Russian Entomol. J. 15(3): 311–314

Three new species of Neotropical Cixiidae (Hemiptera: Fulgoromorpha)

Три новых вида неотропических Cixiidae (Hemiptera: Fulgoromorpha)

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KEY WORDS: Cixiidae, *Bothriocera*, *Haplaxius*, Dominican Republic, Panama, Dominica, Guadeloupe, new species.

КЛЮЧЕВЫЕ СЛОВА: Cixiidae, *Bothriocera*, *Haplaxius*, Доминиканская Республика, Панама, Доминика, Гваделупа, новые виды.

ABSTRACT. Three new species of Cixiidae are described: *Bothriocera emelyanovi* **sp.n.** from the Dominican Republic, *Bothriocera holzingeri* **sp.n.** from Panama, and *Haplaxius hochae* **sp.n.** from Dominica, the first species of *Haplaxius* described from the Lesser Antilles. *Diacira substigmatica* Lethierry, 1881 from Guadeloupe is placed in *Bothriocera — B. substigmatica* (Lethierry, 1881), **comb.n.**

РЕЗЮМЕ. Описаны три новых вида семейства Cixiidae: *Bothriocera emelyanovi* **sp.n.** из Доминиканской Республики, *Bothriocera holzingeri* **sp.n.** из Панамы и *Haplaxius hochae* **sp.n.** с Доминики, который является первым представителем рода *Haplaxius*, описанным с Малых Антил. *Diacira substigmatica* Lethierry, 1881 с Гваделупы перенесена в род *Bothriocera — B. substigmatica* (Lethierry, 1881), **comb.n.**

Introduction

The Cixiidae are rapidly becoming the best studied family of Fulgoromorpha. With this paper, I wish to honor some of the people responsible for this, but also to point out that for Neotropical America only two cixiid genera have been monographed, *Haplaxius* (as *Myndus*) by Kramer [1979] and *Mnemosyne* by Van Stalle [1987]. Even in these genera probably fewer than 50% of the Neotropical species are described, and for all Fulgoromorpha, perhaps fewer than 20%.

All specimens are from my collection (LOB) and some paratypes will be sent to the countries of origin and to each honoree at the museums which follow: ZISP — Zoological Institute of the Russian Academy of Sciences (St.-Petersburg, Russia); OEKO — Oekoteam, Dept. Faunistics and Animal Ecology (Graz, Austria); ZMBH — Museum fur Naturkunde der Humboldt- Universität (Berlin, Germany); CAS — California Academy of Sciences (San Francisco, USA); MHND — Museo Nacional de Historia Naturel (Santo Domingo, Dominican Republic); GBFM — Universidad de Panama (Panama City, Panama); STRI — Smithsonian Tropical Research Institute (Balboa, Panama); FWPD — Forestry, Wildlife, and Parks Division, Minister of Agriculture, Botanical Gardens (Roseau, Dominica) and LOB — Lois O'Brien, (Green Valley, Arizona, USA).

Systematics

Genus *Bothriocera* Burmeister, 1835

The genus *Bothriocera*, represented by 10 species in the US, 20 in the West Indies, and 11 in the Neotropics, has been found from the U.S. south to Brazil and Bolivia. Metcalf [1938], Fennah [1943, 1971], Caldwell [1943, 1950a, b] and Kramer [1983] have illustrated genitalia when they described new species, and included their illustrations of older species, but have not seen types of 11 species (the 4 species which are purported to be *Bothrioceretta* included). Metcalf wrote a key to species using color patterns of the tegmina; the other authors all describe variation in the color patterns within species and illustrate genitalia instead. Fennah [1971] has illustrated the tegminal patterns of the types of *B. undata* Fabricius, 1803 and *B. bicornis* Fabricius, 1803, but not genitalia of the two species. He also placed Fowler's species *Bothriocera albidipennis, excelsa*, *pellucida* and *nigra* in the subgenus *Adanella*, with the type species *albidipennis*, so that *Adanella* is a synonym of *Bothrioceretta* Caldwell, 1950 by tautonomy of two included species, *nigra* and *albidipennis*. The genitalia have not been illustrated of the types of Burmeister (*B. tinealis*, Burmeister, 1835 — Brazil); Fabricius (*B. bicornis* Fabricius, 1803 — S.A.; *B. parvula*, Fabricius, 1798 — French Guiana, and *B. undata* Fabricius, 1803 — West

Indies); Stål (*B. signoreti* Stål, 1864 — Mexico and *B. tinealis* var. *westwoodi* Stål, 1856 — Mexico (Kramer [1979] says the latter type is missing)); and Fowler (*B. venosa* Fowler, 1904 — Guatemala, and the four *Bothrioceretta* from Mexico, (*B. albidipennis, B. excelsa, B. nigra* and *B. pellucida* (all Fowler, 1904), although there are genitalic illustrations of what other authors assumed were the species without seeing types.

