

New species of the genus *Diestrammena* (Orthoptera: Rhaphidophoridae: Aemodogryllinae) from caves of China

Новые виды рода *Diestrammena* (Orthoptera: Rhaphidophoridae: Aemodogryllinae) из пещер Китая

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КЛЮЧЕВЫЕ СЛОВА: новые виды, Orthoptera, Rhaphidophoridae, Aemodogryllidae, *Diestrammena*, Китай, пещеры.

ABSTRACT. 6 new species and 1 new subspecies of the genus *Diestrammena* Br.-W. from southern-eastern part of China are described. These species are characterized by the adaptations (expressed in different degree) to troglophilous mode of life: reduction of both eyes and coloration, and, possibly, development of the characteristic projections on ventral part of abdominal sternites.

РЕЗЮМЕ. Описываются 6 новых видов и 1 новый подвид пещерников рода *Diestrammena* Br.-W. из юго-восточной части Китая. Эти виды характеризуются адаптациями (выраженными в различной степени) к пещерному образу жизни: редукцией глаз, окраски и, возможно, развитием характерных выступов на вентральной части стернитов брюшка.

This paper is based on the material collected in caves of southern China during recent expeditions of the following institutions: Department of Biology, Ljubljana University (Ljubljana, Slovenia); Museum National d'Histoire Naturelle (Paris, French). This material was accumulated by M. Rampini and C. Di Russo, which direct it to A.V. Gorochov for collective study and deposition in Zoological Institute, Russian Academy of Sciences, St. Petersburg (ZIN). The localities of species studied are presented on the map (Fig. 35).

Diestrammena (Gymnaeta) crenata
Gorochov, Rampini & Di Russo **sp. n.**
Figs 1–6.

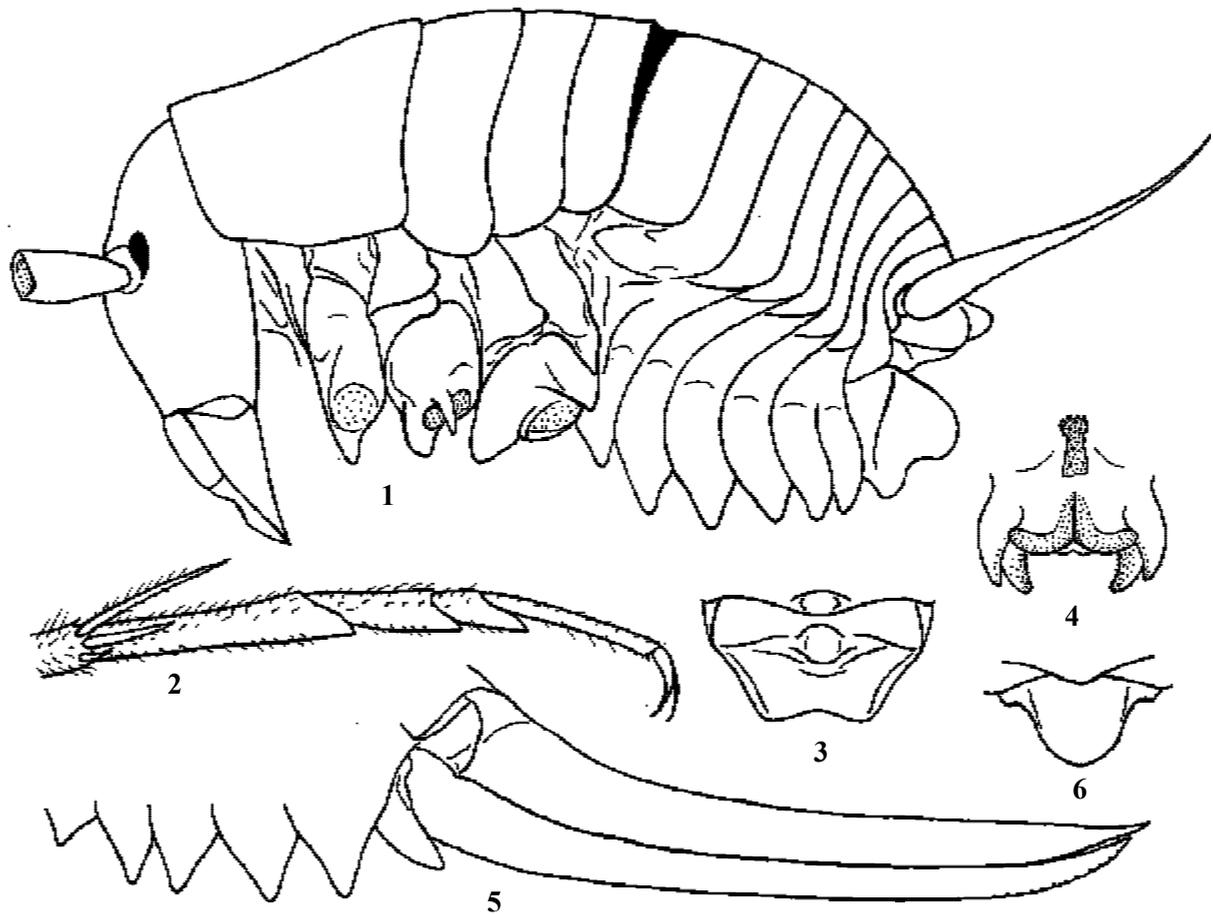
MATERIAL. Holotype: ♂, Hunan Prov., near Longshan City, Huoyan Vill., Second Resurgence of Piduhe (cave), 17.VIII.1995, Deharveng & Bedos leg. *Paratypes*: Hunan Prov., near Longshan City, Huoyan Vill.: 3 ♀♀, Parking Cave, 19.VIII.1995, Deharveng leg.; 1 ♀, 1 larva, Feihu Cave, 13.IV.1997, Cao, Sket & Verovnik leg.

