinctly globular. A marked sexual dimorphism present: males with incrassate pedipalpal tibia carrying a large, rounded, proventrad-directed subdistal apophysis; male tarsus with a ventrad-directed bend near midpoint and with a longitudinal ventral band of pointed denticles; tibia and tarsus of female pedipalp of normal shape.

Etymology: The name is derived from that of the Indian federal state and province Himachal Pradesh. Himachal, a word of Hindi language, stands for 'snow-laden'. Its gender is masculine.

Distribution: The only known species of the new genus occurs in the mountainous northern parts of the Indian federal state Himachal Pradesh. This is one of the sparse records of the predominantly Palearctic Phalangiidae in the Himalayan chain, at the southeastern biogeographical border of the family.

Relationships: See Discussion.

Himachalus pradeshicus sp. nov.

Figs 1-19

Holotype: CJM 9122; male; INDIA, Himachal Pradesh, Nankhari village, 80 km north of Shimla, 31°18'47"N 77°35'21"E, 2086 m, field number NKNNT6; 10.4.2022.

Paratypes: CJM 9120; 1 female; Himri village, 26 km north of Shimla, 2213 m, 31°12'28.512"N 77°17'12.4794"E, field number HNMT5; 9.4.2022. – MHNG-ARTO-0034002; 1 female; same data as for previous female but field number HNNT5. – CJM 9121; 1 male, 1 female; Himri village, same data as for previous females, 2213 m, samples NKNMT6 (female) and HNEMT6 (male), 10.4.2022. – MHNG-ARTO-0034003; 1 male; Himri village, locality details as before, 2213 m, field number HNESA6; 14.3.2021. – CJM 9240; 1 male; Himri village, locality details as previous, field numbers HNESA6; 14.3.2021. All specimens were collected by Shivani Devi.

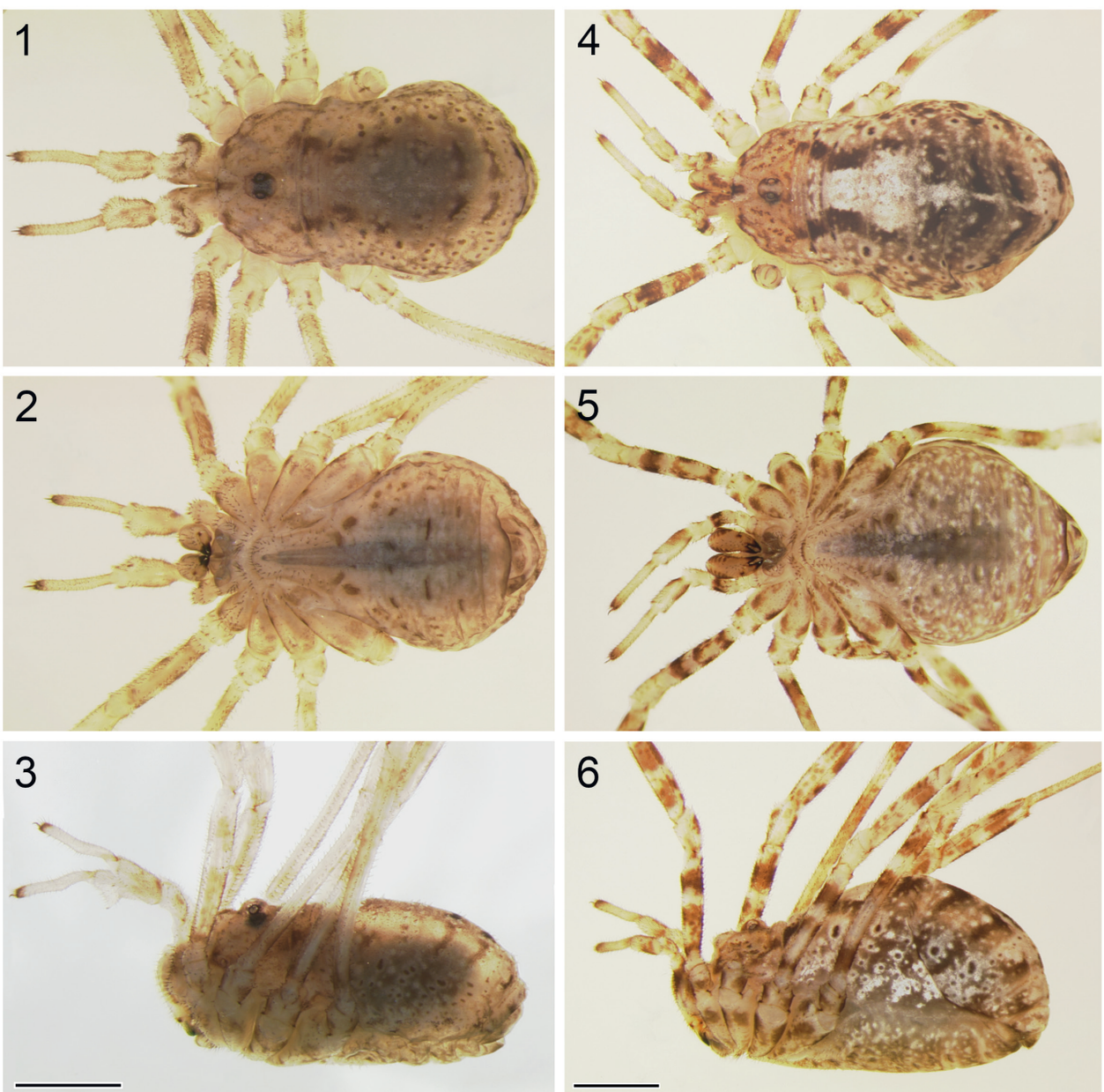
Diagnosis: Characters as given in the diagnosis of the genus. A small, long-legged ground-dwelling species with soft cuticle and largely unarmed body in both sexes, devoid of tubercles and large sensilla except for a group of fine, pointed tubercles in front of Tu oc. Male pedipalp sexually dimorphic, with incrassate Ti and a pronounced proventrad-directed, rounded Apo subdistally. Glans of penis spherically inflated in proximal part.

