



## Two new species in the genus *Indolipa* Emeljanov, 2001 (Hemiptera: Fulgoromorpha: Cixiidae: Pentastirini) from China

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### Abstract

Two new species of the family Cixiidae, *Indolipa fopingensis*, **sp. nov.** and *Indolipa huapingensis*, **sp. nov.**, from China, are described and illustrated. A checklist to all species of this genus in the world and an identification key to Chinese species are provided. Host plants and a map of their geographic distribution are also provided.

**Key words:** planthopper, Fulgoroidea, taxonomy, morphology, new species

### Introduction

The planthopper family Cixiidae is a diverse group of ~2,500 species distributed worldwide (Bourgoin, 2018). Some cixiids such as *Pentastiridius apicalis* (Uhler, 1896), *Oliarus zaonensis* (Wang, 1991), *Melanoliarus vicarius* (Walker, 1851), *Neocarpia bidentata* (Zhang & Chen, 2013) and *N. hamata* (Zhang & Chen, 2013) are economically important pests of cash crops such as rice, jujube trees, daylilies and bamboo in the Oriental Region. Because of their feeding on leaves or plant stalks, the subterranean feeding of nymphs on rootlets, and the potential for plant pathogen transmission, cixiids are important in agroecosystems (Wang, 1991; Wang, 1992; Xiao & Zhou, 2006; Zhang, 2013). Despite their importance, Cixiidae from the Oriental Region have not been studied extensively.

The genus *Indolipa* Emeljanov, 2001, belongs to the tribe Pentastirini (Cixiinae). Emeljanov (2001) transferred 16 species (previously in *Oliarus* Stål, 1862) from the Oriental Region into this new genus, which can be recognized by the following characters: gonostyli with a finger-shaped or spine-shaped process between the base and the dilated apex, pygofer lacking a medioventral process and aedeagus screw-shaped in some species. Currently this genus contains 17 species from the Oriental Region, including China, India, Indonesia, Malaysia, Singapore, Myanmar, Sri Lanka (Distant 1906; Muir 1924; Fennah 1956; Van Stalle 1991; Guo & Feng 2010). Previously three species in this genus have been recorded from China: *I. kurseongensis* (Distant, 1911), *I. gansuensis* Feng (Guo & Feng, 2010) and *I. tappanus* (Matsumura, 1914).

As part of ongoing monitoring studies in Chinese agroecosystems, we collected specimens of Cixiidae from crops and weeds in the locations primarily in Southern China. In this paper, we describe and illustrate two new species of *Indolipa*. A checklist to world species of *Indolipa* is provided with a map of their distribution as well as a key for the Chinese species.

### Material and methods

The cixiids were collected in hand-held sweep nets (150mm×37mm×60mm) from border grasses and crops. Other additional specimens were collected in different years and localities. Most of their geographical distribution data are based on the localities from the literature. The updated distribution data is presented in the checklist and on the map (Fig. 28).

The morphological terminology and measurements follow Bourgoïn & Wilson (1998), Bourgoïn (1993), and Bourgoïn *et al.* (2015), respectively, for male and female genitalia, and the venation patterns of the tegmina. Measurements of the body length are the distance between the apex of the vertex to the tip of the forewing. Measurements of the vertex length are the distance from the apical transverse carina to the most caudal limits of the vertex.

To prepare male genitalia for dissection, the specimens were softened for 12h in a humid glass cylinder. Subsequently, the abdomen of the specimen was dissected from the body carefully by using forceps and pins, and then macerated in a 10% NaOH solution during one night or by boiling for 3 to 5 min. The abdomen was then rinsed in distilled water, and the genitalia were stored in PVC microvials containing glycerol, and then some were moved to glycerine-jelly for drawing. The anal segment and pygofer were drawn. External morphology was observed using a LEICA Zoom 2000 microscope and drawings were made using a LEICA MZ12.5 anatomy stereoscope fitted with a drawing tube and mirror. Photographs of specimens were taken with a Scientific Digital micro-graphy system equipped with an Auto-montage imaging system and a QIMAGING 4000R digital camera (CCD) and imported into Adobe Photoshop CC for labeling and plate composition.

Specimens examined were deposited in the Entomological Museum of Northwest A&F University (NWAUFU), Yangling, Shaanxi Province, China.

## Taxonomy

### Family Cixiidae Spinola, 1839

#### Subfamily Cixiinae Spinola, 1839

#### Tribe Pentastirini Emeljanov, 1971

#### Subtribe Pentastirina Emeljanov, 1971

#### Genus *Indolipa* Emeljanov, 2001

*Indolipa* Emeljanov 2001:72.

