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A REVISION OF THE NEARCTIC SPECIES OF *CLINOHELEA* KIEFFER (DIPTERA: CERATOPOGONIDAE)

William L. Grogan, Jr.¹ and Willis W. Wirth²

ABSTRACT. - The seven species of *Clinohoelea* known to inhabit North America are described and illustrated, and a key is provided for identification. Two species groups are recognized: the *unimaculata* group and the *bimaculata* group. *Clinohoelea longitheca* and *C. pseudonubifera* are new. *Clinohoelea nebulosa* (Malloch) is a synonym of *C. curriei* (Coquillett) **NEW SYNONYMY.**

Clinohoelea Kieffer is a fairly small genus of ceratopogonids, worldwide in distribution. Little is known of their biology; but the adult females are predaceous on other insects, and the larvae are aquatic. The five previously known North American species were described by Loew (1861), Adams (1903), Coquillett (1905), Malloch (1915), and Wirth (1952). Most of these species were originally described in the genus *Ceratopogon* Meigen and later transferred to *Palpomyia* Meigen, *Johannseniella* Williston, or *Johannsenomyia* Malloch. Although Johannsen (1943) correctly placed these species in *Clinohoelea*, the North American species have needed comprehensive revision and a good key for identification.

In the present paper seven Nearctic species of *Clinohoelea*, two of which are new, are described and illustrated. Two species groups are recognized and given the names of the oldest named species in their group. All of the types of *Clinohoelea* species from North America have been examined, as well as examples of 17 species from other parts of the world. All specimens examined unless otherwise noted are part of the collection of the National Museum of Natural History (USNM) in Washington. In the lists of

specimens examined, slide-mounted specimens are denoted (S), and pinned specimens as (P). The types of our new species will be deposited in the USNM.

Measurements and other data are based on slide-mounted specimens and are recorded in the manner of Chan and LeRoux (1965). When possible, 10 females of each species were critically measured. The data are presented in the following manner: mean value (minimum value - maximum value, n = number of measurements), except in the case of new species, where the actual values are given for the holotype, and the mean, minimum-maximum, and number of measurements are given in the variation section. Numerical characters for female Nearctic *Clinohoelea* are presented in Table 1.

For general terminology of Ceratopogonidae see Wirth (1952) and Chan and LeRoux (1965). The following special terms are used in the descriptions of females. Wing length is measured from the basal arculus to the wing tip. Antennal proportions (AP) are the relative lengths of each flagellomere; antennal ratio (AR) is the length of the proximal 8 flagellomeres, divided into the length of the distal 5 flagellomeres. Palpal ratio (PR) is the length of the 3rd palpal segment divided

TABLE 1.— Numerical characters of female Nearctic *Clinohoelea* (minimum-maximum values).

Species	Wing length (mm)	Wing breadth (mm)	Costal ratio	Palpal ratio	Antennal ratio	Femoral spines		
						Fore	Mid	Hind
UNIMACULATA GROUP								
<i>curriei</i>	2.53-3.23	0.81-0.94	0.81-0.87	3.20-4.50	1.50-1.66	0-3	0-2	1-3
<i>nubifera</i>	2.32-2.42	0.71-0.77	0.85-0.86	4.00-4.36	1.41-1.46	0	0-3	2-4
<i>pseudonubifera</i>	2.03-2.19	0.65-0.69	0.82-0.83	2.86-3.00	1.35-1.38	0	0-1	0-1
BIMACULATA GROUP								
<i>bimaculata</i>	1.65-2.68	0.50-0.74	0.82-0.86	2.60-3.40	1.17-1.36	0	0	0-3
<i>dimidiata</i>	2.32-2.74	0.68-0.87	0.76-0.82	3.17-3.80	1.25-1.40	0	0	0
<i>usingeri</i>	2.50-2.74	0.70-0.81	0.80-0.81	3.17-3.67	1.29-1.35	0	0	0
<i>longitheca</i>	1.97-2.00	0.61	0.82-0.84	2.89-3.11	1.17-1.36	0	0	0

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by its greatest breadth. Terminology dealing with male genitalia follows that of Snodgrass (1957) and Chan and LeRoux (1965). All female genitalia and spermathecae have been drawn to the same scale. Types have been illustrated whenever possible.

We are especially indebted to Mrs. Ethel L. Grogan for preparation of the illustrations. Thanks are also extended to the following persons and their institutions for the loan of type and other material or information regarding specimens in their collections: Donald W. Webb, Illinois Natural History Survey, Urbana (INHS); George W. Byers, Snow Entomological Museum, University of Kansas, Lawrence (KU); Wilford J. Hanson, Utah State University, Logan (USU); and Janice C. Scott, Museum of Comparative Zoology, Cambridge, Massachusetts (MCZ).

Genus *Clinohelca* Kieffer

Clinohelca Kieffer, 1917: 295. Type-species, *Ceratopogon variegatus* Winnertz, by original designation.

DIAGNOSIS.— Moderately large, shining ceratopogonids, usually with infuscated wings; body nearly bare, rather slender; pleuron usually with transverse silvery band. Eyes bare; widely separated. Antenna slender; flagellomeres 1-8 long, flagellomeres 9-13 elongate in female; flagellomeres 11-13 elongate in male; plume sparse in male. Palpus slender; 3rd segment slender, lacking a pit. Female mandible with coarse teeth. Mesonotum moderately robust, without humeral pits, a

short anterior tubercle sometimes present. Femora slender, occasionally with up to four spines; 4th tarsomere of at least mid and hind legs deeply bilobed, each lobe ending in a stout blunt spine and smaller spines; fore 5th tarsomere greatly swollen in both sexes; fore claws equal, mid and hind very unequal in female; all claws equal in male. Wing long, without macrotrichia; costa extending to 0.75 but not more than 0.90 of wing length; two radial cells present, 2nd much longer than 1st; no intercalary fork; medial fork broadly sessile. Female abdomen without eversible glands or gland rods; genital sclerotization small, simple; two well-developed spermathecae. Male genitalia with 9th sternum short, broad; 9th tergum tapered with large cerci; basimere and telomere relatively long and slender; aedeagus with low anterior arch, distal portion broad, underlying membrane extending beyond tip; claspettes usually divided, each portion slender with an elongated bulbous tip.

IMMATURE STAGES.— Larvae are aquatic. Wirth (1951) described the pupa of *C. bimaculata*, which he reared from the sandy margin of a small stream in Virginia. This is apparently the only Nearctic species that has been described in an immature stage.

