



Review of the leafhopper tribe Goniagnathini (Hemiptera: Cicadellidae: Deltocephalinae) from China

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Abstract

The leafhopper tribe Goniagnathini (Cicadellidae: Deltocephalinae) is reviewed from China. Seven species are recognised and a key provided for the six species for which males are known. One new species, *Goniagnathus cornutus* sp. n., is described and *Megalopsius tamaricius* Cai, is transferred to *Tamaricades*, **comb. nov.**

Key words: Taxonomy, Homoptera, Auchenorrhyncha, leafhopper, new species, China

Introduction

By virtue of their squat appearance and short and broad head (Fig. 7) members of cicadellid tribe Goniagnathini are some of the most conspicuous leafhoppers of the subfamily Deltocephalinae. Similarly, their male genitalia are distinctive, having fused subgenital plates and valve (Figs 1–6B), fused aedeagus and connective, the latter with arms close to each other (Figs 1–6D, 1–6E) and styles usually with a transverse fracture at midlength (Figs 1–6C). Of the three genera included in the tribe, two, *Goniagnathus* Fieber and *Tamaricades* Emeljanov, occur in China and are revised in the present work. In total, seven of the eight valid species are treated (one new) and a key is provided for their separation. One species, *G. formosanus* Matsumura, 1913: 69, plate 8, fig. 22, known only from the female, is not treated further. Other regional studies of the tribe, all for species of *Goniagnathus*, include Linnavuori (1978) (Africa), Dash & Viraktamath (2001) and Viraktamath & Gnaneswaran (2009) (India) and Fletcher & Zahniser (2008) (Australia). Morphological terminology follows Kuoh (1966) and Zhang (1990)

Depositories

The material examined is deposited in the Entomological Museum of Northwest A & F University (NWAUFU), Zhongshan University (ZSU), Guangdong Entomological Institute (GDEI), Hebei University (HU), Jiangxi Agricultural University (JXAU) and Shanghai Entomological Museum, Chinese Academy of Sciences (SHEM).

Checklist of Chinese Goniagnathini

Goniagnathus Fieber s. str.
brevis (Herrich-Schäffer)

Goniagnathus (*Tropicognathus*) Viraktamath & Gnaneswaran

cornutus Duan, **sp. n.**

formosanus Matsumura

nervosus Melichar

punctifer (Walker)

taiwanus (Matsumura)

Goniagnathus (*Epitephra*) Emeljanov

rugulosus (Haupt)

castaneus Kato

Tamaricades Emeljanov

tamaricus Cai

Key to the genera of Goniagnathini from China

1. Pronotum transversely striate.....*Goniagnathus*
- Pronotum smooth.....*Tamaricades*

***Goniagnathus* Fieber**

Goniagnathus Fieber, 1866: 506. Type species: *Jassus brevis* Herrich-Schäffer, by original designation.

Distribution. Palaearctic, Afrotropical, Oriental, Australia.

Remarks. Emeljanov (1999) divided the Palaearctic species of the genus into five subgenera (in key) and Viraktamath & Gnaneswaran (2009) added another subgenus (*Tropicognathus*) for the Indian species. These changes are reflected below. From its description the identity of *G. taiwanus* (types not examined) remains uncertain.

Key to subgenera and species of Chinese *Goniagnathus* (males)

1. Fused subgenital plates and valve elongate (Fig. 5B); male pygophore without appendages (Fig. 5A).....*G. (Epitephra) rugulosus* (Haupt)
- Fused subgenital plates and valve short; male pygophore with or without appendages2
2. Pygophore without appendages (Fig. 1A); style apophysis with apex strongly oblique, subapical lobe well developed (Fig. 1C); aedeagal shaft very elongate with short spine-like processes (Figs 1D and 1E).....*G. (Goniagnathus) brevis* (Herrich-Schäffer)
- Pygophore with dorsocaudal appendages present (Figs 2A, 3A and 4A); style apophysis with apex not strongly oblique, subapical lobe moderate to weakly developed; aedeagal shaft moderately long with elongate processes (Figs 2D, 2E, 3D, 3E, 4D and 4E) *G. (Tropicognathus)* 3
3. Pygophore with dorsal margin concave, apical margin truncate (Fig. 4A); style apophysis expanded apically (Fig. 4C).....*G. nervosus* Melichar
- Pygophore subtriangular with apex narrowly rounded (Figs 2A, 3A); style apophysis similar in width throughout length (Figs 2C, 3C).....4
4. Pygophore process elongate (Fig. 2A); aedeagal shaft in lateral view with pair of apical linear processes (Fig. 2E).5
- Pygophore process robust (Fig. 3A); aedeagal shaft in lateral view with pair of apical triangular processes (Fig. 3E).....*G. cornutus* **sp. n.**
5. Lower aedeagal processes situated at midlength of shaft (Figs 2D, 2E).....*G. punctifer* (Walker)
- Lower aedeagal processes situated slightly basad of midlength of shaft*G. taiwanus* (Matsumura)

Goniagnathus (Goniagnathus)

Goniagnathus (Goniagnathus) Fieber, 1866: 506. Type species: *Jassus brevis* Herrich-Schäffer

***Goniagnathus (Goniagnathus) brevis* (Herrich-Schäffer)**

(Figs 1A–E, 7A, 7G, 8A)

Jassus brevis Herrich-Schäffer, 1836: 15.

Goniagnathus brevis, Ribaut, 1952: 189, Figs 408–413.

Length. Male: 5.5 mm.

Robust. Dark brown with interrupted white fascia on face. Forewing veins with white spots.

Vertex 3–4x as wide as median length. Pronotum transversely rugose, slightly narrower than vertex, 3x as long as crown. Forewing veins thick, inner anteapical cell closed basally by cross vein.

Male genitalia. Pygophore constricted at mid-length with a few macrosetae, without appendages. Fused subgenital plates and valve almost as broad as long, with convexly rounded caudal margin, with a few macrosetae. Apophysis of style with tooth-like processes. Aedeagus long of uniform width, flared at apex, with one spinule at midlength on each lateral margin; gonopore apical.

