



Review of stick insects (Insecta: Phasmatodea) from Yintiaoling Nature Reserve of China, with description of two new species

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Abstract

This is the first investigation of stick insect from the Yintiaoling National Nature Reserve, Chongqing of China. Totally seven species were collected. Four of them belong to the subfamily Clitumninae of Phasmatidae: *Interphasma emeiense* Chen & He, 2008, *Paraentoria sichuanensis* Chen & He, 1997, *Parabaculum wushanense* (Chen & He, 1997) and *Baculonistria alba* (Chen & He, 1990). The other three belong to the subfamily Necroschiinae of Lonchodidae, including two new species: *Micadina conifera* Chen & He, 1997, *Hemisosibia yintiaolingensis* **sp. nov.** and *Dianphasma chongqingensis* **sp. nov.**

Key words: Chongqing, Taxonomy, New species, diversity, description

Introduction

Phasmatodeans are more commonly known as stick or leaf insects, most are apterous or reduced wings, which exhibit forms of twig, leaf mimicry or aposematic coloration for a few diurnal species. They are usually nocturnal herbivores and hemimetabolous insects, mainly distributed across the tropics. The Chinese phasmids are largely studied since late 1980, most taxa were described by Chen Shu-Chun in their monograph (Chen & He 2008) and a few new taxa were reported by other researchers (Cai & Liu 1990; Bi 1995; Bi et al. 2001; Hennemann & Conle 2008; Hennemann et al. 2008a, b). Ho (2013–2021) did some revisional work on Chinese phasmids. Nowadays, 4341 species under 19 families worldwide, 450 species under 7 families and 78 genera from China have been reported (Brock *et al.*, 2022).

Yintiaoling National Nature Reserves is located at the northeastern border of Chongqing Municipality, China. The total area is approximately 22,423 hm², the average altitude is 1,900 meters above sea level, and the main peak of Yintiaoling is 2,796 meters above sea level, which is the highest point in Chongqing. Yintiaoling belongs to the edge of the range of the Shennongjia original forest and is the only old-growth forest in Chongqing. Herein, seven species of stick insects were studied from Yintiaoling. Measurements of adults, description of eggs and images of all species are provided, including two new species *Hemisosibia yintiaolingensis* **sp. nov.** and *Dianphasma chongqingensis* **sp. nov.**

Materials and Methods

Due to the nocturnal behavior of most Phasmatodeans, specimens of stick insects were collected at night. A waterproof OTRLIGHT Z821 torch was used during collection. Adult specimens caught in the wild were temporarily

reared in ventilated boxes until female oviposition. After adults and eggs were killed, adults were pinned and eggs were stored in small tubes. All materials studied were deposited in the Insect Collection of Southwest Forestry University, China (SWFU).

Morphological observation was made with a SOPTOP SZ stereomicroscope (Sunny Group Co., Ltd., China). Digital images were obtained using a Liyang Super Resolution System LY-WN-YH (Chengdu Liyang Precision Machinery Co., Ltd., China). Whole-view images of specimens were taken with a Canon 5D digital camera and LAOWA 100 mm F2.8 2X macro lens (Anhui Changgeng Optics Technology Co., Ltd., China). Image stacking was done using the software Zerene Stacker (Zerene Systems LLC, USA, zerenesystems.com/cms/home). Measurements were taken with an electronic caliper and given in millimeters (mm). Terminology follows Bragg (1997, 2001).

Taxonomy

Phasmatidae: Clitumninae



FIGURE 1 *Interphasma emeiense*, female, A–H. **A.** habitus, dorsal view; **B.** habitus, ventral view; **C.** habitus, lateral view; **D.** head, dorsal view; **E.** head, lateral view; **F.** terminalia, dorsal view; **G.** terminalia, lateral view; **H.** terminalia, ventral view.

Interphasma emeiense Chen & He, 2008 (Figures 1–4)

- Chen S.C. & He Y.H., 2008. Phasmatodea of China. 330.

Material examined. 3 females, 4 males and 10 eggs, China, Chongqing, Wuxi County, Yintiaoling National Nature Reserve, Hongqi management station, 994 m, 11–12 Aug. 2022, Leg. Chong-Xin Xie; 1 female and 1 male, Yintiaoling Nature Reserve, Yanping management station, 1,784 m, 19 Aug. 2022, Leg. Chong-Xin Xie; 1 female and 2 males, Yintiaoling Nature Reserve, Linkouzi management station, 1,270 m, 14 Aug. 2022, Leg. Chong-Xin Xie.

Description. Eggs. Capsule oval, off-white, with irregular brown or dark brown mottling. Micropylar plate obcordate shaped, central area with a light brown longitudinal ridge. Micropylar cup black and distinct, followed by a short light brown median line. Operculum almost elliptical, slightly convex, central area distinctly concaved, with capitulum in the cavity. Weakly collared. Polar apex slightly concave.

Measurements. Female. Body length 51.0–61.0; head length 3.7–4.2; pronotum length 3.2–3.7; mesonotum 12.2–13.3; metanotum 5.3–6.8; median segment 2.4–2.6; profemora 19.8–21.1; mesofemora 12.6–13.2; metafemora 17.3–19.2; protibiae 23.9–25.7; mesotibiae 14.2–15.1; metatibiae 21.4–23.7. **Male.** Body length 48.0–58.0; head length 2.3–3.2; pronotum length 2.0–3.1; mesonotum 11.3–13.2; metanotum 5.8–6.5; median segment 1.8–2.0; profemora 22.1–24.2; mesofemora 14.4–16.3; metafemora 19.5–20.6; protibiae 25.5–27.6; mesotibiae 15.0–17.1; metatibiae 22.1–23.9. **Egg.** Length 1.9–2.1, width 1.6–1.8, height 1.9–2.1.



FIGURE 2 *Interphasma emeiense*, male, A–H. **A.** habitus, dorsal view; **B.** habitus, ventral view; **C.** habitus, lateral view; **D.** head, dorsal view; **E.** head, lateral view; **F.** terminalia, dorsal view; **G.** terminalia, lateral view; **H.** terminalia, ventral view.

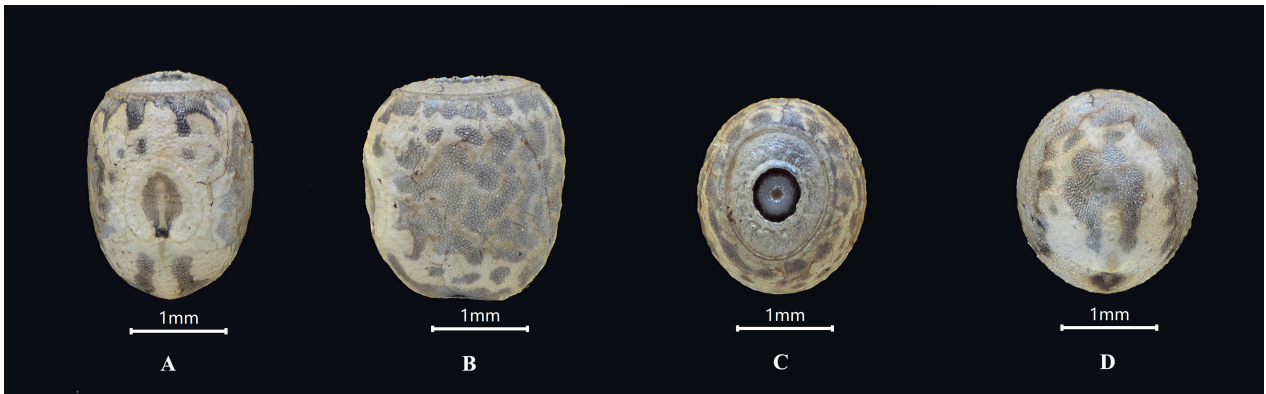


FIGURE 3 *Interphasma emeiense*, egg, A–D. A. dorsal view; B. lateral view; C. top view; D. polar view.