Etymology: The name Pradesh refers to a province or territory in various languages. It derives from the Sanskrit प्रदेश (= pradeśa), meaning sub-region or sub-country. The epithet "pradeshicus" is a Latinized adjective meaning "of Pradesh".

Description: MALE. *Body, dorsal side* (Figs 1, 7): Small body, smooth, sparsely hirsute except for rows of minute setae on all opisthosomal areas and on prosomal areas I and II; a small and low group of pointed hyaline Apo on posterior edge of opisthosoma; fully sclerotized specimens with a distinct colour pattern. Between mesopeltidium and opisthosomal area V a row of large paramedian dark patches, these close to each other on meso- and metapeltidium and on opisthosomal areas I and II, more widely spaced on opisthosomal areas III and IV, close to each other again on remaining opisthosomal segments; minute brownish patches on lateral flanks of opisthosoma causing a mottled pattern.
Tu oc (Figs 1, 3, 7): Low, dorsally rounded, carrying a few scattered small denticles, separated by approximately its length from front edge of prosoma.

Ventral side (Fig. 2): Smooth, without conspicuous Apo or denticles. Setation sparse on Cx I-IV, locally dense on sternites. Each Cx with a large irregular contrasting dark patch distally, plus small patches or dots irregularly scattered over ventral side causing a mottled pattern. Penis visible through translucent cuticle.

Pedipalp (Figs 15-16): Tr dorso-distally with one Apo, ventrally with a small group of low and stump Apo carrying a strong seta each; Fe stout, slightly incrassate on ventral side, dorsal side with strong but short setae, fewer of these on ventral side, few setae retro-laterally and pro-laterally, few short spicules dorso-distally and retro-laterally; Pt stout, sparsely set with a row of strong spicules dorsally, in lower part of retro-ventral side few small blunt tubercles carrying setae; Ti very bulky, in la view wider than Fe, ventrally slightly concave in midsection, sub-distally with a rounded Apo on pro-lateral side, extending beyond ventral margin of Ti; ventral margin of tibial Apo with four stout protuberances of different sizes; Ti pro-laterally, retro-laterally, dorsally and on pro-ventral side of Apo coated with a dense layer of fine sensory setae and trichomes, longest near ventral



