

**A revision of *Trichaphodius* species from the Indian Subcontinent
(Coleoptera: Scarabaeidae: Aphodiinae: Aphodiini)**

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Abstract. Four species of the genus *Trichaphodius* Schmidt, 1913 from the Indian Subcontinent are dealt with. A new species, *Trichaphodius sipeki* sp. nov., is described from Rajasthan. Two new combinations are proposed as follows: *Trichaphodius jirianus* (Balthasar, 1965) comb. nov. and *T. moorei* (Paulian, 1936) comb. nov. *Trichaphodius jirianus* (Balthasar, 1965) is restituted from synonymy with *T. hindustanicus* (Balthasar, 1935). The lectotype of *T. hindustanicus* (Balthasar, 1935) is designated. Types of all the species studied and further additional materials were examined. Key to species and photos are presented. The present actions and distributional data are discussed.

INTRODUCTION

The genus *Trichaphodius* Schmidt, 1913 includes numerous species particularly inhabiting Afrotropical and Oriental Regions, but the authors of the work presented here recently transferred most Asian species to the genus *Gilletianus* Balthasar, 1933 within the framework of a “Preliminary checklist of Asian and New-Guinean species of the genus *Gilletianus* Balthasar, 1933” (Král et al. 2014); before this action, five species have already been considered by Dellacasa & Dellacasa (2006) to belong to *Gilletianus*, a subgenus of *Aphodius* Hellwig, 1798.

We believe that true members of the genus are only species sharing *inter alia* the following characters. All dorsal surfaces are macrosetaceous (on the head, the macrosetation can be quite distinct, but in some species, the macrosetae can be short, distinct only under high magnification and/or present only posteriorly; on the pronotum, the macrosetae are quite distinct, but they can be sometimes moderately sparser on the pronotal disc than on lateral areas; the elytra are distinctly macrosetaceous throughout, the macrosetae being mostly arranged in two longitudinal rows in each interval, but some additional macrosetae can sometimes be found in some intervals beyond the two rows). Punctures on the pronotum surface are rather dense. The punctation is either simple or rough (rasplike), never double (i.e. never consisting of larger punctures intermixed with smaller ones), evenly distributed throughout the pronotal surface (never sparser on the pronotal disc and denser laterally).

These features are also present in the *Trichaphodius humilis* group as defined by Bordat (1989) for species of the Afrotropical fauna including the type species of the genus, *Aphodius humilis* Roth, 1851 based on subsequent designation by Paulian (1942).

We have studied more than 1000 specimens of the genus *Trichaphodius* from the Indian Subcontinent: from Sri Lanka, India (Himachal Pradesh, Uttarakhand, Rajasthan, Goa, Puducherry, West Bengal, Arunachal Pradesh, Karnataka, and Tamil Nadu), Nepal, and Pakistan. They belong to four species, which are discussed below, and which are actually all the currently known Asian species of the genus *Trichaphodius* within the framework of the concept mentioned above.

MATERIAL AND METHODS

The specimens were examined with the Olympus SZ61, MBS-10 and SZP 1120-T stereomicroscopes. Measurements were taken with an ocular grid. The elytra length is considered as a distance between a line connecting anterior margin of elytra (at humeri) and elytral apex (along the elytral suture). The photographs published here were taken by using a Meopta laboratory microscope and CMOS 5 digital camera with the Helicon Focus 3.20.2 Pro software.

Male genitalia (aedeagi) were treated by boiling with a 10% sodium hydroxide solution.

Each specimen of the newly described species is provided with a printed red label: “name of the taxon sp. nov., HOLOTYPUS ♂ [or] ALLOTYPUS ♀, Miloslav Rakovič, David Král, & Ladislav Mencl det. 2016” and with a pale green label specifying numbers related to a photo-documentation system by the third author (LM). Exact label data (as shown on white labels) are cited for the material examined. Individual lines within each label are separated by slashes “/”; double slash “//” stands for the separation of individual labels. Information in quotation marks indicates the original spelling. Our remarks and additional comments are found in brackets. Morphological terminology concerning the epipharyngeal structures was adopted from Dellacasa et al. (2001).

The following acronyms identify the collections housing the material examined (curators names are in parentheses):

- DKCP David Král collection, deposited in NMPC;
- IRSB Institut royal des Sciences naturelles de Belgique, Bruxelles, Belgium (Alain Drumont);
- LMCT Ladislav Mencl private collection, Týnec nad Labem, Czech Republic;
- MNHN Muséum national d’Histoire naturelle, Paris, France (Antoine Mantilleri, Olivier Montreuil);
- MRCO Miloslav Rakovič private collection, Dobřichovice, Czech Republic;
- NHMB Naturhistorisches Museum, Basel, Switzerland (Matthias Borer);
- NMPC National Museum, Praha, Czech Republic (Jiří Hájek);
- PBCS Patrice Bordat private collection, Saint-Cirq, France;
- ZFMK Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany (Dirk Ahrens).

TAXONOMY

Trichaphodius hindustanicus (Balthasar, 1935)

(Figs. 1-11)

Aphodius (*Trichaphodius*) *humilis hindustanicus* Balthasar, 1935: 256 (description).

Aphodius (*Trichaphodius*) *humilis hindustanicus*: Balthasar (1964: 165) (monograph); Dellacasa (1988: 398) (catalogue); Chandra 1999: 94 (catalogue).

Aphodius (*Trichaphodius*) *hindustanicus* [partim]: Stebnicka (1989: 16, figs 15-16) (valid species); Stebnicka (1990: 7) (distribution); Ahrens & Stebnicka (1997: 15) (distribution).

Aphodius (*Trichaphodius*) *hindustanicus*: Dellacasa & Dellacasa (2006: 139) (catalogue).

Trichaphodius hindustanicus: Dellacasa et al. (2016a: 12) (new combination), Dellacasa et al. (2016b: 153) (catalogue).

Type locality. “India orientalis, Nagpore [= East India, Chota Nagpur Plateau]”.

