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NOTES ON HIGHER CLASSIFICATION OF THE FAMILY NOGODINIDAE (HEMIPTERA: AUCHENORRHYNCHA: FULGOROIDEA), WITH DESCRIPTION OF NEW TRIBE AND NEW SPECIES

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Summary. A new tribe *Bilbiliini trib. n.* is erected for the genus *Bilbilis* Stål, 1861 which is reviewed and *B. elongatus sp. n.* is described from Kalibbarri National Park in Western Australia. The tribe *Bladinini* Kirkaldy, 1907 is upgraded to subfamily. The relationships of the tribes of *Nogodinidae* are discussed. Imaginal sensory pits are recorded for the first time for *Bilbilis* species. Male and female genitalia of *Bilbilis modestus* (Stål, 1859) are illustrated for the first time. Key to subfamilies and tribes of the *Nogodinidae* as well as to species of the genus *Bilbilis* are given.

Key words: *Auchenorrhyncha*, *Fulgoromorpha*, *Nogodinidae*, morphology, taxonomy, new tribe, new species, new status, key, Australia.

В. М. Гнездилов, Замечания по классификации высших таксонов семейства *Nogodinidae* (Hemiptera: Auchenorrhyncha: Fulgoroidea) с описанием новой трибы и нового вида // Дальневосточный энтомолог. 2017. N 347. С. 1-21.

Резюме. Новая триба *Bilbiliini trib. n.* установлена для рода *Bilbilis* Stål, 1861, который ревизован с описанием *B. elongatus sp. n.* из Национального

парка Калибарри в Западной Австралии. Триба Bladinini Kirkaldy, 1907 повышена в ранге до подсемейства. Обсуждены родственные отношения триб в семействе Nogodinidae. Имагинальные сенсорные ямки впервые обнаружены у представителей рода *Bilbilis*. Впервые проиллюстрированы гениталии самца и самки *Bilbilis modestus* (Stål, 1859). Даны определительные таблицы подсемейств и триб семейства Nogodinidae и видов рода *Bilbilis*.

INTRODUCTION

Since R.G. Fennah (1978, 1984, 1987) proposed the tribal system and subfamilial division of the family Nogodinidae Melichar, 1898 two more tribes and one subfamily were added (Gnezdilov, 2007, 2012). Thus currently modern world fauna of the family Nogodinidae comprises three subfamilies – Nogodininae (with 8 tribes), Colpopterinae, Gastriniinae. However the relationships between the tribes are still not clear and this system need to be verified by phylogeny and apparently developed using more morphological characters. My comparative morphological studies of the members of all nogodinid tribes allow making some preliminary conclusions on higher classification of the family and relationships of tribes which increased the number of subfamilies to 4 and total number of tribes to 11 including a new tribe for the genus *Bilbilis* Stål, 1861.

The genus *Bilbilis* was erected by C. Stål (1861) in the family Issidae (genera Issidarum *sensu* Stål) for a single Australian species – *Hysteropterum modestum* Stål, 1859. More than hundred years later the genus was transferred to the family Nogodinidae (tribe Bladinini Kirkaldy, 1907, subtribe Gaetuliina Fennah, 1978) and added by two more species – *B. dorsale* (Walker, 1851) (originally *Hysteropterum dorsale* Walker, 1851) and *B. caligula* Fennah, 1984 (Fennah, 1984). Recently the genus was placed provisionally in the tribe Mithymnini Fennah, 1967 of the family Nogodinidae (Gnezdilov, 2007) and the Gaetuliina Fennah was placed in synonymy under Elicini Melichar, 1915 which is assigned to the family Tropicididae (Gnezdilov, 2013). However, still now the taxonomic position of *Bilbilis* was uncertain as the tribe Mithymnini is treated as South African endemic characterized by peculiar shape of the gonopods (Gnezdilov, 2017a).

MATERIAL AND METHODS

Morphological terminology follows Gnezdilov (2003). The genital segments of the examined specimens were macerated in 10% KOH and figured in glycerine jelly using light microscope Leica MZ95. Photographs of the specimens were made using Leica MZ8 with JVC video camera KY F70B and Leica Z16 APOA with Leica video camera DFC490, images are produced using the software Leica Application Suite ver. 3.7, Synoptics Automontage, and Adobe Photoshop. Drawings are made with Leica MZ95 light microscope with camera lucida attached.

The specimens studied are deposited in the Naturhistoriska Riksmuseet, Stockholm, Sweden (NHRS), Hungarian Natural History Museum (Budapest, Hungary) (HNHM), Musèum national d'Histoire naturelle (Paris, France) (MNHN), Museum der Naturkunde für Humboldt Universität zu Berlin (Germany) (MNHB), and the Natural History Museum, London, United Kingdom (BMNH).

TAXONOMY

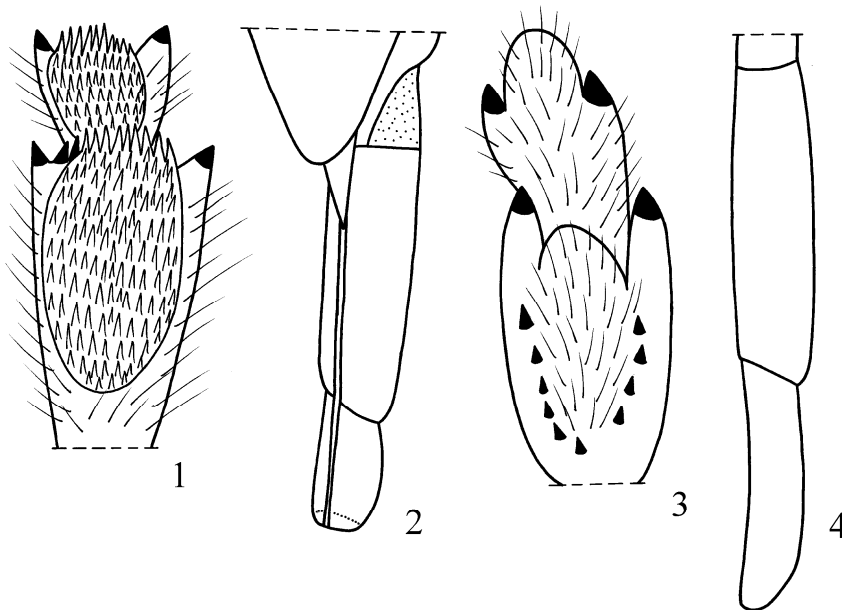
Family Nogodinidae Melichar, 1898

The family is worldwide distributed comprising 4 subfamilies with 11 tribes including the changes proposed below (see the key) with nearly 90 genera including more than 300 species in modern fauna (Bourgoin, 2017).

REMARKS. Within the Nogodinidae there are two types of intermediate spines arrangement on first metatarsomere. First type – spines are in straight row (Colpopterinae, Gastriniinae, Nogodinini, Mithymnini, Bilbiliini trib. n.). Second type – spines are arranged in shape of “V” letter (Tongini, Epacriini, Varciini, Pisachini) (Fig. 3). Bladininae stat. n. have only 2 intermediate spines (Fig. 1) and apparently may be placed near to first type and Lipocalliini have no intermediate spines which may be explained by reduction.