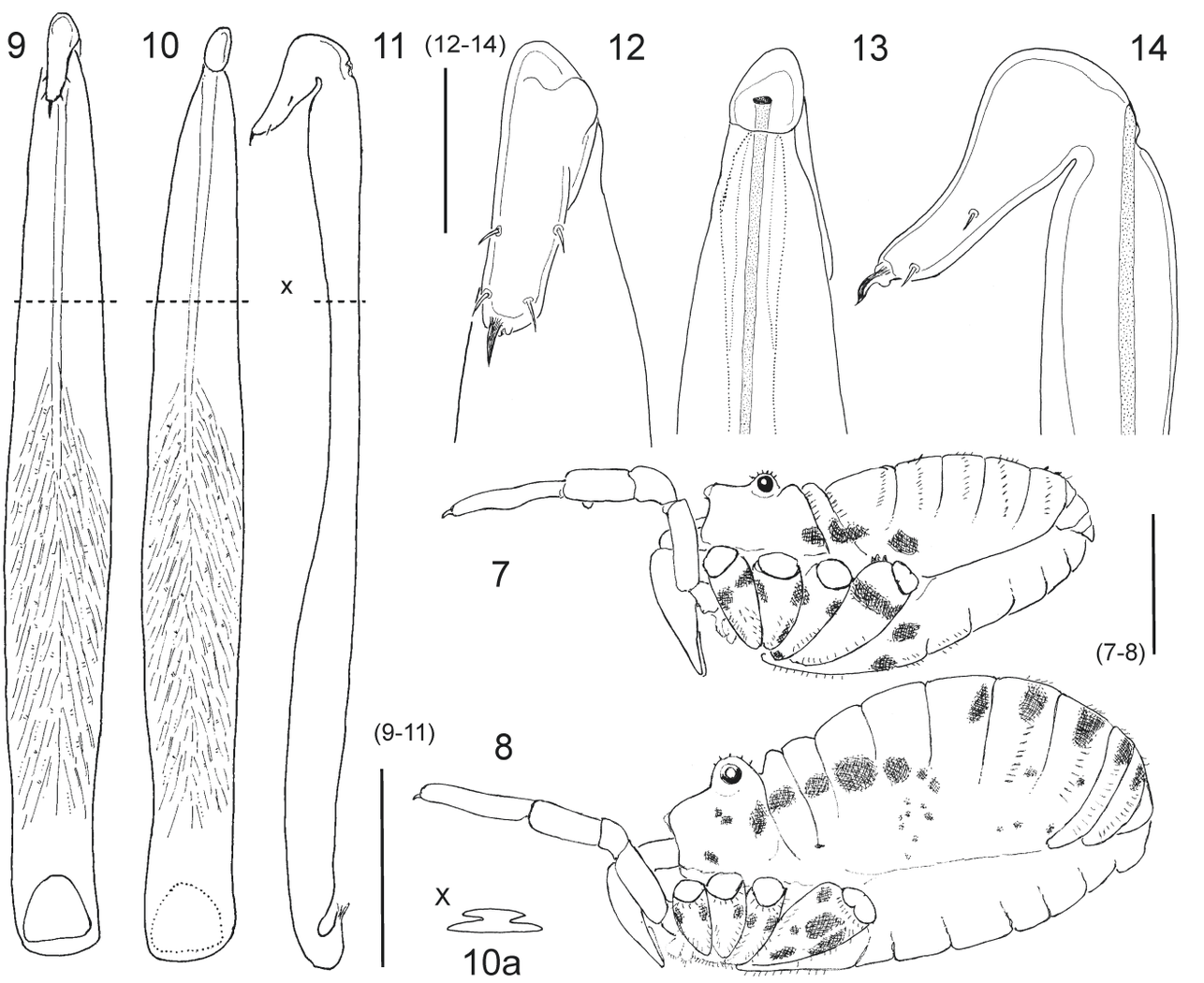
Figs 1-6. *Himachalus pradeshicus* gen. et sp. nov. (1) Body of male paratype MHNG-ARTO-0034003 in dorsal view. (2) Same in ventral view. (3) Same in lateral view. (4) Body of female paratype MHNG-ARTO-0034002 in dorsal view. (5) Same in ventral view. (6) Same in lateral view. Scale lines: 0.5 mm (1-3; 4-6).

side and on Apo; Ta relatively bulky and short (with regard to phalangiine morphology, see female palp in Fig. 17), in most parts parallel-sided, with a slight ventrad-directed bend proximal to mid-point; ventral side set with a longitudinal band of pointed denticles extending to pro-lateral side and reaching nearly distal end of Ta; whole Ta with a dense cover of fine trichomes, in distal half denser than in proximal half, few longer sensory setae on ventral and dorsal side, more numerous near insertion of tarsal claw than elsewhere. Claw smooth.

Chelicera (Fig. 18): Stout, basal article with few setae on dorsal side, ventrally a low stump protuberance; second article of normal proportions, with scattered setae on frontal side, no tubercles or apophyses.

Legs: Slender and quite long for a phalangiine species; Tr I-IV each with a dark pro- and retro-lateral patch; Fe, Pt and Ti of legs I and III stout, markedly thickened, enforced with five sharply delimited longitudinal rows of small, pointed, nearly hyaline tubercles carrying strong setae, all oriented in direction of tip, these enforcements causing a pentagonal cross-section for each article; leg II much slenderer than legs I and III; leg IV only slightly slenderer than legs I and III. Mt and Ta with many minute setae and microtrichia. Legs with distinct brownish annular markings: Fe I and III with three rings, femur IV with two rings, femur II with one basal ring; small dark patches interspersed between these marked rings giving the legs a mottled pattern.

