

RESEARCH PAPER

A review of *Thysanarthria* with description of seven new species and comments on its relationship to *Chaetarthria* (Hydrophilidae: Chaetarthriini)

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Abstract. The Old World genus *Thysanarthria* Orchymont, 1926 is reviewed taxonomically and compared to the related genus *Chaetarthria* Stephens, 1835. *Chaetarthria* is considered to consist of three groups differing in the morphology of male genitalia and surrounding sclerites: (1) large Old World *Chaetarthria* which seems to stand apart of the remaining groups, and (2) European *Chaetarthria* plus (3) American *Chaetarthria* which both share the male sternite 8 with a long median projection with *Thysanarthria*. The reduced mesal part of male sternite 9 is shared by European *Chaetarthria* and *Thysanarthria*, supporting their close relationship proposed by previous molecular analyses. Sixteen species are recognized within *Thysanarthria* which differ in the details of the morphology of the aedeagus illustrated for all species. Seven species are described as new: *T. bifida* sp. nov. (Thailand), *T. cardamona* sp. nov. (India: Kerala), *T. chui* sp. nov. (Taiwan), *T. persica* sp. nov. (southern Iran), *T. saurahana* sp. nov. (Nepal), *T. trifida* (Laos), and *T. wadicola* sp. nov. (Oman). New records are provided for *T. ceylonensis* Hebauer, 2001 (new to India: Madhya Pradesh), *T. championi* (Knisch, 1924) (new to Afghanistan, India: Arunachal Pradesh, China: Yunnan, and Myanmar), *T. madurensis* Hebauer, 2001 (new to Nepal and India: Kerala), and *T. siamensis* Hebauer, 2001 (new to India: Uttarkhand, Nepal and Laos). *Chaetarthriomorphus sulcatus* Chiesa, 1967 is revealed as a junior synonym of *Chaetarthria championi* Knisch, 1924, and lectotypes are designated for both these taxa. An undescribed species of the American group of *Chaetarthria* is recorded from Saudi Arabia either as an accidental introduction or due to mislabeling; the species is illustrated but not described.

Key words. Hydrophilidae, Chaetarthriinae, *Thysanarthria*, *Chaetarthria*, systematics, distribution, new species, new records, lectotype designation, genitalia morphology, introduced species

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Introduction

The tribe Chaetarthriini is a rather small group of water scavenger beetles (Hydrophilidae) characterized by a row of long setae at the base of the abdomen, which holds pieces of gelatinous substance of unknown origin and function (SHORT & FIKÁČEK 2013; Figs 3G–H). The clade currently comprises 75 species classified in 8 genera (SHORT & FIKÁČEK 2011, 2013; FIKÁČEK et al. 2012; JIA et al. 2013, 2018). Five of these genera were included in the

analysis by SHORT & FIKÁČEK (2013), and Chaetarthriini was revealed as a paraphyletic assemblage in respect to the tribe Anacaenini. In addition, the paraphyly of the largest genus *Chaetarthria* Stephens, 1835 was revealed, as the small genus *Thysanarthria* Orchymont, 1926 was deeply nested in *Chaetarthria*. Better species sampling is however needed to corroborate these results; molecular phylogeny of the tribe is under investigation by B. Clarkson et al. (in prep.) at the moment.



The genus *Thysanarthria* was first defined by ORCHYMONT (1926a,b) for the Madagascan species *Hydrobius atriceps* Régimbart, 1903, but the Himalayan *Chaetarthria champi- oni* Knisch, 1924 was assigned to it as well, although partly based on misidentified specimen from northern Vietnam where the latter species does not occur. This indicated that the genus is widely distributed in the Old World tropics. An additional species, *Thysanarthria brittoni* Balfour-Browne, 1951 was described 25 years later from Yemen (BALFOUR-BROWNE 1951). HANSEN (1991) accepted this concept of the genus and added a fourth species, *T. sulcata* (Chiesa, 1967) from Afghanistan, transferring this species to *Thysanarthria* from the monotypic *Chaetarthriomorphus* Chiesa, 1967. *Thysanarthria atriceps* was declared to be widespread in sub-Saharan Africa by subsequent authors (HEBAUER 2006), and *T. sulcata* was reported from the Arabian Peninsula and Iran (HEBAUER 1997, FIKÁČEK et al. 2010). HEBAUER (2001) reviewed the genus and described six new species from the Oriental Region. The study revealed that the species diversity in Asia is much higher than previously expected. Unfortunately, genitalia illustrations in this paper are of rather poor quality and moreover based on dried card-mounted genitalia, which made subsequent identification of the Asian species impossible.

The aim of this paper is two-fold: (1) to provide good-quality illustrations of the genitalia of previously described species to allow their identification, with a special focus on the Asian ones, and (2) to provide basic information about the morphology of the genus and its comparison to *Chaetarthria*. In addition, seven undescribed species were found in the material examined which are also described here.

Material and methods

Thysanarthria species are very similar to each other, with male genitalia being the principal and often the only distinguishing character. For this reason, this revision is based mainly on the morphology of male genitalia which are illustrated in detail for all examined species. As a consequence, only specimens from collecting events for which at least one male was examined are listed, with a few exceptions (*T. chui* sp. nov., *T. wadicola* sp. nov.). However, we were not able to dissect all specimens from the examined series: for series of specimens with similar body size, coloration and dorsal microsculpture (i.e. the only external characters varying among species) we usually examined one or two males only, and only if some variability was observed in these characters more (but not all) specimens were dissected. We examined the holotypes and for some species also some paratypes of all described *Thysanarthria* species except *T. atriceps*. The latter species could not be examined as it is deposited in the Museum national d'histoire naturelle de Paris which does not allow loans of the type material; due to the difficulty of dissection of the tiny species, we decided not to risk the dissection of the holotype outside the first author's Prague office.

The genitalia were dissected from water-relaxed specimens and examined in temporary glycerine slides without using a cover glass. Genitalia of the previously described

types, which were dry-mounted in all cases, were first relaxed in a drop of water and then transferred to 95% alcohol which was left on the hot plate heated to 65°C until the air bubbles disappeared or got reduced in number and volume as much as possible. Once ready, the genitalia were transferred directly to the glycerine for examination, and after that through a short bath in 95% alcohol to the drop of Euparal resin on a small slide attached below the respective specimen. In most cases, the genitalia were not treated with KOH to remove the muscular tissue, as a few early attempts indicated that such treatment could distort the parameres and median lobe (compare Figs 7D–E).

Genitalia photographs were taken with a Canon D1100 digital camera attached to an Olympus BX41 compound microscope. Habitus photographs were taken using a Canon EOS 550D digital camera with an attached Canon MP-E65 mm f/2.8 1–5× macro lens. In both cases, multiple partially focused photographs were taken and stacked into the final photo using Helicon Focus software. Final photographs were adapted in Adobe Photoshop for the plates. The original unedited photographs are available in Zenodo scientific archive under <https://doi.org/10.5281/zenodo.3162266>. Distribution maps were constructed in QGIS software using freely available altitude data from <https://www.ngdc.noaa.gov/mgg/topo/globe.html> and freely available country border data available at <http://diva-gis.org/>; the Excel spreadsheet of all examined specimens in DarwinCore format is available at <https://doi.org/10.5281/zenodo.3162266>. Scanning electron micrographs were taken from uncoated dried specimens using a Hitachi S-3700N environmental electron microscope at the Department of Paleontology, National Museum (Prague, Czech Republic). The specimens examined are deposited in the following collections:

ASHG Andre Skale's collection, Hof, Germany;
 BMNH Natural History Museum, London, United Kingdom;
 HNHM Hungarian Museum of Natural History, Budapest, Hungary;
 IBEB Institut de Biologia Evolutiva, Barcelona, Spain;
 MZLU Lund University, Lund, Sweden;
 NHMB Naturhistorisches Museum, Basel, Switzerland;
 NHMW Naturhistorisches Museum, Wien, Austria;
 NMNS National Museum of Natural Science, Taichung, Taiwan;
 NMPC National Museum, Prague, Czech Republic;
 SMNS Staatliches Museum für Naturkunde Stuttgart, Germany (coll. F. Hebauer);
 TARI Taiwan Agriculture Research Institute, Taichung, Taiwan;

The following specimens of *Chaetarthria* were examined for comparative purposes:

Chaetarthria panda Orchymont, 1939: 1 male (NMPC): **BRASIL:** MATTO GROSSO: Jacaré, P. N. Xingu, xi. 1965, leg. Alvarenga & Werner, det. D. Miller 1973.
Chaetarthria malickyi Hebauer, 1995: 1 male (ASHG): **CHINA:** YUNNAN: Baoshan Pref., Gaoligong Shan near Xiaoheishan N. R., 35 km SE Tengchong, 2110 m, 24°50'16"N 98°45'43"E, primary deciduous forest, sifted leaf litter, 30.v.–4.vi.2007, lgt. D. W. Wrase (11), M. Fikáček det.
Chaetarthria seminulum (Herbst, 1797): 28 spec. (NMPC): **PORTUGAL:** Setubal, Gandola, 20.vi.2011, lgt. Z. Laštůvka. **TURKEY:** ÇANAKKALE: S of Ayvaçık, 39°34'38"N 26°24'04"E, 280 m, banks of small river, among gravel and vegetation, 27.–28.ix.2006, M. Fikáček lgt., all M. Fikáček det.
Chaetarthria similis Wollaston, 1864: 5 spec. (NMPC): **SPAIN:** CATALUÑA: Girona, Les Guilleries, Osor, Els Ortigots, Riera d'Osor, 41°56'41.4"N 2°34'40"E, in gravel as side of small river, 280 m, 1.vi.2014, lgt. Deler-Hernández, Fikáček, Ribera & Cieslak, M. Fikáček det.

Systematic position of *Thysanarthria*

Thysanarthria was described as differing from *Chaetarthria* in the presence of elytral striae, which are absent in all *Chaetarthria* (and in fact also in other Chaetarthriini genera). The phylogenetic analysis by SHORT & FIKÁČEK (2013) revealed *Thysanarthria* as deeply nested in *Chaetarthria* (represented by the European *C. seminulum* and a clade comprising the Oriental *Chaetarthria indica* group; American species were not included). *Thysanarthria* was found to be in sister position to the European species, i.e. the type species of the genus. These results raised two

questions: (1) Is *Thysanarthria* a monophyletic clade characterized by a set of clear synapomorphies? and (2) Can its genus status be justified? The second question can be solved only by the phylogenetic analysis of the group. The first question requires comparison with all groups of *Chaetarthria* which is outlined here. The present study is mainly based on Old World species of *Chaetarthria* we are familiar with, more American species should be examined in the future to clarify the conclusions presented below.

Comparison of *Thysanarthria* and the principal groups of *Chaetarthria* revealed that several large groups can be



Fig. 1. Habitus of the *Thysanarthria* species and related Old World Chaetarthriini. A – *Thysanarthria bengalensis* Hebauer, 2001, holotype; B – *T. persica* sp. nov., paratype; C – *T. siamensis* Hebauer, 2001, holotype; D – *T. hongsonensis* Hebauer, 2001, holotype; E – European *Chaetarthria*: *C. seminulum* (Herbst, 1797); F – large Old World *Chaetarthria*: *C. nigerrima* (Blackburn, 1891).

defined based on the morphology of the sclerites surrounding the male genitalia in the *Chaetarthria*+*Thysanarthria* clade. The fact that additional unique characters (possible synapomorphies) besides features of the genitalia can be found indicates that each of these groups likely represents a monophylum. The groups are as follows:

Group 1: Large Old World *Chaetarthria*

(Figs 1F, 2T–Z, e)

Species examined in detail. *Chaetarthria malickyi* Hebauer, 1995.

Species included. Eight described species: *C. almorana* Knisch, 1924; *C. incisa* Fikáček, 2010; *C. indica* Orchymont, 1920; *C. kuiyanae* Jia, Wang & Aston, 2018; *C. malickyi* Hebauer, 1995; *C. nigerrima* (Blackburn, 1891); *C. polita* Balfour-Browne, 1958; *C. saundersi* Orchymont,



Fig. 2. Morphological differences among *Thysanarthria* and principal groups of *Chaetarthria*. A–Z – male genitalia and surrounding sclerites; a–e – details of elytral pubescence. A – *Chaetarthria similis* Wollaston, 1864; B–G, c – *Chaetarthria seminulum* (Herbst, 1797); H–M, b – *Thysanarthria championi* (Knisch, 1924); N–S, d – *Chaetarthria panda* Orchymont, 1939; T–Z, e – *Chaetarthria malickyi* Hebauer, 1995; a – *Thysanarthria atriceps* (Régimbart, 1903). A–D, K–M, Q–S, X–Z – aedeagus in dorsal, lateral and ventral view; E, J, P, V – male sternite 9; F, H, N, T – male sternite 8; G, I, O, U – male tergite 8. Figures a–e are all to the same scale.

1923. One potentially undescribed species is known from China (JIA et al. 2018) and more undescribed species are present in the collections from the Malay Archipelago (M. Fikáček, unpubl. data).

Genital characters. Male sternite 8 without median projection (Fig. 2T). Male sternite 9 with anterior median part bearing median projection and with posterior part membranous, without distinct sclerites (Fig. 2V). Aedeagus strongly compressed dorsoventrally, of simply trilobate form; phallobase not cylindrical; basal apophyses of median lobe not reaching deeply into phallobase (Figs 2X–Z). **Additional characters.** Dorsal punctation very sparse, with simple setae (not easy to see under binocular microscope, hence elytra looking bare; Figs 1F, 2e). Abdominal ventrites 1–2 without median carina. Body size larger (1.8–2.6 mm). Dorsal coloration uniformly black to brown, in some species with pale elytral apex. Elytra without elytral striae.

Distribution. Most species are distributed in the Oriental Region, one in tropical Africa (*C. polita*), two in the Australian Region (*C. nigerrima* in Australia, *C. incisa* in New Caledonia).

Biology. Based on my own experience and label data of museum material, Oriental species are mostly collected in moist leaf litter, often far from any water courses. The same is the case of the New Caledonian *C. incisa* (FIKÁČEK 2010).

Group 2: European *Chaetarthria*

(Figs 1E, 2A–G, c)

Species examined in detail. *Chaetarthria seminulum* (Herbst, 1797), *C. similis* Wollaston, 1864.

Species included. Three described species: *C. seminulum*, *C. similis*, *C. simillima* Vorst & Cuppen, 2003.

