New species of the genus Nebria Latreille, 1802 (Epinebriola K. & J. Daniel, 1904) from eastern Central Nepal Himalaya (Coleoptera, Carabidae)

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New species of the genus *Nebria* Latreille, 1802 (*Epinebriola* K. & J. Daniel, 1904) from eastern Central Nepal Himalaya (Coleoptera, Carabidae)

Charles Huber & Joachim Schmidt

ABSTRACT Contrib. Nat. Hist. 9: 1–14.

Two new species of the genus *Nebria* Latreille, 1802 (subgenus *Epinebriola* K. & J. Daniel, 1904) from the upper Rolwaling valley in eastern Central Nepal are described: *Nebria* (*Epinebriola*) *molendai* sp. nov. and *Nebria* (*Epinebriola*) *christinae* sp. nov.. Based on additional material from the upper Tamur valley in the Eastern Nepal Himalaya, a description of the unknown male of *Nebria* (*Epinebriola*) *schawalleri* Shilenkov, 1998 is given.

Zusammenfassung: Zwei neue *Nebria*-Arten der Untergattung *Epinebriola* K. & J. Daniel, 1904 aus dem oberen Rolwaling Tal (östliches Zentral-Nepal) werden beschrieben: *Nebria* (*Epinebriola*) *molendai* sp. nov. und *Nebria* (*Epinebriola*) *christinae* sp. nov.. Dank neuer Funde im oberen Tamur Tal (Ost-Nepal) kann das bislang unbekannte Männchen von *Nebria* (*Epinebriola*) *schawalleri* Shilenkov, 1998 beschrieben werden.

Keywords: Coleoptera, Carabidae, *Nebria*, *Epinebriola*, taxonomy, new species, Himalaya, Nepal.

Introduction

The alpine zone on the northern slope of the Solu Khumbu massif and the adjacent northern Rolwaling Himal (Gaurishankar massif) in the eastern Central Nepal Himalaya near the Tibetan border are faunistically poorly investigated. The region is accessible only by several days' march through the Rolwaling valley, which represents an eastern valley of the upper Tama Koshi river (Fig. 12). The only entomological expedition into the Rolwaling valley known so far is that of H. Löffler (Zoologische Staatssammlung München), resulting in the description of a new species of the genus *Carabus* (Mandl 1970).

During the fighting between the Maoist rebels and the Royal Nepalese Army, the region of the upper Tama Koshi river was inaccessible. In a period of calm the co-author undertook two entomological study trips into the upper Tama Koshi valley and the Rolwaling valley in August/September 1999 and May/June 2000. Up to now only a small part of the rich collected material has been analyzed, resulting in the description of the male of *Carabus koganae angustipennis* Mandl, 1970 (Deuve 2000) and the redescription of *Chydaeus irvinae* (Andrewes, 1930) (Kataev & Schmidt 2001). In the present paper two new species of the genus *Nebria* Latreille, 1802, subgenus *Epinebriola* K. & J. Daniel, 1904, are described. The material dates from the second study trip into the Rolwaling valley.

The subgenus *Epinebriola* is restricted to the Himalaya. Twenty species are known so far, most of them from the western part of the Himalaya (Afghanistan, Pakistan, Kashmir, India). In the Eastern Himalaya two species (*Nebria orestias* Andrewes, 1932, *N. rasa* Andrewes, 1936) are known from Eastern Nepal and Sikkim (Andrewes 1932, 1936), and two species from Nepalese localities only (*N. schawalleri* Shilwenkov, 1998, *N. tangjelaensis* Shilenkov, 1998). *N. zayula* Andrewes, 1936, is known from the Zayul valley in Southeastern Tibet, north of Myanmar. These five species were combined by Ledoux & Roux (2005) in the *zayula* group for geographical reasons. There is a distributional gap of nearly 800 kilometres between the *Epinebriola* species of the *zayula* group from the Eastern Nepal Himalaya to the western species in Uttar Pradesh in India. Additional unknown species are expected to occur in this distributional gap (Ledoux & Roux 2005). The two new species reduce the apparent wide gap in the *Epinebriola* distribution.

Nebria (*Epinebriola*) *schawalleri* Shilenkov, 1998 was described on a female specimen only. No additional specimens were known so far. Expeditions into the upper Tamur valley (Ghunsa Valley) of the Taplejung district in Eastern Nepal have provided new records of this taxon, and the description of the unknown male genitalia is given.

Abbreviations and material depository:

cJS = coll. Joachim Schmidt, Admannshagen, Germany
NMBE = Natural History Museum Bern, Switzerland
NME = Naturkundemuseum Erfurt, Germany
SMNS = Staatliches Museum für Naturkunde Stuttgart, Germany

EL = elytra length
EW = elytra width
HW = head width

PL = pronotum length
PBW = pronotum base width
PW = pronotum width

The photographs are made with a reflex camera Canon D30 and with the auto-montage software Syncroscopy.

Descriptions

***Nebria* (*Epinebriola*) *molendai* sp. nov.** (Fig. 1)

Holotype,♂: Nepal, Rolwaling valley, Na to Omai Tsho lake, 4100–4500 m, 22. 5. 2000, leg. Schmidt (NMBE).