**Type species:** *Oliarus indiensis* Van Stalle, 1991

**Amended diagnosis.** Total length varies from 5.4–8.9mm. Head including eyes narrower than pronotum. Face and vertex black with yellow carinae and borders. Vertex one to 1.6 times as long as broad. Posterior margins roundly and acute-angled, deeply U-shaped or arcuate; subapical transverse carina connected or not to the anterior margin by two small carinae (Figs. 3, 8). Frons flat at base, median carina well-developed, incomplete or absent, lateral margins elevated. Frontoclypeal suture gently bent and widest at level of antennae. Median ocellus clearly visible at center of frontoclypeal suture (Figs. 4, 9). Pronotum tapered with distinct carinae, strongly incised in middle. Mesonotum with five prominent concolorous carinae, protruding medially, descending laterally (Figs. 3, 8). Forewing hyaline and longer than abdomen, tectiform, 2.7 to 3.4 times as long as broad; veins brown, with conspicuous tubercles; venation is similar to that of *Oliarus* Stål, with 9–12 apical cells (Figs. 5, 10). Legs yellowish, generally with 3–6 tibial lateral spines. Metatibiotarsal formula 6/ (6–7)/ 5, metabasitarsus distally with 6–7, 2<sup>nd</sup> metatarsal joint with 5 teeth without platellae.

**Male terminalia.** Anal segment and pygofer symmetrical; anal segment with various apical caudo-ventral processes (Figs. 16, 24). Pygofer usually without medioventral process (Figs. 15, 20). Gonostyli with dorsal finger- or spine-shaped process near midlength between the base and dilated apex (Figs. 13, 14, 21, 22); nearly symmetrical. Aedeagus structurally complex and variable among species.

**Female genitalia.** Structurally variable among species. Posterior margin of 7<sup>th</sup> sternite (pregenital sternite) with caudal margin usually convex, medially rounded; sclerite usually triangular, sometimes more circular. In some species, the posterior margin of the 7<sup>th</sup> sternite less curved. Ovipositor reduced, in ventral view gonocoxa VIII usually small, gonapophysis VIII (first valvula) and gonapophysis IX (second valvula) comparatively thin and elongate, reduced in various species. Abdominal 9<sup>th</sup> tergite caudally with a distinct wax plate.

**Remarks.** The distinguishing characters of *Oliarus indiensis* Van Stalle, 1991 have been modified as follows: the genitalia of both males and females have been more precisely described. These changes are described in the diagnosis section.

*Indolipa* Emeljanov, 2001 is distinguished from all other Pentastirini by the unique characters of the male genitalia: Gonostyli with dorsal finger- or spine-shaped process near mid-length between base and dilated apex (Figs. 13, 14, 21, 22). Pygofer usually without medioventral process (Figs. 15, 20). Aedeagus screw-shaped in some species.

**Distribution.** China (Tibet, Shaanxi, Gansu, Hubei, Guangxi, Taiwan), India, Indonesia (Borneo), Malaysia, Myanmar, Singapore, Sri Lanka.

### Checklist and distributions of the species of *Indolipa* Emeljanov, 2001

- I. bidiensis* (Van Stalle, 1991); Malaysia (Borneo).
- I. binghami* (Distant, 1911); Myanmar (Rangoon).
- I. brunnifrons* (Muir, 1924); Singapore.
- I. fopingensis*, **sp. nov.**; China (Shaanxi).
- I. fusconebulosus* (Distant, 1906); Myanmar (Mongmit).
- I. gansuensis* Feng, 2010 (in Guo & Feng, 2010); China (Gansu).
- I. greeni* (Distant, 1911); Sri Lanka (Eppawala, Kandy).
- I. huapingensis*, **sp. nov.**; China (Guangxi).
- I. indiensis* (Van Stalle, 1991); India (Nilgiri Hills).
- I. kurseongensis* (Distant, 1911); China (Tibet, Hubei, Guangxi, Hunan, Yunnan), India (Darjeeling).
- I. lawitensis* (Van Stalle, 1991); Malaysia (Trenghganu).
- I. madrasensis* (Van Stalle, 1991); India (Madras).
- I. malayensis* (Van Stalle, 1991); Malaysia (Pahong).
- I. nilgiriensis* (Van Stalle, 1991); India (Singara, Madras).
- I. pahangensis* (Van Stalle, 1991); Malaysia (Pahong).
- I. sabahensis* (Van Stalle, 1991); Malaysia (Borneo).
- I. tamangensis* (Van Stalle, 1991); Malaysia (Pahong).
- I. tapanus* (Matsumura, 1914); China (Taiwan).
- I. thekkadiensis* (Van Stalle, 1991); India (Thekkady, Madras).

### Key to the Chinese species of *Indolipa* (based on males)

- 1 Vertex longer than broad ..... 2
- Vertex as long as broad ..... *Indolipa tapanus* (Matsumura, 1914)
- 2 Tegmina with 9 apical cells, RP apex 2-branched, cell C1ba absent (Fig. 10) ..... *Indolipa huapingensis*, **sp. nov.**
- Tegmina with 10 apical cells, RP apex 3-branched, cell C1ba narrowed in apical portion ..... 3
- 3 Metatibiotarsal formula: 6/6/5 ..... *Indolipa kurseongensis* (Distant, 1911)
- Metatibiotarsal formula: 6/7/5 ..... 4
- 4 Basal portion of left lateral sinuation of endosoma with a long and slender spine, right lower lateral of dorsal margin with a stout and acute spine and with a serrate apical margin, left lateral sinuation without a spine in the middle (Fig. 18) ..... *Indolipa fopingensis*, **sp. nov.**
- Basal portion of left lateral sinuation of endosoma with a stout, bifurcated process, the upper ramus of bifurcation long and thin, the lower one short and stout, right lower lateral of dorsal margin without a spine, left lateral sinuation with a somewhat undulate process arising from midway ..... *Indolipa gansuensis* Feng, 2010 (in Guo & Feng 2010)