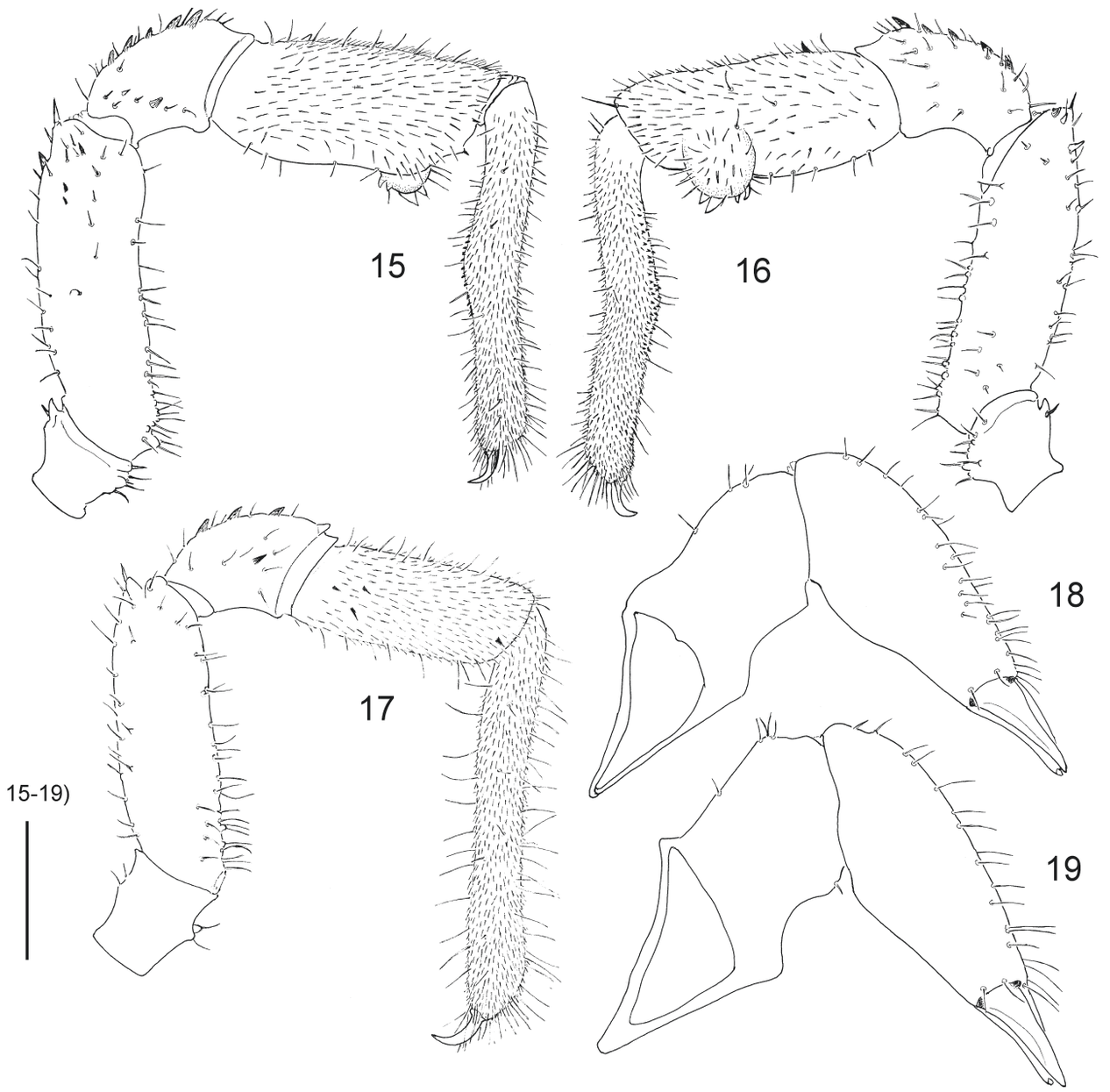
Genital morphology (Figs 9-14): Truncus of penis rather stout and bulky (in dorsal and ventral view); from short parallel-sided proximal part continuously and slightly widening to about mid-part, from there continuously



Figs 7-14. *Himachalus pradeshicus* gen. et sp. nov. (7) Body, left chelicerae and left pedipalp of male holotype in lateral view. (8) Same of female paratype CJM 9121. (9-11) Penis in dorsal (9), ventral (10) and lateral view (11); cross-section through truncus (10a) at level indicated by an "x" and by dashed lines in 9-11. (12-14) Glans penis in dorsal (12), ventral (13) and (14) lateral view. Scale lines: 1.0 mm (7-8), 0.2 mm (9-11), 0.1 mm (12-14).

tapering to insertion of glans; in distal fourth of truncus a lateral invagination or fold present on each side, giving the truncus at this level an x-shaped cross-section (Fig. 10a); in lateral view truncus broadest in proximal half, from there slightly tapering to narrowest portion in distal third, then again widening to constriction below insertion of glans; glans in proximal part considerably enlarged and arched on distal side, towards stylus continuously narrowing and apically tapering to insertion of stylus (Figs 12, 14); glans with two pairs of lateral setae in distal part close to ventral rim, distal pair close to insertion of stylus and surpassing lower rim of glans; stylus short, slightly sigmoid. Intrinsic penial muscle restricted to about proximal half of truncus.

FEMALE: *Body* (Figs 4-6, 8). Dorsal side and ventral side mostly as in male, though slightly larger, without noticeable spines or denticles. Dorsal colouration and pattern more distinct than in male, forming a bell-like whitish area surrounded by a black frame on first two, partly also on third opisthosomal segments (Fig. 4). Ovipositor (not examined) visible through translucent cuticle of ventral side (Fig. 5).