Genital characters. Male sternite 8 with median projection (Fig. 2F). Male sternite 9 with anterior median part in shape of simple transverse bridge without median projection, posterior with two small sclerites on each side (Fig. 2E). Aedeagus not compressed dorsoventrally, strongly 3D in form, short and wide; phallobase cylindrical, bent dorsoventrally; basal apophyses of median lobe not reaching deeply into the phallobase (Figs 2A–D).

Additional characters. Dorsal punctation with sparse simple fine setae which are hard to see under binocular microscope, hence seemingly bare (Figs 1E, 2c). Abdominal ventrites 1–2 with median carina. Body size smaller (1.3–1.6 mm). Dorsal coloration uniformly black; elytra without elytral striae (Fig. 1E).

Distribution. Endemic for Europe and the Near East (Turkey).

Biology. All species are semiaquatic, usually associated with sandy margins of small rivers or standing waters, *Chaetarthria seminulum* and *C. simillima* can be also collected from plant debris at the edges of well vegetated standing water habitats (M. Fikáček, pers. observ.; VORST & CUPPEN 2003).

Group 3: American *Chaetarthria*

(Figs 2N–S, d, 12)

Species examined in detail. *Chaetarthria panda* and an unidentified species from Saudi Arabia (see below). More species need to be examined in the future, as the American *Chaetarthria* seems to be rather diverse in morphology based on the study by MILLER (1974) and may in fact represent more than one principal clade.

Species included. All New World species (see MILLER 1974; SPANGLER 1977, 1986).

Genital characters. Male sternite 8 with median projection (Figs 2N, 12H). Male sternite 9 with anterior median part in shape of wide sclerite bifurcate posteriorly, posterior part with a set of large sclerites (Figs 2P, 12I). Aedeagus not compressed dorsoventrally, strongly 3D in form, various in shape; phallobase cylindrical, bent dorsoventrally; basal apophyses of median lobe reaching deeply into the phallobase (Figs 2Q–S, 12A–C).

Additional characters. Dorsal punctation with peg-like setae (Fig. 2d). Abdominal ventrites 1–2 with median carina. Body size small to medium size (1.1–2.3 mm). Body yellowish to brown with black head (most species; Figs 12D–E), uniformly black (some species of *C. atra* group) or uniformly brownish (some species of *C. glabra* group). Elytra without elytral striae (Figs 12D–E).

Distribution. Southern part of the USA, Central America, Cuba, South America south of Argentina; one species possibly introduced to Saudi Arabia (see p. 251).

Biology. PERKINS (1976) examined the biology of five species of this group, and found them to be psammophilous, occurring on sandy banks of a small river c. 0.13 to 1.00 meter from the water line.

Group 4: *Thysanarthria*

(Figs 1A–D, 2H–M, a–b)

Species examined in detail. All species of the genus, see below.

Species included. 16 species, see below.

Genital characters. Male sternite 8 with median projection (Fig. 2H). Male sternite 9 with anterior median part in shape of a V-shaped transverse bridge without median projection, posterior part with a small sclerite on each side (Fig. 2J). Aedeagus not compressed dorsoventrally, strongly 3D in form, with long cylindrical phallobase bent dorsoventrally; basal apophyses of median lobe not reaching into the phallobase (Figs 2K–M, 4–9).

Additional characters. Dorsal punctation with trifid scale-like setae, with long and pointed median projection (Figs 2a–b). Abdominal ventrites 1–2 with median carina. Body size small to medium sized (1.4–2.2 mm). Dorsal coloration yellowish to brown, head black; elytra with 10 elytral striae (Figs 1A–D).

Distribution. Africa, Arabian Peninsula, Iran, Afghanistan, Indian Peninsula and Himalaya, continental part of the Oriental Region, western and southern China, Taiwan.

Biology. *Thysanarthria atriceps* and *T. chui* sp. nov. are psammophilous and were collected at sandy banks of a small river, *T. persica* and *T. wadicola* were found in a similar habitat at margins of desert stony streams and rock pools, *T. ceylonensis* at the sides of a small stony stream (see under that species for details; Figs 11D–F and RIBERA et al. 2019: Figs 7–8).

Relation of *Thysanarthria* to *Chaetarthria* groups

Three of these groups (European *Chaetarthria*, *Thysanarthria*, and New World *Chaetarthria*) share the sternite 8 with a long median projection (Figs 2F,

H, N; 12H), which is a very unusual character in Hydrophilidae, so far only known from the very distantly related *Oosternum*-group (tribe Megasternini) and in some genera of Berosini (B. Clarkson, pers. comm.). This unique character may indicate that the above three groups form a monophylum, whereas the large Old World *Chaetarthria* stands apart: its sternite 8 lacks the projections (Fig. 2T) which seems to be the plesiomorphic condition for the Hydrophilidae as well as Chaetarthriini. This hypothesis corresponds to the results of the phylogenetic analysis by SHORT & FIKÁČEK (2013) in which European *Chaetarthria* and *Thysanarthria* were revealed as more closely related to each other than to large Old World *Chaetarthria* (but American *Chaetarthria* were not included). Two more characters seem to support the possible close relationship between *Thysanarthria* and European *Chaetarthria*: the median part of male sternite 9 is present just as a transverse bar (straight in European *Chaetarthria* and V-shaped in *Thysanarthria*; Figs 2E, J) and the median lobe is short and not reaching deeply into the phallobase (Figs 2A–D, K–M). Elytral setation does not seem to correspond with this pattern: modified scale-like setae are present only in *Thysanarthria* (Figs 2a–b) and American *Chaetarthria* (Figs 2d, 12J–K). However, the morphology of the setae differs between these two groups (trifid with a long pointed median projection in *Thysanarthria*, simple with a cut-off apex in the New World *Chaetarthria*) and it cannot be excluded that the scale-like setae evolved independently in both groups. To sum up, the morphological characters examined indicate that *Thysanarthria* is a monophyletic clade, which likely makes *Chaetarthria* paraphyletic. On the other hand, the large Old World *Chaetarthria* seems to stand apart from the other *Chaetarthria* and *Thysanarthria* species. These observations need to be corroborated by a molecular phylogenetic study that is now under preparation. Therefore, no changes in generic status of *Chaetarthria* and *Thysanarthria* are proposed here.

Taxonomy

Thysanarthria Orchymont, 1926

Thysanarthria Orchymont, 1926a: 195. Type species: *Hydrobius atriceps* Régimbart, 1903 by original designation.
= *Chaetarthriomorphus* Chiesa, 1967: 276. Type species: *C. sulcatus* Chiesa, 1967 by monotypy. Synonymized by HANSEN (1991: 126).

Diagnosis. The genus can be recognized from other co-occurring genera of the Hydrophilidae based on the following combination of characters: body small to medium sized (1.4–2.2 mm); head black, pronotum and elytra yellowish to pale brown in most species, uniformly brown in the remaining ones (Figs 1A–D); head with large exposed well sclerotized labrum (e.g., Fig. 1B); antenna with 9 antennomeres, scape very long, pedicel bulbous, antennomeres 3–5 very small, cupule and three-segment antennal club pubescent (Fig. 3D); maxillary palpomere 4 basally with row of many peg-like setae (Fig. 3E); mentum projecting anteromedially, with row of setae along anterior margin (Fig. 3A); gular sutures contiguous (Fig. 3C); mesoventrite distinctly divided from anepisterna by sutures, sutures

widely separated on anterior margin of mesothorax (Fig. 3B); mesoventrite flat except of small semicircular elevation posteromesally (Fig. 3B); metaventrite short, sparsely pubescent only mesally and anterolaterally (Fig. 3B); elytra with 10 sharply impressed striae (Figs 1A–D); whole dorsal surface covered by sparsely arranged setae which are trifid basally with a long median projection (Figs 1C, 2a–b); profemora pubescent in basal half (Fig. 3C); mesofemora pubescent anterobasally (Fig. 3B); metafemora bare except on anterobasal margins (Fig. 3B); tarsi rather short and stout, metatarsus with all tarsomeres c. equal in length (Fig. 3F); abdomen with 5 ventrites, basal two bearing shallow cavity covered by long setae arising from base of ventrite 1, holding whitish gelatinous substance (Figs 3G–H); ventrite 1–2 with median carina; male abdominal sternite 8 with narrow median projection (Fig. 2H); male sternite 9 V-shaped medially (Fig. 2J); aedeagus with long tubular phallobase, base of median lobe not reaching deeply into phallobase (Figs 4–9).

Differential diagnosis. The base of abdomen with series of long setae covering a gelatinous substance and antenna with bulbous pedicel distinguish *Thysanarthria* from all other non-chaetarthrine genera. Within Chaetarthriini, the well sclerotized and widely exposed labrum differentiates it from *Hemisphaera* Pandellé, 1876 (which is also smaller and has more depressed body: see FIKÁČEK et al. 2012, JIA et al. 2013) which can co-occur with *Thysanarthria*, and from the Neotropical genus *Guyanobius* Spangler, 1986 (see GUSTAFSON & SHORT 2010). *Thysanarthria* can be distinguished from all three groups of *Chaetarthria* defined above by the elytra with 10 sharply impressed striae (Figs 1A–D). Most species of the genus are easy to recognize in the samples by their small body size and pale coloration of pronotum and elytra contrasting with the black head (this coloration is not present only in the Near East *T. persica* sp. nov. and *T. wadicola* sp. nov.).

Characters important for species-level identification.

All known species of *Thysanarthria* are very similar to each other in most external characters, and their tiny size makes the observation of many characters very difficult. The only external characters are (1) the presence/absence of the microsculpture on the head and labrum, pronotum and elytra, which can be either strongly mesh-like, weak and granulate, or totally absent; and (2) the body shape which can be wider (Fig. 1A) or more elongate (Figs 1B, D), but this is hard to compare in specimens which are not mounted in extended position on labels. Body coloration differs between species, with pronotum and elytra either uniformly yellowish (Figs 1A, C) or partly darkened (e.g. pronotum in Fig. 1D) or uniformly dark brown (Fig. 1B). However, examination of longer series of some species (*T. championi* and *T. siamensis*) revealed that the coloration can vary within a species, and hence is not always reliable for identification. The same is true for the dorsal body microsculpture which seems to vary in intensity, at least in *T. brittoni* (see under that species). The body size also differs between species, and the presence of specimens of different size in the same series may indicate the presence of multiple species. However, in species in

which more specimens were available, the body size was revealed to vary to some extent as well, and the body size can be hence used as an additional character only. Therefore, examination of the male genitalia is necessary for reliable identification in all cases. Ideally, the genitalia should be examined under a medium magnification of the

compound microscope, and attention should be paid also to the membranous structures on the apical part of the median lobe (including short, paired, subapical projections which are present only in some species, e.g. Figs 5D–E, I–J, 6D–E, I–J). The proportions of parameres may be uneasy to observe as they are partly affected by the posi-

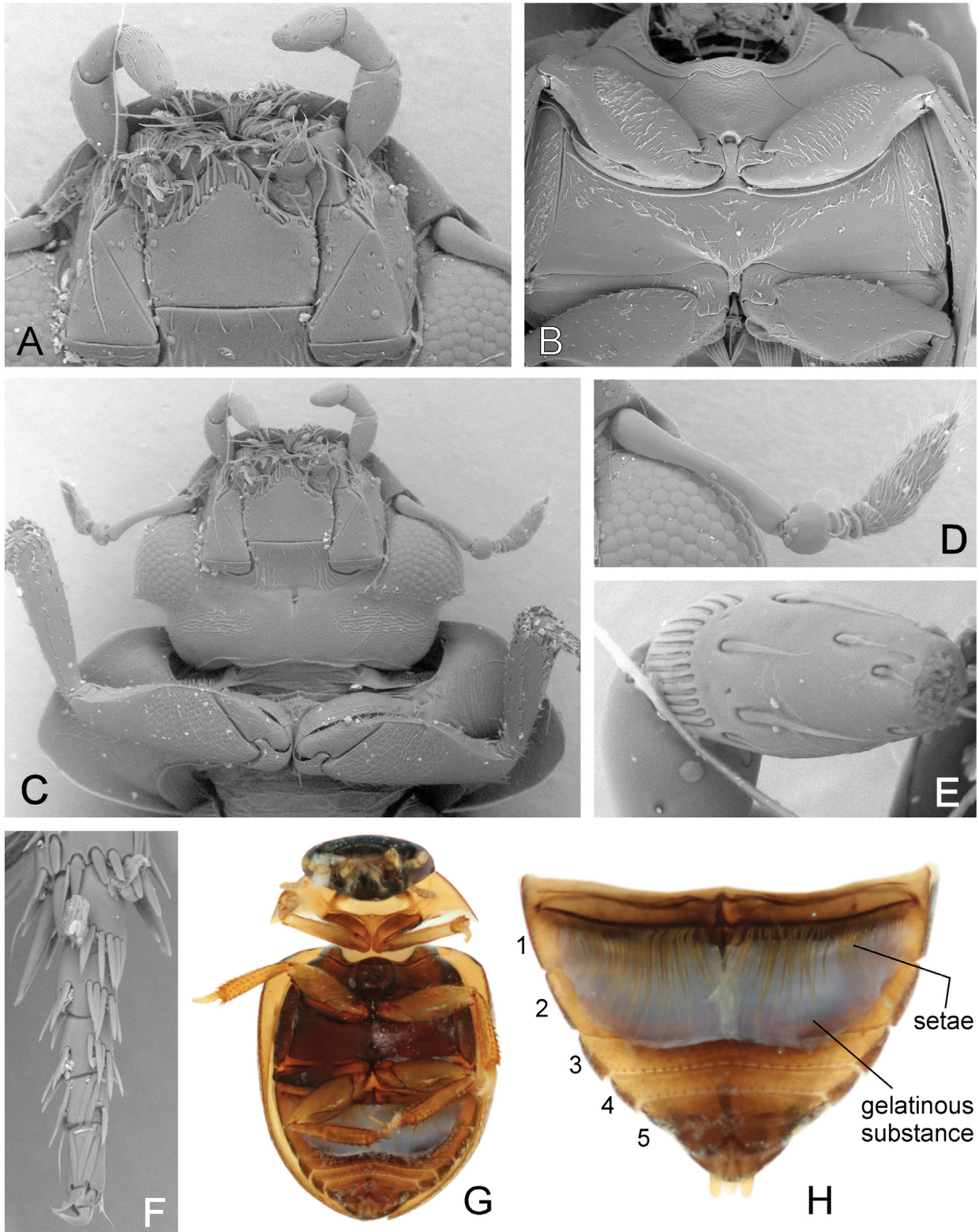


Fig. 3. Morphology of *Thysanarthria*. A – mentum and maxillary palps; B – meso- and metaventrite and meso- and metafemora; C – head and prothorax in ventral view; D – antenna; E – ultimate maxillary palpomere with basal peg-like setae; F – metatarsus; G – ventral view with gelatinous substance on the base of abdomen; H – detail of abdomen with gelatinous substance in the cavity on ventrites 1–2. A, C–F – *Thysanarthria championi* (Knisch, 1924); B, G–H – *T. atriceps* (Régimbart, 1903).

tion of the aedeagus, and the genitalia should be carefully observed under slightly different angles in case of doubts. The ratio of paramere length to phallobase length should be evaluated in lateral view, due to the strongly bent phallobase in many species. The examination of the material used for this study shows that especially the form of the median lobe is constant and diagnostic, whereas the shape of parameres may slightly vary. The apex of the median lobe is membranous in many species, even though usually rather constant in shape, and it seems that at least in some species it can include parts which are normally inverted and hence not easy to observe, and may sometimes get fully everted after the treatment in KOH (which however may distort other parts of the aedeagus; see e.g. 4J and 7E which show fully everted apical membranous parts). Since the observation of this part is difficult, we did not consider it for species diagnosis.

