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LEPTOTARSUS (TANYPREMNA) IN THE LESSER ANTILLES: DESCRIPTION OF A NEW SPECIES FROM GUADELOUPE AND BIOGEOGRAPHICAL NOTES (DIPTERA: TIPULIDAE)

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ABSTRACT

Leptotarsus (Tanypremna) guadeloupensis new species is described from wet secondary forests on the Lesser Antillean island of Guadeloupe. The external morphology of male and female genitalia of the new species and its closest relative, *Leptotarsus (Tanypremna) hodgei* Alexander from Dominica, are described and illustrated. The relationship between the two species and the possible origin of the subgenus *Leptotarsus (Tanypremna)* in the Lesser Antilles are briefly discussed.

KEY WORDS: *Leptotarsus*, *Tanypremna*, Tipulidae, biogeography, Guadeloupe, Antilles

INTRODUCTION

Crane flies in the genus *Leptotarsus* Guérin-Méneville are largely tropical or warm temperate, with only a few species reaching their distributional limits in the Northern Hemisphere (Oosterbroek and Theowald, 1992; Alexander, 1965). About 300 described species of *Leptotarsus* exhibit a Gondwanian distribution (Gelhaus and Young, 1995), and are concentrated in two species-rich regions, one in the Neotropical Region (Alexander and Alexander, 1970), and the other in the Australian Region (Oosterbroek, 1989). *Leptotarsus* as currently classified is considered to be doubtfully monophyletic (Young and Gelhaus, 1992) based on great morphological diversity. Twenty subgenera have been proposed within *Leptotarsus* with *Longurio* being the most widespread, found in all major faunal regions except the Australian. Eleven subgenera with 95 species have been described in the Neotropical Region according to the Catalogue of the Craneflies of the World (Oosterbroek, personal communication), predominantly in South America. No subgeneric revisionary work has been done on the genus. Only a single species is known from the Caribbean area, *Leptotarsus (Tanypremna) hodgei* Alexander from Dominica in the Lesser Antilles. A second species of *Leptotarsus (Tanypremna)* on Guadeloupe is described below, and provides some explanation for the origin of *Leptotarsus* in the Lesser Antilles.

Alexander treated *Tanypremna* Osten Sacken as genus when *T. hodgei* Alexander was first described in 1939. The status of *Tanypremna* remained as genus until 1945 when it and other related taxa were treated as subgenera of *Leptotarsus*. *T. hodgei* was later transferred to subgenus *Longurio* Loew in 1970 by Alexander without any comment. The only remark by Alexander was at the end of the description of the species *L. (T.) clotho* (Alexander, 1944), where he mentioned "*Longurio* Loew and *Tanypremna* Osten Sacken are, in reality, all closely related and may well be found to pertain to a single major generic group." However, *T. hodgei* was listed as *Leptotarsus (Tanypremna) hodgei* in the Catalogue of Neotropic Tipulidae (Alexander and Alexander, 1970). The new species is described

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here in the subgenus *Tanypremna*, and *hodgei* is maintained in *Tanypremna* for the following three reasons. First, after the description of *hodgei*, Alexander compared *hodgei* with four other species: *carbonipes* Alexander, *fuscitarsis* Alexander, *invaripes* Alexander, and *kadeni* Alexander, which are presently all still classified in the subgenus *Tanypremna*. Secondly, the Neotropic species of *Leptotarsus* seem to center around the subgenera *Tanypremna* and *Longurio*. Lastly, the subgenera of *Leptotarsus* are in need of revision and it seems better to follow the classification for all Neotropical species of *Leptotarsus* as given in the Neotropical Catalogue (Alexander and Alexander, 1970), instead of Alexander, 1970, which deals with only one species.

