

ORIGINAL ARTICLE

Chrysotus Meigen (Diptera: Dolichopodidae) from Shanxi, China, with descriptions of two new species

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Abstract The species of the genus *Chrysotus* Meigen from Shanxi, China are reviewed. Two species are described as new to science: *C. shanxiensis* sp. nov. and *C. thornpenis* sp. nov. *C. biprojicienus* Wei & Zhang and *C. serratus* Wang & Yang are recorded from Shanxi for the first time. A key to the species of *Chrysotus* from Shanxi is presented.

Key words Diptera, Dolichopodidae, Diaphorinae, *Chrysotus*, Shanxi, new species.

1 Introduction

The genus *Chrysotus* Meigen, 1824 is the largest genus of the subfamily Diaphorinae, with more than 300 species distributed worldwide. Among them, 65 species are known from the Palaearctic Region, 19 species from the Afrotropical Region, 44 species from the Oriental Region, 20 species from the Australasian and Oceanian Regions, 109 species from the Nearctic Region and 98 species from Neotropical Region (Yang *et al.*, 2011; Wei & Zhang, 2010; Wei, 2012a; Liu *et al.*, 2013). So far, 62 species have been recorded in China (Yang *et al.*, 2011; Wei & Zhang, 2010; Wei, 2012a; Liu *et al.*, 2013).

Shanxi Province, which located in North China, belongs to the Palaearctic Region in biogeography. Five species were known occurring in Shanxi. In this paper, two species are described as new to science and two species are recorded from Shanxi for the first time. A key to the species of *Chrysotus* from Shanxi is presented.

2 Materials and methods

The specimens in this study were collected from 2012 to 2013 by sweep nets, and are deposited in the Entomological Museum of China Agricultural University (CAU), Beijing.

Morphological terminology for adult structures mainly follows McAlpine (1981). Terms for the structures of the male genitalia follow Cumming and Wood (2009). The following abbreviations are used: acr—acrostichal bristle; ad—anterodorsal bristle; av—anteroventral bristle; d—dorsal bristle; dc—dorsocentral bristle; LI—fore leg; LII—mid leg; LIII—hind leg; pd—posterodorsal bristle; v—ventral bristle; CuAx ratio—length of m-cu / length of distal portion of CuA.

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3 Genus *Chrysotus* Meigen, 1824

Chrysotus Meigen, 1824: 40. Type species: *Musca nigripes* Fabricius, 1794.

Diagnosis. The genus can be distinguished from other genera in the Diaphorinae by the following characters: body small to median-sized, metallic green; males and females with frons wider than face, occasionally males holoptic or nearly so; face parallel-sided or narrowing downward; eyes shortly haired; male eyes very narrowly separated or contiguous on face (sometimes widely separated), with enlarged facets toward face; arista long, located at tip; propleuron with 2–3 bristles on lower part, and upper part bare; R_{4+5} and M parallel apically. Male genitalia: surstylus not branched, apically with short hairs and (or) 1 spine-like bristle; epandrial lobe long and broad; cercus small. Some species of the genus are similar to *Diaphorus* and *Dubius*, but can be separated from the others by the fr/fa (frons/face ratio) > 1.0 and arista located at tip (Yang *et al.*, 2011; Wei, 2012b).

Remarks. Yang *et al.* (2006) provided a list of synonymy of the genus.

Key to species (males) of *Chrysotus* from Shanxi

1. Epandrium with characteristic angular projection posteriorly (*Chrysotus laesus*-group *sensu* Wei & Zhang (2010)) 2
Epandrium without characteristic angular projection posteriorly (unknown species group) 3
2. Apex of phallus with row of denticulate processes *C. serratus*
Apex of phallus with two lateral lobes bluntly round *C. biprojicienus*
3. Phallus with 9–10 big spines *C. thornpenis* sp. nov.
Phallus without spines 4
4. Mid tibia with 1 ad at basal 1/5 *C. suavia*
Mid tibia with 2 ad 5
5. Hypandrium behind apex of lateral epandrial lobe 6
Hypandrium far protruded apex of lateral epandrial lobe 7
6. Hind tibia yellow with brown apex; epandrium rounded posteriorly *C. shanxiensis* sp. nov.
Hind tibia black; epandrium with sunk part posteriorly *C. femoratus*
7. Apex of phallus bifid; mid tibia with 1 pd *C. gramineus*
Apex of phallus not bifid 8
8. Fore coxa yellow; apex of phallus with hollow *C. cilipes*
Fore coxa pale black; apex of phallus without hollow *C. pulchellus*

4 New species and new record of *Chrysotus* from Shanxi

4.1 *Chrysotus biprojicienus* Wei & Zhang

Chrysotus biprojicienus Wei & Zhang, 2010. *Zootaxa*, 2683: 10. Type locality: China, Guizhou, Shibing, Yuntaishan.