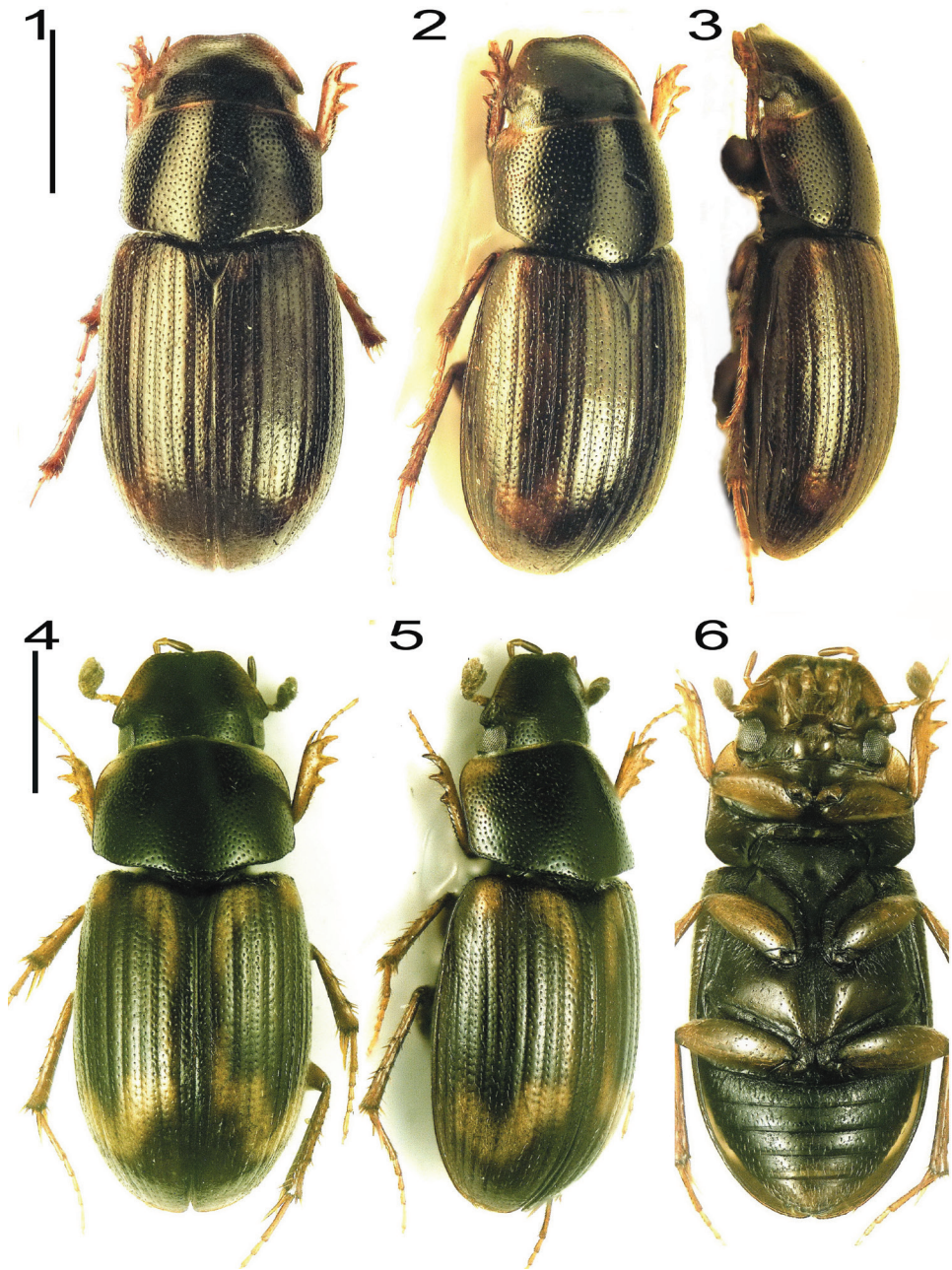
Type material studied. EAST INDIA: Lectotype (by present designation), ♀ (NMPC), “India or. / Nagpore [Nagpore = Nagpur; most likely the Chota Nagpur Plateau in East India (neither Rangpur in Maharashtra, which is West India, nor Nagpur in Bangladesh, which is a lowland location)] [white, printed label] // *A. humilis* ssp. *hindustanicus* / m. / Dr. Balthasar det. [white, handwritten/printed label] // TYPUS [red. printed label] // 1765 / Dok.L.Mencl 2014 [pale green, printed label] // *Aphodius* (*Trichaphodius*) *humilis* / ssp. *hindustanicus* Balthasar, 1935 / L E C T O T Y P U S ♀ / M. Rakovič, D. Král & / L. Mencl des. 2016 [red, printed label] // *Trichaphodius* / *hindustanicus* ♀ / (Balthasar, 1935) / M. Rakovič, D. Král & / L. Mencl det. 2016 [white, printed label]”.

Additional material studied. INDIA: Himachal Pradesh: 4 spec. (MRCD): Umg. Solang, Solang Valley, 32.20°N 77.10°E, 2500-2800 m, 10.-20.vii.2001; 3 spec. (PBCS): Manali, 9.ix.1963, G. A. Calvet lgt.; 4 spec. (MRCD), India, Punjab, Narkanda [Narkanda such as is actually in Himachal Pradesh, about 80 km E. of Punjab border], 9100 ft, 15.-20. ix.1951, Kincl lgt.; 2 spec. (NMPC): Manali, Kulu [pass]. - Uttarakhand: 20 spec. (LMCT): Joshimath, Auli, 2300 m, 13.-17. vii. 1995; 4 spec. (LMCT): Kedarnath, 14 km S. of Rambara, 3300 m, 26.-29.vii.1994; 4 spec. (LMCT): Thalari, 10 km N. of Debal, 22.vii.1994; 2 spec. (NMPC): Naini Tal, 609 m, viii. 1961, G. Scherer lgt.; 66 spec. (MRCD): Syenachati, 5.vi.2001; 62 spec. (MRCD): Mussoorie, 1920 m, 2.vi.2001; 12 spec. (MRCD): 36 km SE of Kotdwara, 7.vi.2001; 18 spec. (MRCD): Pauri env., 7.vi.2001; 1 spec. (MRCD): Mussoorie, Karnikel farm, 1600 m, 9.-10.vii.1989; 2 spec. (DKCP): Bhagirathi River, Dobrani; NEPAL: 1 spec. (MRCD): Dhawalagiri, Myagdi Distr., Kali - Gandaki - Kholra, Kopchepani - Gasa, 1000-2000 m, 19.vi.1986, J. Probst lgt.; 2 spec. (MRCD): Dhunche env., Rasuwa distr., 2500 m, 10.-14.vi.1999; 1 spec. (DKCP): Kamali, Jumla to Sima Himal, 5000 m, 6.-20.vi.1995; 3 spec. (DKCP): Langtang, rain forest, 2300-2800 m, v.-vi.1990; 1 spec. (DKCP): Balukhope, 1270-2600 m, 5.x.1978, Bhakta B. lgt.; 8 spec. (1 DKCP and 7 NHMB); Ramche, 1800-3350 m, 18.vi.1978, Bhakta B. lgt.; 4 spec. (1 DKCP and 3 NHMB): Lngtang, 14.vi.1978, 3350-3400 m, Bhakta B. lgt.; PAKISTAN: 4 spec. (DKCP): Sharan, Kagan Valley, 2500 m, 31.vii.-2.viii.1998, J. Rejsek lgt.

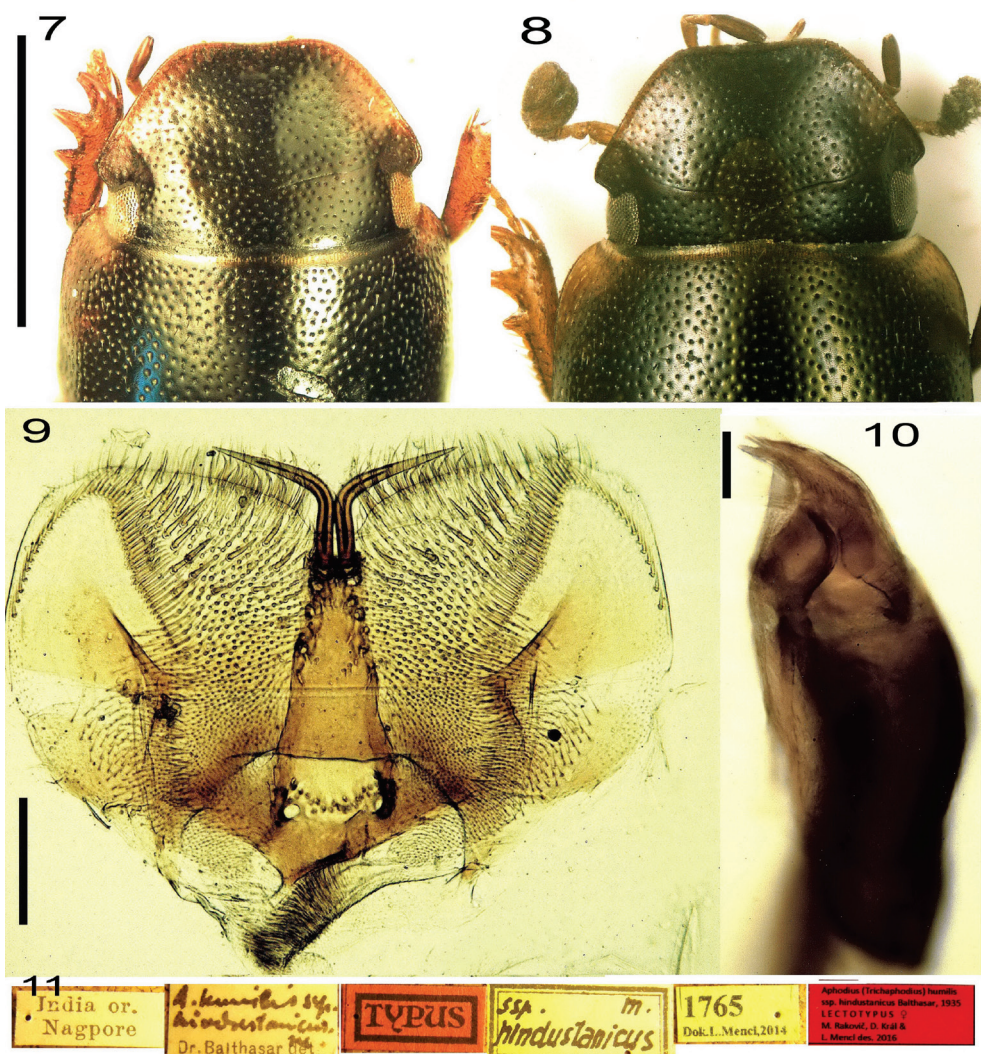
Distribution. India: Himachal Pradesh, Uttarakhand; Nepal, Pakistan (Balthasar 1935, 1964; Chandra 1999; present data). Records published in Stebnicka (1989, 1999) and Ahrens & Stebnicka (1997) can also concern the species *Trichaphodius jirianus* as well as record from Sikkim - Darjeeling in Dellacasa & Dellacasa (2006) and Dellacasa et al. 2016).