FIGURE 4 *Interphasma emeiense* in the wild. A. female; B. female; C. female; D. male; E. mating in the wild; F. mating in the wild.

Distribution. China (Chongqing, Sichuan).

Remarks. Body coloration of different individuals of this species is variable in the wild, shown in Fig. 4. And we found that the antennae of females had 16 segments, but variable in males, six individuals had 19 segments and the remain one had 20 segments. Additionally, Yintiaoling Nature Reserve is the second place where *Interphasma emeiense* was found. Also, this is the new record of Phasmatodea of Chongqing.

***Paraentoria sichuanensis* Chen & He, 1997 (Figures 5–7)**

- Chen S.C. & He Y.H., 1997. Insects of the Three Gorge Reservoir area of Yangtze River. 120.

- Chen S.C. & He Y.H., 2008. Phasmatodea of China. 219.

Material examined. 3 females and 10 eggs, China, Chongqing, Wuxi County, Yintiaoling National Nature Reserve, Linkouzi management station, 1,270 m, 14 Aug. 2022, Leg. Chong-Xin Xie; 2 females, Yintiaoling Nature Reserve, Matang Village, 1,400 m, 13 Aug. 2022, Leg. Chong-Xin Xie.



FIGURE 5 *Paraentoria sichuanensis*, female, A–H. A. habitus, dorsal view; B. habitus, ventral view; C. habitus, lateral view; D. head, dorsal view; E. head, lateral view; F. terminalia, dorsal view; G. terminalia, lateral view; H. terminalia, ventral view.

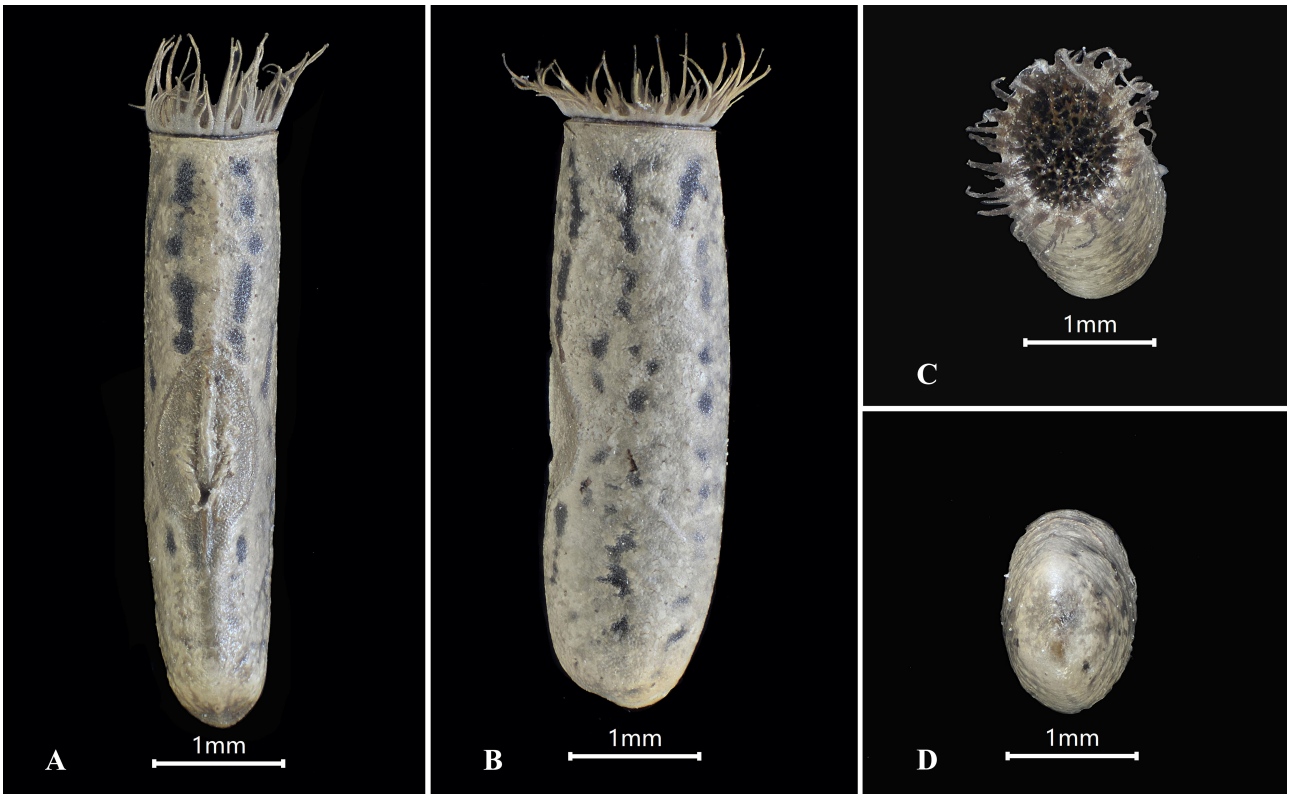


FIGURE 6 *Paraentoria sichuanensis*, egg, A–D. A. dorsal view; B. lateral view; C. top view; D. polar view.



FIGURE 7 *Paraentoria sichuanensis* female in the wild.

Description. Eggs. Capsule cylindrical, off-white, and with irregular black mottling. Micropylar plate oval-shaped, central area with a short longitudinal ridge. Micropylar cup distinct, followed by a short light brown median line. Operculum almost circular, the outer ring with tangled long irregular spines, central without capitulum. Polar apex rounded.

Measurements. Female. Body length 120.2–132.5; head length 4.6–6.1; pronotum length 3.8–4.4; mesonotum 21.3–23.2; metanotum 13.1–15.3; median segment 3.6–4.6; profemora 37.5–42.8; mesofemora 22.5–24.6; metafemora 29.6–32.4; protibiae 43.8–50.0; mesotibiae 27.0–30.2; metatibiae 35.6–39.8. **Egg.** Length 4.3–4.5, width 0.9–1.1, height 1.2–1.4.

Distribution. China (Chongqing).

Remarks. The genus *Paraentoria* is an endemic group of China, including three species from South of China. But these species are all known only with females. Here we still failed to find the male of *P. sichuanensis*.

Parabaculum wushanense (Chen & He, 1997) (Figures 8–11)

- Chen S.C. & He Y.H., 1997. Insects of the Three Gorge Reservoir area of Yangtze River. 116.

- Hennemann F.H., Conle O.V., Zhang W.W., 2008. Zootaxa. 1735:34.

- Chen S.C. & He Y.H., 2008. Phasmatodea of China. 301.



FIGURE 8 *Parabaculum wushanense*, female, A–H. **A.** habitus, dorsal view; **B.** habitus, ventral view; **C.** habitus, lateral view; **D.** head, dorsal view; **E.** head, lateral view; **F.** terminalia, dorsal view; **G.** terminalia, lateral view; **H.** terminalia, ventral view.

Material examined. 5 females, 8 males and 10 eggs, China, Chongqing, Wuxi County, Yintiaoling National Nature Reserve, Daqiaowan, 993 m, 15–16 Aug. 2022, Leg. Chong-Xin Xie.

Description. Eggs. Capsule flat and nearly rectangular, grayish brown, with tiny tubercles. Three coarse longitudinal ridges in the dorsal view and among them with a thin longitudinal ridge. Micropylar plate oval-shaped, central area with a thin longitudinal carina. Micropylar cup distinct followed by a much shorter median line. Operculum almost oval, coarsely rugose, centrally without capitulum. Polar apex concave, with cross ridges and lateral of the longitudinal ridge with a thin longitudinal ridge.