Paratypes: 26 ♂♂, 16 ♀♀, same labels: Nepal, Rolwaling valley, Na to Omai Tsho lake, 4100–4500 m, 22. 5. 2000, leg. Schmidt (cJS, NMBE); 1 ♂ 2 ♀♀, Na to Tsho Rolpa lake, 21. 5. 2000, leg. Schmidt (cJS); 43 ♂♂, 21 ♀♀, Tsho Rolpa lake, 4400 m, 21. 5. 2000, leg. Schmidt (cJS, NMBE, NME, SMNS); 2 ♂♂ Na to Yarlung Ri Base Camp, 4200–4900m, 23. 5. 2000, leg. Schmidt (cJS).

Size large, body length 12–13.5 mm. Colour dark brownish to black, shiny, appendages of head piceous. Legs black, tarsi brown.

Head (Fig. 2) with a shallow transverse impression behind the prominent eyes. Labrum with anterior margin straight, bearing 6 setae. Apical margin of clypeus straight. Clypeus laterally unisetose. Supraorbital setae variable, generally 1 seta (78%), sometimes asymmetrically bisetose (19%), rarely bisetose (3%). Frontal furrows shallow. Vertex distinctly wrinkled. Antennae long and slender extending to the middle of the elytra. Antennal scape elongate (Fig. 1), a little longer than the eye's diameter, basally narrowed, cylindrical apically, with 1 dorsal seta. Second antennomere with 1 seta ventroapically. Penultimate labial palpomere trisetose. Mentum with bifid medial tooth. Submentum with a row of 14 setae. Microsculpture of the head isodiametric, sparsely punctate on vertex.

Pronotum (Fig. 2) slender, subcordate, moderately convex, narrowed basally, lateral margin straight in basal half, convexly narrowed to the hind angle; no concave sinuation before the basal angles. Lateral explanation narrow with a conspicuous groove, broadened basally. Lateral margin basally blade-like, obliquely or vertically bent upwards. Basal angles acute, projected poste-

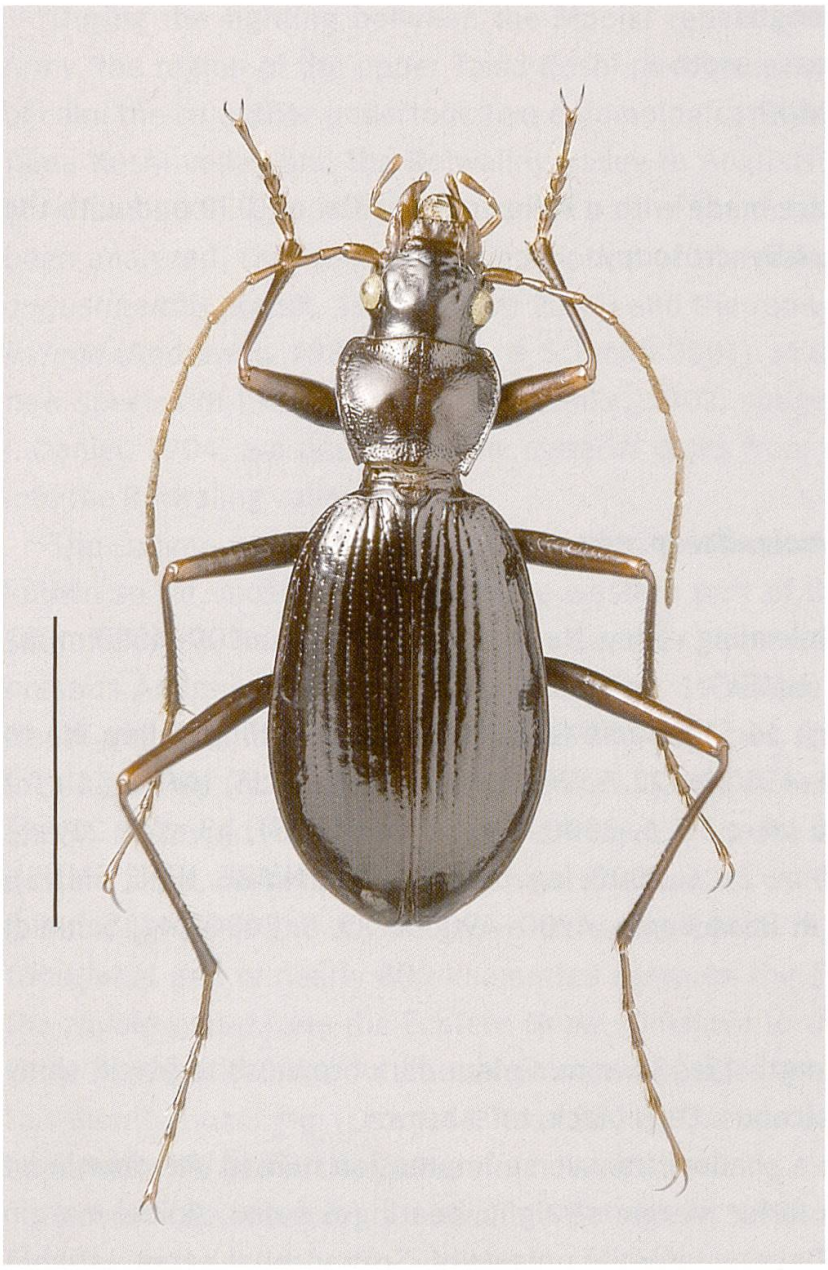
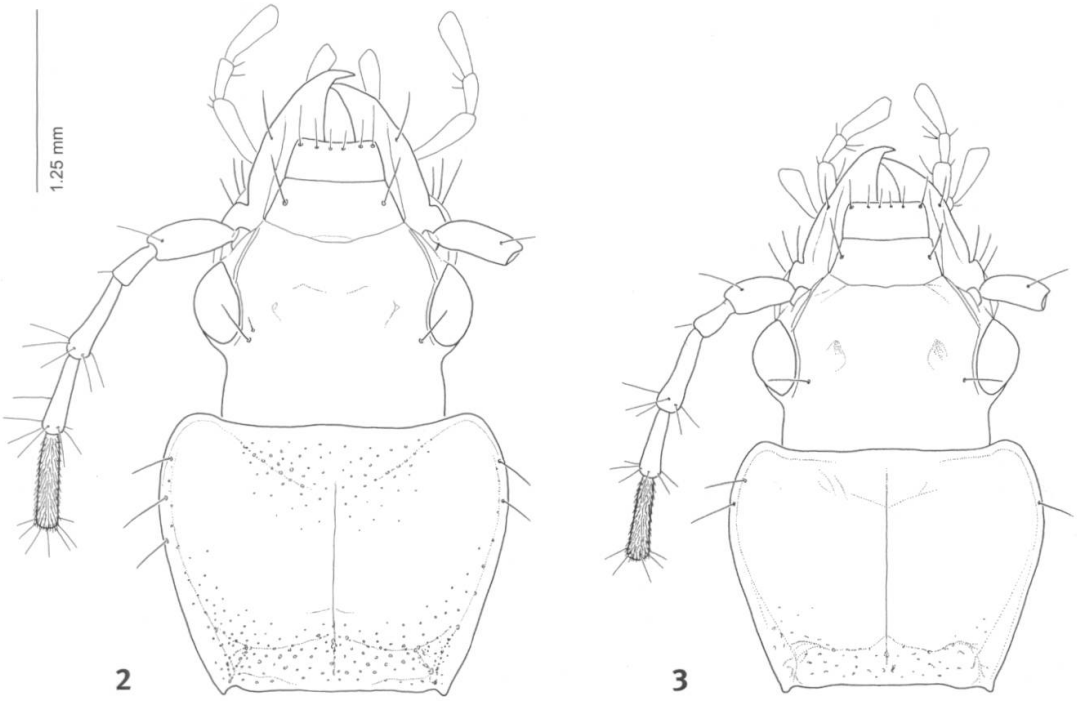