Notes. Photos of the habitus (Figs. 1-6) and details of the head, epipharynx and aedeagus (Figs. 7-10) are presented here for the female lectotype and/or for a non-type male specimen from Uttarakhand. Fig. 11 shows labels pinned under the lectotype specimen.

No redescription is necessary here, but we feel that it is useful to comment the colour variability, which is quite considerable. The forebody (head and pronotum is dark, blackish



Figs. 1-6. *Trichaphodius hindustanicus* (Balthasar, 1935), habitus: 1- lectotype, ♀, dorsal aspect; 2- lectotype, ♀, dorsolateral aspect; 3- lectotype, ♀, lateral aspect; 4- specimen from Uttarakhand, ♂, dorsal aspect; 5- specimen from Uttarakhand, ♂, lateral aspect; 6- specimen from Uttarakhand, ♂, ventral aspect. Scale line 1 mm. Photographs by L. Mencl.



Figs. 7-11. *Trichaphodius hindustanicus* (Balthasar, 1935), details and labels: 7- lectotype, ♀, head, dorsal aspect; 8- specimen from Uttarakhand, ♂, head, dorsal aspect; 9- specimen from Uttarakhand, ♂, epipharynx; 10- specimen from Uttarakhand, ♂, aedeagus lateral aspect; 11- labels pinned under lectotype. Scale lines: 0.5 mm for head, 0.1 mm for epipharynx and aedeagus. Photographs by L. Mencl.

brown, with lighter (brown) clypeus lateral margins, anterior angles of the pronotum and narrow lateral pronotum margins. The elytra can be prevalently dark brown (as in Fig. 1), usually with yellowish humeri and more or less extended yellowish area at the scutellum. The preapical spot can be more or less distinct (as in Fig. 2). Interval 2 is frequently yellowish. All the above mentioned yellowish areas of the elytral surface can be sometimes more extended, sometimes being even prevalent over the darker areas.

***Trichaphodius jirianus* (Balthasar, 1965) stat. restit., comb. nov.**
(Figs. 12-24)

Aphodius (*Trichaphodius*) *jirianus* Balthasar, 1965: 110 (description).

Aphodius (*Trichaphodius*) *jirianus*: Petrovitz (1968: 38) (distribution); Stebnicka (1981: 323, figs. 7-9) (distribution); Stebnicka (1986: 29, fig. 62) (distribution, key); Dellacasa (1988: 398) (catalogue).

Aphodius (*Trichaphodius*) *jirianus* [as synonym of *Aphodius hindustanicus* Balthasar, 1935]: Stebnicka (1989: 16, figs 15-16) (synonymy, distribution); Dellacasa & Dellacasa (2006: 139) (catalogue); Dellacasa et al. (2016b: 153) (catalogue)

Aphodius (*Trichaphodius*) *hindustanicus* [partim]: Stebnicka (1989: 16, figs. 15-16) (valid species); Stebnicka (1990: 7) (distribution); Ahrens & Stebnicka (1997: 15) (distribution).

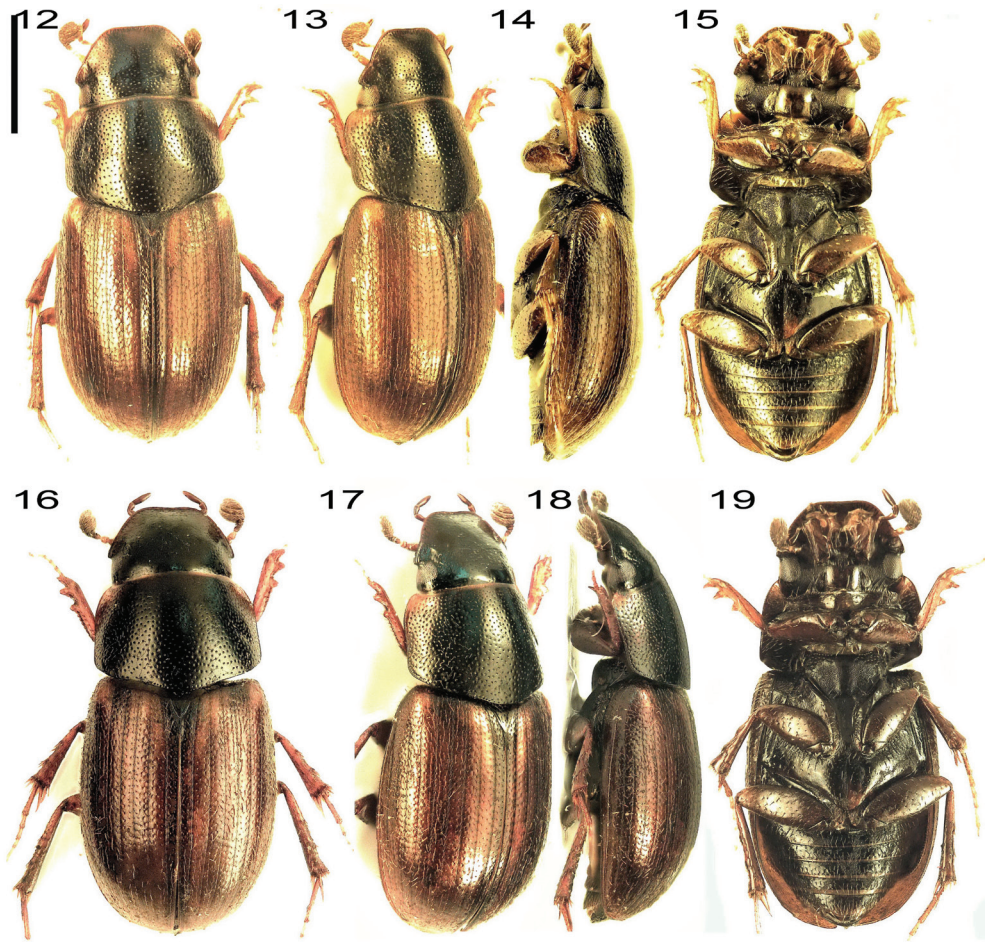
Type locality. “Nepal, Umgebung von Jiri, ([altitude above sea level of] 1900 m)”.