### *Indolipa fopingensis* sp. nov.

(Figs. 1–5, 11–18)

**Diagnosis.** *Indolipa fopingensis* is externally identical to *I. gansuensis*; but these species are readily distinguished by: 1) the processes of left lateral sinuation of endosoma at basal portion (*I. fopingensis* with a long and slender

spine, directed left-cephalad, but *I. gansuensis* with a stout bifurcated process, the upper ramule acute and thin, directed left side, the lower one blunt and stout, directed cephalad); 2) the processes on left lateral sinuation of endosoma on right lower lateral of dorsal margin (*I. fopingensis* with a stout and acute spine, with serrate apical margin, directed right-dorso-cephalad but *I. gansuensis* without process); 3) the processes on left lateral sinuation of endosoma in the middle area (*I. fopingensis* without process, but *I. gansuensis* with an undulate and finger-shaped spine, directed cephalad).

**Description. Male.** Body length (from apex of vertex to tip of forewings) 6.0–6.2 mm.

**Head.** Vertex (Figs. 1, 3) black, about 1.4 times as long as broad, with a distinct subapical transverse U-shaped carina, connected with anterior border of vertex by two small longitudinal carinae, median carina absent. Posterior margin deeply excavated, lateral margins elevated. Face black with carinae and margins yellowish. Frons with median carina well-developed, fork of median carina near apex. Rostrum (Fig 2) reaching hind coxae; apically black.

**Thorax.** Pronotum (Figs. 1, 2, 3) black with yellowish carinae and borders, median carina indistinct. Mesonotum (Figs. 1, 3) black with concolorous carinae. Tegmina (Figs. 1, 2, 5) hyaline, 2.8 times as long as broad, veins yellowish with dark brown granules without setae; apical and stigma brown fumated costal margin brown with protruding granules. Venation pattern: RA unbranched, RP 3-branched, cell C1b developed, cell C1ba narrowed in apical, MP forked after nodal lines, MP1+2 and MP3+4 apically bifurcated into MP<sub>1</sub>, MP<sub>2</sub>, MP<sub>3</sub>, MP<sub>4</sub> terminals, CuA 2-branched, the forking of ScP+RA and RP slightly basad of the forking of CuA<sub>1</sub>+CuA<sub>2</sub>, the forking of Pcu+A<sub>1</sub> basad of center of clavus, with ten apical cells.

**Legs.** Legs brown, tibiae and tarsi yellowish, hind tibia with three lateral spines. Meta-tibiotarsal formula: 6/7/5.

**Male genitalia.** Anal segment (Figs. 11, 12, 16) asymmetrical, in dorsal view sub-ovate, longer than broad, slender, slightly curving to right. Apical process with ventral margin excavated medially and with two convex productions. Pygofer (Figs. 11, 12, 15) with lateral margin subtriangular in outline, asymmetrical, medioventral process absent, replaced by two small projections. Apical margin beset with many setae. In lateral view, pygofer with semicircular furrow-like sulcus in middle. Gonostyli (Figs. 13, 14, 17, 18) in lateral view, thumb-shaped, swelling at apex. Gonostyli apically rounded with many setae along margin, shaft short. Between the apex and shaft, with a deep excavation, and the inner margin rounded with short setae. The basal dorso-lateral angle of dilated apex (Emeljanov, 2001) with a tusk-like tooth. Aedeagus screw-shaped. Endosoma (= flagellum) convoluted with two sinuations, a right lateral one (Fig. 17) and a left lateral one (Fig. 18). Aedeagus with 7 sclerotized processes. In the right lateral view, endosoma with two long subparallel ribbon-like processes. Upper one (1) is long, with a flaky, sclerotized membrane at the apex of subapical dorsal margin. Apex slightly expanded and round, curving left-caudally. The lower one (2) shorter, with acute apex, directed left-caudally; basal portion (3) slightly outspread and round apically, curved left-laterally and slightly directed cephalad. In left lateral view, the basal level of left lateral sinuation of endosoma has two strong spines. The upper one (4) is long and slender at the basal portion, directed left-cephalad. The lower one (5) arises from midway along the dorsal margin, and stout and acute, with serrate apical margins, directed right-dorso-cephalad. Distal end of aedeagus with a big S-shaped process (6), tongue-like; ventral margin of process with serrate margin near distal 2/3 longitudinally extended. A scoop-like basiventral process (7) arises from the basal 1/3 of periandrium, directed cephalad.

