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# IMMATURE STAGES OF *FORCIPOMYIA SEMINOLE* WIRTH AND A RELATED NEW NEOTROPICAL SPECIES (DIPTERA: CERATOPOGONIDAE)

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## ABSTRACT

Three species of the genus *Forcipomyia* subgenus *Lepidohelea* of the *Forcipomyia bicolor* group are distinguished in a taxonomic key and assigned to a new *Forcipomyia seminole* subgroup. They are *F. beckae* Wirth from Florida, *F. seminole* Wirth, with new records from Florida to Brazil, and *F. luteigenua* Wirth & Spinelli, **New Species**, which is widely distributed from Florida and Mexico to Brazil and Colombia. Immature stages are described for *F. seminole* and *F. luteigenua*, the first descriptions of immatures of any Western Hemisphere species of the subgenus *Lepidohelea*.

## RESUMEN

Tres especies del genero *Forcipomyia*, subgenero *Lepidohelea*, del grupo *Forcipomyia bicolor* se reconocen en una clave taxonomica, y se las incluye en el subgrupo *Forcipomuyia seminole* (nuevo subgrupo). Ellas son: *F. beckae* Wirth, de Florida, *F.*

*seminole* Wirth, con nuevas citas & desde Florida hasta Brasil, y *F. luteigenua* Wirth & Spinelli, **Especie Novum**, especie ampliamente distribuida, desde Florida y Mexico hasta Brasil y Colombia. Se describen los estados immaduros de *F. seminole* y de *F. luteigenua*, siendo estas las primeras descripciones de primagos de especies del subgenero *Lepidohelea* del Hemisferio Occidental.

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In 1976 Wirth described two prettily-marked Florida species of *Forcipomyia* (*F. beckae* Wirth and *F. seminole* Wirth) with small dark spots on their legs, and compared them with a Neotropical species, *F. pictoni* Macfie (1938), with similar but more extensive leg spots. He also described the immature stages of *F. pictoni*. Wirth (1976) placed all three species in his "*Forcipomyia cinctipes* group," which he characterized "by the presence of some flattened, striated, appressed scales in addition to the usual setae and macrochaetae of the body, wings often with a conspicuous color pattern of large pale areas or variegated areas, and legs usually with prominent pale or dark bands."

Debenham (1987a) reviewed the Australasian species of the subgenera *Forcipomyia* and *Lepidohelea* of the genus *Forcipomyia*, and presented a set of characters that for the first time satisfactorily distinguished similarly marked species of the two subgenera. Wirth (1990) redescribed *Forcipomyia cinctipes* (Coquillett) and re-assigned the species to the subgenus *Schizoforcipomyia* Chan & LeRoux (1971). In 1991 Wirth placed *F. beckae* and *F. seminole* in the subgenus *Lepidohelea*, *F. bicolor* group, which he renamed for some of the American species that he formerly had placed in the "*cinctipes* group." He gave a key by which species of the *F. bicolor* group could be distinguished from those of the Old World *F. chrysolopha* group, and a newly formed *F. annulatipes* group, which he proposed for banded-legged American species with 4 palpal segments, a single spermatheca, and male dististyle more or less expanded distally. Of the 3 species that Wirth treated in 1976, only *F. pictoni* remains a valid member of the subgenus *Forcipomyia* as characterized by Debenham (1987a). On the basis of leg coloration, we are treating *F. beckae*, *seminole*, and *luteigenua* n. sp. as a subgroup of the *F. bicolor* group, which we here name the "*F. seminole* subgroup," where they would key out in couplet 5a in the key by Wirth (1991: 509).

The immature stages of members of the *F. bicolor* group have not previously been described. We take this opportunity to describe the larva and pupa of *F. seminole* that occur in the leaf axils of epiphytic bromeliads and of *Pandanus*, and to describe all stages of a new species that has been reared from rotting plant materials such as cacao pods and banana pseudostems in terrestrial habitats.

Debenham (1987b) pointed out that the larva of *F. (Schizoforcipomyia) borbonica* Clastrier (described as *F. petersoni* Chan & LeRoux) resembled the larva of known species of *F. (Lepidohelea)* in the basal swelling of the *a* setae of the body, but that *Lepidohelea* larvae could be distinguished by the presence of a halfmoon-shaped chitinous plate on the last body segment, from which arise 4 *b*-like setae (2 *b* setae and 2 modified *a* setae; well illustrated by de Meillon (1931) for *F. (L.) randensis* (de Meillon). This plate is absent in *Schizoforcipomyia*. This crescent-shaped plate (Fig. 1) is well developed in our species of the *F. bicolor* group, and in addition the larva of one of our species (*F. luteigenua* n. sp.) has a remarkable vesicle-like development of the *a* seta of the prothorax (Fig. 2).

