Taxonomic notes on the antlion genus *Paraglenurus* van der Weele (Neuroptera: Myrmeleontidae: Nemoleontinae), with some new findings from China and Vietnam

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Abstract: We review the genus *Paraglenurus* van der Weele, 1909 in China, and provide a new Chinese record: *P. scopifer* (Gerstaeker, 1888) from Orchid Island (Lanyu). Additionally, we describe a new species of *Paraglenurus* from South Vietnam, i.e., *P. badanoi* **sp. nov.**, which represents the first record of this genus in Indochina. Furthermore, we confirm that the paratypes of *P. pumilus* (Yang, 1997) are actually a distinct new species in the genus *Indophanes* Banks, 1940, i.e., *I. zhiliangi* **sp. nov.**

Key words: Neuropterida; taxonomy; Oriental region; larva

白云蚁蛉属分类记述及中国与越南的新种及新记录（脉翅目：蚁蛉科：恩蚁蛉亚科）

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摘要：我们对中国的白云蚁蛉属 *Paraglenurus* (van der Weele, 1909) 进行了回顾，并报道了中国的新记录种：产于兰屿的东洋白云蚁蛉 *P. scopifer* (Gerstaeker, 1888)。我们还描述了来自越南南部的白云蚁蛉属的新种：巴氏白云蚁蛉 *P. badanoi* **sp. nov.**，这是该属在中南半岛的首次记录。此外，确认小白云蚁蛉 *P. pumilus* (Yang, 1997) 的所有副模均属于英蚁蛉属 *Indophanes* (Banks, 1940) 的 1 个新种，即志良英蚁蛉 *I. zhiliangi* **sp. nov.**。

关键词：脉翅总目；分类；东洋区；幼虫

Introduction

The antlion genus *Paraglenurus* van der Weele, 1909 belongs to the subfamily Nemoleontinae, and is currently comprised of 12 known species. Ten species are distributed in Asia (Stange 2004; Matsumoto *et al*. 2021; Oswald 2024): the type species *P. scopifer* (Gerstaecker, 1888) is recorded from the Buru and Seram Islands of Indonesia; *P. borneensis* van der Weele, 1909 is endemic to Central Kalimantan (Indonesia); *P. pumilus* (Yang, 1997) is distributed along the coastal areas of Fujian and Taiwan (China) (Yang 1997, 1999; Wang *et al*. 2018; Ábrahám & Giacomino 2020); seven species are distributed in Japan: *P. albiventris* Matsumoto, Kikuta & Hayashi, 2021; *P. fulvus* Matsumoto, Kikuta & Hayashi,

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2021; *P. impunctatus* Matsumoto, Kikuta & Hayashi, 2021; *P. japonicus* (McLachlan, 1867); *P. melanostictus* Matsumoto, Kikuta & Hayashi, 2021; *P. okinawensis* (Okamoto 1910); and *P. sakishimensis* Matsumoto, Kikuta & Hayashi, 2021. Their distribution across the Japanese Archipelago and the Ryukyu Islands is complicated (Matsumoto *et al.* 2021). Notably, in addition to Japan, *P. japonicus* is widely recorded in China, North Korea, South Korea, and the Russian Far East (Miller *et al*. 1999; Stange 2004; Krivokhatsky 2011; Wang *et al.* 2018). This requires further study of the relationships among *P. japonicus* and other morphologically similar species from East Asia, and especially all species in Japan. Additionally, two species are recorded from East African islands, i.e., *P. pinnulus* (Auber, 1955) from Madagascar and *P. ornatus* (Needham, 1913) from Seychelles Islands (Auber 1955; Ábrahám 2023). Whether they are in a monophyly with the Asian species remains uncertain. Furthermore, based on current records, we have observed a notable distribution gap for *Paraglenurus* between the Chinese mainland and Kalimantan. This suggests a strong possibility that *Paraglenurus* may also be distributed in the Indochina and the Malaysian regions but has yet to be discovered.

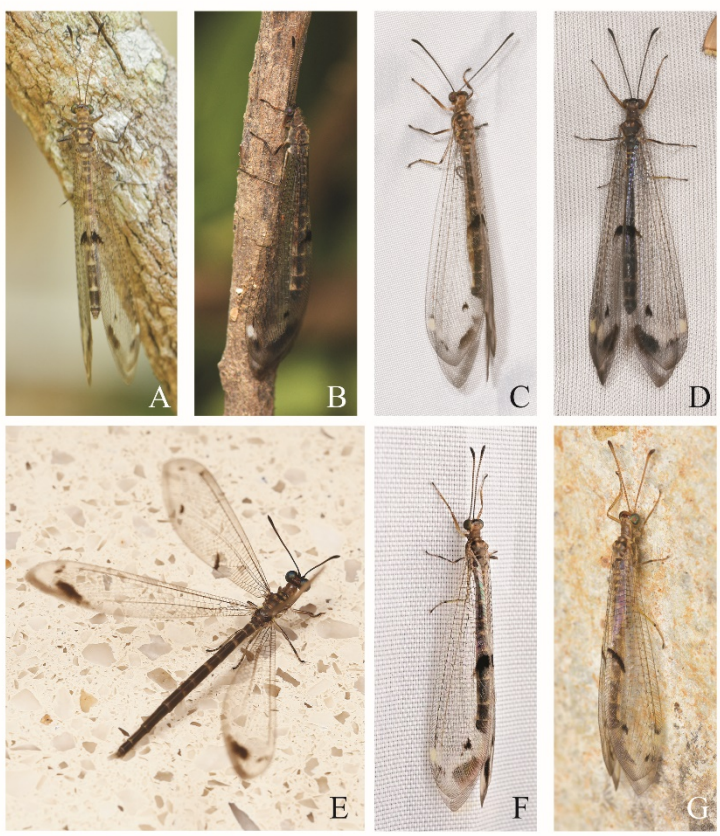

Figure 1. *Paraglenurus* spp. from China, living adults from different localities. A–F. *P. japonicus* (McLachlan, 1867): A. Ledong, Hainan; B. Longyan, Fujian; C. Jinzhai, Anhui; D. Hanzhong, Shaanxi; E. Jiading, Shanghai; F. Weixi, Yunnan. G. *P. pumilus* (Yang, 1997), Xiamen, Fujian. (A–D, G. Photos by Yuchen ZHENG; E. Photo by Deyao ZHOU; F. Photo by Fan GAO).

Here, we describe a new species of *Paraglenurus* from South Vietnam, i.e., *P. badanoi* **sp. nov.**, which is the first record of this genus in Indochina. It presents significant morphological differences and is in geographic isolation from all other species. Meanwhile, we report a new Chinese record: *P. scopifer* from Orchid Island (also known as Lanyu). Moreover, we describe a special new species of *Indophanes*, i.e., *I. zhiliangi* **sp. nov.**, which was initially considered conspecific with *P. pumilus*.

Material and methods

All specimens examined and mentioned herein are deposited in the following collections:

CAU — Entomological Museum, China Agricultural University, Beijing, China

EIHU — Entomological Institute, Hokkaido University, Sapporo, Japan

EMAU — Ernst-Moritz-Arndt Universitat Greifswald, Zoologisches Institut und Museum, Greifswald, Germany

FSCA — Florida State Collection of Arthropods, Florida, USA

IZCAS — Institute of Zoology, Chinese Academy of Sciences, Beijing, China

NHMUK — Natural History Museum, London, UK

ZCAU — Yuchen Zheng collection, China Agricultural University, Beijing, China

ZMHB — Museum für Naturkunde, Bereich Zoologisches Museum, Berlin, Germany

The holotypes of *Paraglenurus littoralis* Miller & Stange, 1999 and *P. riparius* Miller & Stange, 1999, which are deposited in FSCA, were examined based on photographs obtained from Zenodo (Bremer 2021a, b, c). Genitalia were prepared by clearing the apex of the abdomen with 15% KOH in 135℃ for seven minutes. After rinsing the KOH with distilled water, the apex of the abdomen was transferred to glycerin for further examination. Habitus photos were taken by using a Nikon® D850 digital camera with a AF-S Micro Nikkor 105 mm 1/2.8G ED lens. Head and thorax were photographed by a Nikon® D850 digital camera with a Laowa® 25 mm F/2.8 2.5–5.0X Ultra Macro lens. The photos of genitalia were taken using a Leica® DM2000 outfitted with Nikon® D850 digital camera.

The classification system of Myrmeleontidae follows Machado *et al.* (2019). Terminology of wing venation mainly follows Breitkreutz *et al*. (2017), while that of wing fields follows Machado & Oswald (2020). Terminology of genitalia mainly follows Aspöck & Aspöck (2008), Badano *et al.* (2017), and Zheng & Liu (2023). Terminology of the antlion larval morphology follows Badano & Pantaleoni (2014).

Abbreviations of terms of wing venation. C — costa; Sc — subcosta; RA — radius anterior; RP — radius posterior; MA — media anterior; MP — media posterior; CuA — cubitus anterior; CuP — cubitus posterior; A — anal veins; BL — Banksian line.

Abbreviations of terms for male and female Terminalia. ect — ectoprocts; gp — gonapophyses; gst — gonostylus; gx — gonocoxites; pp — pregenital plate; S — sternum.

Abbreviations of terms for larva. 1t — first tooth; 2t — second tooth; 3t — third tooth; Ims — interdental mandibular setae; Ms — mesothoracic spiracles; Msp — mesothoracic setiferous processes; Do — dolichaster; Ds — digging setae.

Taxonomy

Family Myrmeleontidae Latreille, 1802
Subfamily Nemoleontinae Banks, 1911
Tribe Megistopini Navás, 1912
Genus *Paraglenurus* van der Weele, 1909

Paraglenurus van der Weele, 1909: 29. Type species: *Myrmeleon scopifer* Gerstaecker, 1888, by original designation.

Glenuroides Okamoto, 1910: 294. Type species: *Glenuroides communis*, Okamoto, 1910, by original designation.

Eoleon Navás, 1921: 65. Type species: *Glenurus japonicus* McLachlan, 1867, by original designation.

Diagnosis. Adult. Vertex raised. Antenna longer than head plus thoracic length. Eye large, nearly as wide as frons. Gena wider than half of length. Leg slender, hind femur plus tibia nearly as long as entire length of head plus thorax; thickened setae on ventral tarsomere 5 blunt; pretarsal claw opposable. Distal wings with some pale markings. Forewing nearly as long as hindwing; RP origin distad MP and CuA fork. Male gonocoxites 9 curved slender plate-like; gonostyli 11 prominent. Female tergum 7 with some thick setae on posterior margin; gonocoxites 8 elongate, digitiform; gonocoxite 9 covered with thick digging setae. Larva. Dolichasters on head and pronotum relatively thick, distally swollen. Distance between base of mandible and first tooth shorter than that between first and third teeth; third tooth larger than second tooth. Abdominal spiracles developed, prominent. Odontoid processes on abdominal segment 8 absent. Rastra of abdominal segment 9 with inner digging seta shorter than one third of others.

Biology. The larvae are often found in sandy soil environments near plant roots and where the climate is relatively moist. The larvae are fully buried in the sandy soil, with only their mandibles exposed to ambush prey.

Distribution. Asia: China, Indonesia, Japan, North Korea, South Korea, Russia (Far east), Vietnam; Africa: Madagascar, Seychelles.

Included species. Asia: *P. albiventris* Matsumoto, Kikuta & Hayashi, 2021; *P. badanoi* **sp. nov.**; *P. borneensis* van der Weele, 1909; *P. fulvus* Matsumoto, Kikuta & Hayashi, 2021; *P. impunctatus* Matsumoto, Kikuta & Hayashi, 2021; *P. japonicus* (McLachlan, 1867); *P. melanostictus* Matsumoto, Kikuta & Hayashi, 2021; *P. okinawensis* (Okamoto, 1910); *P. pumilus* (Yang, 1997); *P. sakishimensis* Matsumoto, Kikuta & Hayashi, 2021; *P. scopifer* (Gerstaecker, 1888). Africa: *P. ornatus* (Needham, 1913); *P. pinnulus* (Auber, 1955).