**Female genitalia.** Unknown.

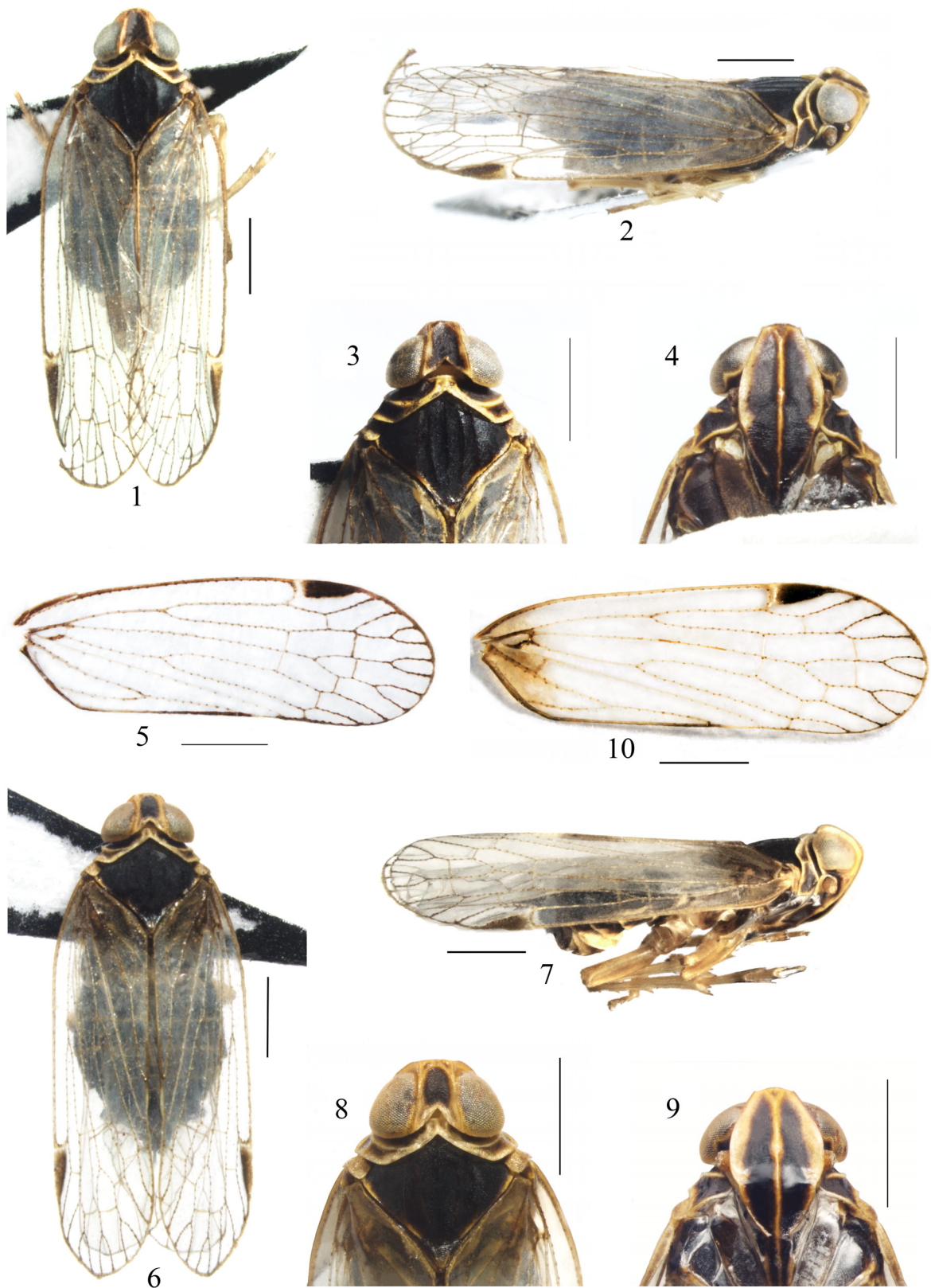
**Material examined.** Holotype: male, CHINA, **Shaanxi Prov.**, Foping County, Yueba (33°55'N, 107°82'E), Alt 600–650m, 7.VII.2014, Rui-Kai Bai (NWFU); paratypes: 2 males, the same data as holotype.

**Etymology.** The specific epithet is named after the county in Shaanxi, the type locality.

**Distribution:** China (Shaanxi).

**Host plants:** *Echinochloa crusgalli* (L.) Beauv. (Poaceae).

**Biology.** *I. fopingensis* sp. nov. is known to occur in Foping county, which is on the southern slope of the middle Qingling Mountains. The specimens were collected near the rice fields in Yueba of Foping County at an elevation between 600m to 650m.



**FIGURES 1–10.** *Indolipa fopingensis* sp. nov. and *I. huapingensis* sp. nov. 1–5, *I. fopingensis*. 1, Habitus, dorsal view; 2, Habitus, lateral view; 3, Head and thorax, dorsal view; 4, Frons and clypeus; 5, forewing; 6–10, *I. huapingensis*. 6, Habitus, dorsal view; 7, Habitus, lateral view; 8, Head and thorax, dorsal view; 9, Frons and clypeus; 10, forewing. Scale bars = 1 mm.

