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A review of the New World Krisnini (Hemiptera: Cicadellidae: Iassinae) including three genera and six new species

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including three genera and six new species

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A review of the New World Krisnini (Hemiptera: Cicadellidae: Iassinae) including three genera and six new species

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Abstract. The tribe Krisnini (Hemiptera: Cicadellidae) is presently known in the New World from three species from Puerto Rico and one species from Dominican Amber, all described in the Old World genus *Krisna* Baker. The three species from Puerto Rico are being placed in *Lipokrisna*, **new genus**, with *Krisna insularis* Oman as the type species, becoming *Lipokrisna insularis* (Oman), **new combination**. The other species in this genus are *L. montana* (Caldwell) and *L. aesta* (DeLong) both **new combinations**. The one species from Dominican amber is placed in the Genus *Archiokrisna*, **new genus**, with *Krisna garciamarquezi* Dietrich as the type species, becoming *Archiokrisna garciamarquezi* (Dietrich), **new combination**. The genus, *Neokrisna*, **new genus**, is described for six new species from the Dominican Republic, with *Neokrisna oncora*, **new species**, as the type species. The other **new species** in the genus are *N. breva*, *N. decliva*, *N. libera*, *N. longula*, and *N. stena*. A key to the species of *Neokrisna* is included. The three genera are compared with each other and the old World genus *Krisna*.

Key words. Hemiptera, Cicadellidae, Iassinae, *Krisna*, *Lipokrisna*, *Archiokrisna*, *Neokrisna*, leafhoppers, Puerto Rico, Dominican Republic

Introduction

The tribe Krisnini (Hemiptera: Cicadellidae) is known from the Oriental region of the Old World, and from the Caribbean region in the New World. All species of the tribe Krisnini look superficially alike and differ primarily only in the shape of the head and the male genitalia. Viraktamath (2006) recently reviewed the Indian genera and species. This paper reviews the genera and species that occur in the Caribbean region.

All New World species that have been described were placed in the genus *Krisna* Baker, including three species from Puerto Rico and one species from Dominican amber. Oman (1936) described the first species from Puerto Rico, *Krisna insularis*. Caldwell described *Krisna montana*, in Caldwell and Martorell's (1952) review of the species of leafhoppers from Puerto Rico. DeLong (1982) described *Krisna aesta* from Puerto Rico. The Dominican amber species, *Krisna garciamarquezi*, was described by Dietrich, in Dietrich and Vega (1995).

While all New World species have characters in common with the Old World genus *Krisna*, they appear to belong to separate genera. The Krisnini in general are rather large oval shaped leafhoppers. They are nearly unicolorous green, yellow green or straw color, and have a femoral setal formula of 2-2-1. The forewing usually has some reticulate veins in the apical area. The anterior margin of the head is either bluntly or sharply foliaceous, and the ocelli are on the margin near the eyes. The appendix of the forewing varies from nearly absent to well-developed. The male aedeagus is short, curved dorsad and with or without basal processes.

The New World species differ from the Old World species by having the anterior margin of the head usually sharply foliaceous (Fig. 4) whereas in the Old World species it is usually bluntly foliaceous (Fig. 2). The New World species also have one incomplete submarginal vein of the hindwing and not across the jugal lobe, whereas the Old World species have a complete submarginal vein and across the jugal lobe. This latter character was discussed by Webb (1991) for the first time. The New World species also have the appendix reduced, or nearly absent, and the Old World species have the appendix well developed. The aedeagus of the New World species have a pair of ventral processes, and the Old World species usually have an aedeagus without processes.

Materials

Codens for institutions in which the material is deposited are the following: **BMNH** = British Museum of Natural History, London, England, Great Britain; **CMNH** = Carnegie Museum of Natural History, Pittsburgh, Pennsylvania, U.S.A.; **FSCA** = Florida State Collection of Arthropods, Gainesville, Florida, U.S.A.; **MHND** = Museo Nacional de Historia Natural, Santo Domingo, Dominican Republic; and **UKYL** = University of Kentucky Collection, Lexington, Kentucky, U.S.A.

Archiokrisna Freytag, new genus

Type species: *Krisna garciamarquezi* Dietrich, here designated.