Measurements. Female. Body length 87.0–109.0; head length 3.5–4.2; pronotum length 2.9–3.0; mesonotum 17.2–21.6; metanotum 11.8–14.2; median segment 3.0–4.1; profemora 22.3–33.1; mesofemora 16.2–23.4; metafemora 18.9–26.2; protibiae 29.2–42.1; mesotibiae 19.8–24.3; metatibiae 20.5–29.9. **Male.** Body length 67.0–75.0; head length 2.5–2.8; pronotum length 2.0–2.3; mesonotum 14.4–15.7; metanotum 10.1–11.6; median segment 2.2–2.5; profemora 28.2–31.9; mesofemora 18.1–20.9; metafemora 22.1–25.2; protibiae 32.4–38.6; mesotibiae 20.8–22.3; metatibiae 26.1–30.2. **Egg.** Length 5.3–5.5, width 1.7–1.9, height 2.7–2.9.

Distribution. China (Chongqing, Sichuan, Henan, Shaanxi).



FIGURE 9 *Parabaculum wushanense*, male, A–H. A. habitus, dorsal view; B. habitus, ventral view; C. habitus, lateral view; D. head, dorsal view; E. head, lateral view; F. terminalia, dorsal view; G. terminalia, lateral view; H. terminalia, ventral view.

Remarks. Three species of *Parabaculum* are known from the world, two of which from China. Here we have provided details on the egg description as well as new images of *P. wushanense*. Female of this species also has diverse body coloration in the wild (Fig. 11).

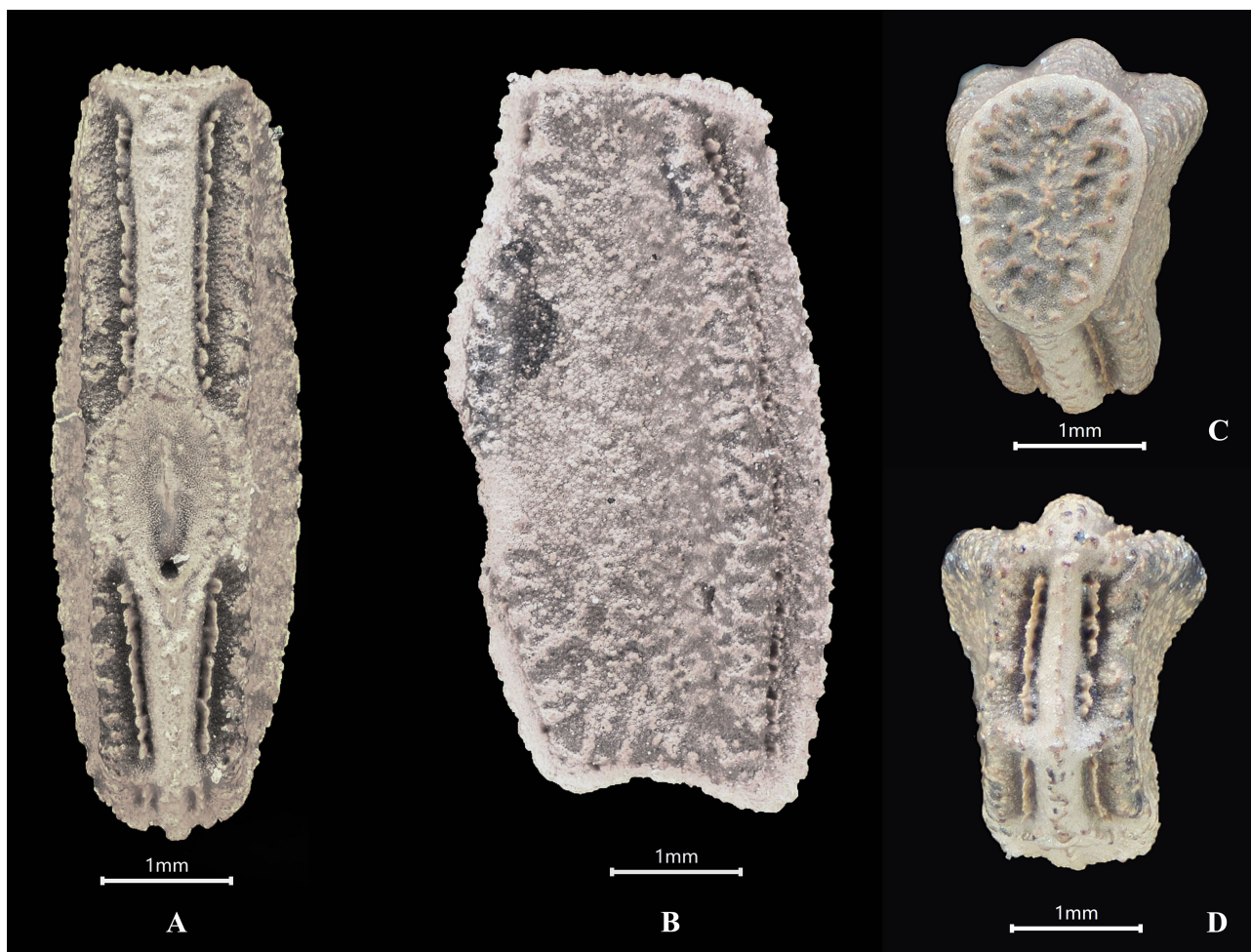


FIGURE 10 *Parabaculum wushanense*, egg, A–D. A. dorsal view; B. lateral view; C. top view; D. polar view.



FIGURE 11 *Parabaculum wushanense* female in the wild.

***Baculonistria alba* (Chen & He, 1990) (Figures 12–15)**

- Chen S.C. & He Y.H., 1990. Journal of Beijing Forestry University. 12(4): 54.
- Chen S.C. & He Y.H., 1997. Insects of the Three Gorge Reservoir area of Yangtze River. 114.
- Hennemann, Conle & Zhang W., 2008. Zootaxa. 1735: 8.
- Chen S.C. & He Y.H., 2008. Phasmatodea of China. 347.
- Hennemann & Conle, 2008. Zootaxa. 1906:87.

Material examined. 1 female and 10 eggs, China, Chongqing, Wuxi County, Yintiaoling National Nature Reserve, Hongqi management station, 994 m, 15–16 Aug. 2022, Leg. Chong-Xin Xie; 1 male, Yintiaoling Nature Reserve, Matang Village, 1,400 m, 13 Aug. 2022, Leg. Chong-Xin Xie; 1 female, Yintiaoling Nature Reserve, Linkouzi management station, 1,270 m, 14 Aug. 2022, Leg. Chong-Xin Xie; 1 male, Yintiaoling Nature Reserve, Yanping management station, 1,784 m, 19 Aug. 2022, Leg. Chong-Xin Xie.

Description. Eggs. Capsule long elliptic, grayish brown, with irregular dark brown mottling. Micropylar plate obcordate shaped, central area brown and with a small bump, outside with slightly convex wide carina. Micropylar cup dark brown and distinct, followed by a weakly thin median line. Collar brown and distinct. Operculum almost circular, central with a capitulum. Capitulum nearly hexagonal, juttet out in the center of operculum. Capitular stalk weak, covered by capitulum. Polar apex slightly concave, with two off-white bumps.



FIGURE 12 *Baculonistria alba*, female, A–H. A. habitus, dorsal view; B. habitus, ventral view; C. habitus, lateral view; D. head, dorsal view; E. head, lateral view; F. terminalia, dorsal view; G. terminalia, lateral view; H. terminalia, ventral view.



FIGURE 13 *Baculonistria alba*, male, A–H. **A.** habitus, dorsal view; **B.** habitus, ventral view; **C.** habitus, lateral view; **D.** head, dorsal view; **E.** head, lateral view; **F.** terminalia, dorsal view; **G.** terminalia, lateral view; **H.** terminalia, ventral view.