Fig. 1: *Nebria* (*Epinebriola*) *molendai* sp. nov., male.
Origin: Na to Omai Tsho lake, 4100–4500 m.
Scale: 5 mm.

riorly. Apical angles wide, rounded, weakly protruding. Basal margin bisinuate, before the hind angle a strong incision towards the basal fovea. Pronotal disc weakly convex. Basal fovea deep, apical and posterior transverse impressions deep, well-defined; median longitudinal impression weak. Basal fovea, lateral and transverse impressions tightly and strongly punctate. Punctation of the apical transverse impression extended to the apical margin. Posterior transverse impression as well as the posterior part of the median longitudinal impression with faint wrinkles. Apical margination restricted to lateral one-third; basal margination absent. Basolateral seta absent (58%), present on one side (22%), present on both sides (20%). 2–3 (rarely 4) midlateral setae in the apical half of the pronotum. Microsculpture of the pronotum isodiamet-

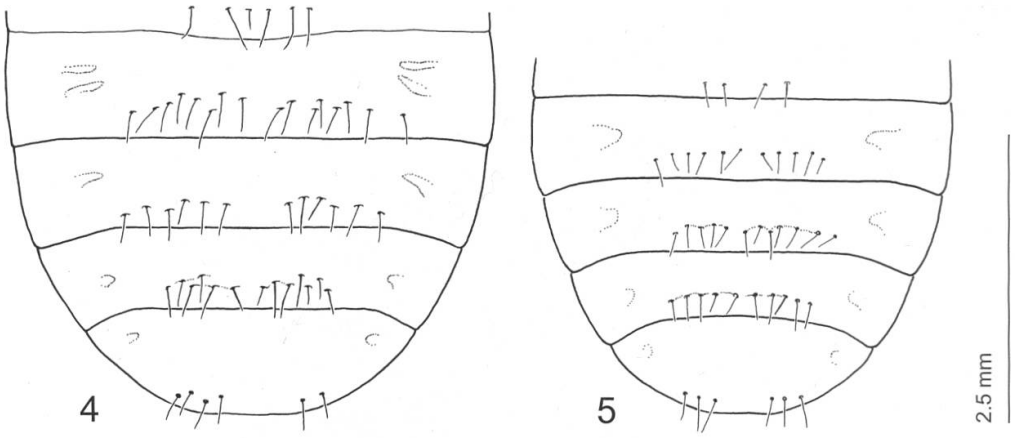


Figs. 2–3. 2: Head and pronotum of *Nebria* (*Epinebriola*) *molendai* sp. nov. 3: Head and pronotum of *Nebria* (*Epinebriola*) *christinae* sp. nov.

ric, sparsely and faintly punctate on disc. Proepisternum sparsely and faintly punctate; prosternal process elongate, rounded apically, unmargined at apex, weakly margined at sides.