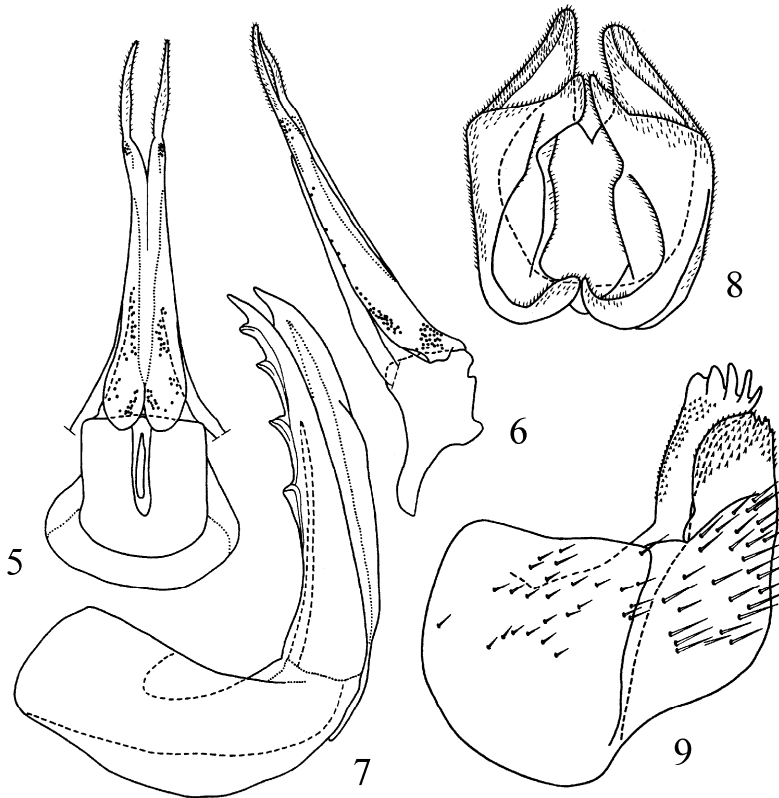
Key to subfamilies and tribes of Nogodinidae

- 1(2) Third segment of rostrum twice as short as second one, not narrowing apically (Fig. 2). First metatarsomere with peculiar oval area of short dense setae on its ventral surface (Fig. 1). Anterior connective lamina of gonapophyse VIII wide, with 5 large flat teeth (Fig. 9)
..... Subfamily Bladininae Kirkaldy, 1907, **stat. n.** (tribe Bladinini)



Figs 1–4. Nogodinidae, rostrum (2, 4) and hind tarsomere (1, 3). 1, 2 – *Bladina fawleri* Fennah, female, Belize; 3, 4 – *Pisacha* sp., female, Japan, Ryukyu.

- 2(1) Third segment of rostrum as long as second one or slightly shorter, conically narrowing apically (Fig. 4). First metatarsomere with long, usually hair-shaped setae ventrally (Fig. 3). Anterior connective lamina of gonapophyse VIII narrow (Fig. 7), if wide (Fig. 13) than with another shape and arrangement of teeth.
- 3(4) Paradiscal field / paranotal lobe border of pronotum in shape of distinct carina and each paranotal lobe with another distinct transverse carina below this border. Fore wing without precostal area (Fig. 50). Gonoplacs long and narrow, large anal tube clasping the gonoplacs dorsally and laterally (Fig. 51)
 Subfamily Gastriniinae Fennah, 1987 (tribe Gastriniini)
- 4(3) Paradiscal field / paranotal lobe border of pronotum and paranotal lobes without transverse carinae. Fore wing with precostal area. Gonoplacs wide or beak-shaped and curved.



Figs 5–9. Nogodinidae, female genitalia, anterior connective lamina of gonapophyse VIII (7, 9), posterior connective laminae of gonapophyses IX (5, 6, 8). 5–7 – *Philbyella glareata* Dlabola et Heller; 8, 9 – *Bladina* sp. (after Gnezdilov, 2003).

- 5(6) Fore wing with rich transverse venation usually only in its distal half (Gnezdilov, 2012, figs 4, 35). Hind wing well developed, with simple venation (R and CuA with two branches, M simple or with 2 branches and Pcu simple) (Gnezdilov, 2012, figs 15, 36) Subfamily Colpopterinae Gnezdilov, 2003 (tribe Colpopterini)
- 6(5) Fore wing usually with rich transverse venation on whole area (Fig. 23). Hind wing rudimentary or well developed, with R, M, and CuA with two and more branches and Pcu simple (Figs 33, 34) or if M simple than Pcu with two branches (Gnezdilov & Constant, 2014, figs 3, 18) Subfamily Nogodininae Melichar, 1898
- 7(8) Fore wing with precostal margin hemicircularly protruding below the eye (in lateral view) (Fig. 38, *hp*). First metatarsomere with only 2 latero-apical spines and without intermediate spines Tribe Lipocalliini Fennah, 1984
- 8(7) Fore wing with precostal margin not protruding below the eye (in lateral view). First metatarsomere with 2 latero-apical spines and several intermediate spines.
- 9(14) First metatarsomere with straight row of intermediate spines.
- 10(11) Macropterous, fore wing with wide precostal area. Hind wing well developed, with first and second anal veins not fused medially and second anal vein with 2 branches (A_2 2) (Fig. 33). Gonoplacs flattened laterally Tribe Nogodinini Melichar, 1898
- 11(10). Subbrachypterous, fore wing with more narrow precostal area. Hind wings rudimentary or reduced. Gonoplacs convex 12
- 12(13) Pronotum with anterior margin strongly protruding and reaching anterior margin of eyes (in dorsal view) (Fig. 25). Gonoplacs hemisphaerical (Fig. 10, 48) Tribe Bilbiliini Gnezdilov, **trib. n.**
- 13(12) Pronotum with anterior margin less protruding, not reaching anterior margin of eyes (in dorsal view) (Fennah, 1967, fig. 24B). Gonoplacs convex or cylindrical, each with peculiar invagination (Gnezdilov, 2017a, fig. 8) Tribe Mithymnini Fennah, 1967
- 14(9) First metatarsomere with intermediate spines arranged in shape of “V” letter (Fig. 3).
- 15(20) Gonoplacs convex or nearly cylindrical, with denticles or teeth. Hind wing with first anal vein 3-branched (A_1 3) with its posterior branch ($A_{1,3}$) fused on a long distance with second anal vein which is simple (A_2 1) (Fig. 32).
- 16(19) Metope often with sublateral carinae converging above metopoclypeal suture in shape of “V” letter (Meng et al., 2014, fig. 31). Gonoplacs convex or nearly cylindrical, with thicken distal parts.
- 17(18) Gonoplacs with dense rows of teeth on its thicken distal parts which are situated nearly perpendicular to lateral sides of gonoplacs (Meng *et al.*, 2014, figs 32, 33). Apices of anterior connective laminae of gonapophyses VIII are well visible above the gonoplacs Tribe Pisachini Fennah, 1978
- 18(17) Gonoplacs with rudimentary areas of denticles on its thicken distal parts which are mainly smooth. Apices of anterior connective laminae of gonapophyses VIII not visible above the gonoplacs Tribe Varciini Fennah, 1978

- 19(16) Metope with sublateral carinae converging on upper margin of metope in shape of inverted “V” letter (Chan & Yang, 1994, figs 31B, 32B) or horse-shoe-shaped (Fennah, 1954, fig. 7A) or without carinae (Gnezdilov & Constant, 2014, figs 4, 13). Gonoplacs flat Tribe Tongini Kirkaldy, 1907
- 20(15) Gonoplacs flattened laterally, nearly triangular, without denticles or teeth (Gnezdilov, 2017b, fig. 15). Hind wing (if not reduced) with first and second anal veins separated and second anal vein simple (A_2 1) (Gnezdilov, 2017a, fig. 13; Gnezdilov, 2017b, figs 4, 18) Tribe Epacriini Fennah, 1978

Subfamily Bladininae Kirkaldy, 1907, stat. n.