As male genitalia are the only reliable character for species identification, below we provide detailed illustrations of the genitalia with which new specimens to be identified should be compared. Once the candidate species is found based on genital morphology, the external characters mentioned above (body size and coloration, presence/absence of the microsculpture) should be compared with the (re)descriptions provided below. No identification key is hence provided.

Species groups. The limited number of characters makes it difficult to group the species into supposedly monophyletic species groups. Based on the genital morphology, the African *Thysanarthria atriceps* is very similar to the Arabian *T. brittoni*, and these two species seem to form a group of closely related species. The presence of subapical membranous lobes on the median lobe in *T. brincki*, *T. bifida*, *T. cardamona*, *T. madurensis*, and *T. trifida* (Figs 5D–E, I–J; 6D–E, I–J; 8N–O) may also point to a close relationships. *Thysanarthria brincki* and *T. cardamona* may form a clade within this group characterized by lateroapical spine on the paramere (Figs 5A–J).

Function of the abdominal gelatinous substance. All members of the tribe Chaetarthriini including *Thysanarthria* bear a series of long setae on the base of the abdomen which cover a shallow depression in ventrites 1–2 filled in by whitish gelatinous substance (Figs 3G–H). When submerged, *Thysanarthria* floats with dorsal body surface facing up, i.e. in the position usual for most other Hydrophilidae. The gelatinous substance hence does not serve to increase the buoyancy of the beetle as might be the case in the non-related genus *Amphiops* Erichson, 1843 which bears similar-looking gelatinous substance at the base of abdomen and is swimming in an upside-down position when submerged (Fikáček & Angus, pers. observ.). Moreover, the gelatinous substance does not interfere with the ventral air bubble of the submerged beetle: the bubble covers the whole ventral side of the beetle including the whole abdomen. Therefore, it seems that the substance cannot be functional in submerged beetle but may be an adaptation to its usual environment on the wet sand outside water. The gelatinous substance is sticky in alive specimens. Its function remains unknown.

Thysanarthria atriceps (Régimbart, 1903)

(Figs 2a, 3B,G,H, 4A–J)

Hydrobius atriceps Régimbart, 1903: 33.

Hydrobius atriceps: KNISCH (1924a: 169, catalogue); ZAITZEV (1908: 373, catalogue).

Thysanarthria atriceps: ORCHYMONT (1926a: 195, transfer to *Thysanarthria*); ORCHYMONT (1926b: 242, transfer to *Thysanarthria* explained in more detail, comparison with *T. championi*); BALFOUR-BROWNE (1952: 134, distribution); BALFOUR-BROWNE (1957: 21, distribution); HANSEN (1999: 105, catalogue); HEBAUER (2001: 394, redescription and update of distribution); HEBAUER (2005: 39, distribution); HEBAUER (2006: 24, catalogue).

Type material. Not examined.

Additional material examined. MALAWI: 2 ♀♀ (NMP): Nkhotakota env., 12.92716°S 34.2831°E, 2–3.i.2002, J. Bezděk lgt. REPUBLIC OF SOUTH AFRICA: WESTERN CAPE: 3 ♂♂, 2 unsexed specimens (NMP): 8 km NEE of Stanford, in gravel/sand and small isolated pools at the sandy stream and on/in sandy banks along the stream, 34°25.0'S 19°32.4'E, 4–5.xii.2015, Arriaga, Fikáček, Seidel & Vondráček lgt. (RSA49). ZIMBABWE: 1 ♂, 7 unsexed specimens (NMP): 20 km W Gwanda, 120 km SE Bulawayo, 6.xii.1999, F. Kantner lgt.

Redescription. *Body* length 1.4–2.0 mm, maximum body width 1.1–1.3 mm. Head and labrum black, pronotum and elytra uniformly yellowish; legs reddish to yellowish. *Head* with strongly granulate microsculpture on interstices; punctation sparse. Eyes separated by 2.7× the width of one eye in dorsal view. *Pronotum* with sparse setiferous punctation similar to that on head; interstices with strongly granulate microsculpture. *Elytra* with 10 striae sharply impressed except anteromedially (near scutellar shield) where neither striae nor serial punctures are visible; interval punctation sparse, setiferous; interstices without distinct microsculpture. *Aedeagus* (Figs 4A–J) c. 0.5–0.6 mm long. Phallobase slightly widened at base of parameres, slightly narrower than bases of parameres combined, weakly constricted at c. midlength, slightly bent in lateral view. Paramere widely rounded basally, narrowing in apical third, apex rounded. Median lobe narrow, membranous apically, without subapical projections; apex reaching c. level of apex of parameres; gonopore transversely oval, situated in distal third.

Variability. The examined specimens from the Republic of South Africa and Zimbabwe differ slightly in the shape of the basal part of the parameres (compare Figs 4A–E and 4F–J) but seem to be identical in all other aspects including the morphology of the median lobe. Examination of much larger material from Africa covering the known distribution would be needed to reveal whether these differences may be constant and correlated with geography; without such a study we consider the observed differences to be intraspecific variation for the moment.

Differential diagnosis. *Thysanarthria atriceps* seems to be the only species occurring in Africa and is hence easy to identify. In form of the median lobe and parameres it resembles only the Arabian *T. brittoni* from which it differs in relatively longer and narrower parameres and less constricted phallobase.

Biology. The species seems to be usually collected at light. Examined South African specimens were collected from wet sandy banks of a small lowland stream (Fig. 11E), the beetles were found when the sandy parts were flooded

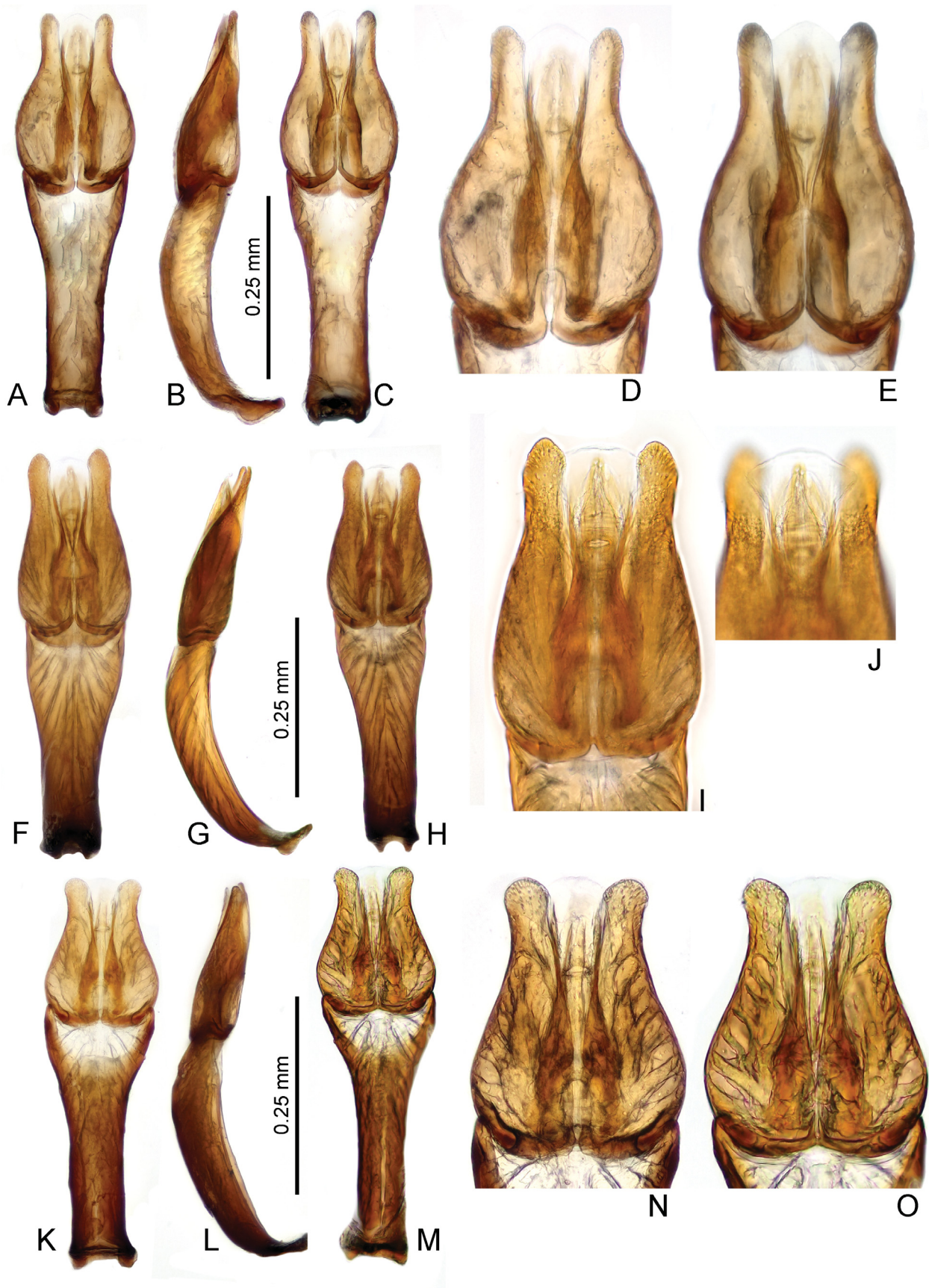


Fig. 4. Male genitalia of *Thysanarthria* species. A–E – *T. atriceps* (Régimbart, 1903) from Zambia: 20 km W of Gwanda, coll. NMPC (A–C – whole aedeagus in dorsal, lateral and ventral view; D–E – detail of median lobe and parameres in dorsal and ventral view); F–J – *T. atriceps* from Republic of South Africa: 8 km NEE of Stanford, coll. NMPC (F–H – whole aedeagus in dorsal, lateral and ventral view; I–J – detail of median lobe and parameres in dorsal and ventral view); K–O – *T. brittoni* Balfour-Browne, 1951, holotype (K–M – whole aedeagus in dorsal, lateral and ventral view; N–O – detail of median lobe and parameres in dorsal and ventral view).

with water or pressed to get submerged, which caused the beetles to float on the water surface.

Distribution. Central and southern part of Africa and Madagascar (where the type locality is situated); on African continent so far recorded from Togo, the Ivory Coast, Angola, Rwanda, Burundi, Malawi, Zimbabwe, Mozambique, and the Republic of South Africa (HEBAUER 2006).

Thysanarthria brittoni Balfour-Browne, 1951

(Figs 4K–O, 11)

Thysanarthria brittoni Balfour-Browne, 1951: 215.

Thysanarthria brittoni: HEBAUER (1997: 267, catalogue); HANSEN (1999: 105, catalogue).

Type material examined. HOLOTYPE: ♂ (BMNH), 'Type // W ADEN PROT / Wadi at foot of / Jebel Harir / ca. 5,000 ft / 1,2.xi.1937 // B. M. Exp. to / S. W. Arabia / H. Scott & / E. B. Britton / B. M. 1938-246 // J. Balfour-Browne det. / *Thysanarthria* / *brittoni* Type!'

Redescription. *Body* length 1.6 mm, maximum body width 1.0 mm. Head and labrum black, pronotum and elytra uniformly yellowish; legs reddish to yellowish. **Head** with weak microsculpture on interstices; punctation sparse, each puncture bearing pointed seta. Eyes separated by 3.1× the width of one eye in dorsal view. **Pronotum** with sparse setiferous punctation similar to that on head; interstices with weak microsculpture. **Elytra** with 10 striae sharply impressed except anteromedially (near scutellar shield) where neither striae nor serial punctures are visible; interval punctation sparse, setiferous; interstices without distinct microsculpture. **Aedeagus** (Figs 4K–O) c. 0.5 mm long. Phallobase strongly widened at base of parameres, c. as wide as bases of parameres combined, strongly constricted at c. midlength, slightly bent in lateral view. Paramere widely rounded basally, slightly narrowing in apical third, apex rounded, apices divergent from each other. Median lobe narrow, membranous apically, without subapical projections; apex reaching c. level of apex of parameres; gonopore transversely oval, situated in distal third.

Variability. BALFOUR-BROWNE (1951) mentions that the dorsal microsculpture of the head and pronotum, which is very weakly developed in the holotype, is stronger in some of the paratypes which are hence externally undistinguishable from *T. atriceps*.

Differential diagnosis and discussion. *Thysanarthria brittoni* is very similar to *T. atriceps* in all characters including male genitalia, which only differ in the proportions of the parameres including their slightly diverging apices, and by the more strongly constricted phallobase (see under *T. atriceps* for details). The difference of the genitalia of *T. brittoni* from the examined specimens of *T. atriceps* is bigger than the observed intraspecific variability of *T. atriceps*, which is the reason why we consider *T. brittoni* a separate species at the moment.

Biology. Unknown.

Distribution. Only known from the type locality in western Yemen, Arabian Peninsula (BALFOUR-BROWNE 1951).

Thysanarthria bengalensis Hebauer, 2001

(Figs 1A, 5K–M, 11)

Thysanarthria bengalensis Hebauer, 2001: 395.

Type material examined. HOLOTYPE: ♂ (SMNS), 'EAST PAKISTAN / Dinajpur / X-1969 Barbe // HOLOTYPUS / *Thysanarthria* / *bengalensis* sp.n. / des. F. Hebauer'.

