

# CAVE-DWELLING TERRESTRIAL ISOPODS FROM SOUTHERN CHINA (CRUSTACEA, ISOPODA, ONISCIDEA), WITH DESCRIPTIONS OF FOUR NEW SPECIES

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## ABSTRACT

Seven species of terrestrial isopods from 11 caves in Guizhou, Guangxi and Guangdong provinces (southern China) are recorded. Three species of Armadillidae (*Trogdillo latellai*, *Dryadillo guizhouensis* and *D. parviocellatus*) and one of *Exalloniscus* (*E. troglophilus*) are described as new and illustrated. A further new species of *Exalloniscus* (*E. japonicus*) is established for specimens previously identified as *E. cortii* Arcangeli, 1927 from Japan. Two species, *Trogdillo latellai* and *Dryadillo parviocellatus*, show some troglomorphic traits, such as the reduction of pigment and number of ommatidia, and can be considered as eutroglophilic forms. *Exalloniscus troglophilus* belongs to a genus whose species are mainly associated with ants or termites. All the other species are troglloxenous forms.

**Key words:** Crustacea, Isopoda, Oniscidea, caves, southern China, new species.

## INTRODUCTION

Very little is known about terrestrial isopods inhabiting caves in southern China. To date, only seven species have been recorded (Kwon & Taiti, 1993; Schultz, 1995) from caves in Guangxi (*Sinoniscus cavernicolus* Schultz, 1995) and Yunnan (*Burmoniscus yunnanensis* Kwon & Taiti, 1993; *Lucasioides cavernicolus* Kwon & Taiti, 1993; *Porcellionides pruinosus* (Brandt, 1833); *Sinodillo troglophilus* Kwon & Taiti, 1993; *S. ferrarai* Kwon & Taiti, 1993; and *Spherillo raffaelei* Kwon & Taiti, 1993).

In recent years, several expeditions have been carried out to explore the numerous caves in the karst systems of southern China. The present paper deals with seven species of Oniscidea collected in caves of Guizhou and Guangdong provinces by the team of the Museo Civico di Storia Naturale, Verona, from 2000 to 2006, and in caves of Fengshan County in the northwest of Guangxi Province by Arthur Clarke, Hobart, during the Guangxi China Caves Expedition 2005 led by Ged Campion.

## LIST OF CAVES INVESTIGATED

For each cave, we report the locality, elevation and GPS co-ordinates of the entrance (taken with WGS84 datum), and some characteristics (when available).

### Guizhou Province

**Duobing Dong** (GZ/Pb/1), Pingba County, Sancha River, ca. 900 m a.s.l.

**Tu Shi Dong** (Soil Rock Cave) (GZ/GI/10), Guanling County, Huajiang, 1209 m a.s.l. Small cave (58 m long and 8 m deep) in the middle of a rice plantation near the village.

**Sha Dong** (Sand Cave) (GZ/GI/4), Guanling County, Huajiang, 1190 m a.s.l., 25°44'12.386"N 105°36'18.969"E. The cave is located in a cone karst near Huajiang village and is about 210 m long.

**Da Dong** (GZ/GI/1), Guanling County, Huajiang, 1148 m a.s.l., 25°42'06.3"N 105°40'46.1"E.

**San Ge Dong** (Three Entrances Cave) (GZ/GI/11), Guanling County, Huajiang, 1199 m a.s.l., 25°49'06.4"N 105°35'00.5". Large cave with two main branches, a fossil one 20 m deep and 200 m long and an active one 70 m deep with stream and lakes.

**Pudding-Stone Cave** (Gz/Qx/9), Qianxi County, Hong Lin, 1552 m a.s.l., 27°07'32.40"N 105°52'02.20"E. Very small cave (10 m long) in a conglomerate formation.

**An Ja Da Dong** (GZ/Zf/4), Zhen Feng County, Zhe Xiang, 934 m a.s.l., 25°32'01.9"N 105°42'50.0"E. Very long cave (about 900 m long and 40 m deep), partially used as a tourist cave.

#### Guangxi Province

**Chuan Long Yan Dong**, Fengshan County, 479 m a.s.l., 24°33'25.0"N 107°02'34.8"E.

**Jiang Zhou Cave System** (via Long Huai entrance), Fengshan County, 501 m a.s.l., 24°20'45.0"N 106°59'12.8"E. Jiang Zhou is a very large karst system (ca. 37 km long) located in Fengshan County, with one part extending into Bama County.

**Da Dong**, Fengshan County, 567 m a.s.l., 24°24'52.1"N 106°42'25.4"E. This cave is part of a very isolated block of limestone in the northern part of Fengshan County, quite remote from the more southerly Jiang Zhou system.

#### Guangdong Province

**Long Yan Dong** (Dragoon Rock Cave) (GD/Yc/1), Yangchun County, Tan Shui, 75 m a.s.l., 22°07'41.9"N 111°34'44.8"E. The cave (ca. 150 m long and 27 m deep) is very large at the entrance, where a temple is present, and continues inside with narrow passages and a small stream.

Type-species: *Porcellio scaber* Latreille, 1804.

#### *Porcellio laevis* (Latreille, 1804)

*Porcellio laevis*; Arcangeli, 1927: 225; Chen, 1990: 87, Figs 1, 2; Kwon & Taiti, 1993: 56; Gui *et al.*, 1994: 67, Fig. 4; Dai & Cai, 1998: 139, Fig. 10; Nunomura & Xie, 2000: 77.

*Porcellio bombosus* Shen, 1949: 53, Fig. B, 1-15.

*Porcellio elongata* Shen, 1949: 56, Fig. C, 1-15.

*Porcellio (Mesoporcellio) laevis*; Arcangeli, 1952: 297.

#### Material examined

China: 2 ♂♂, 4 ♀♀, 1 juv., Guangxi Province, Fengshan County, Chuan Long Yan Dong, underneath ceremonial pots and incense holders in Buddhist Temple, twilight/transition zone 250 m into cave, 6.XI.2005, leg. A. Clarke, MZUF; 6 juvs, same locality, decaying fabric of woven grass and reed bedding near base of "Bedroom chamber", twilight zone ca. 400 m into cave, 6.XI.2005, leg. A. Clarke, MZUF.

#### Distribution

Cosmopolitan species of Mediterranean origin. This species is certainly introduced to China, where it is widespread. It occurs only occasionally in caves.

#### Family Agnaridae

#### Genus *Lucasioides* Kwon, 1993

Type-species: *Porcellio (Lucasius) gigliotosi* Arcangeli, 1927.

*Lucasioides cf. daliensis* Nunomura & Xie, 2000 (Figs 1-18)

#### Material examined

China: 1 ♂, Guizhou Province, Pingba County, Sancha River, Duobing Dong, 7.XI.2003, leg. L. Latella & H. Chen, MSNV; 1 ♂, same data, MZUF.

#### Remarks

At present, the genus *Lucasioides* includes 21 species distributed in China, Korea and Japan (Nunomura, 2000a; 2003; Nunomura & Xie, 2000; Schmalfuss, 2003). Eight species are

#### ABBREVIATIONS

IZCAS = Invertebrate Zoology Section of the Chinese Academy of Sciences, Beijing, China;

MSNV = Museo Civico di Storia Naturale, Verona, Italy;

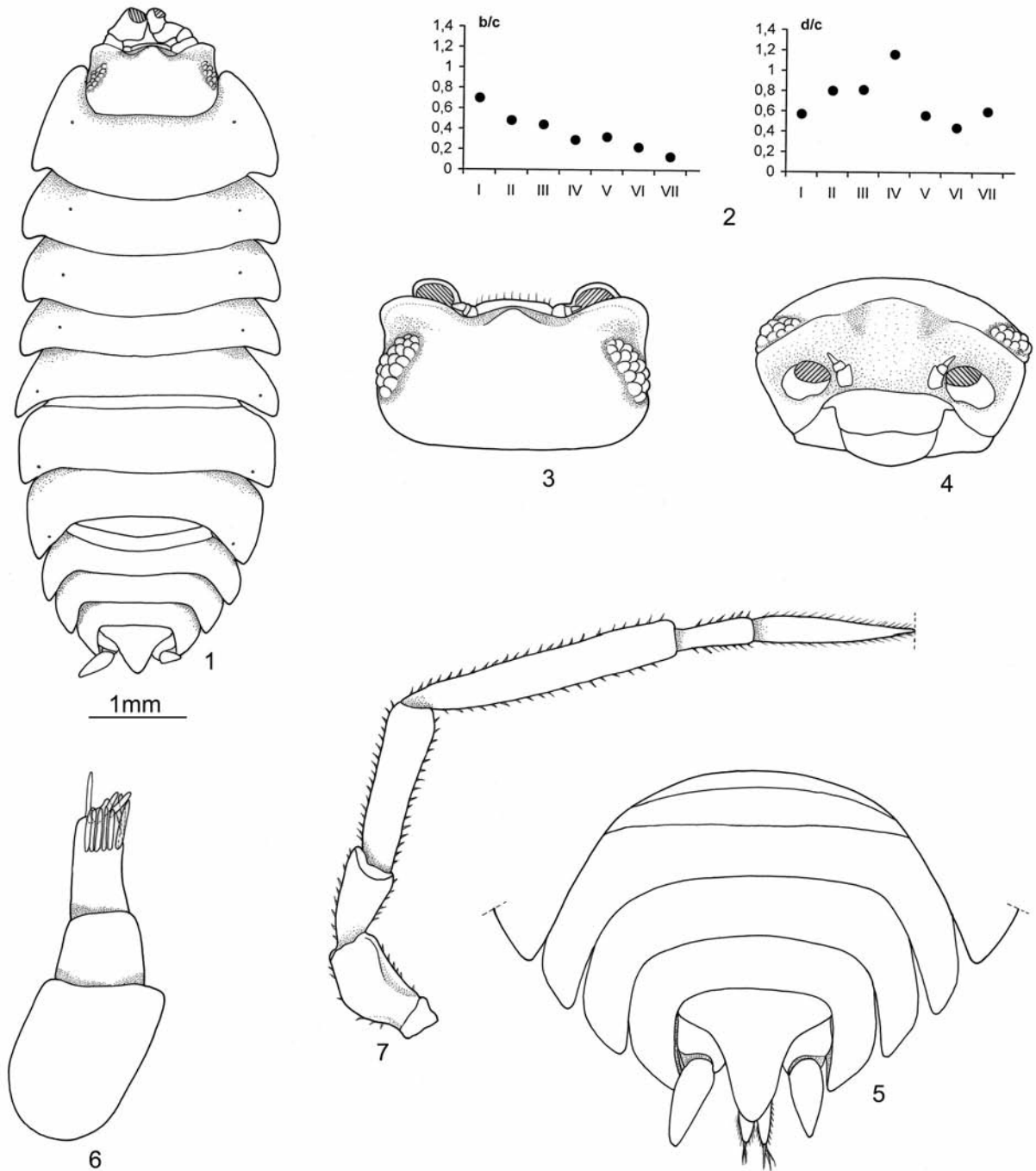
MZUF = Museo di Storia Naturale dell'Università, Sezione di Zoologia "La Specola", Florence, Italy;

TMAG = Tasmanian Museum & Art Gallery, Hobart, Tasmania, Australia.