Bladinini Kirkaldy, 1907: 9, 93.

Type genus: *Bladina* Stål, 1859.

REMARKS. The tribe Bladinini Kirkaldy, 1907 placed in the subfamily Nogodininae (Fennah, 1978; Gnezdilov, 2012) is characterized by some features clearly distinguishing this monotypic taxon from other nogodinids: peculiar oval areas of short dense setae on ventral surface of first and second metatarsomeres (Fig. 1) (all other tribes are characterized by the presence of hair-shaped long setae on these tarsomeres ventrally, see Fig. 3); short apical segment of rostrum – twice shorter than second one, cylindrical, not narrowing apically (Fig. 2) (all other tribes are characterized by third segment nearly as long as second one or slightly shorter, conically narrowing apically) (Fig. 4); gonoplacs convex, nearly rounded (not flattened), completely covering connective laminae of gonapophyses VIII and IX, without denticles or marginal teeth; wide and complex posterior connective laminae of gonapophyses IX and anterior connective lamina of gonapophyse VIII with peculiar group of apical teeth (Figs 8, 9) (rather narrow and alongate in other tribes) (Meng *et al.*, 2014, figs 52, 54, 55, 65, 68, 69) (Figs 5–7). All mentioned features of Bladinini separate this group within Nogodinidae and allow me treating it as subfamily Bladininae Kirkaldy, 1907, **stat. nov.**

COMPOSITION. The subfamily and tribe comprises only the genus *Bladina* Stål, 1859 with currently known 21 species and subspecies distributed from Southern Mexico to Southern Brazil (Fennah, 1952; Kramer, 1976).

Subfamily Nogodininae Melichar, 1898

REMARKS. Within the Nogodininae the tribes Pisachini and Varciini are closely related according to the presence of sublateral carinae of metope converging in shape of “V” letter above metopoclypeal suture (Meng *et al.*, 2014, fig. 31) and in arrangement of intermediate spines of first metatarsomere in shape of “V” letter as well (Meng *et al.*, 2014, fig. 9) (Fig. 3). However the members of the Varciini are distinguished by the reduction of marginal teeth of gonoplacs up to several small rounded plates on each gonoplac in contrast to Pisachini which have several rows of teeth. From the other hand, Pisachini and Varciini are close to the Tongini according

to hind wing venation. Thus my examination of hind wing venation of the members of the tribes Bladinini, Colpopterini, Epacriini, Nogodinini, Pisachini, Tongini, and Varciini (Mithymnini and Lipocalliini are characterized by reduced or rudimentary hind wings and no specimens of the subfamily Gastriniinae with intact hind wings were available for study) showed that Tongini, Varciini, and Pisachini are distinguished by first anal vein 3-branched (A_1 3) with its posterior branch ($A_{1,3}$) fused medially with second anal vein which is simple (A_2 1) (Meng *et al.*, 2014, fig. 7; Melichar, 1898, Taf. 12, figs 1, 9) (Fig. 32), but in the tribes Bladinini, Colpopterini, Epacriini, and Nogodinini A_1 and A_2 have no such anastomosis (Figs 33, 34). Similar condition of anastomosis between A_1 and A_2 on hind wing was observed by M. Asche (2015) in the family Achilidae. It is also necessary to note that the characters suggested by R.G. Fennah (1978) to separate the Pisachini within other Nogodinidae (spine arrangement of first metatarsomere and the shape and dentation of the gonopods) are not distinguish them from the Tongini (type genera *Pisacha* and *Tonga* were compared in my study) assigned at that time to the Issidae (Fennah, 1954).

According to flat, nearly triangular gonopods without denticles or teeth the Epacriini (Gnezdilov, 2017b, fig. 15) is very close to the Lipocalliini, but the members of last taxon are very peculiar by fore wing abris with protruding precostal margin below the eye (Fig. 38, *hp*) and the absence of intermediate spines of first metatarsomere.

The tribe Mithymnini apparently may be placed within the Nogodininae near to the complex of tribes with convex or nearly cylindrical gonopods which are Pisachini and Varciini (Meng *et al.*, 2014, figs 32, 33) and the tribe Nogodinini occupies separated position within the subfamily as the members of this tribe have flat gonopods with marginal areas of denticles and the second anal vein of hind wing with 2 branches (Fig. 33) in contrast to all other Nogodinidae (no information on Gastriniinae) which have second anal vein simple (Fig. 34).

Tribe Bilbiliini Gnezdilov, trib. n.

Type genus: *Bilbilis* Stål, 1861.

DESCRIPTION. Fore wings beetle-shaped, with narrow precostal area, costal vein running to fuse Sc + R distally (Figs 23, 27, 36, 39, 42). Hind wings rudimentary. Gonopods convex, hemispherical, completely covering anterior and posterior laminae of gonapophyses VIII and IX, without denticles or marginal teeth (Figs 10, 48). First metatarsomere with 2 latero-apical and straight row of intermediate spines, ventral surface with hair-shaped setae. Third segment of rostrum slightly shorter than second one, narrowing apically. Hind tibia with 2 lateral spines distally.

REMARKS. The species of the genus *Bilbilis* Stål have characteristic massive hemispherical gonopods, without denticles or teeth, completely covering anterior and posterior connective laminae of gonapophyses VIII and IX (Figs 10, 48). Such shape and structure of gonopods allowed to Fennah (1984) place this taxon in the subtribe Gaetuliina Fennah (currently Tropicuchidae, Elicini Melichar), but male genitalia structure and particularly the style with long and narrow capitulum without

lateral tooth (Figs 18, 28) show the correct position of the genus *Bilbilis* within Nogodinidae rather than Tropiduchidae. Coleopterous fore wings of *Bilbilis* with narrow precostal area makes it similar to Epacriini Fennah, 1978 and Lipocalliini Fennah, 1984, however, differences in ovipositor structure including in addition to gonoplasts (flat and nearly triangular in Epacriini and Lipocalliini) (Fennah, 1978, figs 9, 10; Gnezdilov, 2017b, fig. 15) also the structure of anterior connective lamina of gonapophyse VIII and posterior connective laminae of gonapophyses IX which are narrow in the members of Epacriini and Lipocalliini (Figs 5–7) and wide in *Bilbilis* (Figs 13, 14) place this genus separately within Nogodinidae and accordingly I propose to treat it as a distinct tribe – Bilbiliini **trib. n.** As the members of the genus *Bilbilis* are characterized by convex hemispherical (not flat) gonoplasts (Figs 10, 48) generally similar (by its convex and not flat shape, but different in details) to those of Pisachini Fennah, 1978, Varciini Fennah, 1978, and Mithymnini Fennah, 1967 I suggest to keep Bilbiliini **trib. n.** within Nogodininae until the phylogeny of the family is not developed.