Redescription. *Body* length 2.2 mm, maximum body width 1.3 mm. Head and labrum black, pronotum and elytra uniformly yellowish; legs reddish to yellowish. **Head** with strong mesh-like microsculpture on interstices; punctation sparse, each puncture bearing pointed seta. Eyes separated by 3.0× the width of one eye in dorsal view. **Pronotum** with sparse setiferous punctation similar to that on head; interstices with strong mesh-like microsculpture. **Elytra** with 10 striae, sharply impressed except basally; intervals distinctly convex at midlength and near apex; interval punctation sparse, setiferous; interstices with very faint mesh-like microsculpture. **Aedeagus** c. 0.6 mm long. Phallobase wide at base of parameres, strongly constricted at midlength into a very narrowly tubular basal part, bent in nearly right angle in lateral view close to parameral base, c. 1.3× longer than parameres. Parameres wide, c. of same width throughout, arcuately bent, cut off apically and projecting into a small denticle apicomeresally. Median lobe not examined as it is absent (damaged) in the holotype. **Differential diagnosis.** *Thysanarthria bengalensis* is the largest species of the genus and differs from all other species in all elytral series (including the mesal ones) nearly reaching the base of the elytra. In the presence of strong microsculpture on the head and pronotum it resembles *T. brincki* and *T. saurahana*, from which it can be easily distinguished by the morphology of male genitalia. The form of the phallobase (extremely constricted in dorsal/ventral views, and bent in nearly right angle in the lateral view – Fig. 5M) is also unique for this species, and makes it easy to distinguish.

Biology. Unknown.

Distribution. Only known from the type locality in northern Bangladesh (HEBAUER 2001).

Thysanarthria bifida sp. nov.

(Figs 6A–E, 11)

Type material. HOLOTYPE: 1 ♂ (NHMW), THAILAND: MAE HONG SON: Mae Ping, at light, 6.i.–30.ix.1991, lgt. Malicky. PARATYPES: 6 specimens (NHMW, NMPC): same data as the holotype. CHIANG MAI: 2 spec. (NHMW): Chiang Mai, Zoo, at light, 18.–25.iv.1988, lgt. Chantaramongkol & Malicky. SONGKHLA: 3 spec. (NHMW): 'ab Ton Nga Chang WF', 4.–5.v.1993.

Description. *Body* length 1.2–1.5 mm (holotype 1.3 mm), maximum body width 0.8–0.9 mm (holotype 0.9 mm). Head and labrum black, pronotum and elytra uniformly yellowish; legs reddish to yellowish. **Head** with weak mesh-like microsculpture on interstices; punctation sparse, each puncture bearing a seta. Eyes separated by 4.0× the width of one eye in dorsal view. **Pronotum** with sparse setiferous punctation similar to that on head; interstices smooth, without microsculpture. **Elytra** with 10 striae sharply impressed except anteromedially (near scutellar

shield) where neither striae nor serial punctures are visible; intervals convex at midlength and near apex; interval punctation sparse, setiferous; interstices without microsculpture. *Aedeagus* 0.5 mm long. Phallobase weakly and gradually narrowing from base of parameres towards base, slightly widened basally, weakly arcuately bent in lateral

view; c. 2× longer than parameres. Parameres short, wide basally, gradually narrowing towards apex, lateral face nearly continuously arcuate, apex bluntly rounded. Median lobe wide at level of gonopore, indistinctly constricted basally of it, apex membranous, widely rounded; subapical part with two triangular membranous lobes; apex reaching

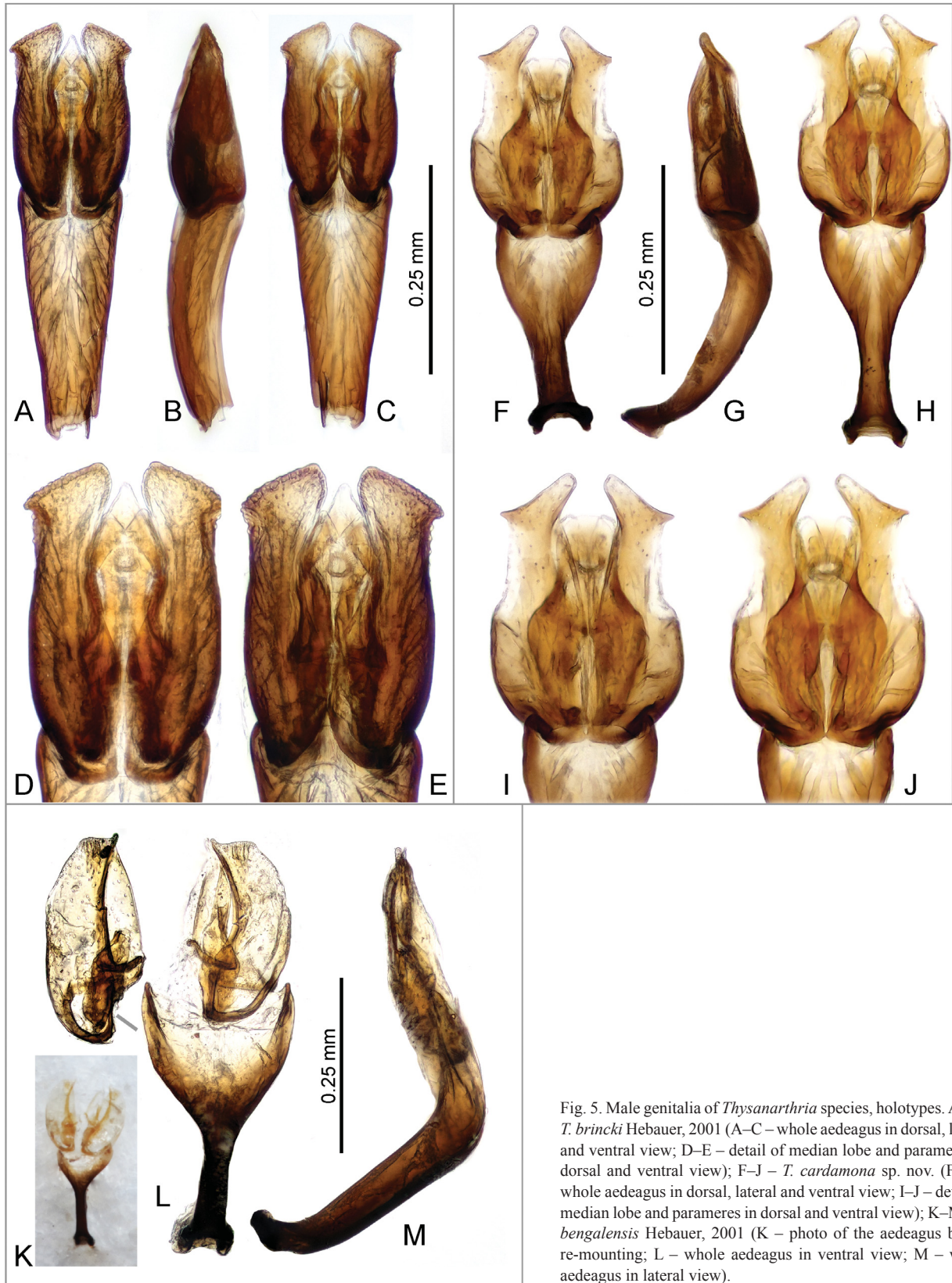


Fig. 5. Male genitalia of *Thysanarthria* species, holotypes. A–E – *T. brincki* Hebauer, 2001 (A–C – whole aedeagus in dorsal, lateral and ventral view; D–E – detail of median lobe and parameres in dorsal and ventral view); F–J – *T. cardamona* sp. nov. (F–H – whole aedeagus in dorsal, lateral and ventral view; I–J – detail of median lobe and parameres in dorsal and ventral view); K–M – *T. bengalensis* Hebauer, 2001 (K – photo of the aedeagus before re-mounting; L – whole aedeagus in ventral view; M – whole aedeagus in lateral view).

c. level of apex of parameres; gonopore transversely oval, situated below bases of paired projections.

Differential diagnosis. *Thysanarthria bifida* is easy to recognize by the median lobe bearing a pair of subapical membranous projections combined with the short parameres arcuately narrowing into simply rounded apices. In these characters it closely resembles *T. trifida* sp. nov. from which it mainly differs in smaller body size (1.2–1.5 mm in *T. bifida*, 1.9–2.0 mm in *T. trifida*), shorter and wider parameres (compare Figs 6A–E to 6F–J) and the membranous apex of the median lobe widely rounded (compared to the pointed one in *T. trifida*).

Etymology. The species name refers to the subapical pair of projections on the median lobe which make the apex of the median lobe seemingly bifid when observed under the microscope. Adjective.

Biology. Most examined specimens were collected at light, no more data are available about the biology.

Distribution. The species is so far known from three localities, two of which are situated in northwestern Thailand (provinces Mae Hong Son and Chiang Mai) and the last in the southernmost Thailand close to the border with Malaysia (province Songkhla). This indicates that the species is likely quite widely distributed but overlooked and rarely collected.

Thysanarthria brincki Hebauer, 2001

(Figs 5A–E, 11)

Thysanarthria brincki Hebauer, 2001: 395

Type material examined. HOLOTYPE: ♂ (MZLU), 'Ceylon, E. Prov. / Madura Oya / 15 mls NNW Bibile / 13.III.62 Loc. 138 // near river // Lund University / Ceylon Expedition 1962 / Brinck-Andersson- / Cederholm // MZLU / Type no. / 3119:1 // Photo 2017 / by MZLU // MZLU / 2017 / 510'.

Redescription. *Body* length 1.6 mm, maximum body width 1.0 mm. Head and labrum black, pronotum and elytra uniformly yellowish; legs reddish to yellowish. *Head* with strong mesh-like microsculpture on interstices; punctuation sparse, each puncture bearing pointed seta. Eyes separated by 2.8× the width of one eye in dorsal view. *Pronotum* with sparse setiferous punctuation similar to that on head; interstices with mesh-like microsculpture. *Elytra* with 10 striae sharply impressed anteromedially (near scutellar shield) where neither striae nor serial punctures are visible; intervals weakly convex at midlength and near apex; interval punctuation sparse, setiferous; interstices without microsculpture. *Aedeagus* slightly over 0.5 mm long (basal part of phallobase broken in the holotype). Phallobase weakly and gradually narrowing from base of parameres to base, weakly arcuately bent in lateral view, slightly longer than parameres. Parameres wide, c. of same width throughout, arcuately bent, apex rectangularly widened, with a denticle apicolaterally. Median lobe pointed apically, widening to the level of gonopore, more basally slightly constricted again, subapically with a pair of triangular projections; apex not reaching the level of apex of parameres; gonopore transversely oval, situated below the base of paired projections.

Differential diagnosis. *Thysanarthria brincki* is easy to recognize by the unusual shape of the parameral apices

which are widely rectangular with a small anterolateral spine; in this character it slightly resembles *T. cardamona* sp. nov. but differs from it in parameres c. of the same width throughout (compared to the parameres wide basally and strongly constricted in distal third in *T. cardamona*).

Biology. Unknown.

Distribution. Only known from the type locality in Sri Lanka (HEBAUER 2001).

Thysanarthria cardamona sp. nov.

(Figs 5F–J, 11)

Type material. HOLOTYPE: ♂ (NHMW), INDIA: KERALA: Cardamon Hills, 50 km NW of Pathanamthitta, Pambaiyar river, at light, 6.–9.v.1994, lgt. Z. Kejval. PARATYPES: 9 specimens (NHMW, NMPC): same data as the holotype.

Description. *Body* length 1.4–1.7 mm (holotype 1.4 mm), maximum body width 0.8–1.0 mm (holotype 0.8 mm). Head and labrum black, pronotum and elytra uniformly yellowish; legs reddish to yellowish. *Head* with weak microsculpture on interstices; punctuation sparse, each puncture bearing pointed seta. Eyes separated by 3.5× the width of one eye in dorsal view. *Pronotum* with sparse setiferous punctuation similar to that on head; interstices with weak microsculpture. *Elytra* with 10 striae sharply impressed except anteromedially (near scutellar shield) where neither striae nor serial punctures are visible; intervals flat at midlength, weakly convex near apex; interval punctuation sparse, setiferous; interstices without microsculpture. *Aedeagus* 0.5 mm long. Phallobase wide at base of parameres (but narrower than bases of parameres combined), strongly constricted at c. midlength into narrowly tubular base, in lateral view slightly bent shortly below parameral bases. Paramere wide basally, strongly narrowing up to the apical third, apical half membranous on outer face; apical part projecting into sharp tooth laterally and narrow rounded lobe mesally. Median lobe membranous, rounded apically, not widening subapically; subapically with a pair of rounded projections; apex not reaching the level of apex of parameres; gonopore transversely oval, situated below the base of paired projections.

Differential diagnosis. *Thysanarthria cardamona* is easy to distinguish by its very characteristic aedeagus which only slightly resembles that of *T. brincki*; see under the latter species for the differences.

Etymology. The species name refers to the Cardamon Hills where the type locality of the species is situated. Adjective.

Biology. The type series was collected at light, no more information is available.

Distribution. Only known from the type locality.

Thysanarthria ceylonensis Hebauer, 2001

(Figs 6K–O, 11)

Thysanarthria ceylonensis Hebauer, 2001: 396

Type material examined. HOLOTYPE: ♂ (MZLU), SRI LANKA: NORTHERN PROVINCE: 'Ceylon, N. Prov. / Kudattanai / 6 mls SE Point Pedro / 13.II.62, Loc. 70 // At pond in semi- / desert // Lund University / Ceylon Expedition 1962 / Brinck-Andersson- / Cederholm // MZLU / Type no. / 3120:1 // Photo 2017 / by MZLU // MZLU / 2017 / 511'.