Type material studied. Nepal: two paratypes, ♂ and ♀ (NMPC), “NEPAL / Jiri 1900 m / 17.-19.v.[19]62 / leg. G. Ebert [white, printed label] // *Aphodius* / *Trichaphodius* / *jirianus* n. sp. / Balth. [19]63 / Paratypus [pink, handwritten/printed label] // 1763 and 1764, respectively / Dok.L.Mencl [pale green, printed label] // *Trichaphodius* / *jirianus* (Balthasar, 1965) ♂ and ♀, respectively / status rest., comb. nov. / M. Rakovič, D. Král & / L. Mencl det. 2016 [white, printed label]”.

Additional material studied. INDIA: Arunachal Pradesh: 5 spec. (2 DKCP and 3 ZFMK): Dirang vicinity, 1550±150 m, 27°21'-23'N 92°13'-16'E, 1.-9.vi.1995. - Uttarakhand: 24 spec. (LMCT): Joshimath, Auli, 2300 m, 13.-17.vii.1995; 1 spec. (LMCT): Kedarnath, 14 km S. of Rambara, 3300 m, 26.-29.vii.1994; 1 spec. (LMCT): Thalari, 10 km N. of Debal, 22.vii.1994; 1 spec. (LMCT): Karna Prayag env., 19.-21.vii.1994; - West Bengal: 3 spec. (DKCP): Tonglu, 3070 m, 1.-4.vi.2006. NEPAL: 1 spec. (MRCD): Anapurna Himal Lumle, 17.-22.vi.1999; 29 spec. (25 DKCP and 4 MRCD): Kosi prov., Basantapur, 21°11'N 87°27'E, 22.-23.vi.2000, excr. Bos; 24 spec. (DKCP): Kangchenjunga Himal Mts, Gyabla vill., 27°37'N 87°52'E, 2720 m, 4.vii.2000, excr. Bos; 44 spec. (DKCP): Kangchenjunga Himal Mts, Ghunsa vill. env., 27°40'N 87°56'E, 3375 m, 6.-10.vii.2000, excr. Bos; 1 spec. (DKCP): Chautara Distr., Nauling Lekh, in tussocks under stones, 11.-20.vi.1983; 1 spec. (DKCP): Hille, 28.vi.1988; 1 spec. (DKCP): Nuwakot Distr., Bhanyang Tharpa, 1900-2000 m. 9.vi.1993, J. Probst lgt.; 5 spec. (DKCP): Kosi, Chauki, 27°11'-12'N 87°27'-28'E, 2600-3000 m, 22.-24.vi.2001, NHMB Basel expedition to Nepal 2001; 5 spec. (MRCD): Illam env., 26.iv.-2.v.2013; 3 spec. (MRCD): Suketar Distr., Taplejung, 7.-9.v.2013; 2 spec. (MRCD): Mangalbare Distr., Terhatum, 2.-9.vi.2013; 3 spec. (PBCS): Myagdi Distr., Dhawalagiri, Hille - Ghorepani, 1600-2600 m, 10.vi.1986. C. Holzschuh lgt.; 1 spec. (PBCS): Kosi, Kuwapani - Chichila, 2300-3100 m, 24.iv.1984, I. Löbl - A. Smetana lgt.; 4 spec. (PBCS): Sulu Khumbu Lukla, 2800 m, 5.iv.2003; PAKISTAN: 1 spec. (DKCP): Murree, 2130 m, 35°54'38" N 73°23'25" E, cattle dung.

Distribution. India: Arunachal Pradesh, Darjeeling, Uttarakhand, West Bengal; Nepal and Pakistan (Balthasar 1965; Petrovitz 1968; Stebnicka 1981, 1986; present data). For confusion with the distribution of *Trichaphodius hindustanicus* see the paragraph Distribution with that species.

Similarly as in the preceding species, we should mention the colour variability. The head and pronotum are mostly dark, with or without lighter clypeal and pronotal margins. Elytra can be prevalently paler (as in the two paratypes depicted in Figs. 12 and 16), but they are frequently darker, with yellowish humeri and area at scutellum. The yellow preapical spot can be distinct, but is more frequently indistinct or absent. Even in pale individuals, there is a darker spot at elytral base on the interval 5.



Figs. 12-19. *Trichaphodius jirianus* (Balthasar, 1965) stat. restit., comb. nov., habitus: 12 - paratype, ♂, dorsal aspect; 13- paratype, ♂, dorsolateral aspect; 14- paratype, ♂, lateral aspect; 15- paratype, ♂, ventral aspect; 16- paratype, ♀, dorsal aspect; 17- paratype, ♀, dorsolateral aspect; 18- paratype, ♀, lateral aspect; 19- paratype, ♀, ventral aspect. Scale line 1 mm. Photographs by L. Mencl.

Notes. Photos of the habitus (Figs. 12-19) and details of the head, epipharynx and aedeagus (Figs. 20-23) are presented here for the male and/or female paratype. Fig. 24. shows labels pinned under a paratype specimen.

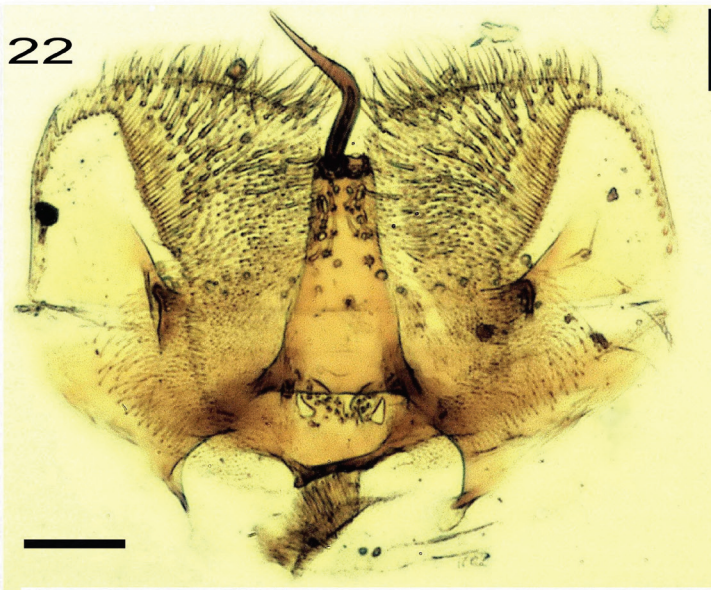
20



21



22



23



NEPAL
Jiri 1900 m
17.-19.V.62
leg. G. Ebert

24

Aphodias
(Trichaphodius)
jirianus n. sp.
Balth.
Paratypus ♂

1763

Dok. L. Mencl, 2014

Trichaphodius
jirianus (Balthasar, 1965) ♂
status rest., comb. nov..
M. Rakovič, D. Král &
L. Mencl det. 2016

Trichaphodius
jirianus (Balthasar, 1965) ♀
status rest., comb. nov..
M. Rakovič, D. Král &
L. Mencl det. 2016

Figs. 20-24. *Trichaphodius jirianus* (Balthasar, 1965) stat. restit., comb. nov., details and labels, paratypes: 20- ♂, head, dorsal aspect; 21- ♀, head, dorsal aspect; 22- ♀, epipharynx; 23- ♂, aedeagus lateral aspect; 24- labels pinned under paratype. Scale lines: 0.5 mm for head, 0.1 mm for epipharynx and aedeagus. Photographs by L. Mencl.

***Trichaphodius moorei* (Paulian, 1936) comb. nov.**

(Figs. 25-35)

Aphodius (*Trichonotulus*) *moorei* Paulian, 1936: 364, fig. a.

Aphodius (*Trichaphodius*) *moorei*: Balthasar (1964: 166) (monograph), Dellacasa (1988: 399) (catalogue); Stebnicka (1988: 64) (distribution), Chandra (1999: 94) (catalogue); Král & Šípek (2013: 245) (distribution).

Type locality. “Ceylon [= Sri Lanka]”.