COMPOSITION. Monotypical Australian tribe.

Genus *Bilbilis* Stål, 1861

Bilbilis Stål, 1861: 208.

Type species: *Hysteropterum modestum* Stål, 1859 by original designation.

DIAGNOSIS. Metope bearing sensory pits, with median and sublateral carinae not joint on its upper margin, but far separated from each other (Figs 24, 40, 43, 46). Coryphe short at midline and wide. Pronotum bearing sensory pits, with strongly convex (protruding between the eyes) anterior margin (Figs 21, 25); posterior margin strongly concave. Paradiscal fields relatively wide. Paranotal lobes large and long, with trough-curved lower margin (Fig. 24). Aedeagus with pair of long ventral hooks. Apical aedeagal processes bilobed apically. Style with long and narrow capitulum, without teeth.

COMPOSITION. The genus *Bilbilis* is endemic to Australia and currently comprises 4 species including a new one described below – two species are known from Western Australia and one species – from New South Wales; type locality of fourth species is unknown. Key to species is given below.

Key to species of the genus *Bilbilis*

- 1(2) General coloration ochre yellow greenish (Figs 35, 36). Coryphe with anterior margin weakly convex (Fig. 21) *B. modestus* (Stål)
- 2(1) General coloration light brown whitish or brown (Figs 39–47). Coryphe with anterior margin strongly convex (Figs 25, 41, 44) 3
- 3(6) Fore wings distinctly enlarged distally (Figs 39, 42). General coloration brown, each wing with dark brown band or stripe 4
- 4(5) Fore wings with wide brown or dark brown band distally (Fig. 42)
..... *B. caligula* Fennah
- 5(4) Fore wings with narrow dark brown stripe caudo-ventrally (Fig. 39)
..... *B. dorsalis* (Walker)

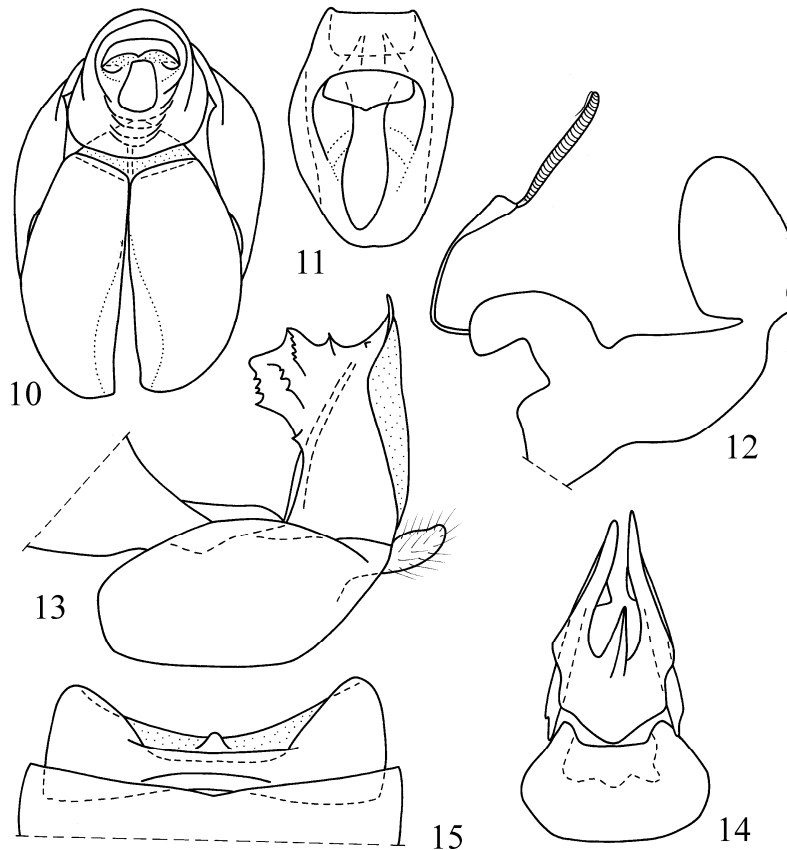
6(3) Fore wings elongate, weakly enlarged distally (Figs 27, 47). General coloration light brown whitish, each wing with large dark brown area
 *B. elongatus* Gnezdilov, sp. n.

***Bilbilis modestus* (Stål, 1859)**

Figs 10–23, 35–37

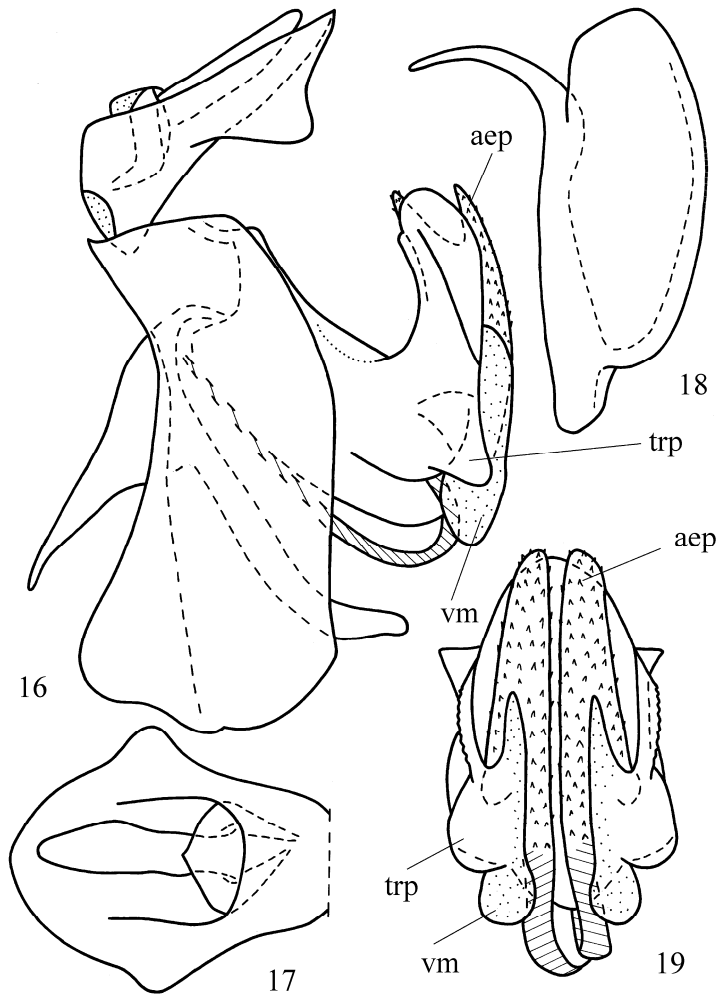
Hysteropterum modestum Stål, 1859: 279.