DESCRIPTION. MALE (holotype). Size rather small. Coloration uniformly yellowish, but with blackish upper part of membrane between 1st and 2nd abdominal tergites. Head with small, rounded rostral tubercles; eyes moderately reduced (scape 1.7 times as wide as eye); ocelli indistinct (Fig. 1). Tergites of thorax as in Fig. 1; coxae with large medial projections (Fig. 1); all femora undenticulated; fore tibiae with 1 outer lower spine and 4 spurs (a pair of rather long lower lateral spurs, 1 shorter lower median spur, 1 short upper outer spur); middle tibiae with only 4 spurs (3 lower spurs as in fore tibiae and 1 short upper inner spur); hind tibiae with 21 inner and 19 outer short upper spines as well as a pair of short subapical spines and 3 pairs of spurs (an upper part longest, a lower pair rather short, a middle pair intermediate between these pairs); longest spur (upper inner) of hind tibiae somewhat shorter than hind metatarsi (Fig. 2). Abdomen with cone-like projections on 3rd–8th sternites and genital plate; apici of these projections almost acute (Fig. 1); genital plate as in Figs 1, 3; genitalia with narrow sclerotized plate; median lobe of genitalia with a pair of wide apical lobules, but without distinct lateral sclerites (Fig. 4).

FEMALE. Similar to male in general appearance, structure of head, armament of legs (spine of fore tibiae and upper spurs of fore and middle tibiae sometimes absent; number of spines of hind tibiae varied), and shape of abdominal sternites (Fig. 5), but coloration distinguished from that of male by light membranes between all abdominal tergites. Genital plate with almost rounded hind median lobe and without distinct lower projection (Figs 5, 6); ovipositor moderately short (hind femur 2.1–2.2 times as long as ovipositor), with petty denticulated apical part of lower valvae (Fig. 5).

LENGTH (mm). Body: male 10.5, female 11–13; pronotum: male 3, female 3–3.4; hind femora: male 14, female 14.5–16; hind tibiae: male 16, female 16.5–18.5; inner upper spur of hind tibiae: male 1.9, female 1.8–2; hind metatarsi: male 2.7, female 2.8–3.0; ovipositor 7.0–7.5.

COMPARISON. The new species distinctly differs from all other congeners in the characteristic structure of 3rd–8th abdominal sternites. The shape of male genital plate is rather



Figs 1–6. *Diestrammena crenata* sp.n.: 1–4 — male, 5–6 — female; 1 — body (without antennal flagellum, maxillae, labium, femora, tibiae, and tarsi), lateral view; 2 — inner side of hind tarsus and tibial apex, lateral view; 3 — genital plate, ventral view; 4 — genitalia, dorsal view. 5 — lower parts of 3rd–7th abdominal sternites, genital plate, and ovipositor, lateral view; 6 — genital plate, ventral view.

Рис. 1–6. *Diestrammena crenata* sp.n.: 1–4 — самец; 5–6 — самка; 1 — тело (без антеннальных жгутов, максилл, лабиума, бедер, голени и лапок), сбоку; 2 — внутренняя сторона задних лапки и вершины голени, сбоку; 3 — генитальная пластинка, снизу; 4 — гениталии, сверху; 5 — нижние части 3-го–7-го стернитов брюшка, генитальная пластинка и яйцеклад, сбоку; 6 — генитальная пластинка, снизу.

similar to that of *D. ingens* Karny from Taiwan [Gorochov, 1998: Fig. 186] and *D. nicolai* Gor. from Japan [Gorochov, 2002: Fig. 4] having numerous denticles on hind femora. The latter character orders to include *D. ingens* and *D. nicolai* in the subgenus *Diestrammena* Br.-W., as well as the absence of these denticles orders to include *D. crenata* in the subgenus *Gymnaeta* Ad. Similarity of these species in the shape of male genital plate assumes close relationship of all these species and formality of the above-mentioned subgenera.

