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# To the biology of the xylophilous flies of the genus *Ceriana* Rafinesque, 1815 (Diptera: Syrphidae) with the descriptions of the larvae and puparia of *C. caesarea* Stackelberg and *C. naja* Violovitsh

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The larvae of *Ceriana caesarea* Stackelberg and *C. naja* Violovitsh proved to breed under the bark or in bast saturated with sap or in holes with moist substratum of *Populus diversifolia* Schrenk. Imagoes emerged in April – May. The larva and puparia of *C. naja* Violovitsh and the puparia of *C. caesarea* Stackelberg are described. Variations of coloration of males of *C. caesarea* Stackelberg are discussed.

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*Key words.* Syrphidae, *Ceriana*, *caesarea*, *naja*, larva, puparia, morphology, biology, imago, coloration, variations.

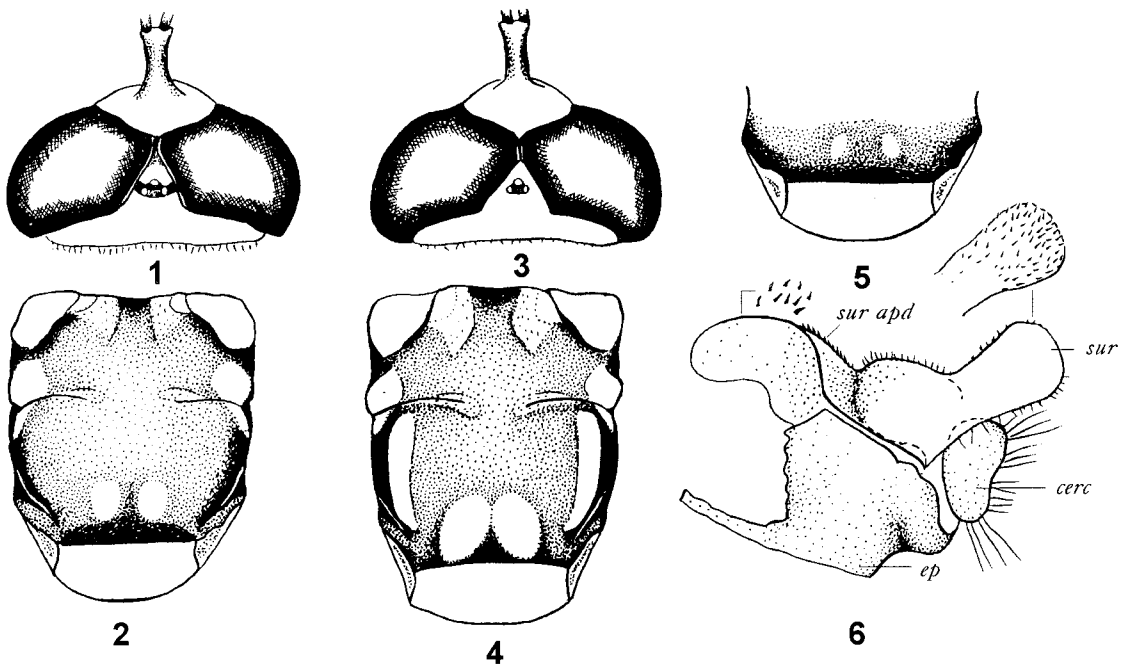
## Introduction

The genus *Ceriana* Rafinesque together with close genera is considered in the tribe Cerioidini in the subfamily Eristalinae (Vockeroth, Thompson, 1987; Thompson, Rotheray, 1998) or Milesiinae (Peck, 1988). Shatalkin (1975) considered this tribe as subfamily Cerioidinae [Cerioidinae]. Examining genitalia of *Ceriana conopsoides* L. and *Sphiximorpha subsessilis* (Illiger) (as *Ceriana subsessilis* Illiger) the latter author came to a conclusion that they have no analogs with other Syrphidae and the relationship with other Milesiinae is doubtful.

The genus *Ceriana* Rafinesque contains about 15 palaeartic species distributed mainly in

southern and east territories of Palaearctic. Only one species — *C. conopsoides* L. is transpalearctic. It is necessary to note that in some works (Violovitsh, 1974) the species of the close genera from the tribe Cerioidini are considered inside *Ceriana*.