1**. *Paraglenurus badanoi* sp. nov.** (Figs 2A, 3, 16A, 16B)

Male posterior gonocoxites 9 nearly trapezoidal in ventral view, with a projection and prominent in lateral view. Gonocoxites 11 narrowly arched.

Description of adult. Size. Head width: 1.97 mm; forewing length: 27.34 mm; hind wing length: 27.96 mm.

Head. Vertex raised, anteriorly with a transversal black band, medially brown, posteriorly dark brown (Fig. 3B). Scape mostly dark brown; pedicel pale brown; non-swollen part of flagellomeres each basally dark brown and distally pale brown, swollen part of flagellum mostly dark brown. Frons pale brown on anterior half, brown on posterior half,

covered with a few dark setae. Gena pale yellowish-brown (Fig. 3C). Clypeus pale brown. Labrum pale yellow. Maxillary palpus yellowish-brown, covered with a few thick short dark setae. Labial palpus generally pale yellowish, distal palpomere slightly fusiform. Mandibles pale yellowish-brown with distal half dark reddish-brown.

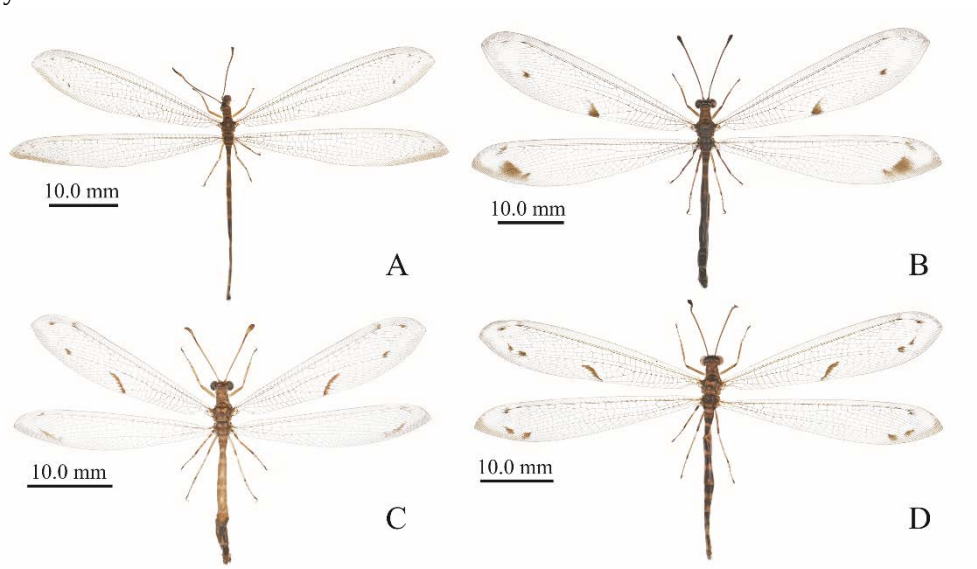

Figure 2. Adult habitus of *Paraglenurus* van der Weele, 1909. A. *P. badanoi* **sp. nov**., male, holotype, Binh Thuan, Dong Tien (Vietnam); B. *P. japonicus* (McLachlan, 1867), female, Longyan, Fujian (China); C. *P. pumilus* (Yang, 1997), female, Xiamen, Fujian (China); D. *P. scopifer* (Gerstaeker, 1888), female, Orchid Island, Taiwan (China).

Thorax. Pronotum mostly dark brown, pale yellow on lateral margin, covered with some dark setae. Mesoprescutum generally dark brown, lateral margin with some long setae; mesonotum generally dark brown, medially brown; mesoscutellum dark brown, posterior margin pale brown. Metanotum generally dark brown; metascutellum dark brown, lateral margin with a pair of yellowish-brown spots (Fig. 3C). Pleurae generally dark brown. Meso- and metasterna pale yellowish-brown.

Legs. Slender (Fig. 3A). All coxae generally pale yellowish-brown; femora generally pale yellowish-brown, distally with a dark brown marking; tibiae pale yellowish-brown with some dark dots, distally with a dark brown marking; ventral tibiae distally with dense short thick brownish setae; tibial spurs tiny, claw-shaped, nearly 1/3 as long as tarsomere 1 (Fig. 16A); tarsomeres 1–4 each yellowish-brown, with distal brown; tarsomere 5 brown on basal half, dark brown on distal half, as long as entire length of tarsomeres 2–4, ventrally with many thickened blunt setae; pretarsal claws opposable (Fig. 16B).

Wings. Mostly hyaline, distal part with some dark dots and a marginal dark band on posterior margin. Banksian lines absent. Pterostigma pale. Forewing slightly shorter than hindwing. Forewing mediocubital crossveins each suffused with an indistinct brown dot on basal half; rhegma as a small dark brown spot; cubital area generally hyaline, basally with an indistinct spot; costal crossveins simple; RP origin distad of MP and CuA fork; 11 to 13

presectoral crossveins present; RP with 11 branches. Hindwing mediocubital basal crossveins each suffused with an indistinct brown dot; rhegma absent; presectoral area with only one crossvein; RP originates anteriorly to MP fork (Figs 2A, 3A).

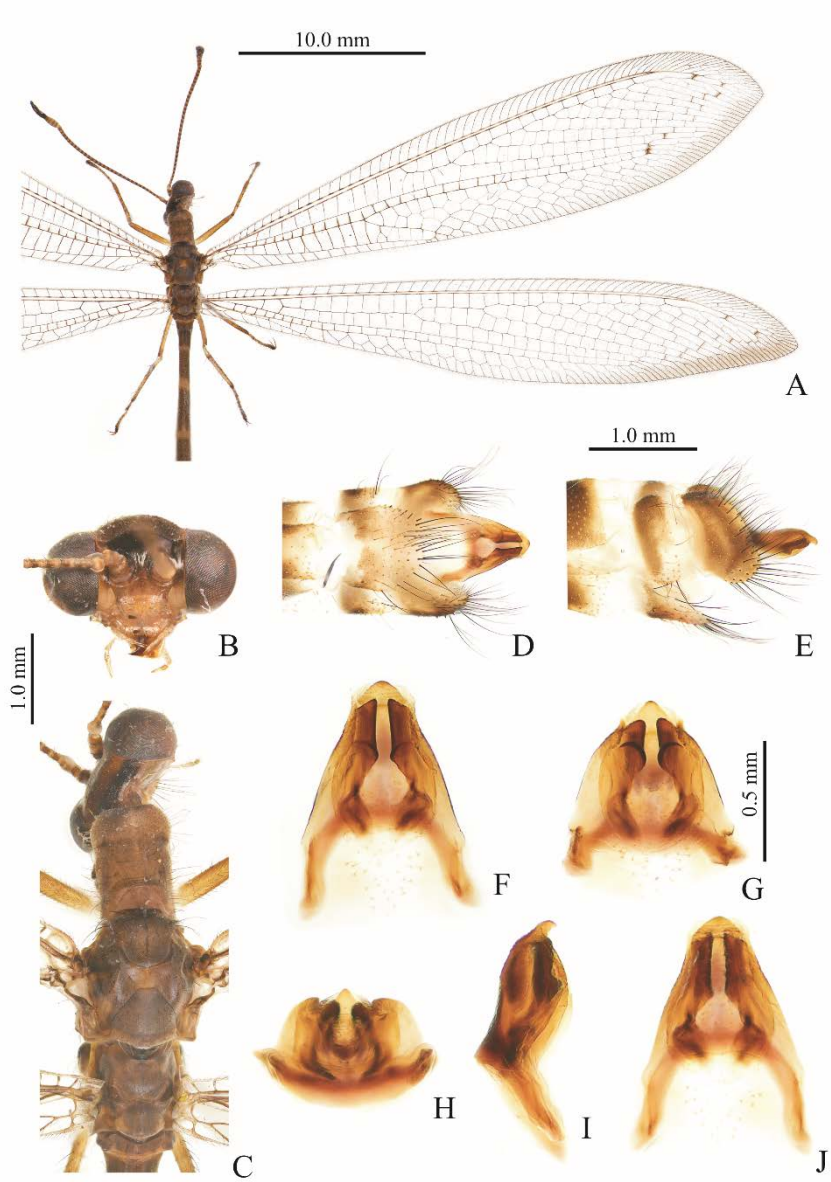

Figure 3. *Paraglenurus badanoi* **sp. nov.**, ♂, holotype. A. Habitus; B. Head, frontal view; C. Head and thorax, dorsal view; D, E. Male terminalia, ventral and lateral views; F–J. Male genitalia, ventral, anteroventral, caudal, lateral and dorsal views.

Wings. Mostly hyaline, distal part with some dark dots and a marginal dark band on posterior margin. Banksian lines absent. Pterostigma pale. Forewing slightly shorter than hindwing. Forewing mediocubital crossveins each suffused with an indistinct brown dot on

basal half; rhegma as a small dark brown spot; cubital area generally hyaline, basally with an indistinct spot; costal crossveins simple; RP origin distad of MP and CuA fork; 11 to 13 presectoral crossveins present; RP with 11 branches. Hindwing mediocubital basal crossveins each suffused with an indistinct brown dot; rhegma absent; presectoral area with only one crossvein; RP originates anteriorly to MP fork (Figs 2A, 3A).

Abdomen. Dark brown, terga 3–8 each medially and posterior margin with pale yellow spots (Figs 2A, 3A). Male genitalia. Sternum 9 rounded, distal margin slightly concave medially, covered with some setae (Fig. 3D). Anterior gonocoxites 9 slender and curved; posterior gonocoxites 9 nearly trapezoidal in ventral view, with a projection and prominent in lateral view. Gonocoxites 11 narrowly arched, gonostyli 11 curved and prominent in lateral view (Figs 3F–J). Ectoproct long, ovoid in lateral view, slightly protruded ventrally, covered with some long setae (Fig. 3E).

Holotype. ♂, **Vietnam**, Binh Thuan, Dong Tien, VI.2024 (IZCAS).

Etymology. This new species is dedicated to Dr. Davide Badano, an Italian neuropterologist, in recognition of his outstanding contributions to the study of Neuroptera, and to honor his friendship with the authors.

Diagnosis. Vertex posteriorly with a transverse black band. Pronotum mostly dark brown, pale yellow on lateral margin. All tibial spurs tiny, claw-shaped, nearly 1/3 as long as tarsi 1. Wings mostly hyaline, only distal part with some dark dots and a marginal dark band in posterior margin.

Remarks. This new species has tiny tibial spurs (Fig. 16A), generally hyaline hindwings without rhegma (Figs. 2A, 3A), and nearly trapezoidal male posterior gonocoxites 9 in ventral view with a distinct projection (Fig. 3I). These characters can distinguish it from other species of *Paraglenurus*.

2. ***Paraglenurus japonicus* (McLachlan, 1867)** (Figs 1A–F, 2B, 4, 5, 16C)

Glenurus japonicus McLachlan, 1867: 248 (type locality: Japan; syntypes in NHMUK). McLachlan, 1875: 175 (*Glenurus*). Matsumura, 1907: 177 (*Glenurus*). Matsumura, 1908: 41 (*Glenurus*). Okamoto, 1910: 279 (mixed up with *Dendroleon pupillaris* (Gerstaecker, 1893)). Nakahara, 1913a: 95 (mixed up with *Dendroleon pupillaris* (Gerstaecker, 1893)). Nakahara, 1913b: 301 (mixed up with *D. pupillaris*). Okamoto, 1914: 249 (*Glenuroides*). Nakahara, 1915: 333 (*Glenuroides*). Navás, 1921: 65 (*Eoleon*). Okamoto 1926: 18 (*Glenuroides*). Navás, 1926: 112 (*Glenuroides*). Markl, 1954: 187 (*Glenuroides*). Hirai, 1955: 297 (*Glenuroides*). Kuwayama, 1960: 31 (*Glenuroides*). Kuwayama 1962: 383 (*Glenuroides*). Luppova, 1987: 74 (*Glenuroides*). Makarkin, 1990: 43 (*Glenuroides*). Yang, 1992: 647 (*Glenuroides*). Yang, 1999: 148 (*Glenuroides*). Yang & Wang, 2002: 297 (*Glenuroides*). Whittington, 2002: 382 (*Glenuroides*). Stange, 2004: 213 (*Paraglenurus*). Krivokhatsky, 2011: 112 (*Paraglenurus*). Hayashi, 2013: (*Paraglenurus*). Yoshitomi *et al.*, 2013: 4 (*Paraglenurus*). Sekimoto, 2014: 62 (*Paraglenurus*). Sekimoto & Yoshizawa, 2016: 36 (*Paraglenurus*). Ikeda & Okui, 2017: 19 (*Paraglenurus*). Wang *et al*. 2018: 135 (*Paraglenurus*). Yang *et al*., 2018: 70 (*Paraglenurus*). Lin *et al*., 2019: 137 (*Paraglenurus*). Matsumoto *et al*. 2021: 11 (*Paraglenurus*). Zheng & Liu, 2021: 557 (*Paraglenurus*). Yang *et al*., 2023: 848 (*Paraglenurus*).