Figs 15-19. *Himachalus pradeshicus* gen. et sp. nov. (15) Left male pedipalp in pro-lateral view. (16) Same in retro-lateral view. (17) Left female pedipalp in pro-lateral view. (18) Right male chelicera in retro-lateral view. (19) Right female chelicera in same view. Scale lines: 0.3 mm (15-19).

Table 1. Measurements of legs and pedipalp of male holotype CJM 2122 and female paratype CJM 9121 (in parentheses).

	Tr	Fe	Pt	Ti	Mt	Ta	total
Leg I	0.4 (0.4)	1.6 (1.4)	0.5 (0.5)	1.3 (1.3)	1.5 (1.7)	2.5 (2.5)	7.8 (7.8)
Leg II	0.4 (0.4)	3.5 (2.5)	0.8 (0.8)	3.2 (3.0)	2.6 (2.2)	7.2 (6.7)	17.7 (15.6)
Leg III	0.4 (0.4)	1.7 (1.4)	0.6 (0.5)	1.3 (1.2)	1.7 (1.4)	2.6 (2.7)	8.3 (8.6)
Leg IV	0.4 (0.4)	2.7 (2.4)	0.7 (0.6)	1.9 (1.8)	2.5 (2.4)	3.7 (3.8)	11.9 (11.4)
Pedipalp	0.15 (0.2)	0.25 (0.25)	0.2 (0.15)	0.18 (0.18)	--	0.3 (0.2)	0.81 (0.98)

Pedipalp (Fig. 17). Proportions similar as in male, but slenderer and without Apo on Ti; Ta parallel-sided in lateral view, without ventral field of pointed denticles, sensory setae mainly on ventral and dorsal side and nearly as long as width of Ta.
Chelicera (Fig. 19). Generally as in male; ventral protuberance of basal article more pronounced than in male, second article slightly slenderer than in male; scanty setation as in male.
Legs. Like in male, but slightly shorter (see Table 1) and more distinctly spotted.

Measurements: Body lengths of males: 2.8-3.1 (n=3), of females: 3.3-4.3 (n=3). Penis length of holotype: 0.7. For measurements of leg articles of male holotype and a female paratype see Table 1.

Variation: Very little variation among the available specimens was observed. Body size, body and leg setation and male pedipalp morphology of the seven male and female specimens examined are largely invariable. Colouration and pattern of body and legs vary slightly, presumably depending on time passed since the final moult.

DISCUSSION

Distribution and altitudinal record

The localities of this species lie in the Shimla and Kullu Districts of Himachal Pradesh, near the villages Nankhari and Himri, at an elevation of 2086 m and 2213 m. This area is situated in the southern mid-altitudes of the Himalayan main range. The few adult specimens dealt with here were collected between March 14 and April 10 in two consecutive years. All specimens showed no wear and appeared to be quite newly moulted, certainly not aged. According to these scarce data the maturity period of *H. pradeshicus* sp. nov. seems to start not later than in early spring. Another possibility is overwintering as adults. It is uncertain when the final moult to adulthood occurs.
In Nepal Phalangiinae species are confined to higher altitudes (above 1200 m). Surprisingly *Homolophus* Banks, 1893 appears to occur in the subtropical Terai lowlands (Martens, 1973), although this was not corroborated by new records. *Homolophus* is widely distributed in high-altitude areas of Central Asia including Tibet (Snegovaya & Cokendolpher, 2021). The Nepal records and one from Assam represent the southernmost known presence of Phalangiinae in the east. Concerning altitudinal distribution, the only West Himalayan record of *Homolophus* is in accordance with the Nepal findings. Consequently, we may expect new Phalangiinae species to be discovered in the Himalayas east and west of Nepal, though that fauna apparently is not as rich and diverse as that in the subtropical parts of the central and eastern parts of the Himalaya. Apparently this is due to the more dry and arid landscapes of the western Himalayas, including the monsoon-exposed moister southern parts of the main range.

The opilionid fauna of India and the western Himalaya

On the composition of the opilionid fauna of the Indian subcontinent, namely the countries of India and Pakistan, exists only very sparse information. Only about one hundred species have been described from various localities of the subcontinent, mainly by the lifelong activities of Carl-Friedrich Roewer. No revisions or biogeographical analyses exist, not to mention molecular genetic research. Consequently, the harvestmen fauna of the Himalayan chain forming the northern rim of the subcontinent is also more or less unexplored, with the exception of the harvestmen of Nepal, the rich fauna of which is relatively well known. Roewer (1912, 1954a, b, 1955a, b) described a few species from Sikkim and West Bengal, and Suzuki (1966a, b, 1967, 1970) worked on randomly collected specimens brought in by various Nepal expeditions. The latter are presentations of species by modern taxonomic, morphology-based standards. These first hints of a rich local fauna were followed by the explorations of J. Martens and subsequent publications (1972, 1973, 1977, 1978, 1982, 1987, 2015, 2018a, 2021). In Nepal closely related species of several genera exhibit remarkable species complexes which occur in a broad altitudinal range that extends even beyond the timberline. They attest to strong and rapid evolutionary processes associated with the uplift of the Himalayas that shaped a rough geomorphological landscape.