The data on the life-history of the representatives of *Ceriana* are relatively small. The known larvae breed in sap concentrations on the trunks of trees or in saturated with sap substrata (Lundbeck, 1916; Heiss, 1938; Bhatia, 1931; Maier, 1982, 1987; Rotheray, Hancock, Maier, 1998). The larvae of some species were discovered in water, concentrated inside cut bamboo stems in Brasil (Lane, Carrera, 1943). The morphology of the larvae of Nearctic species *Ceriana abbreviata* (L.) is known from the literature.



Figs 1—6. Male of *Ceriana caesarea* (Stackelberg).

1, 3, head, dorsal view; 2, 4, thorax, dorsal view; 5, prescutellar part of scutum, dorsal view; 6, terminalia, lateral view.

Abbreviations: *cerc* — cercus; *ep* — epandrium; *sur* — surstylus; *sur apd* — surstylar apodeme.

*viata* (Loew) and Neotropical species *Ceriana odontomera* (Curran) were studied (Rotheray, Hancock, Maier, 1998). The figures of general view, anterior part and posterior spiracles are given in this work. The data on the puparium of the Nearctic species *Ceriana signifera* (Loew) (as *Cerioides*) are given in the work of Heiss (1938).

#### Materials and methods

The materials used in this study included larvae and reared imagoes kept in the collection of the Institute of Ecology and Evolution, Russian Academy of Sciences and imagoes deposited in the collection of the Zoological Museum of Moscow University. The imagoes were determined by Prof. A. A. Stackelberg and Dr. L. V. Zimina.

#### Descriptions

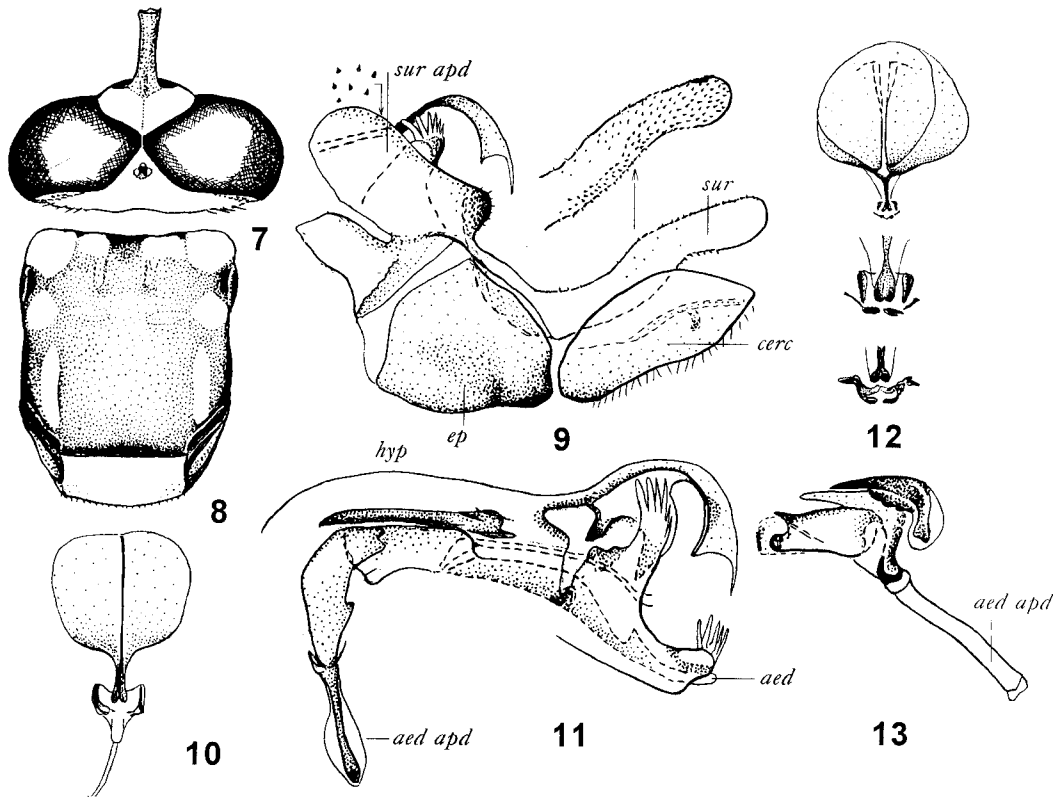
##### *Ceriana caesarea* (Stackelberg, 1928)