ADULT HABITS.— Adults can be found on vegetation bordering water, and Grogan has taken them at flowers and from a small grove of trees in Utah. Downes (1960, 1971) stated that adult females are predaceous on other small insects that are captured in flight, but did not give specific examples.

Key to the Nearctic Species of *Clinohelca* (primarily Females)

1. Fore 5th tarsomere solid brown; wing with two spots, one centered over 1st radial cell, second near tip of costa (*bimaculata* group) 2
- Fore 5th tarsomere with pale band; wing with 1 spot centered over 1st radial cell or entirely infuscated (*unimaculata* group) 5
2. Spermathecae large, elongated, ellipsoid *longitheca* n. sp.
- Spermathecae small, spheroid to ovoid 3
3. Legs predominantly yellow, distal one-fourth of hind femur brown *bimaculata* (Loew)
- Legs predominantly brownish, distal one-half of hind femur brown 4
4. Tibiae entirely brown; basal arms of male aedeagus separated *dimidiata* (Adams)
- Tibiae yellowish in midportion, basal and apical portions brown; basal arms of male aedeagus intact *usingeri* Wirth

5. Wing with narrow dark infuscation extending from apex of costa to tip *nubifera* (Coquillett)
 Wing without narrow dark infuscation at tip 6
6. Fore 5th tarsomere with pale band twice as long as width of tarsomere *curriei* (Coquillett)
 Fore 5th tarsomere with pale band much shorter than width of tarsomere *pseudonubifera* n. sp.

UNIMACULATA GROUP

Wing with infuscation usually centered over 1st radial cell or entirely infuscated. Fore 5th tarsomere with pale band. At least hind femur with spines usually present. Species examined in this group not from North America: *C. unimaculata* (Macquart), Europe.

Clinohelea curriei (Coquillett)

(Fig. 1, 6a)

- Ceratopogon curriei* Coquillett, 1905: 62 (female; British Columbia)
Palpomyia curriei (Coquillett); Malloch 1914: 219 (combination; description; key)
Clinohelea curriei (Coquillett); Johannsen, 1943: 783 (combination); Wirth, 1965: 136 (distribution)

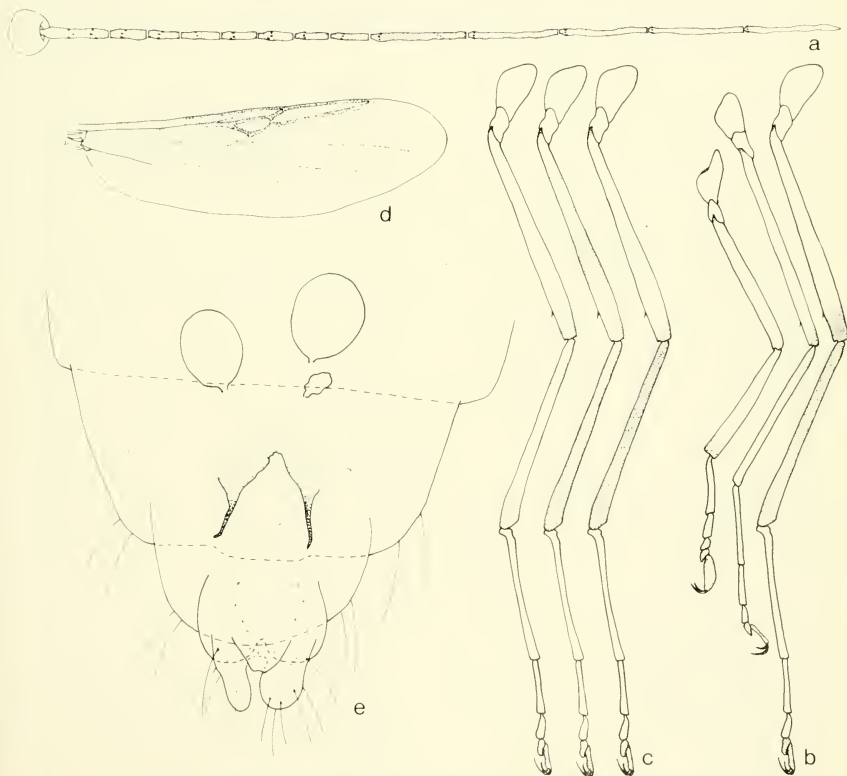


Fig. 1. *Clinohelea curriei* (Coquillett) female: a, antenna; b, leg pattern; c, variations in hind leg pattern; d, wing; e, genitalia.

Palpomyia nebulosa Malloch, 1915: 322 (female; Michigan). NEW SYNONYMY

Clinohelca nebulosa (Malloch); Johannsen, 1943: 783 (combination); Wirth, 1965: 136 (distribution)

DIAGNOSIS.— Distinguished from all other Nearctic *Clinohelca* by the following combination of characters: fore 5th tarsomere with pale band longer than width of 5th tarsomere; wing with infuscation centered over 1st radial cell or entirely infuscated.

FEMALE.— Wing length 2.78 (2.53-3.32, $n = 10$) mm; breadth 0.85 (0.81-0.94, $n = 10$) mm.

Head: Brown. Antenna (Fig. 1a) slender; pedicel yellow to pale brown; basal flagellomere with proximal two-thirds pale, distal one-third brown; remaining flagellomeres brown; AP 22-10-10-10-10-11-12-30-28-29-29-31 ($n = 10$); AR 1.57 (1.50-1.66, $n = 10$). Palpus brown; 3rd segment longer than 5th; PR 4.03 (3.20-4.50, $n = 10$). Mandible like that of *C. bimaculata* (Fig. 4c).

Thorax: Mesonotum, scutellum, post-scutellum dark brown. Legs (Fig. 1b) yellow; apex of fore tibia, mid femorotibial area, fore distal 3 tarsomeres, mid and hind 4th and 5th tarsomeres brown; hind leg pattern variable, most common form (Fig. 1b) with distal one-sixth of femur and tibia brown, other hind leg patterns as in Figure 1c; fore 5th tarsomere with pale band longer than width of tarsomere; 0-3 fore, 0-2 mid, and 1-3 hind femoral spines. Wing (Fig. 1d) usually with infuscated area centered over 1st radial cell or entirely infuscated; veins brown; CR 0.84 (0.81-0.87, $n = 10$). Halter pale.

Abdomen: Brown. Genitalia as in Figure 1e with a pair of slender, posteriorly directed sclerotized arms arising anteriorly from a lighter sclerotized area. Spermathecae small, spheroid to ovoid, subequal to unequal with short necks.