Measurements. Female. Body length 165.0–176.0; head length 7.5–8.2; pronotum length 5.1–6.2; mesonotum 26.9–31.2; metanotum 23.0–26.2; median segment 3.2–4.2; profemora 40.5–44.3; mesofemora 24.4–25.1; metafemora 28.1–29.8; protibiae 45.1–53.2; mesotibiae 26.0–27.2; metatibiae 31.0–32.3. **Male.** Body length 128.0–132.0; head length 4.5–5.1; pronotum length 4.3–4.6; mesonotum 25.1–27.1; metanotum 21.4–22.3; median segment 2.9–3.2; profemora 39.1–40.2; mesofemora 23.9–24.6; metafemora 27.9–28.8; protibiae 50.2–53.2; mesotibiae 27.5–28.2; metatibiae 37.1–38.6. **Egg.** Length 3.4–3.6, width 2.0–2.2, height 2.2–2.5.

Distribution. China (Chongqing, Hubei).

Remarks. *Baculonistria alba* was recorded as a pest by Chen & He (2008). This species can wreak havoc on forests and crops, such as tung-oil tree, oriental white oak, and corn.

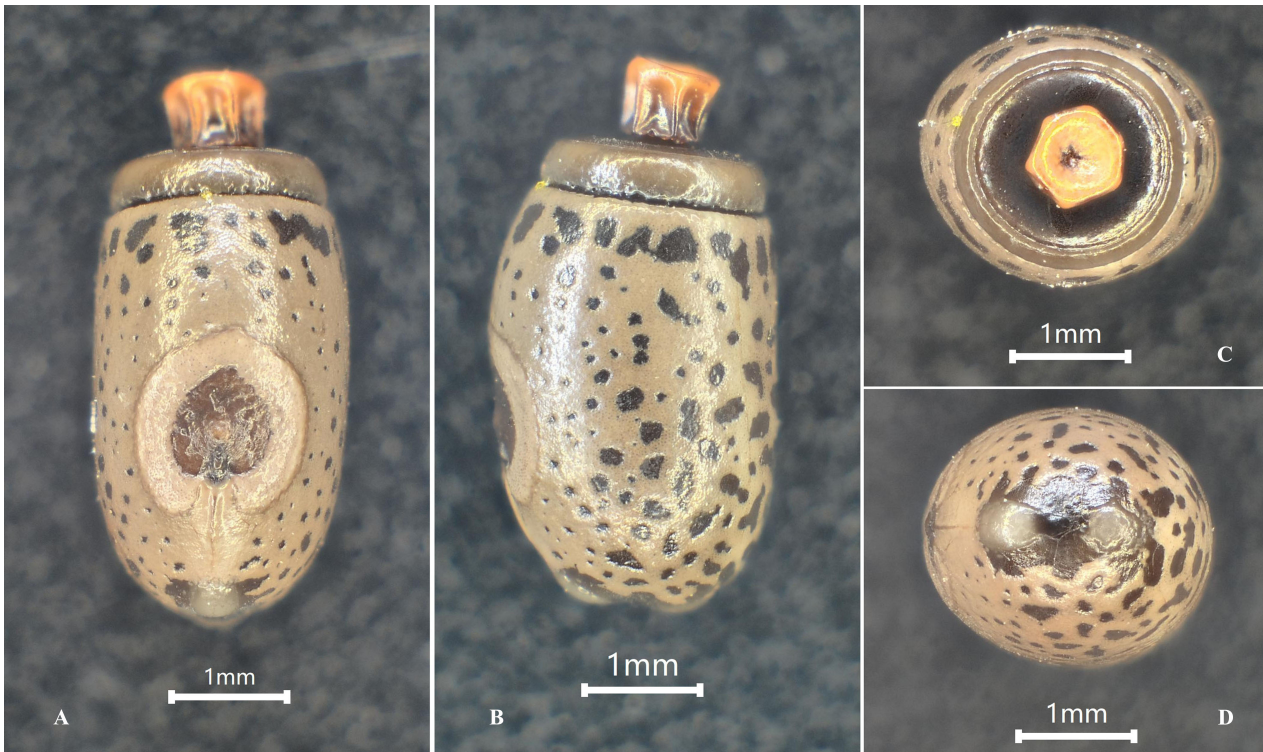


FIGURE 14 *Baculonistria alba*, egg, A–D. A. dorsal view; B. lateral view; C. top view; D. polar view.



FIGURE 15 *Baculonistria alba* in the wild. A. mating in the wild; B. female.

Lonchodidae: Necrosiinae

Micadina conifera Chen & He, 1997 (Figures 16–18)

- Chen S.C. & He Y.H., 1997b. Insects of the Three Gorge Reservoir area of Yangtze River. 119.

- Chen S.C. & He Y.H., 2008. Phasmatodea of China. 123.

Material examined. 7 females, 10 eggs, China, Chongqing, Wuxi County, Yintiaoling National Nature Reserve, Yuanmuping, 991 m, 15–16 Aug. 2022, Leg. Chong-Xin Xie; 7 females, Yintiaoling Nature Reserve, Yanping management station, 1,784 m, 19 Aug. 2022, Leg. Chong-Xin Xie.

Description. Eggs. Capsule elliptical, black and with irregular brown reticulate. Micropylar plate rhombic shaped, anterior and posterior gradually becoming slender, median much broader and with a short dark brown longitudinal ridge. Micropylar cup black and distinct, followed by a short brown median line. Operculum almost circular, coarsely rugose, and slightly raised. Collar distinct.