Additional material examined. INDIA: MADHYA PRADESH: 1 ♂, 2 specimens (NHMW, NMPC): River Denwa, ca. 8 km SSE Matkuli, Satpura Range, 400 m, 28.ii.2008, lgt. M. Jäch, S. & P. Sharma; 1 ♀ (NHMW):

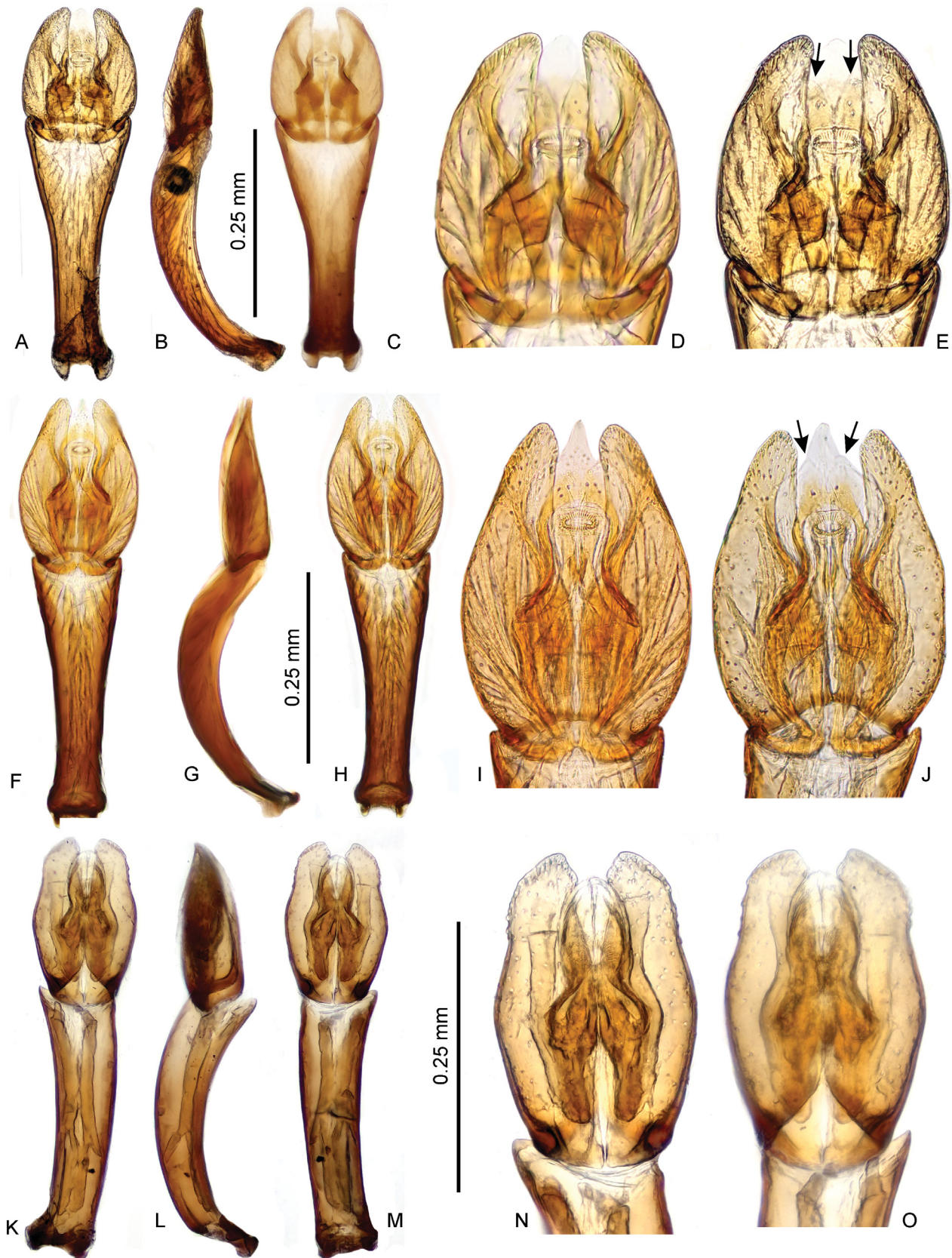


Fig. 6. Male genitalia of *Thysanarthria* species, holotypes (A–I, K–O) and paratype (J). A–E – *T. bifida* sp. nov. (A–C – whole aedeagus in dorsal, lateral and ventral view; D–E – detail of median lobe and parameres in dorsal and ventral view). F–J – *T. trifida* sp. nov. (F–H – whole aedeagus of the holotype in dorsal, lateral and ventral view; I – details of parameres of the holotype; J – same of the paratype). K–O – *T. ceylonensis* Hebauer, 2001 (K–M – whole aedeagus in dorsal, lateral and ventral view; N–O – details of median lobe and parameres in dorsal and ventral view).

Hoshangabad Distr., Bandrabhan, ca. 60 km SSE Bhopal, ca. 5 km NE Hoshangabad, River Narmada, 280 m, 23.–24.ii.2008, lgt. M. Jäch, S. & P. Sharma; 1 spec. (NHWM): Chhindwara Distr., Bhadhua Chora (stream), ca. 10 km E Matkuli near Mahul Jhir, 400 m, 28.ii.2008, lgt. M. Jäch, S. & P. Sharma; 1 ♀ (NHMW): Hoshangabad Distr., Dhobighat Nala (stream), ca. 2 km SE Pachmarhi, Saphura Range, 900 m, 27.ii.2008, lgt. M. Jäch, S. & P. Sharma.

Redescription. *Body* length 1.5–1.7 mm (holotype 1.5 mm), maximum body width 0.9–1.0 mm (holotype 0.9 mm). Head and labrum black and pronotum uniformly yellowish; elytra yellowish with slightly darker lateral parts; legs reddish to yellowish. *Head* with strong microsculpture on interstices; punctation sparse, each puncture bearing pointed seta. Eyes separated by 3.5× the width of one eye in dorsal view. *Pronotum* with sparse setiferous punctation similar to that on head; interstices without microsculpture. *Elytra* with 10 striae sharply impressed except anteromedially (near scutellar shield) where neither striae nor serial punctures are visible; intervals weakly convex at midlength and near apex; interval punctation sparse, setiferous; interstices without microsculpture. *Aedeagus* (Figs 6K–O) 0.4 mm long. Phallobase not much wider at base of parameres than more basally, only indistinctly narrowed at midlength; arcuate in lateral view. Paramere moderately wide basally, slightly narrowing towards apex, apex widely angulate. Median lobe widely bottle-shaped, rounded apically, without paired subapical projections; apex not reaching level of parameral apices; gonopore rounded, situated far from apex.

Differential diagnosis. *Thysanarthria ceylonensis* resembles *T. bengalensis*, *T. brincki* and *H. saurahana* in having strong mesh-like microsculpture on the head, but it can be easily distinguished from all these species as well as from all other *Thysanarthria* by a very characteristic aedeagus.

Biology. Specimens from Madhya Pradesh were collected at the sides of small to large rivers with stony banks (e.g., Fig. 11D) but precise microhabitat is not known (M. A. Jäch, pers. comm.).

Distribution. Described from Sri Lanka (HEBAUER 2001) but here recorded from central India (Madhya Pradesh), hence the species is likely widespread in the Indian Peninsula.

Thysanarthria championi (Knisch, 1924)

(Figs 2H–M,b, 3A,C–F, 7A–J, 11)

Chaetarthria championi Knisch, 1924b: 40.

Thysanarthria championi: ORCHYMONT (1926a: 195, transfer to *Thysanarthria*); ORCHYMONT (1926b: 242, transfer to *Thysanarthria* explained in more detail, comparison with *T. atriceps*); HANSEN (1999: 105, catalogue); HEBAUER (2001: 398, redescription and update of distribution).

Chaetarthriomorphus sulcatus Chiesa, 1967: 276, **syn. nov.**

Thysanarthria sulcata: HANSEN (1991: 126, transfer to *Thysanarthria*); HANSEN (1999: 105, catalogue). All other records of this species refer to different species, see under *T. persica* sp. nov. and *T. wadicola* sp. nov.

Type material examined. *Chaetarthria championi*. LECTOTYPE (here designated): ♂ (BMNH), INDIA: UTTARKHAND: ‘Ranikhet / Kumaon / India, H. G. C. // G. C. Champion / Brit. Mus. / 1924-42. // Chaetarthria / championi / Knisch // det. Knisch / W. E. Z. 1924’. PARALECTOTYPES: 1 spec. (BMNH), same label data as the lectotype; 1 spec. (BMNH): ‘W. Almora / Kumaon U.P. / India, H. G. C. // G. C. Champion / Brit. Mus. / 1924-42. // Chaetarthria / championi / Knisch // Knisch det. 1922

/ *Chaetarthria / championi*’; 1 spec. (BMNH): ‘W. Almora / Kumaon / India, H. G. C. // G. C. Champion / Brit. Mus. / 1924-42. // Chaetarthria / championi / Knisch // Knisch det. 1922 / Chaetarthria / championi’

Chaetarthriomorphus sulcatus: LECTOTYPE (here designated): ♂ (HNHM): AFGHANISTAN: ‘NO. Afghan. 1953 / J. Klapperich // Nuristan, 1200 m / Bashgultal, 20.IV. // Paratypus 1964 / Chaetarthriomorphus / sulcatus / Chiesa // CHAETARTHRIOMORPHUS / sulcatus / CHIESA / CHIESA DET. // AEDEAGUS / DRAWN BY / P. D. PERKINS’.

Additional material examined. NEPAL: 1 ♂ (NMPC), S Ganesh Himal village, near Kali Sundhara Bazar, 700 m, 24.–25.v.1996, lgt. Ahrens, Kulbe & Rulik; 1 ♂, 3 specimens (SMNS): Narayani, Sauraha, bank of Rapti River, light trap, 180, 84.49695, 27.56667, 2000-04-18, A. Weigel; 1 ♂ (SMNS): same label data but lgt. A. Skale. INDIA: UTTARANCHAL: 1 ♂, 22 specimens (NMPC): ca. 13 km NW of Nainital, Khaira [= Khaima] bridge, near river, at light, 900 m, 13.–17.vii.2003, lgt. Z. Kejval & M. Trýzna. ARUNACHAL PRADESH: 1 ♂, 8 specimens (NMPC): 8 km S Jamiri-Sesa vicinity, 350 m, 4.–26.v.2006, lgt. P. Pacholatko. CHINA: YUNNAN: 1 ♂, 2 spec. (NHMW): 100 km W of Kunming, Diaolin Nature Reserve, 22.v.–2.vi.1993, lgt. E. Jendek & O. Šauša; 1 ♂, 2 spec. (NMPC): Tongbiguan vill., near river, at light, 1340 m, 24°36.7'N 97°39.4'E, 24.–26.vi.2018, lgt. J. Hájek & J. Růžička. MYANMAR: 1 ♂, 6 specimens (NHMW): Mandalay, ca. 50 km NW Kalaw, Myitsona river, 450 m, 25.x.1998, lgt. Schillhammer.

Redescription. *Body* length 1.5–2.0 mm (holotype 1.9 mm), maximum body width 1.0–1.1 mm (holotype 1.0 mm). Head and labrum black; pronotum yellowish with vaguely delimited darker central spot of variable extent or in some specimens (incl. holotype) completely dark brown; elytra yellowish with darkened elytral striae, or with darker lateral parts, or uniformly brown (incl. in holotype); legs yellowish to brown. *Head* with weak microsculpture on interstices; punctation sparse, each puncture bearing pointed seta. Eyes separated by 3.1× the width of one eye in dorsal view. *Pronotum* with sparse setiferous punctation similar to that on head; interstices without microsculpture. *Elytra* with 10 striae sharply impressed except anteromedially (near scutellar shield) where neither striae nor serial punctures are visible (but darker spots may be present, resembling real punctures); intervals weakly convex at midlength and near apex; interval punctation sparse, setiferous; interstices without microsculpture. *Aedeagus* (Figs 7A–J) c. 0.5 mm long. Phallobase not much wider at base of parameres than more basally, only indistinctly narrowed at midlength; arcuate in lateral view. Paramere wide basally, gradually narrowing towards apex, outer face nearly continuously arcuate, slightly bisinuate in apical fourth, apex bluntly pointed; mesal face with short cuticular asperities (visible in cleaned aedeagus only, Fig. 7E). Median lobe widely bottle-shaped, without paired subapical projections; apex nearly reaching level of parameral apices, membranous, rounded in relaxed position (Figs 7D, I–J), with a pair of backwards directed lobes when fully everted (not usually visible); gonopore rounded, situated subapically.

Differential diagnosis. *Thysanarthria championi* resembles *T. bifida* sp. nov., *T. trifida* sp. nov., and *T. chui* sp. nov. in the general morphology of the aedeagus and the basally wide parameres arcuately narrowing into widely to narrowly rounded apex; of these *T. bifida* and *T. trifida* can be distinguished by the presence of a pair of subapical projections on the median lobe (absent in *T. championi*); *T. chui* lacks these lobes, but its parameres are relatively shorter and more abruptly narrowed apically, projecting into rounded lobes. *Thysanarthria championi* is one of four species co-occurring



Fig. 7. Male genitalia of *Thysanarthria championi* (Knisch, 1924). A–E – lectotype of *Chaetarthria championi* Knisch, 1924 (A–C – whole aedeagus in dorsal, lateral and ventral view; D – detail of median lobe and parameres in dorsal view; E – same after KOH treatment, with fully everted internal sac). F–J – lectotype of *Chaetarthriomorphus sulcatus* Chiesa, 1967 (F–H – whole aedeagus in dorsal, lateral and ventral view; I–J – details of parameres and median lobe in dorsal and ventral view).

in Himalaya, along with *T. madurensis*, *T. saurahana* sp. nov., and *T. siamensis*; it can be easily distinguished from all of them by the morphology of male genitalia.

Comments on synonymy. The above type specimen of *Chaetarthriomorphus sulcatus* is the only found in the Klapperich collection in HHNM. It is largely damaged, with prothorax and one elytron completely missing. However, the abdomen and male genitalia are present, and the morphology of the aedeagus corresponds completely with that of the lectotype of *T. championi*. The elytron is paler, not dark brown, which further supports the fact that *C. sulcatus* cannot be conspecific with the specimens from southern Iran (described here as *T. persica* sp. nov.) and the northern Arabian Peninsula (described here as *T. wadicola* sp. nov.) as erroneously reported by HEBAUER (1997) and FIKÁČEK et al. (2010). Following these facts, the examined specimen is designated as the lectotype, and *Chaetarthriomorphus sulcatus* is here placed in synonymy with *Chaetarthria championi*.

Biology. Part of the examined specimens was collected at light on river banks, no more information is available.

Distribution. The species is widely distributed in the foothills of the Himalaya Mts. and the adjacent mountain systems in eastern Afghanistan (Hindukush Mts.), southwestern China (Yunnan), and Myanmar. The specimens listed by HEBAUER (2001) from Laos are females and hence their identity cannot be confirmed.

Thysanarthria chui sp. nov.

(Figs 8A–E, 11)

Type material. HOLOTYPE: ♂ (NMNS), TAIWAN: Kaohsiung, Shanpin [= Shan Ping Forest Ecological Garden], at light, 22.–23.iv.2003, lgt. C. S. Lin. PARATYPES: 20 spec. (NMNS, TARI, NMPC, NHMW, BMNH): TAIWAN: Taichung City, Wufeng district, Zhongkeng Industry Road, 4.3 km SEE of Chaoyang Univ. of Technology, 24.054983N 120.755433E, 180 m, 25.iv.–14.v.2019, H.-C. Liu lgt., on sandy banks of of small slowly running lowland stream.