(Figs 1—6, 12—16, 24, 25, 29—31)

Material. **Tajikistan**, “Tigrovaja Balka” Preserve (near Dzhilikul), larvae under the bark of *Populus diversifolia* Schrenk and in litter near a hole filled with water; 7 ♂, 11.04.1978, N 171 (M. Danilevskij); 1 ♂, 12.04.1985, N 18 (A. Kompantzev); 1 ♂, 10.04.1987, N 24 (A. Zaitzev); 1 ♀, on *Populus diversifolia*, 21.05.1988 (N. Krivosheina).

Male. Some characters of male given in literature (Stackelberg, 1928; Violovitsh, 1974) proved to be variable, so we decided to give its description.

Occiput and vertical triangle completely yellow except ocellar triangle (Fig. 3). Scutum with 3 large yellow lateral spots, besides the anterior pair of spots covers postpronotum and areas near it. Two large brought together oval



Figs 7—13. Male of *Ceriana naja* Violovitsh (7—11) and *C. caesarea* (Stackelberg) (12—13).

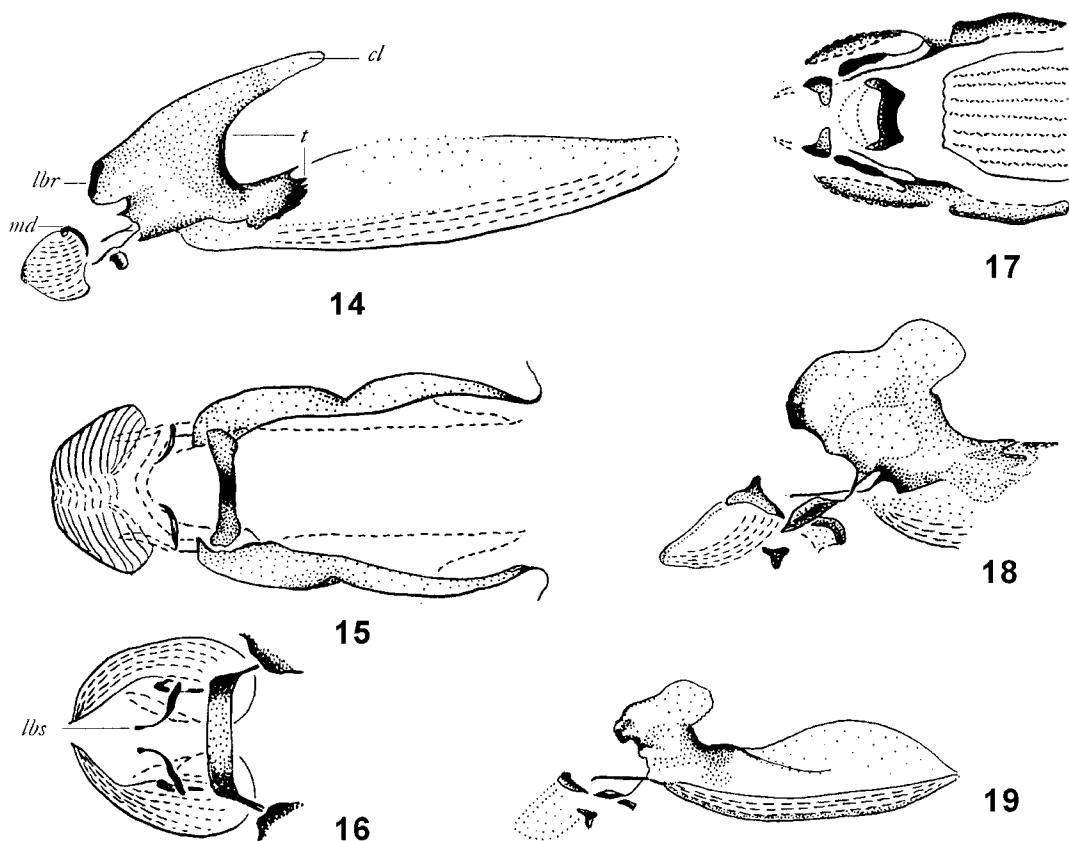
7, head, dorsal view; 8, thorax, dorsal view; 9, terminalia, lateral view; 10, 12, ejaculatory apodeme; 11, 13, aedeagus and associated structures.