***Indolipa huapingensis* sp. nov.**

(Figs. 6–10, 19–27)

**Diagnosis.** *Indolipa huapingensis* is externally identical to *I. kurseongensis*; but they can be readily distinguished by: 1) in right lateral view, the processes of ventral margin of endosoma (*I. huapingensis* with a tusk-like process, sheet-like, curved and directed cephalad, but *I. kurseongensis* without process); 2) the sheet-like process in the basal area of right lateral sinuation of endosoma (*I. huapingensis* with a sheet-like process, which is divided into two processes, but *I. kurseongensis* with a sheet-like process which is divided into three processes); 3) the processes of in the basiventral area of the left lateral sinuation of endosoma (*I. huapingensis* with a foliaceous, broader, curve process, and directed dorsocaudad, but *I. kurseongensis* with a Y-shaped process).

**Description. Male.** Body length (from apex of vertex to tip of forewings) 6.1–6.3 mm.

**Head.** Vertex (Figs. 6, 8) black with pale yellow carinae and borders, about 1.4 times as long as broad, with a distinct subapical transverse carina U-shaped, connected with anterior border of vertex by two small longitudinal carinae, median carina absent. Posterior margin deeply excavated, lateral margins elevated. Face black, carinae and margins pale yellow. Frons with median carina prominent, fork of median carina near apex. Rostrum (Fig. 7) just reaching hind coxae; apically black.

**Thorax.** Pronotum (Figs. 6, 7, 8) dark brown with pale yellowish carinae and borders, median carina indistinct. Mesonotum (Figs. 6, 8) black with con-colourous carinae. Tegmina (Figs. 6, 7, 10) hyaline, 3.1 times as long as broad, veins yellow, apical and stigma brown fumated. Costal margin yellow brown with protruding granules. Basal area with brown mark at level of basal cell. Venation pattern: RA unbranched, RP 2-branched, cell C1b developed, cell C1ba absent, MP forked after nodal lines, MP<sub>1+2</sub> and MP<sub>3+4</sub> apically bifurcated into MP<sub>1</sub>, MP<sub>2</sub>, MP<sub>3</sub>, MP<sub>4</sub> terminals, CuA 2-branched, the forking of ScP+RA and RP distad of the forking of CuA<sub>1</sub>+CuA<sub>2</sub>, the forking of Pcu+A<sub>1</sub> basad of center of clavus, with nine apical cells.

**Legs.** Legs, tibiae and tarsi yellow, hind tibia with three lateral spines. Meta-tibiotarsal formula: 6/6/5.

**Male genitalia.** Anal segment (Figs. 19, 23, 24, 25) asymmetrical, in dorsal view sub-ovate, longer than wide, slender, right lateral margin arched, convex, left lateral margin wavy. Anal style finger-shaped, beyond anal segment. Pygofer (Figs. 19, 20, 25) without a medio-ventral process, replaced by two small projections. In left lateral view, left margin sub-triangular in outline, asymmetrical, with several setae along apical margin; In right lateral view, the outer borders of pygofer with a semi-circular furrow-like sulcus near middle. Gonostyli (Figs. 21, 22, 26, 27) in lateral view, thumb-shaped. Outer margin slightly arched, concave, with many setae, shaft short, a deep excavation present between shaft and dilated apex, the inner margin rounded, with short setae. Basal dorso-lateral angle of dilated apex (Emljanov 2001) with a tusk-like tooth. Aedeagus screw-shaped. Endosoma (= flagellum) convoluted with two sinuations, a right lateral one (Fig. 26) and a left lateral one (Fig. 27). Aedeagus in total with 7 sclerotized processes. In right lateral view, apex of right lateral sinuation of endosoma has a long rod-like process (1), slightly round and dilated, directed left-caudally. Basal area of endosoma with a sclerotized, basally sheet-like process divided into two processes, inner one (4) longer, tusk-like, directed ventro-cephally; the outer one (3) short and pointed. Ventral margin of endosoma with a tusk-like process (2), sheet-like, curved and directed cephalad. In left lateral view, middle area of left lateral sinuation of endosoma, with a foliaceous process (5), broader, curving and directed dorso-caudally. Distal end of aedeagus with a big S-shaped process (6) with tongue-like apex. A spoon-like basiventral process (7) arising from basal 1/3 of perianthrium, directed cephalad.