Elytral outline moderately convex, ovoid-elongate, narrowed basally, widest in the apical half of the elytra, no subapical sinuation. Elytral apex sharp. Basal margination straight, smoothly merged, or joined at an obtuse angle, with the lateral margination. Humeral carina faintly developed. Subapical carina evanescent. Striae distinct on disc, markedly punctate. Striae and punctation obliterate towards the basal margin and towards the apex; stria 8 visible as a faint trace of punctation. Intervals rather convex, more convex on disc and towards the basal margin; interval 3 with 3–6 small setae adjoining stria 3. Scutellar seta present. Microsculpture transverse, oblong. Mesepisterna smooth with a few strong punctulae. Metepisterna 1.6 times as long as wide; smooth with longitudinal impression, sparsely and strongly punctate. Metacoxa with 2–3 basal and 1 apical setae. Hindwings present as a short strap-like vestige.

Third to fifth visible abdominal sterna (sterna 4–6 sensu Ledoux & Roux 2005) each with 5–6 posterior paramedial setae, second abdominal sternum with a row of 6–8 medial setae (Fig. 4). Anal sternum with 2–4 paramedial setae in male, 3–5 in female. All sterna with faint impressions laterally.



Figs. 4–5. 4: Ventral sterna of *Nebria* (*Epinebriola*) *molendai* sp. nov.; 5: Ventral sterna of *Nebria* (*Epinebriola*) *christinae* sp. nov.

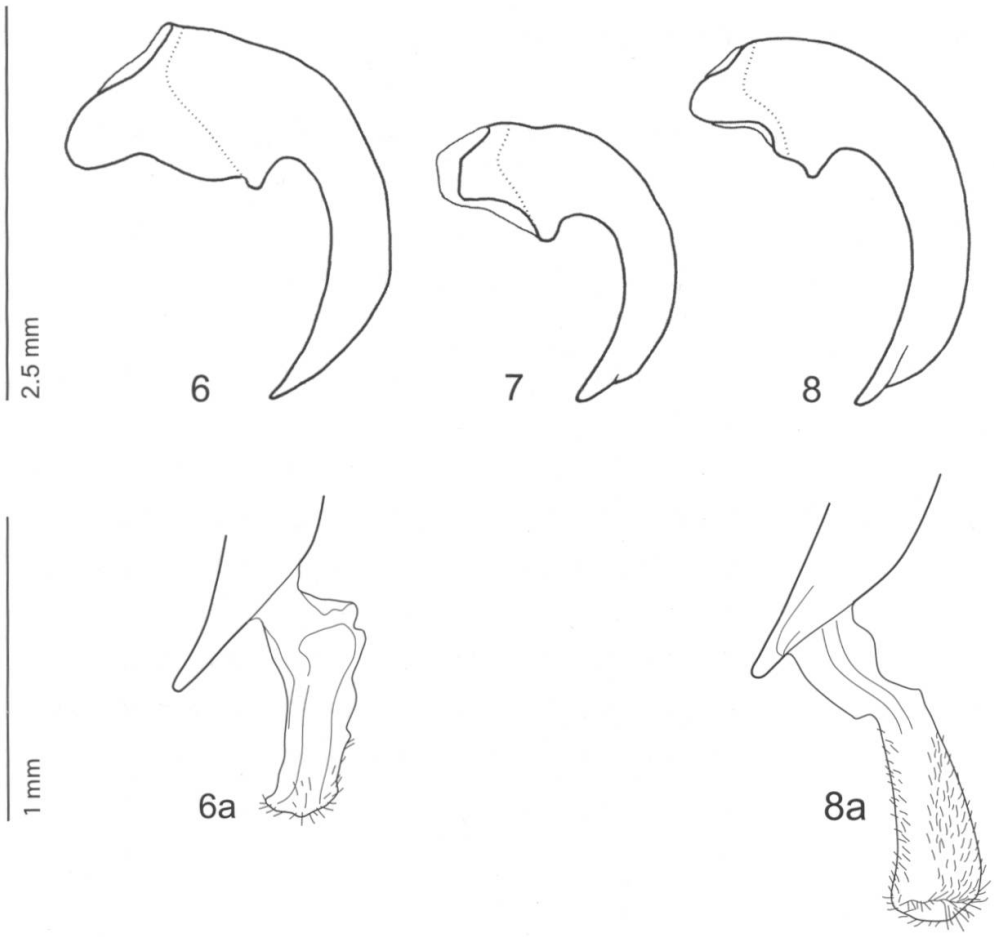
Legs long and slender. All tarsi without dorsal pubescence, rarely with a few short setae. Front tarsus of male with tarsomeres 1–3 distinctly broader than those in female, and with pads of adhesive setae ventrally. Apex of posterior tarsomere 4 markedly projected.