Glenuroides communis Okamoto, 1910: 295 (type locality: Japan: Nakano; lectotype in EIHU). Nakahara, 1913a: 96 (*Glenuroides*). Nakahara, 1913b: 301 (*Glenuroides*). Esben-Petersen, 1913: 223 (*Glenuroides*). Nakahara, 1915: 333 (*Glenuroides*). Navás, 1930: 194 (*Glenuroides*). Navás, 1932: 9 (*Glenuroides*). Navás, 1936: 49 (*Glenuroides*). Synonymised by Kuwayama 1962: 383.

Paraglenurus littoralis Miller & Stange in Miller *et al.*, 1999: 56 (type locality: China: Taiwan, Ilan

County, Hanben Beach, 24°20'12.4"N 121°46'58.3"E; holotype in FSCA). Stange *et al*., 2003: 92 (*Paraglenurus*). Stange, 2004: 213 (*Paraglenurus*). Wang *et al*. 2018: 137 (*Paraglenurus*). Yang *et al*., 2018: 70 (*Paraglenurus*). Synonymised by Krivokhatsky, 2011: 112.

Paraglenurus riparius Miller & Stange in Miller *et al*., 1999: 59 (type locality: China: Taiwan, Ilan County, Yinshih Bridge, 24°36'32.1"N 121°31'36.3"E; holotype in FSCA). Stange *et al*., 2003: 98 (*Paraglenurus*). Stange, 2004: 214 (*Paraglenurus*). Wang *et al.* 2018: 138 (*Paraglenurus*). Yang *et al*., 2018: 70 (*Paraglenurus*). Synonymised by Krivokhatsky, 2011: 112.

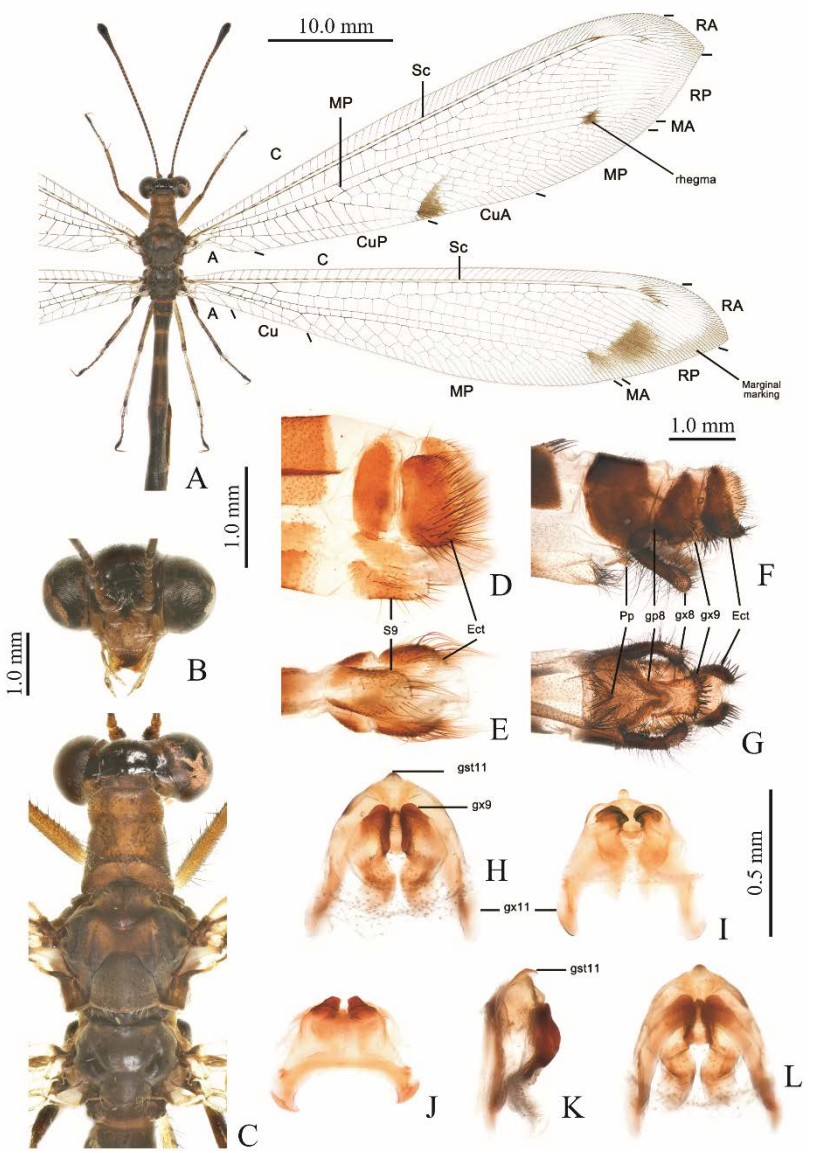

Figure 4. *Paraglenurus japonicus* (McLachlan, 1867), Longyan, Fujian (China). A. Habitus; B. Head, frontal view; C. Head and thorax, dorsal view; D, E. Male terminalia (photos by Yuezheng Tu), lateral and ventral views; F, G. Female Terminalia, lateral and ventral views; H–L. Male genitalia, ventral, anteroventral, caudal, lateral and dorsal views.

Redescription. See Sekimoto (2014) and Matsumoto *et al.* (2021).

Type specimens examined. Lectotype. ♀, here designated, "Japan/ McLachlan Coll. B.M.1938–674./ *Glenurus japonicus* Mcl. (Type)/ NHMUK010288195/ Syntype" (NHMUK); **Paralectotype.** ♀, here designated, "Japan/ McLachlan Coll. B.M.1938–674./ *Glenurus japonicus* Mcl. (Type)/ NHMUK010288196/ Syntype" (NHMUK). Type of *Paraglenurus littoralis* Miller & Stange, 1999: Holotype. ♂, **China**, "Taiwan: Ilan Co., Hanben Beach, 17-IV-1998, R. Miller, L. Stange & H. Wang, 24°20'12.4"N 121°46'58.3"E" (FSCA). Types of *Paraglenurus riparius* Miller & Stange, 1999: Holotype. ♂, **China**, "Taiwan: Ilan Co. Yinshih Bridge, 320 m, 15-IV-1998, R. Miller, L. Stange & H. Wang, 24°36'32.1"N 121°31'36.3"E" (FSCA); Paratype. ♂, **China**, "TAIWAN: Kaohsiung Co. Santimen For. Sta., 9 Km SE. Lukuei 700 m, 04–07-XI-1984, J. Heppner & H. Wang" (CAU).

Other specimens examined. 1♀, **China,** Anhui, Hefei, Shushan District, Mt. Dashu, VII-2022 (ZCAU); 1♀, **China,** Anhui, Mt. Huangshan, Monkey Valley, 18-VII-1977, Haitian SONG (CAU); 1♀, **China**, Anhui, Mt. Huangshan, Yungu Temple, 13-VII-2013, Chikun YANG (IZCAS); 2♂6♀, **China**, Anhui, Lu'an, Jinzhai County, Mazongling Forestry Centre, 680 m, 24-VII–11-VIII-2018, Yuchen ZHENG (CAU); 1♂, **China**, Chongqing, Bishan District, Mt. Jinyun, 883 m, 19-VIII-2020, Jiazhi ZHANG & Wenkai KOU (ZCAU); 1♀, **China**, Fujian, Longyan, Xinluo District, Mt. Liantai, 1,050 m, 01-VII-2019, Yuchen ZHENG (IZCAS); 1♀, **China**, Fujian, Longyan, Xinluo District, Mt. Tiangong, 1,000 m, 06-VII-2020, Yuchen ZHENG (IZCAS); 1♀, **China**, Fujian, Nanping, Mt. Wuyi, Tongmu Village, 500 m, 25-VII-2022, Wenqiang CAO (IZCAS); 2♀, **China**, Fujian, Sanming, Jiangle County, Longqishan National Nature Reserve, Malaise Trap, 2018 (IZCAS); 2♀, **China**, Fujian, Xiamen, Jimei District, 2019, Fuxiang WANG (IZCAS); 1♀, **China**, Guangdong, Shaoguan, Ruyuan County, Nanling National Nature Reserve, 24-VI-2017, Yisheng ZHAO (IZCAS); 2♂2♀, **China**, Guangxi, Guilin, Huaping National Reserve, Cujiang Station, 1,290 m, 19-VI-2020, Yan LAI (IZCAS); 1♀, **China**, Guangxi, Guilin, Xingan County, Mt. Maoer, 900 m, 03-VIII-2005, Ping ZHAO (CAU); 1♀, **China**, Guangxi, Hezhou, Fuchuan County, Liujia Township, 375 m, 14-VIII-2021, Xiaodong CAI (IZCAS); 1♀, **China**, Guangxi, Laibin, Jinxiu County, Mt. Dayao, 2018, Guoquan WANG (IZCAS); 1♀, **China**, Guizhou, Guiyang, Guizhou University, West Campus, VI-2023, Rixin JIANG (IZCAS); 5♂15♀, **China**, Hainan, Ledong County, Jianfengling, Fenjieling, 650 m, 06–12-V-2022, Yuchen ZHENG & Ying YANG (IZCAS); 1♂3♀, **China**, Hainan, Baisha County, Yaba, 400 m, 24-IV-2022, Yuchen ZHENG & Ying YANG (IZCAS); 4♂8♀, **China**, Henan, Jiyuan, Jiyuan Taihangshan Macaque Nature Reserve, 21-VII-2020, Xingyue LIU (IZCAS); 10♂5♀, **China**, Henan, Neixiang County, Baotianman, 1,350 m, 24-VII-2004, Zhiliang WANG (CAU); 2♀, **China**, Henan, Sanmenxia, Lushi County, Liushuwan Village, Minglang River, 1,029 m, 18-VIII-2020, Weihai LI & Yanhua YAN (IZCAS); 1♂4♀, **China**, Hubei, Shennongjia, Songbai Town, Xinping Villag, 1,124 m, 04-VII-2022, Guo CHEN & Ying YANG (IZCAS); 1♀, **China**, Hubei, Yicang, Wufeng County, Maoping Village, 1,149 m, 05-VIII-2019, Yuezheng TU (IZCAS); 1♂, **China**, Hunan, Hengyang, Mt. Hengshan, Mojingtai, 22-VI-1963, Chikun YANG (CAU); 1♀, **China**, Jiangsu, Lianyungang, Mt. Yuntai, 02-VII-1986 (CAU); 1♀, **China**, Jiangxi, Ganzhou, Mt. Jiulian, 14-IX-2020, Xulong CHEN (IZCAS); 1♀, **China**, Liaoning, Dandong, Heigou Village, 180 m, 30-VII-2022, Xingyue LIU

(IZCAS); 1♀, **China**, Liaoning, Dalian, Mt. Laotie, 16-VIII-2023, Xuankun LI & Tingting ZHANG (IZCAS); 4♀, **China**, Shaanxi, Hanzhong, Yangxian County, Huayang Town, Yangjiagou, 1,300 m, 21-VII-2017, Yuchen ZHENG (IZCAS); 1♀, **China**, Shaanxi, Baoji, Weibin County, Dasanguan Village, 805 m, 07-VIII-2020, Bing ZHANG (IZCAS); 1♂1♀, **China**, Shandong, Rizhao, Donggang District, Nanhu Town, Anziping Village, VII-2023, Han WANG (IZCAS); 2♂, **China**, Shandong, Yantai, Mt. Kunyu, 24-VII-2005, Lei CHANG & Fenghui CHEN (CAU); 1♀, **China**, Shanghai, Jiading District, VIII-2024, Deyao ZHOU (ZCAU); 3♀, **China**, Taiwan, Pingtung County, Wutai Township, Ali Village, 800 m, 06-VI-2019, Yuchen ZHENG & Wen-I CHOU (IZCAS). 1♂, **China**, Yunnan, Diqing, Weixi County, Zhonglu Township, Zanli Village, 1,685 m, 06-VII-2022, Zhihao QI (ZCAU); 3♀, **China**, Zhejiang, Hangzhou, Linan District, Mt. Tianmu, 16-VII-2017, Yandong CHEN & Yixiang ZHANG (IZCAS); 1♂, **China**, Zhejiang, Lishui, Jingning County, Caoyutang, 1,133 m, 08-VIII-2016, Tong ZHENG (IZCAS). 2♀, **China**, Zhejiang, Lishui, Mt. Longquan, Longquan Valley, 1,482 m, 28-VII-2019, Hongyu LI (IZCAS); 1ex, **China**, Zhejiang, Lishui, Qingyuan County, Baishanzu, 800 m, 17-VIII-1993, Hong WU (CAU); 2♀, **China**, Zhejiang, Wenzhou, Taishun County, Wuyanling, 650 m, 28-VII-2005, Zhiliang WANG (CAU).

