A New Species of *Trechus* From the Ethiopian Highlands (Coleoptera: Carabidae: Trechinae) and Key to the *Trechus* Species of Ethiopia

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ABSTRACT The enormous genus *Trechus* Clairville is distributed mainly in the Holarctic regions, but 24 species from Ethiopia were described previously. A key to the species of Ethiopian *Trechus* is provided, including a new species, *Trechus amharicus* from the Choke Mountains (Ethiopian Highlands). The latter taxon is described. The species was found in the Afroalpine grassland, living under stones, sometimes located at the base of the giant *Lobelia rhynchopetalum* Hemsl. It is noteworthy that in spite of the small number of known species of Ethiopian *Trechus*, there are more morphological and chaetotaxic variations among them than in their Holarctic congeners. The taxonomic position of the new species is difficult to situate, because *T. amharicus* does not fit in any of the groups of species recognized to date in Ethiopia. *T. amharicus* n. sp. bears some resemblance to *T. patrizii* in that it has a pronotum with posterior angles without setae, and elytra with only a single anterior discal seta. However, the different configuration of the protarsus and aedeagus in the male clearly separates the two taxa.

KEY WORDS Carabidae, *Trechus*, Ethiopia, taxonomy

The Trechini constitute a large tribe of Carabidae that has radiated into a diverse series of lineages and extended throughout a large part of the world. There is a remarkable degree of disparity within this tribe (sensu Gould 1989), the result of adaptation to various types of edaphic life styles that has even led to the development of an "aphaenops-like facies." Nevertheless, the "phyletic lineage of the *Trechus*" (sensu Casale and Laneyrie 1982) is above all interesting for its great specific diversity, because it includes the enormous genus *Trechus* Clairville, 1806. This taxon contains >600 species, most of which are Palaearctic in distribution (Moravec et al. 2003). However, in the Nearctic region only around fifty species are known to exist (Larochelle and Larivière 2003), whereas just a few *Trechus* live outside the Holarctic region in, e.g., eastern Africa (Casale et al. 1988). The first records of *Trechus* in Ethiopia were made by Raffray (1885), who described two species, to which Alluaud (1918) subsequently added a third. These three Ethiopian species are the only species to be mentioned by Jeannel (1927), whose comprehensive work contains much of our current knowledge of this genus. This monograph, nevertheless, is insufficient as an up-to-date tool for the study of the situation of this genus in Ethiopia. More recent publications (Jeannel 1935, 1950, 1954, 1960; Pawlowski 2001, Magrini and Sciaky 2006) have broadened our knowledge of the *Trechus*, and today >25 species are known from this region of Africa. The objectives of this study was to 1) provide a key to the *Trechus* species of Ethiopia, including a new species from the Choke Mountains; and 2) to describe the latter, the fourth known from that zone in central Ethiopia, but very different from the species belonging to the *Trechus chokensis*-group (sensu Pawlowski 2001).

Materials and Methods

Specimens of the new *Trechus* were collected during an entomological expedition in the Choke Mountains (Ethiopian Highlands), lying north of Debre Markos (Gojam, Ethiopia). This expedition was supported financially by the University of Santiago de Compostela (Spain). It was made possible by a Memorandum of Understanding between the Wildlife Conservation Department (Ethiopia) and the University of Santiago de Compostela, signed in Addis Ababa in 2005, concerning a project to prospect for species of Carabidae in several zones in the Ethiopian Highlands. The specimens were collected by turning over stones, and looking for them under mats of vegetation and leaf litter, by using a Winkler sieve and Mocsarsky apparatus. For an explanation of both devices, see Colas 1969).

The aedeagus was extracted from the abdomen, and the parameres were separated from the surface of the median lobe, and immersed in lactic acid for maceration. After examination, the genital preparations were put in dimethyl-4 hydroxy-3(2*H*)-furanone (DMHF) on

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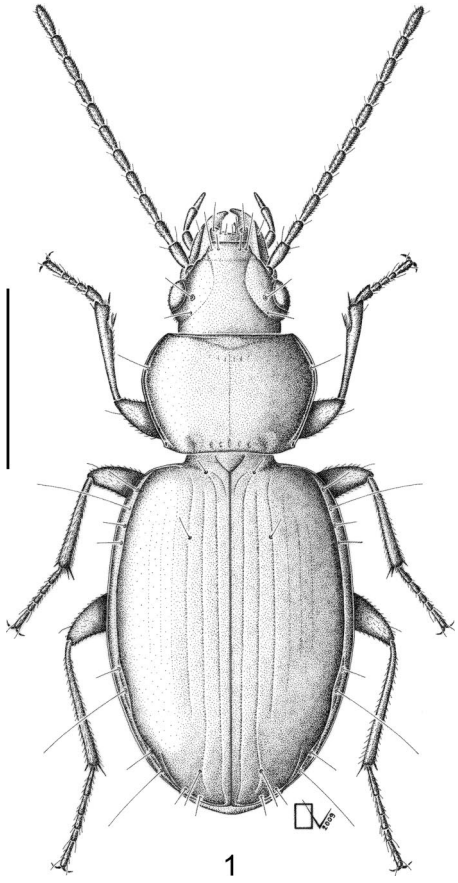

Fig. 1. Habitus of *T. amharicus* Ortuño & Novoa n. sp. Scale bar = 1 mm.