SYSTEMATIC ENTOMOLOGY

Order Diptera Linnaeus, 1758
Family Tipulidae Latreille, 1802
Subfamily Tipulinae Latreille, 1802
Leptotarsus (Tanypremna) guadeloupensis Young, **new species**
(Fig. 1A–B)

Diagnosis.—Males of this species are extremely similar to that of *L. (T.) hodgei* but differ by having a distinct dorsal spine on middle part of the inner dististyle. Female differs from *L. (T.) hodgei* by having the median extension of the posterior border of Tergum X extended medially reaching inner base at about one-half length of the paired cerci. In *L. (T.) hodgei* the extended Tergum X reaches inner base at about one-third length of the paired cerci.

Description.—Body length: ♂, 13 mm; ♀, 13 mm. Wing length: ♂, 12 mm; ♀, 11 mm.

Head: Occiput and rostrum reddish fulvous, slightly pruinose at vertex; rostrum short; nasus inconspicuous; palpi yellow, with distal segment subequal in length to preceding ones combined. Eyes widely separated dorsally and ventrally. Antenna short, 13 segmented, subequal to length of palpi; scape cylindrical, twice as long as wide; pedicel globular; flagellomeres simple, with dorsal and ventral verticillar setae twice as long as corresponding flagellomeres; first flagellomere distinctly enlarged, narrowed at base, expanded distally; remainder of flagellomeres shorter than first and tapered apically.

Thorax: Mesonotal praescutum yellowish brown, with a narrow median line, and two shorter, broader, fainted lateral stripes extending from prescutal pits to transverse suture; small, dark brown, triangular areas at prescutal pits, laterodorsal corners of scutum, and anterior of lateral prescutal stripes. Pleura evenly yellow, except for dark brown katatergite. Wings grayish subhyaline, with brown suffusion; subcostal cell and stigma dark brown; discal cell hexagonal; Rs one and half length of m-cu. Haltere well developed, with yellowish, cylindrical basal pedicel and dark, conspicuous blade-like capitulum. Legs long and slender in both sexes; coxae and trochanters yellowish brown; femora and tibiae brownish black with dark tips; tibial spur formula 1-1-1; tarsal claws each with one basal tooth and one middle tooth in both sexes.

Abdomen: Abdomen elongate; tergum bicolored with apical half dull black and outer portion of basal half yellow with a narrow blackened ring at base; sternum yellowish brown, basal dark ring indistinct, basal yellow area extending into more than half of each segment; Tergum VIII and hypopygium uniformly black; setae scattered only over darker areas of terga.

Hypopygium (Fig. 1A): Posterior margin of Tergum IX emarginated. Basistyle long, slightly narrowed apically. Both dististyles elongate, fused at bases. Outer dististyle simple, spatulate, with setae of moderate length, fused with inner dististyle for two-thirds its length. Inner dististyle dilated at base, bent mesocaudally near middle forming elongate beak, beak with two small blackened spinoid setae on outer margin before apex, outer basal lobe long, curved inward from base into long, gradually recurved, black terminal spine; a second distinct spine, directed anteriorly, located on dorsal part in the middle of inner dististyle.

Ovipositor (Fig. 1B): Ratio of (length Tergum VIII + cerci) / (length Sternum VIII + hypovalves) = 1.4 in cleared specimens. Tergum VIII rectangular, posterior border straight. Tergum IX not clearly separated by intersegmental membrane from Tergum X; length of Tergum IX one-half that of Tergum VIII; length of Tergum X three times that of Tergum IX. Posterior border of Tergum X extended