Description. Femora blackish; tibiae yellow except bases of all tibiae and apex of hind tibia blackish. Epandrium with angular projection posteriorly. Hypandrium with somewhat pointed end, slightly projecting beyond level of waved distal margin of lateral epandrial lobe. Apex of phallus with two lateral lobes.

Specimens examined. 5♂, 5♀, China, Shanxi, Qinshui, Xiachuan (35°48'N, 112°16'E; elev. 772 m), 27–31 July 2012, coll. Zhen-Hua Zhang.

Distribution. China (Shanxi, Tibet, Guizhou).

4.2 *Chrysotus serratus* Wang & Yang

Chrysotus serratus Wang & Yang, 2006. *Mitt. Mus. Nat. kd. Berl., Dtsch. Entomol. Z.*, 52(2): 253. Type locality: China, Beijing, Xiangshan Park.

Description. Male face rather wide. Eyes rather widely separated on face. First flagellomere 2.0 times wider than long. Palpus black. Legs chiefly black. Apex of phallus with row of denticulate processes.

Specimens examined. 2♂, China, Shanxi, Yicheng, Dahe (35°26'N, 111°55'E; elev. 583 m), 26 July 2012, coll. Zhen-Hua Zhang.

Distribution. China (Shanxi, Beijing).

4.3 *Chrysotus shanxiensis* sp. nov. (Figs 1, 3–5)

Description. First flagellomere subtriangular, 1.4 times wider than long. Base and apex of fore and mid femora yellow, especially ventral side with more yellow at base and apex, hind femur yellow at basal 1/2; fore and mid tibiae yellow, hind tibia yellow with brown apex (Fig. 1).

Male. Body length 1.7–2.2 mm, wing length 1.5–2.0 mm.

Head metallic green with pale gray pollinosity; eyes contiguous on face. Hairs and bristles on head black except postero-ventral hairs pale. Antenna brown; first flagellomere subtriangular, 1.4 times wider than long; arista brown, short pubescent (Fig. 3). Proboscis brown with pale hairs; palpus brown with 1 dark yellow bristle at apex.



Figs 1–2. Habitus photographs. 1. *Chrysotus shanxiensis* sp. nov., male. 2. *Chrysotus thornpenis* sp. nov., male. Scale bars = 0.5 mm.

Thorax metallic green with pale gray pollinosity. Hairs and bristles on thorax black; 6 dc (5 strong and anterior 1 weak), 6–7 irregularly paired acr short and hair-like; scutellum with 2 pairs of bristles, basal pair short and hair-like, lateral pair long; proepisternum with 1 long black bristle on lower part and 1 short black bristle on upper part.

Legs mainly brown except all trochanters yellow; base and apex of fore and mid femora yellow, especially ventral side with more yellow at base and apex, hind femur yellow at basal 1/2; fore and mid tibiae yellow, hind tibia yellow with brown apex. Fore and mid tarsomere 1 and base of tarsomere 2 yellow, base of hind tarsomere 1 yellow. Hairs and bristles on legs black. Fore coxa with long hairs, hind coxa with 1 outer bristle at base. Hind trochanter with 1 bristle at middle. Fore femur with 4 pv, mid femur with 2–3 pv, hind femur with 3 av. Fore tibia with 1 ad at basal 1/4, apically with 3 short bristles. Mid tibia with 2 strong ad at basal 1/5 and 3/5, with 2 weak pd at basal 1/5 and 3/5; apically with 4 bristles. Hind tibia with row of av and 3 ad; apically with 3–4 bristles. Hairs on apical of hind tibia and hind tarsomere 1 dense and long. Relative lengths of tibia and 5 tarsomeres of legs I–III as follows: LI : 4.5 : 2.0 : 1.2 : 0.7 : 0.5 : 0.5 ; LII : 5.5 : 2.8 : 1.5 : 1.0 : 0.5 : 0.5 ; LIII : 5.5 : 2.0 : 1.5 : 1.0 : 0.6 : 0.5.

Wing hyaline; veins blackish, R_{4+5} and M parallel apically; CuAx ratio 0.25. Squama yellow with brown hairs. Halter pale yellow.