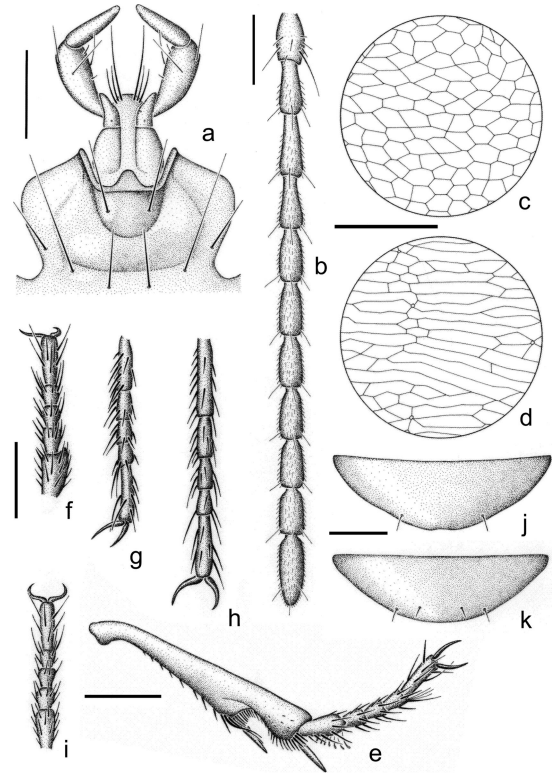

Fig. 2. Morphological details of *T. amharicus* Ortuño & Novoa n. sp. (a) Labium, prebasilar, and ligula (with labial palps). (b) Antenna. (c) Pronotal microsculpture. (d) Elytral microsculpture. (e) Left protibia and protarsus in the dorsal view. (f) Protarsum of the male. (g) Mesotarsus of the male. (h) Metatarsus of the male. (i) Protarsum of the female. (j) Last abdominal sternum of the male. (k) Idem of the female. Scale bars (a, b, e, f, g, h, i) = 0.2 mm, 0.05 mm (c and d), and 0.3 mm (j and k).

an acetate sheet. To prepare the female reproductive appendages, the terminal abdominal segments were first placed in a saturated solution of KOH and then washed in Scheerpeltz's solution (composition of the latter: 75% ethyl alcohol, 20% water, and 5% acetic acid. See Marcos García and Galante Patiño 2004) and opened dorsally. Staining was with Chlorazol black E in aqueous solution. After removing the excess dye with KOH, the structures were washed again with Scheerpeltz's solution, then prepared for observation and drawing. The female genital preparations were included in DMHF and put on an acetate sheet. We follow Puff and Nemomissa (2005) to describe some details referring to the type of vegetation.

Results

Description of *Trechus amharicus* Ortuño & Novoa, n. sp.

(Figs. 1–3)

Type Material. All specimens collected by F. Novoa (leg.). Holotype male. Ethiopia. Danghle, Mt. Choke, Debre Markos; 10° 38′19.26″ N, 37° 50′04.15″ E, 3,793-m altitude, 24-III-2005. Deposited in the Museo Nacional de Ciencias Naturales de Madrid, Madrid, Spain (type catalog no. 2103).

Paratypes. Six males and four females with the same locality and data as the holotype; three males and two females collected in Waybein, Mt. Choke, Debre Markos; 10° 34′56.41″ N, 37° 47′18.94″ E, 3,264-m altitude, 23-III-2005, all deposited in the Departamento de Zoología y Antropología, Universidad de Santiago de Compostela, Spain (F. Novoa collection) and the Departamento de Zoología y Antropología Física, Universidad de Alcalá, Spain (V. M. Ortuño collection).

Etymology. Dedicated to the Semitic language of Amharic in homage to this Ethiopian people.

Diagnosis (Figs. 1, 2f, 3b and d). Apterous species; eyes large and prominent; integument shiny, glabrous except for small areas furnished with microtrichia (eyes and tempora). Color dark brown, appendages paler. Pronotum suborbicular, transverse, with hind angles obtuse but marked. Elytra oval-shaped, convex, shoulders not marked; six striae visible, the three inner ones well marked, one and two usually entire. Sometimes, a seventh stria is discernible. Male protarsi with only the first segment moderately dilated. Aedeagus falciform, apical lamina wide and rounded, basal bulb

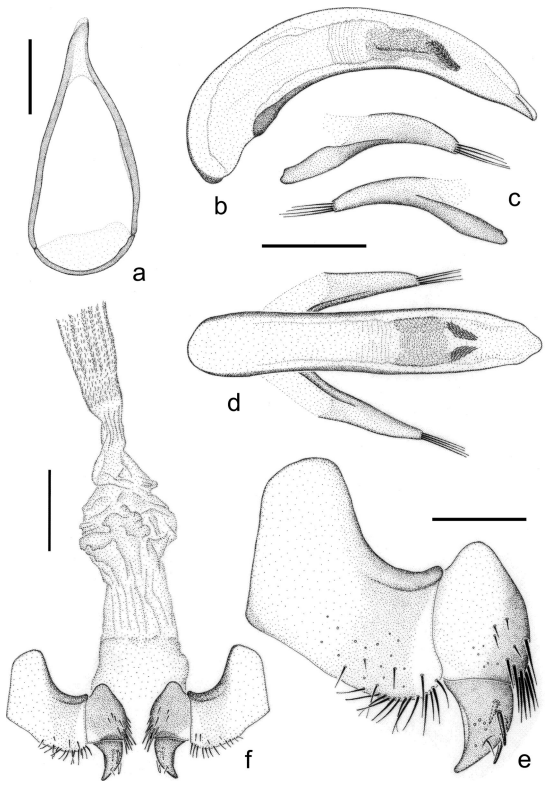

Fig. 3. Morphological details of *T. amharicus* Ortuño & Novoa n. sp. (a) Ring of male genital segment. (b) Median lobe in left lateral view. (c) Left and right parameres in lateral view. (d) Median lobe in dorsal view. (e) External female genitalia. (f) Female genitalia (including spermathecal complex). Scale bars (a–d) = 0.3 mm, 0.1 mm (e) and 0.2 mm (f).