Explanation of the taxonomic characters used in this paper can be found in the general papers on Ceratopogonidae by Wirth et al. (1977) and Downes & Wirth (1981), and the revision of the North American *Forcipomyia (Euprojoannisia)* by Bystrak & Wirth (1978).

Key to the Species of the *seminole* Subgroup

1. Hind femur pale with a narrow dark band at midlength (Fig. 18)(*seminole* Subgroup) ..... 2
— Hind femur dark, at least on distal half ..... *bicolor* Subgroup
2. Fore and mid femora each with broad median dark band; tibiae with complete subbasal and median dark bands (Fig. 18) ..... *luteigenua* n. sp.
— Fore and mid femora entirely pale; tibiae with incomplete dark rings or several isolated dark spots ..... 3
3. Female wing dark with 2 large creamy pale areas on anterior margin past tip of costa; mesonotum dark on disc; male dististyle nearly straight with slender tip ..... *beckae* Wirth
— Female wing pale with 2 small black spots on anterior margin and indistinct pale areas at wing margin at tips of veins M1, M2, M3+4, and Cul; mesonotum yellowish on disc; male dististyle gradually curved, with tip bent and slightly expanded ..... *seminole* Wirth

*Forcipomyia (Lepidohelea) seminole* Wirth
(Figs. 4, 6-7)

*Forcipomyia seminole* Wirth, 1976: 81 (male, female; Florida; figs.).
*Forcipomyia (Forcipomyia) seminole* Wirth; Wilkening, et al., 1985: 516 (in list; Florida distribution).
*Forcipomyia (Lepidohelea) seminole* Wirth; Wirth, 1991: 509 (new status; in key).

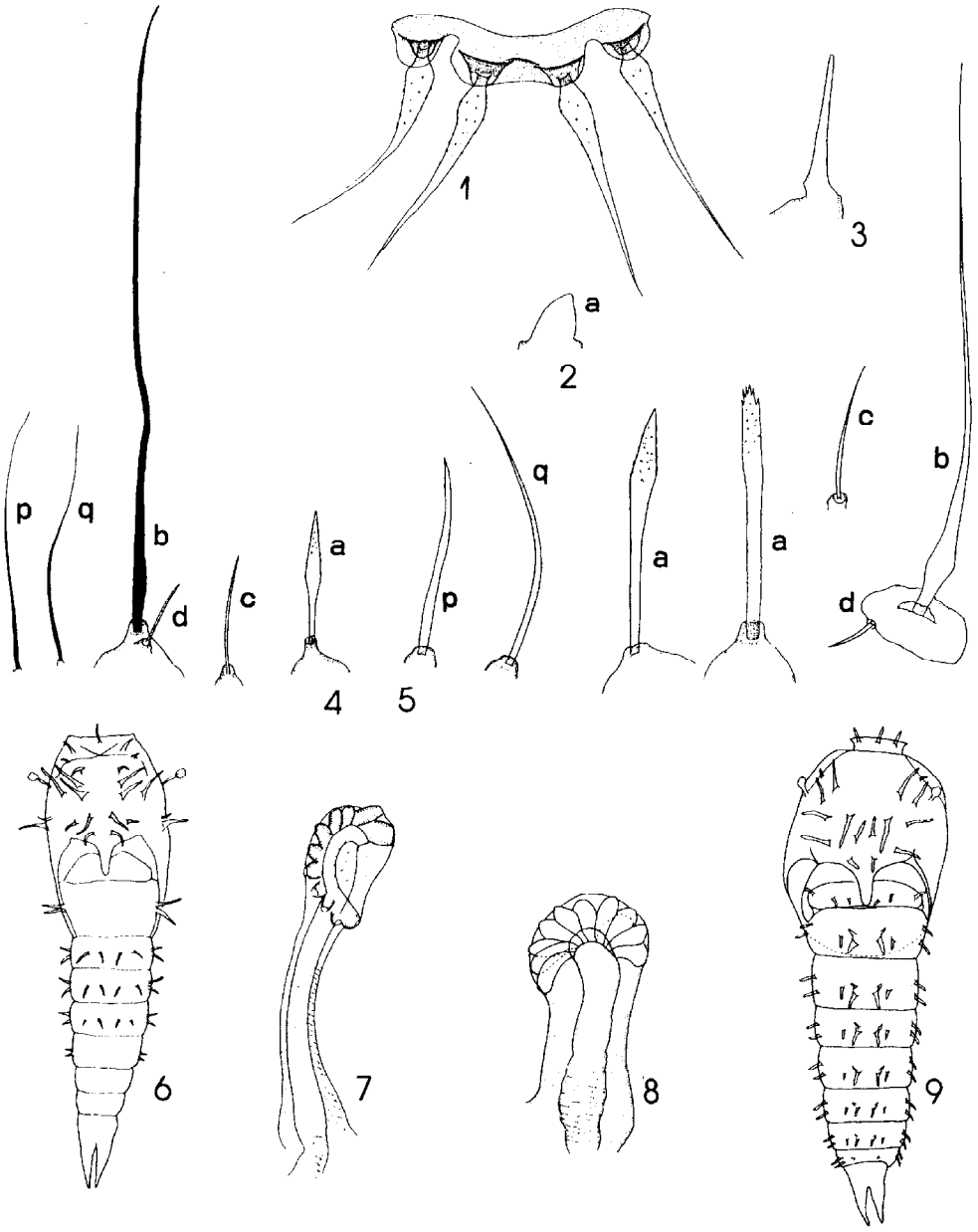
DIAGNOSIS.