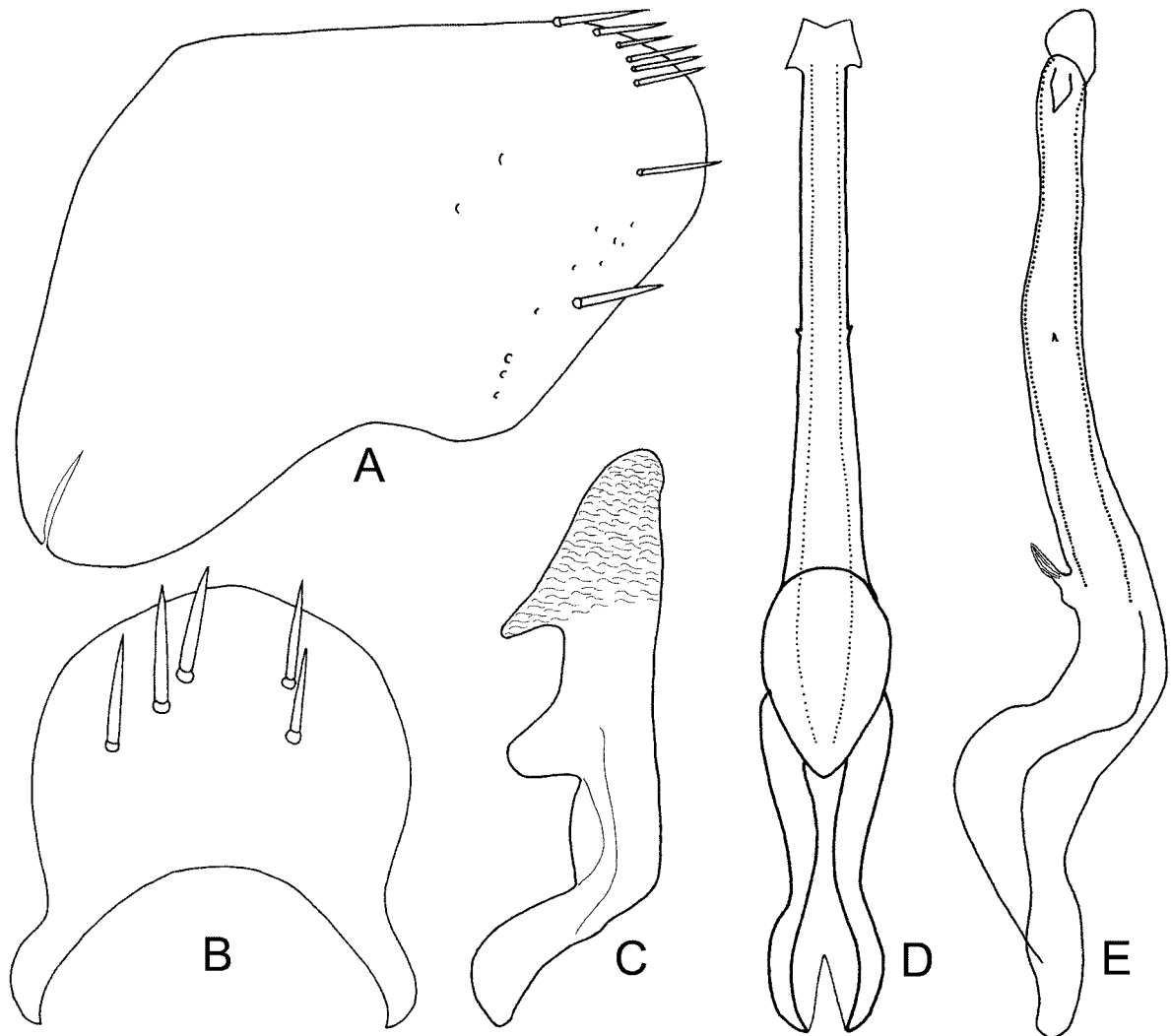


FIGURE 1. *Goniagnathus (Goniagnathus) brevis* (Herrich-Schäffer). A: Male pygophore, lateral view; B: Fused subgenital plates and valve, ventral view; C: Apical half of style, dorsal view; D: Aedeagus, dorsal view; E: Aedeagus, lateral view.

Material examined. China, 1♂, **Xinjiang Autonomous Region:** Buerjin, Hemu, 9. viii. 2006, coll. Dai Wu & Kang Juxia (NWFU).

Distribution. Europe, China (Xinjiang) [new record for China].

Remarks. The identity of this species is taken from Ribaut (1952).