Diestrammena (Gymnaeta) semicrenata

Gorochov, Rampini & Di Russo sp.n.

Figs 7–11.

MATERIAL. Holotype: ♂, Hubei Prov., Shennongjia Distr., Yishang Vill, Spider Cave, VII-VIII.1992. Paratypes: 1 ♂, 2 larvae, same data as for holotype.

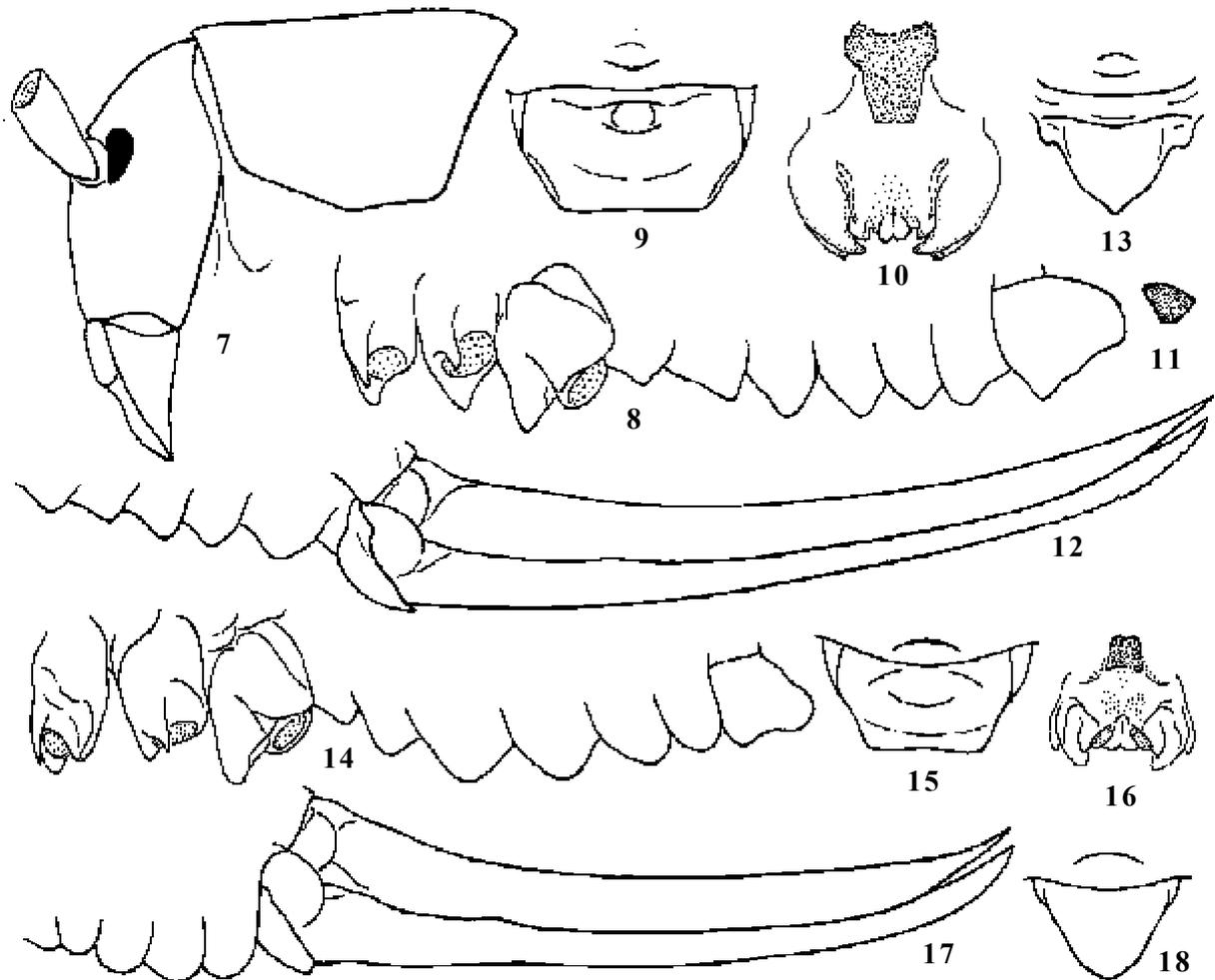
DESCRIPTION. MALE (holotype). Size slightly larger than in *D. crenata*. Coloration as in *D. crenata*, but with light membranes between all abdominal tergites. Head with rostral tubercles as in *D. crenata*, but eyes less reduced than in *D. crenata* (scape 1.5 times as wide as eye); ocelli indistinct (Fig. 7). Thorax and abdomen similar to those of

D. crenata, but coxae with slightly smaller medial projections, 3rd–8th abdominal sternites and genital plate with less long cone-like projections (Fig. 8); legs similar to those of *D. crenata*, but fore tibiae with 2 outer and 1 inner lower spines, middle tibiae with a pair of lower spines, hind tibiae with 20 inner and 22 outer short upper spines (subapical spines of these tibiae and spurs of all tibiae as in *D. crenata*), and tarsi slightly longer. Genital plate with somewhat wider apical part than in *D. crenata* (Fig. 9); genitalia with large sclerotized plate having widened apical part; median lobe of genitalia with 2 pairs of small apical lobules and distinct lateral sclerites (Figs 10–11).