Description. Length of male 7 mm. One species was described by Dietrich, in Dietrich and Vega (1995), for an amber-preserved specimen from the Dominican Republic. This description is adequate to describe this genus and the species. The main characters that differ from other genera is the anterior margin of the head is not sharply foliaceous as in present day New World species, but not bluntly rounded as in the Old World genus *Krisna*. Also the male seventh sternum is greatly expanded and the subgenital plates are very long which is not found in present day species. Only the one species is known.

Etymology. The genus name is formed from the Greek stem *archi-* meaning first or ancient in combination with the name *krisna*. The gender is feminine.

Archiokrisna garciamarquezi (Dietrich), new combination

Krisna garciamarquezi Dietrich, in Dietrich and Vega 1995: 263, fig. 1-5, 16-17.

Notes. The head of this species lies between the robust rounded anterior margin of *Krisna* and the sharply foliaceous margin of the other New World species. This species appears to be as small or smaller than all known present day New World species. The appendix of the forewing is very small or nearly absent. These characters along with the male genital characters justify this species to be placed in a separate genus.

Lipokrisna Freytag, new genus

Type species: *Krisna insularis* Oman, here designated.

Description. Length 8.0 – 12.0 mm. Head with thin foliaceous anterior margin, with ocelli on anterior margin near eyes. Body rather robust, but somewhat flattened dorsoventrally. Forewing with reticulate veins in apical third, appendix small. Hindlegs with femoral setal formula 2-2-1. Color usually yellow to light green. Male genitalia: Pygofer without processes. Style relatively long, with foot-like apex. Aedeagus short, C-shaped, with pair of basal lateral processes, parallel to shaft.

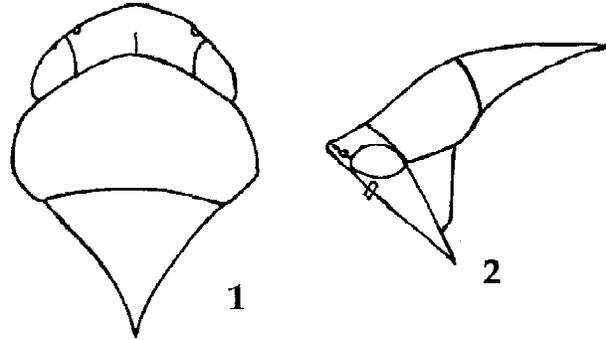
Notes. In the two species with known males, the male genitalia are similar. The pygofer is without processes. The style is relatively long with a foot-like apex. The aedeagus is short, C-shaped, with a pair of lateral ventral processes which parallel the aedeagal shaft. There are three species known, all from Puerto Rico.

Etymology. The name for the genus is formed using the Greek stem *lip-* meaning lack or leave, in combination with the name *krisna*. The gender is feminine.

***Lipokrisna aesta* (DeLong), new combination**

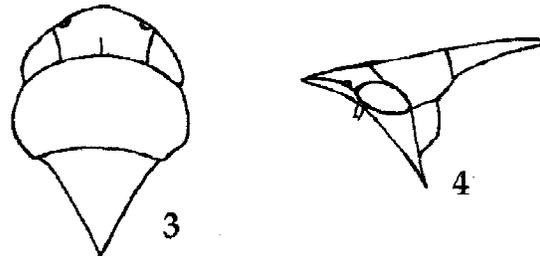
Krisna aesta DeLong 1982: 610.

Notes. Length of male 10 mm, female unknown. The male of this species is larger than the female of *L. montana*, so it is not likely that this is the male of that species, as males are usually smaller than the females. It appears to be a valid species.

***Lipokrisna insularis* (Oman), new combination**

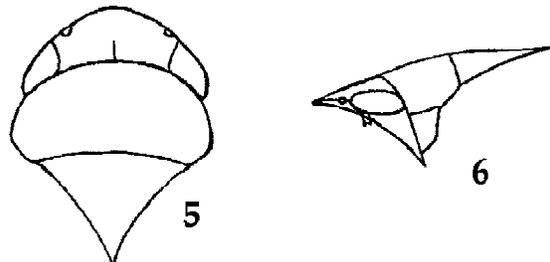
Krisna insularis Oman 1936: 3.