without sagittal winglet, and scaly internal sac with two fore areas scleroticized.

Description. Length (from tip of mandible to apex of elytra): 3.2–3.5 mm. Head (Fig. 1) nearly as long as wide (not considering mandibles in length); labium emarginate with a tooth monodentate (Fig. 2a); frontal furrows deep, prolonged to clypeus, outlining supraocular and ocular areas; eyes large and prominent, producing a large ocular convexity, prolonged over the area of the temples, the latter reduced; ocular surface and temples furnished with microtrichia. Antennae filiform (Figs. 1 and 2b), pilose and long, reaching the basal third of the elytra. Antennomeres (Fig. 2b) with a length (L)-to-width (W) ratio of ≈2.25, with the exception of: antennomere 1 (ratio L/W ≈1.8); antennomere 3 (ratio L/W ≈2.6); antennomere 10 (ratio L/W ≈2.0); antennomere 11 (ratio L/W ≈2.9). Cephalic chaetotaxy (Fig. 1): one seta in the sulcus of each mandible; two setae on the labial disc, and six setae on the prebasilar area; six setae on the labrum; two setae at both sides of the clypeus; two pairs of supraocular setae, anterior and posterior, the former located at the level of the middle of the inner margin of the eye, the latter posteriorly to it.

Pronotum (Fig. 1) suborbicular, transverse (ratio L/W = 0.7), widest at the apical third; disc convex, divided lengthways by a fairly marked medial sulcus; basal margin produced a little forward at the middle, clearly oblique inside the hind angles; sides rounded in their anterior part, straight posteriorly, with short sinuation before the hind angles; the latter obtuse but marked; lateral depressions narrow and deep. Basal foveae shallow, weakly impressed, not punctate. Disc with isodiametric microsculpture of the integument (Fig. 2c). Pronotal chaetotaxy (Fig. 1): only one seta on each side, located on the first third; a minute pore next to the hind angles.

Elytra (Fig. 1) with curved sides, oval-shaped, its greatest width at the middle; shoulders not marked; basal margin short, slightly oblique; border rounding the shoulder reaching the level of the fourth stria; striae slightly punctate; six striae visible (sometimes, a seventh stria is discernible), the three inner stria well marked, one and two usually entire; scutellary striole distinct; a deep recurrent striole conspicuous at the apex; intervals 1, 2, and 3 more or less convex, the rest flat; lateral channel wide. Disc with isodiametric microsculpture more transverse (Figs. 2d). Elytral chaetotaxy (Fig. 1): scutellar pore at the origin of the first stria; one setigerous puncture near the end of the second stria; one discal seta on the third stria, located in the anterior fourth; marginal umbilical series as follows: humeral area with four equidistant setae, and subapical area with four setae, two anterior and two posterior.

Legs (Figs. 1 and 2e–i) have femora and tibiae without special characteristics; anterior tibiae with scarce pilosity on distal dorsum and without longitudinal sulcus; two clip setae on the cleaner organ of the protibiae (Fig. 2e); all tarsi with basitarsi as long as the sum of the two following basitarsi; male protarsi with only the first segment moderately dilated (ratio L/W = 2) (Fig. 2f), provided with a tooth on the internal margin and adhesive setae ventrally.

Last sternite of abdomen with two short setae in males (Fig. 2j) and four in females (Fig. 2k).

Ring of the male genital segment pyriform (Fig. 3a).

Aedeagus with medial lobe symmetrical in dorsal view (Fig. 3d), falciform in lateral view (Fig. 3b), regularly arched, but with a slender preapical swelling; apical lamina wide and rounded; basal bulb without sagittal winglet; scaly internal sack without laminar copulatrix pieces (Fig. 2b and d), with two areas exhibiting very scleroticized scales on each side of the sagittal plane (Fig. 3d). Parameres subsymmetrical (the right slightly shorter), laminates and plurisetules normally with four setae (Fig. 3c and d). Female genitalia. External genitalia (Fig. 3e and f) formed by dimerous IX gonopods (gonocoxites and subgonocoxites) and IX laterotergites; gonocoxite unguiform with an ensiform seta on the ventral surface (sometimes lacking in some specimens) and two ensiform setae (of uneven size) on the dorsal surface close to the internal edge; near to the apex, a nematiform seta is located on a little ogival fovea; the subgonocoxite is longer than wide, provided with a dozen thorn-shaped setae, of different length and size, located close to the internal edge, most on the ventral surface, some on the dorsal

face; aliform IX lateritergite is weakly scleroticized, with one group of 15 setae assembled like a fringe over the basal margin and another one consisting of six setae scattered on the ventral surface. Spermathecal complex (internal genitalia) (Fig. 3f) is completely membranous, spermathecal and accessory glands wanting; tube-shaped vagina-bursa with longitudinal folds; its proximal end widens, making contact with the oviduct.