MALE.— Similar to female with following differences: smaller; antennal pedicel dark brown, flagellum brown; legs more diffused with brown; 0-1 fore, 0-1 mid, and 0-2 hind femoral spines. Genitalia form and shape like that of *C. bimaculata* (Fig. 4f); aedeagus as in Figure 6a.

DISTRIBUTION.— Alaska and California to Newfoundland and Florida (locality records plotted in Figure 3).

Types.— Holotype female of *C. curriei*, Kaslo, British Columbia, 17 June 1903, R. P. Currie (Type no. 8361, USNM); holotype female of *C. nebulosa*, Grand Junction, Van Buren Co., Michigan, 15 July 1914, C. A. Hart (INHS).

SPECIMENS EXAMINED.— 82 slides, 218 pinned specimens from:

ALASKA: Anchorage (Aldrich); Matanuska (Chamberlin). CALIFORNIA: Eldorado Co., Luther Pass (Schlinger, Univ. Calif. Davis). CONNECTICUT: Fairfield Co., Redding (Melander); Tolland Co., Storrs (Melander). DELAWARE: New Castle Co., Delaware City. FLORIDA: Alachua Co., Gainesville (Wirth). IDAHO: Ada Co., Boise (INHS); Nez Perce Co., Sweetwater (Aldrich). INDIANA: Porter Co., Mineral Springs (INHS). IOWA: Hancock Co., Pilot Knob St. Park (Gaud). MAINE: Hancock Co., Bar Harbor (Johnson). MASSACHUSETTS: Franklin Co., Rowe (Coler); Middlesex Co., Bedford (Wirth); Concord (Wirth); Suffolk Co., Boston (Melander). MICHIGAN: Cheboygan Co. (Dreisbach); Douglas Lake (Williams); Clare Co. (Dreisbach); Iron Co. (Dreisbach); Lake Co. (Dreisbach); Livingston Co., George Reserve (Sabrosky, Steyskal); Manistee Co. (Dreisbach); Midland Co. (Dreisbach); Nottawa (Sabrosky, Dreisbach); Missaukee Co. (Dreisbach); Osceola Co. (Dreisbach); Roscommon Co. (Dreisbach); Van Buren Co., Grand Junction (Hart, holotype of *nebulosa*); Wexford Co. (Dreisbach). MINNESOTA: Ramsey Co. (Wall). NEBRASKA: Cherry Co., Hackberry Lake (Wirth); Pelican Lake (Wirth). NEW HAMPSHIRE: Grafton Co., Stinson Lake (Wirth). NEW YORK: Chautauqua Co., S. Dayton (Wirth); Erie Co., East Aurora (Van Duzee), East Concord Bog (Wirth); Franklin Co., Adirondacks (Melander); Lewis Co., Brantingham Lake (Wirth); Letchworth St. Park (Wirth); Whetstone Gulf (Wirth); Monroe Co., Braddock Bay (Wirth); Orleans Co., Albion (Wirth); St. Lawrence Co., Cranberry Lake (Wirth); Suffolk Co., Cold Spring Harbor (Melander); Tompkins Co., Ringwood Reserve (Wirth). OHIO: Summit Co. (Lipovsky, KU). UTAH: Cache Co., Hyrum (Grogan). VERMONT: Caledonia Co., Lyndon (Melander). VIRGINIA: Alexandria (Wirth); Fairfax Co., Dead Run (Wirth). WISCONSIN: Polk Co. (Baker, paratype of *nebulosa*, INHS). WEST VIRGINIA: Pocahontas Co., Cranberry Glades (Wirth, Sabrosky). BRITISH COLUMBIA: Kaslo (Currie, holotype of *curriei*), Quebec: Meach Lake (Wirth). NEWFOUNDLAND: Squire's Mem. Park (Alexander). NOVA SCOTIA: Baddeck (Fairchild). ONTARIO: Algonquin Park (Wirth); Kemptville (Wirth); Ottawa (Melander, Wirth); Toronto (Van Duzee); Wanamack (Melander).

DISCUSSION.— The Palaearctic species, *C. unimaculata* (Macquart) closely resembles *C. curriei*. However, the hind tibia is pale except for the narrow base and apex: the apices of the fore and mid femora are conspicuously dark, narrowly on the fore leg but more broadly on the mid leg; and the hind femur lacks any

trace of infuscation except the conspicuous apical dark band.

Clinohelca nubifera (Coquillett)

(Fig. 2a, c, e, g; 6b)

Ceratopogon nubifer Coquillett, 1905: 61 (female; Florida)

Palpomyia nubifera (Coquillett); Malloch, 1914: 217 (combination; key)

Clinohelca nubifera (Coquillett); Johannsen, 1943: 783 (combination); Wirth, 1965: 136 (distribution)

DIAGNOSIS.—Distinguished from all other Nearctic *Clinohelca* by the following combination of characters: wing with in-

fuscation centered over 1st radial cell and a narrow infuscated band extending from apex of costa to wing tip; and fore 5th tarsomere with pale band.

FEMALE.—Wing length 2.35 (2.32-2.42, $n = 3$) mm; breadth 0.74 (0.71-0.77, $n = 3$) mm.

Head: Vertex and proboscis brown, frontoclypeus lighter brown to yellowish. Antenna (Fig. 2a) slender; pedicel yellow to light brown; proximal 5-8 flagellomeres pale on basal portions, distal portions light brown; distal 5 flagellomeres brown; AP 26-12-11-11-11-11-12-32-29-30-30-30 ($n = 3$); AR 1.43 (1.41-1.46, $n = 3$). Palpus