Having said that, I feel I can safely describe the following two species of *Bothriocera* with milky tegmina with no dark spots larger than an eye in honor of two of our colleagues who have been working on the phylogeny of Cixiidae. The other species with milky wings are *Bothriocera lua* Fennah, 1971 from Haiti, and *Bothrioceretta albidipennis* Fowler, 1904 from Mexico.

Bothriocera emelyanovi O'Brien, **sp.n.**
Figs 1–3, 12.

MATERIAL. Holotype, ♂ (CAS), Allotype, ♀ (CAS), and 189 ♂♂ and 244 ♀♀, paratypes, from Dom[inican] Rep[ublic], [Province] La Vega,/ 15 km.E. El Rio,/ May 26, 1978, C.W. & L.B./ O'Brien & [G.B.] Marshall. Second label: on *Heterotrichum umbellatum* [(Miller) Urban, Melastomataceae]; 1 ♂, 1 ♀, same except 20 mi. E. El Rio, Aug. 4, 1979; 3 ♂♂, 4 ♀♀, same except 23 mi. E. El Rio, Aug. 3, 1979, either G.B. Marshall or L.B. O'Brien; 2 ♂♂, 8 ♀♀, same except 24 mi. E. El Rio; 2 ♂♂, 7 ♀♀, same except 18 km. E. El Rio, Aug. 4, 1979, crest, cloud forest, either G.B. Marshall or C.W. O'Brien. 23 ♂♂, 47 ♀♀, La Vega, 20 km. SW. Piedra Blanca, May 29, 1978, /CW & L.B. O'Brien and [G.B.] Marshall. 1 ♀, [Province] Peravia,/ 14 km. E. San Jose de/Ocoa, Aug. 8, 1979/ G.B. Marshall, no host. Paratypes in collections: ZIN, OEKO, ZMBH, MHND, CAS, LOB.

OTHER MATERIAL. 8 ♂♂ from the type locality which have atypical (i.e., faded) spots on tegmen.

DESCRIPTION. Body pale tawny; hind wings white; tegmen milky, semi-transparent, with transverse series of three dark brown dots at level of stigma, largest in middle at first branch of M, and curving series of 6 dark lines along apical crossveins (Fig. 12); rarely several others in addition.

Macrocoryphe (vertex) at widest part 3× length, no transverse carina. Tegmen almost 3 (2.7)× as long as broad, apical area expanded, overlapping, costal margins nearly parallel at rest. Post-tibia with 6 spines, 3 on each side of space. First and second tarsomeres with 7 spines each.

Pygofer somewhat quadrate on left side (Fig. 1), rounded on right; medioventral lobe roundly triangular. Anal segment short, deflexed, not exceeding pygofer. Aedeagus with periandrium short; flagellum curled around and above aedeagus for about 180 degrees, its midportion ribbonlike, apically with flat circular area behind denticulate membranous area (Figs 1–3).

Length. ♂ — 4.2–5.0 mm, ♀ — 4.5–5.4 mm.

ETYMOLOGY. With great pleasure I name this species in honor of Dr. Alexandre Emelyanov, who has been contributing to the phylogeny of Cixiidae as well as many other of the Fulgoromorphan families.

COMPARATIVE NOTES. This species differs from Fennah's description and illustrations of *lua* from Haiti, which I have not seen, and from the new species from Panama in the tegminal color pattern, the lack of aedeagal spines or projections, and the flagellar ribbon with a denticulate membranous ball (Figs 2–3). It differs from *Bothrioceretta albidipennis* in not having the transverse carina on the macrocoryphe.

Bothriocera holzingeri O'Brien **sp.n.**
Figs 5–7, 13.