Median lobe (Fig. 6): Basal part of the median lobe wide, with prominent triangular basolateral lobes which are separated from the median lobe by a suture-like line. Mid-shaft strongly curved at base, moderately at apex. Apex slender, acute, like a long triangle in dorsal view, faintly deflected ventrally and left. The shaft of the everted internal sac sparsely covered with short setae (Fig. 6a). Apical gonocoxite of female (Fig. 10) broader than in *N. christinae* sp. nov., ventral medial face with a diagonal row of 3–4 setae along a membranous field; inner margin with 2 setae.

Proportions: PW/HW = 1.23 ± 0.021 (1.15–1.27); PW/PBW = 1.57 ± 0.041 (1.46–1.70); EW/PW = 1.66 ± 0.040 (1.60–1.78); PW/PL = 1.25 ± 0.022 (1.18–1.33); EL/EW = 1.66 ± 0.036 (1.56–1.73).

Diagnosis: The setation of the second abdominal sternum is unique to *N. molendai* sp. nov. and to *N. christinae sp.* nov. (see below), separating both species from all representatives of the subgenus *Epinebriola*.

N. molendai sp. nov. differs from *N. christinae* sp. nov. by the larger number of medial setae in the second abdominal sternum, by the distinct punctation of the pronotal impressions, by the different shaping of the pronotal basal angles, and by the pronotal apical angles, which only weakly protrude. Furthermore *N. molendai* sp. nov. differs from *N. schawalleri* by the presence of three setae on the penultimate labial palpomere (2 in *schawalleri*), by the presence of usually one supraorbital seta (2 in *schawalleri*), the presence of only 2–3 midlateral setae of the pronotum (5–6 setae in *schawalleri*), and the different pronotum, especially by the strong punctation on base and front, and



Figs. 6–8. 6: Median lobe (lateral) of *Nebria* (*Epinebriola*) *molendai* sp. nov.; 6a: Everted internal sac of *Nebria* (*Epinebriola*) *molendai* sp. nov.; 7: Median lobe (lateral) of *Nebria* (*Epinebriola*) *christinae* sp. nov.; 8: Median lobe (lateral) of *Nebria* (*Epinebriola*) *schawalleri* Shilenkov, 1998; 8a: Everted internal sac of *Nebria* (*Epinebriola*) *schawalleri* Shilenkov, 1998.

the convex lateral margin of the hind angles (concave in *schawalleri*). It differs from *N. orestias* and from *N. tangjelaensis* by the presence of scutellar setae, the polysetose lateral margin of the pronotum (in both species unisetose) and the polysetose basal margin of the coxa (in both species unisetose). In *N. rasa* the penultimate labial palpomere is bisetose (trisetose in *molendai* sp. nov.).

Geographical range (Fig. 12): Known only from the uppermost Rolwaling valley in the eastern Central Nepal Himalaya. Sympatric and at least in one place (Na to Yarlung Ri base camp) also syntopic with *Nebria* (*Epinebriola*) *christinae* sp. nov. (see below).

Ecology: Stenohygrophilic; in frost debris soil along meltwater rivulets.

Larvae: unknown.

Etymology: We dedicate the new species to the memory of our friend and colleague Roland Molenda, University of Basel. Through his untimely death we lost an important partner in our ongoing molecular and zoogeographical projects on alpine *Carabus* and *Nebria* species from the Himalaya and the Alps.

***Nebria* (*Epinebriola*) *christinae* sp. nov.** (Fig. 9)

Holotype, ♂: Nepal, Rolwaling valley, Na to Yarlung Ri Base Camp, 4200–4900m, 23. 5. 2000, leg. J. Schmidt (NMBE).

Paratypes: 4 ♂♂, 7 ♀♀, with same labels: Nepal, Rolwaling valley, Na to Yarlung Ri Base Camp, 4200–4900m, 23. 5. 2000, leg. J. Schmidt. (cJS, NMBE).

Size medium, body length 10–11 mm. Colour dark brownish to black, shiny, appendages of head piceous. Legs black, tarsi brown.

Head (Fig. 3) with a shallow transverse impression behind the prominent eyes. Labrum with anterior margin straight, bearing 6 setae. Apical margin of clypeus straight. Clypeus laterally unisetose. 1 supraorbital seta on each side. Frontal furrows flat. Vertex distinctly wrinkled. Antennae long and very slender, hardly extending to the middle of the elytra. Antennal scape stocky (Fig. 3), shorter than the eye's diameter, narrowed towards base and apex; with 1 dorsal seta. Second antennomere with 1 seta ventroapically. Penultimate labial palpomere trisetose. Mentum with bifid medial tooth. Submentum with a row of 12–14 setae. Microsculpture of the head isodiametric, vertex impunctate.

Pronotum (Fig. 3) slender, subcordate, moderately convex, narrowed basally, lateral margin straight in the basal half, often with a sharp concave sinuation just before the basal angles. Lateral explanation narrow with a conspicuous groove, broadened basally. Lateral margin basally blade-like, obliquely bent upwards. Basal angles acute and tooth-like, distinctly projected posteriorly. Apical angles slender, rounded, protruding. Basal margin bisinuate, before the hind angle a moderate incision towards the basal fovea. Pronotal disc weakly convex. Basal fovea deep, apical and posterior transverse impressions deep, well-defined; median longitudinal impression moderately deepened. Basal fovea, lateral and posterior transverse impression sparsely punctuate, apical part of the lateral groove and the anterior transverse impression even impunctate. Apical transverse impression with faint longitudinal wrinkles. Posterior transverse impression as well as the posterior part of the median longitudinal impression with faint wrinkles. Apical margination restricted to lateral one-third; basal margination absent. Basolateral seta normally absent (84%), present on one side (8%), present on both sides (8%). Lateral margin unisetose in the apical half of the pronotum (50%), asymmetrically bisetose (42%) and rarely bisetose (8%). Microsculpture of the pronotum isodiametric, no punctation on disc. Proepisternum impunctate; prosternal process elongate, rounded apically; apex with a longitudinal ridge, unmargined.