Abdomen metallic green with pale gray pollinosity; hairs and bristles on abdomen black. Male genitalia (Figs 4–5): Epandrium somewhat rounded, without angular projection posteriorly. Lateral epandrial lobe protruded and wide. Surstylus somewhat long and curved, with acute end. Cercus short and wide, with moderated bristles. Apex of phallus with 2 fin-like structure.

Female. Body length 2.0–2.4 mm, wing length 1.9–2.2 mm. Similar to male, but eyes widely separated. Hind tibia entirely yellow. Hairs on apical of hind tibia and hind tarsomere 1 normal.

Holotype ♂, China, Shanxi, Qinshui, Xiachuan (35°48'N, 112°16'E, elev. 772 m), 27–31 July 2012, coll. Zhen-Hua Zhang. Paratypes: 5♂, 5♀, same data as holotype.

Distribution. China (Shanxi).

Etymology. The specific epithet refers to the locality of the holotype, Shanxi.

Remarks. The new species is similar to *C. motuoensis* Liu & Yang, 2013 in the male genitalia and antenna, but can be separated from the latter by the fore tibia with 1 ad at basal 1/4 and the apex of phallus with 2 fin-like structures. In *C. motuoensis*, the fore tibia has no ad and the apex of phallus has 2 sheet-like structures (Liu & Yang, 2013).

4.4 *Chrysotus thornpennis* sp. nov. (Figs 2, 6–8)

Description. First flagellomere nearly subtriangular, 1.5 times wider than long. All legs dark brown to black; all coxae and femora black; all tibiae and tarsi brown (Fig. 2).

Male. Body length 2.0–2.2 mm, wing length 1.8–2.0 mm.

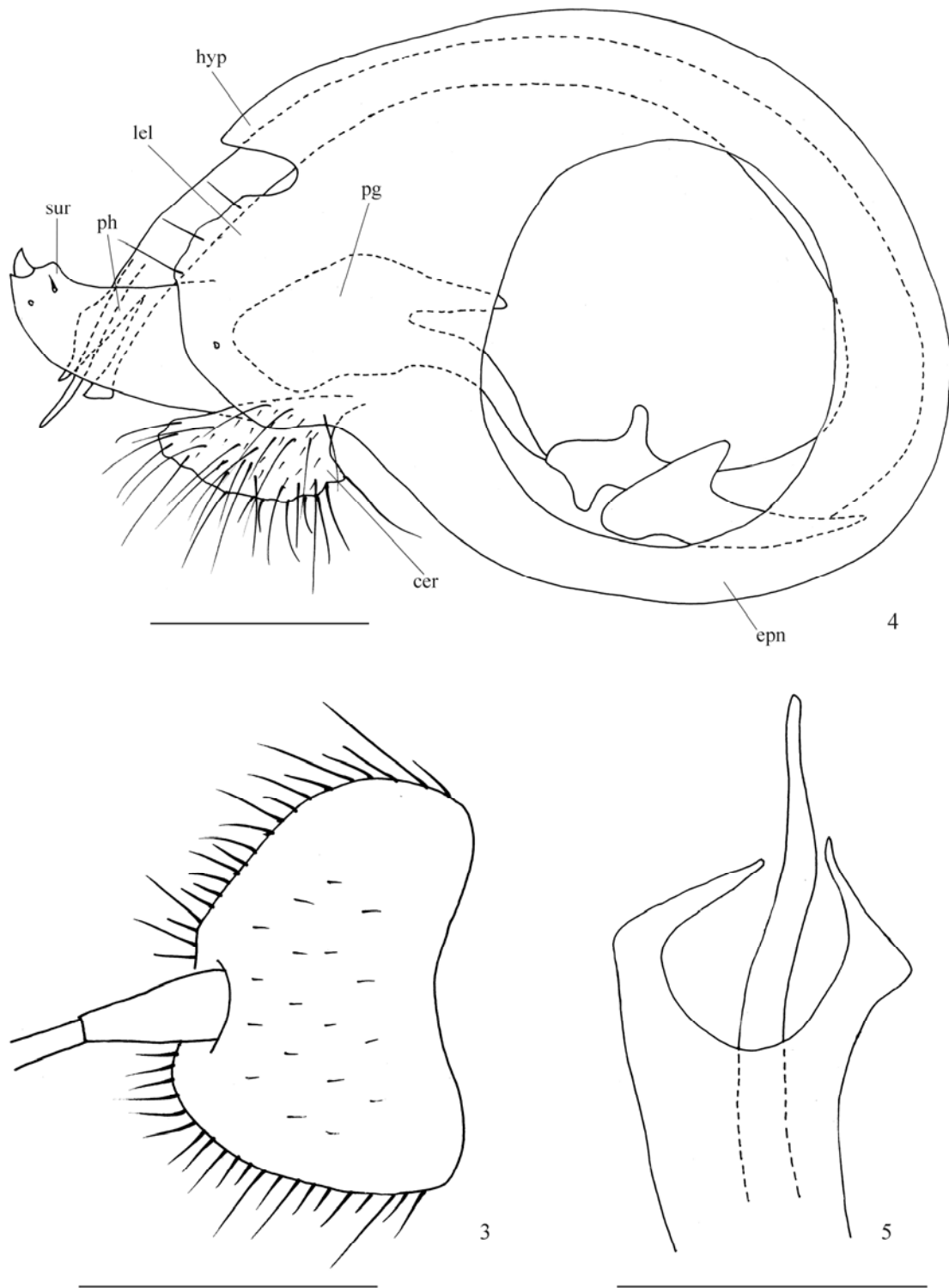
Head metallic green with pale gray pollinosity; eyes contiguous on face. Hairs and bristles on head black, postocular bristles (including postero-ventral hairs) somewhat pale. Antenna dark brown to black, scape and pedicel black, flagellomere dark brown; first flagellomere nearly subtriangular, 1.5 times wider than long; arista dark brown, short pubescent (Fig. 6). Proboscis brown with brown hairs; palpus brown with 1 brown bristle.