Notes. Length of male 9.5-10.0 mm, female 11.5 mm.

***Lipokrisna montana* (Caldwell), new combination.**

Krisna montana Caldwell, in Caldwell and Martorel 1952: 21.

Notes. Length of female 8.5 mm, male unknown.

***Neokrisna* Freytag, new genus**

Type species: *Neokrisna ornata* Freytag n. sp., here designated.

Description. Length 7.0 – 12 mm. Externally similar to species of *Lipokrisna*, mostly oval in shape in dorsal view, yellow to green in color with some reticulate veins, but male genitalia quite different. Male genitalia: Pygofer with sword-like ventral process, usually with spur. Style long, somewhat expanded beyond middle than curved to acute apex. Aedeagus C-shaped, with pair of lateral processes usually closely appressed to shaft.

Notes. All species of this genus have only been found in the Dominican Republic at fairly high elevations from 240 to 1780 m.

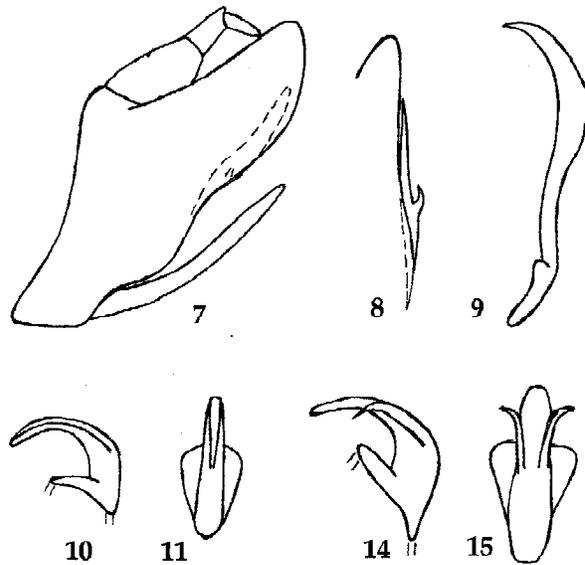
Etymology. The name of the genus is formed using the Greek stem neo- meaning new or recent, in combination with *Krisna*. The gender is feminine.

Figures 1-6. 1-2) *Krisna strigicollis* (Spinola). 1) Head, pronotum and scutellum, dorsal view. 2) Head, pronotum and scutellum, lateral view. 3-4) *Lipokrisna insularis* (Oman). 3) Head, pronotum and scutellum, dorsal view. 4) Head, pronotum and scutellum, lateral view. 5-6) *Neokrisna longula* n. sp. 5) Head, pronotum and scutellum, dorsal view. 6) Head, pronotum and scutellum, lateral view. All drawn to the same scale, which equals 3.0 mm.

***Neokrisna oncora* Freytag, new species**

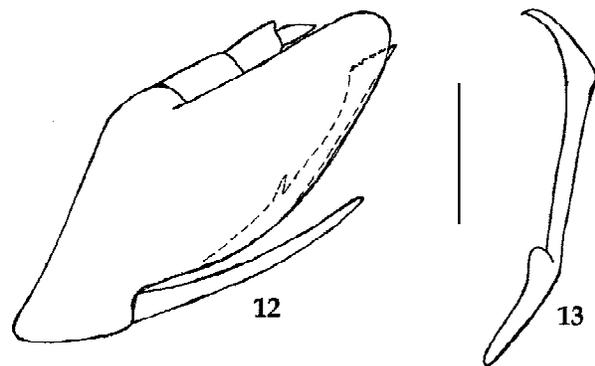
(Figures 7-11)

Description. Length of male 7.5 mm, females 8.5-9.0 mm. Color straw yellow overall. Front wings with reticulate veins mostly in the apical area, with small brown dark spot on first basal medial cross vein. Male genitalia: Pygofer (Fig. 7) narrowing to rounded apex, with blade-like process on ventral margin which extends to near apex of pygofer, with hook-like spur on basal medial side (Fig. 7-8). Subgenital plate (Fig. 7) thin, long, two-thirds length of pygofer. Style (Fig. 9) long, enlarged near middle, curving near apex to dorsally pointed apex. Aedeagus (Fig. 10-11) short, stout, curving dorsad to pointed apex, with lateral pair of closely appressed processes extending to apex of shaft of aedeagus.