Sexual Dimorphism. Male: protarsi with only the first segment dilated and provided with adhesive setae (Fig. 2f and i); last abdominal sternite, with two setigerous pores close to the apical margin (Fig. 2j). Female: last abdominal sternite provided with four setae near apical margin (Fig. 2k).

Distribution. The species is only known from two localities in the Choke Mountains, Danghle and Waybein, northwest of Debre Markos, as we indicated in the type material.

Ecology. The species was found in the Afroalpine grassland, as in Danghle (nearly 3,800-m altitude), where the only tree-like plants were the Giant Lobelias, *Lobelia rhynchopetalum* Hemsl, forming large populations often consisting of hundreds of individuals, as in the Simen Mountains (Puff and Nemomissa 2005). The species was living under stones, sometimes located at the base of lobelias. In Waybein (≈3,200-m altitude) the new *Trechus* was in a degradated ericaceous forest, living under stones and depressed mats of vegetation.

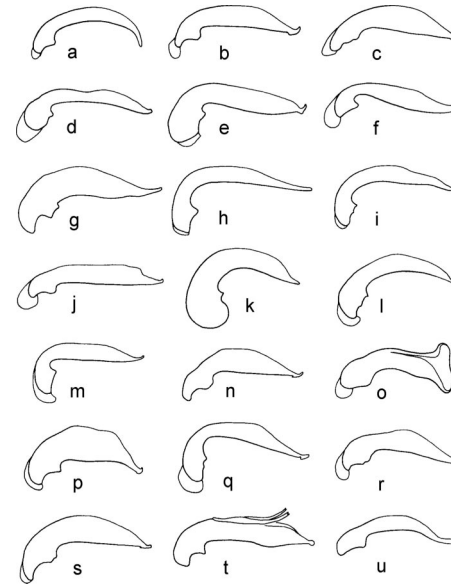

Fig. 4. Morphology of the median lobe (aedeagus) of other Ethiopian *Trechus* species: (a) *T. ambasarensis.* (b) *T. aethiopicus.* (c) *T. patrizzi.* (d) *T. chokensis.* (e) *T. dimorphicus.* (f) *T. gigas.* (g) *T. martelluccii.* (h) *T. raffrayanus.* (i) *T. peynei.* (j) *T. bastianinii.* (k) *T. simienensis.* (l) *T. loeffleri.* (m) *T. gugheensis.* (n) *T. gallorites.* (o) *T. scotti.* (p) *T. chillalicus.* (q) *T. bipartitus.* (r) *T. culminicola.* (s) *T. batuensis.* (t) T. *buhaitensis.* (u) *T. schimperanus.* Redrawn from Jeannel 1927, 1935, 1950, 1954, 1960; Pawlowski 2001, and Magrini and Sciaky 2006.

Key to Ethiopian *Trechus* Species

1. Elytra with one discal seta . . . . . (2)
   Elytra with two discal setae . . . . . (5)
2. Elytra retaining a hind discal seta (close to the fourth stria); striae very faint. Aedeagus with median lobe falciform and small sagittal winglet (Fig. 4a); internal sac without copulatrix pieces. Length ≈2.5 mm. Distribution: Arguine, Simen . . . . . *T. ambarasensis* Jeannel, 1954
   Elytra retaining fore discal seta (on third stria) . . . . . (3)
3. Pronotum with hind angles rectangular; two setae on each side of the pronotum (fore and hind). Elytra with striae 1–4 deep, the rest superficial. Aedeagus: with median lobe as a reflexed hook at apex and basal bulb with a small sagittal winglet (Fig. 4b); internal sac scaly and with a large copulatrix piece. Length ≈ 5.5 mm. Distribution: Petit Akaki (tributary river from Awash River) . . . . . *T. aethiopicus* Alluaud, 1918
   Pronotum with hind angles obtuse and no hind seta on either side. Elytra with striae 1–3 well developed, the others obsolete or only weakly marked . . . . . (4)
4. Male protarsus with first two tarsomeres dilated. Base of pronotum protruded. Aedeagus with median lobe almost straight, with a reflexed hook at apex, and basal bulb with a sagittal winglet (Fig. 4c); internal sac with a small copulatrix piece weakly scleroticized. Length ≈3.6 mm. Distribution: Torre Asciaba and Aselle (Mt. Chillálo) . . . . . *T. patrizzi* Jeannel, 1960
   Male protarsus with only the first tarsomere dilated (Fig. 2f). Base of pronotum slightly notched. (Fig. 1). Aedeagus with medial lobe falciform; apex not distinctive (rounded lamina); basal bulb without sagittal winglet; scaly internal sac (no laminar copulatrix pieces), with two fore areas (one on each side of the sagittal plane) with very scleroticized scales (Fig. 3b and d). Length: 3.2–3.5 mm. Distribution: Debre Markos (Mt. Choke) . . . . . *T. amharicus* n. sp.
5. Integument with microtrichia, at least on elytra (in some species, it is more distinct in one sex than the other, or found on the apical third of the elytra) . . . . . (6)
   Elytra glabrous . . . . . (10)
6. Pronotum transverse (arcuate sides) or cordate (sides slightly sinuate), but in both cases with hind angles well marked. Elytra with all striae very visible and discal setae arranged on the third stria. Aedeagus with sagittal winglet; internal sac with copulatrix pieces scleroticized. Medium to large species (length: 4.5–7.0 mm) . . . . . (7)
   Pronotum with arcuate sides and rounded hind angles; at least the second discal seta posi-

tioned close to the fourth stria or about where the stria would be if it were impressed. . . . . (9)