MATERIAL. Panama: Holotype, ♂ (CAS) and allotype, ♀ (CAS) and 51 ♂♂ and 20 ♀♀ from Panama, Chiriqui [Province]/ Fortuna [Dam Area], 82°15'W/ 8°44'W, May 20, 1979/ O'Briens & Marshall; 27 ♂♂ and 14 ♀♀, same except May 16; 39 ♂♂ and 12 ♀♀ same except May 18; and 2 ♀♀, same except May 19. Paratypes in collections: OEKO, ZIN, ZMBH, GBFM, STRI, CAS, LOB. Other specimens: 4 ♂♂, 3♀♀, Panama, Chiriqui [Province], Res[erva]/ For[estal] La Fortuna, IRHE/Trail, 22.VII.1995, 1000/m, C.W. & L.B. O'Brien; 3 ♂♂, 6 ♀♀, same except Quebrada Aleman with no elevation, 7–21; 3 ♂♂, same except Cont[inental] Div[ide] Tr[ail], 7–20; and 1 ♂ same except El Vivero, 7–19.

DESCRIPTION. Body pale tawny; tegmen milky with tawny veins, sometimes pale tawny indistinct transverse band at level of stigma; transverse apical crossveins of M and Cu narrowly dark brown as is Sc as it nears margin; usually three dark dots near stigma (Fig. 13).

Vertex at widest part 3× length, no transverse carina. Tegmen almost 2× as long as broad, apical area expanded, overlapping, but habitus triangular, with apical margin showing indentation between tegmina. Post-tibia with 6 spines, 3 on each side of space. First and second tarsomeres with 7 spines each.

Pygofer roundly triangular; medioventral lobe rounded elongate triangular. Anal segment deflexed, exceeding pygofer. Aedeagus rotating 360 degrees, complex; flattened periandrium with two avicephaliform projections, flagellum rodlike along left side, then flattened, ribbonlike, curled around and above aedeagus, "ribbon" with three (sometimes 2) dark sclerotized rods, membranous material on each side; three projections at origin of ribbon, (to support membrane and /or keep flagellum from rubbing against anal segment).

Length. ♂ — 5.6–6.0 mm, ♀ — 5.8–7.0 mm.

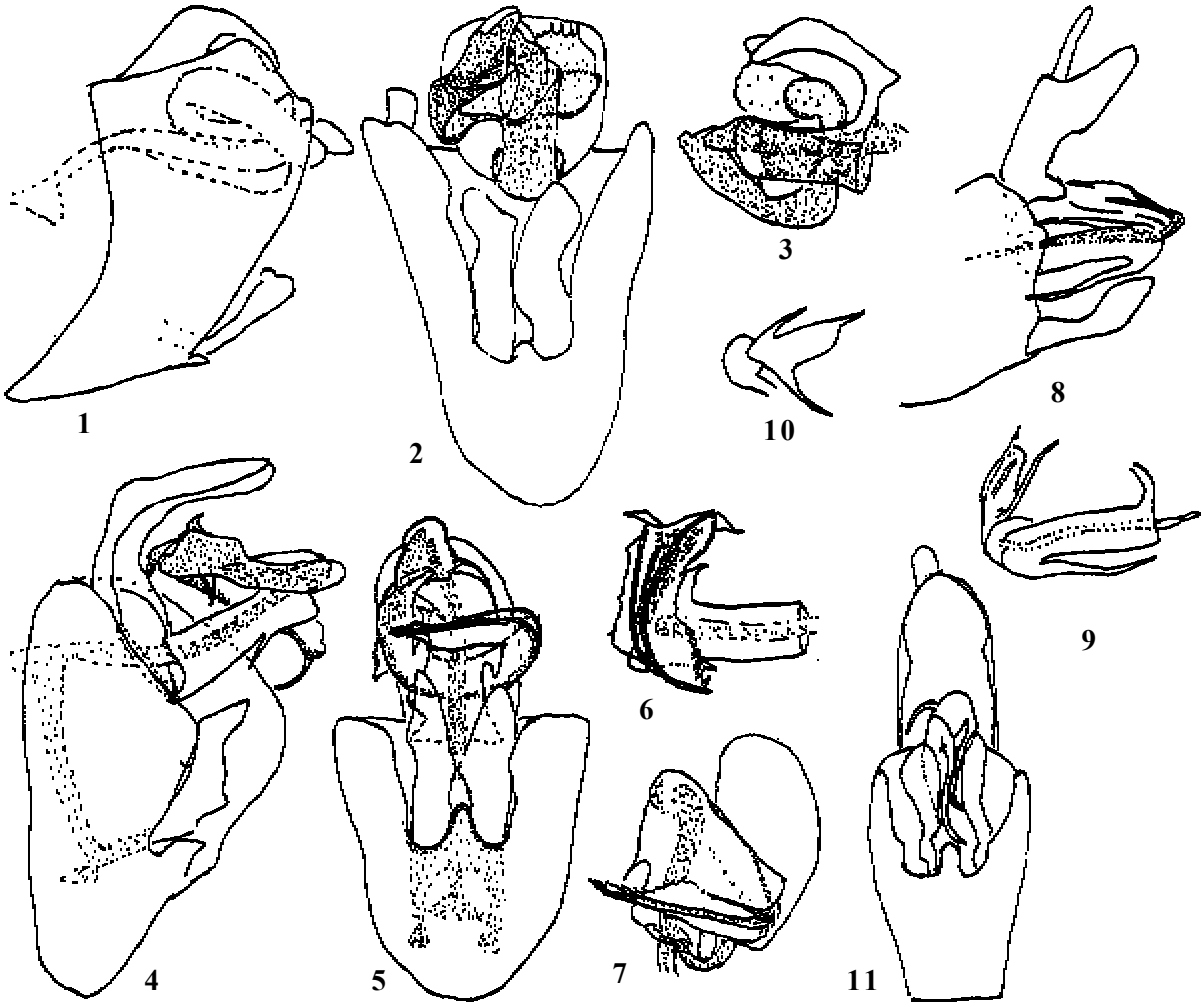
ETYMOLOGY. With pleasure I name this species in honor of Dr. Werner Holzinger, who has contributed much to the phylogeny of the Cixiidae.