Type material. Holotype male: Dominican Republic, Pedernales, 26 km N. Cabo Rojo, 18°06'N 71°38'W, 730 m., 16-VII-1992, C. Young, R. Davidson, S. Thompson, J. Rawlins, mesic deciduous forest with scattered pines (CMNH). Paratype: One female, same data as holotype (CMNH).

Other specimens: One female, Dominican Republic, Independencia, Sierra de Neiba, just South of crest, 5 km NNW Angel Felix, 1780 m., 18°41'N 71°47'W, 13-15-X-1991, J. Rawlins, R. Davidson, C. Young, S. Thompson, cloud forest (CMNH).



Notes. This species is the smallest species found on the island of Hispaniola, and can be recognized by its small size and the easily seen spur on the male pygofer process. It is named for the spur on the pygofer process.

Figures 7-15. 7-11) *Neokrisna oncora* n. sp. 7) Male genital capsule, lateral view (setae not shown). 8) Pygofer ventral margin, showing pygofer process, ventral view. 9) Style, lateral ventral view. 10) Aedeagus, lateral view. 11) Aedeagus, ventral view. 12-15) *Neokrisna decliva* n. sp. 12) Male genital capsule, lateral view (setae not shown). 13) Style, lateral ventral view. 14) Aedeagus, lateral view. 15) Aedeagus, ventral view. All drawn to the same scale, which equals 1.0 mm.

***Neokrisna decliva* Freytag, new species**

(Figures 12-15)

Description. Length of males 11 m., females 11.5 mm. Color yellow or greenish yellow, with front wings with reticulate venation throughout, brown spots on medial cross veins from none to four or five. Male genitalia: Pygofer (Fig. 14) long, narrowed to rounded apex, with long blade-like process along ventral margin. Pygofer process nearly as long as pygofer, expanded at apex, serrate on dorsal apical margin, with a small spur near base on dorsal margin. Subgenital plate (Fig. 14) long, narrow, nearly two-thirds length of pygofer. Style (Fig. 15) long, narrow, with expanded, nearly foot-like apex, apex pointed. Aedeagus (Figs. 12-13) short, stout, curving dorsad to pointed apex, with pair of lateral processes closely appressed at base, but deviating from shaft at two-thirds its length.

Type material. Holotype male: Dominican Republic, La Vega, Monsenor Nouel, Loma El Casabito, summit, 19°03'N 70°31'W, 1390 m., 19-23-XI-1992, J. Rawlins, M. Klingler, R. Davidson, S. Thompson, cloud forest (CMNH). Paratypes: One female, same data as holotype (CMNH); two males, one female, Dominican Republic, La Vega, Loma del Casabito, 19°03'N 70°31'W, 1390 m., 3-XI-2002, W. A. Zanol, C.

W. Young, C. Staresinic, J. Rawlins, wet cloud forest, UV light, sample 24119, numbered CMNH-288,844, CMNH- 293,032 and CMNH- 293,509 (one male, CMNH; one male, one female FSCA).

Notes. Similar to *N. oncora* but larger and with different male genitalia. This species can be separated from the other species in this genus by the front wings having mostly reticulate veins, and the male aedeagus with the lateral processes flaring near apex. It is named for the shape of the aedeagal processes.

***Neokrisna breva* Freytag, new species**

(Figures 16-20)

Description. Length of males 11.0-11.5 mm, females 11.5-11.8 mm. Similar to *N. decliva* in general size and color. Male genitalia: Pygofer (Figs. 16-17) very long, somewhat truncate at apex, with ventral spine-like process from middle of ventral margin, with basal spur on dorsal median margin. Style (Fig. 18) long expanded near middle, with a small spur on ventral margin, then narrowing to acute apex. Aedeagus (Figs. 19-20) stout, C-shaped in lateral view, narrowing to apex, with pair of lateral processes from middle of shaft extending just beyond apex.

Type material. Holotype male: Dominican Republic, Independencia, Sierra de Neiba, just South of crest, 5 km NNW Angel Felix, 1780 m., 18°41'N 71°47'W, 13-15-X-1991, J. Rawlings, R. Davidson, C. Young, S. Thompson, cloud forest (CMNH). Paratypes: Four males, same data as holotype (two males, CMNH; two males, FSCA).