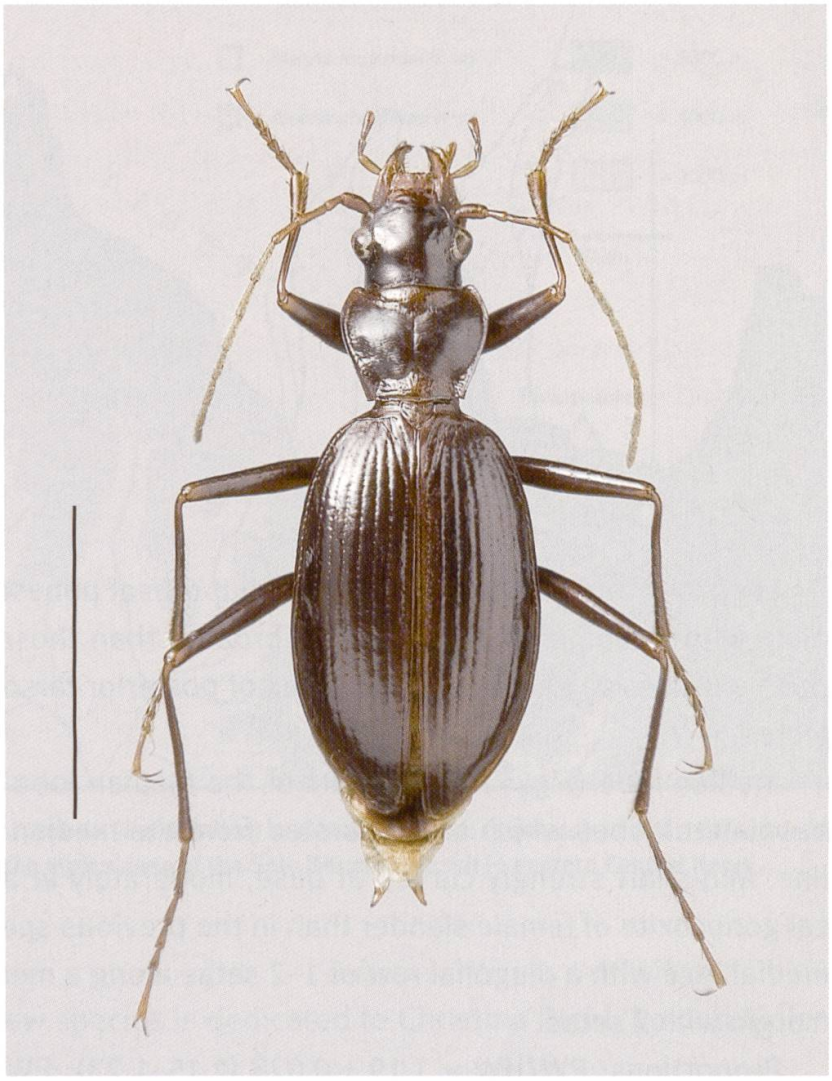
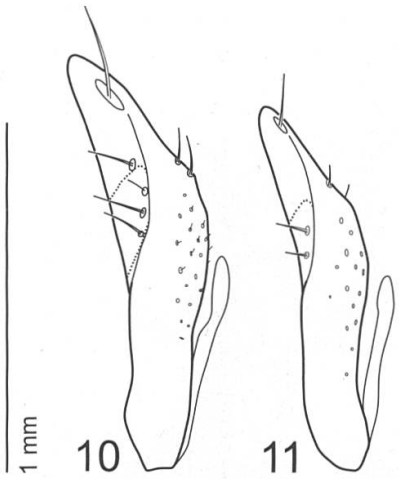


Fig. 9: *Nebria (Epinebriola) christinae* sp. nov., female.
Origin:
Na to Yarlung Ri Base Camp, 4200–4900 m.
Scale 5 mm.

Elytral outline moderately convex, ovoid, widest just behind the middle of the elytra, no subapical sinuation. Elytral apex sharp. Basal margination straight, smoothly merged with the lateral margination. Humeral sinuation more pronounced than in N. molendai. Humeral carina faintly developed. Subapical carina evanescent or absent. Striae moderate on disc, weakly punctate. Striae and punctation obliterate towards the basal margin and towards the apex; stria 8 visible as a faint trace of punctation. Intervals rather convex, more convex on disc and towards the basal margin; interval 3 without setae, rarely asymmetrically 1 dorsal seta adjoining stria 3. Scutellar seta present. Microsculpture transverse, oblong. Mesepisterna smooth. Metepisterna 1.6 times as long as wide; smooth with a longitudinal impression. Metacoxa with 2–5 basal and 1 apical setae. Hindwings present as a short strap-like vestige.