Biology. See Matsumoto *et al.* (2021).

Distribution. China (Anhui, Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Henan, Hubei, Hunan, Jiangxi, Jiangsu, Liaoning, Shaanxi, Shandong, Shanghai, Taiwan, Yunnan, Zhejiang); Japan (Honshu, Shikoku, Kyushu, Toshima, Awajishima, Tsushima); North Korea (Kumgangsan); South Korea (North Jeolla, South Gyeongsang); Russia (Primorsky Krai).

Diagnosis. Adult. Vertex typically with a transversal black band anteriorly, sometimes discontinuous or presenting variation in the width. Forewing cubital area with a varying oblique marking, rhegma as a dark spot. Distal hindwing with a various dark marking fused with the marginal band. Strongly sclerotized part of male gonocoxite 9 triangular in ventral view (Fig. 4H); gonocoxite 9 slightly protruded in lateral view (Fig. 4K). 3rd instar larva. Dorsal head sometimes with a pair of arched dark brown stripes, ventral head with a pair of dark brown spots (Matsumoto *et al*. 2021).

Remarks. According to current records, this species appears to be widely distributed in the moist regions of East Asia. Matsumoto *et al.* (2021) considered that the two previously known species in Japan, i.e., *P. japonicus* and *P. okinawaensis* (Okamoto, 1910) contained cryptic species, and they split these two species into seven (*P. albiventris* Matsumoto, Kikuta & Hayashi, 2021, *P. fulvus* Matsumoto, Kikuta & Hayashi, 2021, *P. impunctatus* Matsumoto, Kikuta & Hayashi, 2021, *P. japonicus*, *P. melanostictus* Matsumoto, Kikuta & Hayashi, 2021, *P. okinawensis*, and *P. sakishimensis* Matsumoto, Kikuta & Hayashi, 2021) based on mitochondrial gene fragments. However, after examining the photographs of male genitalia presented in their study and comparing them with specimens from China, we found that the genital differences among the seven Japanese species and two Chinese species (*P. japonicus* and *P. pumilus*) are subtle. Furthermore, there appears to be a degree of transitional variation in body and wing markings among *Paraglenurus* species from East Asia. In particular, the wing markings differ only in shape, depth of color, and size, while their positions remain consistent. Additionally, clearly distinguishing the larvae of all species based on morphology

is difficult. Specimens matching the morphology of the *P. japonicus* types are widely distributed across nearly all non-desert and non-grassland regions of China (extending west to the western Hengduan Mountains, north to northeastern China, south to Hainan Island, and east to Taiwan Island). These specimens exhibit variations in body and wing markings, and we currently treat them all as *P. japonicus*. Therefore, we cannot exclude the possibility that *Paraglenurus* in East Asia represents a single widespread species (*P. japonicus*) with multiple geographic forms. In the future, we will supplement molecular data from China for further study, and for now, no taxonomic treatment will be given.

Figure 5. Types of *Glenurus japonicus* McLachlan, 1867 (current name: *Paraglenurus japonicus*). A. Lectotype, ♀, new designation; B. Paralectotype, ♀, new designation. (Photos by Benjamin W. Price).

3. ***Paraglenurus pumilus* (Yang, 1997)** (Figs 1G, 2C, 6, 7, 8, 9, 10A)

Glenuroides pumilus Yang, 1997: 616 (type locality: China: Fujian, Zhangzhou, Dongshan County; holotype in CAU). Yang, 1999: 148 (*Glenuroides*). Stange, 2004: 214 (*Paraglenurus*). Wang *et al*., 2018: 137 (*Paraglenurus*). Yang *et al*., 2018: 70 (*Paraglenurus*). Ábrahám & Giacomino, 2020: 65 (*Paraglenurus*). Yang *et al*., 2023: 849 (*Paraglenurus*).

Paraglenurus lotzi Miller & Stange in Miller *et al*., 1999: 58 (**type locality**: China: Taipei, Danshuei Beach; holotype in FSCA). Stange *et al*., 2003: 100 (*Paraglenurus*). Stange, 2004: 213 (*Paraglenurus*). Wang *et al*. 2018: 137 (*Paraglenurus*). Yang *et al*., 2018: 70 (*Paraglenurus*). Lin *et al*., 2019: 137 (*Paraglenurus*). Synonymised by Ábrahám & Giacomino, 2020: 65.

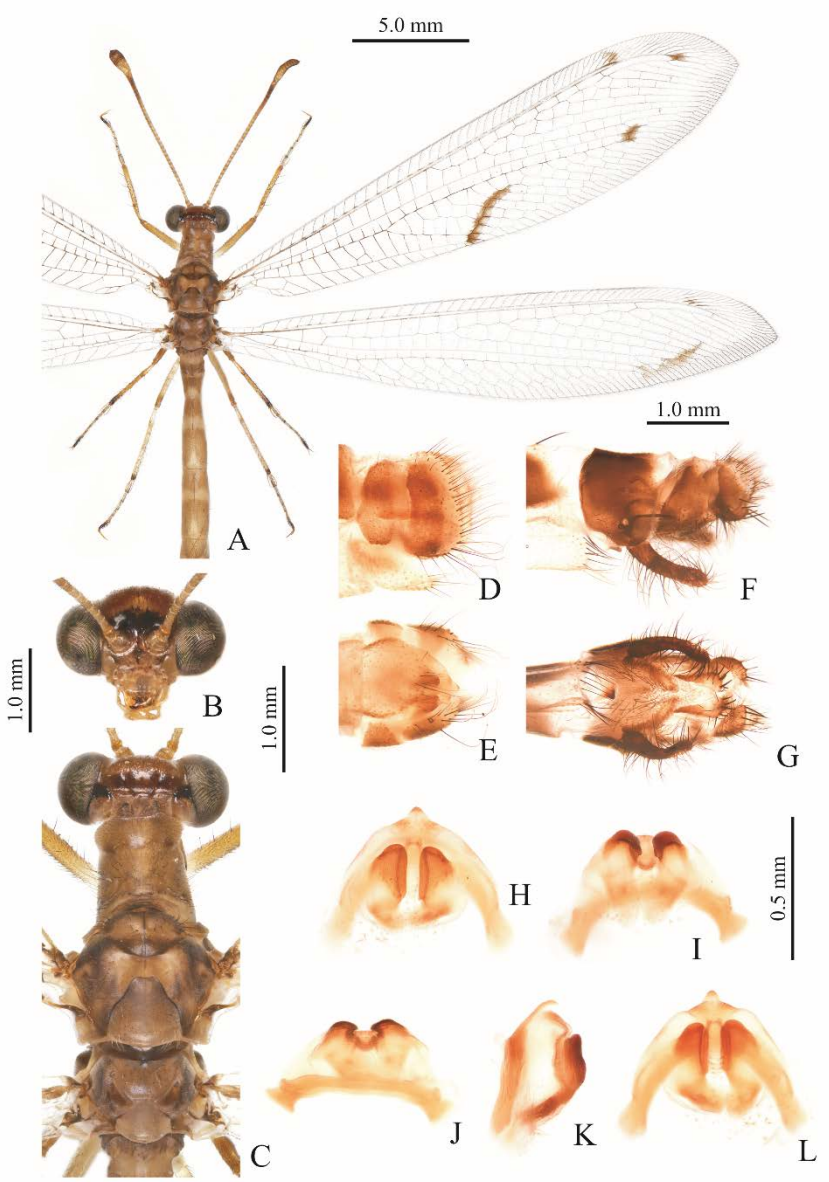

Figure 6. *Paraglenurus pumilus* (Yang, 1997), Xiamen, Fujian (China). A. Habitus; B. Head, frontal view; C. Head and thorax, dorsal view; D, E. Male Terminalia, lateral and ventral views; F, G. Female Terminalia, lateral and ventral views; H–L. Male genitalia, ventral, anteroventral, caudal, lateral and dorsal views.

Redescription of adult. Size. Head width: 1.83–1.91 mm; forewing length: 21.22–23.76 mm; hind wing length: 20.83–23.42 mm.

Head. Vertex anteriorly with a transversal dark brown band, anterolaterally with a pair of black spots (Fig. 6C). Scape and pedicel pale brown; non-swollen part of flagellomeres each basally brown and distally pale brown; swollen part of flagellum mostly dark brown, sometimes medially pale brown. Frons pale brown with some indistinct markings. Gena pale

yellowish-brown (Fig. 6B). Clypeus pale brown. Labrum pale yellow. Maxillary palpus yellowish-brown. Labial palpus generally pale yellowish, distal palpomere slightly fusiform. Mandibles pale yellowish-brown with distal half dark reddish-brown.

Thorax. Pronotum mostly brown, medially sometimes with a pale brownish stripe, posterolaterally with a pair of indistinct dark spots, covered with some dark setae. Mesoprescutum generally pale brown, anterior margin dark brown, with some short setae; mesonotum laterally dark brown, medially pale brown; mesoscutellum dark brown. Metanotum generally dark brown; metascutellum generally dark brown (Fig. 6B). Pleurae generally dark brown. Meso- and metasterna pale yellowish-brown.

Legs. Slender. All coxae generally pale yellowish-brown; ventral tibiae distally with dense short thick brownish setae; tibial spurs curved; tarsomeres 1–4 each pale yellow, distally pale brown; tarsomere 5 pale yellowish brown on basal half, dark brown on distal half, shorter than entire length of tarsomeres 2–4, ventrally with many thickened blunt setae; pretarsal claws opposable, dark reddish-brown. Foreleg: coxa pale yellow; femur generally pale brown; tibia pale yellow with some dark dots, distally brown; tibial spurs reaching base of tarsomere 2. Midleg: coxa pale yellow; femur generally pale brown, distally dark brown; tibia pale yellow with some dark dots, distally dark brown; tibial spurs reaching base of tarsomere 2. Hind leg: coxa pale yellow; femur generally pale yellowish brown, distally brown; tibia pale yellow, distally dark brown; tibial spurs reaching apex of tarsomere 1; tarsomere 1 longer than that of fore- and midleg (Fig. 6A).