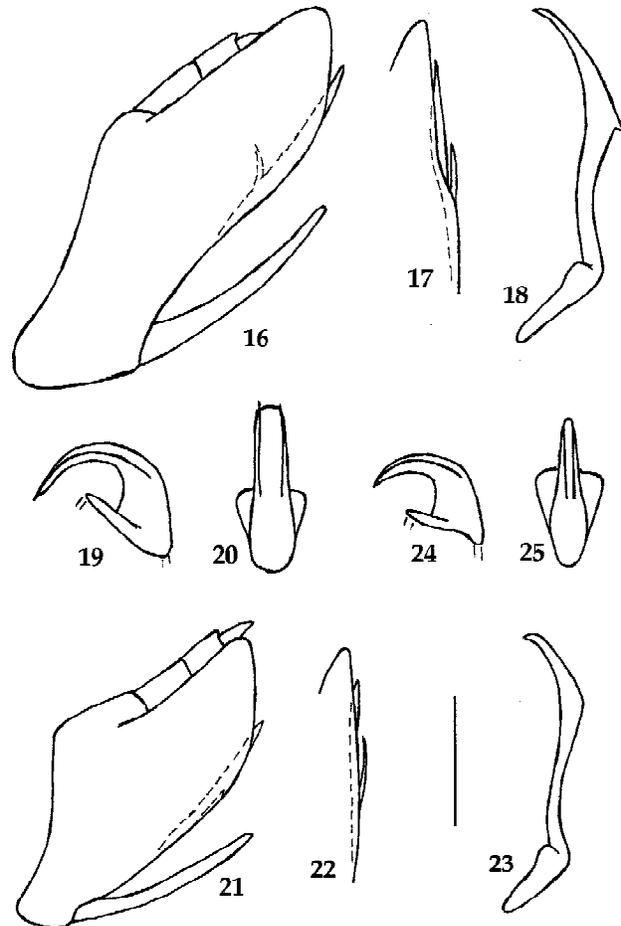
Other specimens: Thirty four males, five females, Dominican Republic, Independencia, San Juan and Barahona (two males, two females from Barahona, UKYL, remainder CMNH).

Notes. Similar to *N. oncora* but larger and with different male genitalia. It is named for the ventral spur on the male style, which does not occur on the other species of the genus..

***Neokrisna longula* Freytag, new species**

(Figures 3-4, 21-25)

Description. Length of males 9.5-10.5 mm, females 10.2-10.7 mm. Similar to *N. decliva* in general size and color. Male genitalia: Pygofer (Fig. 21-22) about twice as long as wide, narrowing to small rounded apex, with spine-like ventral process which has long median spine-like spur on ventral median side. Style (Fig. 23) long, very narrow to apical third, then slightly expanded, then narrowing to acute apex. Aedeagus