Female: Wing length 0.97 mm. A brown species, mesonotum yellowish on disc. Legs pale creamy yellowish, hind femur with narrow subapical brown ring, tibiae each with 2 incomplete narrow pale rings, one near base and other just past midlength; tarsi with inconspicuous segmental bands of narrow dark scales in midportions. Wing creamy whitish, with small areas of dark macrotrichia forming distinct spots over 2nd radial cell and on posterior margin halfway between end of costa and wing tip, and suffuse dark areas along apices of veins M1, M2, M3+4 and Cul. Palpal pit especially small and shallow, round with pore same size as pit.

Male Genitalia: Ninth segment brownish. Basistyle brownish; dististyle pale, with abruptly bent tip, quite slender for most of length, bent tip very slightly expanded. Aedeagus with acutely pointed tip, basal arch well developed. Parameres broadly separated at bases, distal filiform portion rather short, not twisted.

Larva: Length 3.6 mm. Color whitish with pronounced black basal tubercles to the body setae; head strongly testaceous to black around mouth. Chaetotaxy (Fig. 4): *p* and *q* setae of head simple, black, swollen slightly at base; *a* setae of body large, dark, narrowly lanceolate, chitinous with minute spicules on surface; *b* setae very large, long, sinuous, swollen basally, black; *d* setae small, straight, arising from a common tubercle with *b*; *c* longer than *d*, straight. Dorsal setae of last abdominal segment swollen basally, not lanceolate.

Pupa (Fig. 6): Length 2.4 mm. Color of exuviae pale, almost colorless, tinged fuscous on thorax. Operculum with a spine on both the median and lateral triangles. Cephalothorax with a most unusual number of spines, there being in all 10 pairs disposed as in figure. The most remarkable of all are the two lateral pairs upon the site of the normal conical or ridged projections covering the wing bases of the imago. Posterior median projection of cephalothorax short, not reaching posterior margin of 1st abdom-




Figs. 1-3, 5, 8-9, *Forcipomyia luteigenua*; 4, 6, 7, *F. seminole*: 1, dorsal sclerite of last segment of larva, with *a* and *b* setae; 2, vesicle-like *a* seta of larval prothorax; 3, larval antenna; 4, 5, head and body setae of larva, as lettered; 6, 9, pupa, dorsal view; 7, 8, prothoracic respiratory horn of pupa.

inal segment. Abdominal segments 2-5 each with 2 dorsal and 2 lateral pairs of spines; 6 with lateral pairs only. Prothoracic respiratory horn (Fig. 7) most unusual; knob small and irregular on end of a long, curving, slender stem; spiracular openings about 11, arranged roughly like pegs radiating from a semicircle, with a small external respiratory area.

DISTRIBUTION. Florida, Brazil, Costa Rica, Guyana, Jamaica, Puerto Rico.