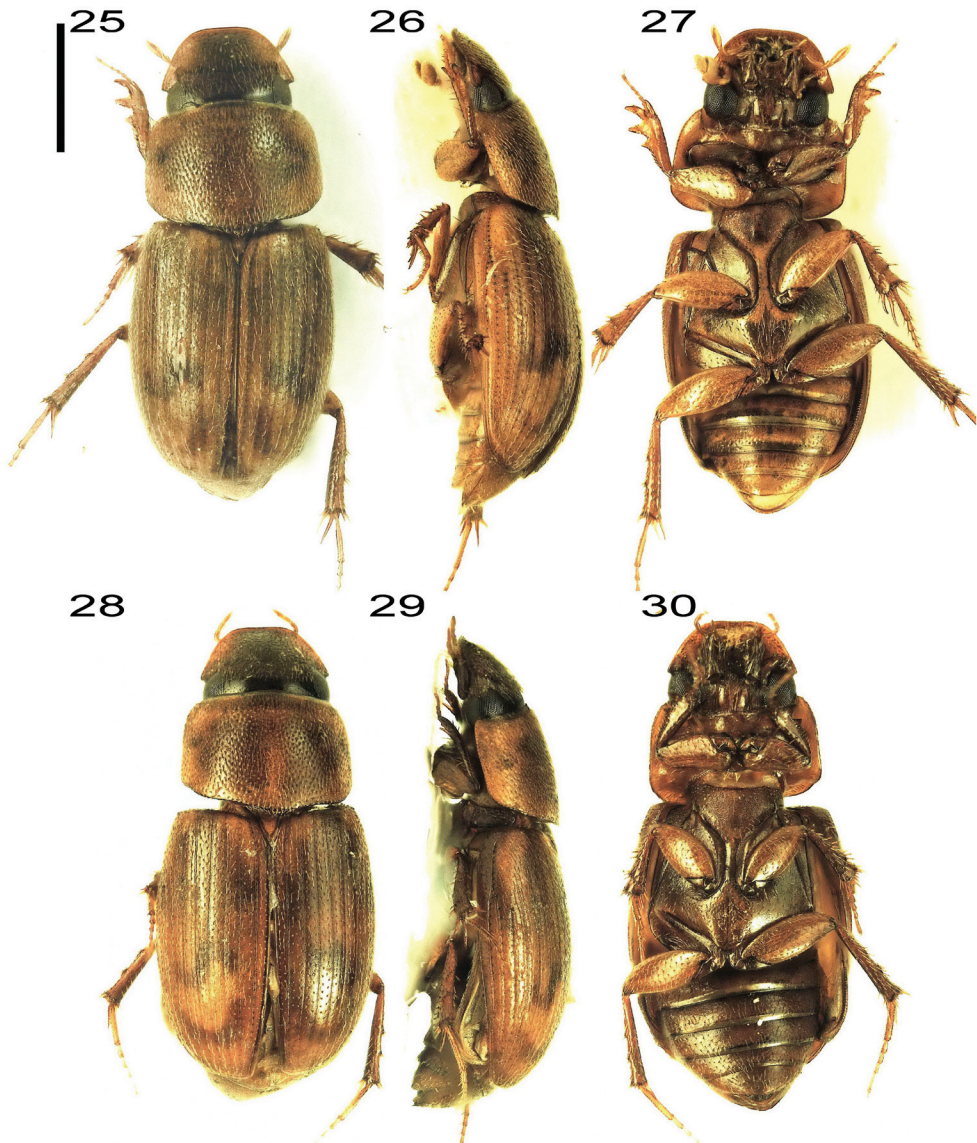
Type material studied. Two syntypes [originally mounted on one card: left specimen - ♂, right specimen - ♀; currently mounted on two separate cards, pinned on one pin - upper card with lectotype, designated here, lower card with paralectotype] (MNHN); lectotype “A. (*Trichonotulus*) / *moorei* Paulian / Type [white, handwritten label] // R. PAULIAN / Vidit // Ex-Museo / Fred.Moore / acq. 1891 [white, printed label] // Ceylon [white, handwritten label] // TYPE [red, printed label] // 1771 Dok.L.Mencl, 2014 [pale green, printed label] // *Aphodius* (*Trichonotulus*) *moorei* Paulian, 1936 / L E C T O T Y P U S ♂ / M. Rakovič, D. Král & / L. Mencl des. 2016 [red, printed label] // *Trichaphodius* / *moorei* ♂ / (Paulian, 1936) / M. Rakovič, D. Král & L. Mencl det. 2016 [white, printed label]”; paralectotype - data of first five labels specified above for lectotype are also valid for paralectotype; three further labels are added for paralectotype: “1772 Dok.L.Mencl, 2014 [pale green, printed label] // *Aphodius* (*Trichonotulus*) / *moorei* Paulian, 1936 / P A R A L E C T O T Y P U S No. 1 ♀ / M. Rakovič, D. Král & / L. Mencl des. 2016 [red, printed label] // *Trichaphodius* / *moorei* ♀ / (Paulian, 1936) / M. Rakovič, D. Král & / L. Mencl det. 2016 [white, printed label]”.

Additional material studied. INDIA: Goa: 1 spec. (DKCP): 0-20 m, Margao = Madgaon, Palolem env., 14.-22.viii.2002, P. Šípek & M. Fikáček lgt. - Karnataka: 151 spec. (51 MRCD and 150 IRSN): Shimoga [= Shivamogga], 17.-19.vii.1936, P. S. Nathan lgt.; 2 spec. (NMPC): Mysore State, Shimoga [= Shivamogga]. - Rajasthan: 1 spec. (DKCP): Rishikesh Umg., vi.1991, Richter leg.; 6 spec. (5 DKCP and 1 MRCD): 35km N. of Dausa, Nararimata env., 10.ix.-15.x.2002, P. Šípek lgt.; 1 spec. (DKCP): Baratpur, Kaeladeo N. P., 20.ix.1997, L. Nádai lgt. - Puducherry: 1 spec. (NMPC): Karikal [= Karaikal], ii.1966, P. S. Nathan lgt. - Tamil Nadu: 2 spec. (PBCS): Coimbatore, x.-xi.1969; 5 spec. (PBCS): Coimbatore, Madras, x.1972; 48 spec. (8 MRCD and 40 IRSN): Nedungadu, 25.vii.1936, P. S. Nathan lgt.; 1 spec. (NMPC): Madras, Coimbatore, 1400 f, xi.1965, P. S. Nathan lgt.; 1 spec. (NMPC): Pulney Hills [= Vellagavi Forest], 1898, R. P. Castets lgt. - Uttarakhand: 420 spec. (LMCT): Haridwar Chila, 300 m, 4.-14.viii.1994; 120 spec.: Haridwar Chila, 330 m, 9.-14.viii.1994; 7 spec.: Kotdwara, 1.-3.viii.1994; 1 spec. (DKCP): Rishikesh Umg., vi.1991, Richter lgt.; 1 spec. (MRCD): Haridwar - Chila, 300 m, 5.-14.viii.1994, M. Valenta lgt.; 6 spec. (MRCD): Kotdwara env., 1.-14.viii.1994 - West Bengal: 1 spec. (MRCD): Mandar., vii.1891, P. Cardon lgt.; SRI LANKA: 1 spec. (PBCS): Anuradhapura Distr., Hunuwilagama, near Willpattu, 200 feet, black light, 28.x.-3.xi.1976; 1 spec. (PBCS): Polonnaruwa.