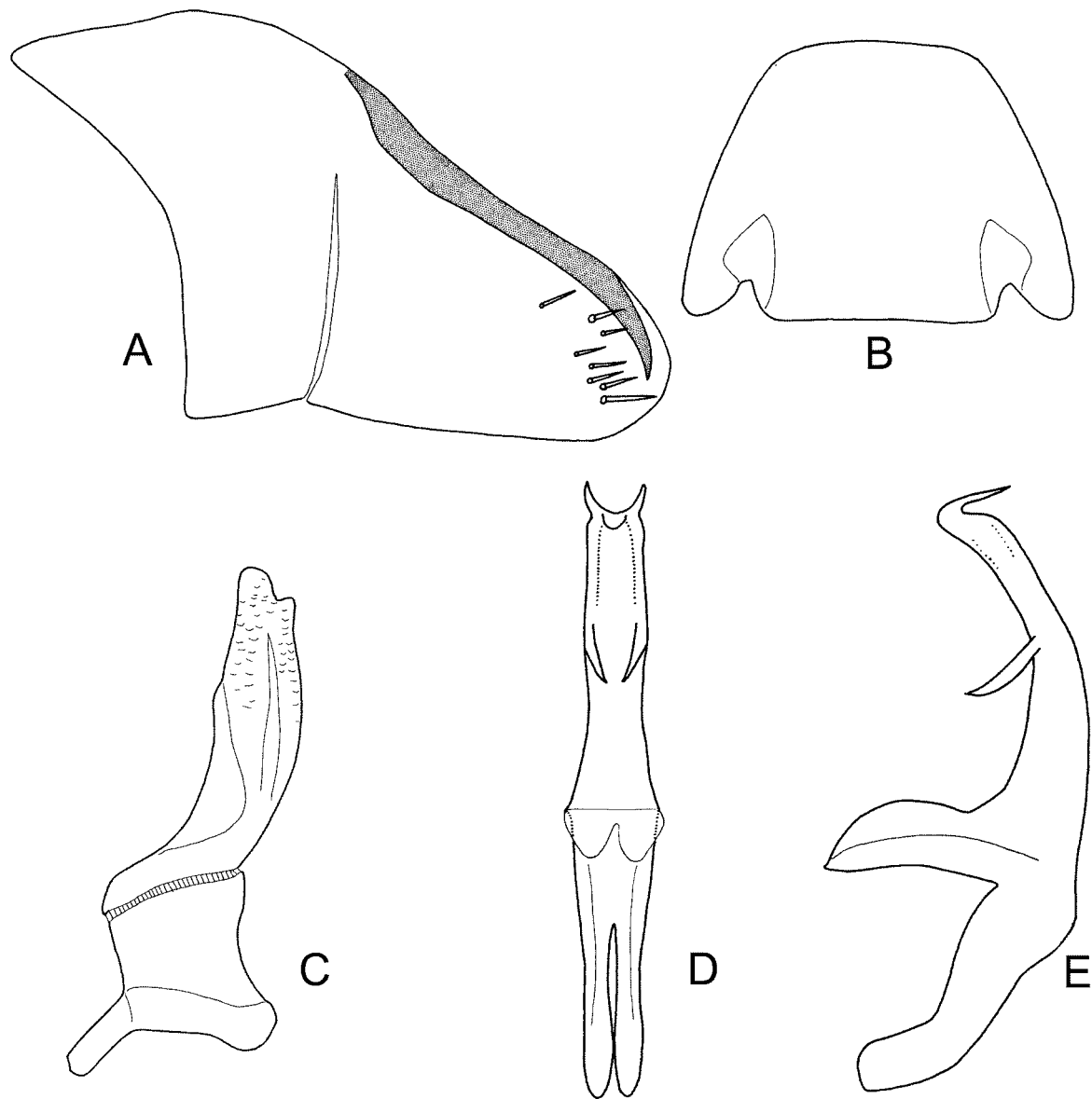


FIGURE 2. *Goniagnathus (Tropicognathus) punctifer* (Walker). A: Male pygophore, lateral view; B: Fused subgenital plates and valve, ventral view; C: Style, dorsal view; D: Aedeagus, dorsal view; E: Aedeagus, lateral view.

Goniagnathus (Tropicognathus)

Goniagnathus (Tropicognathus) Viraktamath, 2009: 52. Type species: *Goniagnathus fumosus* Distant.

Goniagnathus (Tropicognathus) punctifer (Walker)

(Figs 2A–E, 7E, 7K, 8D)

Bythoscopus punctifer Walker, 1858: 104.

Goniagnathus elongatus Lethierry, 1892: 209.

Goniagnathus spurcatus Melichar, 1903: 181.

Goniagnathus punctifer, Distant, 1908: 311; Zhang, 1990: 91; Dash & Viraktamath, 2001: 71, Figs 38–44.

Goniagnathus (Tropicognathus) punctifer, Viraktamath & Gnanewaran, 2009: 52.

Length. Male: 5.1–6.4mm; Female: 5.6–6.4mm.

Ochraceous, with irregular reddish-brown markings on vertex, pronotum and scutellum. Anterior margin of vertex yellow with faint brownish spots. Eyes black with reddish-brown margin and stripes. Face with interrupted black fascia. Forewing ochraceous.

Vertex 5x as wide as median length. Forewing with inner anteapical cell closed basally by cross vein.

Male genitalia. Pygophore caudally narrowed with an obtusely rounded caudal lobe having a few setae, dorsocaudal appendage slender, black, not reaching caudo-ventral angle. Fused subgenital plates and valve twice as broad as median length, narrowed caudally with truncate apex. Style with bilobed apophysis, outer lobe slightly longer than inner one. Aedeagal shaft slightly curved, with an apical pair of laterally directed processes, a median pair of slightly asymmetrically curved processes on cephalic margin at mid-length; gonopore large, apical; dorsal apodeme prominent.

Female genitalia. Seventh sternite 3x as wide as long, hind margin broadly produced with a median notch.

Material examined. China, **Jiangxi Prov.:** 26♂♂, 16♀♀, Ruijin, Bayingxiang, 280m, 15–16. viii. 2004, coll. Weicong & Yang Meixia (NWFU); **Zhejiang Prov.:** 1♂, Jiande Lingxi, 24. ix. 1982, coll. Xia Fan (SHEM); **Guizhou Prov.:** 1♂, 19. vi. 1958 (SHEM); **Hunan Prov.:** 1♀, Baisha, 23. iii. 1959, coll. Jin Gentao (SHEM); **Fujian Prov.:** 19♂♂, 14♀♀, various localities and dates (NWFU); **Yunnan Prov.:** 17♂♂, 7♀♀, various localities and dates (NWFU); **South China:** 1♂, Kwangsi, Taipingfu, Sung-Shan District, 5–6. viii. 1934, Ernast, P. Tinknam (ZSU); **Guangxi Autonomous Region:** 3♂♂, 4♀♀, various localities and dates; **Canton:** 7♂♂, 5♀♀, various localities and dates (ZSU); **Hainan Is.:** 1♂, Hoi-how, K'iong District, 1932, William E Hoffmann (ZSU); **Guangdong Prov.:** 1♂, Shenzhen, 20. vii. 1986, coll. Zhang Yalin (NWFU); **Guangdong Prov.:** 1♂, Shenzhen, 4. vii. 1987, coll. Wu Xinshe; 8♂♂, 11♀♀, 2006 (GDEI); **Hainan Prov.:** 23♂♂, 11♀♀, various localities and dates (NWFU).

Distribution. Palearctic and Oriental Region.

Remarks. The identity of this species is taken from Dash & Viraktamath (2001).

Goniagnathus (Tropicognathus) taiwanus (Matsumura)

Selenocaphalus taiwanus Matsumura, 1912: 295–296.

Goniagnathus taiwanus, Zhang & Webb, 1996: 7.

Remarks. The types of this species were examined by one of us (Webb) some years ago and have not been re-examined here. From sketches made at that time it is similar to *punctifer* but has the lower aedeagal processes slightly more basad.

Distribution. China (Taiwan)

Goniagnathus (Tropicognathus) cornutus Duan, sp. n.

(Figs 3A–E, 7B, 7H)

Length. Male: 5.3 mm.

Ochraceous, speckled with brown mottling. Anterior margin of vertex dark brown; face with interrupted black fascia. Forewing ochraceous.