Wings. Distal part with an indistinct marginal dark band on posterior margin. Banksian lines absent. Pterostigma pale. Forewing nearly longer than hindwing. Forewing costal space with an indistinct brown spot proximal to pterostigma; a dark spot present on distal hypostigmal cell; rhegma as a dark brown spot; cubital area with a slender oblique stripe; costal crossveins simple; RP origin distad MP and CuA fork; nine to ten presectoral crossveins present; RP with eight to nine branches. Hindwing distally with a transversal dark brown band fused with marginal band; presectoral area with only one crossvein; RP originates anteriorly to MP fork (Figs 2C, 6A, 10A).

Abdomen. Brown, terga 3–8 each medially and posterior margin with pale yellowish-brown spots (Fig. 6A). Male genitalia. Sternum 9 nearly a pentagon in ventral view, covered with some setae (Fig. 6E). Anterior gonocoxites 9 curved; posterior gonocoxites 9 nearly triangular in ventral view, truncate in lateral view. Gonocoxites 11 arched, gonostyli 11 prominent on lateral view (Figs 6H–L). Ectoproct long ovoid on lateral view, slightly truncate on distal margin, covered with some long setae (Fig. 6E). Female genitalia. Tergum 7 with some thick setae on distal margin. Pregenital plate coniform. Gonocoxites 8 slender, long digitiform. Gonapophyses 8 narrow, ribbon-shaped. Gonocoxites 9 with thick digging setae posteriorly. Ectoprocts slightly protruded ventrally, covered with some thick tapered setae on ventral side (Figs 6F–G).

Description of 3rd instar larva. Size. Body length (excluding mandible): 4.44–6.88 mm; head length: 1.21–1.88 mm; head width 1.20–1.86 mm; mandible length: 1.36–2.04 mm.

Head. Wide, subrectangular in dorsal view, slightly longer than wide, anterior part wider than posterior part. Clypeo-labrum medially dark brown and laterally pale brown in dorsal view; anterior margin slightly concaved, with a row of distally swollen thick dolichasters.

Dolichasters on dorsal head relatively short and thick, distally swollen. Head yellowish brown (sometimes reddish-brown), anteromedially with a pair of fused dark brown markings, and posteriorly with a pair of dark brown spots in dorsal view, laterally with a pair of dark brown stripes; ventral part of head generally pale yellowish brown. Ocular tubercles prominent. Antennae short and thin, generally pale brown, distally dark brown. Mandibles longer than head, reddish-brown; equipped with three pairs of teeth that gradually darken distad; second tooth longer than first tooth, third tooth nearly as long as second tooth; three to four interdental mandibular setae present anterior to first tooth; one interdental mandibular seta between first and second teeth; one interdental mandibular seta between second and third teeth; external margin of mandible with a few stout setae. Labial palps brown (Figs 7A, 8A, 8B, 9A).

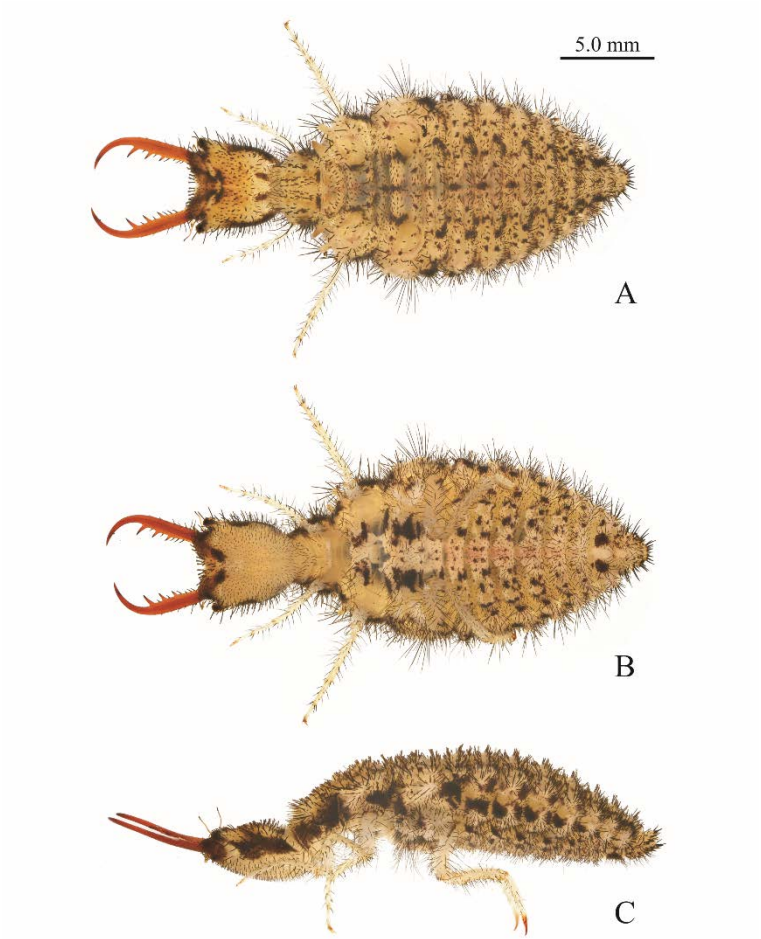

Figure 7. Habitus of *Paraglenurus pumilus* (Yang, 1997), 3rd instar larva. A–C. Dorsal, ventral and lateral views.

Thorax. Pale yellowish brown (sometimes reddish-brown). Pronotum posteriorly with four dark brown spots, covered with some short distal swollen dolichasters, lateral margin with many stout setae. Mesothorax with spiracles present on protruded brown sclerotized

tubercle; meso- and metathorax with a few markings; meso- and metathoracic setiferous processes pedunculated, first pair pedunculated, second pair sub-pedunculated, bearing some long setae (Figs 7A, 8C, 9A).

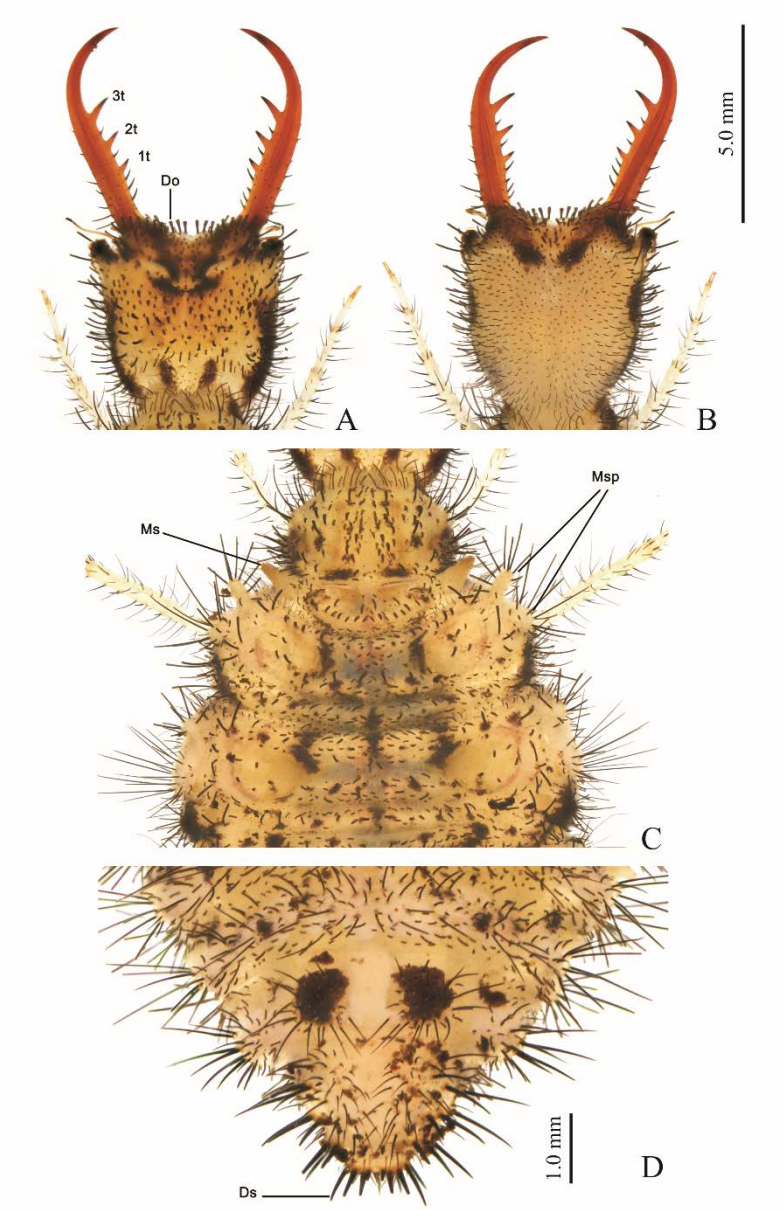

Figure 8. *Paraglenurus pumilus* (Yang, 1997), 3rd instar larva, Dongshan, Fujian (China). A, B. Head, dorsal an ventral views; C. Thorax, dorsal view; D. Abdominal segments 8–9, ventral view.

Legs. Pale yellowish brown, with short stout black setae and long slender black setae (Figs 7B, 7C).

Abdomen. Pale yellowish-brown (sometimes reddish-brown) with many dark brown dots,

dorsal segments 1–8 each medially with a dark spot and laterally with two pairs of oblique dark brown spots (Fig. 7A); ventral abdomen with many dots, ventral segment 8 with a pair of large dark brown spots (Fig. 7B). Segment 9 subtriangular, nearly as long as wide, laterally with many stout setae; rastra equipped with four pairs of thin digging setae, the innermost pair of digging setae shortest (Fig. 8D).

Figure 9. *Paraglenurus pumilus* (Yang, 1997) from Fujian (China). A. 3rd instar larva, reddish brown color form, Dongshan; B. Living 3rd instar larva, Dongshan; C. Habitat, Dongshan; D. Microhabitat, arrows indicate the positions where the larvae were collected; E, F. Habitats, Xiamen. (Photos by Yuchen ZHENG).

Type specimens examined. 1♂ (holotype), **China**, Fujian, Zhangzhou, Dongshan County, 26-IX-1980, Fujian Forestry Department (CAU). Type of *Paraglenurus lotzi* Miller & Stange, 1999: Holotype. ♂, **China**, "Taiwan: Taipei Co., Danshuei Beach, 06-V-1998, R. Miller, L. Stange, H. Wang" (FSCA).

Other specimens examined. Adults: 1♂1♀, **China**, Fujian, Xiamen, Siming District, Huandao Road, Wanyuepo, 25-VI-2021, Yuchen ZHENG (ZCAU). 1♀, same locality as above, 23-I-2022, reared to adult, Yuchen ZHENG (IZCAS); 1♂1♀, **China**, Fujian, Zhangzhou, Dongshan County, Zhangtang Town, Jinluanwan, 23-VI-2022, Yuchen ZHENG

(ZCAU). Larvae: two 3rd instar larvae preserved in 95% ethyl alcohol, **China**, Fujian, Fuzhou, Pingtan County, Tannanwan, 25-II-2024, Yuchen ZHENG & Renato Jose Pires MACHADO (IZCAS). six 3rd instar larvae preserved in 95% ethyl alcohol, **China**, Fujian, Zhangzhou, Dongshan County, Zhangtang Town, Jinluanwan, 10-III-2021, Yuchen ZHENG (ZCAU); three 3rd instar larvae preserved in 95% ethyl alcohol, **China**, Fujian, Zhangzhou, Dongshan County, Dongmenyu Island, 11-III-2021, Yuchen ZHENG (ZCAU).