Abbreviations: *aed* — aedeagus; *aed apd* — aedeagal apodeme; *cerc* — cercus; *ep* — epandrium; *hyp* — hypandrium; *sur* — surstylus; *sur apd* — surstyler apodeme.

spots are situated in front of scutellum (Fig. 4). These characters are given in the work of Violovitsh (1974). There are several specimens in our collection in which ocellar triangle is connected with the margins of eyes by black bands; the same specimens have less spots on scutum: sickle-like lateral spots between the base of the wing and scutellum are absent and oval spots in front of scutellum are smaller and not brought together (Figs 1, 2, 5). The spots on the thorax are of 2 types: bright yellow in coloration or yellow-grey, pollen. The spots of the latter type are situated along transverse suture and internally from postpronotum. The examination of genitalia of specimens with these variations did not show some differences in their structure.

*Puparium*. Body length about 12.0 mm. For the sorrow the cups of the puparia with anterior spiracles are lost.

Cephalopharyngeal skeleton (Figs 14—16) with narrow mandibles, elongated and posteriorly narrowed clypeal sclerite, significantly sclerotized parts of labrum and sclerotized tentorial bridge connecting tentorial rods. Anterior part of prothorax with an area of spinules, same as in *C. naja* Violovitsh. Lateral cuticular papillae large with groups of stick-like and hair-like structures on the top (Figs 29—31). Abdominal pseudopodia (Figs 27—28) distinctly projecting above the surface of the body with 2 rows of well separated hooks, the anterior row consisting of 6—7 large apically darkened hooks



Figs 14—19. Cephalopharyngeal skeleton of *Ceriana caesarea* (Stackelberg) (14—16) and *C. naja* Violovitsh (17—19).

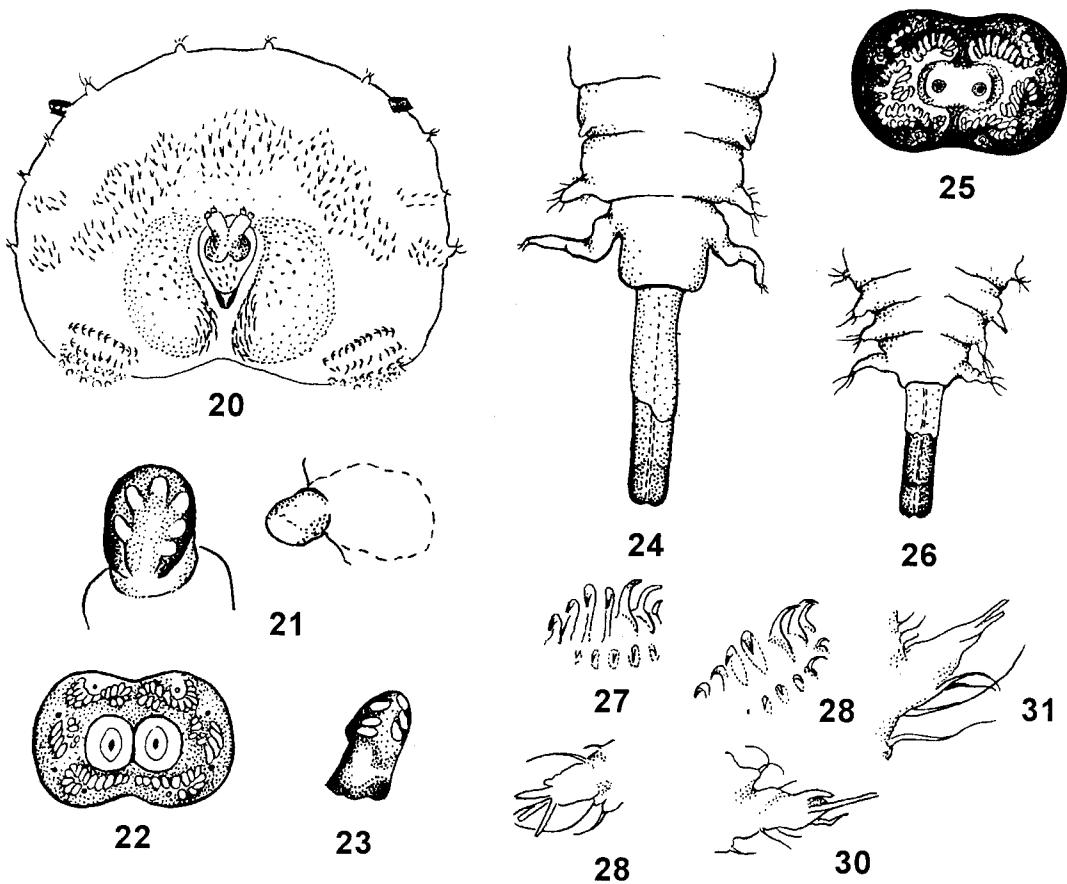
14, 18, 19, lateral view; 15, dorsal view; 16, 17, ventral view.