However, the Himalayan opilionid fauna west of the western border of Nepal, on the Indian and Pakistani parts of the mountain chain, and east of the eastern border of Nepal is virtually unknown.

The fauna of Himachal Pradesh and areas further to the northwest

Also the harvestman fauna of the Indian federal state of Himachal Pradesh, which forms part of the north-western Indian Himalayas, was grossly neglected by science. Roewer (1954a, b, 1955a, b) described four species of the species-rich subfamily Gagrellinae (Sclerosomatidae) based on specimens collected in Shimla, the capital of Himachal Pradesh, the preferred summer residence of the government during British colonial times. These four are long-legged and conspicuous species, which are easy to collect.

Only quite recently Das & Bastawade (2006) described one more opilionid species, *Homolophus martensi* Das & Bastawade, 2006, from Lahul Spiti in Himachal Pradesh. Unfortunately, they overlooked that a species carrying this name already existed: *Homolophus martensi* Staręga, 1986. In accordance with the ICZN (1999) Staręga (2013) replaced this homonym by *H. bastawadei* Staręga, 2013. These five species are all we know about Himachal Pradesh opilionids. Further to the northeast, in Kashmir and in adjacent Pakistan, the situation is by no means better. *Egaenus tibetanus* Roewer, 1912 was recorded from Askole, *Egaenus kashmiricus* Caporiacco, 1934 from Kashmir ["Garhi, in valle fl. Hydaspis (nunc Jehlum ditti) m. 1200"], and *Pseudohomalenotus bicornutus* Caporiacco, 1934 also from (the present) Indian Kashmir, the latter being a small soil-dwelling sclerosomatine species. *Opilio nigridorsus* Caporiacco, 1934 inhabits the dry areas north of the main Himalayan range in Ladakh, generally a less hospitable area for opilionid species. Martens (2017) described a nemastomatid species from northern Pakistan, *Starengovia loebli* Martens, 2017, an unexpected find connecting the records of a few, largely disjunct congeners in Central Asia and in China. All Indian and Pakistani Himalayan species, except for the sole *Starengovia* species mentioned before, require revision with respect to species validity, their relationships to closely related species and their generic placement.

Regarding this situation, the discovery of a minute phalangiid species representing a new genus is not surprising at all, and for the time being its relationships remain obscure. Close relationships neither seem to exist with *Himalphalangium* Martens, 1973 nor with *Homolophus*, genera that are both rather rich in species in Nepal and southern Tibet. More novelties are to be expected – not only with such litter-dwelling opilionids that are difficult to collect.

Phalangiidae, namely the subfamily Phalangiinae, is a Palearctic faunal component with the highest diversity in the western parts of its geographical range, mainly Europe. Martens (2018b) presented an overview of the West-Palearctic genera of the subfamily. They occur as far as East Siberia, where species are few, with no native species in Japan. The Himalayan chain represents, at least in part, the southern border of the Phalangiidae range in Asia, and only few genera are represented there. Best known from Nepal are: *Himalphalangium* (6 species), *Opilio* Herbst, 1799 (1 species) and *Homolophus* (1 species). *Himalphalangium* occurs also in Bhutan, and several species of this genus are widely distributed in South Tibet (J.M. unpublished). The novelty on the generic level we are describing here is thus unexpected, especially considering the low number of known phalangiine genera in the Himalaya.

Phylogenetic relationships of *Himachalus* gen. nov.

The phylogenetic relationships of *Himachalus* gen. nov. are unknown. The male genital and pedipalp morphology of *H. pradeshicus* sp. nov. is unparalleled among Himalayan and Asian phalangiids. It lacks the large gland of the male pedipalpal tarsus present in *Himalphalangium* species, a genus widely distributed at least in the central and eastern Himalayas and in southern Tibet (Martens, 1973 and unpublished data). Apparently, *Himachalus* gen. nov. represents an old lineage with a rather limited distribution, maybe even with an isolated systematic position. It is also remarkable by its small size, ranging among the very smallest known phalangiids (Martens, 2018b). The known vertical distribution of the new species lies roughly between 2100 m and 2250 m and fits the biogeographical pattern of phalangiine in that area.

We have to keep in mind that except for *Himalphalangium* (see Martens, 1973) and *Homolophus* (see Snegovaya & Cokendolpher, 2021) none of the Himalayan genera of Phalangiinae have been revised in accordance with modern taxonomic standards.

Life cycle of *Himachalus pradeshicus* sp. nov.