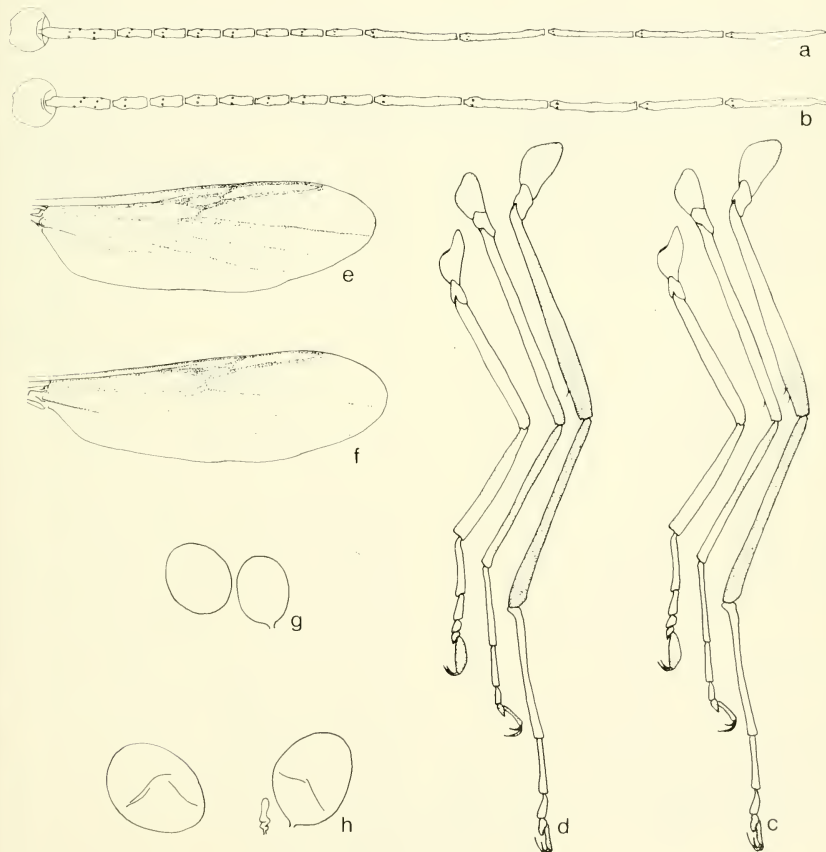


Fig. 2. Female *Clinohelca*: a,c,e,g, *C. nubifera* (Coquillett); b,d,f,h, *C. pseudonubifera* n. sp.; a,b, antennae; c,d, leg patterns; e,f, wings; g,h, spermathecae.

brown; 3rd segment nearly twice as long as 5th; PR 4.12 (4.00-4.36, $n = 3$). Mandible like that of *C. bimaculata* (Fig. 4c).

Thorax: Mesonotum, scutellum, post-scutellum dark brown. Legs (Fig. 2c) yellow; proximal portions of mid and hind coxae, distal portion of hind femur, apices of fore and mid femora, all of hind tibiae, proximal one-half of fore and mid tibiae, and 4th and 5th tarsomeres brown; fore 5th tarsomere with pale band shorter than width of tarsomere; 0-2 mid and 2-4 hind femoral spines. Wing (Fig. 2c) veins brown; infuscated area centered over 1st radial cell, and narrow infuscated band extending from apex of costa to tip; CR 0.86 (0.85-0.86, $n = 3$). Halter stem brownish; knob pale.

Abdomen: Brown. Spermathecae (Fig. 2g) small, ovoid, subequal with short necks.

MALE.—Unknown. A female specimen from Santa Rosa Co., Florida, had male genitalia mounted with her on a slide. These male genitalia were remounted in an attempt to examine them in detail. The overall shape and form of the genitalia are like that of *C. bimaculata* (Fig. 4f); aedeagus as in Figure 6b.

DISTRIBUTION.—Florida, New York (locality records plotted in Figure 3).

TYPE.—Holotype, female, Jacksonville, Florida, Mrs. A. T. Slosson (Type no. 8357, USNM, pinned).

SPECIMENS EXAMINED.—From the following localities:

FLORIDA: Alachua Co., Gainesville (Blanton), 2 females (S); Jacksonville (Slosson, holotype female, P); Highland Co., Sebring (Wirth), 1 female (P); Santa Rosa Co., Blackwater River (Fairchild), 1 female (S). NEW YORK: Suffolk Co., Cold Spring Harbor (Melander), 1 female (P).

Clinohelca pseudonubifera Grogan and Wirth, n. sp.

(Fig. 2b, d, f, h; 6c)

Clinohelca species 1; Wirth, 1951: 321 (females; Virginia).

DIAGNOSIS.—Most closely related to *C. nubifera*, and can be distinguished from all other Nearctic *Clinohelca* by the following combination of characters; fore 5th tarsomere with very short, pale band, legs mostly yellow with hind tibia and distal five-sixths of hind femur brown, and wing

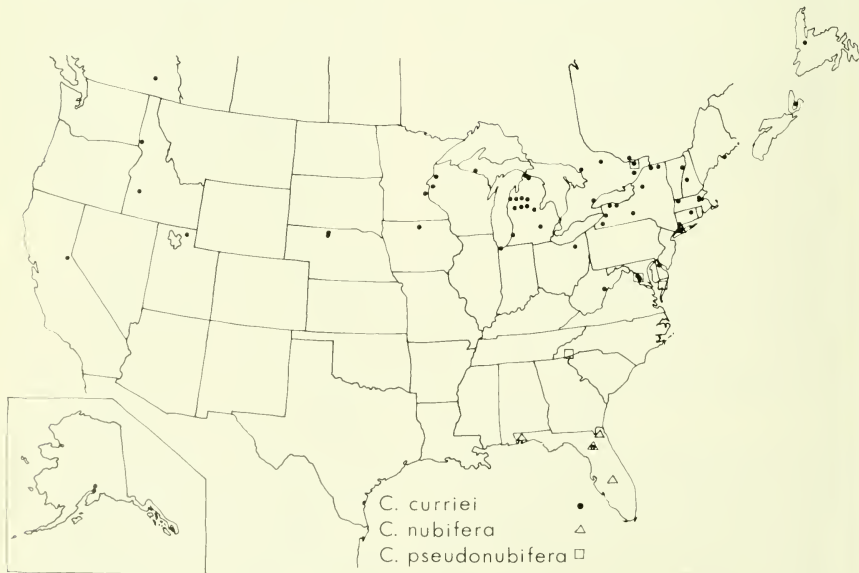


Fig. 3. North American locality records for *Clinohelca* of the *unimaculata* group.

with infuscation centered over 1st radial cell.

FEMALE HOLOTYPE.—Wing length 2.03 mm; breadth 0.65 mm.

Head: Vertex and proboscis brown; frontoclypeus lighter brown. Antenna (Fig. 2b) slender; pedicel yellow, proximal 4 flagellomeres pale, distal 9 flagellomeres brown; AP 17-9-9-8-9-9-10-21-21-21-21-26; AR 1.38. Palpus brown; 3rd segment about as long as 5th; PR 3.00. Mandible like that of *C. bimaculata* (Fig. 4c).

Thorax: Mesonotum, scutellum, post-scutellum dark brown. Legs (Fig. 2d) yellow; proximal portions of coxae, distal five-sixths of hind femur, distal one-fifth of mid femur, mid and hind tibiae, and 4th and 5th tarsomeres of tarsi brown; fore tibia very light brown; fore 5th tarsomere with very short, pale band; mid and hind femora with 1 spine. Wing (Fig. 2f) with dark infuscation centered over 1st radial cell; veins brown; CR 0.83. Halter pale with dark brown spot on knob.