Abbreviations: *cl* — clypeal sclerite; *lbr* — labrum; *lbs* — labial sclerite; *md* — mandibles; *t* — tentorium.

and posterior row of 5—6 smaller hooks. Oval cuticular structures around hooks not developed. The end of the body with 3 paired projections the terminal of which is the longest, 3.5—4 times as long as wide (Fig. 24). The anterior pair of projections practically is not developed and represents light papillae distinctly differing in coloration from the other integument. Anal slit transverse, situated in the centre of abdominal segment VII. There is one row of large papillae in front of the slit and 2 pairs of large papillae placed in trapezium order behind the slit. Breathing tube long, 4.5 times as long as wide. Posterior spiracles (Fig. 25) with 3 meandering slits opening in cavities with many chambers.

*Biology.* The larvae breed under the bark of *Populus diversifolia* Schrenk. Several pupae were found in litter near the hole filled with water — possibly the larvae left this hole before the pupation. The emergence of imagoes happens mainly in April, sometimes in May.

*Remarks.* The pupa of this species differs from *C. naja* Violovitsh by the structure of pseudopodia which are larger and have no cuticular structures around hooks as well as by the form of the last body segment — terminal projections are larger and the part of segment bearing terminal projections is as long as wide. Cephalopharyngeal skeleton of this species is with long clypeal sclerites and with narrow mandibles.



Figs 20—31. Details of morphology of larvae and pupae of *Ceriana caesarea* (Stackelberg) (24, 25, 27—31) and *C. naja* Violovitsh (20—23, 26).

20, anterior part of larva; 21, prothoracic spiracle of larva; 22, 25, posterior spiracle of pupa; 23, prothoracic spiracle of pupa; 24, 26, end of pupa; 27, 28, cuticular structures of pseudopodia of abdominal segments I and V of pupa; 29, 30, lateral papillae of abdominal segments I and V of pupa; 31, lateral papilla of abdominal segment VII of pupa.

