

## Morphological differences between *Stephanitis pyri*, *Corythucha arcuata* and *C. ciliata* (Heteroptera: Tingidae) distributed in the south of the European part of Russia

## Морфологические различия между *Stephanitis pyri*, *Corythucha arcuata* and *C. ciliata* (Heteroptera: Tingidae), распространенными на юге европейской части России

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The paper presents an original key for the identification of three harmful species of the lace bugs (Heteroptera: Tingidae) distributed in the south of the European part of Russia: the Palearctic *Stephanitis pyri* (Fabricius, 1775) and the Nearctic *Corythucha arcuata* (Say, 1832) and *C. ciliata* (Say, 1832); the last two species are invasive in Europe.

В статье дан оригинальный ключ для определения трех вредных видов клопов-кружевниц (Heteroptera: Tingidae), распространенных на юге Европейской части России: палеарктического *Stephanitis pyri* (Fabricius, 1775) и неарктических *Corythucha arcuata* (Say, 1832) и *C. ciliata* (Say, 1832); два последних вида – инвазивные в Европе.

**Key words:** lace bugs, key, identification, *Corythucha arcuata*, *Corythucha ciliata*, *Stephanitis pyri*, Heteroptera, Tingidae

**Ключевые слова:** клопы-кружевницы, ключ, определение, *Corythucha arcuata*, *Corythucha ciliata*, *Stephanitis pyri*, Heteroptera, Tingidae

### INTRODUCTION

The Palearctic species *Stephanitis pyri* (Fabricius, 1775) and the invasive in Europe Nearctic species *Corythucha arcuata* (Say, 1832) and *C. ciliata* (Say, 1832) reproduce in large numbers and cause considerable damage to various trees and shrubs in the south of the European part of Russia, namely in the Krasnodar Territory and the Republic of Adygea. The first species lives on trees of the family Rosaceae as well as on *Tilia* spp., *Betula* spp., *Quercus* spp. and other genera (Putshkov, 1974; Péricart, 1983). The latest data on the distribution of *S. pyri* in Russia are provided by Golub

(2002). The pest of *Platanus* spp., *C. ciliata*, inhabited the south of Russia in the 1990s (Voight, 2001; Kalinkin et al., 2002; Golub et al., 2008). The pest of *Quercus* spp., *C. arcuata*, appeared in the Krasnodar Territory in 2015, and now it is also distributed in Adygea (Shchurov et al., 2016; Neimorovets et al., 2017). All these three species inhabit the same territory and are very similar to each other in their habitus (Figs 1–3), that greatly complicates their identification. The analysis of the morphological characteristics of these species allowed us to make up a key for them, which was previously absent; this original key is given below. The ascertained reliable diagnostic characters of the species can be used in subsequent ecological studies and the development of a system of plant protection measures.

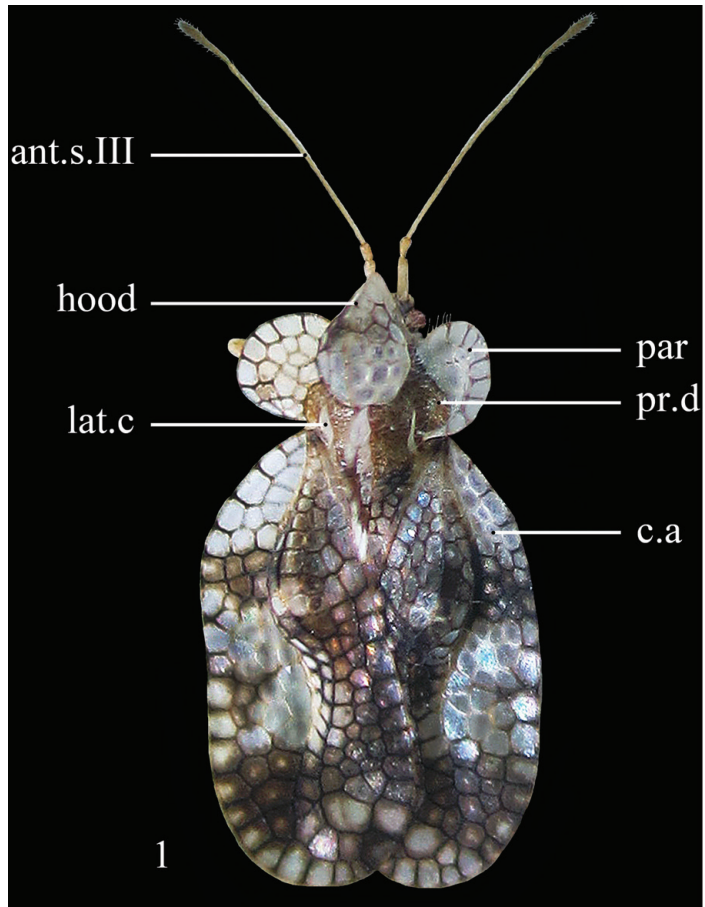
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## MATERIAL AND METHODS

The analysis of the morphological characters of the mentioned species is based on the following material: 1) more than 300 specimens of *S. pyri* from various localities of the European part of Russia from the collection of the Zoological Institute of the Russian Academy of Sciences, St Petersburg; 2) material from the collection of the first author. The latter material is listed below. *Stephanitis pyri*: 130 specimens (imago), Voronezh Prov., Belogorye, 140 km SE Voronezh (N 50°29'36", E 40°00'50"), on slopes of steppe gully with chalk outcrops, on *Malus sylvestris*, 31.VII.2017 (V. Golub, V. Soboleva); 110 specimens (imago), Krasnodar Terr., Gelendzhik (N 44°33', E 38°04'), on *Prunus armeniaca* in a park, 10.VI.2006 (V. Golub). *Corythucha arcuata*:

38 specimens (imago), Krasnodar Terr., Sevskiy Distr., Il'skiy Settlm. (N 41°51'16", E 38°34'13"), on *Quercus petraea*, 13.VI.2016 (V. Neimorovets). *Corythucha ciliata*: 76 specimens (imago), Krasnodar Terr., Slavyansk-on-Kuban' (N 45°15', E 38°07'), on *Platanus orientalis*, 19.VIII.2006 (V. Golub, E. Kotenev).