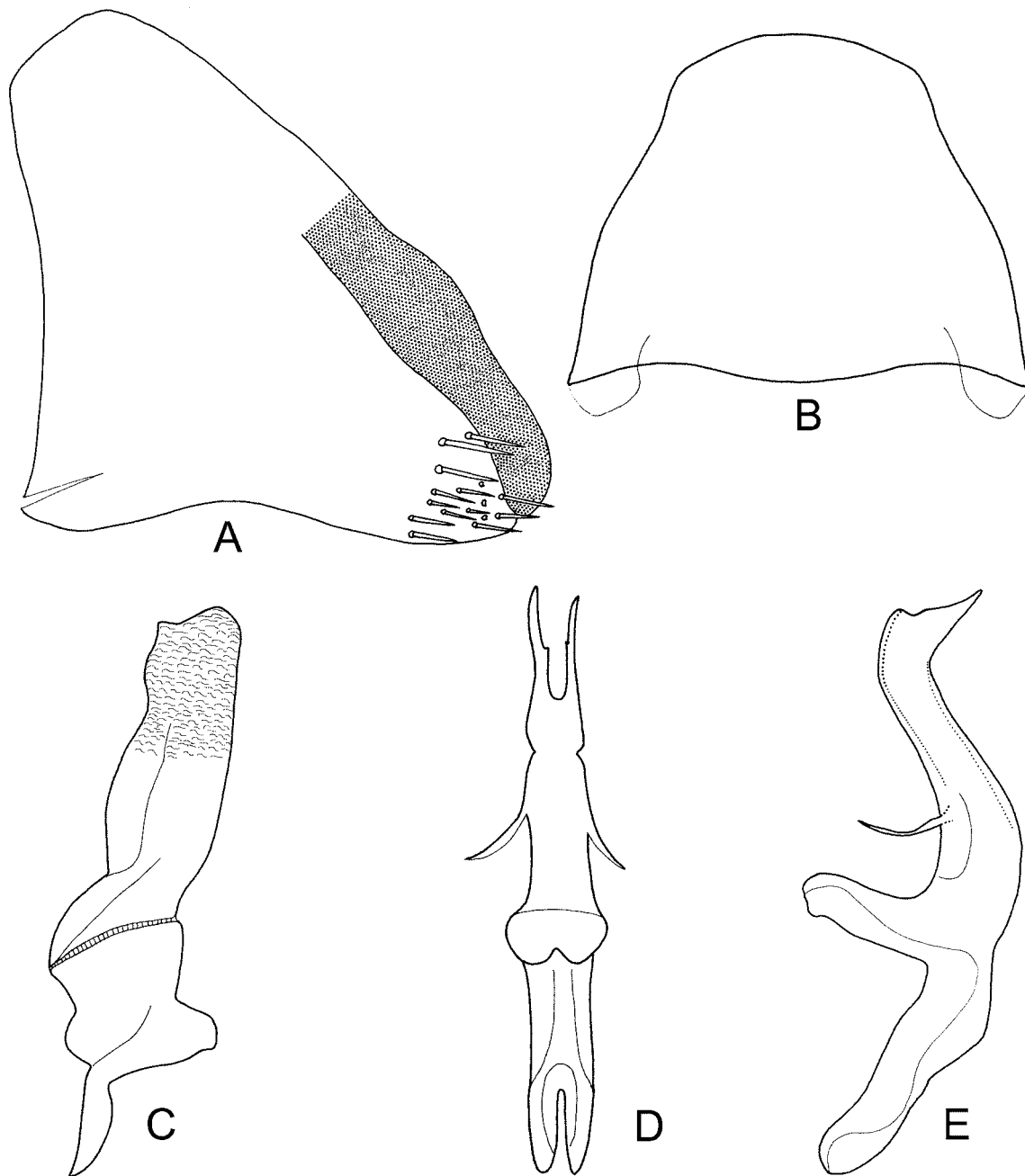


FIGURE 3. *Goniagnathus(Tropicognathus) cornutus* Duan, **sp. n.** A: Male pygophore, lateral view; B: Fused subgenital plates and valve, ventral view; C: Style, dorsal view; D: Aedeagus, dorsal view; E: Aedeagus, lateral view.

Pronotum 2.3x as long as crown. Forewing macropterous, four apical cells, three anteapical cells with, inner anteapical cell closed basally by cross vein.

Male genitalia. Pygophore subtriangular, with a few macrosetae before caudal margin, dorsocaudal appendage reaching caudo-ventral angle. Fused subgenital plates and valve with slightly convex caudal margin. Apophysis of style bilobed. Aedeagal shaft with a pair of ventral apical blade-like processes caudally narrowed to a pointed apex and one pair of slightly asymmetrical median processes on basal 0.4; gonopore large, apical.

Etymology. The species name is based on the horn-like apical aedeagal processes.

Type. Holotype: ♂, **China, Hainan Prov.,** Mt. Lianhua, 5. viii. 1929 (ZSU).

Remarks. This new species is closely related to *Goniagnathus punctifer* but can be easily distinguished from the latter by: 1) pygophore with dorsal process more robust and reaching caudo-ventral angle; 2) aedeagal shaft with paired apical processes triangular in lateral view.