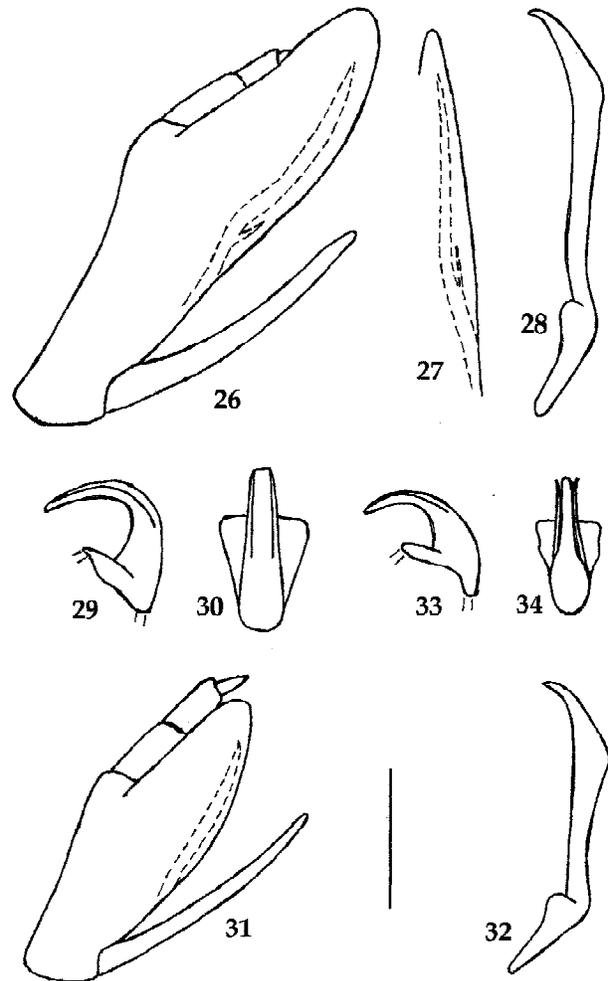


Figures 16-25. 16-21) *Neokrisna breva* n. sp. 16) Male genital capsule, lateral view (setae not shown). 17) Pygofer ventral margin, showing pygofer process, ventral view. 18) Style, lateral ventral view. 19) Aedeagus, lateral view. 20) Aedeagus, ventral view. 21-25) *Neokrisna longula* n. sp. 21) Male genital capsule, lateral view (setae not shown). 22) Pygofer ventral margin, showing pygofer process, ventral view. 23) Style, lateral ventral view. 24) Aedeagus, lateral view. 25) Aedeagus, ventral view. All drawn to the same scale, which equals 1.0 mm.

(Fig. 24-25) stout, C-shaped in lateral view, narrowing beyond middle to acute apex, with pair of latero-ventral processes extending along shaft to apex.

Type Material. Holotype male: Dominican Republic, La Vega, Monsenor Nouel, Loma El Casabito, summit, 19°03'N 70°31'W, 1390 m., 19-20-XI-1992, J. Rawlins, M. Klingler, R. Davidson, S. Thompson, cloud forest (CMNH). Paratypes: Eleven males, same data as holotype (five males, CMNH; three males, FSCA; two males, UKYL; and one male, BMNH).

Other specimens: Two males, Dominican Republic, La Vega, Monsenor Nouel, Loma del Casabito, 19°03'N 70°31'W, 3-XI-2002, W. A. Zanol, C. W. Young, C. Staresinic, J. Rawlings, wet cloud forest, UV light, sample 24119, numbers CMNH-289,358 and CMNH-291,570 (CMNH); one male, Dominican Republic, La Vega, Cordillera Central, 4.1 km SW El Convento, 18°50'38"N 70°42'51"W, 1733 m., 31-V-2003. J. Rawlings, R. Davidson, C. Young, C. Nunez, P. Acevedo, montane forest with pines near pasture, UV light, sample 22111, number CMNH-310,229 (CMNH); nine males, Dominican Republic, La Vega, Cordillera Central, Loma Casabito, 15.8 km NW Bonao, 19°02'12"N 70°31'08"W, 1455 m., 28-V-2002, J. Rawlings, C. Young, R. Davidson, C. Nunez, P. Acevedo, evergreen cloud forest, East slope, UV light, sample 21212, numbers CMNH-307,789, CMNH-310,653, CMNH-309,298, CMNH-306,971, CMNH-310,049, CMNH-310,303, CMNH-308,518, CMNH-311,232, and CMNH-308,705 (CMNH); one male, same data as last, except hand collected, sample 21242, number CMNH-311,162 (CMNH); one male, same data, except Malaise trap, sample 21282, number CMNH-306,808 (CMNH); one male same data, except canopy trap, sample 21292, number CMNH-309,307 (CMNH); one male, Dominican Republic, La Vega, Cordillera Central, Reserva Vallé Nuevo, 18°41'47"N 70°35'30"W, 2252 m., 25-V-2003, R. Davidson, C. Young, C. Nunez, J. Rawlins, P. Acevedo, montane meadow in cloud forest, pine, UV light, sample 24112, number CMNH-309,504 (CMNH); three males, Dominican Republic, La Vega, Cordillera Central, Reserva Vallé Nuevo, La Nevera, 15.3 km SE Vallé Nuevo, 18°41'39"N 70°35'28"W, 3-VI-2003, R. Davidson, C. Young, C. Nunez, J. Rawlings, P. Acevedo, M. de La Cruz, wet montane forest with pine, UV light, sample 24512, numbers CMNH-310,000, CMNH-310,694, and CMNH-306,829 (CMNH); two males, same data as last, except canopy trap, sample 24492, numbers CMNH-307,355 and CMNH-308,440 (CMNH); and twenty eight males, three females, all from La Vega (twenty five males, two females CMNH; two males, one female UKYL; and one male MHND)