Thorax metallic green with pale gray pollinosity. Hairs and bristles on thorax black; 6 dc (5 strong and anterior 1 weak), 4–5 irregularly paired acr short and hair-like; scutellum with 2 pairs of bristles, basal pair long, lateral pair short and hair-like; proepisternum with 1 long black bristle on lower part and 1 short black bristle on upper part.

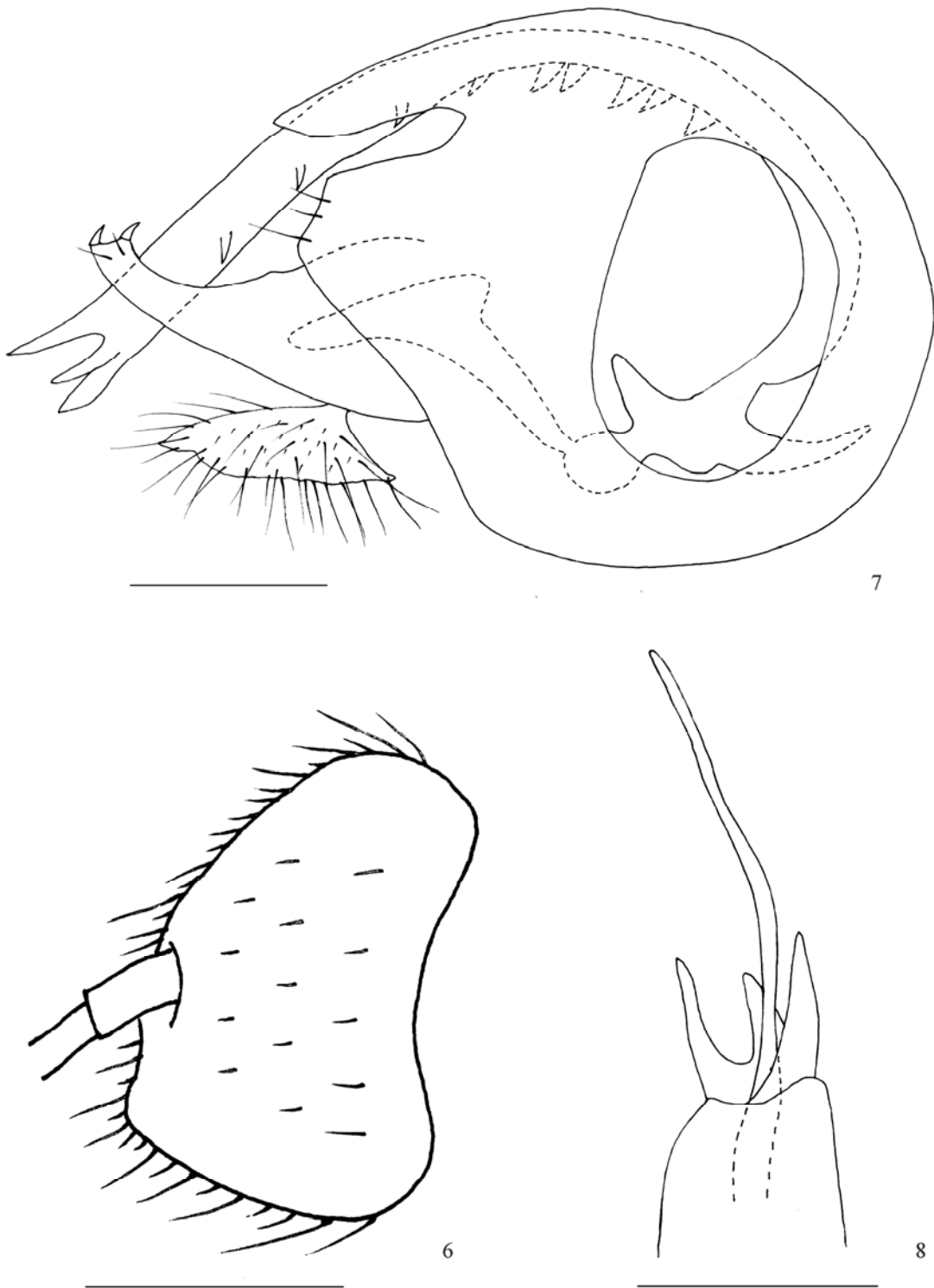
All legs dark brown to black; all coxae and femora black; all tibiae and tarsi brown. Hairs and bristles on legs black. Fore coxa with long hairs; mid coxa with 1 bristle; hind coxa with 1 outer bristle at base and 1 short bristle at apex. Hind trochanter with 1 bristle at middle. All femora with row of av and row of pv. Fore tibia with 5–6 weak ad, a row of weak v; 3–4 bristles apically. Mid tibia with 2 strong ad at basal 1/4 and 1/2, 1 weak pd at basal 1/2; 3–4 bristles apically. Hind tibia with 2 ad at basal 1/5 and 2/5, 3–4 pd, 5–6 weak pv, a row of weak av; apically with 3–4 weak bristles. Relative lengths of tibia and 5 tarsomeres of legs I–III as follows: LI : 4.5 : 2.3 : 1.2 : 1.0 : 0.6 : 0.6 ; LII : 5.7 : 2.8 : 1.5 : 1.1 : 0.7 : 0.7 ; LIII : 6.5 : 2.0 : 1.7 : 1.3 : 0.8 : 0.8 .