**Female genitalia.** Unknown.

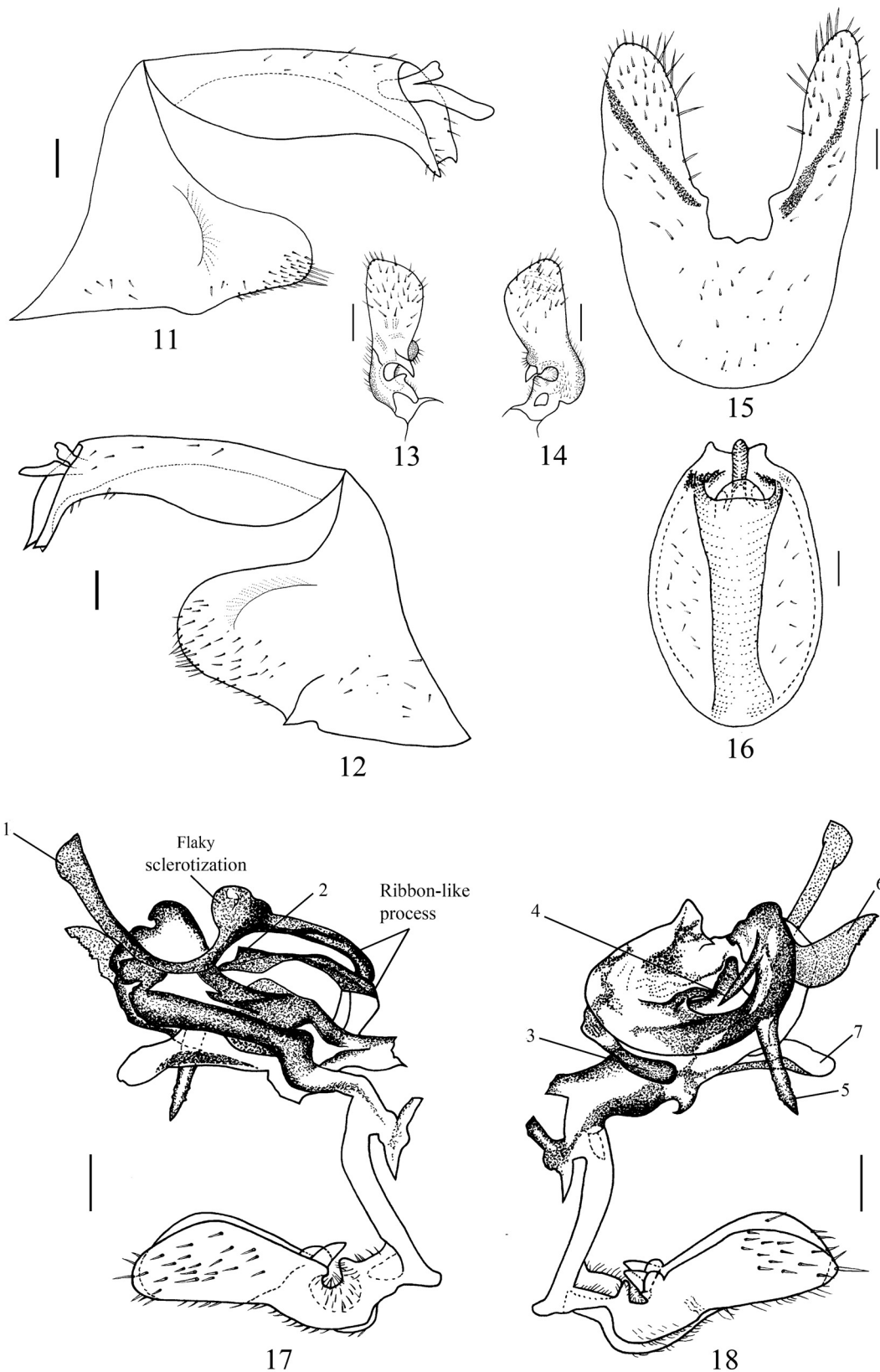
**Material examined.** Holotype: male, CHINA, **Guangxi Prov.**, Huaping County (24°34'N, 106°17'E), Alt 550–600m, 24.VII.2014, Rui-Kai Bai (NWAFU); paratype: 1 male, CHINA, **Guangxi Prov.**, Lingyun County (24°35'N, 106°55'E), Alt 600–700m, 15.VIII.2014, Rui-Kai Bai (NWAFU).