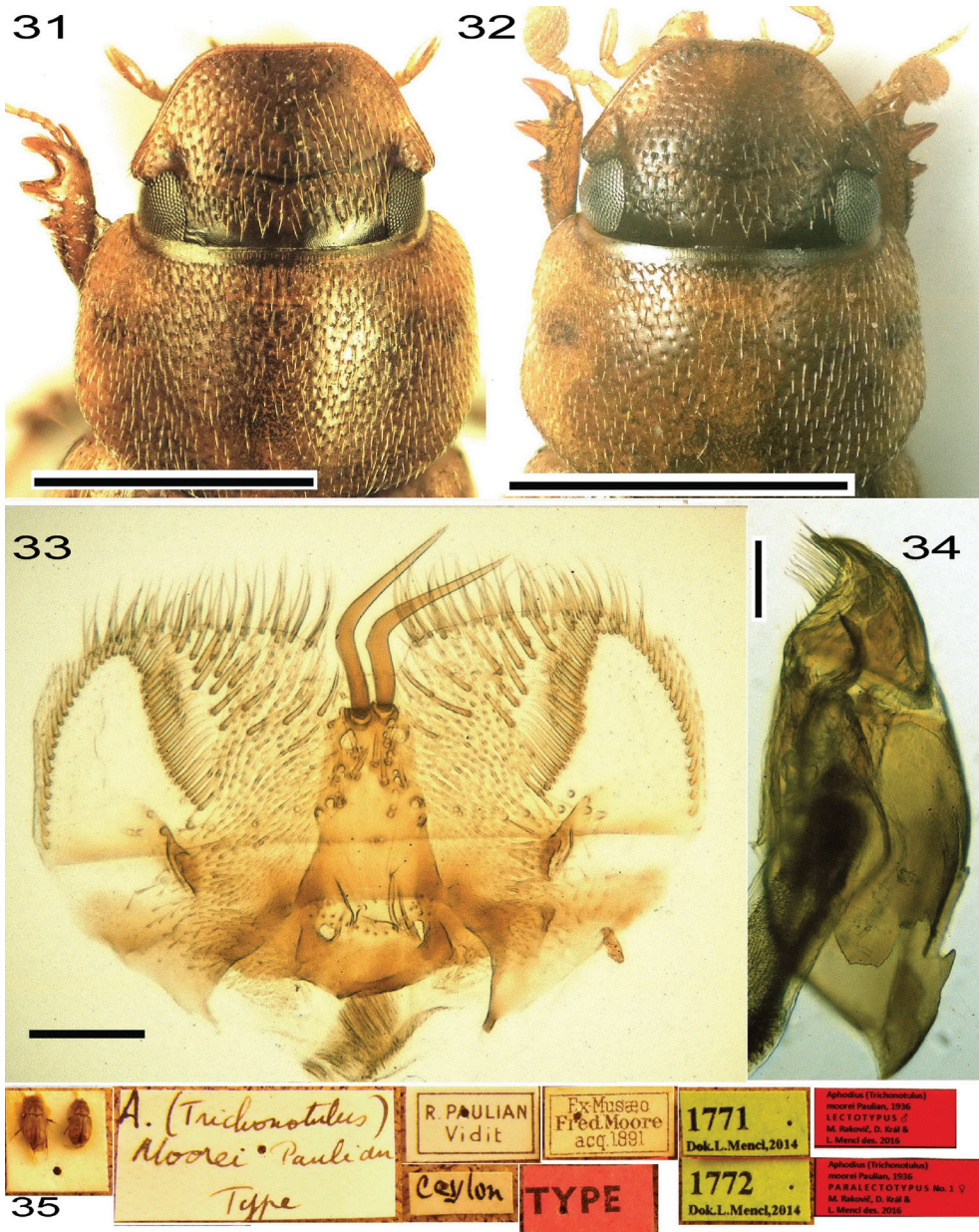
Notes. Photos of the habitus (Figs. 25-30) and details of the head, epipharynx and aedeagus (Figs. 20-23) are presented here for the male lectotype and/or female paralectotype. Fig. 24. shows labels pinned under the lectotype and paralectotype specimens.

Contrastingly to the preceding two species, which have prevalently dark brown to black head and pronotum, and exert considerable variability in the elytra colour, the species *T. moorei* is fairly uniform in appearance. The whole dorsal surface is yellowish brown. The elytra have a light preapical spot surrounded by darker marking (Figs. 25 and 28). The spot can be moderately smaller or larger and more or less contrast.

Distribution. India: Goa, Karnataka, Rajasthan, Tamil Nadu, Uttarakhand, West Bengal; Sri Lanka (Balthasar 1964, Král & Šípek 2013, Stebnicka 1988, present data).



Figs. 25-30. *Trichaphodius moorei* (Paulian, 1936) comb. nov., habitus: 25- lectotype, ♂, dorsal aspect; 26- lectotype, ♂, lateral aspect; 27- lectotype, ♂, ventral aspect; 28- paralectotype, ♀, dorsal aspect; 29- paralectotype, ♀, lateral aspect; 30- paralectotype, ♀, ventral aspect. Scale line 1 mm. Photographs by L. Mencl.



Figs. 31-35. *Trichaphodius moorei* (Paulian, 1936), comb. nov., details and labels: 31- lectotype, ♂, head, dorsal aspect; 32- paralectotype, ♀, head, dorsal aspect; 33- lectotype, ♂, epipharynx; 34- lectotype, ♂, aedeagus, lateral aspect; 35- original situation of lectotype (left) and paralectotype (right) and labels pinned under types. Scale lines: 0.5 mm for head, 0.1 mm for epipharynx and aedeagus. Photographs by L. Mencel.

***Trichaphodius sipeki* sp. nov.**
(Figs. 36-47)

Aphodius (*Trichaphodius*) *hindustanicus* [partim, specimen from Rajasthan, see Note below for details]: Král & Šípek 2013: 645 (distribution).

Type locality. India, Rajasthan, 100 km west of Udaipur, Mt. Abu env., 24°35'35"N 72°42'72"E, 1150 m a. s. l.

Type material. Holotype, ♂ (NMPC), India: Rajasthan: "INDIA bor. occ. / RAJASTHAN province / 100 km W of Udaipur / MT. ABU env. 1150 m [white, printed label] // INDIA 2002 Expedition / 24°35'35"N 72°42'72"E / 24. - 27. Viii. 2002 / P. Šípek & M. Fikáček lgt. [white, printed label] // ex coll. D. Král / National Museum / Prague, Czech Republic [white, printed label] // 2255 / Dok.L.Mencl, 2016 [pale green, printed label] // *Trichaphodius* / *sipeki* sp. nov. ♂ / H O L O T Y P U S / M. Rakovič, D. Král & / L. Mencl det. 2016 [red, printed label]. Allotype, ♀ (NMPC), "Himalaya [white, handwritten label] // Sammlung / Cl. Müller [white, printed label] // 2256 / Dok.L.Mencl, 2016 [pale green, printed label] // *Trichaphodius* / *sipeki* sp. nov. ♀ / A L L O T Y P U S / M. Rakovič, D. Král & / L. Mencl det. 2016 [red, printed label] //". Labels belonging to the male lectotype and female paralectotype are depicted in Figs. 46 and 47, respectively.

Description of holotype (♂). Dorsum (Figs. 36-41). Small (total body length of 3.9 mm), moderately broader behind (length-to-width ratio 2.11), dorsal surface matte, mostly (pronotum and elytra) macrosetaceous, yellowish brown (head and pronotum darker than elytra).