Figures 26-34. 26-30) *Neokrisna stena* n. sp. 26) Male genital capsule, lateral view (setae not shown). 27) Pygofer ventral margin, showing pygofer process, ventral view. 28) Style, lateral ventral view. 29) Aedeagus, lateral view. 30) Aedeagus, ventral view. 31-34) *Neokrisna libera* n. sp. 31) Male genital capsule, lateral view (setae not shown). 32) Style, lateral ventral view. 33) Aedeagus, lateral view. 34) Aedeagus, ventral view. All drawn to the same scale, which equals 1.0 mm.

Notes. Similar to *N. breva*, but smaller, and with different male genitalia. It is named for the long spur on the pygofer process, which is much longer than any of the other species of this genus.

***Neokrisna stena* Freytag, new species**

(Figures 26-30)

Description. Length of males 10.5-11.5 mm, females unknown. Similar to *N. decliva* in general size and color. Male genitalia: Pygofer (Fig. 26-27) long, rounded at apex, with ventral spine-like process with spur on basal ventral margin. Style (Fig. 28) long, slightly expanded subapically, with acute apex bent dorsad. Aedeagus (Fig. 29-30) stout, C-shaped in lateral view, narrowing to apex, with pair of lateral processes from near middle of shaft extending along shaft to near apex.

Type material. Holotype male: Dominican Republic, La Vega, La Cienega de Mamabao, park hdqt., 3-5-VII-1999, 915 m., R. E. Woodruff, blacklight (FSCA). Paratypes: Fourteen males, same data as holotype (six males, FSCA; three males, CMNH; two males, UKYL; one male, BMNH; and two males, MHND).

Notes. Similar to *N. longula*, but with different male genitalia. It is named for the long narrow male pygofer, which is much narrower than the other species of this genus.

***Neokrisna libera* Freytag, new species**

(Figures 31-34)

Description. Length of male 9.5 mm, female unknown. Similar to *N. decliva* in general size and color. Male genitalia: Pygofer (Fig. 31) longer than width, rounded at apex, with spine-like process along ventral margin. Style (Fig. 32) long, expanded subapically, narrowing then to acute apex. Aedeagus (Fig. 33-34) stout, C-shaped in lateral view, narrowing from base to nearly acute apex, with pair of lateral processes from middle of shaft extending along shaft to near apex.

Type material. Holotype male: Dominican Republic, La Vega, 15 km N Jarabacoa, 240 m., 21-VII-1987, J. Rawlins, R. Davidson (CMNH).

Notes. Similar to *N. stena*, but smaller and with different male genitalia, with the pygofer process without a spur as in the other species. It is named for the male pygofer process being free of the spur.

Key to males of the species in the genus *Neokrisna*

1. Length < 8 mm *N. oncora* n. sp.
Length > 9 mm 2
- 2(1). Aedeagal lateral processes diverging at two-thirds their length (Fig. 14-15) *N. decliva* n. sp.
- Aedeagal lateral processes not diverging from shaft, usually closely appressed to shaft (Fig. 19-20) 3
- 3(2). Style with heal-like spur on ventral margin (Fig. 18), spur of pygofer process on dorsal margin (Fig. 16) *N. breva* n.sp.
- Style without obvious spur on ventral margin (Fig. 23), spur of pygofer process not on dorsal margin (Fig. 21) or lacking (Fig. 31) 4
- 4(3). Pygofer and pygofer process long (Fig. 26), spur of pygofer process long and pin-like (Fig. 27) *N. stena* n. sp.
- Pygofer and pygofer process short (Fig. 21), spur of pygofer process not pin-like (Fig. 22) or absent (Fig. 31) 5
- 5(4). Pygofer process with spur long, on inner margin (Fig. 17-18) *N. longula* n. sp.
- Pygofer process without spur (Fig. 31) *N. libera* n. sp.

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