

DESCRIPTIONS OF THE FEMALE GENITALIA OF CIXIOPSIS PUNCTATUS AND TAMBINIA DEBILIS (HEMIPTERA, FULGOROMORPHA, TROPIDUCHIDAE)

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Abstract Female genitalia and their various components of *Cixiopsis punctatus* Matsumura and *Tambinia debilis* Stål (Hemiptera, Fulgoromorpha, Tropiduchidae) are described and illustrated. The results show that *C. punctatus* has a monotrystic conformation, while *T. debilis* has a ditrystic configuration. The female genitalia characters are suggested as useful characters for taxonomic and phylogenetic studies.

Key words Tropiduchidae, *Cixiopsis punctatus*, *Tambinia debilis*, female genitalia.

1 Introduction

Although maximum attention has been paid to the variability of male genitalia in Fulgoromorpha systematics since the beginning of last century, relatively little is known about female genitalia. For Tropiduchidae, only few papers provided valuable information about the structure of female genitalia: Asche & Wilson (1989) described the female genitalia of 10 species in genus *Ommatissus* Fieber, 1872. Yang *et al.* (1989) described the external structures of female genitalia of 12 species in Tropiduchidae from Taiwan. Bourgoïn and Huang (1991) studied the Trypetimorphini.

This study consists of descriptions and illustrations of the female genitalia of *Cixiopsis punctatus* Matsumura, 1900 and *Tambinia debilis* Stål, 1859. Their various components are also given, with the aim of providing useful data for taxonomic and phylogenetic studies.

2 Materials and Methods

The specimens studied in the course of this work are from the Insect Collection of the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS).

Specimens used for description and illustration were pinned or preserved in 70% isopropyl alcohol. Abdomens were removed and cleaned in 10% cold KOH overnight. After transferred to distilled water, the specimens were stained by Methylrosanilinium

Chloride Solution to highlight the internal thin and transparent membranous parts of the structures studied. Precise dissections and cleaning of genitalic structures were finished in distilled water. Observations and drawings were done in glycerine.

Terminology used in descriptions of the female genitalia follows Bourgoïn (1993). Absolute measurements are used for body length in millimetres (mm). Abbreviations used for characters include: ACL = anterior connective lamina of gonapophyses VIII, At = anal tube, ap = anal apodeme, BC = bursa copulatrix, BCd = bursa copulatrix ductus, c = copulaporus, CT = copulatory duct, dr = ductus receptaculi, dvd = diverticulum ductus, Epr = epiproct, g = gonoporus, Fa = anterior fibula, Fp = posterior fibula, ga = glandula apicalis, Gl = gonospiculum, Gp = gonoplac, Gxf = gonocoxal fold, GxP = endogonocoxal process, GxL = endogonocoxal lobe, Gx VIII = gonocoxae VIII, Gy VIII = gonopophyses VIII, Gy IX = gonopophyses IX, o = oviporus, OC = common oviduct, or = orificium receptaculi, PCL = posterior connective lamina, Ppr = paraproct, so = sclerotized ornamentations, Sp = spermatheca, spp = pars intermedialis, V = vagina, VA = anterior vagina, VP = posterior vagina.

3 Descriptions of Female Genitalia

Cixiopsis punctatus Matsumura, 1900 (Figs. 1-4)
Cixiopsis punctatus Matsumura, 1900. *Ent. Nachr.*, 26: 208 (4).