**Etymology.** The specific epithet is named after the county in Guangxi, the type locality.

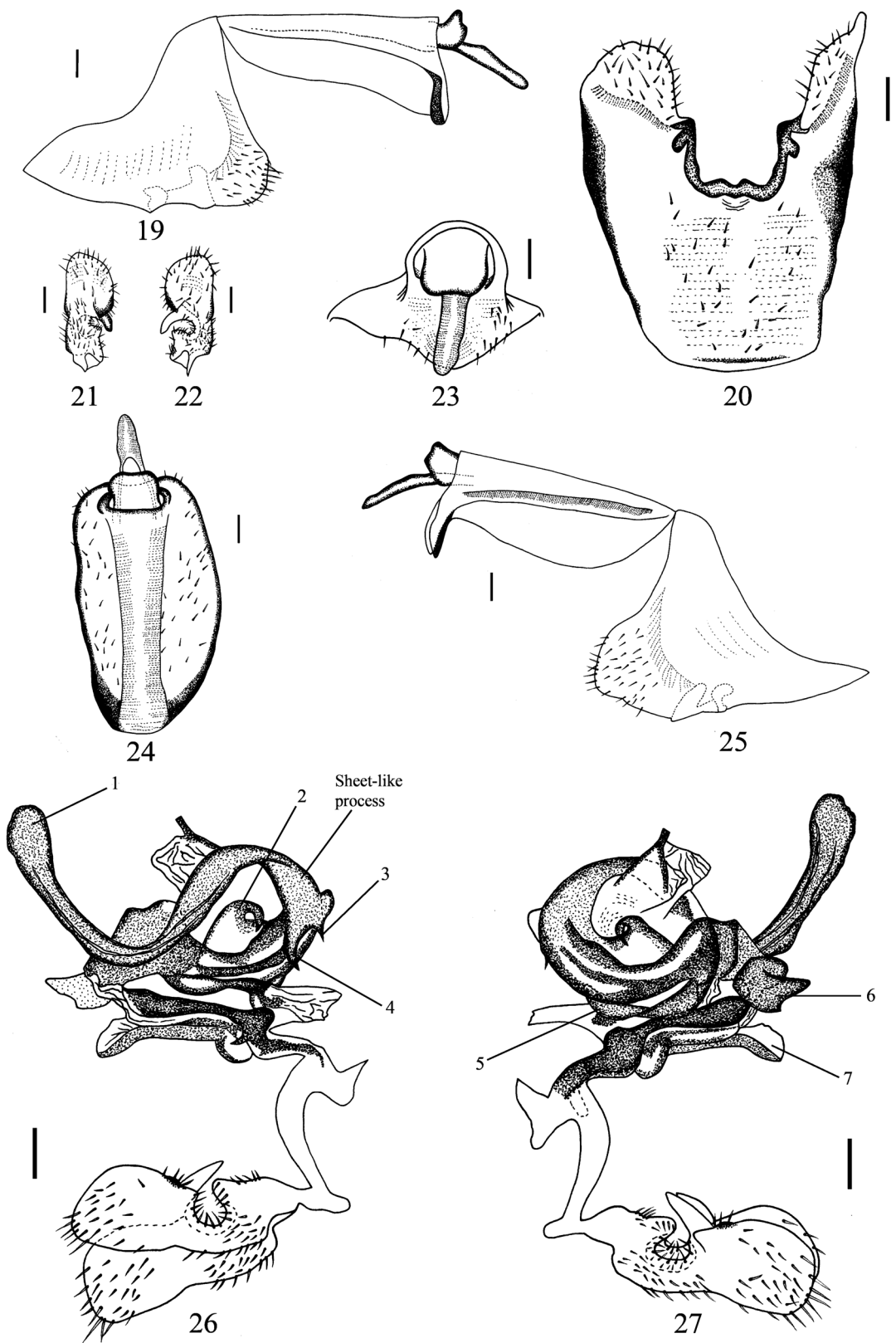
**Distribution:** China (Guangxi).

**Host plant:** *Artemisia argyi* H. Lévl. & Vaniot. (Asteraceae)

**Biology.** *I. huapingensis* sp. nov. occurs in two different districts of the Guangxi Province in China: Huaping National Nature Reserve (HNNR) of Huaping County in the northeast of Guangxi Province at about 500m to 1800m a.s.l and Cenwanglao mountain National Nature Reserve (CNNR) of Lingyun County in the northwest of Guangxi Province, close to the southeast boundaries of Yunnan-Guizhou Plateau, at 210m to 2000m a.s.l. All the specimens were collected in hand-held sweep nets. In the HNNR, the specimens were collected near the foot of



**FIGURES 11–18.** *Indolipa fopingensis* sp. nov. 11, Pygofer and anal segment, left lateral view; 12, Pygofer and anal segment, right lateral view; 13, Genital style, dorsal view; 14, Genital style, ventral view; 15, Pygofer, ventral view; 16, Anal segment, dorsal view; 17, Aedeagus, connective and genital styles, right lateral view; 18, Aedeagus, connective and genital styles, left lateral view. Scale bars = 0.1 mm.



**FIGURES 19–27.** *Indolipa huapingensis* sp. nov. 19, Pygofer and anal segment, left lateral view; 20, Pygofer, ventral view; 21, Genital style, dorsal view; 22, Genital style, ventral view; 23, Anal segment, caudal view; 24, Anal segment, dorsal view; 25, Pygofer and anal segment, right lateral view; 26, Aedeagus, connective and genital styles, right lateral view; 27, Aedeagus, connective and genital styles, left lateral view. Scale bars = 0.1 mm.



Tianping Mountain at elevations between 550m to 600m. In the CNNR, the specimens were collected from the side of a mountain road of Cengwanglao Mountain at an elevation between 600m to 700m.

### ***Indolipa tappanus* (Matsumura, 1914)**

*Oliarus tappanus* Matsumura, 1914: 424.

*Oliarus tappanus* Matsumura: Tsaour, Hsu & Van Stalle, 1988: 46, fig. 6, A–H; Van Stalle, 1991: 51, figs. 281–286.

*Oliarus tappanus* Matsumura;

*Indolipa tappanus* (Matsumura): Emeljanov, 2001: 72; Guo & Feng, 2010: 33.