Third to fifth visible abdominal sterna each with 5–7 posterior paramedial setae, second abdominal sternum with a row of 2–6 medial setae (Fig. 5). Anal sternum with 2–3 paramedial setae in male, 3–5 in female. All sterna with faint impressions laterally.



Figs. 10–11:
10: Left apical gonocoxite of *Nebria* (*Epinebriola*) *molendai* sp. nov., ventral view;
11: Left apical gonocoxite of *Nebria* (*Epinebriola*) *christinae* sp. nov., ventral view.

Legs long and slender. All tarsi without dorsal pubescence. Front tarsus of male with tarsomeres 1–3 distinctly broader than those in female, and with pads of adhesive setae ventrally. Apex of posterior tarsomere 4 markedly projected.

Median lobe (Fig. 7): Basal part of the median lobe wide, with triangular basolateral lobes which are separated from the median lobe by a suture-like line. Mid-shaft strongly curved at base, moderately at apex. Apex short. Apical gonocoxite of female slender than in the previous species (Fig. 11), ventral medial face with a diagonal row of 1–2 setae along a membranous field; inner margin with 2 setae.

Proportions: PW/HW = 1.19 ± 0.028 (1.15–1.23); PW/PBW = 1.53 ± 0.034 (1.46–1.55); EW/PW = 1.68 ± 0.033 (1.63–1.74); PW/PL = 1.28 ± 0.039 (1.20–1.33); EL/EW = 1.63 ± 0.046 (1.56–1.69).

Diagnosis: The setation of the second abdominal sternum is unique to *N. christinae* sp. nov. and to *N. molendai* sp. nov. (see above), separating both species from all representatives of the subgenus Epinebriola. Differentiation to *N. molendai* sp. nov. see above.

N. christinae sp. nov. differs from *N. rasa*, *N, zayula* and *N. schawalleri* by the absence of setae in the elytral interval 3. In *N. christinae* sp. nov. the lateral margin of the pronotum is unisetose or asymmetrically bisetose, whereas in *N. rasa* and *N. schawalleri* the lateral margin is polysetose (3–6 setae). It differs from *N. orestias* and from *N. tangjelaensis* by the presence of scutellar setae, the polysetose basal margin of the coxa (in both species unisetose), and the absence of the basolateral seta of the pronotum

Geographical range (Fig. 12): Known only from the type locality at the North slope of the Yarlung Ri mountain on uppermost Rolwaling valley. Syntopic with *Nebria* (*Epinebriola*) *molendai* sp. nov.

Ecology: Stenohygrophilic; in frost debris soil along meltwater rivulets.

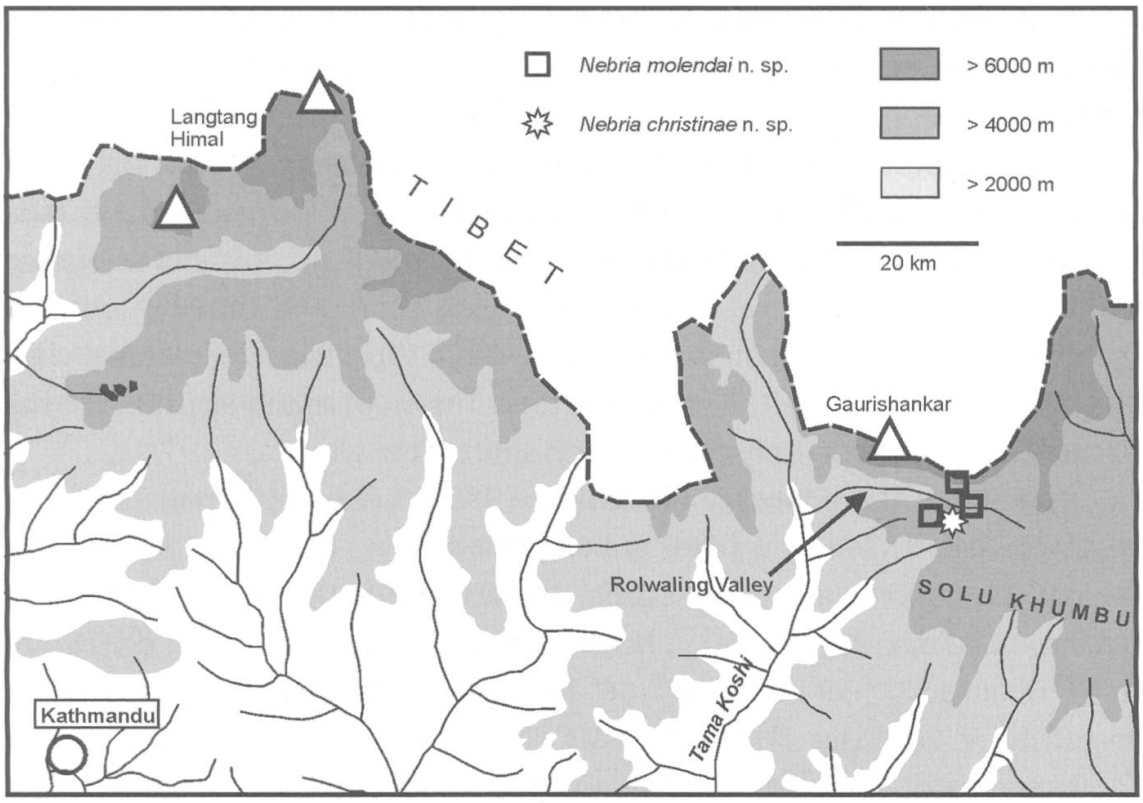


Fig. 12: Map of localities of *Nebria* (*Epinebriola*) *molendai* sp. nov. (squares) and *N.* (*Epinebriola*) *christinae* sp. nov. (star) in the alpine zone of the Solu Khumbu massif in eastern Central Nepal.