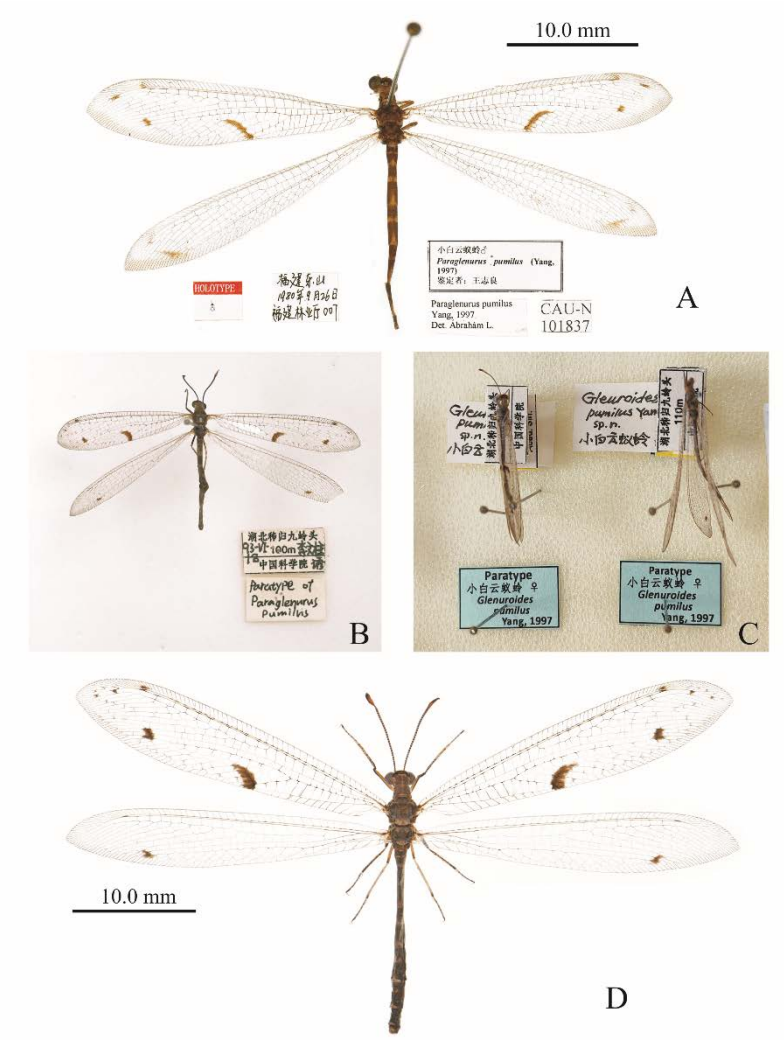

Figure 10. A–C. Types of *Glenuroides pumilus* Yang, 1997 based on original description: A. Male, holotype (photo by Jinglei Wang); B. One paratype in CAU, treated as *Indophanes zhiliangi* **sp. nov.** (photo by Jinglei WANG); C. Two paratypes in IZCAS, treated as *I. zhiliangi* **sp. nov.** (photo by Kuiyan ZHANG); D. Female holotype of *I. zhiliangi* **sp. nov.**

Biology. This species is distributed in the coastal forests of Fujian and Taiwan, typically found in sandy areas near the roots of *Casuarina* trees. It buries its entire body in the sand,

exposing only its mandibles to capture preys.

Diagnosis. Adult. Typically, vertex anteriorly with a transversal dark brown band, anterolaterally with a pair of black spots. Forewing cubital area with a slender oblique stripe. Hindwing distally with a transversal dark brown band fused with marginal band. Strongly sclerotized part of male gonocoxite 9 triangular in ventral view. 3rd instar larva. Body yellowish-brown or reddish-brown with dark markings; ventral head without spot.

Remarks. The genitalia and larval characters of *P. pumilus* are very similar to those of other East Asian *Paraglenurus* species, with only subtle differences. This species is smaller in size, paler in body color, and has a slender oblique stripe in the forewing cubital area, which can currently distinguish it from other species. Systematic molecular study of these similar species is necessary in the future to confirm their validity.

Besides, we examined the paratypes of this species and confirmed that they all belong to the new species described in this paper, i.e., *Indophanes zhiliangi* **sp. nov.** These specimens are hereby designated as paratypes of the new species.

4. ***Paraglenurus scopifer* (Gerstaeker, 1888)** (Figs 2D, 11, 16D), new record to China

Myrmeleon scopifer Gerstaeker, 1888: 110 (type locality: Indonesia: “Ceram” = Seram; holotype in EMAU). van der Weele, 1909: 31 (*Paraglenurus*). Esben-Petersen 1929: 101 (*Paraglenurus*). New, 2003: 179 (*Paraglenurus*). Stange, 2004: 214 (*Paraglenurus*).

Redescription. Size. Head width: 1.95 mm; forewing length: 26.65 mm; hind wing length: 26.93 mm.

Head. Vertex raised, dark brown, a pair of dark brown spots present on anterior vertex (Fig. 11C). Scape and pedicel brown; non-swollen part of flagellomeres each basally brown and distally pale brown; swollen part of flagellum mostly dark brown. Frons pale brown. Gena pale yellowish-brown (Fig. 11B). Clypeus pale brown. Labrum pale yellow. Maxillary palpus yellowish-brown. Labial palpus generally pale yellowish, distal palpomere fusiform. Mandibles pale yellowish-brown with distal half dark reddish-brown.

Thorax. Pronotum mostly brown, covered with some dark setae. Mesoprescutum generally pale brown, laterally with a pair of yellowish-brown spots, some short setae; mesonotum laterally dark brown, medially pale brown; mesoscutellum anteriorly dark brown, posteriorly pale brown. Metanotum generally dark brown; metascutellum generally pale brown, anteriorly dark brown (Fig. 11C). Pleurae generally dark brown. Meso- and metasterna pale yellowish-brown.

Legs. Slender. All coxae generally pale yellowish-brown; ventral tibiae distally with dense short thick brownish setae; tibial spurs curved; tarsomeres 1–4 each pale yellow, with distally pale brown; tarsomere 5 pale yellowish brown on basal half, dark brown on distal half, nearly as long as entire length of tarsomeres 3–4, ventrally with many thickened blunt setae; pretarsal claws opposable, dark reddish-brown. Foreleg: coxa pale yellow; femur generally yellowish-brown; tibia pale yellow with some dark dots, distally brown; tibial spurs reaching base of tarsomere 2. Midleg: coxa pale yellow; femur generally yellowish-brown, distally dark brown; tibia pale yellow with some dark dots, distally dark brown; tibial spurs reaching base of tarsomere 2. Hind leg: coxa pale yellow; femur generally yellowish-brown, distally dark brown; tibia pale yellow, distally dark brown; tibial spurs reaching apex of tarsomere 1; tarsomere 1 longer than that of fore- and midleg (Figs 11A, 16D).

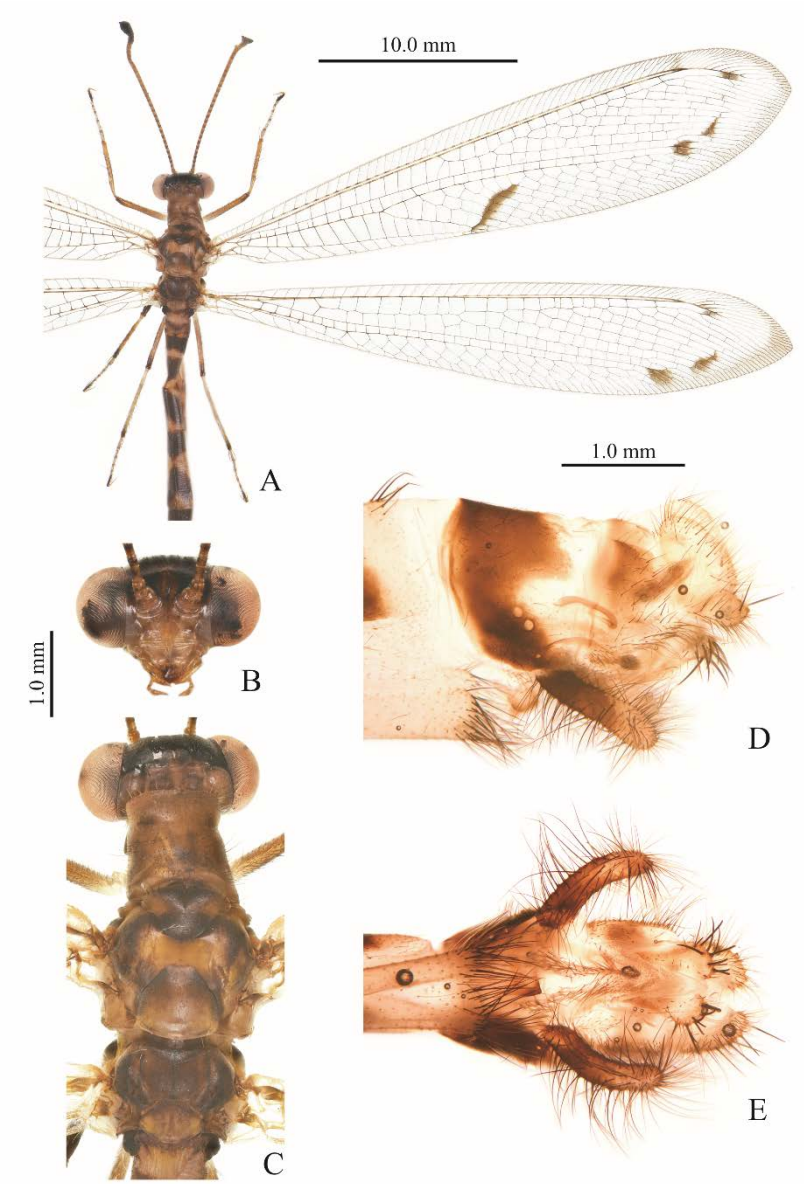

Figure 11. *Paraglenurus scopifer* (Gerstaeker, 1888), ♀, Orchid Island, Taiwan (China). A. Habitus; B. Head, frontal view; C. Head and thorax, dorsal view; D, E. Female Terminalia, lateral and ventral views.

Wings. Distal part with an indistinct marginal dark band on posterior margin. Banksian lines absent. Pterostigma pale. Forewing nearly shorter than hindwing. Forewing costal space with an indistinct brown spot proximal to pterostigma; a dark spot present on distal hypostigmal cell; rhegma as a dark brown spot with another smaller dark brown spot aside; cubital area with a short slender oblique stripe; costal crossveins simple; RP origin distad MP and CuA fork; nine to ten presectoral crossveins present; RP with 10 to 11 branches. Hindwing with a dark spot present on distal hypostigmal cell; rhegma as a dark brown spot

fused with marginal band, with another dark brown spot aside; presectoral area with only one crossvein; RP originates anteriorly to MP fork (Figs 2D, 11A).

Abdomen. Dark brown, terga 3–8 each medially with a pair of yellowish spots and posterior margin with pale yellow marking (Figs 2D, 11A). *Male genitalia*. Unknown. *Female genitalia*. Tergum 7 with some thick setae on distal margin. Pregenital plate coniform. Gonocoxite 8 long digitiform. Gonapophyses 8 narrow, ribbon-shaped, weakly sclerotized. Gonocoxite 9 with long thick digging setae posteriorly. Ectoprocts slightly protruded ventrally, covered with some thick tapered setae on ventral side (Figs 11D, 11E).

Type specimen examined. 1♀ (holotype), **Indonesia**, Pulau Seram, "scopifer Gerst.*/ Ceram Ribbe// scopifer/ v.d.w. gerst./ 1908./ Ceram Ribbe// Zool. Mus. Greifswald II 27448" (EMAU).

Other specimens examined. 1♀, **China**, Taiwan, Taitung County, Orchid Island, Xiaotianchi, 150 m, 08-IV-2021, Wen-I CHOU (IZCAS). 1♀, "New Guinea Compagnie", probably from an island of Indonesia (ZMHB).

Distribution. China (Taiwan: Orchid Island); Indonesia (Pulau Buru, Pulau Seram).