**Distribution:** China (Taiwan).

**Remarks.** Based on the description and figures by Tsaour *et al.* (1988) and Van Stalle (1991), this species can be distinguished from other species of this genus by the following characters: screw-shaped aedeagus, distal end of aedeagus with a large S-shaped process with tongue-like apex; the pygofer without a medio-ventral process; basal portion of aedeagus has a long tongue-shaped process, curving ventro-caudally. In right lateral view, basal area of endosoma has two processes, an acute process pointing left and a tusk-like process directed ventrally. An acute, apical, basi-ventral process arises from the basal 1/3 of periandrium, directed cephalad.

### ***Indolipa gansuensis* Feng, 2010 in Guo & Feng, 2010**

*Indolipa gansuensis* Feng, 2010 in Guo & Feng, 2010: 35, figs. 1–11.

**Distribution:** China (Gansu).

**Remarks.** Based on the description and the figures by Guo & Feng (2010), this species closely resembles *I. fopingensis* in external appearance and male genitalia configuration. Diagnosis of these two species is described under the diagnosis section for *I. fopingensis*.

### ***Indolipa kurseongensis* (Distant, 1911)**

*Oliarus kurseongensis* Distant, 1911: 737.

*Oliarus kurseongensis* Distant: Fennah, 1956: 451, fig. 4, G–H; Van Stalle, 1991:51, figs. 275–280.

*Indolipa kurseongensis* (Distant): Emeljanov, 2001:72; Guo & Feng, 2010: 33, figs. 12–25.

**Distribution:** China (Tibet, Hubei, Guangxi, Hunan, Yunnan), India.

**Material examined:** 3 males, CHINA, **Guangxi Prov.**, Huaping County (24°34'N, 106°17'E), Alt 600m, 24.VII.2014, Rui-Kai Bai (NWFU); 1 male, 8 females, CHINA, **Hunan Prov.**, Huangsang County (26°17'N, 109°67'E), Alt 400–450 m, 7.VII.2016, Yang Luo (NWFU); 1 male, CHINA, **Yunnan Prov.**, Luchun County, Huanglian Mountain (22°53'N, 102°35'E), Alt 650–700m, 24.VI.2017, Ying-Qi Liu (CAU).

**Host plant:** *Conyza canadensis* (L.) Cronq. (Asteraceae).

**Biology.** We collected this species during the summer when the temperature and humidity were high. The specimens were collected along the side of a road in Huangsang County, at an elevation of 400m to 450m. All specimens were collected in hand-held sweep nets. All of the specimens of this species were collected from the host plant *Conyza canadensis* (L.) Cronq.

**Remarks.** Based on the description and the figures by Van Stalle (1991) and Guo & Feng (2010), this species closely resembles *I. huapingensis* in external appearance and male genitalia configuration. Diagnosis of these two species is described under the diagnosis section for *I. huapingensis*.

## **Discussion**

The biology of *Indolipa* species has not previously been studied. According to our collection surveys, these species

are generally found on grasses and shrubs, ranging in altitude from 0m to 2000m a.s.l. The host plants of *Indolipa* have not been previously reported; we found members of this genus on plants of the Asteraceae and Poaceae families. Feeding habits of *Indolipa* have not been documented, but other members of the subtribe *Pentastirina* feed on leaves and stalks, as reported for, e.g., *Melanoliarus oryicola* (Bourgoin *et al.*, 1998), *Oliarus zaonensis* (Wang, 1991), *Pentastiridius apicalis* (Uhler, 1896). *Indolipa* cause similar damage on their host plants.

The genus is distributed in eastern Asia and the Indo-Malayan region (Fig. 28). Most of the species of *Indolipa* occur in the Oriental region of the world, but can also be found in adjacent regions in the southwest Palearctic such as Tibet Autonomous Region (western of China). We anticipate that additional species of *Indolipa* will be found. The genus *Indolipa* has an unusual male genitalia structure that can be readily recognized among the Pentastirini. One of the earliest studies of male genitalia of *Indolipa tappanus* was conducted by Tsaur *et al.* (1988). Guo & Feng (2010) described and illustrated the morphological characters of male genitalia of *I. gansuensis* and *I. kurseongensis*, and these two species have a similar pygofer and male genitalia conformation to *I. gansuensis*, *I. kurseongensis* and *I. tappanus*. The aedeagus (Figs. 17–18, 26–27) of all of these species is screw-shaped and distal end of aedeagus has a large S-shaped process. The pygofer lacks a medioventral process and the periandrium has a basiventral process. We found that all these morphological characters are important in distinguishing this species-group from other *Indolipa* species.



**FIGURES 28.** Geographic distribution of *Indolipa* species: *I. bidiensis* (●); *I. binghami* (▼); *I. brunifrons* (◆); *I. fopingensis*, sp. n. (★); *I. fusconebulosus* (▼); *I. gansuensis* Feng (★); *I. greeni* (●); *I. huapingensis*, sp. n. (★); *I. indiensis* (■); *I. kurseongensis* (★); *I. lawitensis* (●); *I. madrasensis* (■); *I. malayensis* (●); *I. nilgiriensis* (■); *I. pahangensis* (●); *I. sabahensis* (●); *I. tamangensis* (●); *I. tappanus* (★); *I. thekkadiensis* (■).

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