VARIABILITY. In paratype, inner lower spine in one of fore tibiae absent, number of upper spines of hind tibiae slightly different than in holotype, and lateral sclerites of median lobe of genitalia almost indistinct.

FEMALE unknown, but one of larvae (deutonymph of female) similar to male in general appearance, and its genital plate with clearly acute apex.

LENGTH of male (mm). Body 14–15; pronotum 3.4–3.8; hind femora 14.5–15.5; hind tibiae 15.5–16.5; inner upper spur of hind tibiae 2.2–2.5; hind metatarsi 3.5–3.8.



Figs 7-18. *Diestrammena* spp.: 7-11 — *D. semicrenata* sp.n.; 12-13 — *D. caudata* sp.n.; 14-18 — *D. omninoecaeca* sp.n.: 7-11, 14-16, — male, 12-13, 17-18, — female; 7 — head (without antennal flagellum, maxillae, and labium) and pronotum, lateral view; 8, 14 — coxae, lower parts of 3rd-8th abdominal sternites, and genital plate, lateral view; 9, 13, 15, 18 — genital plate, ventral view; 10, 16 — genitalia, dorsal view; 11 — lateral sclerite of median lobe, lateral view; 12, 17 — lower parts of 3rd-7th abdominal sternites, genital plate, and ovipositor, lateral view.

Рис. 7-18. *Diestrammena* spp.: 7-11 — *D. semicrenata* sp.n.; 12-13 — *D. caudata* sp.n.; 14-18 — *D. omninoecaeca* sp.n.: 7-11, 14-16, — самец, 12-13, 17-18, — самка; 7 — голова (без антеннальных жгутов, максилл и лабиума) и переднеспинка, сбоку; 8, 14 — коксы, нижние части 3-го-8-го стернитов брюшка и генитальная пластинка, сбоку; 9, 13, 15, 18 — генитальная пластинка, снизу; 10, 16 — гениталии, сверху; 11 — боковой склерит срединной лопасти гениталий, сбоку; 12, 17 — нижние части 3-го-7-го стернитов брюшка, генитальная пластинка и яйцеклад, сбоку.

COMPARISON. *D. semicrenata* differs from very similar *D. crenata* in the above-mentioned characters. From all other congeners, the new species is distinguished by the uniformly light coloration, partly reduced eyes, characteristic structure of abdominal sternites and genital plate, as well as shape of sclerotized plate in the genitalia.

Diestrammena (Gymnaeta) caudata
Gorochov, Rampini & Di Russo sp.n.

Figs 12-13.

MATERIAL. Holotype: ♀, Guangxi Zhuang Autonomous Region, W of Guilin, Skeletons Cave, VII.1992.