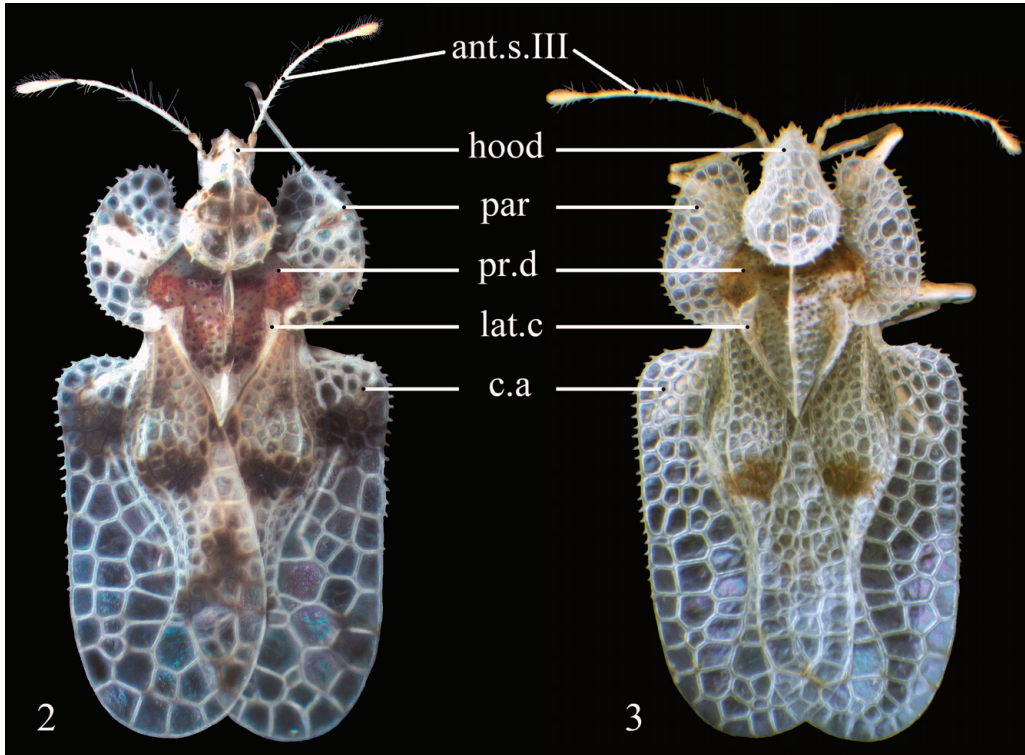
Photographs of specimens of the three discussed species were taken using a stereoscopic microscope MBS-10 equipped a digital camera DCM 800, with subsequent focus stacking in the Helicon Focus software and retouching of the final images in Adobe Photoshop CS5.



**Fig. 1.** *Stephanitis pyri* (Fabricius, 1775), habitus (Krasnodar Terr., Gelendzhik). Abbreviations: *ant.s.III* – antennal segment III; *par* – paranotum; *lat.c* – lateral pronotal carina; *pr.d* – pronotal disc; *c.a* – costal area of hemelytra.

### The key to *Stephanitis pyri*, *Corythucha ciliata* and *Corythucha arcuata*

1. Costal area of hemelytra expanding gradually from base to apex, with two rows of areolae at extreme base. Lateral margins of paranota and hemelytra and veins between areolae of pronotal hood without spinules. Paranota of semicircular shape; their lateral margins strongly arcuate. Hemelytra with two wide blackish bands near the middle of length and near apex (Fig. 1). Length of antennal segment III 0.95–1.12 mm. Body length 2.90–3.20 mm ..... *S. pyri*
- Costal area of hemelytra sharply expanding at base, forming a right angle, with four longitudinal rows of areolae here. Lateral margins of paranota and hemelytra and veins



**Figs 2, 3.** *Corythucha* spp., habitus: 2, *C. arcuata* (Say, 1832) (Krasnodar Terr., Il'skiy Settlm.); 3, *C. ciliata* (Say, 1832) (Krasnodar Terr., Slavyansk-on-Kuban'). Abbreviations as in Fig. 1.

- between areolae of pronotal hood (or vesicula, areolate formation at anterior margin of pronotum) with small elongated spinules. Paranota elongated, of truncate-elliptical shape; their lateral margin smoothly curved. Hemelytra with only separate dark spots . . . 2
2. Lateral pronotal carinae low and very short, anteriorly not or barely extending on convex pronotal disc. Lateral margins of paranota distinctly convex along their entire length. Elevation on hemelytra as well as anterior part of costal area with distinct blackish spots; some veins of pronotal hood, paranota and apical part of hemelytra also dark (Fig. 2). Length of antennal segment III 0.60–0.65 mm. Body length 2.80–3.00 mm . . . . . *C. arcuata*
- Lateral pronotal carinae relatively high, anteriorly distinctly extending on convex pronotal disc. Lateral margins of paranota weakly convex in the middle part of their length, often almost right. Elevation on each hemelytron with distinct brown spot only

(Fig. 3). Length of antennal segment III 0.87–0.95 mm. Body length 2.90–3.17 mm . . . . . *C. ciliata*

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