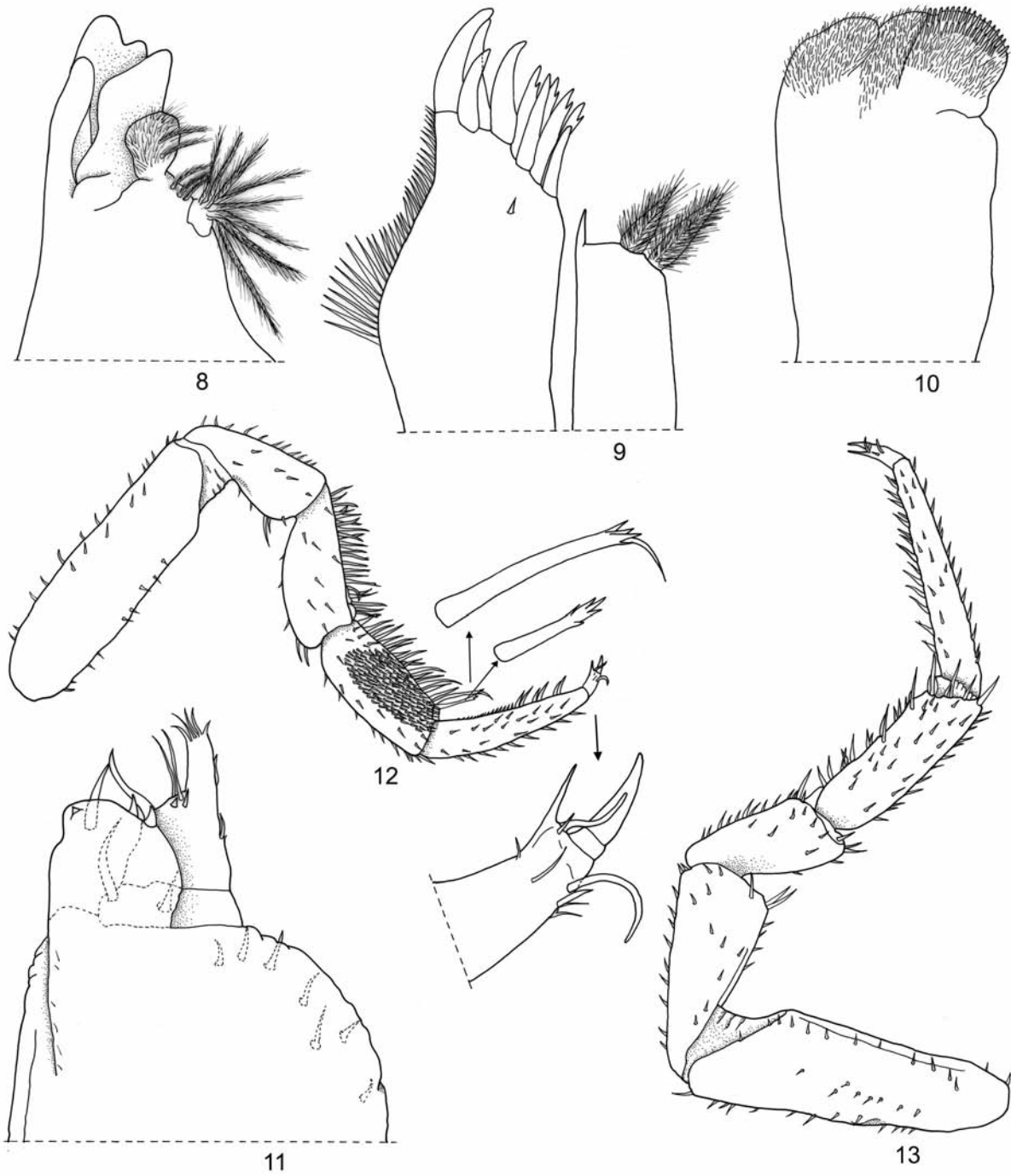
#### SYSTEMATICS

#### Family Porcellionidae

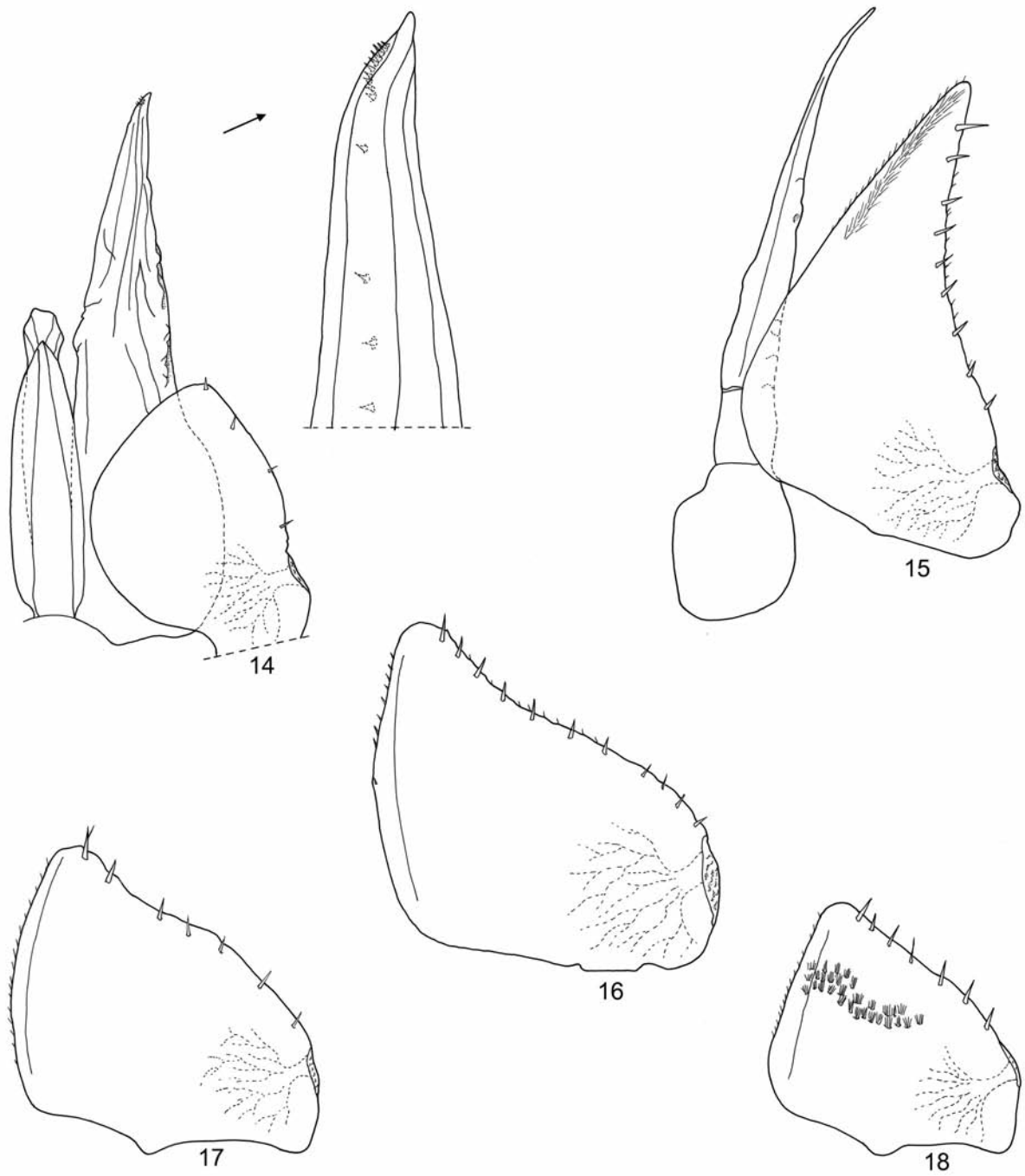
Genus *Porcellio* Latreille, 1804



Figs 1-7 – *Lucasioides cf. daliensis* Nunomura & Xie, 2000 - Duobing Dong, ♂: 1, adult specimen in dorsal view; 2, co-ordinates of the noduli laterales (b = distance of the nodulus lateralis from the posterior margin of the pereonite; c = length of the pereonite; d = distance of the nodulus lateralis from the lateral margin of the pereonite); 3, cephalon, dorsal view; 4, cephalon, frontal view; 5, pleon, telson and uropods, dorsal view; 6, antennule; 7, antenna.



Figs 8-13 – *Lucasioides cf. daliensis* Nunomura & Xie, 2000 - Duobing Dong, ♂: 8, left mandible; 9, maxillule; 10, maxilla; 11, maxilliped; 12, pereopod 1; 13, pereopod 7.



Figs 14-18 – *Lucasioides* cf. *daliensis* Nunomura & Xie, 2000 - Duobing Dong, ♂: 14, pleopod 1; 15, pleopod 2; 16, pleopod 3 exopod; 17, pleopod 4 exopod; 18, pleopod 5 exopod.



recorded from China: six from Yunnan (*L. cavernicolus* Kwon & Taiti, 1993; *L. daliensis* Nunomura & Xie, 2000; *L. gigliotosi* (Arcangeli, 1927); *L. longicaudatus* Nunomura & Xie, 2000; *L. pedimaculatus*, Kwon & Taiti, 1993; and *L. xiaoi* Nunomura & Xie, 2000), one from Hunan (*L. isseli* (Arcangeli, 1927)), and one from Hong Kong (*L. zavattarii* (Arcangeli, 1927)).

The specimens from Doubing Dong are tentatively identified as *L. daliensis*. The description and figures of this species provided by Nunomura & Xie (2000: 67, Fig. 11) are not very clear and species recognition is certainly problematic. Our specimens show a very similar morphology of the male characters, especially pleopod 1 (compare Fig. 14 and Fig. 11P in Nunomura & Xie, 2000), while they differ in the disposition of noduli laterales (compare Fig. 2 and Table 7 in Nunomura & Xie, 2000). However, this last character is often wrongly described by Nunomura (e.g. see the graph of the noduli laterales of *L. sinuosus* by Nunomura (1987: 12, Fig. 104N) and that of the redescription by Kwon (1995: 423, Fig. 8A)).

A full set of figures of a male specimen (Figs 1-18) from Doubing Dong is provided here to facilitate future comparisons.

*Lucasioides sinuosus* (Nunomura, 1987)

*Nagurus sinuosus* Nunomura, 1987: 10, Fig. 104.

*Lucasioides sinuosus*; Kwon, 1995: 522, Figs 8, 9; Nunomura, 1999: 86; Saito *et al.*, 2000: 89.

#### Material examined

China: 1 ♂, Guizhou Province, Guanling County, Huajiang, Sha Dong, 25.VII.2005, leg. L. Latella, MSNV; 2 ♂♂, 1 ♀, same data, MZUF; 1 ♀, same locality and date, leg. D. Avesani, MSNV; 1 ♀, Guizhou Province, Guanling County, Huajiang, Tu Shi Dong, 27.VII.2005, leg. D. Avesani, MSNV.

#### Remarks

This species was described by Nunomura (1987: 10, Fig. 104) as *Nagurus sinuosus* from Shikoku, Kochi Pref., Japan. Kwon (1995: 522, Figs 8, 9) recorded this species from Cheju Island, Korea and transferred it to the genus *Lucasioides* after re-examining the type specimens from Japan. The specimens examined here correspond in all details to the redescription of *L.*

*sinuosus* by Kwon (1995). This is the first record of this species from China.

#### Distribution

Japan, Korea and China.