TYPE MATERIAL (after photos). Holotype – female, **Australia**: “Sidney, Kinb.”, “Typus” [red], “NHRS-HEMI/000000094” (NHRS). The holotype is pinned.



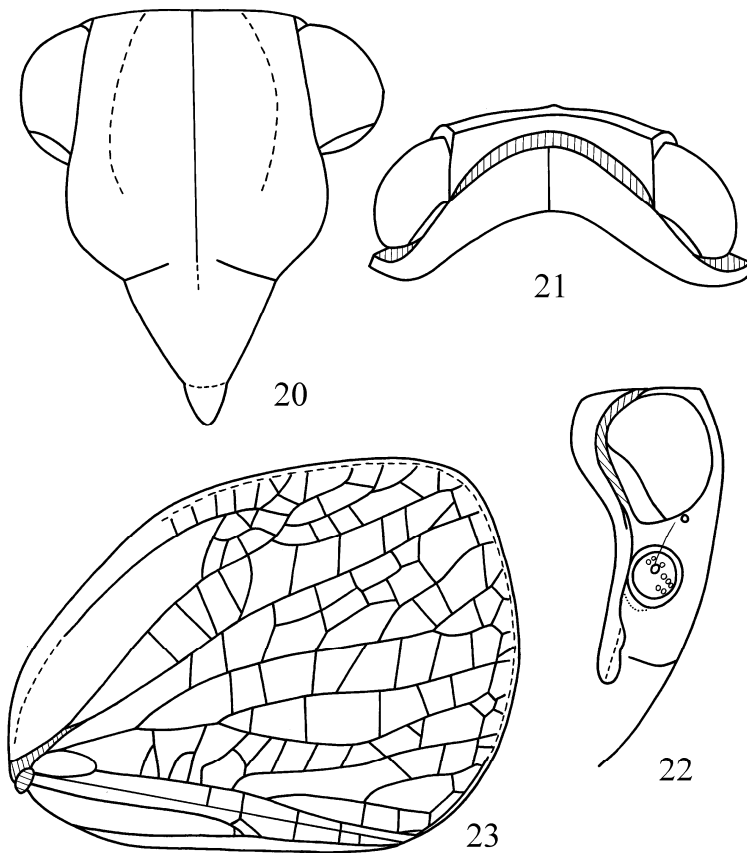
Figs 10–15. *Bilbilis modestus* (Stål), female genitalia, French’s Forest. 10 – anal tube and gonoplacs (ventral view); 11 – anal tube (dorsal view); 12 – Bursa copulatrix (lateral view); 13 – anterior connective lamina of gonapophyse VIII (lateral view); 14 – posterior connective laminae of gonapophyses IX and gonospiculum bridge (ventral view); 15 – VI and VII sternum (ventral view).

OTHER MATERIAL EXAMINED. **Australia:** “Australia, NSW, Blue Mts., Clarence, 1080 m, 31.XII 2005”, 1♂, 1♀, leg. R. Keyzer, I. Rozner, G. Hangay & A. Podlussány” [printed] (HNHM); “Australia, N.S.Wales, Sydney, Biró 1900”, 1♀, “modesta St. det. Melichar” [hand written and printed], “Bilbilis / modesta Stål” [hand written], “Hung. Nat. Hist. Mus., Budapest, coll. Hemiptera” [printed] (HNHM); “Australia, N.S.W., French’s Forest, Nr. Sydney, 21.X 1948”, 1♀, E.B. Britton, “Brit. Mus. 1950-18” (BMNH); “Australie, Verreaux 2-47”, 1♂, “Museum Paris, MNHN(EH) / 7361” (MNHN).



Figs 16–19. *Bilbilis modestus* (Stål), male genitalia, Blue Mts. 16 – genital block (lateral view); 17 – anal tube (dorsal view); 18 – style (lateral view); 19 – penis (ventral view). Abbreviations: *aep* – apical aedeagal process; *trp* – triangularly rounded process; *vm* – ventral margin.

SUPPLEMENTARY DESCRIPTION. Metope wide and flat, enlarged above clypeus (below the eyes) (Fig. 20); lateral margins roof-shapedly cover pedicel. Metope with distinct median carina running from its straight upper margin to metopoclypeal suture; sublateral carinae very weak, not joint with median carina on upper margin of metope. Metopoclypeal suture convex. Clypeus without carinae; lateral margins nearly straight. Coryphe transverse, nearly 10 times as wide as long medially, without carinae; anterior margin weakly convex; posterior margin deeply concave (Fig. 21). Coryphe and metope joint at right angle (in lateral view) (Fig. 22). Ocelli absent. Pedicel shortly cylindrical. Pronotum with median carina and a row of sensory pits along its anterior margin. Paradiscal fields relatively wide. Paranotal lobes large and long, with trough-curved lower margin reaching metopoclypeal suture.



Figs 20–23. *Bilbilis modestus* (Stål), Blue Mts. 20 – head (frontal view); 21 – head and pronotum (dorsal view); 22 – head and pronotum (lateral view); 23 – fore wing.

Mesonotum 2–2.5 times as long as pronotum, with median and lateral carinae. Fore wings wide, enlarged apically (Fig. 23), with wide hypocostal plate. Clavus as long as whole wing, open. Basal cell large. R 4 (furcating near to basal cell) M 5 (firstly and secondary furcating before wing middle; other branches furcating apically) CuA 2 (furcating at wing middle). Many transverse veins. Pcu and A₁ fused at middle of clavus. Hind wings rudimentary. Hind tibia with 2 lateral spines in its apical third and with 8 spines apically. First metatarsomere slightly longer than second one, with 2 latero-apical and around 12 intermediate spines arranged in a row without interruption (intermediate spines large near to lateral ones and small in the middle of row). Ventral surface of first metatarsomere with hair-shaped setae. Second metatarsomere with only 2 latero-apical spines.

COLORATION. General coloration ochre yellow greenish (Figs 35, 36). Pedicel yellow brownish. Fore wings with white costal margin and brownish inner margin of clavus. Thorax, abdominal sternites, and legs sometimes brown. Spine apices black. Gonoplags with black margins.

MALE GENITALIA (Figs 16–19). Pygofer with slightly convex hind margin (Fig. 16). Anal tube wide, rounded apically (in dorsal view), with lateral margins turned down in shape of triangularly rounded processes (Fig. 17).

Anal column (paraproct) long, almost half as long as anal tube (Fig. 17). Connective with large and wide cup. Phallobase strongly curved – horse-shoe shaped (in lateral view), wide in proximal half (Fig. 16). Each dorso-lateral lobe with large triangularly rounded process (Fig. 16, 19, *trp*) on its ventral margin (which is weakly sclerotized (Fig. 16, 19, *vm*)) above ventral hooks (in lateral view). Dorso-lateral lobes rounded apically, each with oblique transverse carina. Aedeagus with pair of long (more than half as long as phallobase) narrow ventral hooks directed basally, pointed apically. Apical aedeagal processes bilobed apically (Figs 16, 19, *aep*). Style with convex hind margin and long and narrow capitulum without teeth (Fig. 18).