Abdomen: Brown. Spermathecae (Fig. 2h) small, ovoid, subequal, with short necks.

MALE ALLOTYPE.—Similar to female holotype with the following differences: smaller; antennal pedicel dark brown, flagellum brown; femora lacking spines. Genitalia shape and form like that of *C. bimaculata* (Fig. 4f); aedeagus as in Figure 6c.

ETYMOLOGY.—The name *pseudonubifera* refers to the resemblance to *C. nubifera*.

VARIATION.—The following characters were recorded for the single female topotype: wing length 2.19 mm; breadth 0.69 mm. AR 7.35. PR 2.86. CR 0.82. The general coloration of all of the paratypes is like that of the holotype. Femoral spines ranged from 0-1 mid, and 0-1 hind.

DISTRIBUTION.—Ontario to North Carolina (locality records plotted in Figure 3).

TYPES.—Female holotype, male allotype, 1 female paratype, Snow Hill, Worcester Co., Maryland, 2 June 1968, W. H. Anderson, light trap (Type no. 66495, USNM). Other paratypes, 4 pinned females as follows: NORTH CAROLINA: Macon Co., Highlands, 15 June 1957, J. R. Vockeroth, 1 female (Canada Nat. Coll.). ONTARIO: Ottawa,

Mer Bleue, 23 June 1952 G. E. Shewell, 1 female (CNC). VIRGINIA: Fairfax Co., Falls Church, 4 July 1950, W. W. Wirth, 2 females.

DISCUSSION.—Wirth (1951) in reference to the two female specimens from Falls Church, Virginia, stated that they were close to *C. nubifera* and *C. dimidiata* but declined to name them at the time.

BIMACULATA GROUP

Wing with two infuscated areas, one centered over 1st radial cell, the other near tip of costa. Fore 5th tarsomere uniformly brown. Femora usually lacking spines, or if present, only on hind femur. Species examined in this group not from North America: *C. barrettoi* Lane and Duret, Brazil; *horacioi* Lane, Brazil; *neivai* Lane, Brazil; *nigripes* Macfie, Brazil; *pachydactyla* Kieffer, Singapore; *rubricaps* Kieffer, Paraguay; *saltanensis* Lane and Duret, Argentina; *tounesi* Lane, Brazil; *townsendi* Lane, Brazil.

Clinohoelea bimaculata (Loew)

(Fig. 4, 6d)

Ceratopogon bimaculatus Loew, 1861: 311 (female; Washington, D.C.).

Johannseniella bimaculata (Loew); Malloch, 1914: 226 (combination; description; key).

Johannsenomyia bimaculata (Loew); Malloch, 1915: 332 (combination; key).

Clinohoelea bimaculata (Loew); Kieffer, 1917: 317 (combination; key; fig. tarsus); Wirth, 1951: 321 (description and fig. pupa); Johannsen, 1952: 164 (key, fig. tarsus); Wirth, 1965: 136 (distribution).

DIAGNOSIS.—Distinguished from all other Nearctic *Clinohoelea* by the following combination of characters: legs mainly yellow with a dark subapical band on the hind femur, two-spotted wings, and antennal pedicel yellow.

FEMALE.—Wing length 2.06 (1.65-2.68, $n = 10$) mm; breadth 0.63 (0.50-0.74, $n = 10$) mm.

Head: Frontoververtex brown; proboscis and palpus pale yellow. Antenna (Fig. 4a) slender; pedicel yellow, proximal 8 flagellomeres brown, distal 5 flagellomeres lighter brown; AP 20-11-10-10-10-11-12-21-23-23-23-25 ($n = 10$); AR 1.24 (1.17-1.36, $n = 10$). Palpus with 3rd segment slightly longer than 5th; PR 2.87 (2.60-3.40, $n = 10$). Mandible (Fig. 4c)

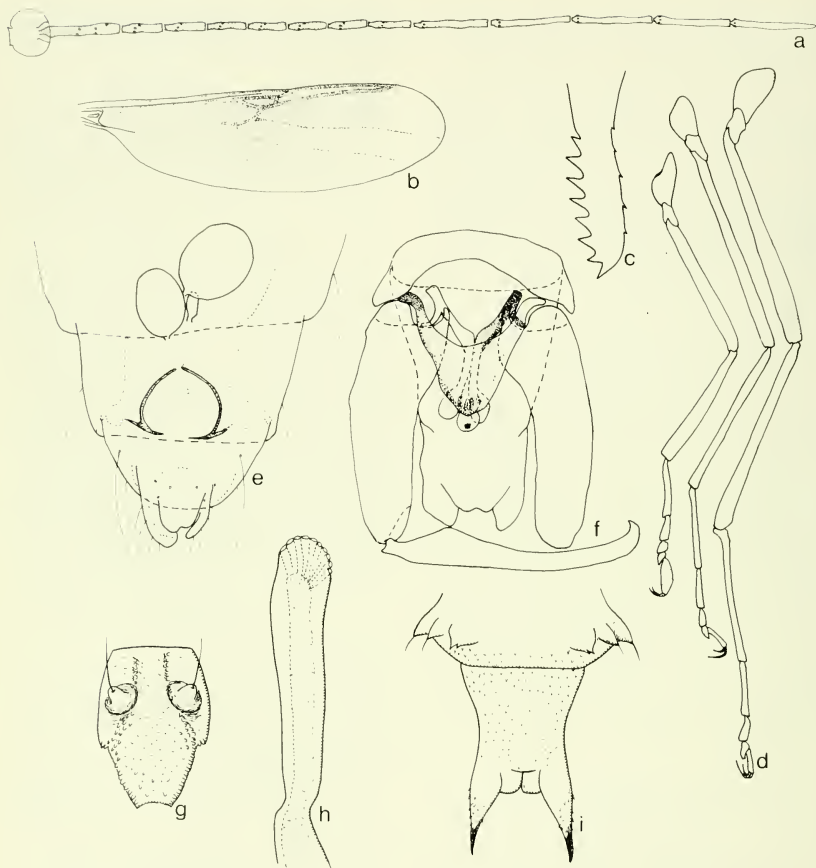


Fig. 4. *Clinohalea bimaculata* (Loew): a-e, female; f, male genitalia; g-i, pupa; a, antenna; b, wing; c, mandible; d, leg pattern; e, genitalia; g, operculum; h, respiratory organ; i, anal segment.

heavily sclerotized; inner margin with six to nine large coarse teeth; outer margin with four or five small teeth.