#### Family Armadillidae

#### Genus *Troglodillo* Jackson, 1937

Type-species: *Troglodillo emarginatus* Jackson, 1937.

#### *Troglodillo latellai* n. sp. (Figs 19-40)

#### Material examined

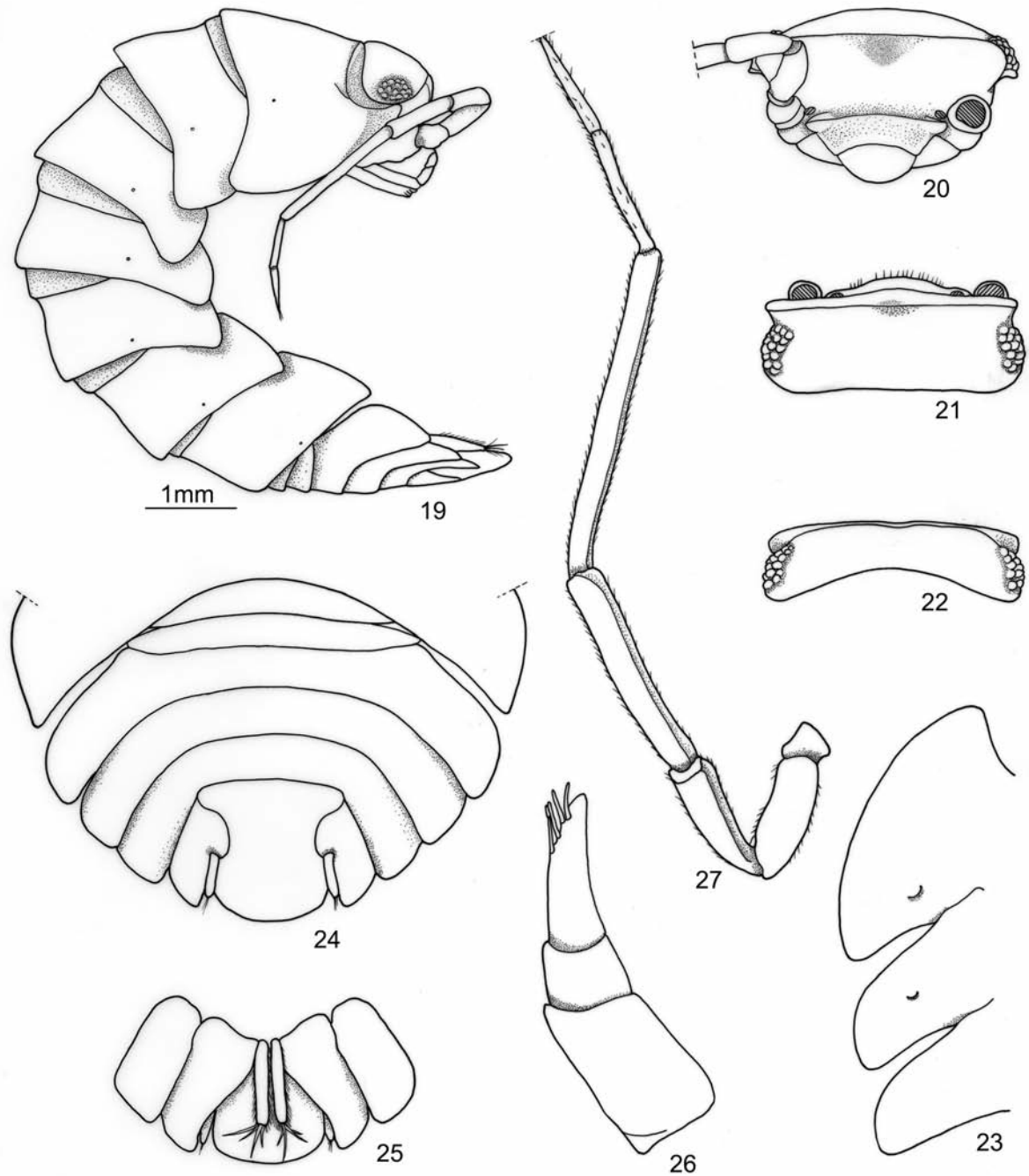
China: 1 ♂ Holotype, Guizhou Province, Qianxi County, Hong Lin, Pudding-Stone Cave, 16.X.2000, leg. L. Latella, MSNV.

#### Description

Dimensions: 10x5 mm. Pale colour after conservation in ethanol. Dorsum smooth. One nodulus lateralis per side on each pereonite; all noduli laterales inserted far (more or less at the same distance) from the lateral margin of the segments. Each eye consisting of 16 ommatidia. Cephalon with frontal shield with a triangular depression in the middle and slightly turned back on vertex, clearly protruding over vertex only at sides; in frontal view, the lateral sides of the shield are rounded. Pereonite 1 with anterior corners slightly turned up; distal margin slightly sinuous at sides; postero-lateral corners rounded; a small rounded ventral lobe on epimera, far from lateral margin. Pereonites 2 and 3 with subtriangular epimera, bent caudally; a small rounded ventral lobe at the base of epimera of pereonite 2. Pereonites 4-7 with quadrangular epimera slightly bent caudally. Telson as long as wide, hour-glass shaped, with distal margin broadly rounded. Antennule of 3 articles, bearing a few superimposed aesthetascs near the apex. Antenna long and slender, reaching rear margin of pereonite 4; flagellum distinctly shorter than fifth segment of peduncle; second flagellar article slightly shorter than first. Mandibles with molar penicil semidichotomized, i.e. consisting of several plumose setae of increasing length arising from a single stem; left mandible with 1+2 and right mandible

with 1+1 penicils. Maxillular outer branch with 4+6 simple teeth and a small accessory tooth; inner branch with rounded distal margin bearing two short stout penicils. Maxilla distally covered with numerous short setae; inner lobe rounded.

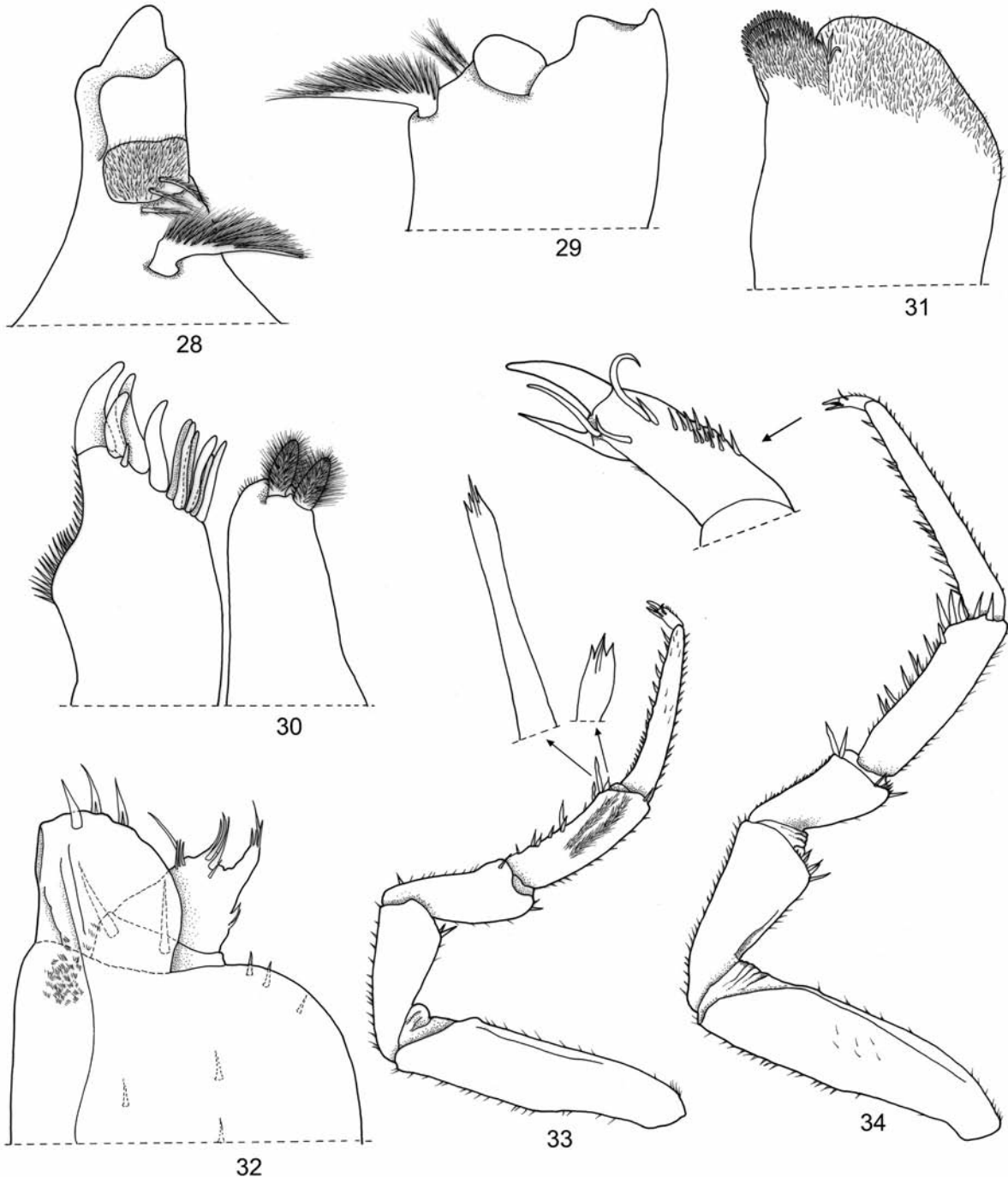
Maxillipedal endite with two long triangular setae on distal margin and the usual subapical triangular seta; two long triangular setae on basal article of palp. All pereopods long and slender; dactylar seta and unguis flagelliform; pereopod 7 is-



Figs 19-27 – *Troglodillo latellai* n. sp. – Pudding-Stone Cave, holotype ♂: 19, specimen in lateral view; 20, cephalon, frontal view; 21, cephalon, dorsal view; 22, cephalon, posterior view; 23, pereonites 1-3, ventral view; 24, pleon, telson and uropods, dorsal view; 25, pleonite 5, telson and uropods, ventral view; 26, antennule; 27, antenna.

chium with slightly sinuous sternal margin. Ventral lobe of pereonite 7 with bilobate median part. All pleopodal exopodites with monospiracular lungs, with wider spiracles in the anterior ones. Pleopod 1 exopod subrectangular with no poste-

rior point; a row of short stout setae on distal margin; endopod with distal third slightly bent outwards, triangular apex. Pleopod 2 endopod as long as exopod. Pleopod 3-5 exopods triangular with distal point progressively decreasing in



Figs 28-34 – *Troglodillo latellai* n. sp. – Pudding-Stone Cave, holotype ♂: 28, left mandible; 29, right mandible; 30, maxillule; 31, maxilla; 32, maxilliped; 33, pereopod 1; 34, pereopod 7.