FEMALE GENITALIA (Figs 10–15). Sternum VII with deeply concave hind margin bearing small triangular process on weakly sclerotised area (Fig. 15). Anal tube wide, nearly oval, truncate apically (in dorsal view) (Fig. 11). Anal column (paraproct) long, more than half as long as anal tube. Gonoplags massive, hemispherical, without denticles or teeth (Figs 10, 48), completely covering posterior connective laminae of gonapophyses IX and anterior connective laminae of gonapophyses VIII. Gonocoxa VIII with convex hind margin. Anterior connective lamina of gonapophyse VIII wide, with a single tooth in apical group and 4 dentate keels in lateral group (Fig. 13). Endogonocoxal process with simple apex. Gonospiculum bridge massive, wide (in ventral view). Posterior connective laminae of gonapophyses IX with distal parts converging apically under acute angle (Fig. 14). Median field of the laminae in shape of single narrowing apically lobe. Lateral fields of the laminae flat. Bursa copulatrix with a single pouch (Fig. 12).

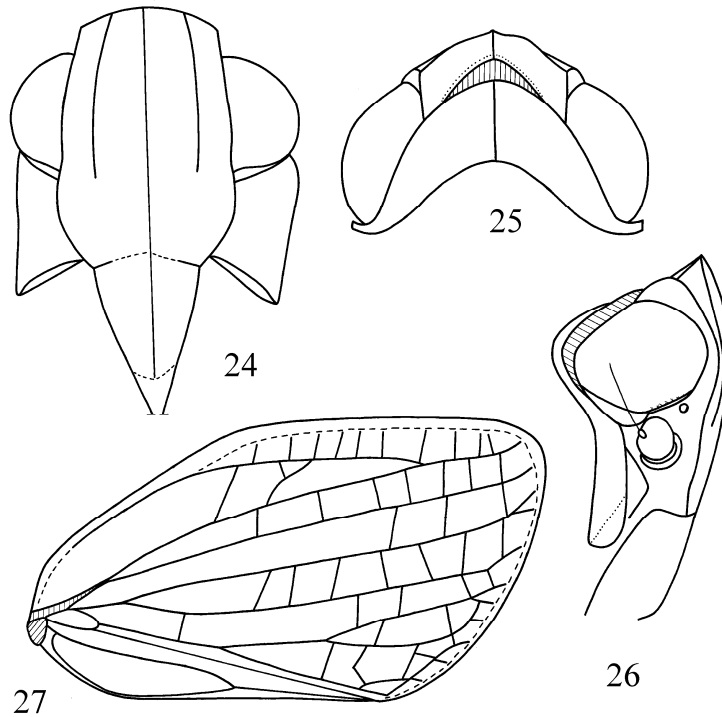
TOTAL LENGTH. Males – 3.5 mm. Females – 4.0 mm.

DISTRIBUTION. Australia (New South Wales).

***Bibilis elongatus* Gnezdilov, sp. n.**

Figs 24–31, 45–47

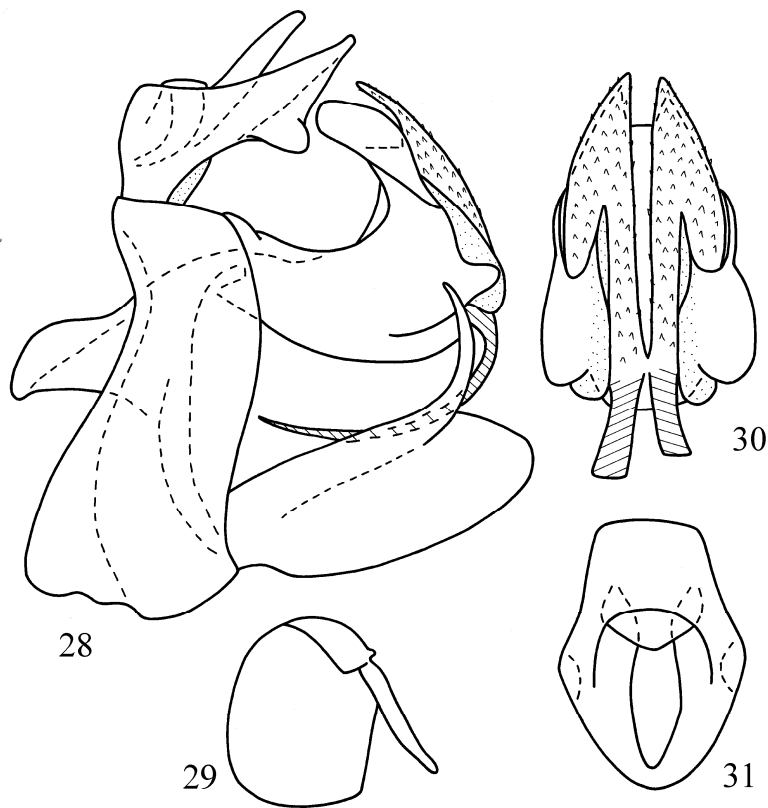
TYPE MATERIAL. Holotype – male, **Australia**: “W. Australia: Kalibbarri Nat. Park, 600 km N Perth, 12–14.XII 1986, J.S. Noyes, NHM(E) 2002-109” (BMNH). The holotype is pinned. Genital segments has been removed and the genitalia dissected; these are in a small glass vial of glycerine pinned under the specimen.



Figs 24–27. *Bibilis elongatus* Gnezdilov, sp. n., holotype. 24 – head and pronotum (frontal view); 25 – head and pronotum (dorsal view); 26 – head and pronotum (lateral view); 27 – fore wing.