COMPARATIVE NOTES. This species may be identified by its color pattern and genitalia, as the four dark lines on the apical crossveins and on Sc as it reaches the margin are fairly constant, and the 3 spots near the stigma are found in more than half of the specimens. It should be confirmed by the male genitalia with a flagellum which curls 360 degrees around the aedeagus and an aedeagus with 2 avicephaliform projections at the apex of the periandrium. Although this and *B. basalis* Metcalf, 1938 are the only described species known from Panama, there are several others in collections, including a small (under 5 mm) pale species found in small numbers in the same locality, Fortuna Dam area, with three of the apical crossveins darkened and different genitalia that is still undescribed. In 1995 we returned to the area in July and collected more specimens which tend to be darker orange on the thorax and have wings damaged. Two males (dissected) are completely orange and have brown markings along anterior crossveins from stigma through M, and at apex of clavus (localities: El Vivero and Quebrada Aleman).

Bothriocera substigmatica (Lethierry, 1881), **comb.n.**

Diacira substigmatica Lethierry, 1881
Sevia substigmatica (Lethierry) [Metcalf's Catalogue, 1936]

I have seen a photograph of *Diacira substigmatica* Lethierry 1881 from Guadeloupe from the Brussels Museum, courtesy of Dr. Jerome Constant, and it is a *Bothriocera*, not a *Sevia* as placed in Metcalf's catalogue (*Sevia* has been moved by Fennah [1950] from the Cixiidae to the Achilidae). I lack matching specimens from Guadeloupe to illustrate the genitalia.



Figs 1–11. Cixiidae, male genitalia: 1–3 — *Bothriocera emelyanovi* **sp.n.**; 4–7 — *Bothriocera holzingeri* **sp.n.**; 8–11 — *Haplaxius hochae* **sp.n.**; 1, 4, 8 — complete left lateral view of genital capsule; 3, 6, 9 — aedeagus in right lateral view; 2, 5, 11 — complete genital capsule in ventral view; 7 — aedeagus and anal segment in caudolateral view to show flattened expansion of periandrium; 10 — flagellum in dorsal view.

Рис. 1–11. Cixiidae, гениталии самца: 1–3 — *Bothriocera emelyanovi* **sp.n.**; 4–7 — *Bothriocera holzingeri* **sp.n.**; 8–11 — *Haplaxius hochae* **sp.n.**; 1, 4, 8 — генитальный блок полностью, слева; 2, 6, 9 — эдеагус, справа; 3, 5, 11 — генитальный блок полностью, снизу; 7 — эдеагус и анальный сегмент, сзади сбоку, чтобы показать уплощённое расширение периандриума; 10 — жгутик, сверху.

Genus *Haplaxius* Fowler, 1904

Emelyanov [1989] recognised the differences of the New World species from the European type-species of the genus *Myndus* Stål, 1862 and resurrected the genus of Fowler [1904]. Kramer [1979] had revised the New World species (as *Myndus*), including 63 species, with species from Cuba, Jamaica, and Trinidad, but none from the Lesser Antilles. The following species is the first known from those islands.

Haplaxius hochae O'Brien, **sp.n.**
Figs 8–11, 14, 15.