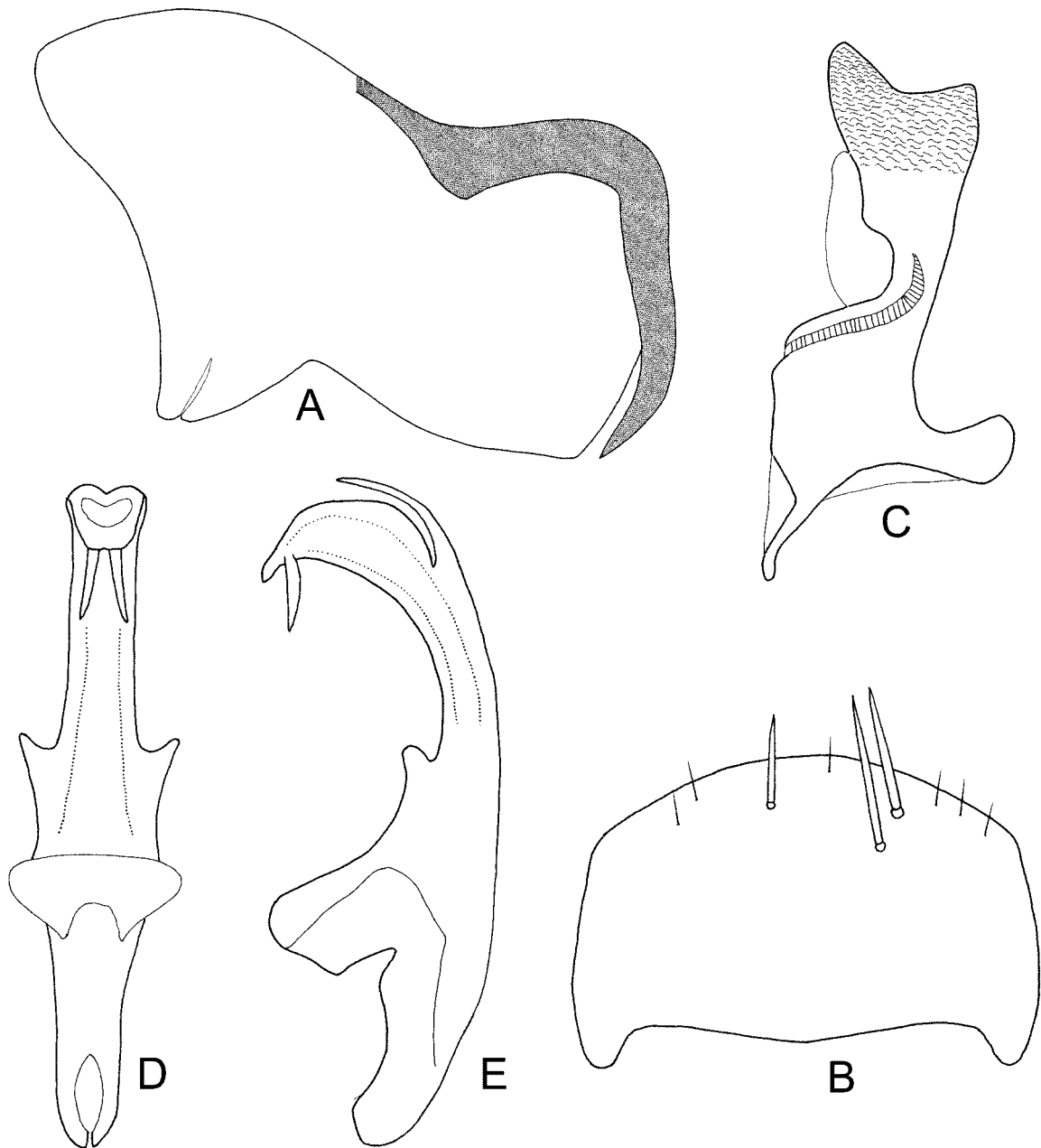


FIGURE 4. *Goniagnathus (Tropicognathus) nervosus* Melichar. A: Male pygophore, lateral view; B: Fused subgenital plates and valve, ventral view; C: Style, dorsal view; D: Aedeagus, dorsal view; E: Aedeagus, lateral view.

***Goniagnathus (Tropicognathus) nervosus* Melichar**
(Figs 4A–E, 7D, 7J, 8C)

Goniagnathus nervosus Melichar, 1903: 180; Kuoh, 1966: 135; Dash & Viraktamath, 2001: 71, Figs 30–37.
Goniagnathus (Tropicognathus) nervosus, Viraktamath & Gnaneswaran, 2009: 52.

Length. Male: 6.2–6.4mm; Female: 6.1–6.5mm.

Reddish-brown. Vertex, pronotum and scutellum mottled with irregular reddish-brown spots. Anterior margin of vertex ochraceous, with two orange traverse stripes, anterior margin sometimes brown; interrupted black fascia on face. Forewing veins mottled with dark brown and white spots.

Vertex 3–4x as wide as median length. Forewing with inner anteapical cell closed basally by cross vein.

Male genitalia. Pygophore constricted at mid-length and broadened caudally with a few hair-like setae apically, dorsocaudal appendage extending over entire caudal margin. Fused subgenital plates and valve twice as broad as long, slightly convexly rounded sometimes with a median notch on caudal margin. Apophysis of style bilobed. Aedeagal shaft strongly curved caudodorsad and in apical 0.25 strongly curved anteriorly, with one basal pair of lateral short, stout processes at 0.25 distance, one slender elongate unpaired process on caudal margin directed caudodorsad at apical 0.33 and one pair of ventrally directed, slender processes arising subapically on anterior margin; gonopore large, apical.

Female genitalia. Seventh sternum 2.5x as wide as long, hind margin sinuate with median notch.

Material examined. China, **Guangdong Prov.:** 1♀, Guangzhou, Mt., Baiyunshan, 9. i. 1935 (ZSU), 1♂, Conghua, Aotou, 43m, 25. viii. 2006, coll. Yang Meixia; **Hainan Prov.:** 1♂, Mt. Lianhuashan, 8. viii. 1929 (ZSU).

Distribution. Sri Lanka, India, China (Guangdong, Hainan).

Remarks. The identity of this species is taken from Dash & Viraktamath (2001).

Goniagnathus (Epitephra)

Goniagnathus (Epitephra) Emeljanov, 1999: 561. Type species: *Athysanus rugulosus* Haupt.

Goniagnathus (Epitephra) rugulosus (Haupt)

(Figs 5A–E, 7F, 7L)

Athysanus rugulosus Haupt, 1917: 248.

Goniagnathus rugulosus, Nast, 1972: 323; Lee, 1979: 372, fig. 289.

Goniagnathus castaneus Kato, 1933: pl. 28, fig. 8, China, synonymised by Kwon & Lee, 1979: 71, 74.

Goniagnathus (Epitephra) rugulosus, Emeljanov, 1999: 561.

Length. Male: 4.4–4.8mm; Female; 4.6–5.3mm.

Robust. Sordid white to pale brown with dark spots and maculation. Interrupted black fascia on face.

Vertex 3–4x as wide as median length. Pronotum, 3x as long as vertex. Forewing with inner anteapical cell closed basally by cross vein.

Male genitalia. Pygophore wider than long, with a few macrosetae, without appendages. Fused subgenital plates and valve twice as long as broad, lateral side sinuate with some setae. Apophysis of style bilobed. Aedeagal shaft slightly curved caudo-dorsally without processes; gonopore large, subapical.

Female genitalia. Seventh sternum 2.5x as wide as long, hind margin sinuate with median notch.