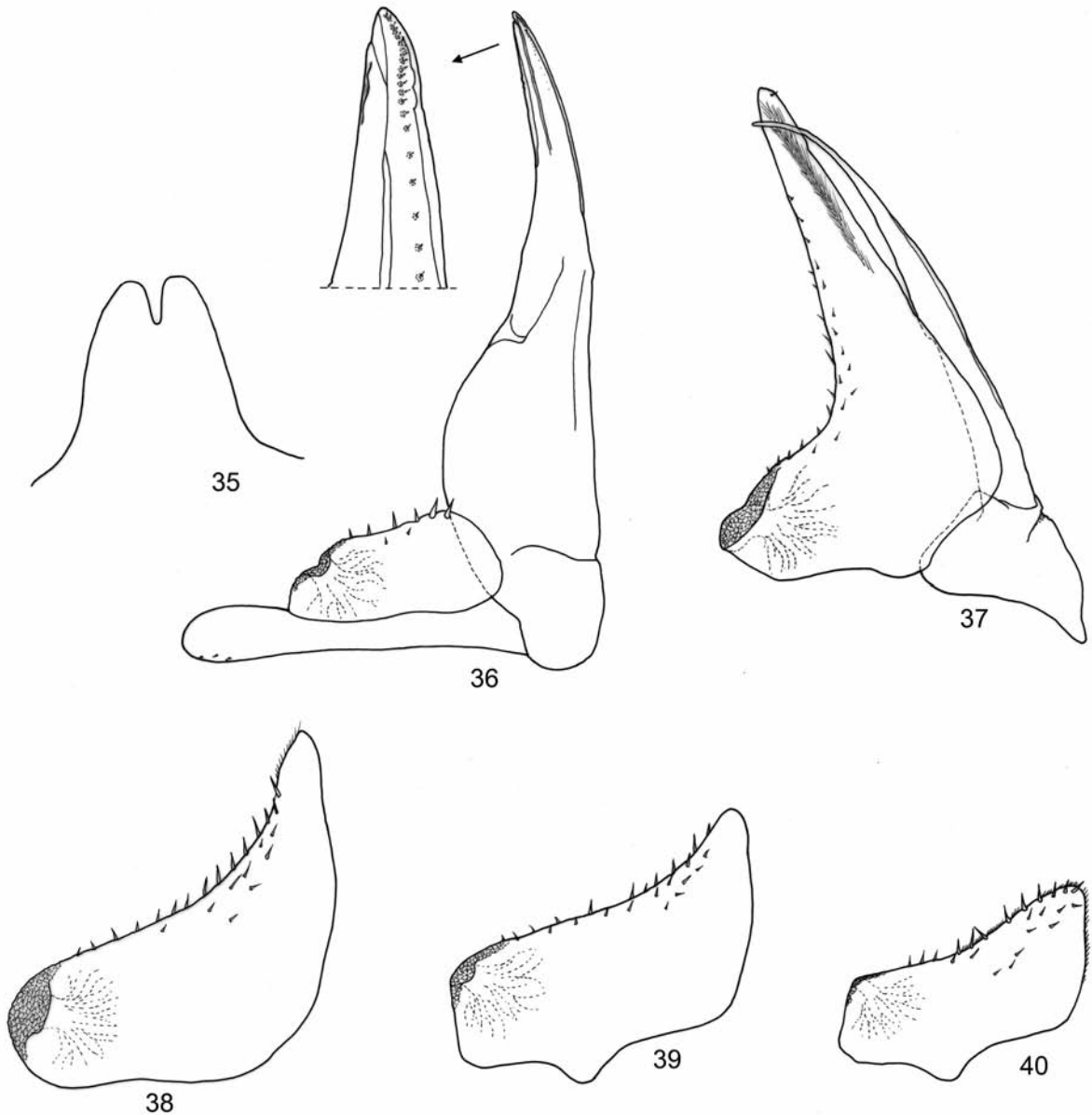
length. Uropodal protopod elongated, with quadrangular distal part reaching tip of telson; exopod long and thin, inserted dorsally near medial margin of protopod; endopod about 2/3 as long as protopod.

*Etymology*

The new species is named after Dr. Leonardo Latella, MSNV, who collected the specimen described here.

*Remarks*

Thus far, the genus *Troglodillo* included only two species: *T. emarginatus* Jackson, 1937 from a cave at Pha-Thai, northern Thailand, and *T. rotundatus* Kwon & Taiti, 1993 from Guilin, Guangxi Province, SW China. Both species are known only from female specimens. *Troglodillo latellai* is morphologically close to *T. rotundatus*, from which it is readily distinguished by the smaller eye (16 vs. 20 ommatidia), cephalon with



Figs 35-40 – *Troglodillo latellai* n. sp. – Pudding-Stone Cave, holotype ♂: 35, ventral lobes of pereonite 7; 36, pleopod 1; 37, pleopod 2; 38, pleopod 3 exopod; 39, pleopod 4 exopod; 40, pleopod 5 exopod.

frontal shield less bent over the vertex, wider telson, distinctly longer antenna, and uropods with quadrangular instead of triangular distal part of protopods. The uniform pale colour may also be a distinguishing character.

The new species differs from *T. emarginatus* by the eye with 16 instead of 29 ommatidia, the telson with broadly rounded instead of emarginate posterior margin, all pleopodal lungs monospiracular whereas in *T. emarginatus* they are polyspiracular in pleopods 1 and 2 and monospiracular in pleopods 3-5.

Genus *Dryadillo* Taiti, Ferrara & Kwon, 1992

Type-species: *Dryadillo baliensis* Herold, 1931.

*Dryadillo guizhouensis* n. sp. (Figs 41-62)

#### Material examined

China: 1 ♂ Holotype, 4 ♀♀ Paratypes, Guizhou Province, Zhen Feng County, Zhe Xi-ang, An Ja Da Dong, 4.IV.2004, leg. L. Latella & R. Zorzini, MSNV; 2 ♀♀ Paratypes, same data, MZUF; 1 ♀ Paratype, same locality, 31.VII.2005, leg. G. Gozzo & S. Meggiorini, MSNV; 2 ♀♀ Paratypes, Guizhou Province, Guanling County, Huajiang, Da Dong, leg. L. Latella, MSNV; 1 ♀ Paratype, same data, MZUF; 1 ♂ Paratype, Guizhou Province, Guanling County, Huajiang, San Ge Dong, 28.VII.2005, leg. L. Latella & D. Avesani, MZUF.

#### Description

Maximum dimensions: ♂ 8x3.5 mm, ♀ 9.5x5 mm. Dark brown colour with the usual yellowish muscle spots; pale uropods. Dorsum smooth. One nodulus lateralis per side on each pereonite; all noduli laterales inserted far (more or less at the same distance) from the lateral margin of the segments. Each eye consisting of 17-19 ommatidia. Cephalon with frontal shield with a triangular depression and turned back on vertex in the middle, upper margin distinctly protruding over vertex only at sides; in frontal view, the lateral sides of the shield are rounded. Pereonite 1 with epimera turned up; distal margin regularly curved; a schisma at the postero-lateral corners with outer lobe broadly rounded and distinctly protruding backwards compared with inner one. Pereonite 2 with quadrangular epimera, ventral-

ly with an elongated lobe. Pereonites 3-7 with quadrangular epimera, distal margin almost straight. Telson slightly wider than long, hour-glass shaped, with distal margin broadly rounded. Antennule of 3 articles; third article with four rows of aesthetascs in the distal half; rounded apex. Antenna short, reaching rear margin of pereonite 2; flagellum distinctly shorter than fifth segment of peduncle; second flagellar article ca. 4 times longer than first. Mandibles with molar penicil semidichotomized; left mandible with 1+2 and right mandible with 1+1 penicils. Maxillular outer branch with 4+6 simple teeth; inner branch with rounded distal margin bearing two short stout penicils. Maxilla distally covered with numerous short setae; inner lobe quadrangular. Maxillipedal endite with two short triangular setae on distal margin, the usual subapical triangular seta and serrate outer margin; one short and one long seta on basal article of palp. Pereopods with dactylar seta and unguis flagelliform. All pleopodal exopods with monospiracular lungs. Uropodal protopod trapezoidal, with rounded posterior corners; exopod short, distinctly not reaching the rear margin of protopod and inserted dorsally beneath a large tooth in the middle of protopod; endopod about 2/3 as long as protopod.

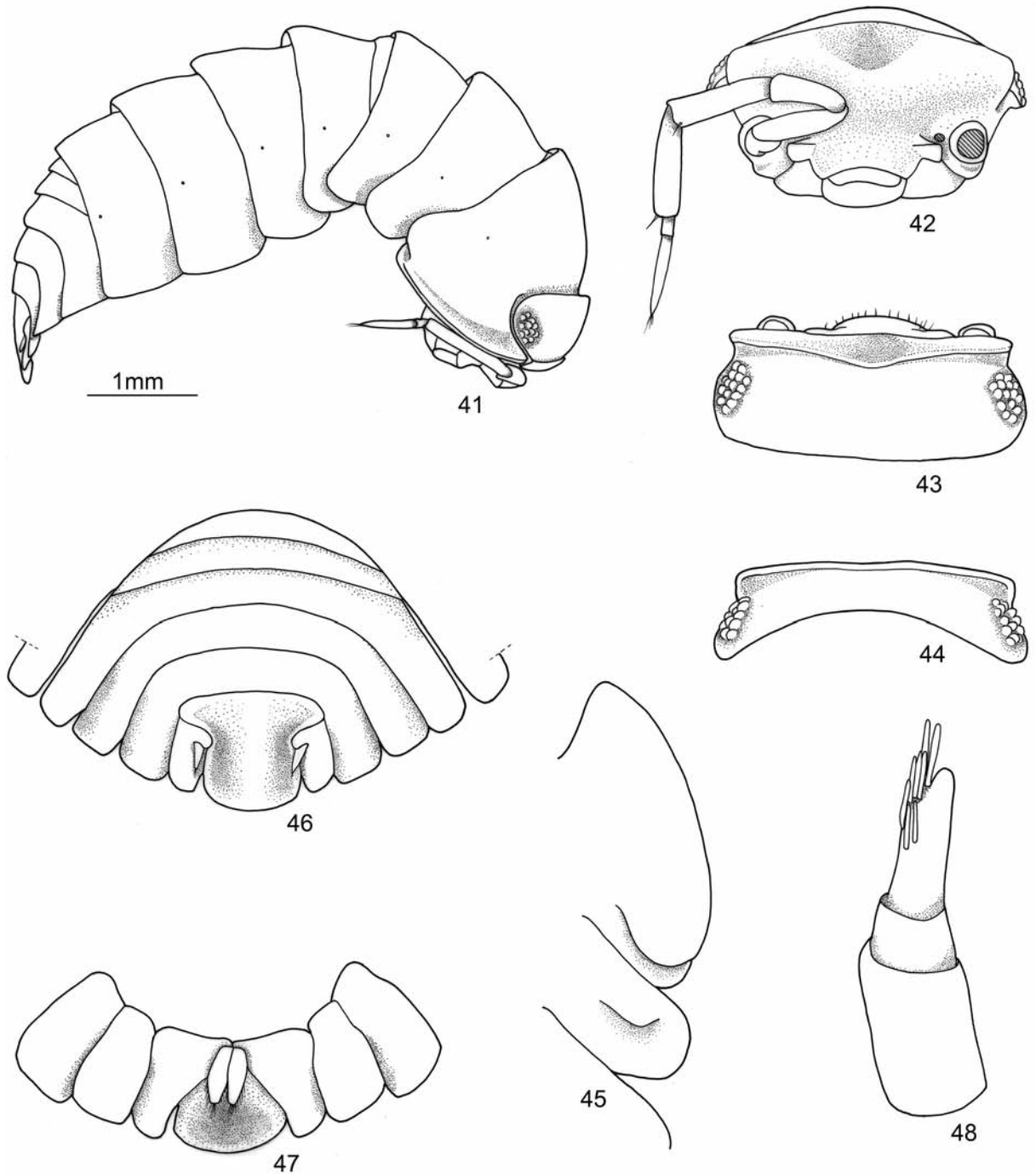
Male. – Anterior pereopods without distinct specializations. Pereopod 7 basis with distal part of sternal margin covered by many short triangular setae; ischium with slightly convex sternal margin. Ventral lobe of pereonite 7 with deeply bilobate median part. Pleopod 1 exopod subtrapezoidal with a few short setae on distal margin; endopod slightly and regularly bent outwards, triangular apical part. Pleopod 2 endopod flagelliform, slightly longer than exopod. Pleopod 3-5 exopods triangular with distal point progressively decreasing in length.