Thorax: Mesonotum, scutellum, post-scutellum brown. Legs (Fig. 4d) yellow; proximal portion of hind coxa, subapical band on hind femur, and 4th and 5th tarsomeres brown; hind femur with 0.3 spines. Wing (Fig. 4b) veins brown; infuscations centered over 1st radial cell and just before tip of costa; occasionally, infuscated areas joined posteriorly; CR 0.84 (0.82-0.86, $n = 10$). Halter stem pale yellowish; knob white.

Abdomen: Brown to reddish brown. Genitalia as in Figure 4e with a pair of slender, sclerotized, anteriorly directed arms arising from shorter, thicker arms. Spermathecae small, spheroid to ovoid, subequal to unequal, with short necks.

MALE.— Similar to female with the following differences: smaller; antennal pedicel brown; hind femur lacking spines. Genitalia as in Figure 4f. Ninth sternum about three times broader than long, base slightly curved with a caudomedial excavation; 9th tergum tapered distally to a rounded tip, cerci short, not reaching apex

of basimeres. Basimere slightly curved, 2.5 times longer than broad; telomere slightly longer than basimere, curved, tapered distally with pointed, hooked tip. Aedeagus (Fig. 6d) heavily sclerotized, triangular, about as broad as long; basal arm recurved about 90 degrees, heavily sclerotized; distal portion with blunt pointed tip; underlying membrane extending beyond tip, rounded with a dark spot. Claspettes divided; basal arm heavily sclerotized, recurved; distal portion more lightly sclerotized, tip elongate, bulbous.

PUPA.—Length 3.5 mm; color light brown. Operculum (Fig. 4g) narrow; 0.9 times as broad as long with a pair of rounded tubercles bearing long seta; surface with fine tubercles, those on lateral margin sharp and setose. Respiratory horn (Fig. 4h) moderately long and slender, about five times longer than broad with 10 apical spiracular papillae. Anal segment (Fig. 4i) about twice as long as broad; surface covered with fine tubercles; apicolateral processes about one-third of total length, with subapical fine tubercles; tips heavily sclerotized and sharply pointed.

DISTRIBUTION.—Michigan and Texas to New Hampshire and Florida (locality records plotted in Figure 7).

TYPE.—Holotype, female, Washington, D.C., Osten-Sacken coll. (Type no. 10379, MCZ).

SPECIMENS EXAMINED.—177 slides, 158 pinned specimens from:

ALABAMA: Mobile Co., Mobile (Blanton, Cannon). CONNECTICUT: Litchfield Co., Lake Waramaug (Melander). DISTRICT OF COLUMBIA: Washington (Coquillett). FLORIDA: Alachua Co., Gainesville (Blanton, Wirth); Baker Co., Olustee (Blanton); Bay Co., Panama City Beach (McElvey); Calhoun Co., Blountstown (Blanton); Collier Co., Collier Seminole St. Park (Wirth); Ochopee (Blanton); Escambia Co., Bratt (Blanton); Glades Co., Palmdale (Irons); Gulf Co., 2 mi. N Beacon Hill (Blanton). Wewahitchka (Blanton); Hardee Co., Ona (Irons); Highlands Co., Archbold Biol. Sta. (Wirth). Lake Placid (Layne), Sebring (Wirth); Indian River Co., Fellsmere (Wirth). Vero Beach (Wirth); Duval Co., Jacksonville (Knight); Jefferson Co., Monticello (Whitcomb); Lake Co., Leesburg (Braddock); Leon Co., 3 mi. N Tallahassee (Blanton); Liberty Co., Torreya St. Park (Blanton, Fairchild, Weems, Wirth); Marion Co., Juniper Springs (Wirth); Orange Co., Lake Magnolia Park (Irons), Rock Springs (Wirth); Palm Beach Co., W. Palm Beach (Hardy, KU); Putnam Co., Lon's Lake (Blanton); Sarasota Co., Myakka

River St. Park (Wirth); Suwanee Co., Suwanee Springs (Beamer, KU); Wakulla Co., Ocklocknee River St. Park (Wirth); Walton Co. (Butler). GEORGIA: Charlton Co., Okefenokee Swamp (Beamer, KU); Mitchell Co., Newton (Pratt); Thomas Co., Thomasville (Palmer). ILLINOIS: Henry Co., Algonquin (INHS); Champaign Co., Urbana (Malloch, INHS); Platt Co., Monticello (Malloch, INHS); Pulaski Co., Pulaski (Malloch, INHS). INDIANA: Tippecanoe Co., Lafayette (Aldrich, Melander). LOUISIANA: East Baton Rouge Parish, Baton Rouge (Wirth). MARYLAND: Anne Arundel Co., Mayo (Wirth); Calvert Co., Chesapeake Beach (Shannon, Knab); Charles Co., Nomomonee (Wirth); Frederick Co., Thurmont (Steyskal); Montgomery Co., Glen Echo (Malloch); Prince Georges Co., Beltsville (Malloch); Worcester Co., Snow Hill (Wirth). MASSACHUSETTS: Middlesex Co., Bedford (Wirth). Concord (Wirth). MICHIGAN: Lapeer Co., Deerfield (Steyskal); Livingston Co., George Reserve (Steyskal); Midland Co., (Dreisbach); Wayne Co., Detroit (Steyskal). NEBRASKA: Nemaha Co., Peru (Harmston). NEW HAMPSHIRE: Grafton Co., Stinson Lake (Wirth). NEW YORK: Franklin Co., Adirondacks (Melander). NORTH CAROLINA: Durham Co., Nelson (Beamer, KU); Onslow Co., Jacksonville (Bohart, USU). SOUTH CAROLINA: Georgetown Co., Hobcaw House (Henry). TENNESSEE: Lake Co., Reelfoot Lake (Snow). TEXAS: Collin Co., Plano (Tucker); Kerr Co., Hunt (Wirth), Kerrville (Bottimer). VIRGINIA: Alexandria (Wirth); Fairfax Co., Falls Church, Montgomery Co., Blacksburg (Messersmith). WEST VIRGINIA: Pocahontas Co., Cranberry Glades (Wirth, Sabrosky); Taylor Co., Grafton (Steyskal).

Clinohelca dimidiata (Adams)

(Fig. 5a, e, g; 6e)

Ceratopogon dimidiatus Adams, 1903: 27 (female; Arizona).

Johannseniella dimidiata (Adams); Malloch: 226 (combination; key).

Johannsenomyia dimidiata (Adams); Malloch, 1915: 332 (combination; key).

Clinohelca dimidiata (Adams); Johannsen, 1943: 783 (combination); Wirth, 1965: 136 (distribution).