TYPES. Described from holotype female, allotype, and 31 male and 543 paratypes, Vero Beach, Indian River Co., Florida, vii.1958 to iv.1959, Ent. Res. Center, light trap (deposited in USNM).

NEW RECORDS. **Florida**: Broward Co., Fort Lauderdale, 5.viii.1951, W. W. Wirth, ex bromeliad, 1 male, 2 larvae, 1 pupa. **Brazil**: Rio de Janeiro, 31.vii.1923, L. G. Saunders (B63), ex epiphytic bromeliad, 1 female, 1 larva, 1 pupa. **Costa Rica**: Siquirres, Hacienda Theobroma, 2.vi.1956, L. G. Saunders (CR12), reared from epiphytic bromeliad, 1 male, 1 female, 2 larvae, 2 pupae. **Guyana**: Georgetown, 20.vi.1953, L. G. Saunders (Cb47), ex bromeliad, 2 larvae, 4 pupae. **Jamaica**: Clarendon Parish, Milk River Bath, 19.xi.1968, R. E. Woodruff, light trap, 2 males. **Puerto Rico**: "Hills", 6.ii.1953, L. G. Saunders (PR18), ex *Pandanus* leaf axils, 3 males, 2 females, 8 pupal exuviae.

NOTE. The late Professor L. G. Saunders of the University of Saskatchewan shortly before his death in 1968 generously donated to the Smithsonian Institution his extensive worldwide collection of *Forcipomyia* midges, mostly reared from immature stages, along with his manuscript notes and drawings. Among these were specimens, notes, and drawings of a species that he collected and reared in Brazil in 1923 and designated as "B-63." During the present study it was determined that "B-63" was the same species that Wirth described in 1976 as *Forcipomyia seminole* Wirth from Florida. Saunders subsequently reared this species from epiphytic bromeliads in Guyana and Costa Rica and from *Pandanus* leaf axils in Puerto Rico. The species has twice been reared from bromeliads in southern Florida. The above descriptions of the larva and pupa were adapted from Saunders' manuscript notes and the figures were redrawn from his sketches of the larva and pupa.

### *Forcipomyia (Lepidohelea) beckae* Wirth, **New Status**

*Forcipomuyia beckae* Wirth, 1976: 82 (male, female; Florida; figs.).
*Forcipomyia (Forcipomyia) beckae* Wirth; Wilkening, et al., 1985: 516 (in list; Florida records.).

DIAGNOSIS.

Female: Wing length 1.15 mm. As in *Forcipomyia seminole* Wirth, but mesonotum dark brown on disc; wing darker, with 2 larger blackish anterior spots, and 2 large anterior creamy pale areas in Cell R5 past tip of costa.

Male Genitalia: As in *F. seminole*, but dististyle straight with slender tip, and aedeagus with a much shorter basal arch.

Immature Stages: Unknown.

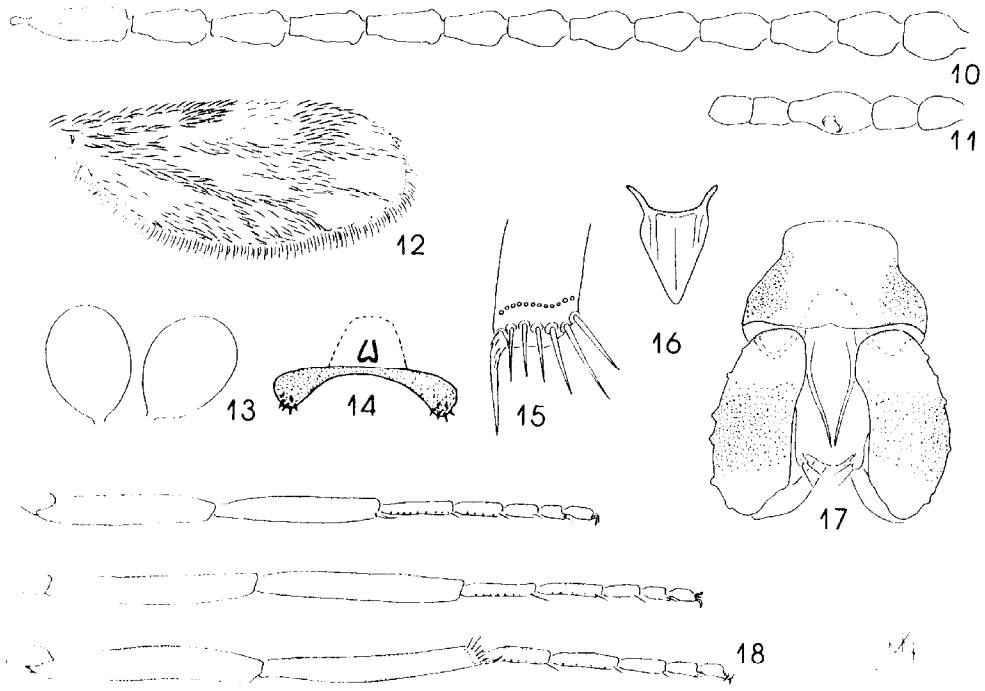
### *Forcipomyia (Lepidohelea) luteigenua* Wirth & Spinelli, **New Species**
(Figs. 1-3, 5, 8-18)

