



Tyriactaca hyalina (Kallies & Arita, 2001) (Lepidoptera: Sesiidae: Tinthiini)— a description of pupa and the introduction into Europe on an infested *Ficus microcarpa*

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Abstract

The clearwing moth, *Tyriactaca hyalina* (Kallies & Arita, 2001) (Tinthiini, Sesiidae), was reared from cultivated *Ficus microcarpa* L.f. which were imported from China to Poland. *Tyriactaca hyalina* is native to southeast Asia and was probably reared before from the same imported *Ficus* plants in Germany and France. This article presents the first description of the pupal morphology of *Tyriactaca*. We compare the description of pupal morphology of *T. hyalina* to known morphological features of the pupae of other Tinthiini species. The morphological characters of adult and male genitalia are also presented.

Key words: alien species, exuviae, *Ficus* sp., species introduction

Introduction

Tyriactaca hyalina (Kallies & Arita, 2001) was originally described from northern Vietnam and Laos as *Ceratocorema hyalina* (Kallies & Arita 2001). The authors suggested then that *Ceratocorema* seems to be similar to the genus *Tyriactaca* Walker, 1862, or may represent a junior subjective synonym of it. Recently Kallies (2020) examined the identity of the genus *Tyriactaca* Walker, 1862, based on its type species *Tyriactaca apicalis* Walker, 1862 from Borneo and confirmed that *Tyriactaca* Walker, 1862 and *Ceratocorema* Hampson, [1893] belong to the same genus-group. *Tyriactaca* Walker, 1862 is an older genus-group name than *Ceratocorema* Hampson, [1893], which is a subjective junior synonym of *Tyriactaca* Walker, 1862. Consequently, the species originally described as *Ceratocorema hyalina* was transferred to the genus *Tyriactaca*.

The genus *Tyriactaca* currently contains nine species known from southern and southeastern Asia (Pühringer & Kallies 2020). Based on external characteristics and genitalia morphology, *Tyriactaca hyalina* is similar to *Tyriactaca cymbalistis* (Meyrick, 1926) and *Tyriactaca semihyalina* (Hampson, 1919). *Tyriactaca hyalina* is distinguished from other congeneric species by having a narrow brownish discal spot on the forewing. Other species have a broader, black discal spot on the forewing. In *T. semihyalina*, the posterior area is semi-transparent, it is transparent in *T. hyalina*. A characteristic feature of *T. hyalina* is the presence of two yellow-orange fan-like anal scale tufts (Kallies & Arita 2001). In addition, in reared individuals of *T. hyalina*, scale tufts on the mid and hind tibia are very noticeable. *Tyriactaca hyalina* was described on the basis of a male (holotype) and a female (paratype) collected in the field. Therefore, the biological characteristics obtained by rearing a male are additionally presented in this article.

Material and methods

A male of *T. hyalina* was reared in February 2019 from *Ficus microcarpa* L.f. commonly called as “ginseng” or ficus bonsai. The infested plant derives from one of the big shopping centers in Katowice, Poland and was sent for study to The Main Inspectorate of Plant Health and Seed Inspection in Katowice, Poland. The infested plant was transported from Zhangpu Shunxin Banyan Miniature Garden Farm, Zhangzhou, Fujian, China to the Netherlands and then to Poland. *Opogona sacchari* (Bojer, 1856) (Tineidae) was reared from the same plant.

The *T. hyalina* specimen is deposited in the collection of the Upper Silesian Museum in the Natural History Department in Bytom (Poland). The description of pupal morphology is based on the studies by Patočka & Turčani (2005) and Nakamura (2009). The systematic order and nomenclature of Sesiidae follows Pühringer & Kallies (2004, updated 2020).

The pupal exuvium was examined with a Nikon SMZ 1000 stereoscope microscope. Photographs of the exuvium and male genitalia were taken with a digital camera AxioCam MRc5 attached to a Lumar V12 stereoscopic microscope, connected to a computer with Axio Vision 4.8 software. Stereoscopic microscope images were taken in the Laboratory of Electron and Confocal Microscopy and in the Department of General Zoology (Faculty of Biology, Adam Mickiewicz University, Poznań).

Results

Description

(Figs. 1–3).

Adult, male. Alar expanse 13.8 mm, forewing length 6.15 mm, body length 6.3 mm, antenna 3 mm.