7. Length: 4.5–5.5 mm. Slight sexual dimorphism (observable by females somewhat larger than males). Elytra with striae distinctly punctate and flat intervals. Aedeagus arcuate with a slightly raised apex (Fig. 4d); internal sac with a narrow oblong copulatrix piece, well sclerotized; parameres with four setae. Distribution: Mt. Choke . . . . *T. chokensis* Pawlowski, 2001

Length ≥5.9 mm. Marked sexual dimorphism, observable on the surface of the elytra. Aedeagus with distinct raised apex; internal sac with two long copulatrix pieces . . . . . (8)

8. Males with elytral striae distinctly punctate and smooth intervals; striae in females impunctate striae, but intervals strongly punctate. Aedeagus: voluminous basal bulb and apex resembling a raised hook (Fig. 4e). Length: 5.9–6.7 mm. Distribution: Mt. Choke . . . . . *T. dimorphicus* Pawlowski, 2001

Elytral striae distinctly punctate in both sexes; smooth intervals in males but strongly punctate in females. Pronotum with microtrichia, especially in females. Aedeagus especially robust at the level of the internal sac, and the apex regularly curved upward to resemble a hook (Fig. 4f); parameres with six setae. Length: 6.2–7.0 mm. Distribution: Mt. Choke. . . . . *T. gigas* Pawlowski, 2001

9. Elytra with no traces of striae; discal setae (fore and hind) situated at about where the fourth stria would be. Small species (length: 2.5–2.6 mm). Distribution: Mindigabsa (Simien) . . . *T. pilosipennis* Jeannel, 1954 [male unknown] (Pawlowski (2003) indicates the possibility that females described as *T. pilosipennis* Jeannel 1954 corresponds to the males described as *T. buahitensis* Jeannel 1954)

Elytra with five first stria visible but poorly marked; fore discal seta on the third stria and the hind seta contiguous with the fourth stria. Aedeagus robust (Fig. 4g) with sinuous basal lamina; basal bulb voluminous with no sagittal winglet; apex slightly raised; internal sac consisting of two diverging lines of large sclerotized spines. Medium-sized species (length ≈3.4 mm). Distribution: Inatye (Simien) . . . . . *T. martelluccii* Magrini & Sciaky, 2006

10. Umbilical series peculiar, more numerous than (4+4) . . . . . (11)

Umbilical series normal (4+4) . . . . . (12)

11. Umbilical series (4+2+4). Elytra with all striae visible. Aedeagus with basal lamina subrectilinear (Fig. 4h); parameres with three diverging setae. Length: 4.5–5.0 mm. Distribution: Maï Datcha (east of Arcuasié) . . . . . *T. raffrayanus* Jeannel, 1954

Umbilical series with greater number of setiferous pores, variable in both number and arrangement (4+1+6/6+1+6/5+1+4+2, etc.). Elytra with all striae visible and heavily marked. Aedeagus with basal lamina slightly gibbose (Fig. 4i); parameres with four setae. Length: 4.7–5.0 mm. Distribution: Inatye (Simien) . . . . . *T. peynei* Magrini & Sciaky, 2006

12. Pronotum with hind angles rectangular . . . (13)

Pronotum with hind angles obtuse, rounded, or without noticeable angles (orbicular pronotum) . . . . . (15)

13. Pronotum transverse with sides slightly sinuate in front of the hind angles, the latter sharp and slight diverging. Elytra with six striae visible, which fade out from the third striae outward; intervals flat. Aedeagus rectilinear (Fig. 4j): with basal bulb almost in line with the median lobe with a large sagittal winglet; apex slightly raised; internal sac without copulatrix pieces; parameres with four setae. Length: 4.6–5.0 mm. Distribution: Mt. Batu. . . . . *T. bastianinii* Magrini & Sciaky, 2006

Pronotum cordate with evident sinuate sides. Elytra with all striae visible. Aedeagus noticeably incurved, with the apex tapering but not raised. Small size (length: 3.0–3.5 mm). . . (14)

14. Internal striae well marked; external striae more superficial but visible. Aedeagus thick, strongly incurved and with a large basal bulb without a sagittal winglet (Fig. 4k); internal sac without copulatrix piece; parameres short, with three setae. Length ≈3.5 mm. Distribution: Maï Datcha (east from Arcuasié) . . . . . *T. simienensis* Jeannel, 1954

All striae well marked and visible almost to the apex of the elytra. Aedeagus falciform, with a small basal bulb provided with a sagittal winglet (Fig. 4l); internal sac with straight copulatrix piece; parameres with four setae. Length ≈ 3.0 mm. Distribution: Inatye (Simien) . . . . . *T. loeffleri* Magrini & Sciaky, 2006

15. Pronotum with hind angles marked and obtuse (sharp or blunt) . . . . . (16)

Pronotum with hind angles either obsolete (more or less rounded) or without hind angles (pronotum suborbicular) . . . . . (19)