Material examined. China, **Heilongjiang Prov.:** 1♀, County Mishan, 17. vii. 2003, coll. Yang Xiujuan and Liu Binbin (HU); **Hebei Prov.:** 1♂, County Changli, 18. vii. 1999, coll. Ma Zhanjun etc (HU); 1♂, County Zunhua, Qingdingling, 25. vii. 1999, coll. Cui Wenming etc (HU); 1♀, County Zunhua, Qingdingling, 25. vii. 1999, coll. Ren Qiuzhuang (HU); **Ningxia Autonomous Region:** 1♀, County Haiyuan, 22. viii. 1986 (NWAUFU); **Shanxi Prov.:** 1♂, Mt. Wutaishan, 2. viii. 2006, coll. Duan Yani (NWAUFU); **Shaanxi Prov.:** 1♂, 2♀♀, County Wugong, 2. vii. 1981, coll. Zhou Jingruo (NWAUFU); 1♂, County Wugong, 29. viii. 1987 (NWAUFU); 1♀, County Qingjian, 700m, 20. vii. 2003, coll. Ba Yibin and Yu Yang (HU); 1♀, Dingbian, 23. iv. 2006, coll. Yang Zhaofu (NWAUFU); **Shandong Prov.:** 1♂, Yantan Mt., Kunyushan, 1. vii. 2001, coll. Qin Daozheng (NWAUFU); 1♀, Laiyang, 8. vii. 2001, coll. Qin Daozheng (NWAUFU); 1♂, Qixia, Taocunzhen, 15. vii. 2001, coll. Qin Daozheng (NWAUFU); 1♀, Mt. Yishan, 500–800m, 20. vii. 2001, coll. Qin Daozheng

(NWFU); **Henan Prov.:** 1♂, Neixiang, Baotianman, 11. vii. 1998, coll. Hu Jian (NWFU); 1♀, County Fengqiu, Huangling, 20. vii. 2007, coll. Zhou Hua etc (NWFU).

Distribution. USSR, Korea, Mongolia, Turkmen, China (Heilongjiang, Hebei, Ningxia, Shanxi, Shaanxi, Shandong, Henan) [new record for China].

Remarks. The identity of this species is taken from Kwon & Lee (1979). The synonymy of *G. castaneus* Kato with this species by Kwon & Lee remains speculative as the Kato collection remains unavailable for study.

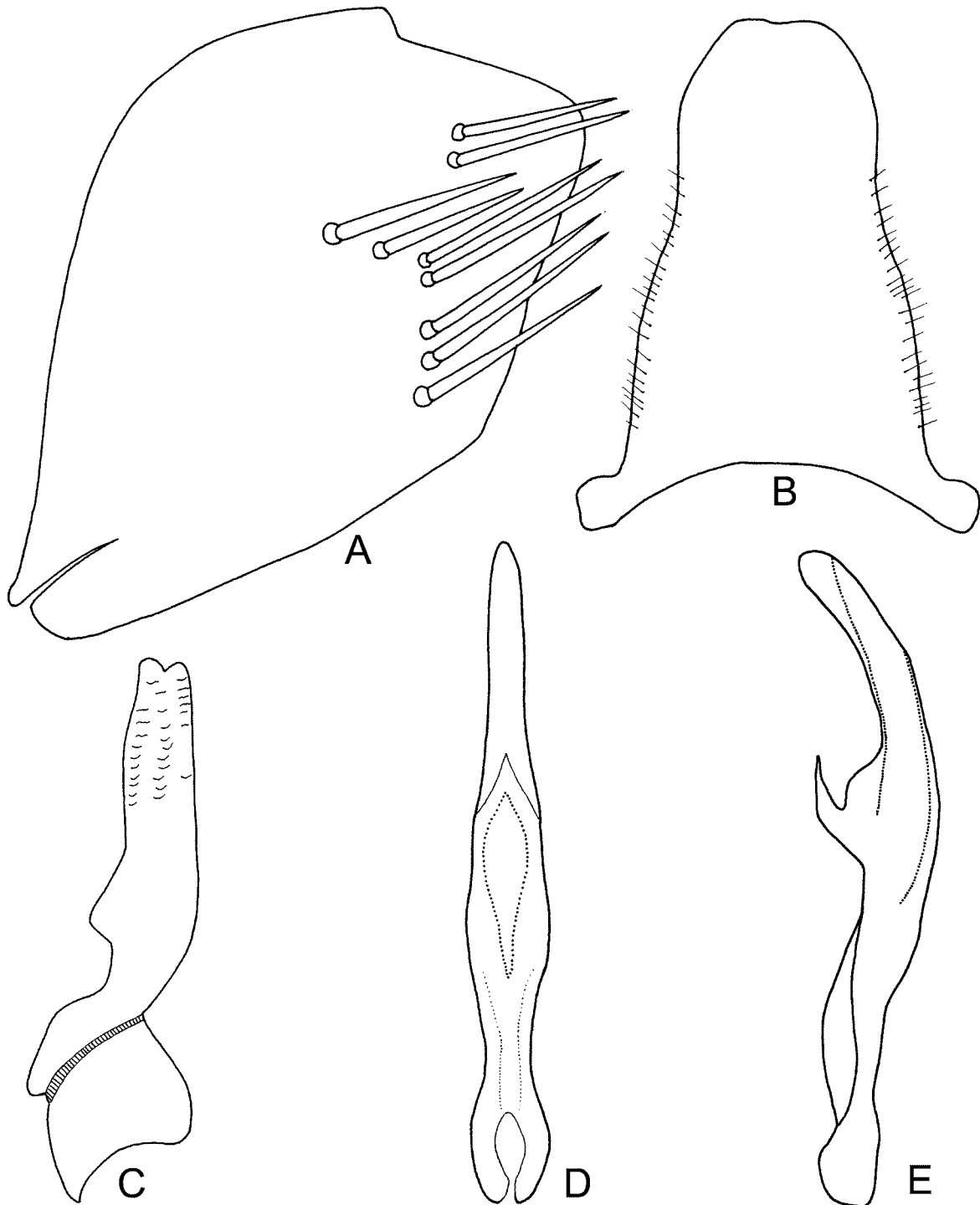


FIGURE 5. *Goniagnathus (Epitephra) rugulosus* (Haupt). A: Male pygophore, lateral view; B: Fused subgenital plates and valve, ventral view; C: Style, dorsal view; D: Aedeagus, dorsal view; E: Aedeagus, lateral view.