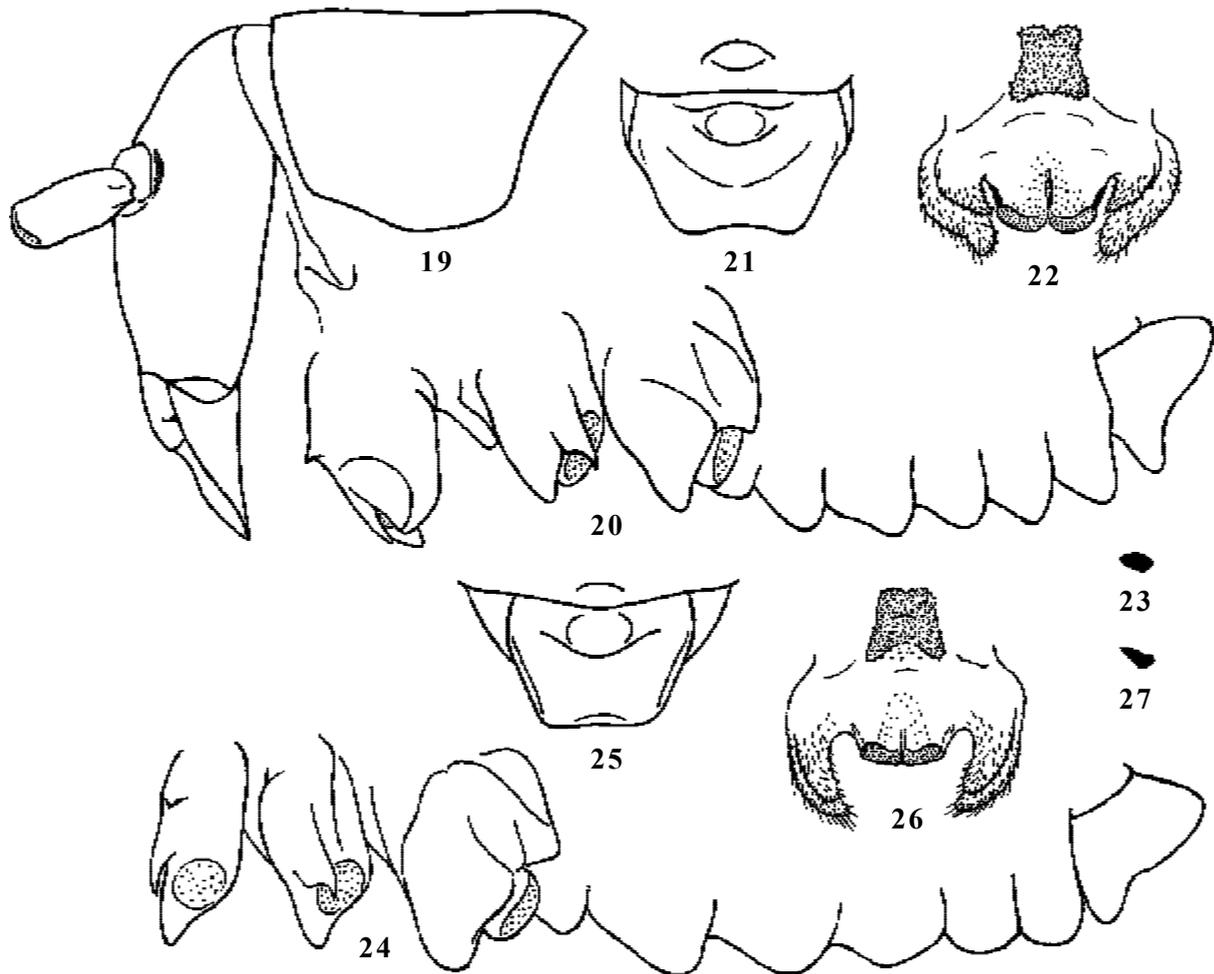
DESCRIPTION. FEMALE (holotype). Size and coloration very similar to those of *D. semicrenata*. Head almost as in *D. crenata* including size of eyes (scape 1.7 times as wide as eye). Thorax, abdomen, and coxae as in *D. semicrenata* (Fig. 12); femora, tibiae and tarsi as in *D. crenata*, but one of fore tibiae

without spine, all fore and middle tibiae without upper spurs, and hind tibiae with 25-27 outer and 26 inner short upper spines. Genital plate with distinctly acute apex of hind median lobe (Fig. 13); ovipositor similar to that of *D. crenata*, but clearly longer (hind femur 1.5 times as long as ovipositor) (Fig. 12).

MALE unknown.

LENGTH of female (mm). Body 15; pronotum 4; hind femora 16.2; hind tibiae 18; inner upper spur of hind tibiae 2.5; hind metatarsi 3.6; ovipositor 10.5.

COMPARISON. *D. caudata* is very similar to *D. crenata* and *D. semicrenata*, but distinguished from them by the following characters: from *D. crenata*, by the less long projections of 3rd-7th abdominal sternites, acute apex of genital plate, and noticeably longer ovipositor; from *D. semicrenata*, by the smaller eyes, less numerous spines on fore tibiae, and absence of spines on middle tibiae; from all other congeners, by the same characters as both these species.



Figs 19–27. *Diestrammena ferecaeca* sp.n., males: 19–23 — *D. f. ferecaeca*; 24–27 — *D. f. proxima* subsp.n.; 19 — head (without antennal flagellum, maxillae, and labium) and pronotum, lateral view; 20, 24 — coxae, lower parts of 3rd–8th abdominal sternites, and genital plate, lateral view; 21, 25 — genital plate, ventral view; 22, 26 — genitalia, dorsal view; 23, 27 — lateral sclerite of median lobe of genitalia, lateral view.

Рис. 19–27. *Diestrammena ferecaeca* sp.n., самцы: 19–23 — *D. f. ferecaeca*; 24–27 — *D. f. proxima* subsp.n.; 19 — голова (без антеннальных жгутов, максилл и лабиума) и переднеспинка, сбоку; 20, 24 — коксы, нижние части 3-го–8-го стернитов брюшка и генитальная пластинка, сбоку; 21, 25 — генитальная пластинка, снизу; 22, 26 — гениталии, сверху; 23, 27 — боковой склерит срединной лопасти гениталий, сбоку.

Diestrammena (Gymnaeta) omninoceca
Gorochov, Rampini & Di Russo sp.n.

Figs 14–18.