Larvae: unknown.

Etymology: The new species is dedicated to Christina Diehl, Roland Molenda's wife.

Nebria (*Epinebriola*) *schawalleri* Shilenkov, 1998

Description of the male, in addition to the description of the female holotype by Shilenkov (1998):

Setation of the head capsule: Generally with 2(–3) supraorbital setae (80%), 20% unisetose or asymmetrically bisetose. Without midfrontal seta as described in the holotype.

Pronotum: No small pitlike impressions visible on the disc as mentioned by Shilenkov (1998). Basolateral seta present, rarely asymmetrically 2 setae. The pore of the basolateral seta distinct, well visible even if the seta is missing. Series of 4–6 midlateral setae; the insertion pores are very close to the bulge of the lateral margin, thereby disturbing the regular curve of the margin.

Elytra: Scutellar seta variable, absent in 55%, asymmetrically present in 30%, present in 15%.

Third to fifth visible abdominal sterna each with 2–4 posterior paramedial setae, second abdominal sternum asetose. Anal sternum with 2–3 paramedial setae.

Median lobe (Fig. 8): Basal part of the median lobe wide, with triangular basal lobes on both sides as in *N. (Epinebriola) rasa* Andrewes, 1936 (see Shilenkov 1998), and as in *N. (Epinebriola) molendai* sp. nov. and *N. (Epinebriola) christinae* sp. nov. (see above). Apex short and broadly rounded (shorter and less acute than in *molendai*), like a short triangle in dorsal view. Apex faintly deflected left, but not ventrally. The shaft of the everted internal sac extendedly and densely covered with short setae (Fig. 8a).

Distribution: type locality (Shilenkov 1998): 1 female, Nepal, Taplejung distr., ascent to Tangje La NW Walungchung Gola, 4400–4600 m, alpine steppe, 23. 5. 1988, leg. Martens & Schawaller: SMNS.

New localities: 5 ♂♂, 5 ♀♀, Nepal, Mechi province, Taplejung distr., 500 m NE Ghunsa, 27° 39' 48"N, 87° 56' 36"E, 3500–3600 m, stone debris/mix. forest, 10. V. 2003, leg. A. Weigel; NME. 2 ♂♂, 8 ♀♀, Nepal, Mechi province, Taplejung distr., 13 km NE Ghunsa, Ghunsa Khola between Kambachen and Lhonak, 27° 45' 50"N, 87° 59' 49"E, 4200–4800 m, waterfall, alpine mats, stone debris, 14. V. 2003, leg. E. Grill; NME. 5 ♂♂, Nepal, Mechi province, Taplejung distr., 5 km S Ghunsa, Camp nr. Sele La, 27° 37' 05"N, 87° 56' 29"E, 4200 m, alpine mats & stone debris, 16. V. 2003, leg. A. Weigel; NME.

Discussion

The setation of the ventral sternum 2 (ventral sternum 3 sensu Ledoux & Roux 2005) rarely appears in the genus *Nebria*. It is known only in three species of different subgenera so far, in the nearctic species *Nebria (Boreonebria) hudsonica* LeConte, 1863 and *N. (Boreonebria) gouleti* Kavanaugh, 1979, and in the Bulgarian species *N. (Tyrrhenia) eugeniae* K. Daniel, 1903 (Ledoux & Roux 2005). The setation appearing now in taxa of the Himalayan subgenus *Epinebriola* signifies that it is a convergently evolved character.

The triangular basolateral lobes in the male genitalia were for the first time reported by Shilenkov (1998) in *N. (Epinebriola) rasa* Andrewes; they were not mentioned by Ledoux and Roux (2005), and were even not known in the genus *Nebria*. In the two new species of the subgenus Epinebriola described above these basolateral lobes are present too, as they are in *N. (Epinebriola) schawalleri* (subsequent description of the male genitalia see above). Basolateral lobes are present in *N. orestias* as well (mentioned as „base of edeagus enlarged" by Ledoux & Roux 2005; a specimen of *N. orestias* was examined

by the authors), and also in *N. (Epinebriola) tangjelaensis* Shilenkov, 1998 (not mentioned but verified by the re-examination of the type material). The basolateral lobes are weakly sclerotized and may be easily and unnoticed removed during preparation. No statement on the phylogenetic value of the character in question is possible until all species of the subgenus *Epinebriola* are re-examined.

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We are very grateful to Mathias Hartmann (NME) for the loan of the material of the Nepal-expeditions of the NME, and to Wolfgang Schawaller (SMNS) for the loan of type material. We gratefully acknowledge the help of Elsa Obrecht (NMBE) with the manuscript and of Hannes Baur (NMBE) with the photographs.

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