16. Elytra with at most three striae visible . . . (17)

Elytra with at least five striae visible (albeit superficial) . . . . . (18)

17. Elytra wide and short, almost orbicular, producing an *Ocys harpaloides*-like facies. Elytra with three striae visible (first and second superficial, and third difficult to see). Pronotum clearly transverse, with regularly arcuate sides. Males larger than females. Aedeagus bent at right angles close to the basal bulb, the latter with a sagittal winglet and the apex thin, slightly raised (Fig. 4m); internal sac with a long hyaline copulatrix piece, covered with sclerotized scales; parameres with five setae. Length: 3–4 mm. Distribution: Mt. Tola . . . . . *T. gugheensis* Jeannel, 1950

Elytra ovate, proportionally narrower, producing the facies of *Trechus*. Elytra with only first stria obvious, second and third practically obsolete. Pronotum transverse with sides slightly arcuate. Males and females of similar size. Aedeagus straight: basal bulb without sagittal winglet, and the apex slightly raised, resembling a small hook (Fig. 4n); internal sac with a copulatrix piece; parameres with three setae. Length: 3.8–4 mm. Distribution: Mt. Chillálo. . . . . *T. gallorites* Jeannel, 1936

18. Pronotum slightly transverse, with sharp hind angles (jutting somewhat outward). Elytra with shoulders; striae very superficial, but visible and without clear punctures. Aedeagus voluminous, slightly arcuate; basal bulb with a sagittal winglet; aberrant apex, broadened to resemble a chalice (Fig. 4o); internal sac hyaline without copulatrix piece; parameres with three setae. Length ≈4.3 mm. Distribution: Mt. Chillálo. . . . . *T. scotti* Jeannel, 1936

Pronotum somewhat transverse, but with rounded hind angles. Elytra ovate with rounded shoulders; the first five or six striae are faint and superficial, but still visible; the most external striae are totally obsolete. Aedeagus short, thick, and only slightly arcuate; basal lamina lightly gibbose; basal bulb with a small sagittal winglet; apex in a small hook (Fig. 4p); internal sac with a long copulatrix piece; parameres with four setae. Length ≈6.5 mm. Distribution: Mt. Chillálo . . . . . *T. chillalicus* Jeannel, 1936

19. Pronotum suborbicular without hind angles; hind margin is considerably narrower than fore margin. Elytra ovate, short, with all striae visible (albeit fine and superficial). Aedeagus: long and strongly bent; basal bulb with a sagittal winglet; apex thin, slightly raised, with a small subterminal and ventral notch (Fig. 4q); internal sac with a long and undulating copulatrix piece. Length ≈4.0 mm. Distribution: Abuna Yusef Malefia . . . . . *T. bipartitus* Raffray, 1885

Pronotum more or less transverse or quadrate, with rounded hind angles (obsolete) . . . (20)

20. Elytra with discal setae on third stria . . . (21)

Elytra with discal setae contiguous with fourth stria . . . . . (22)

21. Elytra with fine and superficial striae, the first three very visible. Aedeagus long, slightly arcuate, but strongly flattened dorsoventrally; basal bulb a little bent and with a sagittal winglet (Fig. 4r); internal sac without copulatrix pieces; parameres short with three setae. Length: 2.8–3 mm. Distribution: Mt. Chillálo . . . . . *T. culminicola* Jeannel, 1936

Elytra with five striae visible but becoming progressively fainter. Aedeagus robust, slightly curved except at the basal bulb, which is large with a small sagittal winglet; apex reinforced ventrally by an apical button (Fig. 4s); internal sac with a triangular copulatrix piece with a spatulate apical process; parameres short with four setae. Length: 3.4–3.9 mm. Distribution: Bluff Tarn and Big Lake (Mt. Batu) . . . *T. batuensis* Magrini & Sciaky, 2006

22. Elytra short (approximately one fourth longer than wide) with superficial striae, including the disc. Small size (length ≈2.5 mm). Distribution: Abuna Yusef Malefia . . . . . *T. sublaevis* Raffray, 1885 [aedeagus unknown]

Elytra longer (nearly one-thirds longer than wide) . . . . . (23)

23. Integument with regular microsculpture forming an isodiametric network. Elytra with subparallel sides. Distribution: Mecana Abbo (Simien) . . . *T. degienensis* Jeannel, 1954 [male unknown]

Integument with regular microsculpture forming a transverse network. Elytra more or less ovate . . . . . (24)

24. Pronotum with more rounded sides. Elytra with shoulders somewhat prominent. Aedeagus: thick and straight; short basal bulb, sharply bent and with no sagittal winglet; basal lamina gibbose; apex retracted into the quadrate lamina (Fig. 4t); internal sac without copulatrix pieces; sclerotized fork-like ligule on the dorsal surface of the median lobule (Fig. 4t); slender parameres with three setae. Length: 3.0–3.2 mm. Distribution: Lori (Simien) and Maï Datcha (east of Arcuasié) . . . . . *T. buahitensis* Jeannel, 1954

Pronotum with less rounded sides. Elytra with shoulders only weakly marked. Aedeagus: slender and sinuate; basal bulb without a sagittal winglet; apex long and compressed laterally in a blade-like manner (Fig. 4u); internal sac without copulatrix pieces; parameres with four setae. Length: 2.8–3.0 mm. Distribution: Aostagheb and Mindigabsa (Simien) . . . . *T. schimperanus* Jeannel, 1954

Discussion

The presence of *Trechus* in the mountains of Ethiopia presumably represents a relict fauna of a group of that once had a more contiguous distribution. Today, the disjointed distribution of *Trechus* in Africa is a result of the implantation and extension of a sub-Saharan-type climate (Jeannel 1927, Mani 1968), which has severely reduced the size of this boreal genus' optimum area for survival. This climatic process has also affected the current distribution of other animal and plant species in this part of Africa, and the distribution of carabid *Calathus*, essentially Holarctic but also present in Ethiopia, a case similar to that of *Trechus* (see Mani 1968).