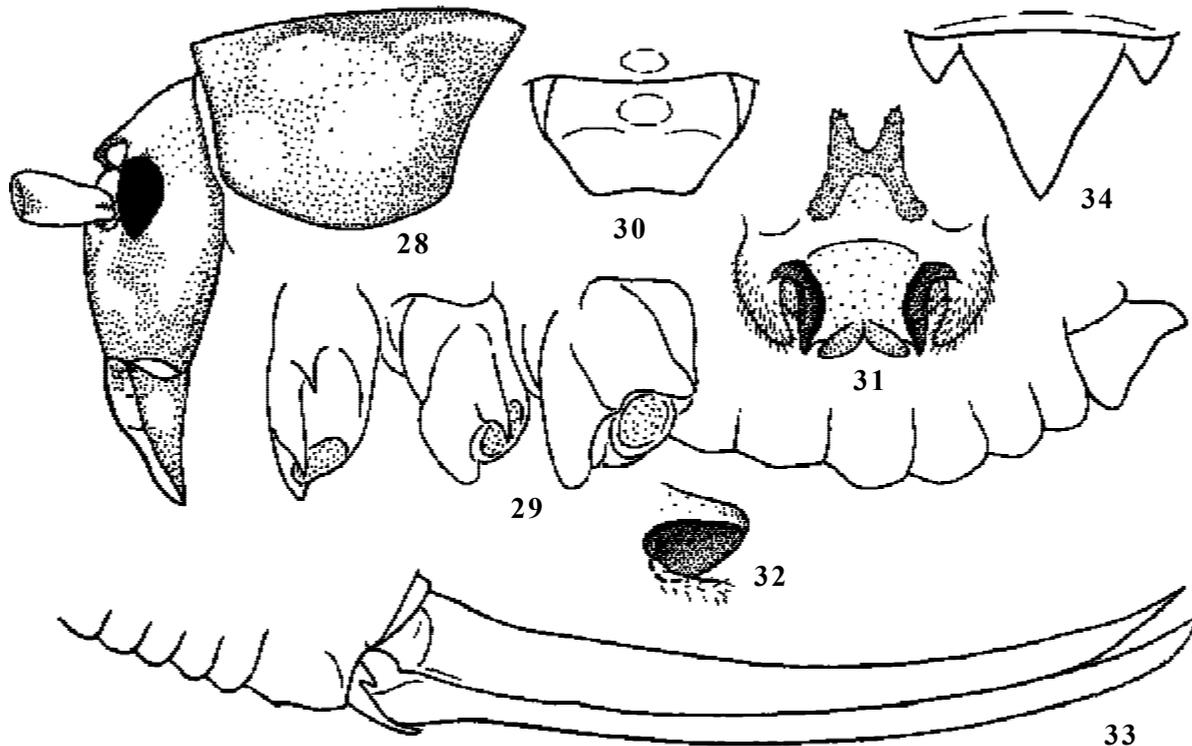
MATERIAL. Holotype: ♂, Hunan Prov., near Longshan City, Huoyan Vill., Phanon Cave, 13.IV.1997, Cao, Sket & Verovnik leg. Paratypes: Hunan Prov., near Longshan City, Huoyan Vill.: 4 ♀♀, 3 larvae, Flying Tiger Cave, 12–14.VIII.1995, Deharveng leg. (ZIN); 1 larva, Second Resurgence of Piduhu Cave, 17.VIII.1995, Deharveng & Bedos leg. (ZIN)

DESCRIPTION. MALE (holotype). Size almost as in *D. semicrenata* and *D. caudata*. Coloration uniformly yellowish. Head without rostral tubercles and eyes. Tergites of thorax, legs and abdomen similar to those of *D. semicrenata*, but fore tibiae with only single outer spine and middle tibiae without spines (as in *D. caudata*), hind tibiae without subapical spines and one of these tibiae without lower outer spur (other spurs of all tibiae as in both previous species; hind tibiae with 23–24 inner and 24–25 outer spines), abdominal sternites and genital plate with slightly more rounded ventral projections (Fig. 14). Genital plate with apical part almost intermedi-

ate between *D. crenata* and *D. semicrenata* (Fig. 15); genitalia with sclerotized plate somewhat narrowing to apex, wider than in *D. crenata* and smaller than in *D. semicrenata*; median lobe of genitalia with 2 pairs of small apical lobules (lateral one semisclerotized) and indistinct lateral sclerites (Fig. 16).

FEMALE. Similar to male in general appearance, structure of head, thorax, legs, and abdomen, but number of spines of hind tibiae somewhat varied, fore tibiae sometimes with 2 lower outer spines, middle tibiae sometimes with a pair of lower spines (one of these specimens with additional lower inner spine), hind tibiae with both lower spurs and sometimes with inner subapical spine. Genital plate with angular apex (less acute than in *D. caudata* and less rounded than in *D. crenata*), but its lateral lobules less distinct than in both previous species (Fig. 18); ovipositor similar to that of all previous species with known female, clearly shorter than in *D. caudata*, but somewhat longer than in *D. crenata* (hind femur 1.9 times as long as ovipositor) (Fig. 17).