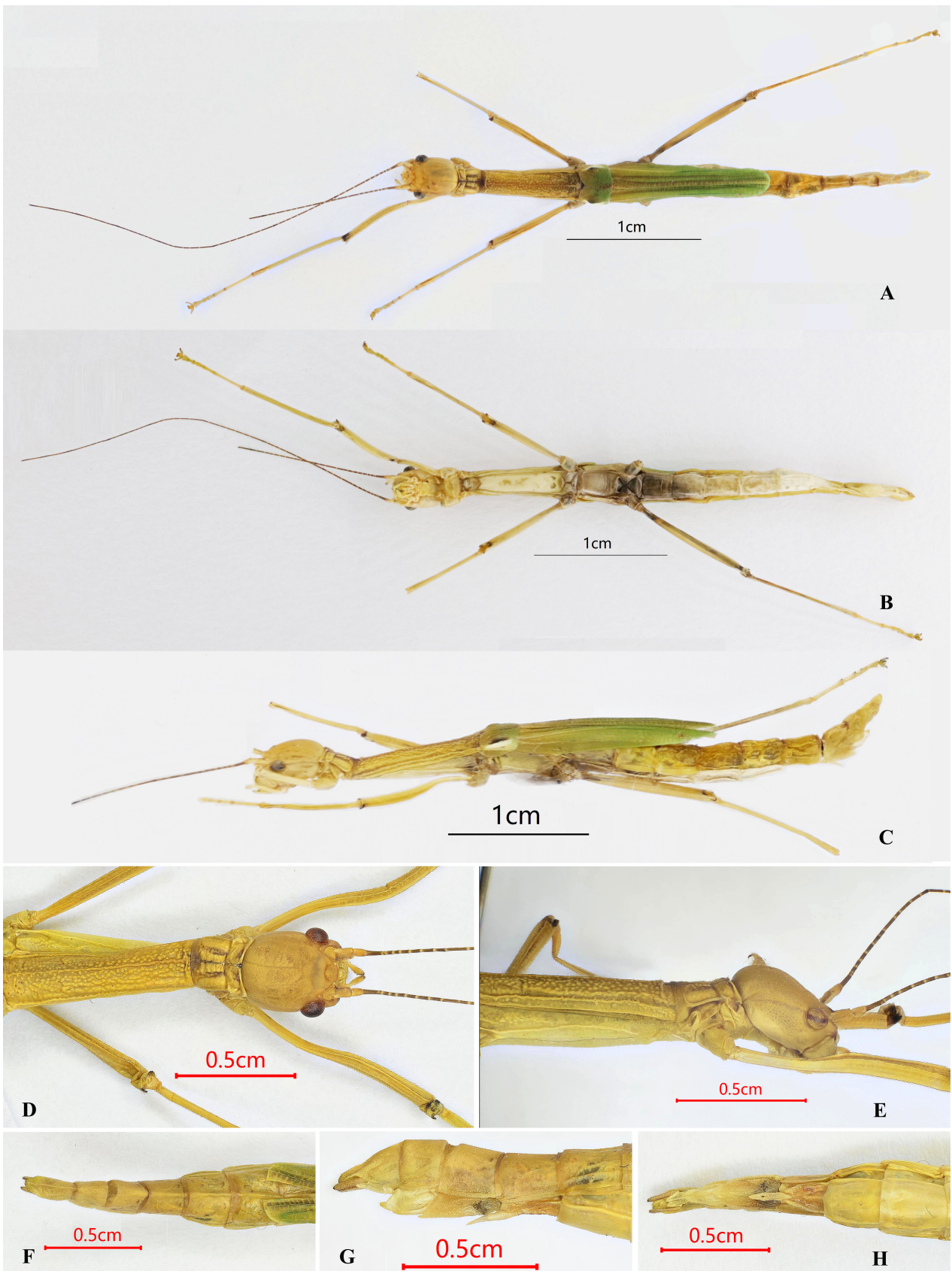


FIGURE 16 *Micadina conifera*, female, A–H. A. habitus, dorsal view; B. habitus, ventral view; C. habitus, lateral view; D. head, dorsal view; E. head, lateral view; F. terminalia, dorsal view; G. terminalia, lateral view; H. terminalia, ventral view.

Measurements. Female. Body length 40.6–42.8; head length 3.5–4.4; pronotum length 1.8–2.5; mesonotum 7.0–8.1; metanotum and median segment 3.4–3.8; profemora 9.2–10.1; mesofemora 6.6–7.1; metafemora 8.5–9.9; protibiae 6.9–8.5; mesotibiae 5.1–6.7; metatibiae 8.0–9.8. **Egg.** Width 1.1–1.3, height 1.3–1.5, length 1.6–1.8.

Distribution. China (Chongqing, Henan, Hubei, Shaanxi); Japan.

Remarks. Only female of this species was known by far. Here we gave more description and images of eggs. And this species is firstly found from Chongqing of China.

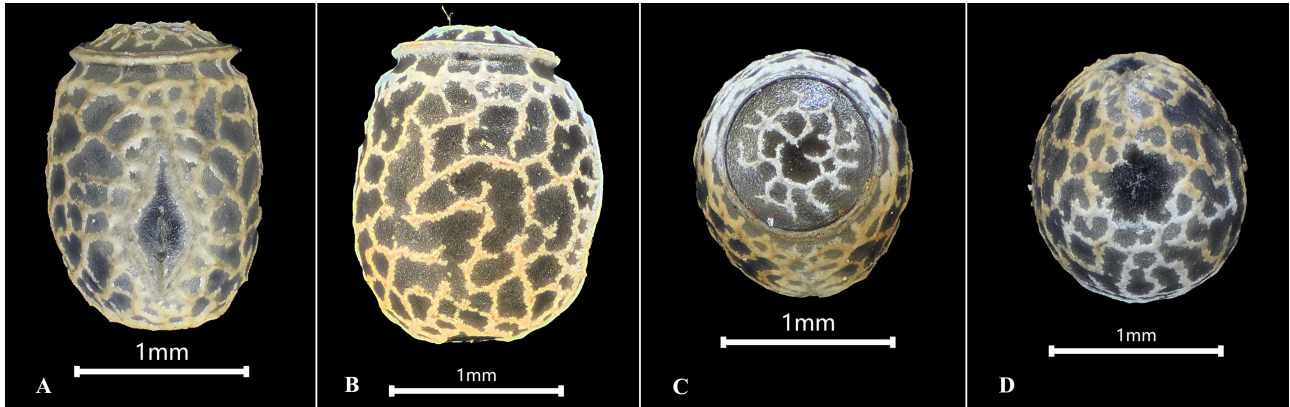


FIGURE 17 *Micadina conifera*, egg, A–D. A. dorsal view; B. lateral view; C. top view; D. polar view.



FIGURE 18 *Micadina conifera* female in the wild.

***Hemisibia yintiaolingensis* Qian & Xie sp. nov. (Figures 19–22)**

Material examined. *Holotype* female, China, Chongqing, Wuxi County, Yintiaoling National Nature Reserve, Matang Village, 1,400 m, 13 Aug. 2022, Leg. Chong-Xin Xie. *Paratype*. 1 male and 10 eggs, same data as holotype.

Description. Female. Pterygote. The general coloration of the body is grayish brown. **Head.** Rounded, longer

than pronotum, with irregular maculation, vertex and occiput rather convex. Antennae filiform, much longer than forelegs. Compound eyes, rounded and prominent, with one ocellus between compound eyes. **Thorax.** Unarmed, with irregular maculation. Pronotum rectangular, longer than broad, with transverse and longitudinal sulci crossing the middle area. Mesonotum gradually broad posterior, about 4 times as long as pronotum, longitudinal carina distinct, each side with 5–6 black granules. Tegmina squamiform, the middle area with a black band. Alae extending to the posterior of the 4th abdominal tergum. **Abdomen.** Cylindrical, unarmed, with some irregular maculation. Terga 2–6 slightly thick, tergum 7 to anal segment gradually narrowed and shorter in dorsal view. Sternum 7 with a short mediolongitudinal carina and apical dichotomous in posterior. Tergum 8 as long as tergum 9 and anal segment combined in lateral view. Tergum 9 slightly shorter than anal segment. Anal segment, median carina distinct, posterior margin rounded and median notched. Subgenital plate scaphoid, reaching 2/3 of the anal segment. Cerci basiconic shaped, straight and surpassing the tip of the abdomen. **Legs.** Slender and long, unarmed, bluish green, with some black strips, all femora about as long as corresponding tibiae, profemora broad and distinctly curved basally.



FIGURE 19 *Hemosibia yintiaolingensis* sp. nov., holotype, female, A–H. **A.** habitus, dorsal view; **B.** habitus, ventral view; **C.** habitus, lateral view; **D.** head, dorsal view; **E.** head, lateral view; **F.** terminalia, dorsal view; **G.** terminalia, lateral view; **H.** terminalia, ventral view.

Male. Pterygote, smaller than female. The general coloration of the body is grayish brown. **Head.** Rounded, slightly longer than pronotum, vertex and occiput rather convex, a black band behind eyes and some faint banding and maculation. Antennae filiform, much longer than forelegs. Compound eyes rounded and prominent, 3 ocelli between compound eyes. **Thorax.** Unarmed. Pronotum rectangular, longer than broad, with transverse and longi-

tudinal sulci crossing the middle area, anterior of transverse sulci with a T-shaped black band, posterior with an inverted V-shaped black band. Mesonotum with irregular maculation, the finest at 3/4 and gradually broader posterior, about 4.5 times as long as pronotum, longitudinal carina distinct. Tegmina squamiform, the middle area with a black band. Alae extending to the anterior of the 6th abdominal tergum. **Abdomen.** Cylindrical, unarmed, with some irregular maculation. Terga 2–9 mediolongitudinal carina distinct. Tergum 7 to anal segment shorter than other abdomen segments. Tergum 8 as long as tergum 9. Anal segment about 4/5 length of tergum 9, median carina distinct, with a small triangular notch in the middle of the posterior margin. Poculum spoon-shaped, rounded posteriorly in ventral view, reaching to the posterior margin of tergum 9. Cerci cylindrical, with a tapering apical. **Legs.** Slender and unarmed. Profemora distinctly curved basally. Pro- and mesofemora nearly as long as corresponding tibiae, metafemora shorter than corresponding metatibiae.