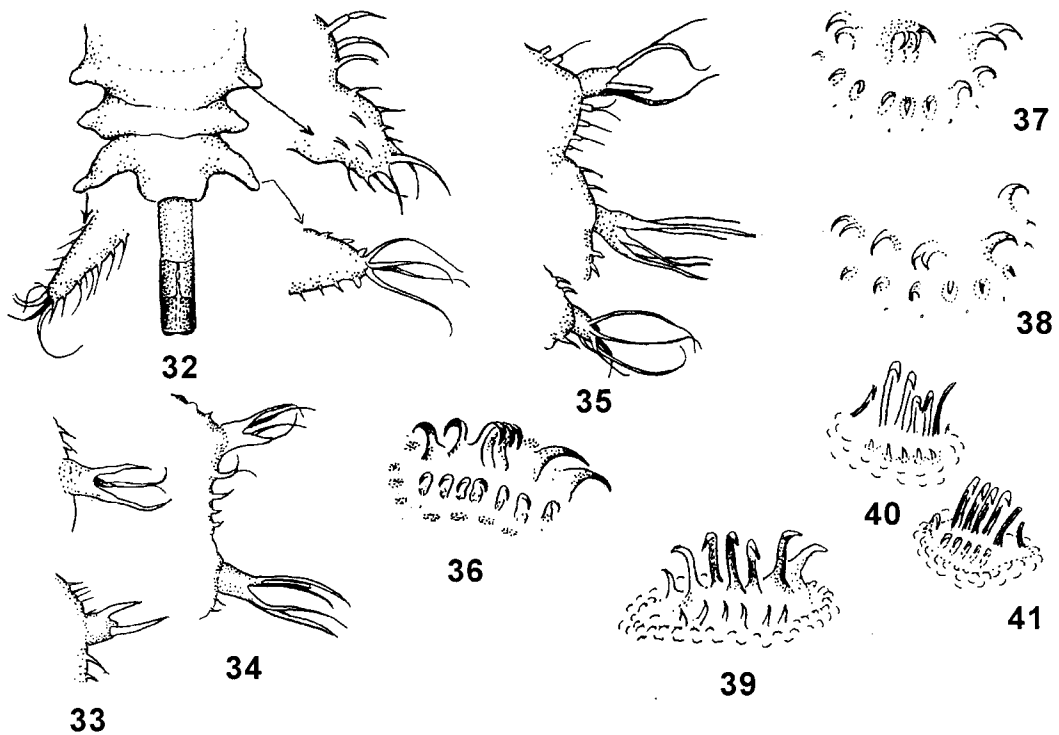
***Ceriana naja* Violovitsh, 1974**

(Figs 7—11, 17—19, 20—23, 26, 32—41)

**Material.** **Tajikistan**, “Tigrovaja Balka” Preserve, near Dzhilikul, larvae in trunks of *Populus diversifolia* Schrenk in bast saturated with sap, 27.03.1986; 1 ♂, emergence of imago 28.04.1986, N 12; 28.03.1986, 2 ♂, 1 ♀, emergence of imago 9.05.1986, N 19; 4.04.1986, 1 ♂, emergence of imago 9.05.1986, N 49; 6.04.1987, 1 ♂, emergence of imago 7.05.1987, N 2 (N.Krivosheina); 3 ♂, 1 ♀, 4.05.1978, N 132; 1 ♀, 16.04.1978, N 34; 1 ♀, 25.04.1978, N 37 (M. Danilevskij). **Turkmenistan**, Karabekaul, larvae in

concentration of sap on *Populus diversifolia* Schrenk; 1 ♂, 19.04.1978, N 1; 2 ♂, 20.04.1978, N 5; 2 ♂, 25.04.1978, N 30 (T. Kompantzeva); Turkmenistan, Dajnu, larvae in the holes of *Populus diversifolia* Schrenk, in moist dust, 7.04.1973, N 42; 2 ♂, emergence of imago 21.05.1973 (N. Krivosheina).

**Male.** The species is close to *C. caesarea* Stackelberg in the coloration of occiput and thorax (Figs 7—8), differing by the structure of genitalia and dark bands on face near the bases of antennae. In spite we have got large materials of imagoes there were no variations in the coloration in this species.



Figs 32—41. Details of larval and pupal morphology of *Ceriana naja* Violovitsh.

32, end of body of larva; 33—35, lateral papillae of thoracic segment III and abdominal segments I, V of larva; 36—38, pseudopodia of abdominal segments I, II, III of larva; 39—41, pseudopodia of abdominal segments I, IV and V of pupa.

*Larva.* Total body length 17.0 mm. Body whitish, broadly rounded anteriorly, cylindrical and tapering posteriorly, breathing tube well developed.