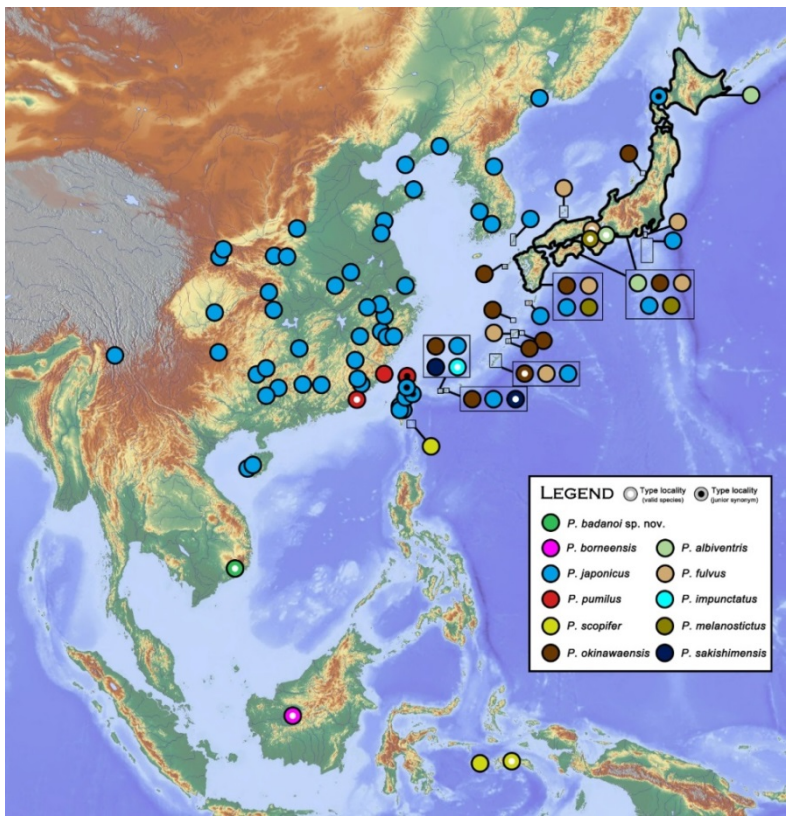

Figure 12. Distribution map of Asian *Paraglenurus* van der Weele, 1909. Considering the significant overlap in the distribution of species in Japan, we have arranged data based on the records of Matsumoto *et al.* (2021), especially dividing the Japanese archipelago into four main regions (Hokkaido, Honshu, Kyushu, and Shikoku) to better present the distribution of *Paraglenurus* in Japan.

Diagnosis. Vertex dark brown, a pair of dark brown spots present on anterior vertex. Wings rhegma as a dark brown spot with another dark brown spot alongside.

Remarks. The finding of *P. scopifer* from Orchid Island extends its known distribution (Fig. 12), suggesting that it is likely widespread across many islands in the Philippines and Indonesia. This also indicates that the insect fauna of Orchid Island is more closely aligned with that of Southeast Asian islands, particularly the Philippine Islands. Additionally, its head and wing markings provide clear differentiation from *P. japonicus* on Taiwan Island.

Genus *Indophanes* Banks, 1940

Indophanes Banks, 1940: 195. Stange, 2004: 181 (synonymized as *Indoleon*). Type species: *Myrmeleon barbarus* Walker, 1853, by original designation.

Biology. Larvae are ambush hunters that anchor themselves on the rock wall and the crevice between stones, completely hiding into debris. When they are disturbed, they can quickly move forward or backward.

Distribution. China, India, Nepal, Pakistan, Sri Lanka.

Diagnosis. Adult: Vertex slightly raised. Antennae over twice as long as pronotum. Eye large, wider than half of head width. Legs slender, hind femur plus tibia nearly shorter than entire length of head plus thorax; pretarsal claws various, generally slightly curved. Wings nearly as long as body, generally hyaline, with scattered minute dark brown markings, mostly along veins. Forewing nearly as long as hindwing; RP origin distad MP and CuA fork. Male gonocoxites 9 with posterior part as a pair of wide plates; gonostyli 11 barely prominent. Female gonocoxites 8 slender, digitiform, projecting distally; gonapophyses 8 narrow, ribbon-shaped; gonocoxites 9 with stout digging setae posteriorly; ectoprocts not protruded, with stout digging setae on ventral side. 3rd instar larva: Clypeo-labrum slightly concave on anterior margin, with a row of dolichasters, which are slender and distally not truncated. Mandibles longer than head. Pronotum with long stout setae laterally. Mesothoracic spiracles weakly developed. Meso- and metathoracic each with two pairs of setiferous processes; first pair pedunculated, second pair sub-pedunculated. Abdominal odontoid process absent; rastrum weakly developed; equipped with thin digging setae of which the internal pair is the shortest (Zheng & Liu 2023).

Included species. *Indophanes amica* Zheng & Liu, 2023; *Indophanes audax* (Walker, 1853); *Indophanes barbara* (Walker, 1853); *Indophanes fusciloma* (Yang, 1986); *Indophanes infesta* (Walker, 1853); *Indophanes nanliae* Zheng & Liu, 2023; *Indophanes sinensis* Banks, 1940; *Indophanes vartianorum* Hölzel, 1972; *Indophanes zhiliangi* **sp. nov.**

5. ***Indophanes zhiliangi* sp. nov.** (Figs 10B, 10D, 13, 14)

Description of adult. Size. Head width: 1.82–2.23 mm; forewing length: 20.25–26.88 mm; hindwing length: 20.76–27.65 mm.

Head. Vertex generally black, posteriorly with a transverse brown band. Scape and pedicel pale brown; non-swollen part of flagellomeres each basally brown and distally pale brown; swollen part of flagellum dark brown, with a reddish-brown marking. Frons pale brown, posterolaterally with a pair of dark dots. Gena pale brown. Clypeus pale brown. Labrum brown. Maxillary palpus pale yellow. Labial palpus generally pale brown, terminal

segment fusiform. Mandibles pale brown with apex half dark reddish brown.

Thorax. Pronotum generally dark brown, medially with a longitudinal slender brown stripe, lateral margin pale brown, laterally covered with some pale setae. Mesoprescutum and mesonotum generally dark brown; mesoscutellum anteriorly dark brown, posteriorly pale brown. Metanotum generally dark brown; metascutellum anteriorly dark brown, posteriorly pale brown. Meso- and metapleurae generally dark brown. Meso- and metasternum dark brown.

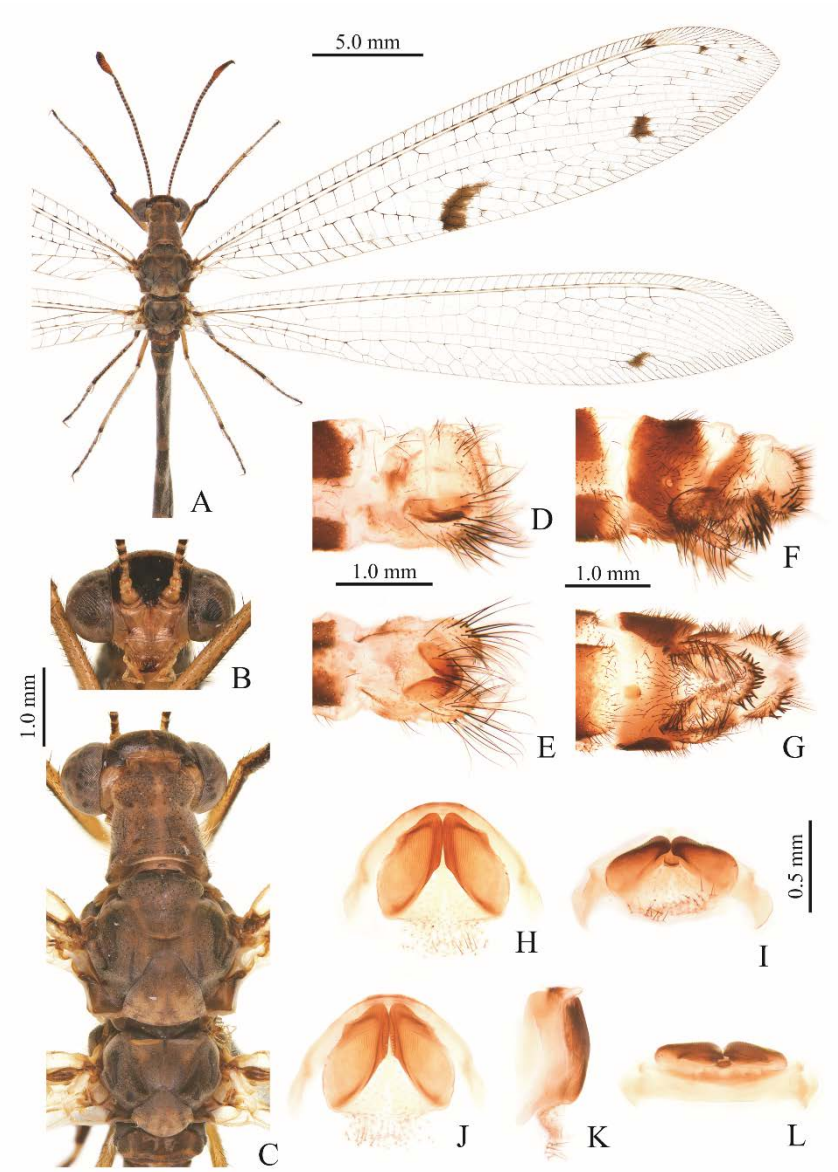

Figure 13. *Indophanes zhiliangi* **sp. nov.** A. Habitus, female, holotype; B. Head, frontal view; C. Head and thorax, dorsal view; D, E. Male Terminalia, lateral view and ventral views; F, G. Female Terminalia, lateral and ventral views; H–L. Male genitalia, ventral, anteroventral, caudal, lateral and dorsal views.

Legs. Slender, with many black setae. All ventral tibiae distally with dense short thick brownish setae; tarsomeres 1–5 generally pale yellow, tarsomeres 1–4 each pale yellow, with distally pale brown; tarsomere 5 pale yellowish brown on basal half, dark brown on distal half, nearly as long as entire length of tarsomeres 3–4, ventrally with many stout curved setae; pretarsal claws opposable. Foreleg: Coxa generally pale brown, with a dark brown marking; femur dark brown dorsally, pale brown ventrally, apex with a dark brown marking; tibia pale yellowish brown, basally and distally dark brown, with many black dots; tibial spurs reaching apex of tarsomere 1. Midleg: Similar to foreleg. Hind leg: Coxa generally pale brown, with a dark brown marking; femur generally yellowish brown, distally with a dark brown spot; tibia generally pale yellow, ventrally with a few dark dots, distally dark brown; tibial spurs reaching medial tarsomere 1, tarsomere 1 longer than that of fore- and midleg; other characters similar to fore- and midleg (Fig. 4A).

Figure 14. A. Living adult of *Indophanes zhiliang* **sp. nov.** from type locality (Baoshan, Yunnan); B. Type locality of *I. zhiliang* **sp. nov.**, Baoshan, Yunnan. (Photos by Yuchen ZHENG).

Wings. Long ovoid, slender, generally hyaline, apex slightly pointed, distally with an indistinct marginal band on posterior margin. Banksian lines absent. Pterostigma pale. Forewing nearly as long as hindwing. Veins dark brown alternating with pale. Forewing costal space simple, with a distinct dark brown spot proximad pterostigma; a dark spot present on distal hypostigmal cell; distal crossveins on radial area with some indistinct dark brown spots; rhegma as a dark brown spot; cubital area basally with a half-crescent dark brown marking; RP origin distad MP and CuA fork; eight to nine presectoral crossveins present; six to seven presectoral crossveins present; RP with 9 to 11 branches. Hindwing rhegma as a dark brown spot; one presectoral crossvein present.

Abdomen. Mostly dark brown. Terga 3–8 each medially with a pale yellowish spot and posterior margin with pale yellowish marking. *Male genitalia*. Sternum 9 nearly pentagonal,

with some long setae. Posterior gonocoxites 9 Male posterior gonocoxite 9 as a pair of nearly rhombic plates, internally with many longitudinal ridges in ventral view; thin and truncate in lateral view; anterior gonocoxite 9 liguliform and short in dorsal view. Gonocoxites 11 arched in ventral view, wide in lateral view; gonostyli 11 slghtly transversal protruded in lateral view. Ectoprocts distally truncated in lateral view, with many long setae. *Female genitalia*. Pregenital plate coniform. Gonocoxites 8 slender, digitiform, with many long setae. Gonapophyses 8 narrow, ribbon-shaped, slightly sclerotized. Gonocoxites 9 with stout tapered digging setae posteriorly. Ectoprocts with some short stout tapered setae on ventral side; distal margin rounded in lateral view, with many long setae.