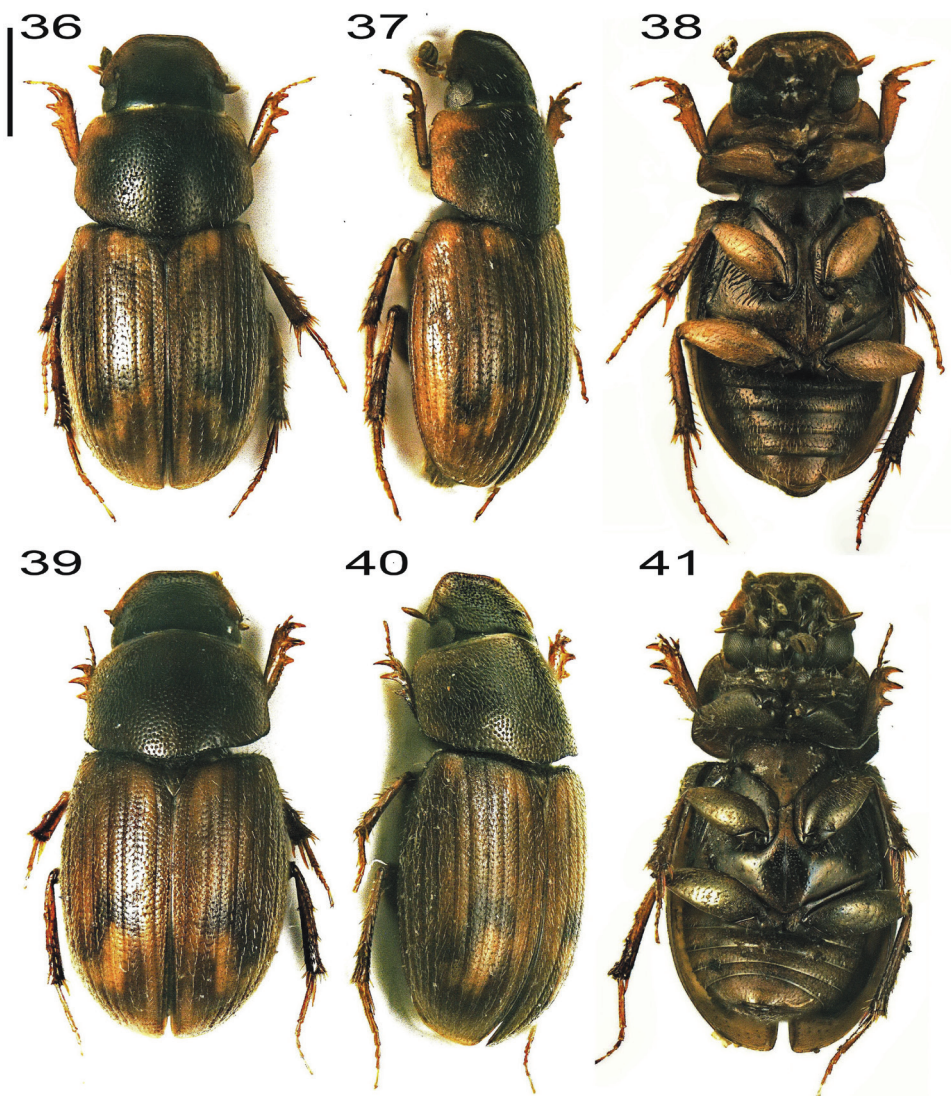
Head (Fig. 42), only moderately convex, with poorly distinct frontoclypeal suture. Clypeus with shallow, but still distinct anteromedian emargination, broadly rounded each side of it. Clypeus anterior margin moderately, narrowly lifted upward, lateral margins nearly straight and aligned with anterior margins of genae; genae about rectangular, protruding more than large eyes. Head surface nearly glabrous (at most with few minute macrosetae), with rather shallow and transversal punctures.

Epipharynx (Fig. 44) transverse, anterior margin deeply sinuate at middle, regularly rounded anterolaterally; epitorma long, slender, weakly divergent basad; helus with about two decades of short, stout macrosetae; corypha with two long, stout, remarkably obliquely refracted apical spiculae; acropariae covered with numerous stout, long macrosetae; chaetopariae with remarkably strong macrosetae, intermixed with numerous, densely spaced fine, relatively long macrosetae; prophobae with dense row of strong, long macrosetae; lateral margin with row of numerous, densely spaced setae; tormae short, slightly sclerotized.

Pronotum transversal (length-to-width ratio of 0.727), widest just at posterior corners, from there nearly straight narrowing toward moderately rounded anterior corners, with non-bordered margins; basal margin distinctly bisinuate each side of midline. Punctures on pronotum surface rough, dense, setigerous, uniform in size and distribution.

Scutellum small (its length equals to about 0.10 elytral suture length), triangular, its surface with few very fine punctures.

Elytra widest at about their midlength (their length-to-width ratio of 1.29), moderately wider than pronotum (pronotum width to elytra width ratio of 0.868), with ten striae and ten intervals, without humeral denticles. Striae fine, narrow, finely punctate; distances between punctures about equal to puncture diameter. Intervals shagreened, each interval mostly with two rows of setigerous punctures; three series of setigerous punctures present to a lesser



Figs. 36-41. *Trichaphodius sipeki* sp. nov., habitus: 36- holotype, ♂, dorsal aspect; 37- holotype, ♂, dorsolateral aspect; 38- holotype, ♂, ventral aspect; 39- allotype, ♀, dorsal aspect; 40- allotype, ♀, dorsolateral aspect; 41- allotype, ♀, ventral aspect. Scale line 1 mm. Photographs by L. Mencl.

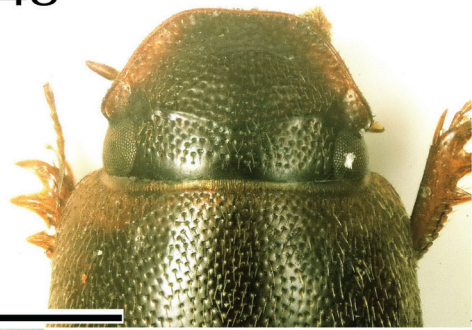
extent (in some lateral intervals). Elytra mostly yellowish brown, paler than pronotum and head, each elytron with a light preapical spot surrounded by dark marking.

Protibia with three large outer teeth; small denticles between the third tooth and protibial base nine in number, well distinct under high magnification only, with semierect macrosetae intercalated between them; apical spur with blunt tip. Metatibia apex fimbriate with not

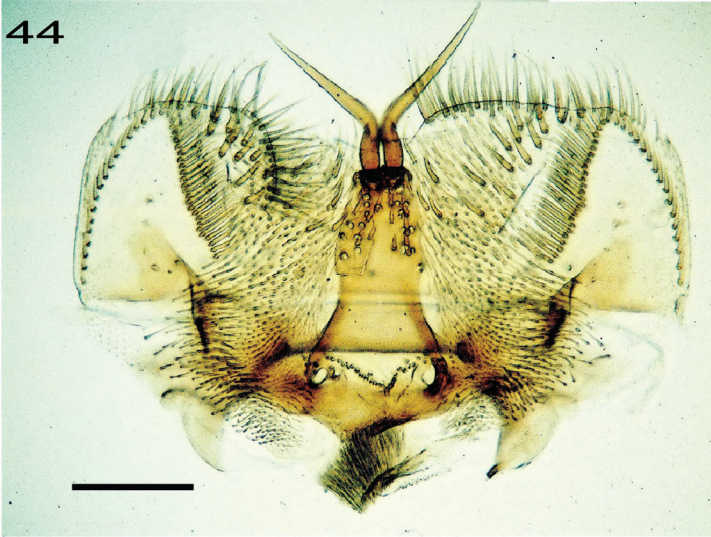
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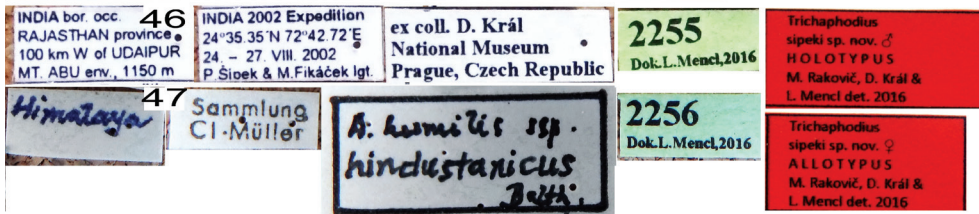
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Figs. 42-47. *Trichaphodius sipeki* sp. nov., details and labels: 42- holotype, ♂, head, dorsal aspect; 43- allotype, ♀, head, dorsal aspect; 44- holotype, ♂, epipharynx; 45- holotype, ♂, aedeagus, lateral aspect; 46- labels pinned under holotype; 47- labels pinned under allotype. Scale lines: 0.5 mm for head, 0.1 mm for epipharynx and aedeagus. Photographs by L. Mencl.

numerous unequal spinules; superior terminal spur straight, slightly exceeding half basal metatarsomere; inferior apical spur continuously arcuately bent outward from its base to its tip, reaching about half terminal spur; basal metatarsomere considerably longer than metatarsomeres 2-4 combined.