DIAGNOSIS.

Female Holotype. Wing length 1.00 mm; breadth 0.36 mm; costal ratio 0.47.

Head: Brown; antenna and palpus pale brown. Antenna (Fig. 10) with lengths of flagellar segments (in microns) 54-47-47-50-50-54-54-54-58-58-58-58-83; antennal ratio 0.76; all segments moderately long and tapering, last segment with terminal papilla. Palpus (Fig. 11) with lengths of segments (in microns) 25-29-58-32-29; third segment moderately swollen on proximal 0.6, palpal ratio 1.60; a small, shallow, sensory pit at midlength. Mandible without teeth.

Thorax: Brown, mesonotum with abundant golden setae. Legs pale yellow with brown bands as in Fig. 18; femora with moderately broad median brown band, paler on




Figs. 10-17, *Forcipomyia luteigenua*: 10-15, 18, female; 16- 17, male; 10, antenna; 11, palpus; 12, wing; 13, spermathecae; 14, genital sclerotization; 15, tibial spur and comb of hind leg; 16, aedeagus; 17, genitalia, aedeagus omitted; 18, color pattern of (top to bottom), fore, mid, and hind legs.

fore and mid legs; tibiae with narrow sub-basal and moderately broad median brown bands, paler on fore and mid legs; tarsi brown with narrowly pale joints. Hind tibial comb (Fig. 15) with 6 slender spines, spur slender, nearly straight, and pale yellowish in color; hind tarsal ratio 1.00. Wing (Fig. 12) appearing shaggy due to numerous coarse, long, 1- striated macrotrichia; those over radial cells broader and clumped, forming a small blackish stigma; those in large areas in apices of cells R5, M1, and M2, and irregularly on disc of wing, slender and pale, forming conspicuous pale mottling as figured. Halter pale.

Abdomen: Brown with numerous golden setae, and long, semi- appressed, brownish, 1- and 2-striated, scalelike setae; cerci yellowish. Genital sclerotization (Fig. 14) a slender transverse ribbon, broader on ends with a few short spines on posterior margin of ends. Spermathecae (Fig. 13) 2, oval with very short, slender necks; slightly unequal, 91 by 67 microns and 87 by 62 microns.

Male Allotype. Wing length 1.14 mm; breadth 0.32 mm; costal ratio 0.43. Similar to female with usual sexual differences. Genitalia (Fig. 17): Ninth sternum without caudomedian excavation; pale mesally, brownish on sides. Basistyle stout, with broad infuscation at midlength; dististyle whitish, nearly straight, tip infuscated, slightly curved. Aedeagus (Fig. 16) rather narrow, with pointed tip and short basal arch. Parameres broadly separated at bases, distal filiform portion rather short, not twisted.

Larva. Length 2.95 mm. Color yellowish, with pronounced black basal tubercles to the body setae. Antenna (Fig. 3) pale, rather short with blunt tip. Chaetotaxy (Fig. 5): *p* and *q* setae of head pale, simple, the first one with filiform tip, the second one smaller, stouter. Seta *a* of prothorax (Fig. 2) stout, short with broad base, vesicle-shaped; *a* setae of remaining body segments pale, narrowly lanceolate and microscopically spicu-

late distally (ending in 5-6 sharp spinules in a more narrowly lanceolate or somewhat truncated tip in some specimens); *b* setae very large, pale, nearly straight, swollen basally; *d* setae small, straight, arising from a common tubercle with *b* seta; *c* twice as long as *d*, slightly curved. Last body segment with prominent crescent-shaped dorsal sclerite (Fig. 1) from which arise 4 setae shaped as in *a* setae of preceding body segments.