Holotype. ♀, **China**, Yunnan, Baoshan, Longyang District, Mangkuan Township , Baihualing Village, Hanlongzhai, 1,450 m, 07-VI-2020, Yuchen ZHENG & Jiazhi ZHANG (IZCAS). **Paratypes**. 3♀, same information as holotype (IZCAS); 1♀, same locality as holotype, 20-VI-2020, Lu QIU (IZCAS); 3♀, same locality as holotype, 24-V-2006, Zhiliang WANG (CAU); 1♀, **China**, Chongqing, Nanchuan District, Mt. Jinfo, 13-VI-2020, Haoyang XIONG (IZCAS); 1♀, **China**, "Sichuan Fengdu Shiping" = Chongqing, Fengdu County, Shiping Village, 610 m, 03-VI-1994, Youwei ZHANG (CAU); 1♀, **China**, Gansu, Longnan, Kangxian County, 1,200 m, 11-VII-1998, Decheng YUAN (CAU); 2♀, **China**, Gansu, Longnan, Wenxian County, Baimahe station, 26-VII-2011, Sipei LIU (IZCAS); 1ex, **China**, Gansu, Longnan, Wenxian County, Bikou Town – Zhongmiao Town, 700 m, 24-VI-1998, Jian YAO (CAU); 1♀, **China**, Gansu, Longnan, Wenxian County, Tielou Township, 1,450 m, 24-VII-1999, Jian YAO (CAU); 1♀, **China**, Guangxi, Chongzuo, Longzhou County, Nonggang, 240 m, 19-V-1982, Chikun YANG (CAU); 1♀, **China**, Henan, Anyang, Linzhou, Shibanyan Town, 23-VII-2006, Junhua ZHANG (IZCAS); 1♀, **China**, Henan, Jiyuan, Jiyuan Taihangshan Macaque Nature Reserve, 21-VII-2020, Xingyue LIU (IZCAS); 1♂1♀, **China**, Henan, Jiyuan, Mt. Wangwu, 700 m, SHEN & REN (CAU); 1♀, **China**, Guizhou, 02-V-1963 (CAU); 1♀, **China**, Henan, Nanyang, Nexiang County, Baotianman (CAU); 1♀, **China**, Hubei, Yichang, Zigui County, Jiulingtou, 110 m, 05-IX-1994, Shimei SONG, previous paratype of *Glenuroides pumilus* Yang, 1997 (IZCAS); 1♀, same locality as above, 06-IX-1994, Jun CHEN, previous paratype of *Glenuroides pumilus* Yang, 1997 (IZCAS); 1♀, same locality as above, 100 m, 18-VI-1993, Wenzhu LI (CAU); 5♀, **China**, Shaanxi, Xi'an, Zhouzhi County, Dianzhen Town, 980 m, 15-VII-2006, Yanlei LI (CAU); 1♂, **China,** Sichuan, Liangshan, Muli County, 17-V-2019 (IZCAS); 1♀, **China**, Sichuan, Panzhihua, Yanbian County, Guosheng Township, Yumen Town, V-2020, Benfu MIAO (IZCAS); 1♀, **China**, Yunnan, Baoshan, Longyang District, Lujiang Township, Bawan Village, 1,100 m, 19–23-V-1992, Dayong XUE (CAU); 1♀, **China**, Xizang, Nyingchi, Zayu County, Cawarong Township, Ridong, 1,900 m, 10-VIII-2021, Xingyue LIU (IZCAS).

Etymology. This new species is named in honor of Dr. Zhiliang WANG, a weevil (Curculionoidea) researcher who previously studied the Myrmeleontidae during his master's period. He first recognized this new species in his master's dissertation but did not publish it. We name this species to recognize his contributions to Chinese myrmeleontid research.

Diagnosis. Adult. Vertex generally black, posteriorly with a transversal brown band. Antenna distally dark brown with a reddish-brown marking. Pronotum generally dark brown, medially with a longitudinal slender brown stripe, lateral margin pale brown. Pretarsal claw

opposable. Forewing rhegma as a dark brown spot; cubital area basally with a half-crescent dark brown marking. Hindwing rhegma as a dark brown spot. Male posterior gonocoxites 9 as a pair of nearly rhombic plates, internally with many longitudinal ridges in ventral view; thin and truncate in lateral view.

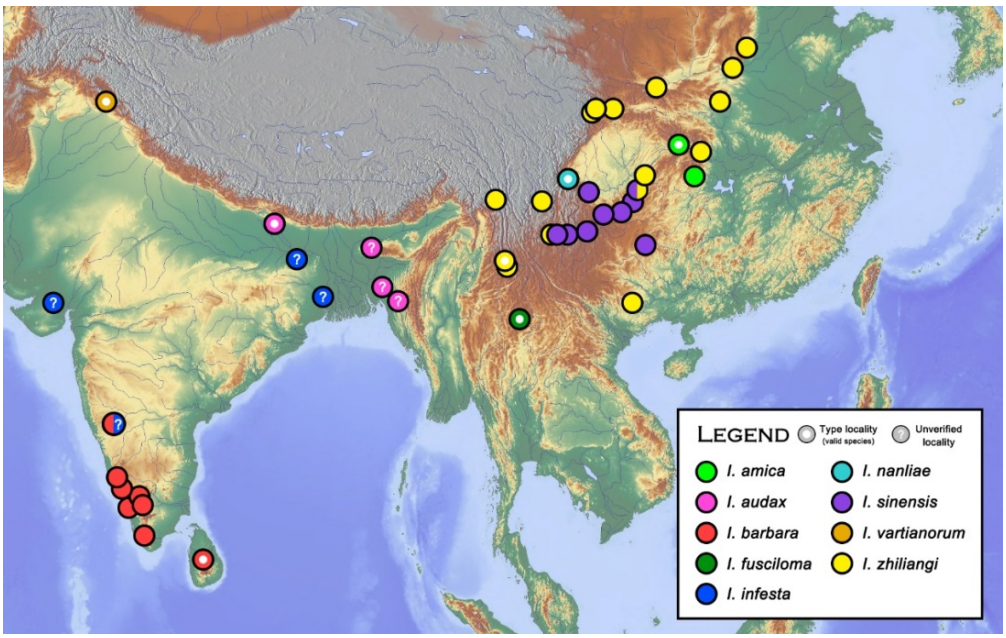

Figure 15. Distribution map of *Indophanes* Banks, 1940. Based on Zheng & Liu (2023) and Suryanarayanan & Bijoy (2024).

Remarks. Yang (1997) treated two specimens of this new species from Hubei as conspecific with the holotype of *P. pumilus* and designated them as paratypes. In the master's dissertation of Zhiliang WANG (Wang 2007), these paratypes were treated as another new species of *Paraglenurus*. In fact, this is a special new species of *Indophanes*. However, it is easily mistaken for a species of *Paraglenurus* at first glance, particularly due to its wing markings and opposable pretarsal claws. Nevertheless, the antenna of this new species is nearly shorter than the entire length of the head and thorax, the ventral setae on tarsomere 5 are not blunt, the posterior part of male gonocoxite 9 is shaped as a pair of wide plates, the male gonostyli 11 are barely prominent, the thick setae of female tergum 7 are absent, and the female ectoproct is not protruded. These characters match with the diagnosis of *Indophanes* rather than *Paraglenurus*. Besides, the shape of the pretarsal claw is often used to distinguish species rather than genera. Both opposable and non-opposable pretarsal claws can occur within a monophyletic genus. For example, in *Nepsalus* Navás, 1914 (Dendroleontinae), three out of the eleven species have opposable pretarsal claws (*N. insularum* Hayashi, Saito & Matsumoto, 2024, *N. jezoensis* (Okamoto, 1910), and *N. maclachlani* Badano, Zheng & Liu, 2024) (Hayashi *et al*. 2024; Zheng *et al*. 2024), while the other eight species have normally curved claws.

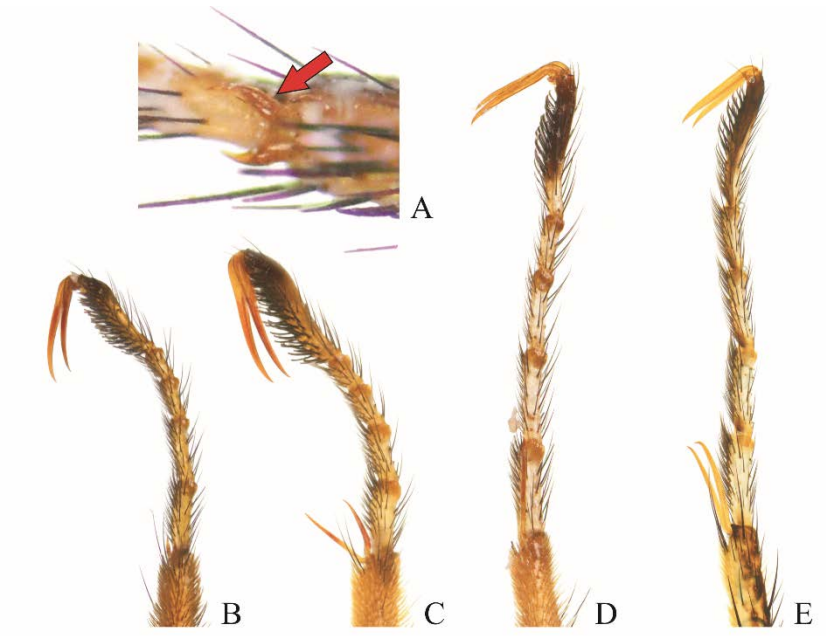

Figure 16. Detail of legs of *Paraglenurus* van der Weele, 1909 and *Indophanes* Banks, 1940. A. Hind tibial spur of *P. badanoi* **sp. nov.**; B–E. Distal tibiae and tarsi of foreleg: B. *P. badanoi* **sp. nov.**, holotype; C. *P. japonicus* (McLachlan, 1867), Jiyuan, Henan (China); D. *P. scopifer* (Gerstaeker, 1888), Orchid Island (China); E. *I. zhiliangi* **sp. nov.**, Cawarong, Xizang (China).

Discussion

So far, the taxonomy and distribution pattern of *Paraglenurus* in Asia have been further updated. The discovery of *P. badanoi* **sp. nov.** in South Vietnam fills a distribution gap for this genus in the Indochina. The taxonomy of *Indophanes zhiliangi* **sp. nov.**, which had long been regarded as *P. pumilus*, has also been clarified.

It is important to emphasize that the intergeneric and intrageneric phylogenies of *Paraglenurus* have not been well resolved. The morphological differences among some known Asian species of *Paraglenurus* remain subtle (see remarks for *P. japonicus*). Although species delimitation in Japan has some molecular support (Matsumoto *et al*. 2021), future molecular data from China, the Korean Peninsula, and the Russian Far East may lead to further splitting of East Asian *P. japonicus* and its closely related species, or reveal that they are actually different populations or geographic variations of single widespread species.

Regarding the *Paraglenurus* species from East African islands, we are also curious about their relationship with Asian *Paraglenurus*. They show strong morphological similarities, suggesting a possible sister-group relationship between the two faunas, or perhaps this is just a case of parallel evolution. Some Eurasian genera (e.g., Asia: *Delgadus* Navás, 1914, *Indophanes* Banks, 1940, *Negrokus* Navás, 1930, *Thaumatoleon* Esben-Petersen, 1921, etc.; Europe: *Megistopus* Rambur, 1842 and *Gymnocnemia* Schneider, 1845, etc.) also show

morphological affinities with *Paraglenurus* (Stange 2004; Badano *et al*. 2017; Zheng & Liu 2021, 2023), which also makes us interested in their phylogenetic relationships with *Paraglenurus*. Nevertheless, stable morphological characters still allow us to easily distinguish Asian *Paraglenurus* from its related genera. Undoubtedly, a comprehensive phylogenetic analysis will help us answer the monophyletic question of *Paraglenurus* and its tribe Megistopini, as well as test the validity of those genera related to *Paraglenurus*.

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