MATERIAL. Holotype, ♂ (CAS), allotype, ♀ (CAS) and 44 ♂♂ and 31 ♀♀, paratypes, from Dominica, ca. 2600'/Morne Trois Pitons N[ational] P[ark]/ Freshwater Lake R[oa]d, 13.VIII.1986, C.W. & L.B. O'Brien. Second label: Under fronds Euterpe globosa [Bannister]; 57 ♂♂ and 46 ♀♀, same except 17.VIII.1986; 10 ♂♂ and 4 ♀♀, same except 21.VIII.1986. Paratypes in collections: ZMBH, ZIN, OEKO, FWPD, CAS, LOB.

DESCRIPTION. Male. Metope and macrocoryphe tawny, lateral carinae edged with brown, flange area of carinae tinged orange. Pronotum and median tablet of mesonotum whitish, lateral compartments orange tawny. Abdomen dorsally pale tawny with brown stripes on each side; venter with median carina and sides tawny, brown stripe between except on tawny hind margin of sternites. Hind wings tawny, clear, except apical margin brown; tegmen tawny hyaline, with stigma paler, margins except for clavus brown, usually brown spot at apex of stigma, on crossvein before it, on apical crossveins between M & Cu and in Cu (Fig. 14).

Female. Color pattern darker, more varible than male. In strongly colored females, head dark tawny, carinae broadly brown, continuing on clypeus. Pro- and mesonotum dark brown with median carina white (this very variable, with some specimens with median tablet pale, or area near tegulae pale). Abdominal dorsum dark brown, venter dark brown with hind margin of sclerites pale. Wing and tegmen hyaline, pale brown, veins brown; tegmen with brown stripe from

12

13

Figs 12–13. *Bothriocera* spp., ♀, habitus: 12 — *B. emelyanovi* **sp.n.**; 13 — *B. holzingeri* **sp.n.**

Рис. 12–13. *Bothriocera* spp., ♀, внешний вид: 12 — *B. emelyanovi* **sp.n.**; 13 — *B. holzingeri* **sp.n.**

14

15

Figs 14–15. *Haplaxius hochae* **sp.n.**, habitus: 14 — ♂; 15 — ♀.

Рис. 14–15. *Haplaxius hochae* **sp.n.**, внешний вид: 14 — ♂; 15 — ♀.

basal cell along M to apex, wider and paler apically, additional brown spots include stigma, dark spots at apical crossveins between M and Cu and within Cu; commissural line white, continuing line from mesonotum, except brown areas behind apex of clavus and behind middle of clavus (Fig. 15). Less well-marked females vary in coloration to that of pale males, i.e. all tawny except dark ovipositor lying spatulate against the body and 2 spots on tegminal crossveins.

Pygofer with posterior margin slightly undulate (Fig. 8). Anal segment deflexed, bilaterally symmetrical, with lobes at base (Fig. 8). Aedeagus with long ventral appendage (Fig. 9), flagellum with three spines (Fig. 10).

Length. ♂ — 4.5–6.0 mm; ♀ — 5.7–6.0 mm.

ETYMOLOGY. It gives me great pleasure to name this species after Dr. Hannelore Hoch, who has contributed so much to our knowledge of the biology and speciation of other cixiid genera in Hawaii.

COMPARATIVE NOTES. This species is the first species of *Haplaxius* described from the Lesser Antilles, although species are known from the U.S. to Argentina, and Jamaica, Cuba, and Trinidad. It may be identified in Kramer's keys to the New World *Haplaxius* by changing couplet 26 to a triplet, with one of them reading: "Aedeagal flagellum well developed, aedeagal- length; anal segment with pair of basal lobes ..... *hochae* **sp.n.**"

The tawny color, the carinae of the metope and macrocoryphe edged or strongly marked with dark brown, and the two spots on the apical crossveins of M + Cu seem to be consistent in all specimens. Over 1/3 of the females are paler than the darkest specimens. If they were consistent in the pale areas, I might consider them teneral, but there seem to be all combinations, so I must conclude that this is natural variation.

HOST. The host was a palm with a deeply bifid blade which botanists identified as *Euterpe globosa* Bannister, which is now *Prestoea acuminata* (Willdenow) H.E. Moore.

ACKNOWLEDGEMENTS. I wish to thank Dr. Jerome Constant for sending a photograph of Lethierry's type from Guadeloupe. Also I wish to add my appreciation to the originators of this volume, and to thank Dr. Emelyanov for his work on Fulgoromorpha and for sharing it with us by cooperating on papers and coming to International Auchenorrhyncha meetings so we can meet and become friends.

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