Head: antenna filiform; labial palps black dorsally, silvery white ventrally, apically whitish. Frons leaden grey; vertex black; pericephalic scales black with individual yellow scales dorsally, silvery white ventrally and laterally.

Thorax: black, tegulae and patagia black shining, metathorax with black hair-like scales. Legs: neck plate white, fore coxa black with white and yellow scales scattered in middle part, fore femur black, fore tibia yellow ventrally, black apically, with yellow short hair-like scales, basal tarsomere yellow ventrally and with black short hair-like scales apically, remaining tarsomeres yellow, blackish basally. Mid coxa black, mid tibia with tufts of black scales near base and longer scales at the distal end; spurs yellow, long and naked; basal tarsomere with black long hair-like scales, remaining tarsomeres white, blackish basally and dorsally. Hind femur black, with white scales distally; hind tibia black basally, yellow distally on ventral side, yellow with white scales, tufts of black hair-like scales at base of spurs; the tibial spurs large and clad with very long scales; spurs yellow, with fine hair-like black scales. Basal tarsomere with tuft black long hair-like scales ventrally, yellow with black scales, remaining tarsomeres white, blackish basally.

Forewing: transparent areas well developed, external transparent area very large, anterior transparent area covered with semitransparent light brownish scales, discal spot narrow light brownish, some individual yellow scales at base of forewing, ventral side of forewings with orange-yellow scales at base. *Hindwing*: transparent, veins black, discal spot not developed.

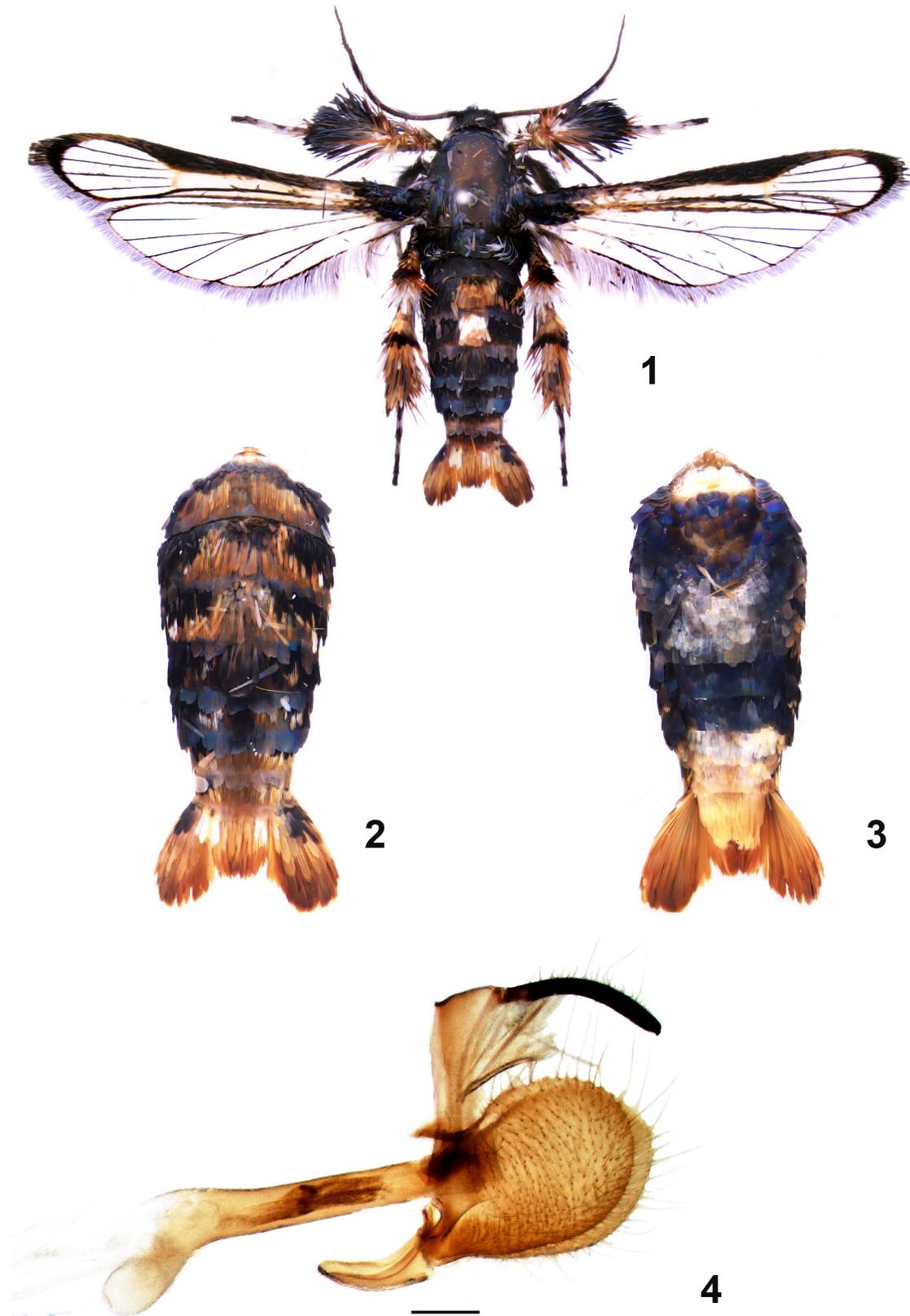
Abdomen: tergite 1, black shining, tergites 2 and 3 black shining with a raised tuft of dirty yellow hair-like scales in middle part, tergite 3 with individual white scales basally, tergites 4 and 5, black shining, tergites 6 and 7 orange yellow with individual black scales laterally, anal tuft, laterally with two fan-like scale tufts, each orange black apically (Fig. 2). Sternite 1 black shining, sternites 2 and 3 black, with white spot medially, sternites 4 and 5 black, sternites 6 and 7 dirty white, sternite 8 yellow orange with white scales at base (Fig. 3).