#### Etymology

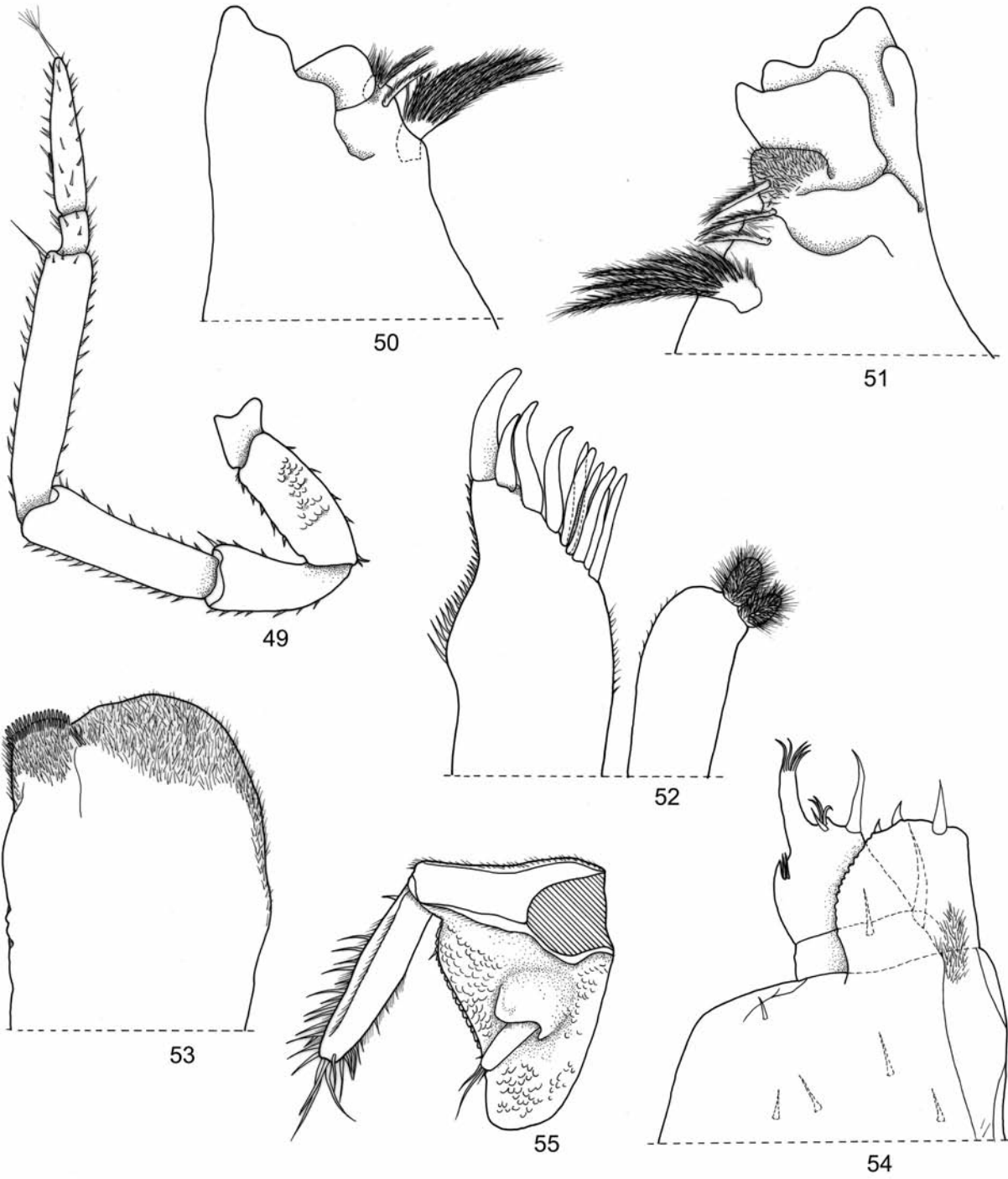
The species is named after Guizhou Province where the caves in which these specimens were collected are located.

#### Remarks

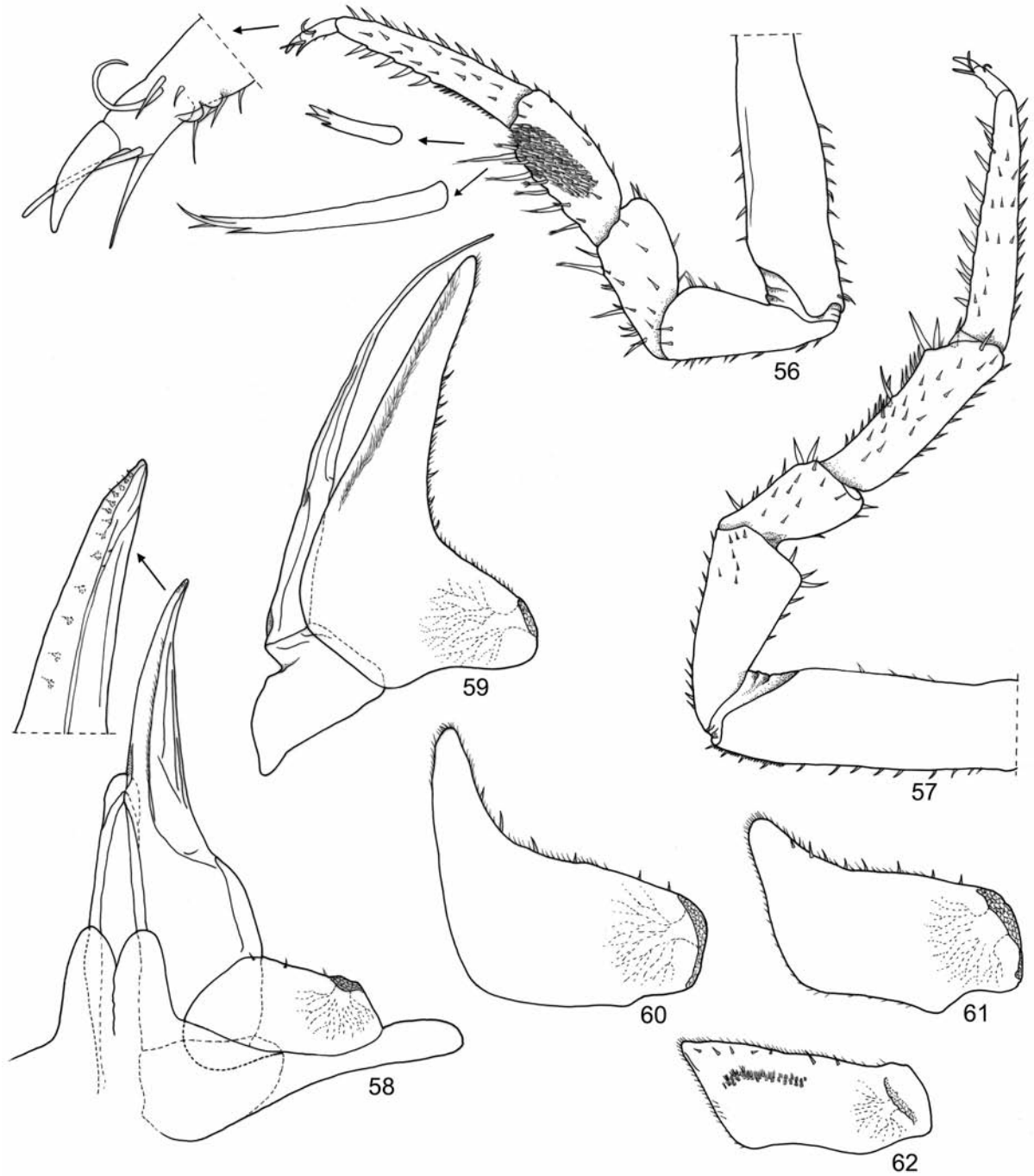
Thus far, the genus *Dryadillo* included 15 species from Indonesia, SW China, Taiwan and Vietnam (Schmalfuss, 2003). Only three species were recorded from China: *D. maculatus* (Ar-



Figs 41-48 – *Dryadillo guizhouensis* n. sp. – An Ja Da Dong, paratype ♀: 41, specimen in lateral view; 42, cephalon and right antenna, frontal view; 43, cephalon, dorsal view; 44, cephalon, posterior view; 45, pereonites 1-3, ventral view; 46, pleon, telson and uropods, dorsal view; 47, pleonites 4, 5, telson and uropods, ventral view; 48, antennule.



Figs 49-55 – *Dryadillo guizhouensis* n. sp. – An Ja Da Dong, holotype ♀: 49, antenna. Paratype ♂: 50, right mandible; 51, left mandible; 52, maxillule; 53, maxilla; 54, maxilliped; 55, uropod.



Figs 56-62 – *Dryadillo guizhouensis* n. sp. – An Ja Da Dong, holotype ♂: 56, pereopod 1; 57, pereopod 7; 58, ventral lobes of pereonite 7 and pleopod 1; 59, pleopod 2; 60, pleopod 3 exopod; 61, pleopod 4 exopod; 62, pleopod 5 exopod.



cangeli, 1952) from Hainan Dao, Macao and Hong Kong, and *D. chengziensis* Dai & Cai, 2003 and *D. jinghongensis* Dai & Cai, 2003 from Yunnan. Because of a setose area on the distal part of the male pereopod 7 sternal margin, the new species shows closest affinities to *D. maculatus* and *D. chengziensis*. It differs from the former in having the epimera of the first pereonite turned up, narrower telson, uropods with narrower basal part of the protopod and shorter exopod, and male pleopod 1 endopod without denticles in the apical part (compare Figs 41, 46, 55 and 58 for *D. guizhouensis* with Figs 273, 279, 281 and 286 in Kwon & Taiti, 1993 for *D. maculatus*); it differs from the latter in the outer lobe of the schisma of pereonite 1 more protruding backwards compared with inner one, narrower telson and uropods with shorter protopod and longer exopod, and male pleopod 1 exopod subtrapezoidal instead of bean-shaped (compare Figs 45, 46 and 58 for *D. guizhouensis* with Figs 15C, D and H in Dai & Cai, 2003 for *D. chengziensis*).