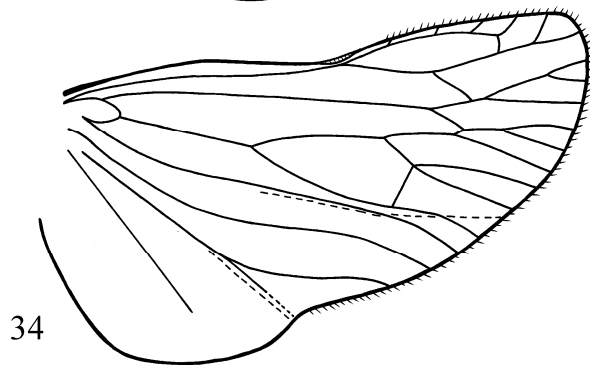
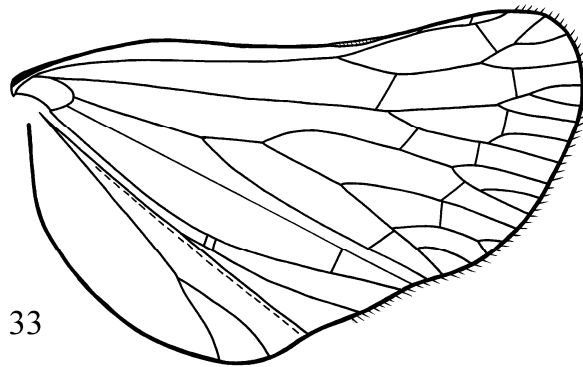
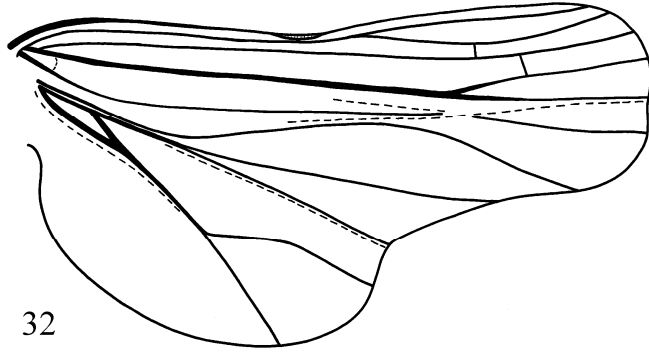
DESCRIPTION. Metope elongate, nearly twice as long as wide between the eyes, slightly enlarged below the eyes above the clypeus (Fig. 24). Lateral margins of metope roof-shapedly cover pedicel. Metope with distinct median carina running from its straight upper margin through postclypeus and sublateral carinae running from its upper margin and indistinct in its lower third. Metopoclypeal suture weakly convex. Postclypeus with median carina. Anteclypeus without carina. Rostrum nearly reaching hind coxae. Second and third rostrum segments are almost equal in length. Third rostrum segment conically narrowing apically. Pedicel shortly cylindrical. Ocelli present. Coryphe transverse, with median carina; anterior margin strongly

convex; posterior margin deeply concave (Fig. 25). Lateral margins of coryphe nearly straight. Coryphe margins keel-shaped. Coryphe and metope joint at acute angle (in lateral view) (Fig. 26). Pronotum with median carina and 2 rows of sensory pits with seta inside – upper row with 8 pits and lower row with 4 pits on each side besides median carina. Paradiscal fields relatively wide, each with a row of sensory pits. Paranotal lobes large and long, with trough-curved lower margin. Mesonotum 1.5 times as long as pronotum, with smooth median and lateral carinae. Tegulae small. Fore wings elongate, slightly enlarged apically (Fig. 27), with narrow hypocostal plate. Basal cell large, oval. R 2 M 2 CuA 3. Radius and median furcating near to basal cell. Cubitus anterior furcating near to wing middle. Clavus as long as whole wing, close. Pcu fusing A_1 at clavus middle. Hind wings rudimentary. Hind tibia with 2 lateral spines in distal third and with 8 apical spines. First metatarsomere slightly longer than second one, with 2 latero-apical and around 10 intermediate spines. Second metatarsomere with only 2 latero-apical spines.



Figs 28–31. *Bilbilis elongatus* Gnezdilov, sp. n., holotype, male genitalia. 28 – genital block (lateral view); 29 – style (dorsal view); 30 – penis (ventral view); 31 – anal tube (dorsal view).

COLORATION. General coloration light brown whitish (Figs 45–47). Post-clypeus with red lateral stripes besides of median carina. Rostrum with black second and third segments. Pro- and mesonotum whitish, with wide light brown median stripe, but median carinae whitish; sensory pits light brown. Paranotal lobes



Figs 32–34. Nogodinidae, hind wing. 32 – *Forculus gibbosus* Distant, male, holotype, Ceylon (BMNH); 33 – *Nogodina reticulata* (F.), male, Santorem (ZIN); 34 – *Bladina* sp., Columbia (ZIN).

brown near to antennae, with whitish outer margins. Fore wings whitish, each with large brown area laing between R and CuA. Tegulae whitish. Legs light brown to brown. Apices of leg spines black. Episternae, epimerae, and abdomen including genital block brown. Styles whitish, with brown margins.

MALE GENITALIA (Figs 28–31). Generally very similar to *B. modestus*. Pygofer long (vertically), with slightly convex hind margin (Fig. 28). Anal tube wide, narrowly rounded apically (in dorsal view) (Fig. 31), with lateral margins turned down in shape of elongately rounded processes (in lateral view). Anal column (paraproct) long, almost half as long as anal tube. Connective with large and wide cup. Phallobase strongly curved – horse-shoe shaped (in lateral view), wide in proximal half (Fig. 28). Each dorso-lateral lobe with large elongately rounded process on its ventral margin (which is weakly sclerotized) above ventral aedeagal hooks (in lateral view) (Figs 28, 30). Dorso-lateral lobes rounded apically, each with oblique transverse carina. Aedeagus with pair of long (more than half as long as phallobase) narrow ventral hooks directed basally, pointed apically. Apical aedeagal processes bilobed apically. Style with convex hind margin and long and narrow capitulum without teeth (Figs 28, 29).

FEMALE. Unknown.

TOTAL LENGTH. 3.0 mm.

DISTRIBUTION. Western Australia (North of Perth).



Figs 35–38. Nogodinidae. 35–37 – *Bilbilis modestus* (Stål), holotype: 35 – dorsal view; 36 – lateral view; 37 – type labels; 38 – *Bilbilicallia truncatella* (Walker), female, holotype, “New Holl.” (BMNH), fore wing. Abbreviation: *hp* – hemicircularly protruding costal margin of fore wing.

***Bibilis dorsalis* (Walker, 1851)**

Figs 39–40, 48

Hysteropterum dorsale Walker, 1851: 375.

Bibilis dorsalis: Fennah, 1984: 83.

TYPE MATERIAL. Holotype – female, **Australia**: “type”, “New Holland” (BMNH). The holotype is pinned.



Figs 39–44. Nogodinidae. 39, 40 – *Bibilis dorsalis* (Walker), holotype: 39 – lateral view; 40 – frontal view; 41–44 – *B. caligula* Fennah, holotype: 41 – head and pronotum, dorsal view; 42 – lateral view; 43 – frontal view; 44 – dorsal view.

SUPPLEMENTARY DESCRIPTION. Metope with 6 pairs (two pits situated closely) of sensory pits besides each sublateral carina (Fig. 40).

TOTAL LENGTH. 4.0 mm.

REMARKS. The photos of holotype are published for the first time. Distribution in Australia is unknown.

***Bibilis caligula* Fennah, 1984**

Figs 41–44

Bibilis caligula Fennah, 1984: 82.

TYPE MATERIAL. Holotype – male, **Australia**: “W Australia Calingeri, 65 mls. N of Perth, 9.XII.1961, E.B. Britton” (BMNH). The holotype is glued on paper triangular which is pinned. Abdomen has been removed and the genitalia dissected; these are in a small glass vial of glycerine pinned under the specimen.

OTHER MATERIAL EXAMINED. **Australia**: “W Australia, Yanchev., 32 mls. N of Perth”: 20–31.XII 1935, 1♀; 24.XI –2.XII 1935, 1♂, all leg. R.E. Turner (BMNH).

SUPPLEMENTARY DESCRIPTION. Metope with 6 pairs (two pits situated closely) of sensory pits besides each sublateral carina (Fig. 43). Pronotum with two rows of sensory pits (Fig. 41).