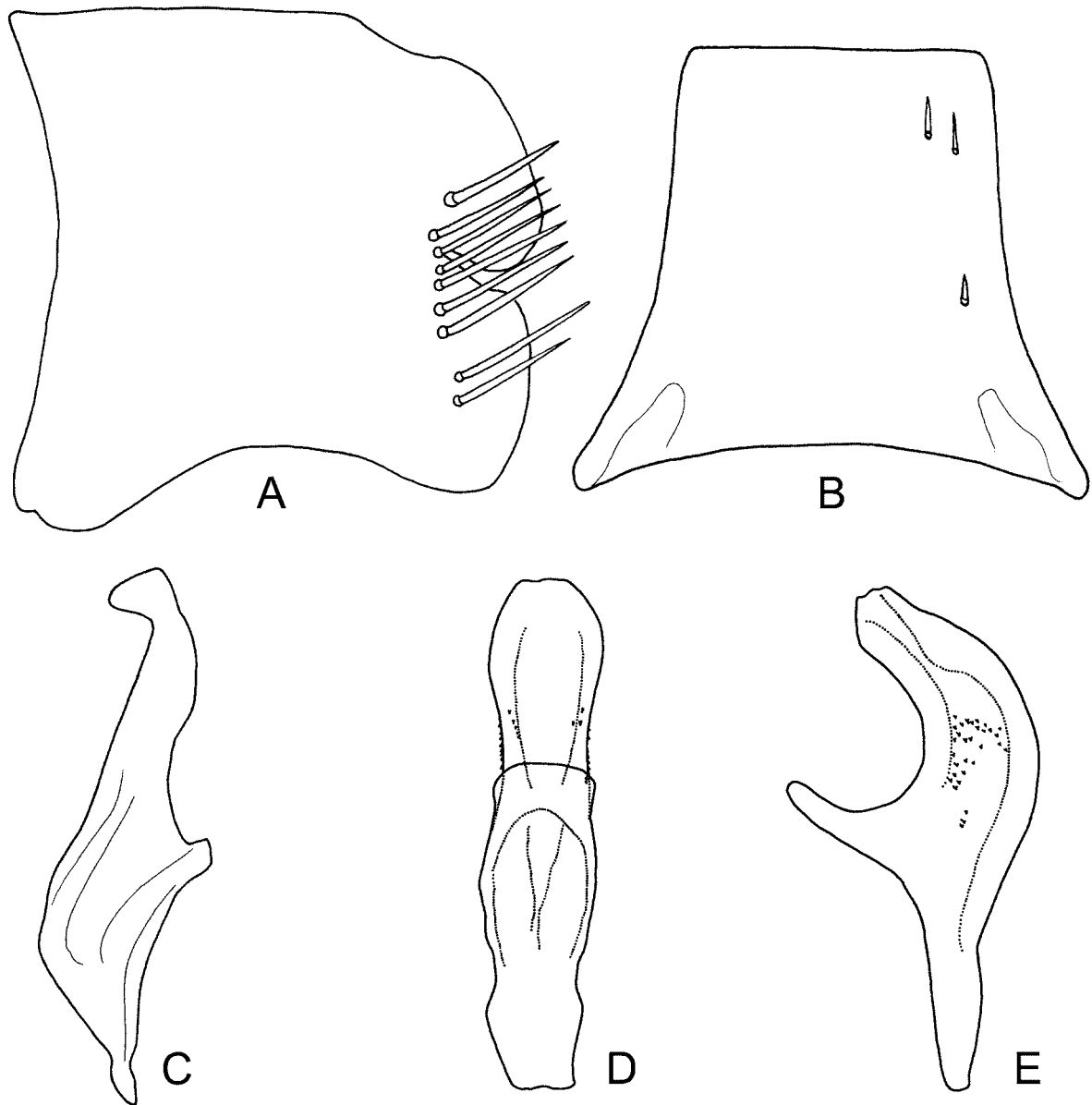


FIGURE 6. *Tamaricades tamaricus* (Cai). A: Male pygophore, lateral view; B: Fused subgenital plates and valve, ventral view; C: Style, dorsal view; D: Aedeagus, lateral view; E: Aedeagus, dorsal view.

***Tamaricades* Emeljanov**

Goniagnathus (*Tamaricades*) Emeljanov, 1962: 163. Type species: *Athysanus decoratus* Haupt
Tamaricades, Dmitriev, 2003: 655 (670).

Remarks. This genus was elevated from subgenus to genus based on a study of the immatures by Dmitriev (2003). It can be distinguished by its smooth rather than transversely striate pronotum. The following single species is known from China.