The female genitalia of *C. punctatus* belongs to

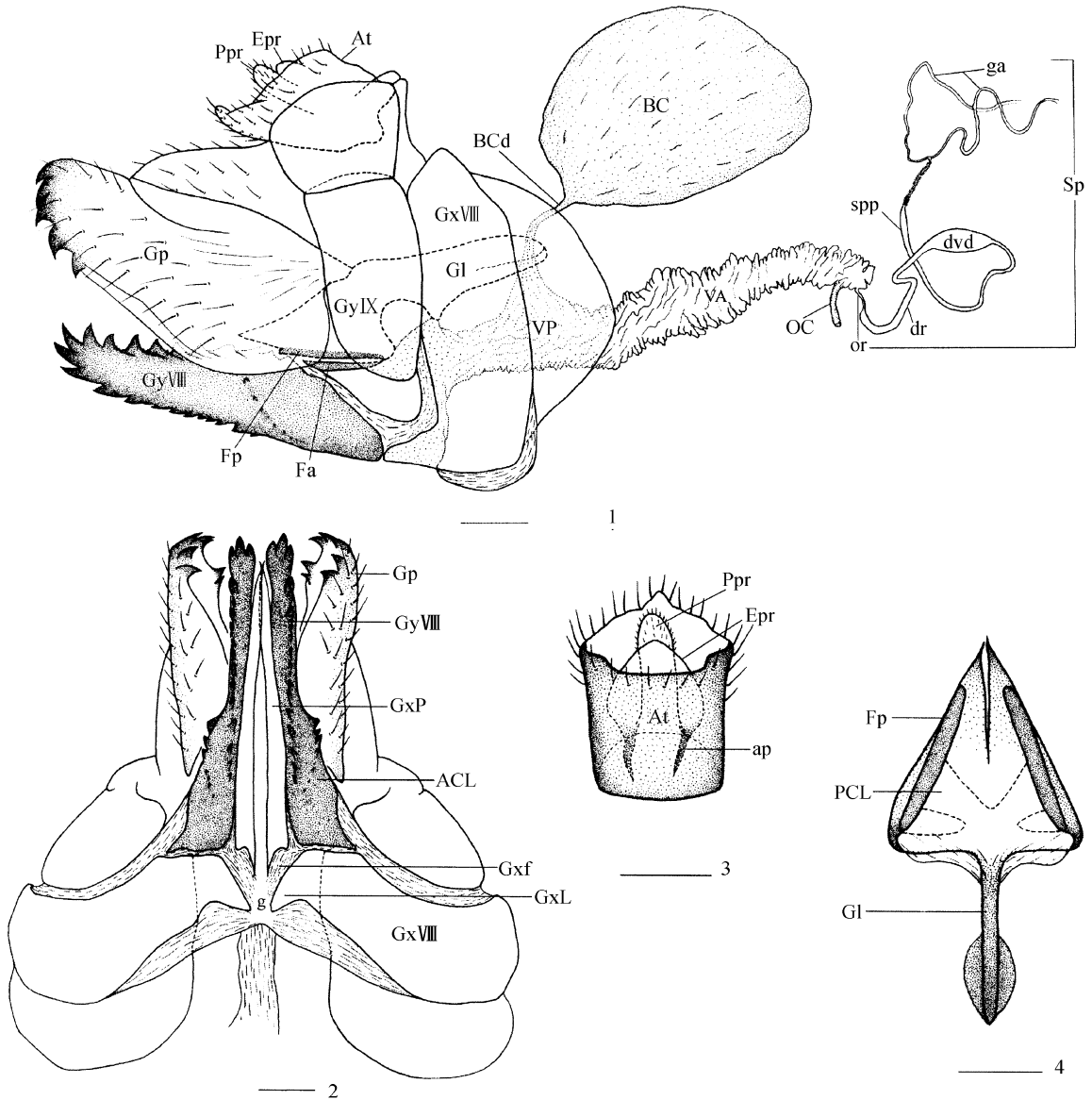
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the ovipositor type. At minute, cylindrical in dorsal view; anal style (Epr and Ppr) relatively short and small, not reaching beyond the apical ventral margin of anal tube in lateral view. Gy VIII (first valvula) saw-like, strongly sclerotized with about 10-12 teeth on their dorsal margin, with several indistinct, minute teeth arranged in 6 oblique short rows, ventral margin with about 11-15 teeth, laterally at base with an oblique row of 5-7 teeth. Gy IX (second valvula) triangular, fused together on their inner lateral margin

and strongly reduced but well sclerotized, apical ends not meeting together, acute at apex, Gl slightly shorter than median length of triangular part 1.0: 1.1, flattened laterally. Gp (third valvula) stout, more or less membranous on their inner margin, the upper margin mainly formed by stout tapering rods that end close to the apex. The margin then curves down into the apical margin, which is subvertical with 7 stout incurved teeth.



Figs. 1-4. *Cixiopsis punctatus* Matsumura. 1. Female genitalia, lateral view. 2. Same, ventral view. 3. Anal segment, dorsal view. 4. Gonopophyses IX, ventral view. Scale bars= 0.2 mm.

C. punctatus has a monotrysic conformation which is the typical and general condition in most Fulgoromorpha. Only one opening (g) occurs between Gy VIII and Gy IX in their genital ducts, the oviposition track and copulation track use the same duct. Gx VIII are almost rectangular sclerotized plates.

Dorsally, a large BC opens into the V by a thin BCd. The OC opens anteroventrally and the Sp opens apically into the VA. Sp comprises five parts, or, dr, dvd, spp and ga, ga distinctly separated two longish ducts.