Both collecting sites remain under snow from mid-December to early March. Minimum air temperatures during the collecting periods in March 2021 and 2022 were 1°C to 3°C, in October 2020 and 2021 6°C to 8°C. It is possible that juvenile stages develop during the monsoon months and adulthood may be reached prior to the onset of low temperatures in the cold period. Thus, adults may overwinter under the sow cover and appear in pitfall traps after the snow has melted in early spring.

For a high-mountain phalangiine species such a phenology is unusual and unexpected because individuals of phalangiine species of Nepal, namely of the genus *Himalphalangium*, mature during the late monsoon and

post-monsoon time and die after the heavy frost period starts (Martens, 1973). In Nepal a life cycle similar to that of *H. pradeshicus* sp. nov. was observed in species of *Rongsharia* Roewer, 1957, a genus of unresolved subfamilial affiliation. Specimens of all its species are exclusively juvenile in autumn, and adults have been collected only in the early and late pre-monsoon period (Martens, 1982 and unpublished data).

The Himalayan *Taxus* project

The *H. pradeshicus* sp. nov. specimens examined were collected for the project "Returning *Taxus contorta* to the forests and the people: a study in Shimla and Kullu Districts of the Indian Himalayan Region" under the National Mission on Himalayan Studies (NMHS) of the Ministry of Environment and Forests & Climate Change, commissioned by the Government of India. The West Himalayan Yew (*Taxus contorta* Griff.) has suffered a 90% population decline in the Himalayas. It has been listed as endangered by the International Union for the Conservation of Nature and National Resources due to overexploitation for its medicinal properties, particularly for the commercial extraction of the anti-cancer drug 'Taxol'. The current presence of the tree is limited to a few isolated pockets, and it is critical to investigate all ecological parameters present in these habitats in order to develop conservation strategies. Along with ecological studies in the remaining pockets of yew forest, soil macroinvertebrates were collected from up to 30 cm deep and 25 cm wide blocks of soil, while ground-dwelling invertebrates were captured by pitfall traps. Ants, beetles, spiders, harvestmen, collembolans, isopods, earthworms, earwigs, and beetle and dipterans larvae were among the captured macroinvertebrates. The new harvestman presented here was discovered during these investigations.

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REFERENCES

Banks N. 1893. The Phalanginae of the United States. *The Canadian Entomologist* 25(8): 205-211.

Caporiacco L. di 1934. Aracnidi dell' Himalaia e del Karakoram raccolti della Missione Italiana al Karakoram [Part 2]. *Memorie della Società Entomologica Italiana* 13: 161-263, tables 1-6.

Das N.P.I., Bastawade D.B. 2006. A new species of genus *Euphalangium* Roewer (Opiliones: Phalangidae) from western Himalayan region of India. *Zoos' Print Journal* 21: 2207-2209.

Herbst J.F.W. 1799. Natursystem der ungeflügelten Insekten 3. Fortsetzung der Naturgeschichte der Insectengattung *Opilio.* Vol 3. *Lange, Berlin*, 30 pp.

ICZN 1999. International Code of Zoological Nomenclature, 4th edition. *The International Trust for Zoological Nomenclature*, *London*, xxix + 306 pp.

Latreille P.A. 1802. Famille troisième. Phalangiens (pp. 314-329). In: Latreille P.A., Sonnini C.S. (eds). Histoire naturelle, générale et particulière des Crustacés et des Insectes, 7. *F. Dufart, Paris*, xii + 467 pp.

Martens J. 1972. Opiliones aus dem Nepal-Himalaya. I. Das Genus *Sabacon* Simon (Arachnida: Ischyropsalididae). *Senckenbergiana biologica* 53: 307-323.

Martens J. 1973. Opiliones aus dem Nepal-Himalaya. II. Phalangiidae und Sclerosomatidae (Arachnida). *Senckenbergiana biologica* 54: 181-217.

Martens J. 1977. Opiliones aus dem Nepal-Himalaya III. Oncopodidae, Phalangodidae und Assamiidae (Arachnida). *Senckenbergiana biologica* 57: 295-340.

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

Martens J. 1982. Opiliones aus dem Nepal-Himalaya V. Gyantinae (Arachnida: Phalangiidae). *Senckenbergiana biologica* 62: 313-348.

Martens J. 1987. Opiliones aus dem Nepal-Himalaya. VI. Gagrellinae (Arachnida: Phalangiidae). *Courier Forschungs-Institut Senckenberg* 93: 87-202.

Martens J. 2015. *Sabacon* Simon, 1879 in the Palaearctic: A survey of new and known species from France, Nepal, India, China, Russia and Japan (Arachnida: Opiliones: Sabaconidae) (pp. 167-210). In: Hartmann M., Weipert J. (eds). Biodiversity and Natural Heritage of the Himalaya, V. *Naturkundemuseum Erfurt*, 570 pp., 4 plates.