The male genitalia (Fig. 4) of this species were described and figured in detail by Kallies & Arita 2001.

Pupa (Figs 5–13). Length and width: 8.2 mm × 2.1 mm.

Head: Plate of head projection blade small and rounded in front. Frons rather long in dorsal view. Frons with shallow and less wrinkled depressions, central ridge strong. Frontal setae situated slightly prior or approximately at level of lateral angles of frons in dorsal view (Fig. 6). Head projection blade not curved in lateral view, dark margin narrow, not undulated. Frons rises steeply from projection blade in lateral view (Fig. 7). Depression of clypeus wide and obtuse in front in ventral view (Fig. 8). Postclypeus without projections, separated from labrum by a distinct

rim. Distance between clypeal setae C12 approximately 3 × greater than distance of C12 from C11. Mandibles wide. Labrum wrinkled, truncate for a greater distance and with slightly concave lateral sides. Labium small, labial palpi reduced, very short (Fig. 9). Proximo-lateral corner of maxilla touching maxillary palpus. Proboscis slightly exceeds prothoracic legs, antennae do not reach ends of mesothoracic legs (Fig. 10).



FIGURES 1-4. Morphology of *Tyriactaca hyalina* adult. 1, male; 2, abdomen dorsally; 3, abdomen ventrally; 4, male genitalia. Scale bar: 4—0.2 mm.



FIGURE 5. Pupa of *TyRICTACA hyalina* in *Ficus microcarpa*.

Thorax: Mesothorax on each side with two mesothoracic dorsal setae (mds) (one near midline), one pore-like sensillum. Metathorax bearing one metathoracic dorsal seta (mtds) and one dorsal sensillum on each side (Fig. 11). Forewing extending to half of 4th abdominal segment; hindwing hidden under forewing at caudal margin of 3th abdominal segment. Tip of prothoracic leg unattached to maxilla.