*Dryadillo guizhouensis*, together with the following new species *D. parviocellatus*, belongs to the group of *Dryadillo* species possessing one line of noduli laterales per side on the pereonites, more or less at the same distance from the lateral margin. This group certainly includes *D. arcangeli* Herold, 1931, *D. montanus* Herold, 1931 and *D. schellenbergi* Herold, 1931 from Lombok, *D. uenoi* Nunomura, 1995 from Vietnam (after examination of topotypic material), and *D. maculatus* (Arcangeli, 1927). Most probably, *D. chengziensis* Dai & Cai, 2003 and *D. jinghongensis* Dai & Cai, 2003 also belong to this group. A second group includes the species with one nodulus lateralis per side on pereonites 1-6, with that on pereonite 4 far from the lateral margin, and two noduli per side on pereonite 7: *D. baliensis* Herold, 1931 from Bali, *D. hebereri* Herold, 1931 and *D. sexlineatus* Herold, 1931 from Flores, *D. rectifrons* (Dollfus, 1898) and *D. kemaensis* Taiti, Ferrara & Kwon, 1992 from Sulawesi. No information on the position of the noduli laterales is known for *D. bedaliensis* Herold, 1931 and *D. feuerborni* Herold, 1931 from Java, and *D. magnificus* Herold, 1931 from Flores.

*Dryadillo parviocellatus* n. sp.  
(Figs 63-80)

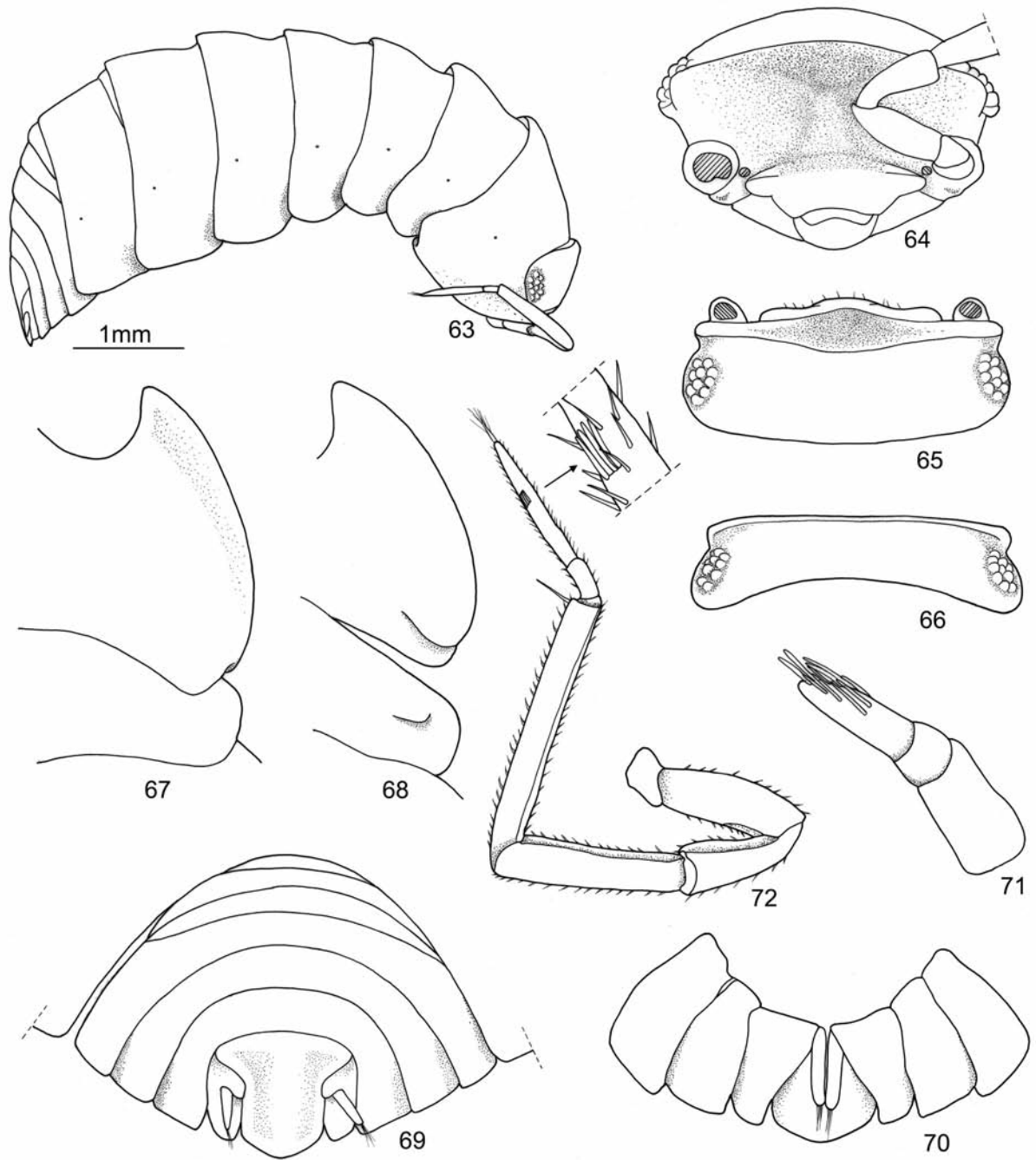
*Material examined*

China: 1 ♂ Holotype, Guangxi Province, Fengshan County, Jiang Zhou Cave System (via Long Huai entrance), from wood fragments ca. 400 m into cave in dark zone, 31.X.2005, leg. A. Clarke, MZUF; 2 ♂♂, 4 ♀♀ Paratypes, same data, MZUF; 2 ♂♂, 2 ♀♀ Paratypes, same data, IZCAS; 3 ♂♂, 3 ♀♀ Paratypes, same data, TMAG; 1 ♂ Paratype, Guangxi Province, Fengshan County, Da Dong, near tree roots on silty clay floor surface of lower chamber, ca. 20 m below surface entrance, 4.XI.2005, leg. A. Clarke, MZUF.

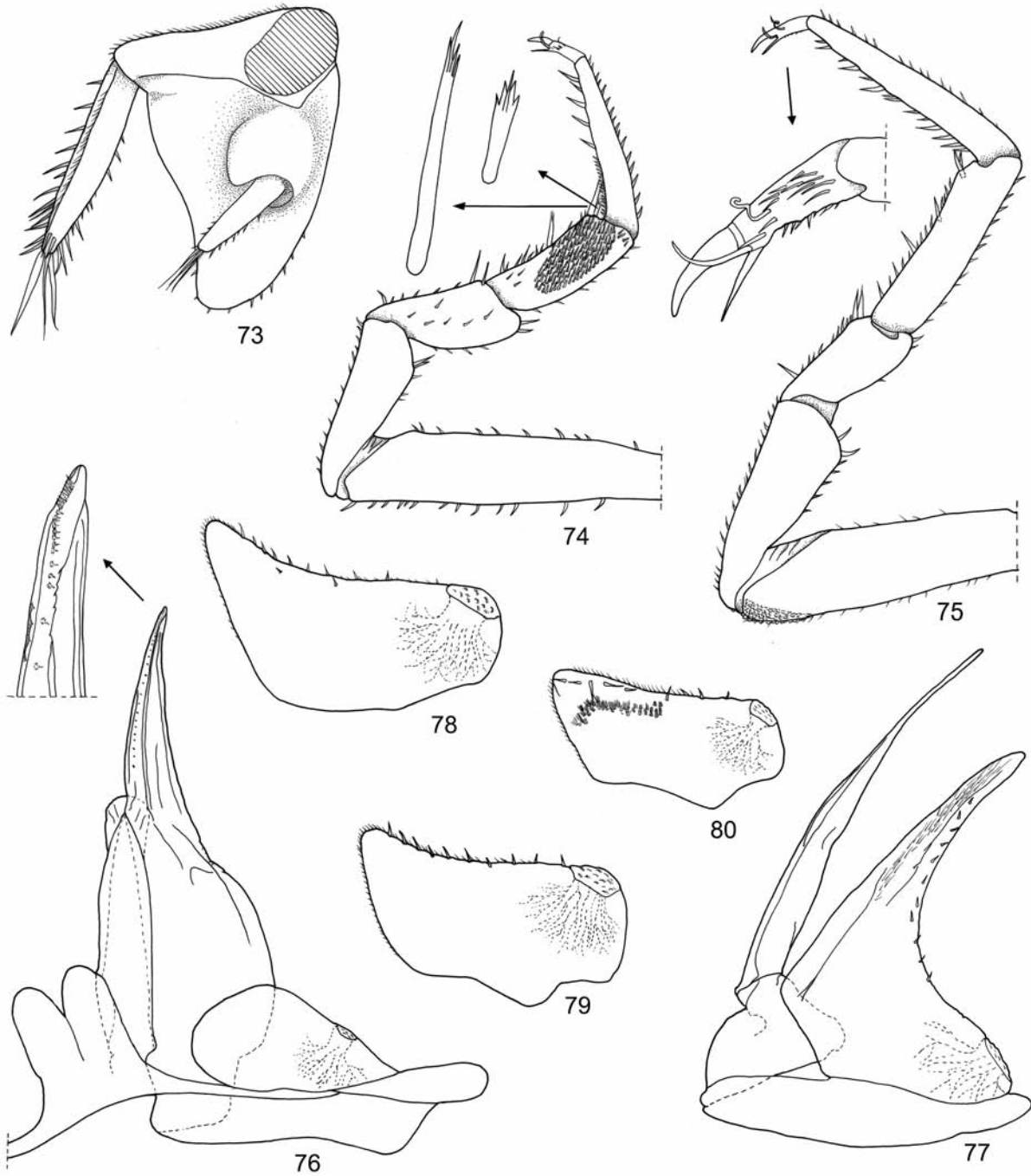
*Description*

Maximum dimensions: ♂ 8x3.5 mm, ♀ 9.5x4.5 mm. Very pale brown colour. Dorsum smooth. Number and position of noduli laterales as in *D. guizhouensis*. Each eye consisting of 9 to 11 ommatidia. Cephalon with frontal shield flat and slightly turned back on vertex in the middle, upper margin distinctly protruding over vertex only at sides; in frontal view, the lateral sides of the shield are rounded. Pereonite 1 with epimera slightly turned up; distal margin regularly curved; a schisma at postero-lateral corners with outer lobe broadly rounded and distinctly protruding backwards compared with inner one. Pereonite 2 with quadrangular epimera, ventrally with a small elongated lobe. Pereonites 3-7 with quadrangular epimera, distal margin almost straight. Telson about as long as wide, with a wider basal part, distal part with parallel sides and posterior margin at obtuse angle. Antennule of 3 articles; third article with many superimposed aesthetascs in the distal half; rounded apex. Antenna with thin articles, reaching rear margin of pereonite 2; flagellum distinctly shorter than fifth segment of peduncle; second flagellar article ca. 4 times longer than first, with a row of 4 aesthetascs in the middle. Buccal pieces as in *D. guizhouensis*. Pereopods with dactylar seta and unguis seta flagelliform. All pleopodal exopods with monospiracular lungs. Uropodal protopod triangular, with outer margin regularly convex and medial margin slightly sinuous; exopod almost reaching the rear margin of protopod and inserted dorsally beneath a large tooth in the middle of protopod; endopod about 3/4 as long as protopod.

Male. – Anterior pereopods without distinct



Figs 63-72 – *Dryadillo parviocellatus* n. sp. – Jiang Zhou, paratype ♂: 63, specimen in lateral view; 64, cephalon and left antenna, frontal view; 65, cephalon, dorsal view; 66, cephalon, posterior view; 67, pereonites 1, 2, dorsal view; 68, pereonites 1, 2, ventral view; 69, pleon, telson and uropods, dorsal view; 70, pleonites 4, 5, telson and uropods, ventral view; 71, antennule; 72, antenna.