Trechus species are geophilous, hygrophilous, and sciophilous Carabidae that are found in the mountains of eastern Africa, where the environmental conditions enable them to thrive. Their adaptation to a hypsobiontic life style is evident from their micropterism and tendency toward melanism, characteristics that are present in all Ethiopian *Trechus.* Both of these traits are adaptive and are common in Coleoptera that live in high mountain areas (Mani 1968).

Despite the relatively small number of species (twenty-four species currently described, plus *T. amharicus* n. sp.), there are more morphological and chetotaxic variations in the Ethiopian *Trechus* than in their Holarctic congeners. Thus, we find in the Ethiopian *Trechus* the following exceptional characteristics: 1) variable pilosity on dorsum; 2) more umbilical setae than usual (4+4); 3) loss of one of the dorsal setae from the elytra; 4) displacement of one of the dorsal setae toward the fourth stria; 5) loss of the angular setae (posterior margin) from the pronotum; 6) a male protarsus with only a single dilated tarsomere; 7) sexual dimorphism in characteristics other than the protarsus; and 8) an aedeagus without copulatory pieces. A large number of these single characters are present in unrelated species and in somewhat modified forms in some of the >500 Holarctic species of *Trechus.*

In *Trechus* the degree of pilosity on the head, pronotum, and elytra is variable, but is in general an infrequent character in this genus (Israelson and Palm 1979), known from a few Macronesian species such as *Trechus fortunatus* Jeannel, 1927; *Trechus uyttenboogaarti* Jeannel, 1936; *Trechus cabrerai* (Jeannel 1936); *Trechus laureticola* Jeannel, 1936; *Trechus machadoensis* Franz, 1984, and *Trechus gomerensis* Franz, 1986. This character is even less frequent in Western Palaearctic species (e.g., *Trechus carrilloi* Toribio & Rodríguez, 1997), but is, nevertheless, well represented in five of the 25 known Ethiopian species (see dichotomous key).

Most umbilical series in *Trechus* occur in two separate groups, a humeral group of four setae and a preapical group of four setae. This character has been well described by Jeannel (1927, 1941). Nevertheless, some Ethiopian species have more setae in the umbilical series, and setae appear in the gap between the humeral and preapical groups, the umbilical series thereby appearing irregular and ungrouped. This is very rare within this genus and is present in at least two of the 25 Ethiopian species (see dichotomous key). It is possible that if he had known these *Trechus* species, Jeannel (1927) would not have used the "regular or irregular nature of the umbilical series" as the first and only step in his key to the genera of Trechini with glabrous fore-tibiae (Jeannel 1927, p. 113).

The discal setae also differ from the generalized and almost universal model used to separate the two subgenera of *Trechus:* two discal setae in *Trechus* and three in *Epaphius* Stephens, 1827. In this case, Jeannel (1927, 1941) indicates the possibility that the species of the subgenus *Trechus* only have a single discal seta, as exemplified by *Trechus aethiopicus* Alluaud, 1918, which posseses this trait. Subsequently Jeannel described two other Ethiopian species that also share this characteristic (Jeannel 1954, 1960). With the description of *T. amharicus* n. sp., four of the 25 species of *Trechus* have just one discal seta. Nevertheless, of these species, three conserve the anterior discal setae, whereas only one, *Trechus ambarasensis* Jeannel, 1954, a posterior seta. The presence of a single dorsal seta is not the only difference in setation seen in some Ethiopian species: whereas in most *Trechus* the discal setae are found on the third stria, in a small number of Ethiopian species the setae are displaced toward the fourth interval and are in contiguous with the fourth stria. The rarity of this feature in *Trechus* was highlighted by Raffray (1885) in his description of *Trechus sublaevis.* Subsequently, Jeannel (1954) described this character in five other species and proposed the *T. sublaevis* group. Recently, *T. martelluccii* Magrini & Sciaky, 2006 has been described, which should also be included in this group, thereby raising the total of known species that have all or some of the discal setae displaced toward the fourth stria to six out of twenty-five.

The angular seta (posterior margin) on the pronotum, usually present in *Trechus,* is not present in either *Trechus patrizzi* Jeannel, 1960, or *T. amharicus* n. sp.