Additional material examined. TAIWAN: LANYU ISLAND: 1 ♀ (TARI): Lanyu, 27.vii.2015, lgt. Y.-T. Wang. The specimen corresponds with the

holotype in all external characters and we are hence assigning it to *T. chui*. However, since male genitalia are needed for reliable identification, I am not including this specimen among the types.

Description. *Body* length 1.3–1.6 mm (holotype 1.6 mm), maximum body width 0.9–1.0 mm (holotype 1.0 mm). Head and labrum black; pronotum brown in the middle, becoming weakly paler towards margins; elytra uniformly dark brown; legs brown. *Head* without microsculpture on interstices; punctation sparse, each puncture bearing pointed seta. Eyes separated by 3.8× the width of one eye in dorsal view. *Pronotum* with sparse setiferous punctation similar to that on head; interstices without microsculpture. *Elytra* with 10 striae sharply impressed except anteromedially (near scutellar shield) where neither striae nor serial punctures are visible; intervals weakly convex at midlength and near apex; interval punctation sparse, setiferous; interstices without microsculpture. *Aedeagus* (Figs 8A–E) 0.5 mm long. Phallobase indistinctly wider at base of parameres, only very weakly constricted more basally, arcuate in lateral view. Parameres wide basally, gradually narrowing towards apex, outer face subrectangular in basal two thirds, apex projecting into narrow rounded lobe. Median lobe narrow apically, rounded and membranous at apex, reaching to the level of parameral apices, pair of subapical projections missing; gonopore transversely oval, situated in apical fourth.

Differential diagnosis. *Thysanarthria chui* externally differs from part of the remaining species in the total absence of dorsal microsculpture and rather dark (brown rather than yellowish) coloration. In the genital morphology it resembles *T. championi*, *T. bifida*, and *T. trifida* in the form of the parameres; *T. bifida* and *T. trifida* differ in the presence of a pair of subapically situated membranous lobes (absent in *T. chui* and *T. championi*). For differences from *T. championi* see under that species.

Etymology. The first author dedicates this new species to Isaac Chu as thanks for introducing him to Taiwan and its culture. The first known specimen of the new species was moreover collected in Mr. Chu's home city of Kaohsiung.

Biology. Paratypes were collected on a sandy bank of a slowly running lowland stream; they were actively crawling on the wet sand out of the water during the day (Figs 11F–G). The holotype was collected at light.

Distribution. The species is known from the lowland localities in western and southern Taiwan. The occurrence on Lanyu (= Orchid Island) needs to be confirmed by examination of a male specimen.

Thysanarthria hongsonensis Hebauer, 2001

(Figs 1D, 8F–J, 11)

Thysanarthria hongsonensis Hebauer, 2001: 398.

Type material examined. HOLOTYPE: ♂ (SMNS), THAILAND: MAE HONG SON: 'Thai, N. Mae Hong Son / prov. Soppong env., 600m / 19°27'N 98°20'E, 28.5.- / 2.6.1999, D. Hauck leg.'

Additional material examined. THAILAND: MAE HONG SON: 1 ♂, 2 spec. (NHMW, NMPC): Mae Ping, at light, 6.ix.1991, lgt. Malicky; 1 ♂, 1 spec. (NHMW): same locality and collector, 24.–25.vi. 1991.

Redescription. *Body* length 1.5 mm, maximum body width 0.9 mm. Head and labrum black; pronotum dark brown in

the middle, becoming weakly paler towards margins; elytra uniformly yellowish; legs yellowish. *Head* without microsculpture on interstices; punctation sparse, each puncture bearing pointed seta. Eyes separated by 3.3× the width of one eye in dorsal view. *Pronotum* with sparse setiferous punctation similar to that on head; interstices without microsculpture. *Elytra* with 10 striae sharply impressed except anteromedially (near scutellar shield) where neither striae nor serial punctures are visible; intervals weakly convex at midlength and near apex; interval punctation sparse, setiferous; interstices without microsculpture. *Aedeagus* (Figs 8F–H) 0.5 mm long. Phallobase at the base of parameres slightly widened, but not wider than parameres combined; very slightly constricted more basally, strongly arcuate in lateral view. Parameres narrow and elongate, narrow basally, gradually narrowing into a rather acute apex, outer face of parameres sinuate. Median lobe nearly reaching apex of parameres, narrow, membranous and rounded apically, without paired subapical projections. **Differential diagnosis.** The species is characterized by a tiny body size, absence of dorsal microsculpture and very characteristic aedeagus with narrow elongate parameres. In narrow parameres it may resemble *T. madurensis* but may be distinguished from it by sinuate lateral face of parameres (arcuate in *T. madurensis*), median lobe without paired subapical projections (with the projections in *T. madurensis*) and only indistinctly widened base of the phallobase (abruptly widened in *T. madurensis*).

Biology. Unknown, most examined specimens were collected at light.

Distribution. So far only known from two nearby localities in northern Thailand (Mae Hong Son Province) (HEBAUER 2001).

Thysanarthria madurensis Hebauer, 2001

(Figs 8K–O, 11)

Thysanarthria madurensis Hebauer, 2001: 398.

Type material examined. HOLOTYPE: ♂ (MZLU), SRI LANKA: 'Ceylon, E. Prov. / Madura Oya / 15 mls NNW Bibile / 13.III.62 Loc. 138 // near river // Lund University / Ceylon Expedition 1962 / Brinck-Andersson- / Cederholm // MZLU / Type no. / 3121:1 // Photo 2017 / by MZLU // MZLU / 2017 / 466'.

Additional material examined. INDIA: KERALA: 1 ♂ (NHMW): Shoranur, bank of Ponnani river, 31.i.1994, lgt. Z. Kejval. NEPAL: 1 ♂, 2 spec. (SMNS, NMPC): Narayani, Sauraha, Rapti River bank, light trap, 18.iv.2000, lgt. A. Weigel.

Redescription. *Body* length 1.3 mm, maximum body width 0.9 mm. Head and labrum black; pronotum uniformly yellowish; elytra uniformly yellowish; legs yellowish. *Head* with weak granulate microsculpture on interstices; punctation sparse, each puncture bearing pointed seta. Eyes separated by 4.0× the width of one eye in dorsal view. *Pronotum* with sparse setiferous punctation similar to that on head; interstices with weak granulate microsculpture. *Elytra* with 10 striae sharply impressed except anteromedially (near scutellar shield) where neither striae nor serial punctures are visible; intervals weakly convex at midlength and near apex; interval punctation sparse, setiferous; interstices without microsculpture. *Aedeagus* (Figs 8K–O) 0.4 mm long. Phallobase moderately wide at base of parameres,



Fig. 8. Male genitalia of *Thysanarthria* species, holotypes. A–E – *T. chui* sp. nov. (A–C – whole aedeagus in dorsal, lateral and ventral view; D–E – detail of median lobe and parameres in dorsal and ventral view). F–J – *T. hongsonensis* Hebauer, 2001 (F–H – whole aedeagus in dorsal, lateral and ventral view; I–J – details of parameres and median lobe in dorsal and ventral view). K–O – *T. madurensis* Hebauer, 2001 (K–M – whole aedeagus in dorsal, lateral and ventral view; N–O – details of median lobe and parameres in dorsal and ventral view).

c. as wide as parameres combined, gradually narrowing towards basal fifth, base abruptly widened, arcuate in lateral view. Parameres narrow and elongate, gradually narrowing towards a pointed apex, apices slightly divergent, outer face of parameres arcuate. Median lobe narrow, not reaching apex of parameres, with a pair of pointed lobes subapically, apex cut off between these projections; gonopore transversely oval, subapical.

Differential diagnosis. In the tiny body size, dorsal surface without microsculpture and narrowly elongate pointed parameres, *T. madurensis* only resembles *T. hongsonensis*. See under the latter species for diagnostic characters.

Biology. Unknown, the Nepalese specimens were collected at light.

Distribution. The species is known from three very distant localities (Sri Lanka, southern India and Nepal). If the label data especially of the Nepalese specimens are correct, the species is likely widely distributed in the Indian peninsula, but overlooked.

Thysanarthria persica sp. nov.

(Figs 1B, 10A–E, 11)

Thysanarthria cf. *sulcata* (part): FIKÁČEK et al. (2010: 139; misidentification).

Type material. HOLOTYPE: ♂ (NMPC), IRAN: SISTAN AND BALUCHESTAN: Iran, Baluchistan, 16 km SE of Tange-Sarhe, 61 km, NNW of Nik-shahr, 10.iv.1973, Expedition National Museum Prague, locality 154. PARATYPES: 4 spec. (NMPC), same data as the holotype. FARS: 1 ♂ (NMPC): Iran, Fars, Ali-abad, 75 km NW of Djahrom, wadi of the river Shur, 10.vii.1970, Expedition National Museum Praha, locality 53. KERMAN: 1 ♂ (NHMW): Iran, Kerman, Manujan, 110 km E Bandarabaas, at light, 2.vi.1974, lgt. Pretzmann, Exp. Nat. Hist. Mus. Vindob. [= expedition of the Natural History Museum, Vienna].

Description. *Body* length 1.7–1.9 mm (holotype 1.7 mm), maximum body width 1.0–1.1 mm (holotype 1.0 mm). Head and labrum black; pronotum dark brown in centre, becoming slightly paler towards margins; elytra uniformly dark brown; legs brown. *Head* without microsculpture on interstices; punctuation sparse, each puncture bearing pointed seta. Eyes separated by 2.5× the width of one eye in dorsal view. *Pronotum* with sparse setiferous punctuation similar to that on head; interstices without microsculpture. *Elytra* with 10 striae sharply impressed except in basal fourth where neither striae nor serial punctures are visible; intervals weakly convex at midlength and near apex; interval punctuation sparse, setiferous; interstices without microsculpture. *Aedeagus* (Figs 10A–E) 0.5 mm long. Phallobase slightly widened at base of parameres, c. as wide as parameres combined, slightly narrowing towards base, arcuately bent in lateral view. Parameres narrowly elongate, gradually narrowing towards apex, outer face arcuate or indistinctly sinuate. Median lobe narrow with widely rounded membranous apex nearly reaching level of parameral apices, paired subapical projections absent; gonopore transversely oval, situated in distal fourth of median lobe.

Differential diagnosis. Unlike most other *Thysanarthria* except *T. wadicola* sp. nov., *T. persica* has uniformly dark pronotum and elytra. Its genitalia are characteristic by rather elongate parameres with arcuate lateral face and widely rounded apex (in contrast to *T. wadicola* with

prolonged acuminate apices of parameres). It also differs from *T. wadicola* in the median lobe nearly reaching the level of apices of parameres (in contrast to very short median lobe in *T. wadicola*), in parameres c. one third as long as phallobase when seen in lateral view (c. as long as phallobase in *T. wadicola*) and in moderately wide bases of parameres in lateral view (very wide base narrowing into a very narrow apex in lateral view in *T. wadicola*).

Etymology. The name refers to Persia, the historical name of Iran this new species is described from. Adjective.

Biology. Based on HOBERLANDT (1981), the type locality was a rocky bank of a mountain torrent without vegetation at c. 900 m of altitude on stony mountains slopes; the specimens were collected from small gravel strands on the bank of the brook. The paratype from Fars was collected in a wadi with a stream with muddy and sandy banks (HOBERLANDT 1974).

Distribution. So far only known from southern Iran.

Thysanarthria saurahana sp. nov.

(Figs 9A–E, 11)

Type material. HOLOTYPE: ♂ (SMNS): NEPAL: ‘Nepal, Narayani, Sauraha, Rapti River bank, light trap, 180, 84.49695, 27.56667, 2000-04-18, A. Weigel, NEPAL, Prov. Narayani / Sauraha, Rapti River / Ufer, 180mNN, 27°34'80"N, 84°29'49"E / LF, 18.IV.2000 / leg. Weigel // *Thysanarthria* / *madurensis* / det. F. Hebauer’.

Description. *Body* length 1.7 mm, maximum body width 1.0 mm. Head and labrum black; uniformly yellowish; elytra uniformly yellowish; legs yellowish. *Head* with strong mesh-like microsculpture on interstices; punctuation sparse, each puncture bearing pointed seta. Eyes separated by 2.7× the width of one eye in dorsal view. *Pronotum* with sparse setiferous punctuation similar to that on head; interstices with strong mesh-like microsculpture. *Elytra* with 10 striae sharply impressed except anteromedially (widely around scutellar shield) where neither striae nor serial punctures are visible; intervals weakly convex at midlength and near apex; interval punctuation sparse, setiferous; interstices without microsculpture. *Aedeagus* (Figs 9A–E) 0.5 mm long. Phallobase slightly widened at base of parameres, c. as wide as parameres combined, slightly narrowed towards basal fifth and abruptly widened at base; arcuate in lateral view. Paramere narrowly elongate, subequal in width throughout, apex abruptly narrowing into a short mesoapical ‘tooth’. Median lobe much shorter than parameres, with strongly sclerotized shorter part arcuate apically, and membranous apical part rounded apically; gonopore large, triangular, situated subapically.

Differential diagnosis. *Thysanarthria saurahana* is the only species in Himalaya with strong mesh-like microsculpture on the pronotum (in contrast to pronotum without microsculpture in *T. championi* and *T. siamensis*, and with weak granulate microsculpture in *T. madurensis*). It can be distinguished from all these species as well as from all other *Thysanarthria* by the shape of parameres and the unique morphology of the median lobe which is not similar to any other species of the genus.