Figs 73-80 – *Dryadillo parviocellatus* n. sp. – Jiang Zhou, paratype ♂: 73, uropod; 74, pereopod 1; 75, pereopod 7; 76, ventral lobes of pereonite 7 and pleopod 1; 77, pleopod 2; 78, pleopod 3 exopod; 79, pleopod 4 exopod; 80, pleopod 5 exopod.

specializations. Pereopod 7 basis with distal part covered by many short scales near sternal margin; ischium narrow, with slightly convex sternal margin. Ventral lobe of pereonite 7 with deeply bilobate median part. Pleopod 1 exopod subtriangular with broadly rounded distal margin; endopod slightly and regularly bent outwards, triangular apical part. Pleopod 2 endopod flagelliform, slightly longer than exopod. Pleopod 3-5 exopods triangular with distal point progressively decreasing in length.

#### *Etymology*

Latin: *parvus* = small + *ocellatus* = with eyes. The name refers to the reduced number of ommatidia (9-11) of the eyes.

#### *Remarks*

*Dryadillo parviocellatus* is readily distinguished from the species belonging to the group with only one line of noduli laterales per side on the pereonites by the eye with 9 to 11 ommatidia and the narrow distal part of telson. Moreover, among the Chinese species of *Dryadillo*, it differs from *D. guizhouensis* in having the frontal shield without a triangular depression in the middle, pereonite 1 with epimera less distinctly turned up, smaller ventral lobe of pereonite 2, longer uropodal exopod and triangular instead of trapezoidal male pleopod 1 exopod; from *D. maculatus* in lacking the denticles on the apical part of the male pleopod 1 endopod; from *D. chengziensis* and *D. jinghongensis* in the larger uropodal exopods and the different shape of the male pleopod 1 exopod.

#### Incertae sedis

#### Genus *Exalloniscus* Stebbing, 1911

Type-species: *Alloniscus coecus* Dollfus, 1898.

*Exalloniscus troglophilus* n. sp.  
(Figs 81-100)

#### *Material examined*

China: 1 ♂ Holotype, Guangdong Province, Yangchun County, Tan Shui, Long Yan Dong (Dragoon Rock Cave), 10.VI.2006, leg. L. Latella & S. Meggorini; 7 ♀♀ Paratypes, same data, MSNV; 1 ♂, 5 ♀♀ Paratypes, same data, MZUF.

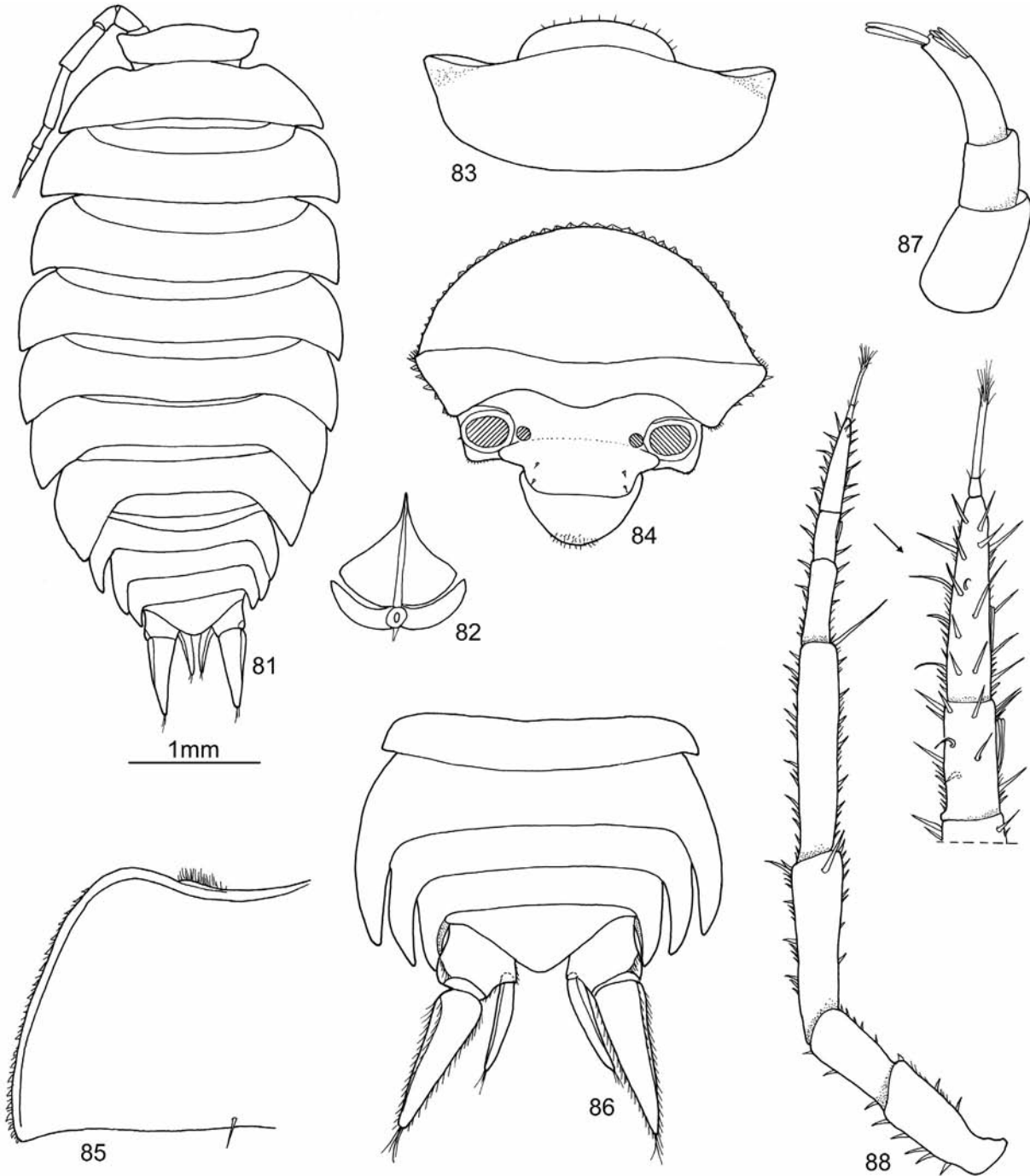
#### *Description*

Maximum dimensions: ♂ 5.5x3 mm, ♀ 6.5x3.2 mm. Pale colour. Dorsum smooth with some triangular scale-setae. One line of noduli laterales per side on the pereonites, located near posterior margin and far from the lateral margin. Eyes absent. Body flattened and enlarged. Cephalon wide, anteriorly depressed; lateral lobes triangular, protruding laterally; frontal line almost straight, supra-antennal line sinuous. Pereonite 1 with posterior margin slightly concave at sides and postero-lateral corners subacute; pereonites 2-7 with corners progressively pointing further backwards. Pleon epimera 3-5 very large, falciform and directed backwards. Telson short, about three times wider than long, triangular with broadly rounded apex. Antennule of three articles; third article subapically with two rows of superimposed aesthetascs and two aesthetascs at the apex. Antenna with flagellum of three articles, slightly longer than fifth article of peduncle; ratio of flagellar joints 5:3:6; second and third flagellar articles with a row of 4 and 2 aesthetascs, respectively. Mandibles with molar penicil consisting of several plumose setae arising from a common stalk; right mandible with 1+1 and left mandible with 2+1 free penicils. Maxillule outer branch with 4+5 (cleft) long teeth + 2 small ones apically entire, a long stalk among the outer group of teeth, and 2 setae in subapical position; inner branch with rounded apex and two long penicils. Maxilla with two subequal rounded lobes at the apex. Maxilliped with a very short penicil on endite; palp with a large seta on the basal article. Pereopods with flagelliform dactylar seta with a brush of fine setae at apex; basis of pereopod 7 with a longitudinal groove covered with lamellar scales. Pleopods without visible respiratory structures. Uropodal protopods distinctly surpassing tip of telson; endopods inserted proximally to exopods.

Female. – Ovigerous females with 6 eggs or embryos in the brood pouch.

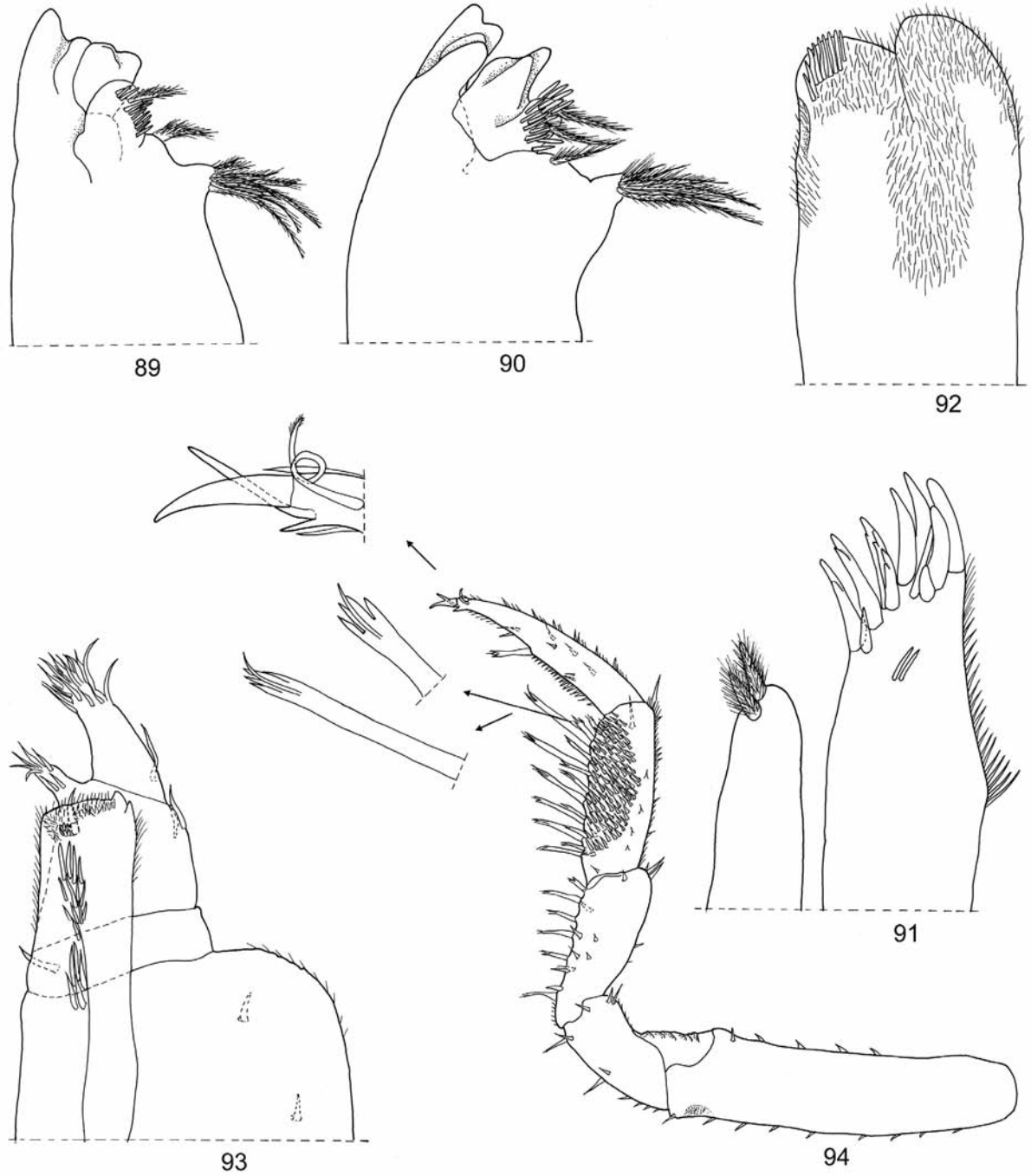
Male. – Pereopods 1 and 2 with some trifid spines on carpus and, to a lesser extent, on merus. Pereopod 7 without distinct specializations; ischium with sternal margin almost straight. Pleopod 1 exopod cordiform, with sinuous outer margin and broadly rounded apex; endopod with a pointed distal part and a large subapical rounded lobe covered with rounded scales on dorsal