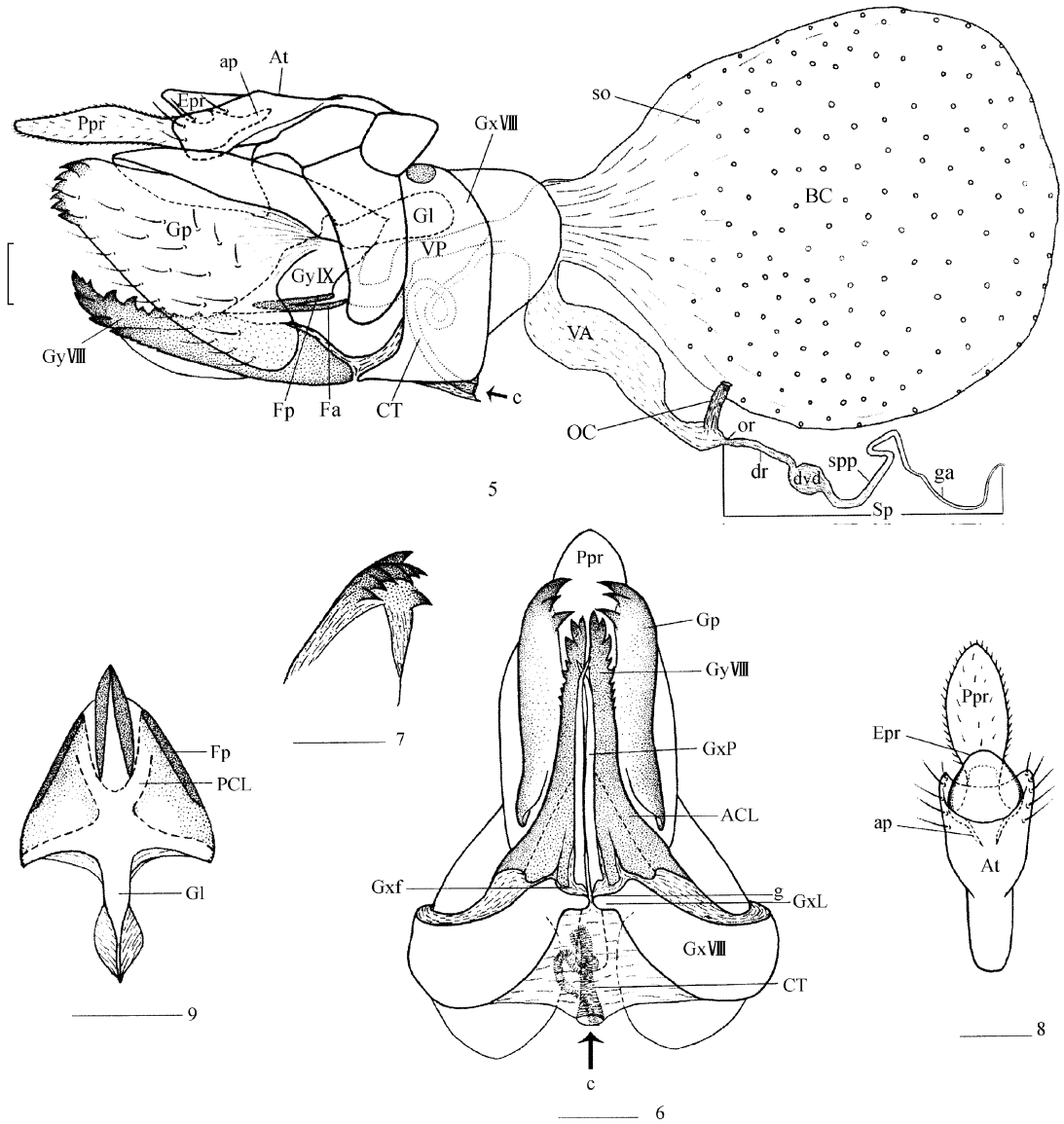
Specimens examined. China, Fujian Province, 1

♀, Guadun, Chonganxincun, 1 140 m, 2 July 1960, JIANG Sheng-Qiao (IZCAS); 1 ♀, Guadun, Chonganxincun, 800-1 140 m, 22 July 1960, PU Fu-Ji (IZCAS); 1 ♀, Guadun, Chonganxincun, 1 140-1 200 m, 22 July 1960, JIANG Sheng-Qiao (IZCAS); 1 ♀, Guanping, Chongantongmuguan, 900 m, 30 July 1960, PU Fu-Ji (IZCAS); 1 ♀, Guanping, Chongantongmuguan, 850-1 000 m, 21 July 1960, JIANG Sheng-Qiao (IZCAS); 1 ♀, Guanping, Chongantongmuguan, 900 m, 30 July 1960, PU Fu-Ji (IZCAS).