Wing hyaline, somewhat tinged brown; veins blackish, R_{4+5} and M parallel apically; CuAx ratio 0.3. Squama brown with black hairs. Halter pale yellow.

Abdomen metallic green with pale gray pollinosity; hairs and bristles on abdomen black. Male genitalia (Figs 7–8): Epandrium somewhat rounded, without angular projection posteriorly. Apex of hypandrium nearly parallel with apex of



Figs 3–5. *Chrysotus shanxiensis* **sp. nov.**, male. 3. First flagellomere, lateral view. 4. Genitalia, lateral view. 5. Apex of phallus, ventral view. Abbreviations: cer, cercus; epn, epandrium; hyp, hypandrium; lel, lateral epandrial lobe; pg, postgonite; ph, phallus; sur, surstylus. Scale bars = 0.1 mm.



Figs 6–8. *Chrysotus thornpenis* sp. nov., male. 6. First flagellomere, lateral view. 7. Genitalia, lateral view. 8. Apex of phallus, ventral view. Scale bars = 0.1 mm.

lateral epandrial lobe. Lateral epandrial lobe short and weakly protruded, bearing 3 setae. Surstylus wide at base. Cercus subtriangular with moderated bristles. Phallus with 9–10 big spines, apex of phallus divide into 3 strip-liked structure.

Female. Body length 2.4–2.6 mm, wing length 2.2–2.3 mm. Similar to male, but eyes widely separated on face, hind tibia without a row of weak av.

Holotype ♂, China, Shanxi, Mt. Li, Shunwangping (35°23'N, 111°58'E; elev. 1900 m), 20 July 2013, coll. Shuai Su. Paratypes: 3♂, 2♀, China, Shanxi, Mt. Li, Zhuweigou Vallage (35°25'N, 111°59'E; elev. 1900 m), 29 July 2013, coll. Ting-Ting Zhang

Distribution. China (Shanxi).

Etymology. The specific epithet refers to the phallus with spines.

Remarks. The new species is similar to *C. polaris* Negrobov & Maslova, 2000 in the phallus with spines, but can be separated from the latter by the phallus with 9–10 big spines, and the apex of the hypandrium nearly parallel with the apex of the lateral epandrial lobe. In *C. polaris*, the phallus has 7 spines, and the hypandrium is far behind the apex of the lateral epandrial lobe (Negrobov & Maslova, 2000).

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