FIGURE 20 *Hemosibia yintiaolingensis* sp. nov., paratype, male, A–H. **A.** habitus, dorsal view; **B.** habitus, ventral view; **C.** habitus, lateral view; **D.** head, dorsal view; **E.** head, lateral view; **F.** terminalia, dorsal view; **G.** terminalia, lateral view; **H.** terminalia, ventral view.

Eggs. Capsule elliptical, black and smooth. Micropylar plate long, band-shaped. Anterior and posterior apex rounded, median slightly broader. Micropylar cup distinct, followed by a short median line. Collar distinct. Operculum oval, slightly raised, central with a protruding capitulum.

Measurements. Female. Body length 82.8; head length 4.6; pronotum length 3.3; mesonotum 13.6; metanotum and median segment 11.6; profemora 10.5; mesofemora 10.3; metafemora 14.2; protibiae 13.2; mesotibiae 8.7; metatibiae 14.8. **Male.** Body length 56.5; head length 2.7; pronotum length 2.4; mesonotum 9.4; metanotum and median segment 7.5; profemora 14.8; mesofemora 9.5; metafemora 15.1; protibiae 15.3; mesotibiae 10.0; metatibiae 15.6. **Egg.** Length 3.7–4.0, width 2.3–2.5, height 2.8–3.0.

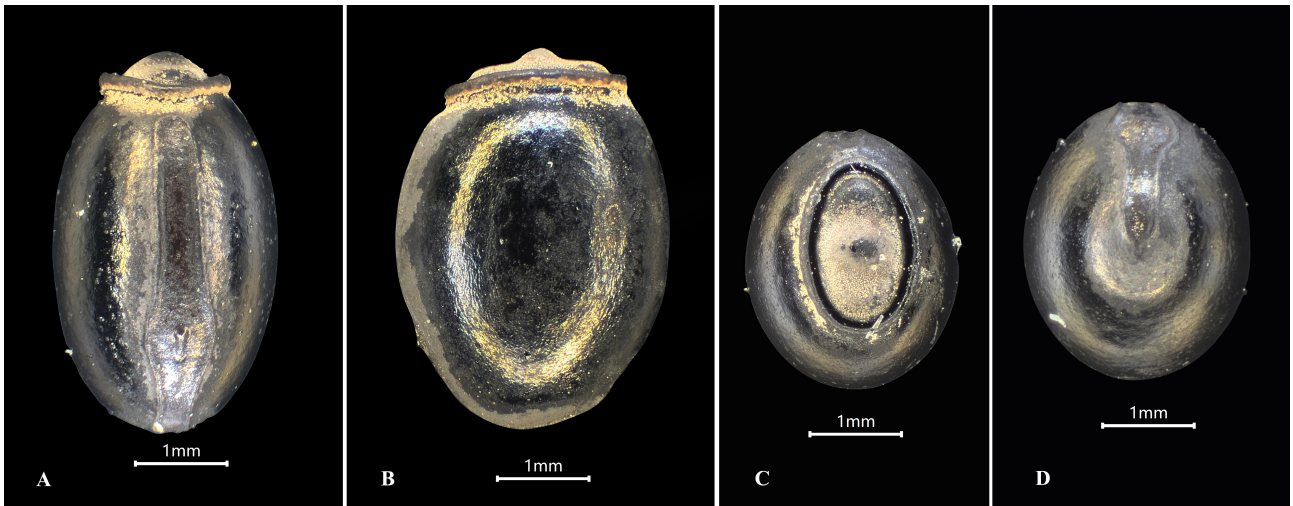


FIGURE 21 *Hemosibia yintiaolingensis* sp. nov., paratype egg, A–D. A. dorsal view; B. lateral view; C. top view; D. polar view.



FIGURE 22 *Hemosibia yintiaolingensis* sp. nov. in the wild. A. female; B. mating in the wild.

Etymology. The specific name is derived from the type locality, Yintiaoling Nature Reserve.

Distribution. China (Chongqing).

Diagnosis. This new species belongs to *Hemisosibia* that by the following characteristics: with ocellus; profemora broad, shorter than mesonotum, distinctly curved basally; pterygote, tegmina squamiform, alae development; posterior margin of anal segment notched; subgenital plate with carina.

The new species is similar to *Hemisosibia incerta* Redtenbacher, 1908, but female of the new species has rounded posterior margin; male tergum 8 as long as tergum 9, anal segment about 4/5 length of tergum 9; egg elliptical and smooth, micropylar plate long and band-shaped. While *H. incerta* female has truncatus posterior margin (Seow-Choen, 2019); male tergum 8 shorter than tergum 9, anal segment about 1/2 length of segment 9 (Seow-Choen, 2017); each side of egg has deep, narrow longitudinal groove, micropylar plate small, oval and recessed (Bragg, 2001). And, the new species is also similar to *H. thoracica* Chen & He, 2008 from Hainan of China, but distinguished by female with a single ocellus, alae extending to the posterior of the 4th abdominal tergum, while *H. thoracica* female with 3 ocelli, alae extending to the middle of the 5th abdominal segment (Chen & He, 2008).



FIGURE 23 *Dianphasma chongqingensis* sp. nov., holotype, female, A–H. A. habitus, dorsal view; B. habitus, ventral view; C. habitus, lateral view; D. head, dorsal view; E. head, lateral view; F. terminalia, dorsal view; G. terminalia, lateral view; H. terminalia, ventral view.

Dianphasma chongqingensis Qian & Xie sp. nov. (Figures 23–26)

Material examined. *Holotype* female, China, Chongqing, Wuxi County, Yintiaoling National Nature Reserve, Linkouzi protection station, 1,270 m, 14 Aug. 2022, Leg. Chong-Xin Xie. *Paratypes*. 2 males and 2 eggs, same data as holotype.



FIGURE 24 *Dianphasma chongqingensis* sp. nov., *paratype*, male, A–H. A. habitus, dorsal view; B. habitus, ventral view; C. habitus, lateral view; D. head, dorsal view; E. head, lateral view; F. terminalia, dorsal view; G. terminalia, lateral view; H. terminalia, ventral view.

Description. Female. General coloration of body brown to dark brown, with irregular dark brown or black marking and off-white pilosity, some tiny granules mainly concentrated at the head, thorax, and terga 2–5. **Head.** Squarish, longer than broad, roughly as long as pronotum; vertex flat and occiput slightly convex in lateral view. Antennae filiform, much longer than forelegs, scapus rectangular and flattened, slightly longer than pedicellus, pedicellus cylindrical, longer than the third segment. Compound eyes rounded and projecting, about 1/3 times as long as gena. **Thorax.** Unarmed. Pronotum rectangular, longer than broad, transverse and longitudinal sulci cross-

ing the middle area. Mesonotum almost parallel-sided, approximately 3 times as long as the pronotum, with some coarse rugose, mediolongitudinal carina distinct. Metanotum as long as it is wide, mediolongitudinal carina weak. Tegmina absent, alae squamiform, not reaching the anterior margin of median segment. Median segment nearly as long as metanotum, mediolongitudinal carina same as metanotum. **Abdomen.** Cylindrical, lacking armature, with some irregular rugose. Terga 2–7 without distinct mediolongitudinal carina, tergum 2 with a short transverse ridge at the hind margin, tergum 3 with two small granules at the hind margin, terga 4–6 hind margin with distinct lobe projecting and gradually becoming larger, terga 6–7 narrowed gradually, tergum 7 with a small hump at the hind margin, terga 8–9 trapezoidal, tergum 8 anterior narrowed, tergum 9 posterior narrowed, two segments with a distinctly broad median ridge in the dorsal view. Sternum 7 lacking praeopercular organ. Anal segment as long as the 9th tergum, with a weakly broad median ridge in the dorsal view, hind margin rounded, middle with a triangular notch. Subgenital plate reaching to the middle of the anal segment in the lateral view, nautiform in the ventral view, anterior narrowed and gradually broadening to the middle area, median widest and then tapering posteriorly, apically rounded. Cerci cylindrical, apices obtuse. **Legs.** Brown with irregular black or dark brown stripes, unarmed, all carina present. Profemora distinctly curved basally and slightly longer than corresponding tibiae. Meso- and metafemora as long as corresponding tibiae.