Tambinia debilis Stål, 1859 (Figs. 5-9)

Tambinia debilis Stål, 1859. *Berliner Ent. Ztit.*, 3: 317.

T. debilis presents a similar morphological configuration, ovipositor type. At moderately large, caudal margin slightly concaved medially, in lateral view with dorsal margin much shorter than ventral margin; anal style (Epr and Ppr) long, protruding to level of Gp (third valvula). Gy VIII (first valvula) narrow, in right lateral aspect taper distad to end, 8-10 teeth on dorsal margin, the apical part with 2 large



Figs. 5-9. *Tambinia debilis* Stål. 5. Female genitalia, lateral view. 6. Same, ventral view. 7. Tip of gonoplac. 8. Anal segment, dorsal view. 9. Gonopophyses IX, ventral view. Scale bars= 0.2 mm.

teeth, the third one outer tooth, 2-3 indistinct, minute teeth at apex; ventral margin slightly curved dorsad, with 8-10 teeth, 3 stout teeth at apical fourth; laterally at apex with an oblique row of several minute teeth. Gy IX (second valvula) strongly reduced and widest at

base, where they are fused together, triangularly converging caudad, apical ends meeting together, acute at apex; G1 slightly shorter than median length of triangular part 1.0: 1.3, flattened laterally, acute at base. Gp (third valvula) very large, relatively

narrow basally, abruptly and strongly widen before the middle then narrow to apex, in lateral view longer than the widest part at basal ninth, about 1.3: 1.0; apical part with 8 teeth directed mesad.

In female of *T. debilis* the genital ducts have two different openings, one is o which situates exteriorly the VP between the four gonapophyses; the other is c occurring just anterior to Gy VIII ducts used in oviposition and copulation are different. Gx VIII are more or less rectangular sclerotized plates with a distinct black spot on the caudodorsal edge. CT is a membranous, more or less sclerotized duct, directed cephalad and twisted ventrad, then enters into the BC. The BC is a pouch like structure which opens broadly into the V, bears many small so which are related to the reception of a spermatophore in its wall (Strübing, 1955). In *T. debilis*, the structure of Sp is appreciably different: ga comprises one duct.

Specimens examined. China, Hainan Province, 1 ♀, Tongshi, 340 m, 3 Aug. 1960, LI Suo-Fu (IZCAS); 1 ♀, Wanning, 10 m, 12 Apr. 1960, LI Chang-Qing (IZCAS); Guangxi Province, 1 ♀, Yanshan, Guilin, 200 m, 12 July 1963, WANG Churr Guang (IZCAS).

4 Discussion

Female genitalic characters have not been used extensively in Fulgoromorpha systematics. This is due to the insufficient examination or availability of specimens that can be associated reliably with males and the paucity of detailed descriptions and illustrations. Several tentative studies have been done on female genitalia to separate species of some

delphacid taxa (Ossiannilsson, 1978) and to revise the tribal classification of Tropiduchidae (Fennah, 1982). Bourgoin (1993) suggested that a detailed study of the female genitalic characters can provide new sets of characters for taxonomic and phylogenetic analyses. The work reported in this paper was undertaken to acquire basic information about the female genitalia of Tropiduchidae species. The data are intended to serve as a basis for further investigation, such as those dealing with the mechanism of transovarian virus transmission, ovulation, oviposition and population buildup by those insects; and for providing new sets of characters for taxonomic and phylogenetic analyses.

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鳖扁蜡蝉和娇弱蛄扁蜡蝉雌性生殖器的描述 (半翅目, 蜡蝉总科, 扁蜡蝉科)

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摘要 对扁蜡蝉科 (半翅目, 蜡蝉总科) 中鳖扁蜡蝉 *Cixiopsis punctatus* Matsumura 和娇弱蛄扁蜡蝉 *Tambinia debilis* Stål 的雌性生殖器进行了详细描述, 绘制特征图并指

关键词 扁蜡蝉科, 鳖扁蜡蝉, 娇弱蛄扁蜡蝉, 雌性生殖器.
中图分类号 Q969.4

明各部分的结构名称。结果表明前者生殖管道属于单开口类型, 而后者是双开口类型。雌性生殖器特征可为分类学和系统发育分析提供更多的参考信息。