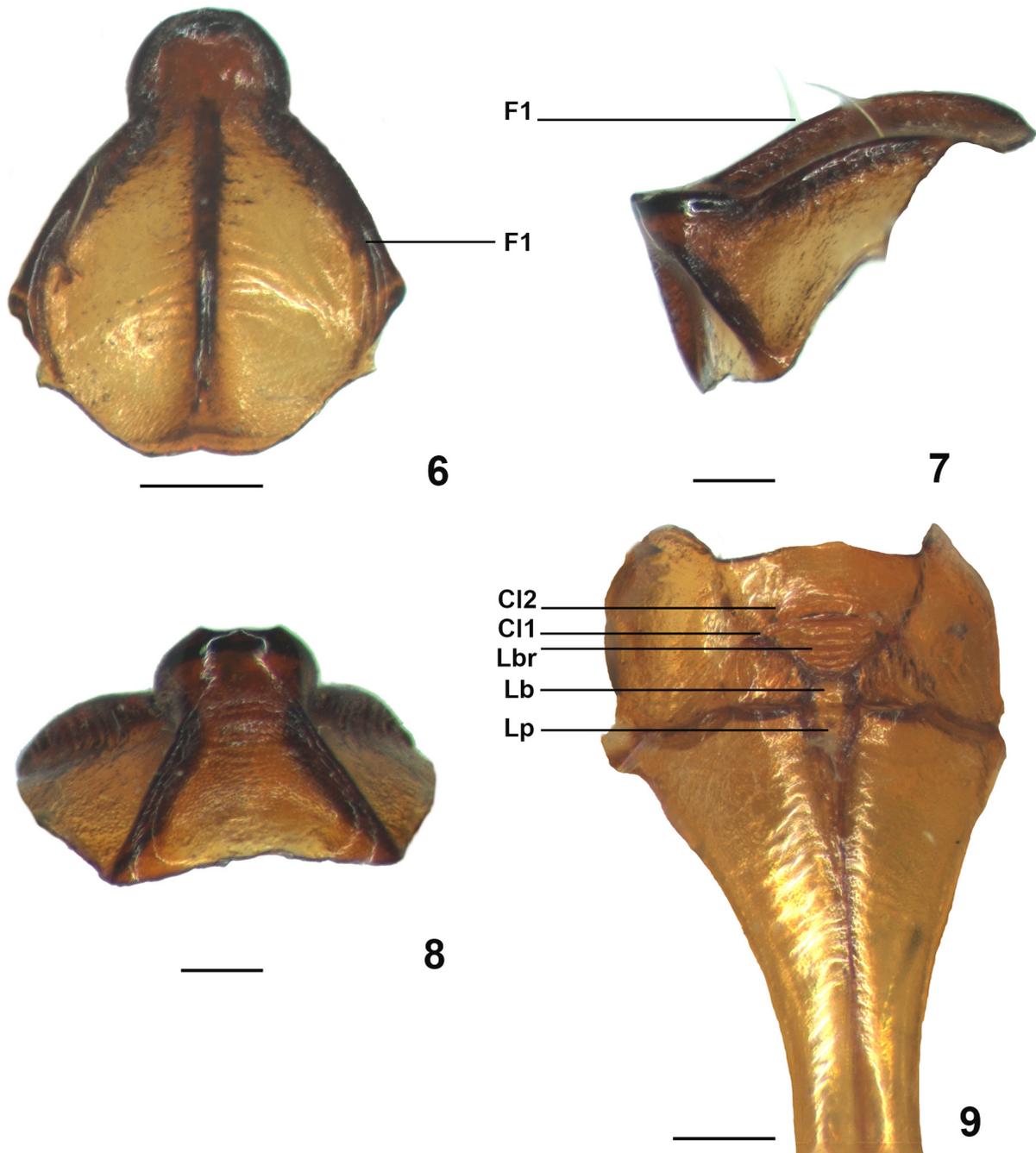
Abdomen: Spines of basal row on the 2nd abdominal segment, absent. Spines of caudal row approximately 3.5–4 × smaller than those of basal row on the 3rd abdominal segment. The 4th abdominal segment bears 6 slender spines of basal row between setae D1. Setae ventral (SV) present on 4th–7th (Fig. 12). Cremaster relatively roundly pointed at end, anal suture slightly shorter than cremaster. Two pairs of robust spines on the 10th abdominal segment with long and twisted distally setae, approximately 3× longer than spines (Fig. 13).

Discussion

Morphology of pupae

Patočka & Turčani (2005) described the diagnostic characters of Tinthinii as having a proboscis that does not reach the mesothoracic legs or ends of the antennae by far, having a reduced, obtuse blade of the head projection with an undulated frontal margin. The description was based on the pupal morphology of *Microsphecia brosisformis* (Hübner, [1813]). Nakamura (2009) described Tinthinii as never having a small spine on the frons, having large labial palpus, maxilla that extend far beyond the tip of the prothoracic leg, two rows of small spines present on the 2nd abdominal segment, and the hindwing hidden under the forewing on the 4th abdominal segment. This description was based on the pupal morphology of *Entrichella constricta* (Butler, 1878) and *E. esakii* (Yano, 1960).