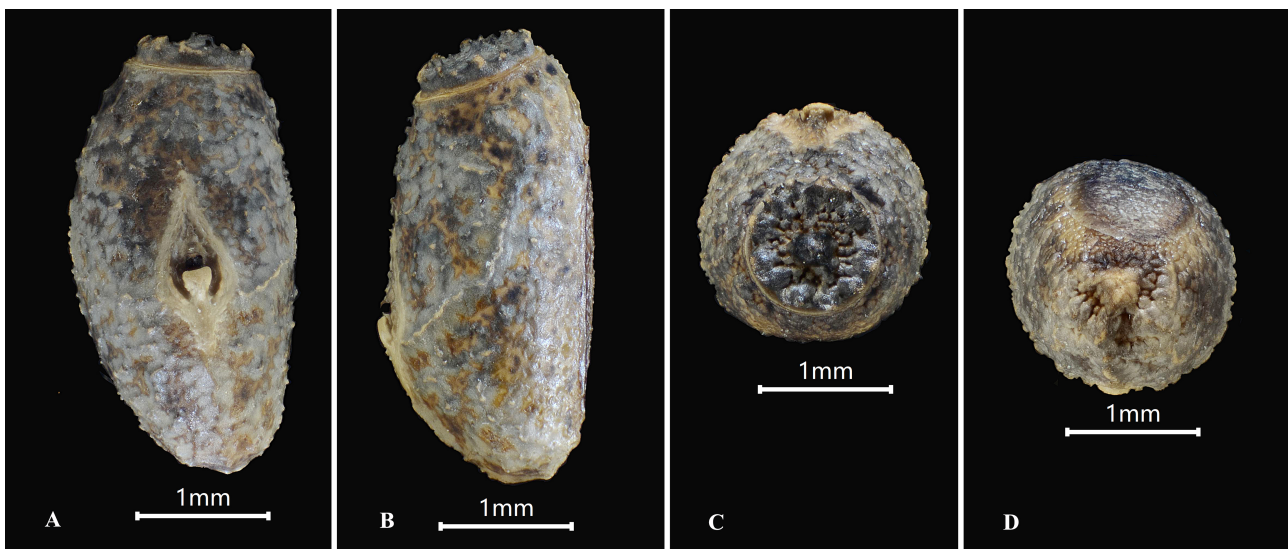


FIGURE 25 *Dianphasma chongqingensis* sp. nov., paratype egg, A–D. **A.** dorsal view; **B.** lateral view; **C.** top view; **D.** polar view.

Male. Slenderer than female. General coloration of body brown to dark brown, with irregular dark brown or black markings and off-white pilosity. **Head.** Squarish, longer than broad, roughly as long as pronotum, vertex flat, occiput weakly convex in lateral view. Antennae filiform, much longer than forelegs, scapus rectangular and flattened, as long as pedicellus, pedicellus cylindrical, shorter than the third segment. Compound eyes rounded and projecting, approximately 1/3 times as long as gena. **Thorax.** Unarmed, with distinctly mediolongitudinal carina. Pronotum rectangular, longer than broad, with sparsely tiny granules; transverse and longitudinal sulci crossing the middle area; behind transverse sulci, a short carina at each side of longitudinal sulci. Mesonotum almost parallel-sided, approximately 4 times as long as pronotum, with some coarsely rugose and irregular black stripes. Metanotum rectangular, approximately 1/4 of mesonotum. Tegmina absent, alae squamiform, not reaching the anterior margin of median segment. Median segment nearly as long as metanotum. **Abdomen.** Cylindrical, lacking armature. Terga 2–6 about the same length, terga 7–9 and anal segment gradually decreasing in length. Anal segment hind margin almost truncated in the dorsal view. Poculum spoon-shaped, projecting over the 1/2 of anal segment, apically rounded in ventral view. Cerci long, cylindrical and apically curved inward, apices obtuse. **Legs.** Slender and unarmed, all carina present. Profemora slightly basally curved and as long as corresponding tibiae; mesofemora slightly longer than corresponding tibiae; metafemora slightly shorter than corresponding metatibiae.

Eggs. Capsule nearly oval, off-white and with irregular black or brown reticulate. Micropylar plate spade-shaped, anterior apex subacute, posterior apex much broader than the anterior apex. Micropylar cup distinctly, a light-yellow semicircular prominence projecting from the anterior of a short median line and covering part of the

micropylar cup. Operculum almost circular, slightly convex, central with a black capitulum, surrounded by irregular small papillae, the outer ring with coarse granules. Polar apex weakly concave.



FIGURE 26 *Dianphasma chongqingensis* sp. nov. in the wild. A. female; B. male.

Measurements (mm). Female. Body length 57.4; head length 3.5; pronotum length 3.9; mesonotum 12.1; metanotum 4.1; median segment 3.8; profemora 11.3; mesofemora 9.0; metafemora 13.0; protibiae 10.8; mesotibiae 8.5; metatibiae 12.5. **Male.** Body length 55.2–55.7; head length 2.8–3.0; pronotum length 3.0–3.1; mesonotum 11.5–12.9; metanotum 3.0–3.2; median segment 3.0–3.2; profemora 14.1–14.7; mesofemora 10.1–10.5; metafemora 14.5–15.8; protibiae 12.9–13.7; mesotibiae 9.0–9.5; metatibiae 15.3–16.8. **Egg.** Length 2.9–3.1, width 1.5–1.7, height 1.4–1.6.

Etymology. This specific epithet is derived from the name of Chongqing municipality, which is one of the famous cities located in Southwest China.

Distribution. China (Chongqing).

Diagnosis. Notable features of this new species show that it should belong to the endemic genus *Dianphasma* of China, such as body covered with fine hairs; head rather long, without conical spines between eyes; antennae longer than profemora; metanotum as long as median segment; fore wings absent, hind wings squamiform; leg short, without any teeth or lamellae; posterior margins of terga 1st–8th with central elevations respectively; anal segment rather long, apex not pointed (Chen & He, 1997a).

There are four species recorded in this genus. In *D. sparsigranulatum* Ho, 2017 and *D. yui* Ho, 2017, tergum 4 lacking tubercle or flattened elevation. In *D. microptera* Chen & He, 1997, with a pair of humps at anterior of terga 4–5; In *D. cheni* Ho, 2013, ocelli indistinct, subgenital plate apex pointed; but the new species can be distinguished by terga 4–6 have a distinct projecting lobe and gradually become larger, lacking ocelli.