Cephalopharyngeal skeleton weakly sclerotized, mandibles short, almost triangle; clypeal sclerite short (Figs 17—19). Antenno-maxillary complex is distinctly developed; there is a group of small spines below antennae. The parts of the cuticle laterally from the mouth opening with a group of long hairs (Fig. 20). Anterior 2 thoracic segments fused, forming united structure, 3/4 as long as wide. Pseudopodia situated on the thoracic segment II with 3 rows of sclerotized hooks, the internal row is formed by 7—8 long hooks and the external — by 10—11 smaller hooks, behind which there is a double row of separated small dark spines. The surface of the cuticle is sclerotized irregularly,

scaled. Thoracic segment III isolated from the abovementioned complex and shorter than the following abdominal segment. Small cylindrical prothoracic spiracles no less than 1.5 times as long as wide. Spiracles cut obliquely at apex and has 6 spiracular openings (Fig. 21). Sclerotized hooks near spiracles absent, the larva differing in this character from those of *Callicera*. Prothorax with broad field of sclerotized spines. The spines are simple or double. The field is not divided into 4 triangular isolated parts as it was stated for the larvae of *C. odontomera* (Curran) (Rotheray, Hancock, Maier, 1998). There are two small isolated groups of spines laterally from the field, the first consisting of 14—15 spines and the second — of 6 spines. Anterior seven abdominal segments are approximately equal, 2.5—3.0 times as wide as long; segment VIII significantly narrower, almost square, 2/3

as long as segment VII. Segment IX is divided into 3 parts by pseudofolds, each of them bearing a pair of lateral projections, the latter — with branched papilla on the top. The posterior pair of projections is the longest, 1.5—2 times as long as wide. The surface of the body seems to be scaled as a result of irregular sclerotization. The anterior seven abdominal segments with 3 large lateral papillae, represented by cylindrical tubercles, bearing stick-like sensilla apically (Figs 33—35). Close in structure but smaller papillae are situated on the dorsal and the ventral sides of the body, the size of papillae increasing in posterior direction. The 6 pairs of abdominal pseudopodia are isolated and bear 2 rows of hooks, forming an oval. Anterior row is formed by large separated 6—8 hooks, darkened apically and lighter in base. Posterior row is formed by 5—7 smaller hooks approximately 2—3 times shorter than the anterior ones. They are surrounded by small and light spines which are hardly visible. The surface of the pseudopodia seems to be scaled. Transverse anal slit is near the border of abdominal segments VII and VIII; it is surrounded by a welt of large papillae anteriorly and a trapezium field of large papillae posteriorly.

Eight abdominal segments are traditionally considered in the larvae of Milesiinae (Ferrari, 1987). However the position of lateral papillae testifies to the fact that the terminal end of the body is formed by abdominal segments VIII and IX. Segment VIII has 2 pairs of large cone-like ventral papillae behind the anal slit, bearing simple and branched sensilla. The breathing tube 3—3.5 times as long as wide.

Posterior spiracles with slits opening in multi-chambered cavities (like on Fig. 22).

*Puparium.* Body length about 13.0 mm. Lateral terminal projections 2.5 times as long as wide. Anterior spiracles tubercle-like (Fig. 23). Breathing tube 3.5 times as long as wide. Pseudopodia flat, hooks brought together, cuticle of pseudopodia with many scales around hooks (Figs 39—41).

*Biology.* The larvae breed in trunks of *Populus diversifolia* Schrenck in bast saturated with sap. The stage of the third instar larva lasts 30—40 days. The emergence of imagoes happens from the end of April till the end of May.

*Remarks.* The species is characterized by relatively flat pseudopodia, the cuticle of which seems scaled. The part of the terminal segment bearing terminal projections is transverse. Cephalopharyngeal skeleton of this species is with significantly shorter clypeal sclerite and broad mandibles.

*Discussion.* The larvae of the abovementioned species differ from the known larvae of Nearctic species by the shape of anterior thoracic field of spinules, the structure of the breathing tube and pseudopodia. Anterior spiracles of *C. naja* Violovitsh are short and cut obliquely, differing from long spiracles of *C. abbreviata* (Loew) and curved ones of *C. odontomera* (Curran). Abdominal pseudopodia of Nearctic species are with more hooks than in described above 2 species. *C. abbreviata* (Loew) has 9 large and 12 smaller hooks and *C. odontomera* (Curran) — 15—16 large and 23—25 smaller hooks.

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