DIAGNOSIS.—Distinguished from all other Nearctic *Clinohelca* by the two-spotted wings and dark brown tibiae; males with basal arms of aedeagus separated.

FEMALE.—Wing length 2.54 (2.32-2.74, $n = 5$) mm; breadth 0.76 (0.68-0.87, $n = 4$) mm.

Head: Brown. Antenna (Fig. 5a) slender; brown, proximal two-thirds of basal flagellomere pale; AP 17-10-9-9-9-10-10-11-22-21-23-23-25 ($n = 4$); AR 1.35 (1.25-1.40, $n = 4$). Palpus with 3rd segment slightly longer than 5th; PR 3.43 (3.17-3.80, $n = 3$). Mandible like that of *C. bimaculata* (Fig. 4c).

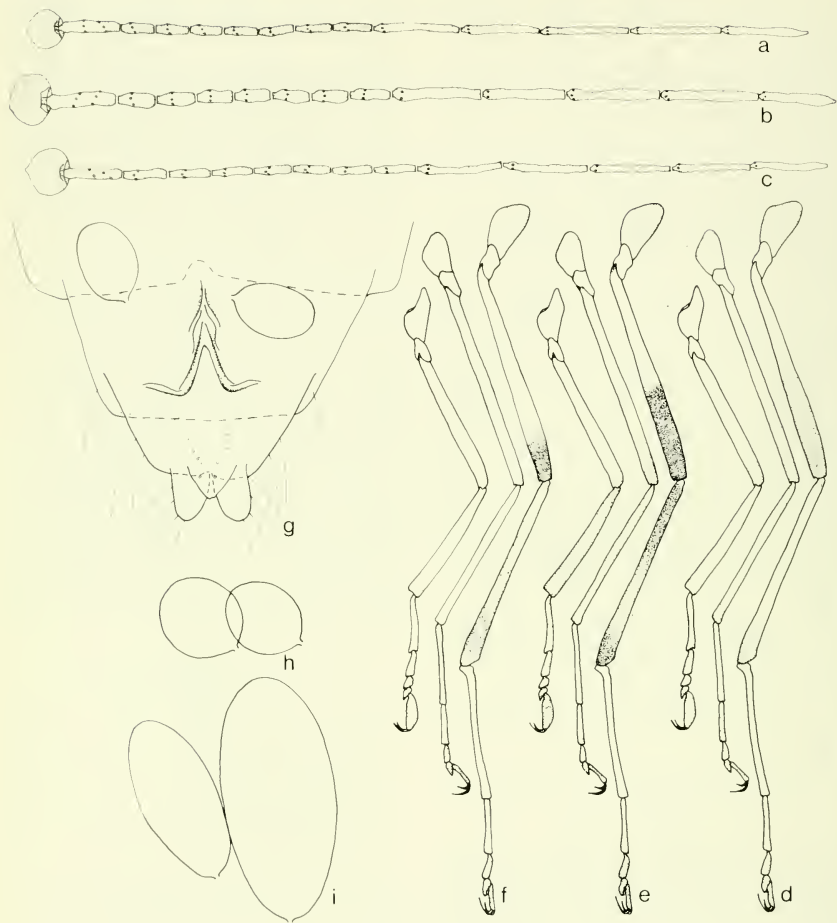


Fig. 5. Female *Clinohoele*: a,e,g, *C. dimidiata* (Adams); b,d,h, *C. usingeri* Wirth; c,f,i, *C. longitheca* n. sp.; a-c, antennae; d-f, leg patterns; g, genitalia; h, i, spermathecae.

Thorax: Mesonotum, scutellum, post-scutellum dark brown. Legs (Fig. 5e) brown; yellow on fore coxae, distal one-fourth of mid and hind coxae, trochanters, most of fore femur, proximal five-sixths of mid femur, proximal half of hind femur, and mid and hind 1st and 2nd tarsomeres. Wing like that of *C. bimaculata* (Fig. 4b). Halter stem pale; knob white.

Abdomen: Brown. Genitalia as in Figure 5g with three small pairs of anteriorly

directed, lightly sclerotized arms. Spermathecae small, ovoid, subequal with short necks.

MALE.—Similar to the female with the following differences: smaller; flagellum entirely brown; legs more diffused with brown. Genitalia shape and form like that of *C. bimaculata* (Fig. 4f); aedeagus as in Figure 6e with basal arms apparently separated, and an anteriorly directed point on the anterior membrane.

DISTRIBUTION.— Arizona, New Mexico, Utah (locality records plotted in Figure 7).

TYPES.— Female lectotype, 3 female paralectotypes, Grand Canyon, Coconino Co., Arizona, C. F. Adams, (KU), here designated.

SPECIMENS EXAMINED.— From the following localities:

ARIZONA: Apache Co., Springerville (Wirth), 1 male (P); Coconino Co., Grand Canyon (Adams, types), 4 females (KU) (P). **NEW MEXICO:** Taos Co., Rio Grande (Wirth), 3 females (P). **UTAH:** Cache Co., Hyrum (Grogan), 3 females (S); Box Elder Co., Brigham City (Hardy, Stains, USU), 1 male, 1 female (S), 1 female (P); Weber Co., Huntsville (Hardy, USU), 1 female (P); Wasatch Co., Heber City (Dreisbach), 1 female (P).

Discussion.— The syntype series was labeled "G. Zuni R., Ariz., 7-27," which Adams published as "Grand Canon, Arizona" for the type locality.

Clinohelca usingeri Wirth

(Fig. 2b, d, h; 6f)

Clinohelca usingeri Wirth, 1952: 209 (female; California); Wirth, 1965: 136 (distribution).

DIAGNOSIS.— Distinguished from all

other Nearctic *Clinohelca* by the two-spotted wing and the legs mainly yellow with distal half of hind femur and apices of tibiae brown; males with basal arms of aedeagus intact.

FEMALE.— Wing length 2.65 (2.50-2.74, $n = 4$) mm; breadth 0.76 (0.70-0.81, $n = 3$) mm.

Head: Brown. Antenna (Fig. 2b) moderately slender; basal one-half of proximal flagellomere lighter brown than remainder of flagellum; AP 17-10-9-9-9-9-10-23-22-22-22-20 ($n = 3$); AR 1.33 (1.29-1.35, $n = 3$). Palpus with 3rd segment longer than 5th; PR 3.33 (3.17-3.67, $n = 3$). Mandible like that of *C. bimaculata* (Fig. 4c).