Sexual dimorphism in *Trechus* species is not very evident and normally consists of the dilation of the first two tarsomeres of the male protarsus, which is not seen in females. Somewhat more infrequently, sexual dimorphism is indicated by size: in *Trechus jeannei* Sciaky, 1998, males (length: 5, 4–6, 1 mm) are longer than females (length: 4, 8-5, 2 mm). Rarer still are cases in which dimorphism appears in other parts of the body: e.g., a curved tibia in males (e.g., *Trechus jeannei* Sciaky, 1998), significant differences in the type of microsculpture on the tegument, presence of elytral micropunctures in the males, but absent in the females (e.g., in the Ethiopian species, *Trechus dimorphicus* Pawlowski, 2001, or differences in the nature of the pubescence on the tegument, as well as its absence or presence. Pawlowski (2003) notes the presence of this latter character in the *T. chokensis* group, which this author refers to as the *T. buahitensis* group, separated from the *T. sublaevis* group of Jeannel (1954). Nevertheless, consistent sexual dimorphism does exist in some Ethiopian *Trechus* species, and there are in fact a few species whose teguments vary in appearance according to sex. This leads to the suspicion that some of the species for only the female form has been described (see dichotomous key) could in fact correspond to dimorphic species whose males have been ascribed a different scientific name. In this regard, Pawlowski (2003) suggests that female *Trechus pilosipennis* Jeannel, 1954, may actually be *Trechus buahitensis* Jeannel, 1954. A surprising degree of sexual dimorphism occurs in the Ethiopian species in which, e.g., some males only have a single dilated articulation on the protarsus. Even though this characteristic is present in the Nearctic subgenus *Microtrechus* Jeannel, 1927, Pawlowski (2003) notes its presence in a number of still undescribed species for which he in-

dicates the possibility of designating a new subgenus; *T. amharicus* n. sp. should be included in this new group of species. In our opinion, the rarity of this morphological trait – like the pilosity on the tegument or the absence or displacement of the discal setae – should not complicate the taxonomy of the genus *Trechus.* On the contrary, instead of creating new subgenera, it would seem more reasonable to redefine the genus *Trechus* in light of current knowledge. Likewise, this is perhaps also an opportunity to reexamine some of the morphological characteristics used by Jeannel (1927) to separate groups of species, as well as genera and subgenera. It is thus possible that the description of *Microtrechus* is erroneous when proposed as a genus and used as such (Jeannel 1927, Ball and Bousquet 2001). It has been used subsequently and referred as a subgenus of *Trechus* (Ball and Bousquet 2001, Larochelle and Larivière 2003, Pawlowski 2003). It is probable that *Microtrechus* represents a lineage within *Trechus* but should not be used as a subgenus, given that its existence is based primarily on the difference in the male protarsus. This character also appears in another group of *Trechus* from Ethiopia, to which can be added a species from Madeira, *Trechus* (*Atlantotrechus*) *cautus* Wollaston, 1854, which Lompe (1999) has separated from its congeners into a new subgenus, *Atlantotrechus* Lompe, 1999. Thus, given that the apomorphy of a single dilated tarsomere in males appears sporadically in *Trechus* belonging to different lineages (America, Madeira archipelago, and eastern Africa) and is not a characteristic that distinguishes just one group within the *Trechus,* it perhaps would be wise to consider both *Microtrechus* and *Atlantotrechus* Lompe, 1999 as synonymous with *Trechus.*

Finally, in some Ethiopian *Trechus* the internal sac of the aedeagus has no copulatory pieces, and instead there is a hyaline sac covered in scales or spines. Although this is not a novelty in the genus as a whole, this character appears more frequently in the Ethiopian species (in 10 of 22 species for whom males are known; see dichotomous key) than in those from other areas of the Northern Hemisphere.

In a discussion of the taxonomic position of *T. amharicus* n. sp., it is difficult to situate this species in any of the species groups recognized to date in Ethiopia. We believe that taxonomic and faunal knowledge of the Ethiopian *Trechus* is still too incomplete to analyze the diversity of the members of this genus in great depth or to examine the combinations of characteristics that appear within these species. Pawlowski (2001) has described five groups—the *T. aethiopicus* group, *T. simienensis* group, *T. bipartitus* group, *T. sublaevis* group, and *T. chokensis* group—and further notes (Pawlowski 2003) that three as yet unpublished groups should be added to these five, which he names the α-group, β-group, and γ-group. Although this author provides a series of characteristics for these unpublished groups, the information provided is in fact rather confusing. Despite this effort to solve the systematics of the Ethiopian *Trechus* group, there are still species that do not fit into any group, as Magrini and Sciaky (2006) recognize in the case of *T. bastianinii.* This also occurs with *T. amharicus* n. sp., which possesses diagnostic characteristics from each of a number of different groups. Thus, it would seem that there is a real need to examine the validity of the systematics of the Ethiopian *Trechus* as proposed by Pawlowski.

T. amharicus n. sp. bears a close resemblance to *T. patrizii,* although this does not necessarily mean that any close phylogenetic relationship exists between them. Both species have a series of apomorphies that are truly singular within the context of this genus: pronotum with posterior angles without setae and elytra with only a single anterior discal seta. Moreover, they also have in common other less obvious characteristics such as obtuse posterior angles on the pronotum, and elytra with only the first three striations visible. Nevertheless, certain differences between these two species leave no doubt as to their separation into two distinct species: *T. amharicus* n. sp. differs from *T. patrizii* in its very different medial lobe and the internal sac of the aedeagus. They are also clearly different in the configuration of the male protarsus: in *T. amharicus* n. sp. the first tarsomere is somewhat dilated, whereas in *T. patrizzi* the first and second tarsomeres are both dilated, as in the majority of *Trechus* species.

In conclusion, we believe that before proposing new taxonomic groups it would be best to have at our disposal information regarding all Ethiopian species to be able to place future discoveries in their correct places within this genus.

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