Etymology. The species name refers to the village of Sauraha at the border of the Chitwan National Park in Nepal

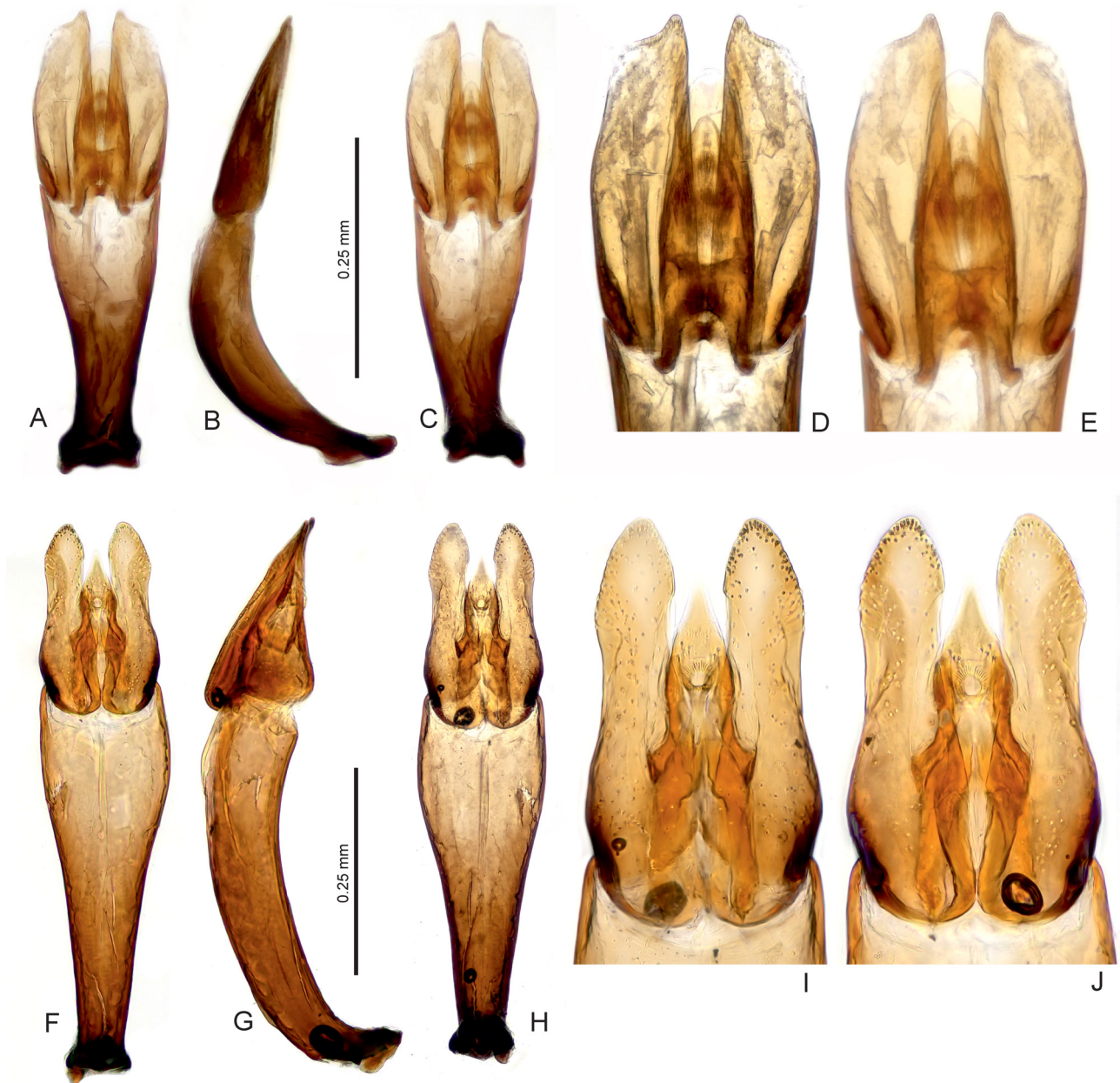


Fig. 9. Male genitalia of *Thysanarthria* species, holotypes. A–E – *T. saurahana* sp. nov. (A–C – whole aedeagus in dorsal, lateral and ventral view; D–E – detail of median lobe and parameres in dorsal and ventral view). F–J – *T. siamensis* Hebauer, 2001 (F–H – whole aedeagus in dorsal, lateral and ventral view; I–J – details of parameres and median lobe in dorsal and ventral view).

where the holotype was collected. Adjective.

Biology. Unknown.

Distribution. Only known from the type locality.

***Thysanarthria siamensis* Hebauer, 2001**

(Figs 1C, 9F–J, 11)

Thysanarthria siamensis Hebauer, 2001: 399.

Type material examined. HOLOTYPE: ♂ (NHMW), THAILAND: MAE HONG SON: ‘N-THAILAND 1993 / Mae Hong Son env. / Ban Huai Po 24-30.VI. / leg. Schneider’.

Additional material examined. 1 ♂, 5 spec. (NHMW, NMPC): INDIA: UTTARKHAND: Gauri (str.), Pauri Garhwal, left tributary of River Alaknanda, ca. 2 km upstream from Thamdar, along road to Marud, ca. 8 km from Srinagar, 730 m, 11.xi.2006, lgt. M. A. Jäch; 1 ♂, 2 spec. (NHMW): River Suhma, Dehradun district, right tributary of river Ganga, ca. 5 km S Raiwala, ca. 10 km N Haridwar, 340 m, 9.ix.2006, lgt. M.

A. Jäch. NEPAL: 1 ♂, 3 spec. (NHMW): Gorkha, 26.–31.v.1992, lgt. Ivo Jeniš. LAOS: VIENTIANE: 1 ♂, 2 spec. (NHMB): Laos, Vientiane, Vang-Vieng, 300, 102.4486, 18.92306, 10.v.2001–6.vii.2001, J. Kolibáč. THAILAND: MAE HONG SON: 1 ♂, 2 spec. (NHMW): Huai Sua Tao, 11–17.v.1992, lgt. Jan Strnad.

Redescription. **Body** length 1.7–2.0 mm (holotype 1.8 mm), maximum body width 1.0–1.2 mm (holotype 1.0 mm). Head and labrum black; pronotum uniformly yellowish or brown centrally and gradually getting paler towards margins; elytra uniformly yellowish to pale brown, with slightly darkened striae; legs yellowish. **Head** without microsculpture on interstices; punctation sparse, each puncture bearing yellowish pointed seta. Eyes separated by 3.1× the width of one eye in dorsal view. **Pronotum** with sparse setiferous punctation similar to that on head;

interstices without microsculpture. **Elytra** with 10 striae sharply impressed except anteromedially (near scutellar shield) where neither striae nor serial punctures are visible; intervals weakly convex at midlength and near apex; interval punctation sparse, setiferous; interstices without microsculpture. **Aedeagus** (Figs 9F–J) 0.7 mm long. Phallobase widened in apical half, widest shortly below bases of parameres (slightly wider than parameres combined); weakly arcuate in lateral view. Parameres short, narrowly elongate, constricted at midlength, widened into rounded lobes apically; widely triangular in lateral view. Median lobe narrow, shorter than parameres, sharply pointed, without membranous apex of paired subapical lobes; gonopore circular, situated subapically.

Differential diagnosis. *Thysanarthria siamensis* is very characteristic by a relatively large aedeagus with lanceolate parameres and sharply pointed median lobe and is hence hard to be confused with any other species of the genus.

Biology. Specimens from India: Uttarkhand were collected at the sides of small to large stony rivers, microhabitat is unknown (M. A. Jäch, pers. comm.).

Distribution. The species is widespread, ranging from western Himalaya to central Thailand and northern Laos.

***Thysanarthria wadicola* sp. nov.**

(Figs 10F–J, 11)

Thysanarthria sulcata (misidentification): HEBAUER (1997: 267; records from Oman, illustration of genitalia); HEBAUER (2001: 399, taxonomic revision).

Thysanarthria cf. *sulcata* (part): FIKÁČEK et al. (2010: 139; misidentification).

Thysanarthria sp. (SLE127): SHORT & FIKÁČEK (2013; molecular phylogeny).

Thysanarthria wadicola: RIBERA et al. (2019: 264; review of Oman aquatic beetles).

Type material. HOLOTYPE: ♂ (NMPC): OMAN: Wadi Andam, 20 km N Samad, 650 m, 17.–18.iv.1985, lgt. C. Holzschuh. PARATYPES: 2 ♂♂

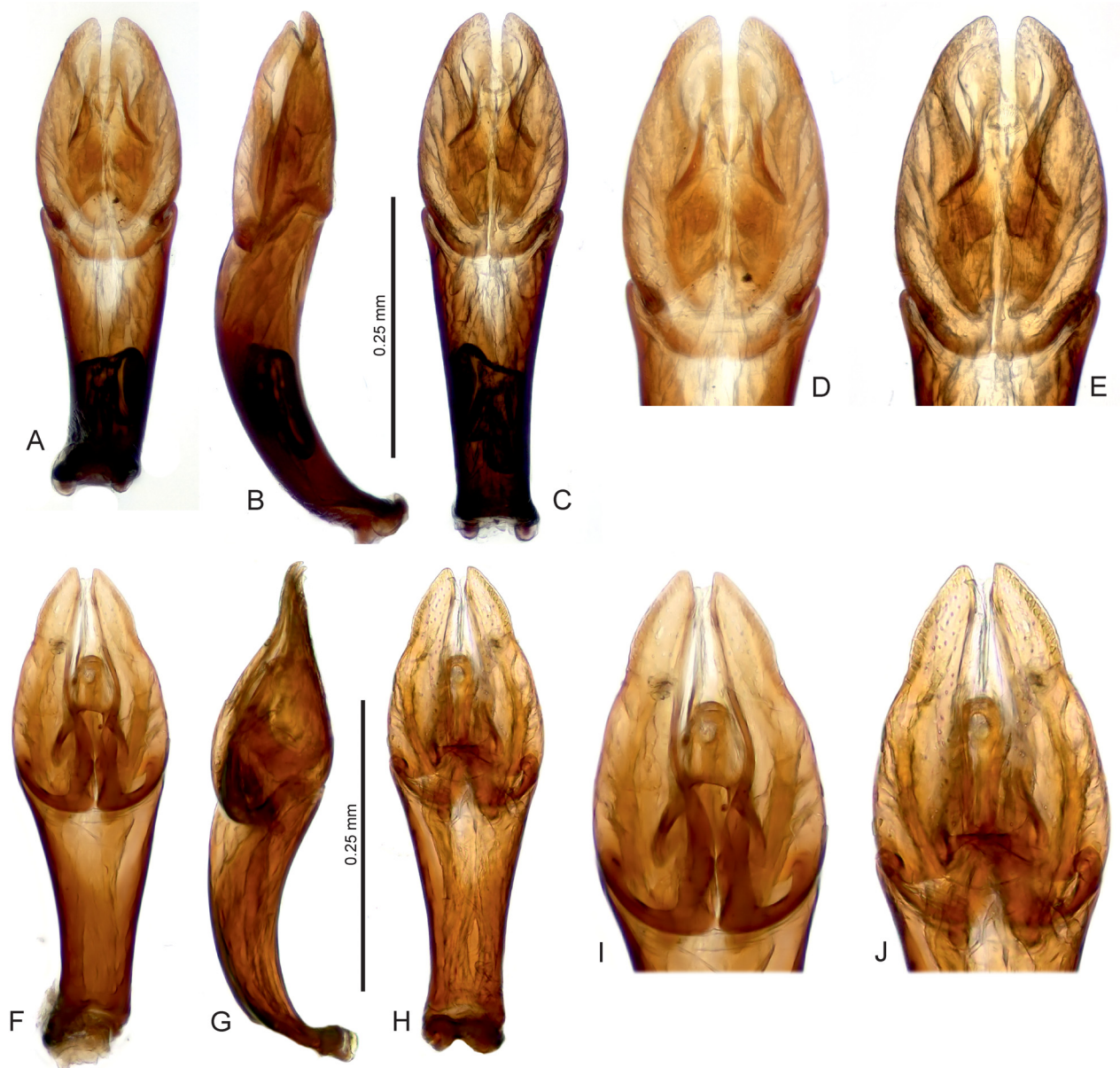


Fig. 10. Male genitalia of *Thysanarthria* species, holotypes. A–E – *T. persica* sp. nov. (A–C – aedeagus in dorsal, lateral and ventral view; D–E – detail of median lobe and parameres in dorsal and ventral view). F–J – *T. wadicola* sp. nov. (F–H – aedeagus in dorsal, lateral and ventral view; I–J – detail of median lobe and parameres in dorsal and ventral view).

(SMNS): same data as the holotype; 3 spec. (IBEB): Murri env., wadi Bani Ghafir, 759 m, stream with pools, 23°29'46.2"N 56°53'34.8"E, 7.iv.2010, Ribera & Cieslak lgt.; 1 spec. (IBEB): Said Bin Sahran env., wadi Indam, Rd. 33, 463 m, residual pools, 22°45'15.2"N 58°00'56.9"E, 8.iv.2010, Ribera & Cieslak lgt.

Additional material examined. UNITED ARAB EMIRATES: 1 ♀ (NMPC): Hatta, at light, 8.–26.iv.2006, lgt, A. van Harten. This female

specimen was collected very close to the type locality of the species and externally corresponds well with the Oman specimen, we hence consider it conspecific. As no male is available from the locality, We are however not including it into the type series.