Martens J. 2017. On *Starengovia* Snegovaya, a genus of Asian nemastomatines (Arachnida: Opiliones: Nemastomatidae). *Revue suisse de Zoologie* 124: 187-201.

Martens J. 2018a. Remarkable new harvestman species from the Nepalese and Indian Himalayas (Arachnida, Opiliones: Phalangiidae and Sclerosomatidae) (pp. 169-178). In: Hartmann M., Barclay M.V.L., Weipert J. (eds). Biodiversity and Natural Heritage of the Himalaya VI. *Naturkundemuseum Erfurt*, 628 pp., 6 plates.

Martens J. 2018b. A European discovery: *Kalliste pavonum* gen. n., sp. n., the smallest phalangiid species known to date (Arachnida: Opiliones: Phalangiidae). *Revue suisse de Zoologie* 125: 155-164.

Martens J. 2021. Assamiidae from the Nepal Himalayas, including a new genus and a new species, with notes on *Dhaulagirius altitudinalis* Martens (Arachnida: Opiliones) (pp. 475-484). In: Hartmann M., Barclay M.V.L., Weipert J. (eds). Biodiversity and Natural Heritage of the Himalaya VII. *Naturkundemuseum Erfurt*, 615 pp.

Roewer C.F. 1912. Revision der Opiliones Plagiostethi (= Opiliones Palpatores). I. Teil: Familie der Phalangiidae (Subfamilien: Gagrellini, Liobunini, Leptobunini). *Abhandlungen aus dem Gebiete der Naturwissenschaften, herausgegeben vom Naturwissenschaftlichen Verein in Hamburg* 19: 1-294.

Roewer C.F. 1935. Alte und neue Assamiidae. Weitere Weberknechte VIII (8. Ergänzung der „Weberknechte der Erde“ 1923). *Veröffentlichungen aus dem Deutschen Kolonial- und Übersee-Museum* 1: 1-168.

Roewer C.F. 1940. Neue Assamiidae und Trogulidae. Weitere Weberknechte X (10. Ergänzung der „Weberknechte der Erde“ 1923). *Veröffentlichungen aus dem Deutschen Kolonial- und Übersee-Museum* 3: 1-31, plates 1-2.

Roewer C.F. 1954a. Indoaustralische Gagrellinae (Opiliones, Arachnida) (Weitere Weberknechte XVIII), 1. Teil. *Senckenbergiana biologica* 35: 181-236.

Roewer C.F. 1954b. Indoaustralische Gagrellinae (Opiliones, Arachnida) (Weitere Weberknechte XVIII), 2. Teil. *Senckenbergiana biologica* 35: 237-292.

Roewer C.F. 1955a. Indoaustralische Gagrellinae (Opiliones, Arachnida) (Weitere Weberknechte XVIII), 3. Teil. *Senckenbergiana biologica* 36: 71-121.

Roewer C.F. 1955b. Indoaustralische Gagrellinae (Opiliones, Arachnida) (Weitere Weberknechte XVIII), 4. Teil. *Senckenbergiana biologica* 36: 123-171.

Roewer C.F. 1957. Über Oligolophinae, Caddoinae, Sclerosomatinae, Leiobuninae, Neopilioninae und Leptobuninae (Phalangiidae, Opiliones Palpatores). (Weitere Weberknechte XX). *Senckenbergiana biologica* 38(5/6): 323-358.

Snegovaya N., Cokendolpher J. 2021. Further studies on the harvestman genus *Homolophus* (Opiliones: Phalangiidae), with descriptions of two new species. *Zootaxa* 4908: 301-353.

Staręga W. 1986. Zwei neue Weberknecht-Arten aus Tibet (Arachnida: Opiliones: Phalangiidae). *Senckenbergiana biologica* 67: 131-136.

Staręga W. 2013. *Homolophus bastawadei*, a replacement name for the homonym *Euphalangium martensi* (Opiliones: Phalangiidae). *Journal of Arachnology* 41: 415.

Suzuki S. 1966a. Four phalangids from Eastern Himalayas. *Japanese Journal of Zoology* 15: 101-104.

Suzuki S. 1966b. The phalangids of Himalayan expedition of Chiba University 1963. *Japanese Journal of Zoology* 15: 115-124.

Suzuki S. 1967. Three species of Opiliones from Nepal. *Annotationes Zoologicae Japonenses* 40: 115-122.

Suzuki S. 1970. Report on a collection of opilionids from Nepal. *Journal of Science, Hiroshima University* (series B 1) 23: 29-57.

Thorell T.T.T. 1876. Sopra alcuni Opilioni (Phalangidea) d’Europa e dell’Asia occidentale, con un quadro deì generi europei di quest’ Ordine. *Annali del Museo civico di Storia naturale di Genova* 8(1): 452-508.

With C. 1903. New and old Phalangiidae from the Indian region. *Journal of the Linnean Society, Zoology* 28: 466-509.