Pupa (Fig. 9). Length 2.45 mm. Color of exuviae dark brown, well-sclerotized with prominent integumental spinules and micro-tubercles. Operculum with 3 pairs of spinulose processes. Cephalothorax with 8 pairs of processes as figured; posteromedian projection reaching posterior margin of 1st abdominal segment. First abdominal segment with 2 dorsal and 2 lateral pairs of spines; remaining segments with an additional pair of dorsal spines arising from the same tubercle as the large median pair. Respiratory horn (Fig. 8) stout, stem short, with 10-11 spiracular openings located around rim at tip of horn.

DISTRIBUTION. Brazil, Colombia, Costa Rica, Dominica, Mexico, Puerto Rico, U.S.A. (Florida).

TYPES. Holotype female, allotype male, **Costa Rica**, Limon Prov., Siquirres, Hacienda Theobroma, 6.vi.1956, L. G. Saunders (CR22), reared from cacao pods (deposited in USNM). Paratypes, 14 males, 10 females, 21 larvae, 20 pupae, as follows: **Costa Rica**: Same data as holotype, 9 males, 6 females, 11 larvae, 10 pupae. Heredia Prov., near La Virgen, Finca La Tigra, 84° 70′ N, 10° 24′ W, A. M. Young, reared from rotting cacao pods, dates as follows, 12,17.xi.1981, 30.vii.1982, 8.viii.1983, 5 males, 4 females, 8 larvae, 10 pupae. Limon Prov., Finca La Lola, 13.viii.1984, A. M. Young, ex rotting cacao pods, 2 larvae.

OTHER MATERIAL EXAMINED (not paratypes). **Brazil**: Bahia, Itabuna, 1970, J. A. Winder, 2 males; Ilheus, CEPEC, v.1977, S. Soria, cacao plantation, 1 female. **Colombia**: Antioquia, Tamesis, 1150 m, iv.1990, J. Furtado, reared from decomposing banana pseudostem, 6 males, 2 females. **Dominica**: Clarke Hall, 10.ii.1965, W. W. Wirth (65W43), reared from under bark on ground under cacao trees, 1 female. **Mexico**: Guerrero, Ixtapa, 23.x.1975, D. J. Pletsch, light trap, 1 male. **Puerto Rico**: Maricao Fish Hatchery, 23.xii.1962, P. & P. Spangler, light trap, 2 females. "Hills," 6.ii.1953, L. G. Saunders, leaf carpet, 1 larva, 1 pupa, 1 female. **U.S.A. Florida**: Dade Co., Homestead, 9.ix.1968, R. M. Baranowski, UV light trap, 2 males; Orchid Jungle, v-vi.1969, Baranowski, UV light trap, 16 males, 10 females; Ross and Costello Hammock, 21.x.1969, Baranowski, UV light trap, 5 males, 10 females. Highlands Co., Archbold Biol. Sta., 13-19.iv.1989, 1.iv.1990, W. W. Wirth, UV light trap, 6 females. Indian River Co., Vero Beach, iii.1959, Ent. Res. tr., light trap, 10 males, 16 females. Polk Co., Lake Alfred, 8.viii.1952, M. H. Muma, 1 female. **Virgin Islands**: St. John, ix-xi.1961, R. W. Williams, light trap, 4 males, 5 females.

ETYMOLOGY. The trivial name *luteigenua* is from the Latin "luteus" (yellow) and "genu" (knee), referring to the pale distal portions of the femora.

DISCUSSION. Of the described species of the *Forcipomyia bicolor* group except *F. seminole* and *F. beckae*, *F. luteigenua* differs in having the hind femur pale except for a brown band at or near midportion. These 3 species are designated, for convenience, the *Forcipomyia seminole* subgroup. *Forcipomyia seminole* and *F. beckae* are readily distinguished from *F. luteigenua* by their entirely pale fore and mid femora, the dark band on the hind femur is well past midlength, on the distal 1/4 of the femur, and by the reduction of the dark bands on the tibiae to very narrow, faint, often incomplete rings. The wing of *F. luteigenua* is much shaggier, appearing mottled with irregular pale and dark markings, while the wing markings of *F. seminole* and *F. beckae* are more regular, with the dark markings dominant in *F. beckae* and the pale markings dominant in *F. seminole*. The male genitalia of *F. beckae* and *F. seminole* are much darker, and the ninth sternum and basistyle are nearly entirely brownish.

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