LENGTH (mm). Body: male 14.5, female 12–15; pronotum: male 3.4, female 3.7–3.9; hind femora: male 15.8, female



Figs 28–34. *Diestrammena solida* sp.n.: 28–32 — male; 33–34 — female; 28 — head (without antennal flagellum, maxillae, and labium) and pronotum, lateral view; 29 — coxae, lower parts of 3rd–8th abdominal sternites, and genital plate, lateral view; 30, 34 — genital plate, ventral view; 31 — genitalia, dorsal view; 32 — lateral sclerite of median lobe of genitalia, lateral view; 33 — lower parts of 3rd–7th abdominal sternites, genital plate, and ovipositor, lateral view.

Рис. 28–34. *Diestrammena solida* sp.n.: 28–32 — самец; 33–34 — самка; 28 — голова (без антеннальных жгутов, максилл и лабиума) и переднеспинка, сбоку; 29 — коксы, нижние части 3-го–8-го стернитов брюшка и генитальная пластинка, сбоку; 30, 34 — генитальная пластинка, снизу; 31 — гениталии, сверху; 32 — боковой склерит срединной лопасти гениталий, сбоку; 33 — нижние части 3-го–7-го стернитов брюшка, генитальная пластинка и яйцеклад, сбоку.

15–16.5; hind tibiae: male 19.5, female 19–20; inner upper spur of hind tibiae: male 2.5, female 2.2–2.8; hind metatarsi: male 3.7, female 3.6–3.8; ovipositor 8–9.

COMPARISON. The new species is distinguished from *D. caeca* Chop. from India [Chopard, 1924: Figs 6–11], also lacking eyes, by the not transverse female genital plate. From all other congeners it well differs in the absence of eyes and structure of male genitalia.

Diestrammena (Gymnaeta) ferecaeca
Gorochov, Rampini & Di Russo sp.n.
Figs 19–23.

MATERIAL. Holotype: ♂, Guizhou Prov. (southern part), Libo County, Jia Ban Vill., La Tai Cave, 6.III.1995, Trontelj leg. Paratype: larva, same data as for holotype.

DESCRIPTION. MALE (holotype). Size, coloration, shape of thoracic tergites, and structure of coxae as in *D. semicrenata*, *D. caudata*, and *D. omninoecaeca*. Head practically without rostral tubercles (as in *D. omninoecaeca*); eyes strongly reduced, presented by narrow stripes with several facets (scape 6 times as wide as eye) (Fig. 19). Femora, tibiae, and tarsi as in *D. caudata*, but hind tibiae with 11 inner and 9 outer spines (except a subapical pair). Abdominal sternites and genital plate with ventral projections almost intermediate between those of *D. crenata* and *D. semicrenata* (Fig. 20); genital plate slightly less transverse than in all previous species with known male (Fig. 21); genitalia with sclerotized plate almost as in

D. omninoecaeca, but median lobe of genitalia with 2 transverse semisclerotized lobules and distinct small lateral sclerites (Figs 22–23).

FEMALE unknown.

LENGTH of male (mm). Body 13.5; pronotum 3.8; hind femora 16.8; hind tibiae 20; inner upper spur of hind tibiae 2.2; hind metatarsi 3.7.

COMPARISON. The new species is well distinguished from all other congeners by the characteristic structure of eyes and male genitalia.

Diestrammena (Gymnaeta) ferecaeca proxima
Gorochov, Rampini & Di Russo sp.n.
Figs 24–27.

MATERIAL. Holotype: ♂, Guizhou Prov. (southern part), Libo County, Libo Town, Feng Cave, 7.III.1995, Trontelj leg.

DESCRIPTION. MALE (holotype). Very similar to non-otypical subspecies, but distinguished from it by hind tibiae with much more numerous spines (26–27 inner and 28–32 outer), abdominal sternites and genital plate with slightly shorter ventral projections (Fig. 24), genital plate with hardly more straight hind edge (Fig. 25), and genitalia with longer membranous lateral lobes, slightly smaller median lobe, and somewhat different shape of lateral sclerites (Figs 26, 27).

FEMALE unknown.

LENGTH of male (mm). Body 15.5; pronotum 3.9; hind femora 17.4; hind tibiae 21.5; inner upper spur of hind tibiae 2.7; hind metatarsi 4.2.



Fig. 35. Distribution of troglophilous species of *Diestrammena* in China: 1 — *D. crenata* sp.n. (Second Resurgence of Piduhe Cave; Parking Cave; Feihu Cave); 2 — *D. semicrenata* sp.n. (Spider Cave); 3 — *D. caudata* sp.n. (Skeletons Cave); 4 — *D. omninoecaeca* sp.n. (Phanon Cave; Flying Tiger Cave; Second Resurgence of Piduhe Cave); 5 — *D. ferecaeca ferecaeca* sp. et ssp.n. (La Tai Cave); 6 — *D. f. proxima* ssp.n. (Feng Cave); 7 — *D. solida* sp.n. (Parking Cave; Mayan Cave).