Redescription. *Body* length 1.6–1.7 mm (holotype 1.6 mm), maximum body width 0.9–1.0 mm (holotype 0.9

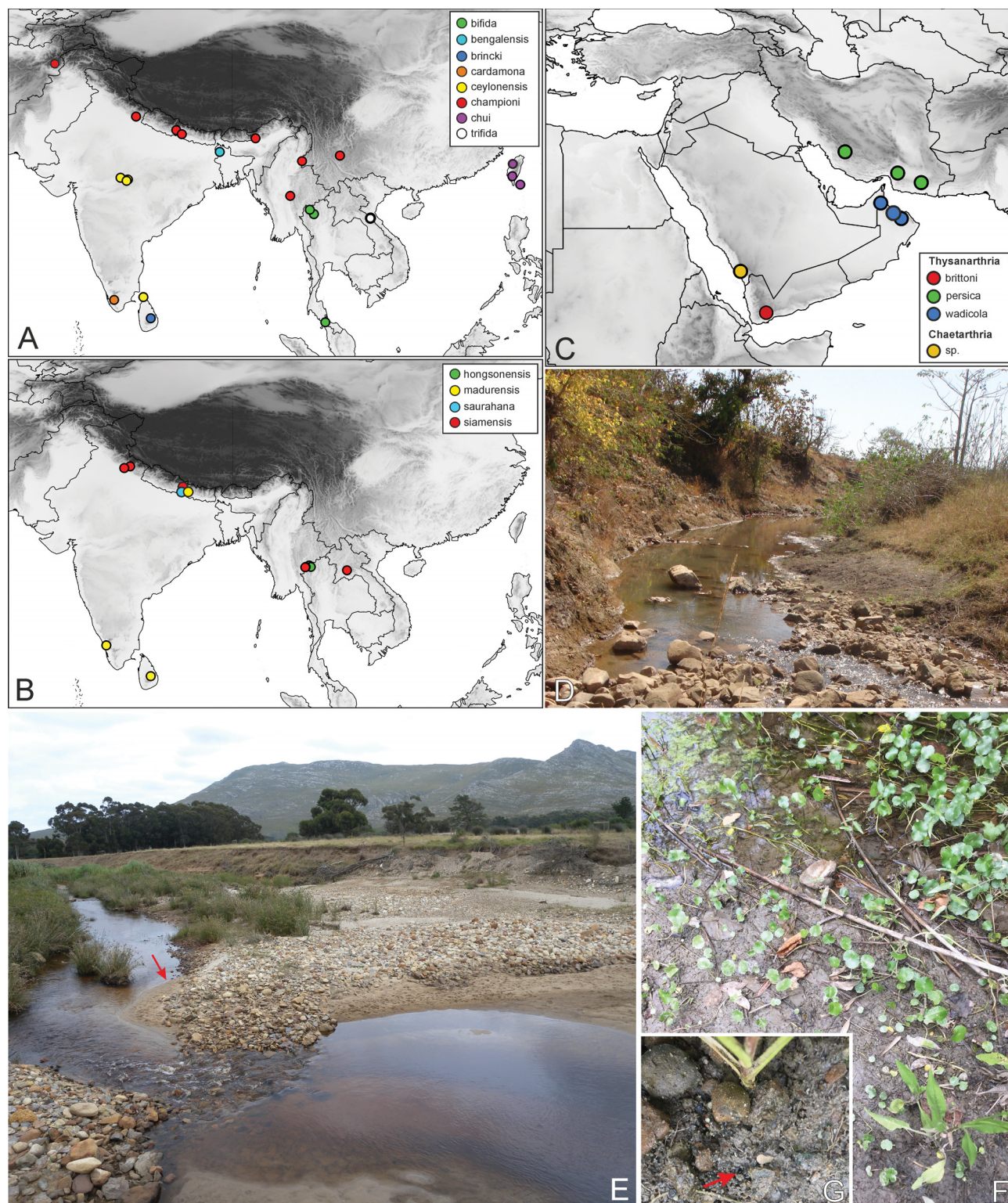


Fig. 11. Distribution of *Thysanarthria* and American *Chaetarthria* in Asia (A–B) and Near East (C), and examples of habitats of *Thysanarthria* (D–F). Localities: D – India, Madhya Pradesh, Bhadhua Chora stream ca. 10 km E of Matkuli Jhir, habitat of *T. ceylonensis* Hebauer, 2001; E – Republic of South Africa, Western Cape, 8 km NEE of Stanford, habitat of *T. atriceps* (Régimber, 1903), collecting spot marked by an arrow; F–G – Taiwan, Wufeng distr., 4.3 km SEE of Chaoyang University of Technology, habitat of *T. chui* sp. nov. (G – detail of sandy shore with one alive beetle). Photo D by M. Jäch, photo E by M. Fikáček, F–G by H.-C. Liu.

mm). Head and labrum black; pronotum uniformly dark brown; elytra uniformly dark brown; legs brown. **Head** without microsculpture on interstices; punctation sparse, each puncture bearing pointed seta. Eyes separated by 3.3× the width of one eye in dorsal view. **Pronotum** with sparse setiferous punctation similar to that on head; interstices without microsculpture. **Elytra** with 10 striae sharply impressed except anteromedially (around scutellar shield) where neither striae nor serial punctures are visible; intervals weakly convex at midlength and near apex; interval punctation sparse, setiferous; interstices without microsculpture. **Aedeagus** (Figs 10F–J) 0.4 mm long. Phallobase slightly widened at bases of parameres, slightly narrower than parameres combined, weakly narrowing more basally in ventral/dorsal view, in lateral view phallobase c. as long as parameres, arcuate, and strongly constricted subbasally. Parameres wide basally, continually narrowing into prolonged pointed apex, outer face slightly sinuate, in lateral view very wide basally and very narrow apically. Median lobe very short, less than half the length of parameres, without distinct membranous part on the apex, without paired projections, gonopore circular, situated apically.

Differential diagnosis. *Thysanarthria wadicola* differs from most species of the genus except *T. persica* in uniformly dark brown pronotum and elytra. For differences from *T. persica* see under that species.

Etymology. The species name is a combination of *wadi* (an Arabic word for seasonally dried-up riverbed) and the suffix *-cola* derived from the word *incola* (Latin, = inhabitant). Noun in apposition.

Biology. Part of the specimens was collected at margins of small rocky pools at the side of a drying-up stream (see RIBERA et al. 2019: Figs 7–8).

Distribution. The species is so far known only from few closely situated localities on the northeastern tip of the Arabian Peninsula.

Thysanarthria trifida sp. nov.

(Figs 6F–J, 11)

Type material. HOLOTYPE: ♂ (NHMB), LAOS: BOLI KHAM XAI: 8 km NE of Ban Nape, 600 m, 1.–18.v.2001, lgt. Pacholátko. PARATYPES: 25 spec. (NHMB, NHMW, NMPC): same data as the holotype; 1 ♂ (SMNS): Ban Nape, Kaew Nua, 18.iv.1998–1.v.1998, lgt. E. Jendek & O. Šauša.

Description. **Body** length 1.9–2.0 mm (holotype 1.9 mm), maximum body width 1.0–1.1 mm (holotype 1.0 mm). Head and labrum black; pronotum uniformly yellowish or slightly darkened centrally; elytra uniformly yellowish or with slightly darkened striae; legs yellowish. **Head** with weak granulate microsculpture on interstices; punctation sparse, each puncture bearing pointed seta. Eyes separated by 2.8× the width of one eye in dorsal view. **Pronotum** with sparse setiferous punctation similar to that on head; interstices without microsculpture. **Elytra** with 10 striae sharply impressed except anteromedially (near scutellar shield) where neither striae nor serial punctures are visible; intervals weakly convex at midlength and near apex; interval punctation sparse, setiferous; interstices without microsculpture. **Aedeagus** (Figs 6F–J) 0.6 mm

long. Phallobase weakly and gradually narrowing from base of parameres towards base, slightly widened basally, weakly arcuately bent in lateral view; c. 1.5× longer than parameres. Parameres narrowly elongate, gradually narrowing towards apex, lateral face nearly continuously arcuate, apex bluntly rounded. Median lobe wide at level of gonopore, distinctly constricted basally of it, apex membranous, acutely pointed; subapical part with two triangular membranous lobes; apex reaching c. level of apex of parameres; gonopore transversely oval, situated below bases of paired projections.

Differential diagnosis. *Thysanarthria trifida* closely resembles *T. bifida* in external characters and genitalia morphology; see under the latter species for diagnostic characters. The other three species with paired subapical projections on the median lobe (*T. brincki*, *T. cardamona* and *T. madurensis*) can be differentiated from *T. trifida* easily by a very different shape of parameres. Species which may resemble *T. trifida* in the shape of the parameres (*T. championi*, *T. hongsonensis*, *T. persica*) all lack the paired projection on the median lobe.

Etymology. The species name refers to the apex of the median lobe bearing three lobes (the apex plus the pair of subapical projections). We purposely select the name sounding similar to that of *T. bifida* which is the most similar species to *T. trifida*. Adjective.

Biology. Unknown.

Distribution. So far only known from the Ban Nape area in central Laos.

Record of *Chaetarthria* from Arabian Peninsula

Chaetarthria sp.

(Figs 11, 12A–K)

Material examined. SAUDI ARABIA: 1 ♂ 4 spec. (NMPC): Jizan, Wadi Atoud, 17.8°N 42.366°E, at light, 245 m, 8.ii.2016, lgt. J. Bezděk & D. Král.

Diagnosis. Body 1.7–2.0 mm long; head and labrum black; pronotum and elytra uniformly yellowish; legs reddish to yellowish; dorsal surface without microsculpture; setae on dorsal surface peg-like (Figs 12J–K); elytron without elytral striae except sharply impressed sutural stria; lateral portion of elytra with weakly developed lateral-most series of punctures not impressed into stria; posterior margin of abdominal ventrites 2–5 bearing stout acute setae; male protibiae arcuate on inner margin; sternite VIII with median basal projection; sternite IX with wide tongue-like median portion; aedeagus 0.7 mm long; phallobase tubular, c. 1.4× longer than parameres; parameres wide basally, narrowing from c. midlength to the quadrate apex, only slightly wider basally than apically in lateral view, completely encompassing median lobe; median lobe very narrow, reaching c. the level of apical fourth of parameres, basally reaching deeply into phallobase; gonopore subapical.

Discussion. The morphology of the male genitalia and the surrounding sclerites correspond precisely to those of Group 3: American *Chaetarthria* defined above (compare

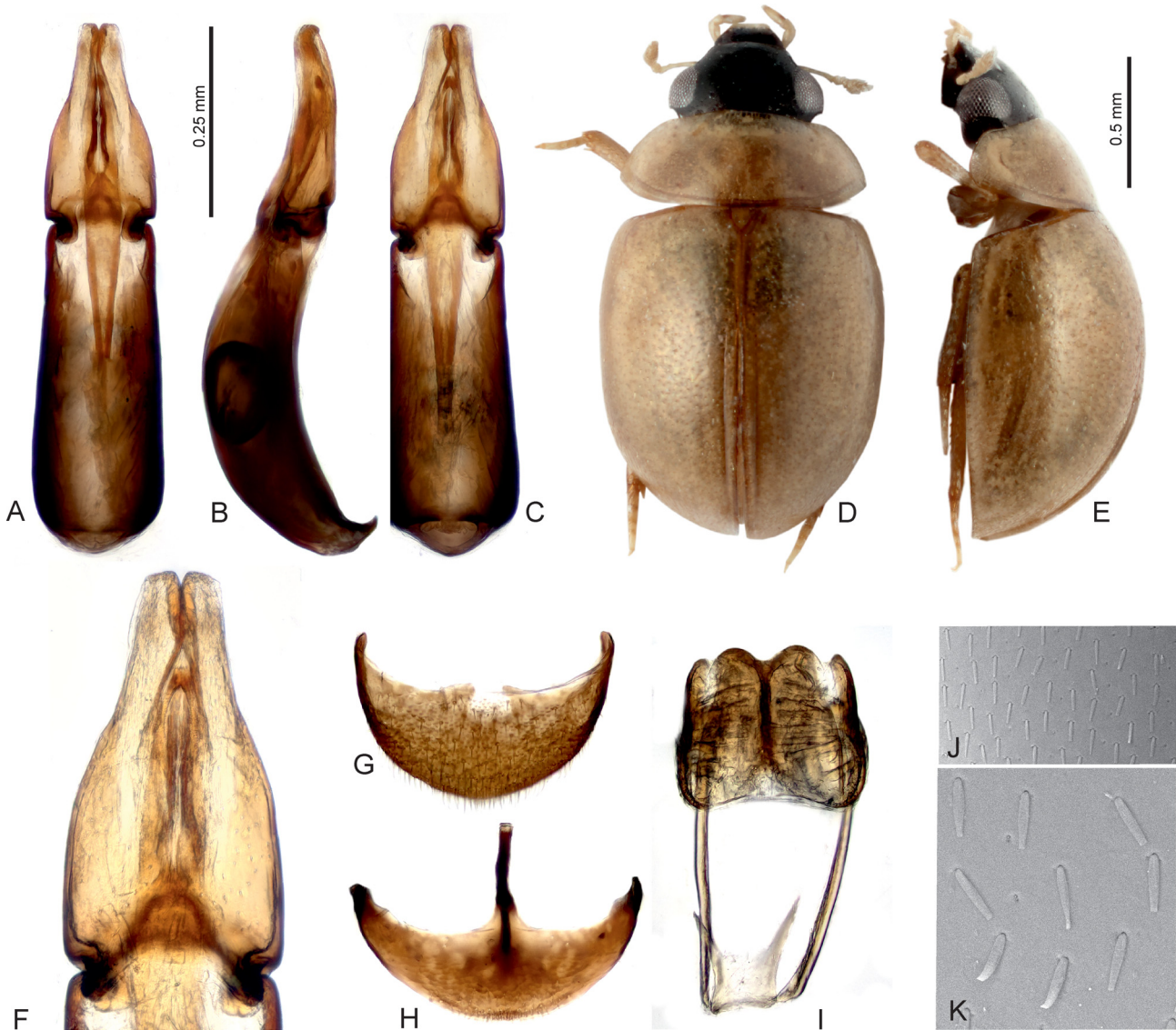


Fig. 12. *Chaetarthria* sp. from Saudi Arabia. A–C – aedeagus (A – dorsal, B – lateral, C – ventral). D–E – habitus (D – dorsal, E – lateral). F – details of parameres and apical part of the median lobe in ventral view. G – male tergite VIII; H – male sternite VIII; I – male sternite IX; J–K – elytral setae, SEM micrographs (J – general view; K – detail).

Figs 12A–C, F–I with Figs 2N–S). External characters support this assignment: dorsal setae are simple and cut-off apically (compare Fig. 12K with Fig. 2d), elytra lack longitudinal striae except for sutural stria, and pronotum and elytra are yellowish in color. The specimens above seem to stand close to the Argentinian species *C. argentina* Miller, 1974 and *C. hermani* Miller, 1974 of the *C. atra* group defined by MILLER (1974). When compared with the genitalia drawings and descriptions provided by MILLER (1974) it seems that the specimens examined here represent an undescribed species. We are however leaving it undescribed, as it is likely introduced and a more detailed comparison with the American species would be necessary to diagnose the species properly.

The presence of the species which is clearly an element of Neotropical fauna in Saudi Arabia is very unexpected. The first author discussed the problem with both collectors (J. Bezděk and D. Král) and with the person who

mounted the specimens for NMPC (P. Pacholátko), and all of them excluded any possibility of mislabeling or mixing the Saudi Arabian material with Neotropical samples at any stage of the processing. Another alternative would be an unintended introduction of this species with some imported cargo. That could be facilitated by the fact that the species comes to light and may have been attracted to the cargo by strong lights usual in the cargo depositories and harbors. The introduction scenario is however called into question by the fact that both *C. argentina* and *C. hermani* (i.e. the species most similar to the Arabian one) live in dry areas of western Argentina (provinces of Tucumán and La Rioja) which is far from any harbor. The locality in Saudi Arabia where the specimens were collected is also quite far from the coast (c. 30 km) as well as from the nearest trade harbor (c.100 km north). Even the introduction would hence need to be confirmed by a repeated catch.

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Digitally archived data

The digital data for this paper are archived in Zenodo under <https://doi.org/10.5281/zenodo.3162266>. The archive includes the Excel spreadsheet of all examined specimens in DarwinCore format and all photographs and SEM micrographs (those used in this paper or taken for comparative purposes) in an original unedited version.

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