Discussion

China has very complex topography, generally higher in the west and lower in the east, forming three terraces. The highest is the Qinghai-Tibetan Plateau, which has lower biodiversity and endemism of insects; the middle terrace consists of high mountains and plateaus in central and southern China, and it has a complex geographic environment and greater biodiversity of insects; the lowest terrace is the hilly eastern coastal region (Shen et al., 2015). Yintiaoling Nature Reserve is located in the middle terrace and belongs to the east margin of the tropical Sichuan basin that has a vast broadleaf forest region, which is the edge of the range of Shennongjia's old growth forest. From 1.5 to 0.025 billion years ago, Shennongjia uplifted to form multi-level topographies and became the eastern extension of the Daba Mountains after the Yanshan movement-Himalaya uplift (He, 2007). The complex topography of this region keeps many rare, ancient species.

Chongqing is the youngest municipality directly under the central government of China, formerly attached to Sichuan Province before 1997. Zhang (2010) summarized the category of phasmids from Chongqing, including 1 suborder, 2 families and 15 species. Besides two new species, this paper also add 2 new records to Chongqing's insects, improving the Phasmatodea of Chongqing to 3 families and 19 species. This is the first insect investigation in Yintiaoling. Studying Yintiaoling's phasmids provides an important understanding of the biodiversity of central China's insect fauna. The findings in this study can supplement future studies in the taxonomy, distribution, biology, and ecology of Phasmatodea in China.

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References

- Bi, D.Y. (1995) Description of three new genera and three new species of Phasmatodea from Xizang, China (Phasmida: Pseudophasmatidae, Heteronemiidae). *Acta Entomologica Sinica*, 38 (4), 452–457.
- Bi, D.Y., Zhang, W.N. & Liu S.J. (2001) Study on the Walking Stick Insects (Phasmatodea) and the genus *Sipyloidea* from Hong Kong District of China. *Entomotaxonomia*, 23 (4), 253–258.
- Bragg, P.E. (1997) A glossary of terms used to describe phasmids. *Phasmid Studies*, 6 (1), 24–33.
- Bragg, P.E. (2001) Phasmids of Borneo. *Natural History Publications, Kota Kinabalu*, 49–63, 560.
- Brock, P.D., Büscher, T., Baker, E. Phasmida Species File Online. Version 5.0/5.0. [17 October 2022]. [<http://Phasmida.Species-File.org>].
- Cai, B.L. & Liu, S.L. (1990) Notes on *Entoria* (Phasmatodea: Phasmatidae) with descriptions of six new species from China. *Oriental Insects*, 24, 415–425.
<https://doi.org/10.1080/00305316.1990.11835549>
- Chen, S.C. & He, Y.H. (1990) *Baculum album*—A New Walking-Stick Injurious to Forests in Sichuan. *Journal of Beijing Forestry University*, 12 (4), 54.
- Chen, S.C. & He, Y.H. (1997a) A new genus and new species of Phasmatodea from Yunnan, China (Phasmatodea: Heteronemiidae). *Acta Zootaxonomica Sinica*, 22 (2), 159–161.
- Chen, S.C. & He, Y.H. (1997b) Phasmatodea: Phasmatidae, Heteronemiidae. In: Xing-Ke Yang (Ed.), *Insects of the Three Gorge Reservoir area of Yangtze River*. Chongqing Publishing House, Chongqing, 116.
- Chen, S.C. & He, Y.H. (2008) Phasmatodea of China. *China Forestry Publishing House, Beijing*, 156–157.
- He, B.Y. (2007) Environmental change records in peat from Dajiuhe in Shennongjia, China. *China University of Geosciences Press, Beijing*, 2–4.
- Hennemann, F.H., Conle, O.V. (2008) Revision of Oriental Phasmatodea: The tribe Pharnaciini Günther, 1953, including the description of the world's longest insect, and a survey of the family Phasmatidae Gray, 1835 with keys to the subfamilies and tribes (Phasmatodea: "Anareolatae": Phasmatidae). *Zootaxa*, 1906, 87.
<https://doi.org/10.11646/zootaxa.1906.1.1>

- Hennemann, F.H., Conle, O.V. & Zhang W.W. (2008a) Catalogue of the Stick and Leaf-insects (Phasmatodea) of China, with a faunistic analysis, review of recent ecological and biological studies and bibliography (Insecta: Orthoptera: Phasmatodea). *Zootaxa*, 1735, 1–76.
<https://doi.org/10.11646/zootaxa.1735.1.1>
- Hennemann, F.H., Conle, O.V., Zhang W.W. & Liu Y. (2008b) Descriptions of a new genus and three new species of Phasmatodea from Southwest China (Insecta: Phasmatodea). *Zootaxa*, 1701, 40–62.
<https://doi.org/10.11646/zootaxa.1701.1.4>
- Ho, G.W.C. (2013a) Contribution to the knowledge of Chinese Phasmatodea I: A review of Neohiraseini (Phasmatodea: Phasmatidae: Lonchodinae) from Hainan Province, China, with descriptions of one new genus, five new species and three new subspecies, and redescriptions of *Pseudocentema* Chen, He & Li and *Qiongphasma* Chen, He & Li. *Zootaxa*, 3620 (3), 404–428.
<https://doi.org/10.11646/zootaxa.3620.3.4>
- Ho, G.W.C. (2013b) Contribution to the knowledge of Chinese Phasmatodea II: Review of the Dataminae Rehn & Rehn, 1939 (Phasmatodea: Heteropterygidae) of China, with descriptions of one new genus and four new species. *Zootaxa*, 3669 (3), 201–222.
<https://doi.org/10.11646/zootaxa.3669.3.1>
- Ho, G.W.C. (2013c) The genus *Dianphasma* (Phasmatodea: Diapheromeridae: Necrosiinae) in China, with description of new species. *Entomotaxonomia*, 35 (3), 169–173.
- Ho, G.W.C. (2016) Contribution to the knowledge of Chinese Phasmatodea III: Catalogue of the phasmids of Hainan Island, China, with descriptions of one new genus, one new species and two new subspecies and proposals of three new combinations. *Zootaxa*, 4150 (3), 314–340.
<https://doi.org/10.11646/zootaxa.4150.3.4>
- Ho, G.W.C. (2017a) Contribution to the knowledge of Chinese Phasmatodea IV: Taxonomy on Medaurini (Phasmatodea: Phasmatidae: Clitumninae) of China. *Zootaxa*, 4365 (5), 501–546.
<https://doi.org/10.11646/zootaxa.4365.5.1>
- Ho, G.W.C. (2017b) Contribution to the knowledge of Chinese Phasmatodea V: New taxa and new nomenclatures of the subfamilies Necrosiinae (Diapheromeridae) and Lonchodinae (Phasmatidae) from the Phasmatodea of China. *Zootaxa*, 4368 (1), 5–7.
<https://doi.org/10.11646/zootaxa.4368.1.1>
- Ho, G.W.C. (2020) Contribution to the knowledge of Chinese Phasmatodea VI: New taxa and new nomenclature of the subfamily Necrosiinae from the Phasmatodea of China. *Hong Kong Entomological Bulletin*, 12 (2), 3–28.
- Ho, G.W.C. (2021) Contribution to the knowledge of Chinese Phasmatodea X: Eight new species of *Cnipsomorpha* from China (Phasmatidae: Clitumninae: Medaurini). *Zootaxa*, 5026 (1), 102–126.
<https://doi.org/10.11646/zootaxa.5026.1.4>
- Seow-Choen, F. (2017) A taxonomic guide to the stick insects of Borneo II. *Natural History Publications, Kota Kinabalu*, 32–34.
- Seow-Choen, F. (2019) A taxonomic guide to the stick insects of Borneo III. *Natural History Publications, Kota Kinabalu*, 65.
- Shen, X.C., Ren, Y.D. & Liu X.T. *et al.* (2015) Insect geography of China. *Henan Science and Technology Press, Zhengzhou*, 7–29.
- Zhang, W.W. (2010) Phasmatodea. In: Chen, B., Li, T.J. & He, Z.B. (Eds.), *Insects in Chongqing Municipality*. Science Press, Beijing, 35–36.