Distribution. Europe, China

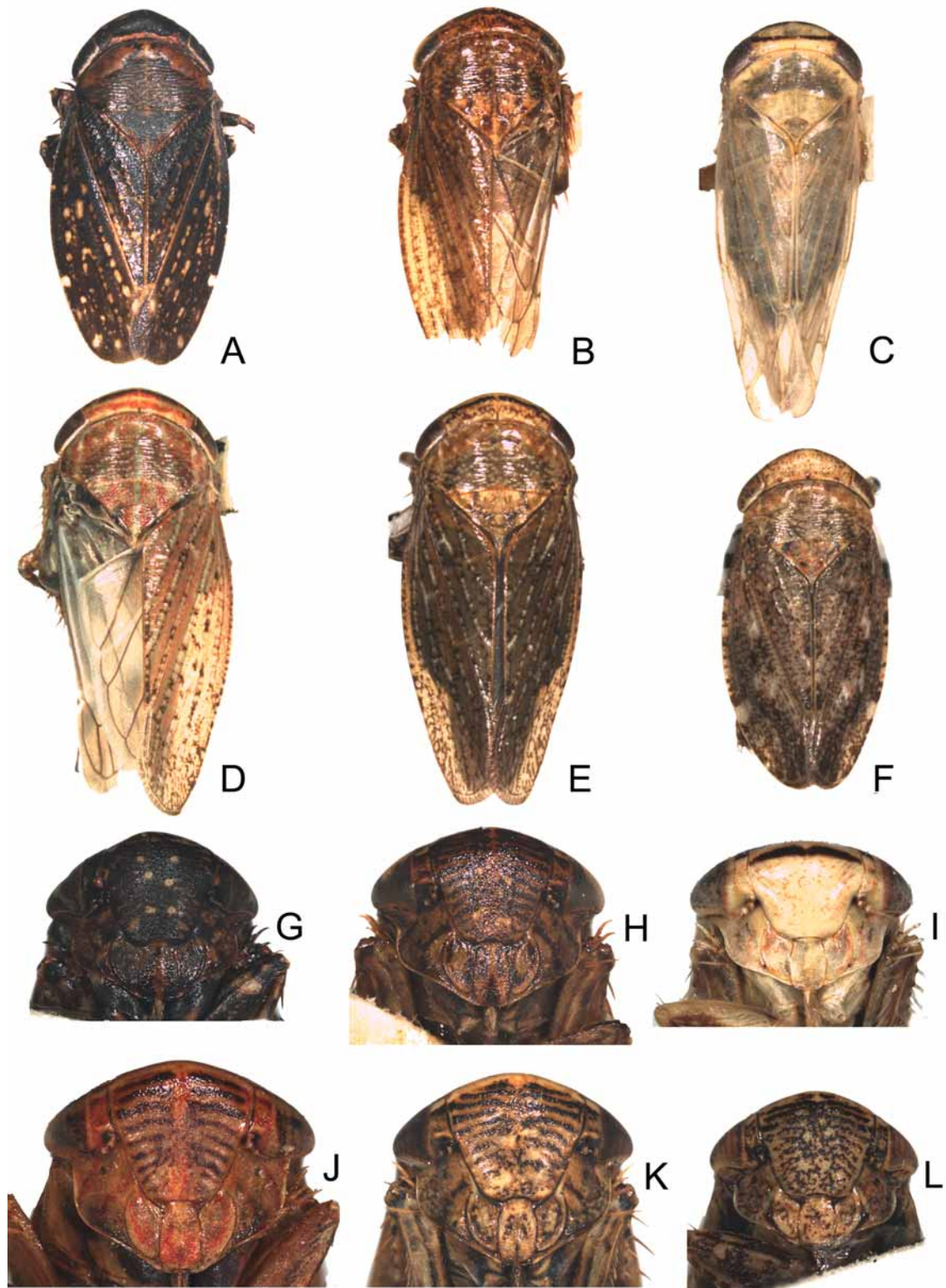


FIGURE 7. *Goniagnathus* and *Tamaricades* species. A–F, habitus. A: *G. brevis*; B: *G. cornutus* Duan, **sp. n.**; C: *T. tamaricus*; D: *G. nervosus*; E: *G. punctifer*; F: *G. rugulosus*. G–L, face. G: *G. brevis*; H: *G. cornutus* Duan, **sp. n.**; I: *T. tamaricus*; J: *G. nervosus*; K: *G. punctifer*; L: *G. rugulosus*.

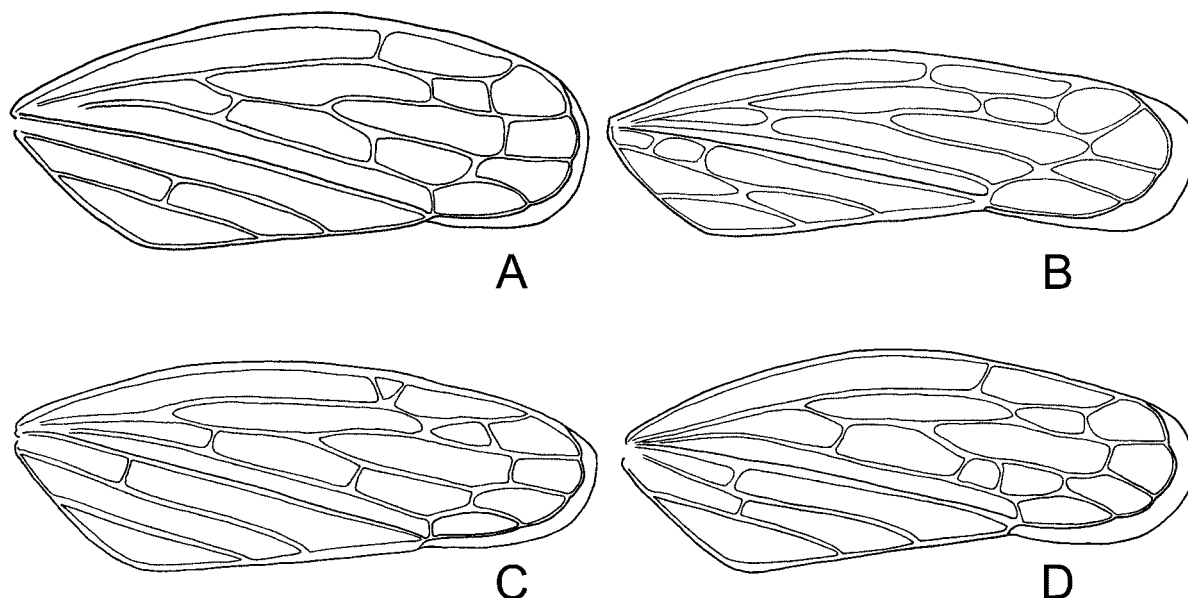


FIGURE 8. Forewings of *Goniagnathus* and *Tamaricades* species. A: *G. brevis*; B: *T. tamaricus*; C: *G. nervosus*; D: *G. punctifer*.

***Tamaricades tamaricius* Cai, comb. nov.**

(Figs 6A–E, 7C, 7I, 8B)

Megalopsius tamaricius Cai, 1998: 57, fig. 3 (1–7).

Length. Male: 4.6–6.1mm; Female: 5.0–6.5mm.

Ochraceous, anterior margin of vertex dark brown, with variable transverse stripe; eyes black with reddish-brown margin and stripes; face with interrupted black fascia. Forewing ochraceous.

Pronotum 1.5x as long as crown.

Male genitalia. Pygophore short and wide, with a few macrosetae near caudal margin, caudal margin strongly bilobed, without appendages. Fused subgenital plates and valve longer than wide, with truncate caudal margin, with a few setae. Apophysis of style foot-like. Aedeagus short and stout, hood-like in caudal view; gonopore apical.

Female genitalia. Hind margin of seventh sternite sinuate with median notch.

Material examined. China, **Xinjiang Autonomous Region:** 4♂♂, 2♀♀, Qiangwu Jiantan, 3. vii. 1985 (NWFU); 1♀, Qiangwu Jiantan, 24. vi. 1985 (NWFU); **Gansu:** 3♂♂, Zhangye, 24. vii. 1985, coll. Lu Jinsheng (NWFU); **Ningxia Autonomous Region:** 4♂♂, Yinchuan, 6. vii. 1982, host: *Tamarix ramosissima* Ledeb; 1♂, Demos Park, 6. vii. 1981, coll. Jin Gentao (SHEM).

Distribution. Europe, China (Xinjiang, Neimenggu, Gansu, Ningxia).

Remarks. The identity of this species is taken from Cai *et al* (1998). This species could be *G. taeniatus* Emeljanov (1979, fig. 36) based on the markings on the vertex but as this species was described only from females the synonymy is uncertain.

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