Figs 45–48. Nogodinidae. 45–47 – *Bibilis elongatus* Gnezdilov, sp. n., holotype: 45 – dorsal view; 46 – frontal view; 47 – lateral view; 48 – *B. dorsalis* (Walker), holotype, ovipositor.

TOTAL LENGTH. Males – 3.7 mm, female – 4.2 mm.

REMARKS. The photos of holotype are published for the first time.

DISTRIBUTION. Western Australia (North of Perth).



Figs 49–52. *Gastrinia vaginata* Stål, female, holotype. 49 – dorsal view; 50 – fore and hind wings; 51 – ovipositor, lateral view; 52 – type labels.

Subfamily Gastriniinae Fennah, 1987

Gastrinia vaginata Stål, 1859

Figs 49–52

TYPE MATERIAL. Holotype – female, **Brazil**: “Bahia: Gomes” [green, hand-written in ink] // “vaginata / Stål* / luctans N. ant.” [green, hand-written in ink] //

“Type” [red, printed] // “4677” [printed] // “Gastrinia vaginata Stål” [hand-written in ink] // “Gastrinia / Stål.” [hand-written in ink] // “Gastrinia / vaginata / Stål*” [hand-written in ink] (MNHB). The holotype is pinned.

REMARKS. The photos of holotype are published for the first time.

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REFERENCES

- Asche, M. 2015. The West Palaearctic Achilidae (Hemiptera, Fulgoromorpha) – a review with description of five new species from the Mediterranean. *Nova Supplementa Entomologica*, 25: 1–135.
- Bourgoïn, T. 2017. FLOW (Fulgoromorpha Lists on The Web): a world knowledge base dedicated to Fulgoromorpha. <http://hemiptera-databases.org/flow/>. Version 8, updated 26 March 2017; accessed 31 October 2017.
- Chan, M.-L. & Yang, Ch.-T. 1994. *Issidae of Taiwan (Homoptera: Fulgoroidea)*. Chen Chung Book, Taichung. 188 p.
- Fennah, R.G. 1952. A revision of *Bladina* Stål (Nogodinidae: Fulgoroidea). *Annals and Magazine of Natural History*, Ser. 12, 5(58): 910–928.
- Fennah, R.G. 1954. The higher classification of the family Issidae (Homoptera: Fulgoroidea) with descriptions of new species. *Transactions of the Royal Entomological Society of London*, 105(19): 455–474.
- Fennah, R.G. 1978. The higher classification of the Nogodinidae (Homoptera, Fulgoroidea) with the description a new genus and species. *Entomologist's Monthly Magazine*, 113: 113–119.
- Fennah, R.G. 1984. Revisionary notes on the classification of the Nogodinidae (Homoptera, Fulgoroidea), with description of a new genus and a new species. *Entomologist's Monthly Magazine*, 120: 81–86.
- Fennah, R.G. 1987. A new subfamily of Nogodinidae (Homoptera: Fulgoroidea) with the description of a new species of *Gastrinia*. *Proceedings of the Entomological Society of Washington*, 89(2): 363–366.
- Gnezdilov, V.M. 2003. Review of the family Issidae (Homoptera, Cicadina) of the European fauna, with notes on the structure of the ovipositor in planthoppers. *Chteniya pamyati N. A. Kholodkovskogo [Meetings in Memory of N.A. Kholodkovsky]*, 56(1): 1–145 (in Russian with 46 pages of English translation, 24 pages of illustrations with Russian and English legends).

- Gnezdilov, V.M. 2007. On the systematic positions of the Bladinini Kirkaldy, Tonginae Kirkaldy, and Trienopinae Fennah (Homoptera, Fulgoroidea). *Zoosystematica Rossica*, 15(2): 293–297.
- Gnezdilov, V.M. 2012. Revision of the tribe Colpopterini Gnezdilov, 2003 (Homoptera, Fulgoroidea, Nogodinidae). *Entomologicheskoe obozrenie*, 91(4): 757–774. [In Russian, English translation: *Entomological Review* (2013), 93(3): 337–353. DOI: 10.1134/S0013873813030081]
- Gnezdilov, V.M. 2013. Contribution to the taxonomy of the family Tropiduchidae Stål (Hemiptera, Fulgoroidea) with description of two new tribes from Afrotropical Region. *Deutsche Entomologische Zeitschrift*, 60(2): 179–191.
- Gnezdilov, V.M. 2017a. On the taxonomic positions of the genera *Paralusanda* Synave, *Paramangola* Synave, *Chondroptera* Bergroth, and *Neolollius* Muir (Hemiptera: Auchenorrhyncha: Fulgoroidea: Nogodinidae). *Proceedings of the Zoological Institute RAS*, 321(1): 19–24.
- Gnezdilov, V.M. 2017b. A new species of the genus *Philbyella* China (Hemiptera: Auchenorrhyncha: Fulgoroidea: Nogodinidae) from the United Arab Emirates. *Entomologicheskoe obozrenie*, 96(2): 332–338. [In Russian, English translation published in *Entomological Review*, 97(4): 493–501. DOI: 10.1134/S001387381704011X]
- Gnezdilov, V.M. & Constant, J. 2014. Notes on the tribe Tongini Kirkaldy, with description of a new species of the genus *Orthophana* from northern Vietnam (Hemiptera, Fulgoroidea: Nogodinidae). *Acta Entomologica Musei Nationalis Pragae*, 54(1): 47–55.
- Kirkaldy, G.W. 1907. Leafhoppers supplement. (Hemiptera). *Bulletin of Hawaiian Sugar Planters' Association Experiment Station. Division of Entomology. Honolulu*, 3: 1–186.
- Kramer, J.P. 1976. Revision of the Neotropical planthoppers of the genus *Bladina* (Homoptera: Fulgoroidea: Nogodinidae). *Transactions of the American Entomological Society*, 102(1): 1–40.
- Melichar, L. 1898. Monographie der Ricaniiden (Homoptera). *Annalen des K. K. Naturhistorischen Hofmuseums*, 13: 197–359 + Tafs 9–14.
- Meng, R., Wang, M. & Wang, Y. 2014. On the taxonomy of the tribe Pisachini (Hemiptera: Fulgoromorpha: Nogodinidae) with the description of new taxa from China and Vietnam. *Zootaxa*, 3866(1): 79–104.
- Stål, C. 1859. Hemiptera. Species novas descripsit. *Kongliga svenska Fregatten Eugenie resa omkring jorden under befäl af C.A. Virgin aren 1851–1853. Vetenskapliga iakttagelser Pa H. Maj :t Konung Oscar den Förstes befallning utgifna af K. Svenska Vetenskaps-Akademiens Zoologi*, 4: 219–298.
- Stål, C. 1861. Nova methodus familias quasdam Hemipterorum disponendi. *Öfversigt af Kongliga Svenska Vetenskaps-Akademiens Förhandlingar*, 18(4): 195–223.
- Walker, F. 1851. *List of the specimens of Homopterous insects in the collection of the British Museum*, 2: 261–636, Pl. 3, 4.