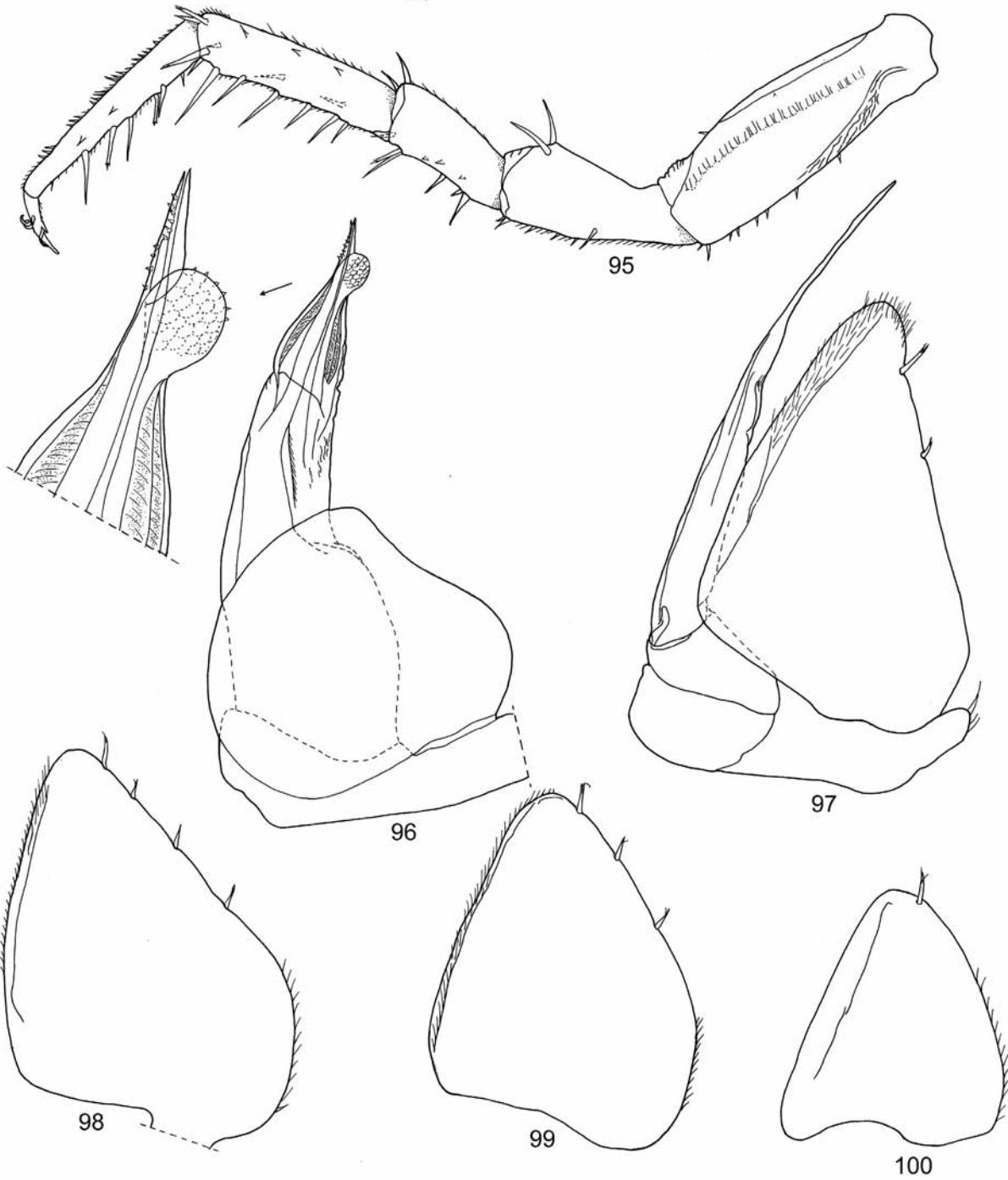


Figs 81-88 – *Exalloniscus troglophilus* n. sp. – Long Yan Dong, paratype ♀: 81, specimen in dorsal view; 82, dorsal scale-seta; 83, cephalon, dorsal view; 84, cephalon, frontal view; 85, left epimeron of pereonite 1; 86, pleon, telson and uropods; 87, antennule; 88, antenna.





Figs 89-94 – *Exalloniscus troglophilus* n. sp. – Long Yan Dong, paratype ♀: 89, right mandible; 90, left mandible; 91, maxillule; 92, maxilla; 93, maxilliped. Paratype ♂: 94, pereopod 1.



Figs 95-100 – *Exalloniscus troglophilus* n. sp. – Long Yan Dong, paratype ♂: 95, pereopod 7; 96, pleopod 1; 97, pleopod 2; 98, pleopod 3 exopod; 99, pleopod 4 exopod; 100, pleopod 5 exopod.

surface. Pleopod 2 endopod flagelliform, distinctly longer than exopod. Pleopod 3-5 exopods triangular, progressively decreasing in size.

#### *Etymology*

Greek: *trōglē* = cave + *philos* = loving. The name refers to the collecting site of the specimens.

#### *Remarks*

The genus *Exalloniscus* included 20 species distributed in Sri Lanka, Nepal, Thailand, Laos, Vietnam, Malaysia, Indonesia, Philippines, China, Korea and Japan (Taiti & Ferrara, 1988; Manicasterri & Taiti, 1991; Kwon & Taiti, 1993; Dalens, 1992; Nunomura, 2000b; Nunomura & Xie, 2000). The genus is clearly defined (Taiti & Ferrara, 1988) but its family ascription is still uncertain (Schmalfuss, 2003; Schmidt & Leistikow, 2004). Four species of *Exalloniscus* were previously known from China, i. e. *E. cortii* Arcangeli, 1927, *E. rotundatus* Taiti & Ferrara, 1986, *E. silvestrii* Kwon & Taiti, 1993 and *E. yinae* Nunomura & Xie, 2000. The last species is recorded from Yunnan and, as far as it is possible to judge from its description and figures (Nunomura & Xie, 2000: 61, fig. 9), it is most probably a junior synonym of *E. bessonni* Dalens, 1992 from Laos.

*Exalloniscus troglophilus* belongs to the group of species possessing a large flat lobe near the apex of the male pleopod 1 endopod. Up to date this group includes *E. cortii* recorded from China, Korea and Japan, *E. silvestrii* from China and Korea, and *E. tuberculatus* Nunomura, 2000 from Japan. In Japan a further species of this group is present, since the specimens from Honmoku, Naka-ku, Yokohama City, identified by Nunomura (1986) and Taiti & Ferrara (1988) as *E. cortii*, certainly do not belong to this species but to a distinct new species that we nominate *Exalloniscus japonicus* n. sp. The male specimen from Honmoku, previously identified as *E. cortii* and deposited in the Toyama Science Museum, is chosen as holotype of *E. japonicus*. The characters of this species are illustrated in Taiti & Ferrara (1988: Fig. 6). It differs from *E. cortii* in the shape of the cephalon and apical part of the male pleopod 1 endopod (compare redescription and figures of *E. cortii* in Kwon, 1993). Examination of further specimens of *E. japonicus* (6 ♂♂, 8 ♀♀, Japan, Misato, Gunma, leg. S. Saito, 12.IV.1988, MZUF) confirms the validity of this species. How-

ever, also *E. cortii* is certainly present in Japan as confirmed by the examination of some specimens (2 ♂♂, 2 ♀♀, Naganohara, Gunma, leg. S. Saito, 19.VII.1991, MZUF). All the specimens of *E. cortii* previously recorded from Japan (see Saito et al., 2000, for a review; Nunomura, 2000a and 2004) must be re-examined in order to check which species (*E. cortii*, *E. japonicus* or other species) they really belong to.

*Exalloniscus troglophilus* is readily distinguishable from all the above mentioned species by the lack of any trace of eyes and the shape of the male pleopod 1 endopod with a narrow pointed apical part and a rounded subapical lobe covered with rounded scales.

Most species of *Exalloniscus* are associated with ants or termites (Taiti & Ferrara, 1988; Ferrara et al., 1988) and only three species were previously recorded from caves: *E. bicoloratus* Taiti & Ferrara, 1988 from Malaysia, *E. beroni* Taiti & Ferrara, 1988 from Thailand, and *E. bessonni* from Laos. At least *E. bicoloratus* and most probably *E. bessonni* (if *E. yinae* is a junior synonym) have been collected also outside caves. We do not know whether *E. troglophilus* is also present outside and is associated with ants or termites.

#### DISCUSSION

Herein we report on seven species of terrestrial isopods recorded in caves from Guangxi (*Porcellio laevis* and *Dryadillo parviocellatus*), Guizhou (*Lucasiodides* cf. *daliensis*, *L. sinuosus*, *Troglodillo latellai* and *Dryadillo guizhouensis*) and Guangdong (*Exalloniscus troglophilus*). With the seven species previously recorded (Kwon & Taiti, 1993; Schultz, 1995), the total number of species known from caves in southern China (Yunnan, Guizhou, Guangxi and Guangdong provinces) is now 14, belonging to 10 genera and six families. Of the seven species recorded here, *T. latellai* and *D. parviocellatus* show some slight troglomorphic traits, such as the reduction of the number of ommatidia and body pigment. However, since the eyes are still distinctly present, these species must be considered eutroglophilic forms (sensu Ruffo, 1955). Also *Exalloniscus troglophilus* shows reduction of pigment and lack of eyes, but these characters are common also to other species in the genus associated with ants or termites and

not cave dwelling forms. None of the other species shows any adaptation to cave life and they are all certainly troglonous. Among the species previously recorded from southern Chinese caves, only the styloniscid *Sinoniscus cavernicolus* from a cave at Taiping Yau, Lin Chuan County, Guangxi Province (Schultz, 1995) can be regarded as a true troglonous, while all the other species are either troglonophilic or troglonous.

From a zoogeographical point of view, *Porcellio laevis* is a cosmopolitan species of Mediterranean origin, certainly introduced to China, *Lucasioides* cf. *daliensis* and *L. sinuosus* belong to a genus widely distributed in the Manchurian sub-region of the Palearctic Region, *Troglophilus latellai*, *Dryadillo guizhouensis* and *D. parviocellatus* belong to genera with an Oriental distribution, while *Exalloniscus troglonophilus* belongs to a genus mainly distributed in the Oriental Region with a few species inhabiting also the Manchurian sub-region of the Palearctic Region.

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