Ventrum (Figs. 38 and 41). Punctate, macrosetaceous; punctures fine, but slightly rough (rasplike), sparser on femora, denser on abdominal ventrites and metaventrums; macrosetae more distinct on abdominal sternites, less distinct on femora; metaventral plate with narrow, complete longitudinal furrow.

Aedeagus (Fig. 45). Parameres remarkably short, approximately one third of phallobasis length; beak like curved downward in lateral view; apex acute, with tuft of numerous long, fine macrosetae.

Sexual dimorphism. Area around the longitudinal furrow of the metaventral plate is flat in the male, concave in the female. There are otherwise no peculiar differences as to characters of the secondary sexual dimorphism between the male and female

Variability. Only the male holotype and female allotype are known. Their body length is of 4.2 and 4.3, respectively. There is also an only slight difference in the colour pattern (darker and paler areas) between the two specimens; the darker area reaches the elytra base on interval 5 in the holotype and on intervals 4-5 in the allotype (Figs. 36 and 39).

Differential diagnosis. Within the framework of the area considered in the present work, the new species is closest to *Trichaphodius moorei* due to its roughly punctate, densely macrosetaceous pronotum surface. The two species can be reliably differentiated from each other based on the Key to species presented below (couple 5, 6).

Collecting circumstances. The type locality is situated on an altiplano in the Arávalli moutanin range. The mountains are covered with subtropical evergreen and semideciduous forests. The specimens were collected individually in cow and buffalo dungpads (see also Král & Šípek 2013, for further details)

Distribution. North India: Rajasthan; “the Himalayas”.

Name derivation. Patronymic, named in honour of our colleague and one of collectors of the type specimens Petr Šípek (Charles University in Prague, Czech Republic).

Note. Král & Šípek (2013) reported the species *Trichaphodius hindustanicus* from Rajasthan and Goa. The specimen collected in Rajasthan actually belonged to the species *T. sipeki* sp. nov. The second specimen reported from the state of Goa there actually does not exist; the reference was included into the table (Král & Šípek 2013: table 1) by mistake.

KEY TO ASIAN SPECIES OF THE GENUS *TRICHAPHODIUS**

- 1 (4) Pronotal punctuation simple, punctures mostly not macrosetigerous. Dorsal surfaces more or less shining. Head and pronotum dark, nearly black throughout (at most anterior corners of pronotum and lateral margins of clypeus brownish in some individuals).
- 2 (3) A considerably more elongate species, widest slightly behind elytra midlength, elytra length to elytra width ratio of about 1.4-1.5 (Figs. 1 and 4). Pronotum basal margin finely sinuate laterally; in dorsal aspect, posterior

- corner of pronotum forms rounded angle. 3.2-4.1 mm. North Pakistan, Nepal, North India (Himachal Pradesh Uttarakhand), East India. *Trichaphodius hindustanicus* (Balthasar)
- 3 (2) A relatively shorter species, widest at about elytra midlength, elytra length to elytra width ratio of about 1.3 (Figs. 12 and 16). Pronotum basal margin without any sinuation; in dorsal aspect, posterior part of pronotum lateral margin, posterior pronotal corner and lateral part of basal pronotal margin produce continuous arc. 3.4-3.9 mm. Pakistan, North India (Uttarakhand), East India (Arunachal Pradesh, West Bengal), Nepal. *Trichaphodius jirianus* (Balthasar) stat. restit., comb. nov.
- 4 (1) Pronotal punctation rough (rasplike), punctures macrosetigerous. Dorsal surfaces matter. Head and pronotum, yellow or yellowish brown.
- 5(6) A smaller, slender species (elytra length to elytra width ratio of about 1.4). Major proportions of all dorsal surfaces (of head, pronotum and elytra) comparable in colour (mostly yellow). Macrosetation on head surface dense, comparable to that on pronotum. Clypeus truncate (not emarginate) anteriorly. 2.8-3.5 mm. North India (Rajasthan, Uttarakhand), East India (West Bengal), South India (Goa, Karnataka, Puducherry, Tamil Nadu), Sri Lanka. *Trichaphodius moorei* (Paulian) comb. nov.
- 6 (5) A larger, more robust species (elytra length to elytra width ratio of about 1.3). Prevalent proportions of head and pronotum surface areas noticeably darker than that of elytra (but brown, not black). Macrosetation nearly absent on head surface, dense on pronotum surface. Clypeus with slight but still present anteromedian emargination. 4.2-4.3 mm. North India (Rajasthan, "the Himalayas"). *Trichaphodius sipeki* sp. nov.

***Note.** The present work is based on material from the Indian Subcontinent, but the present Key actually concerns the Asian fauna of the genus in general with the following exception. The species *Trichaphodius andreinii* (Balthasar, 1939) and *T. foveiventris* (Raffray, 1877) were reported by Pittino (1984) from the Arabian Peninsula; these are, however, Afrotropical species (Endrődi 1964), which penetrated from Africa to Arabia; in addition, we believe that the true *Trichaphodius* includes only Asian species considered here and African species of the *T. humilis* group as defined by Bordat (1989); a future new generic placement of many Afrotropical species still considered within *Trichaphodius* can be expected, but this is beyond the competence of the present authors.

DISCUSSION

The new species described here, *Trichaphodius sipeki* sp. nov., is closest to *Trichaphodius moorei*, but can be reliably differentiated from it based on considerable differences shown in the Key to species. The synonymy of *T. jirianus* (Balthasar, 1965) with *T. hindustanicus* (Balthasar, 1935) is out of question, which can be demonstrated by differences in their characters, as summarized in the Key, and also by photos presented here (Figs. 1-10 and 12-23). They exert a similar pattern of the distribution and inhabit a transitional Palearctic zone extending from Pakistan through North India, Nepal to northern East India. The two species were also found simultaneously at some locations in Uttarakhand, as shown in paragraphs Additional material examined.

It is to expect that some of the species discussed here also occur in certain other states of India, but the distribution as reported in the present work is based only on specimen we had a chance to examine and provide their reliable identification.

As can be seen from data concerning additional materials studied, habitats preferred by the species *T. humilis* and *T. jirianus* are likely to be highlands and mountains, whereas *T. moorei* was frequently found in lowlands. Members of the genus *Trichaphodius* belong to best fliers within Aphodiinae. These facts can explain the considerably large extent of the *T. moorei* propagation (between North India and southern tip of the subcontinent including Sri Lanka).

In a work by Stebnicka (1989), the distribution of *Trichaphodius humilis* is also considered as follows: “Africa, Madagascar, Ceylon, South India”. In our opinions, the species is, however, exclusively Afrotropical. Its occurrence in the Indian Subcontinent is impossible. The data from Sri Lanka and South India probably resulted from a confusion with *T. moorei*, which is similar in its colour and pronotal sculpture, but different in the body size and shape (*T. humilis* is more elongate and larger in average). No *Trichaphodius* was also mentioned in a comprehensive work dealing with the Malgasy fauna (Bordat et al. 1990).

In some species, distributional data from different authors are taken into account, but general taking over is avoided. The occurrence in particular countries and particular States of India presented in the Key to species and in paragraphs Distribution is thus strictly based on verified finds.

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