Рис. 35. Распространение пещерных видов *Diestrammena* в Китае: 1 — *D. crenata* sp.n. (Second Resurgence of Piduhe Cave; Parking Cave; Feihu Cave); 2 — *D. semicrenata* sp.n. (Spider Cave); 3 — *D. caudata* sp.n. (Skeletons Cave); 4 — *D. omninoecaeca* sp.n. (Phanon Cave; Flying Tiger Cave; Second Resurgence of Piduhe Cave); 5 — *D. ferecaeca ferecaeca* sp. et ssp.n. (La Tai Cave); 6 — *D. f. proxima* ssp.n. (Feng Cave); 7 — *D. solida* sp.n. (Parking Cave; Mayan Cave).

COMPARISON. The distinctions from *D. ferecaeca ferecaeca* are listed in the description of *D. f. proxima*.

Diestrammena (Gymnaeta) solida
Gorochov, Rampini & Di Russo sp.n.
Figs 28–34.

MATERIAL. Holotype: ♂, Hunan Prov., near Longshan City, Huoyan Vill., Parking Cave, 19.VIII.1995, Deharveng leg. Paratypes: 1 female, same data as for holotype; 1 ♂, 1 ♀, Hunan Prov., near Longshan City, Huoyan Vill., Mayan Cave, 15.VIII.1995, Deharveng & Bedos leg.

DESCRIPTION. MALE (holotype). Size distinctly larger than in all previous species. Coloration yellowish with light brown and brown spots and bands. Head with rather long, angular rostral tubercles; eyes normal, not reduced (scape 1.1 times as wide as eye); ocelli distinct (Fig. 28). Pronotum as in Fig. 28; mesonotum with brown lateral parts; metanotum and abdominal tergites with lighter lateral parts (all tergites somewhat darkened along hind edge). Legs hardly spotted; coxae with small medial projections; all femora without denticles on lower keels; fore tibiae with 2 outer and 1 inner spines as well as 4–5 spurs [a pair of upper spurs (inner one very short or absent), a pair of longest lower spurs, and unpaired lower median spur]; middle tibiae with a pair of

lower spines and 5 spurs (these spurs as in fore tibiae, but both upper spurs not very short and presented in both legs); hind tibiae with 53–65 outer and 52–64 inner spines, a pair of short subapical spines, and 6 spurs (largest inner upper spur, a pair of short lower spurs, and 3 spurs of intermediate length: long outer upper spur, moderately long inner middle spur, and moderately short outer middle spur); metatarsi similar to that of *D. crenata*, but larger and with apical denticle; inner spur of hind tibiae extending slightly behind this denticle. Abdominal sternites and genital plate with rather short ventral projections (Fig. 29); genital plate transverse, with not very wide apical part (Fig. 30); genitalia with H-shaped sclerotized plate; median lobe of genitalia with a pair of medial lobules and a pair of rather large, oval lateral sclerites (Figs 31–32).

VARIABILITY. Fore tibiae sometimes with 3 outer spines; middle tibiae sometimes with 2 outer spines; number of spines of hind tibiae slightly varied.

FEMALE. Similar to male in general appearance, but inner spur of hind tibiae hardly not reaching apical denticle of hind metatarsus, abdominal tergites (especially 7th one) with very short ventral projections (Fig. 33). Genital plate (Figs 33, 34) with large, triangular median part, having acute apex, and rather large and also triangular lateral lobes (in one of females, these lobes slightly longer and median part of genital plate slightly shorter than in Fig. 34); ovipositor not very long (hind femur 1.7 times as long as ovipositor); its apex similar to that of all previous species with known female (Fig. 33).

LENGTH (mm). Body: male 16–19.5, female 15–18; pronotum: male 6.2–6.5, female 6.2–6.4; hind femora: male 26–28, female 25–27; hind tibiae: male 28–30, female 27–29; inner upper spur of hind tibiae: male 5.5–5.7, female 5.1–5.3; hind metatarsi: male 5.8–6, female 5.6–5.8; ovipositor 15–15.5.

COMPARISON. The new species is well distinguished from all previous species by the larger size, spotted coloration, large eyes, well developed ocelli and rostral tubercles, structure of male genitalia, and shape of female genital plate. From *D. borutzkyi* Gor. from Sichuan [Gorochov, 1994: Figs 167–168], similar to *D. solida* in the shape of female genital plate, the new species differs in the distinctly longer ovipositor. From all other congeners, it differs in the characteristic shape of sclerotized plate in male genitalia and of female genital plate.

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