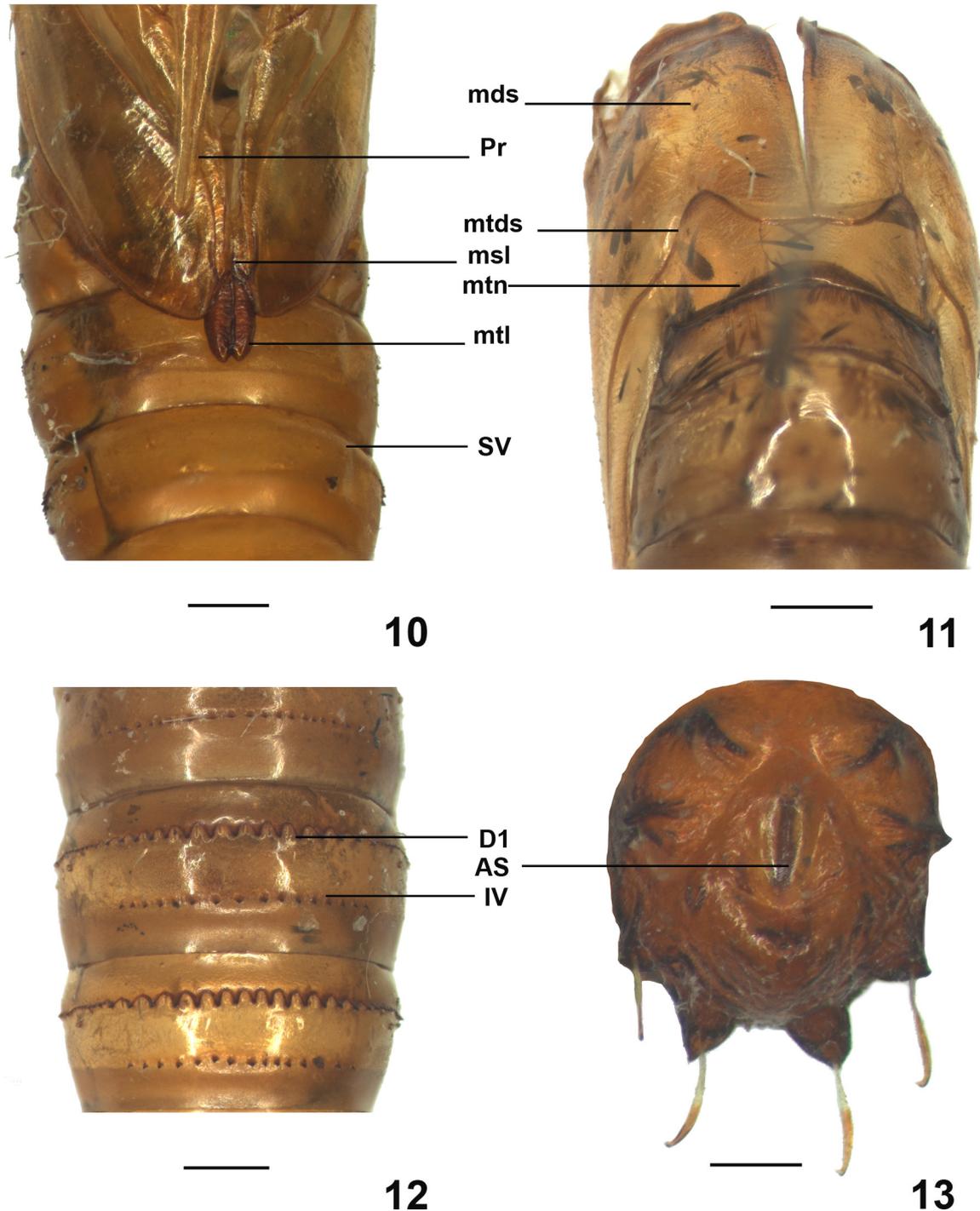
According to Nakamura (2009) the diagnostic characters of the pupae of Tinthininae are: tip of prothoracic leg attached to maxilla; conspicuous ridged notaulix furrow, present on mesothorax; row of small spines presents along cephalic margin of 7th abdominal segment; SDI seta absent on metathorax; SV setae present on 4th–7th abdominal segments.