Thorax: Mesonotum, scutellum, post-scutellum dark brown. Legs (Fig. 2d) yellow; proximal one-third of fore coxa, most of mid and hind coxae, distal one-half of hind femur, femorotibial areas of mid and hind fore legs, apices of tibiae, and distal 4 tarsomeres brown. Wing like that of *C. bimaculata* (Fig. 4d). Halter pale to whitish.

Abdomen: Brown. Spermathecae (Fig. 2h) small, spheroid, subequal with short necks.

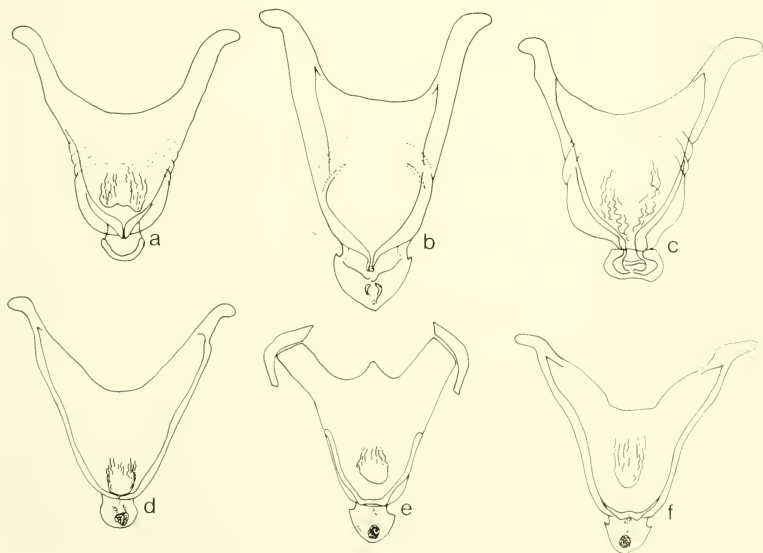


Fig. 6. Aedeagi of male *Clinohelca*: a, *C. currici*; b, *C. nubifera*; c, *C. pseudonubifera*; d, *C. bimaculata*; e, *C. dimidiata*; f, *C. usingeri*.

MALE.— Similar to female with the following differences: smaller; flagellum entirely brown; femora and tibiae entirely brown. Genitalia shape and form like that of *C. bimaculata* (Fig. 4f); aedeagus as in Figure 6f.

DISTRIBUTION.— Arizona, California (locality records plotted in Figure 7).

TYPE.— Holotype, female, Black Lake Canyon, San Luis Obispo Co., California, 22 August 1943, W. W. Wirth (Type no. 59949. USNM).

SPECIMENS EXAMINED.— From the following localities:

ARIZONA: Cochise Co., Sunnyside Canyon (Hardy, KU), 1 male. 3 females. CALIFORNIA: San Diego Co., Live Oak Park (Melander) 1 female (P); San Luis Obispo Co., Black Lake Canyon (Wirth, type series), 1 male. 2 females (P), 3 females (S).

DISCUSSION.— Present records indicate that *C. dimidiata* is an inhabitant of the Great Basin and the Upper Colorado Plateau, while *C. usingeri* is an inhabitant of the Mojave and Sonoran deserts. Further collecting is necessary to determine whether the geographic ranges of these two closely related species overlap, or if they are separated by altitude.

Clinohoelea longitheca Grogan
and Wirth n. sp.

(Fig. 5c, f, i)

DIAGNOSIS.— Distinguished from all other Nearctic *Clinohoelea* by the very large, unequal, elongate, ellipsoid spermathecae, the legs mainly yellow with hind tibia and distal fourth of hind femur brown, and the two-spotted wings.

FEMALE HOLOTYPE.— Wing length 2.00 mm; breadth 0.61 mm.

Head: Brown; frontoclypeus lighter brown. Antenna (Fig. 5c) slender, brown; AP 17-11-10-10-10-10-11-21-21-21-20-20; AR 1.17. Palpus brown; 3rd segment longer than 5th; PR 3.11. Mandible like that of *C. bimaculata* (Fig. 4c).

Thorax: Mesonotum, scutellum, post-scutellum dark brownish black. Legs (Fig. 5f) yellow; most of mid and hind coxae, distal one-fourth of hind femur, hind tibia, and distal 3 tarsomeres brown; distal one-fourth of fore tibia light brown. Wing like that of *C. bimaculata* (Fig. 4d) with an infuscation over 1st radial cell and just before tip of costa. Halter light brown.

Abdomen: Brown. Spermathecae (Fig. 5i) very large, unequal, elongate ellipsoid.

MALE.— Unknown.

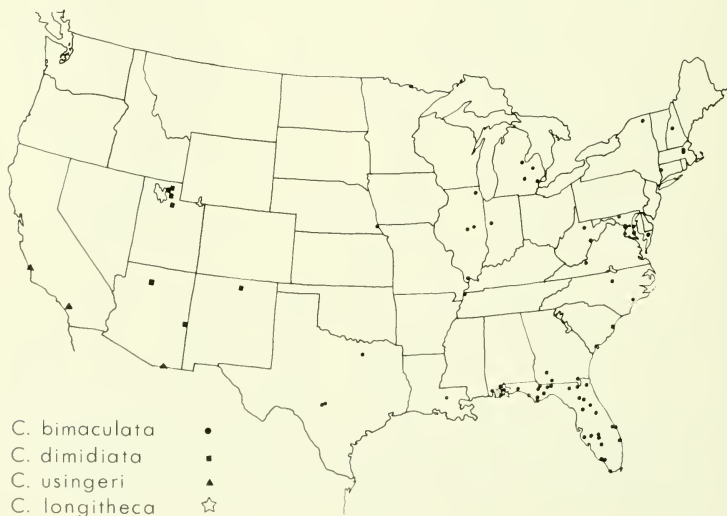


Fig. 7. North American locality records for *Clinohoelea* of the *bimaculata* group.

ETYMOLOGY.— The name *longithec*a is derived from the Latin *longus* (long) and *theca* (sac) and refers to the very large, elongate, ellipsoid spermathecae that are characteristic of this species.

VARIATION.— The following characters were recorded for the single female topotype: wing length 1.97 mm; breadth 0.61 mm. AR 1.36. PR 2.89. CR 0.84. The general coloration is like that of the holotype.

DISTRIBUTION.— Florida (type locality plotted in Figure 7).

TYPES.— Female holotype, 1 female paratype (S), A. & M. Biological Station, Blackwater River State Forest, Santa Rosa Co., Florida, 21 May 1971, G. B. Fairchild, black light trap (Type no. 66496, USNM).

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