FIGURES 6–9. Morphology of *TyRICTACA hyalina* pupa. 6, frons dorsally; 7, frons laterally; 8, frons ventrally; 9, labrum and vicinity. Abbreviations: F1—frontal setae, Cl—clypeal setae, Lbr—labrum, Lb—labium, Lp—labial palpi. Scale bar: 0.2 mm.

Comparing the above descriptions of Tinthiinae with the description of the pupa of *T. hyalina* in this work, there are clear differences in several key features. The most important differences are: (i) in *T. hyalina* the SD1 setae are present on metathorax; (ii) the tip of the prothoracic leg is unattached to maxilla; (iii) the labial palpus is small and reduced; (iv) the two rows of small spines on the 2nd abdominal segment are absent; (v) the hindwing is hidden under the forewing on the 3th abdominal segment. Analyzing all the compared pupal features together, it seems that the diagnostic characters of Tinthiini are as follows: 1) antennae that are not distinctly enlarged at the distal ends, 2) a short proboscis that slightly exceeds the prothoracic legs; 3) rather short labial palpus; 4) the SV setae are present on 4th–7th abdominal segments. For a comprehensive analysis, a detailed study of the morphology of pupae obtained from a larger number of Tinthiini species is needed.

The pupa of *Tyrichtaca* is easily distinguished from that of *Entrichella* and *Microsphecia* based on the shape of the frontal process. In *Tyrichtaca* it is small and rounded in front, and the frontal margin is not undulate. In *Entrichella*, the frontal process is sharpened, spine-like, protruding ventro-cephalad, and both sides have a black pteroid overhang. In *Microsphecia*, the frontal process is reduced and obtuse. The frontal margin is undulated. Among other diagnostic characters of *Tyrichtaca* reduced palpi labiales and very long and twisted distal setae on the 10th abdominal segment are also included.



FIGURES 10–13. Morphology of *Tyrichtaca hyalina* pupa. 10, proboscis and leg ends; 11, meso and metathorax; 12, spines on abdominal segments dorsally; 13, abdominal end ventrally. Abbreviations: setal groups—D1—dorsal, mds—mesothoracic dorsal, mtds—metathoracic dorsal, SV—subventral. AS—anal suture, Pr—proboscis, Msl—mesothoracic legs, Mtl—metathoracic legs, Mtn—metanotum. Scale bar: 0.5 mm.

Distribution and biology

Tyriactaca hyalina was introduced into Europe on an infested *Ficus microcarpa* from Zhangzhou, Fujian, China. This would indicate that this species is widely distributed in Southeast Asia as the species is also known from two localities in northern Vietnam and Laos (Kallies & Arita 2001).

A photo of a moth similar in appearance reared from *F. microcarpa* in Berlin (Germany) was shared by Franz A. Ladda on (<http://www.lepiforum.de> accessed 31.VIII.2020) in 2015 and identified as *Ceratocorema* sp. by Daniel Bartsch. In the same year, a photo of another individual reared from ficus bonsai in Paris (France) was shared on (<http://www.insecte.org> accessed 31.VIII.2020).

The possibility that the host plants of *Ceratocorema* are *Ficus* spp as they were suggested by Kallies & Arita (2001). According to Meyrick (1926) and Fletcher (1933), *C. cymbalistis* was reared from the aerial roots of *Ficus bengalensis* L. and from swellings on twigs of *Ficus religiosa* L. (Moraceae). Fletcher (1933) indicated that pupation takes place in a “tough cocoon of silk intermingled with brown frass.” However the host plant of *T. hyalina* was unknown until now. It has been confirmed that the host plant is *Ficus microcarpa* L.f. and that pupation takes place inside a cocoon created in a gallery of the host plant (Fig. 5).

Tyriactaca hyalina has only been observed rarely in Europe and is not yet considered a pest. In contrast, the banana moth, *Opogona sacchari* (Bojer, 1856), was reared from the same host plant and it is a serious pest of a wide range of ornamental tropical and subtropical plants (Davis & Pena 1990).

Acknowledgements

We would like to express our sincere thanks to Axel Kallies (Australia) for the confirmation of our determination of this clearwing moth. The authors are grateful to Tara Massad (USA) for carefully checking the English and Jacek Wendzonka (Poland) for help with imaging of adult. Finally, we thank reviewers and editor for helpful comments.

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