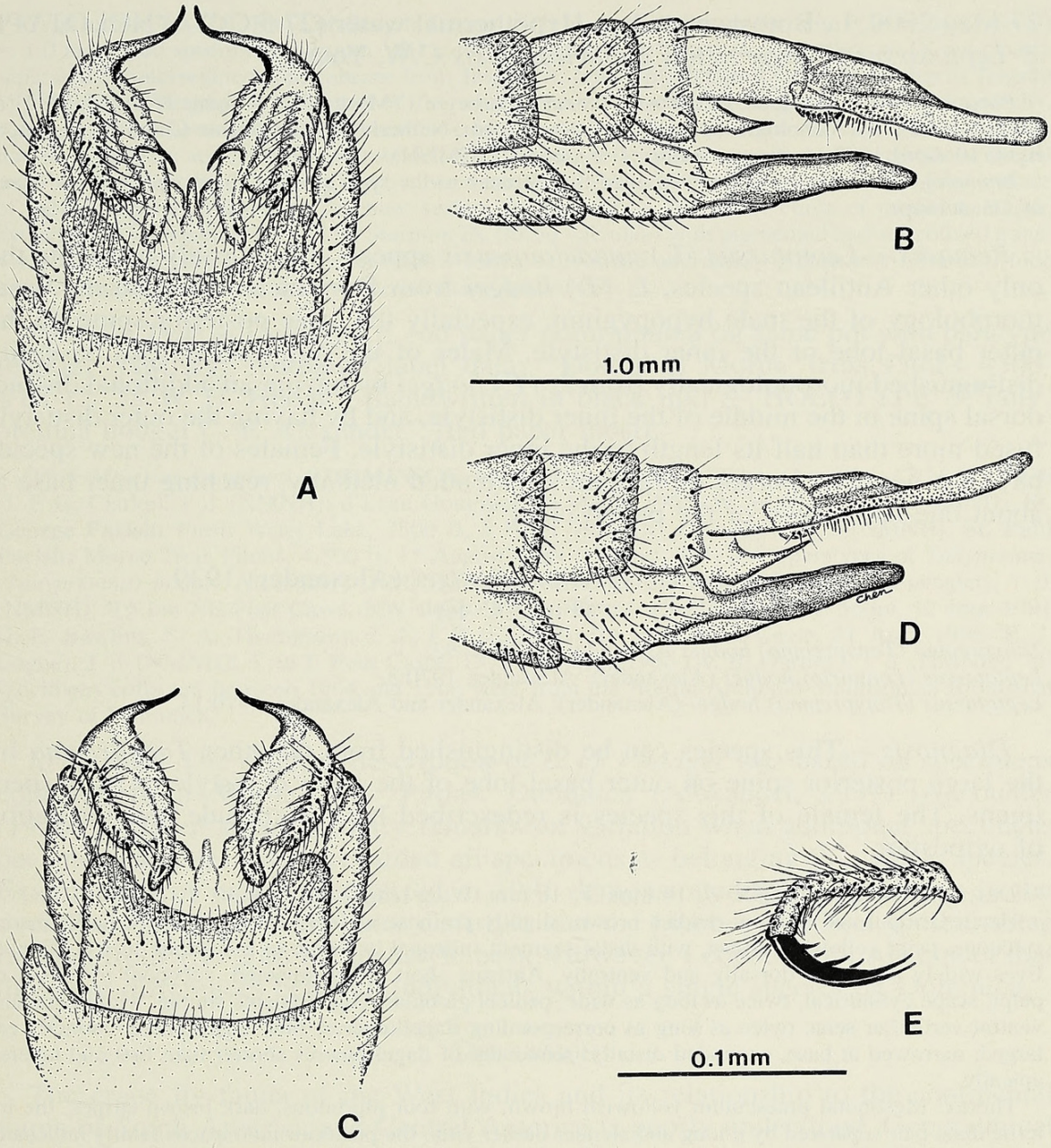

Fig. 1.—A, B. Adult of *Leptotarsus (Tanypremna) guadeloupensis*: A. male hypopygium, dorsal view; B. female ovipositor, lateral view. C, D. Adult of *Leptotarsus (Tanypremna) hodgei*: C. male hypopygium, dorsal view; D. female ovipositor, lateral view. E. distal end of hind leg, lateral view. Figs. A, B, C, and D same scale.

medially, reaching about one-half length of inner base of paired cerci. Cerci of moderate length, dorsal surface flat, broad at base and narrowed to rounded apex. Outer surface of cerci glabrous, large setae scattered over basal half on ventral surface of cerci. Hypovalves basally with a dark brown, transverse band. Outer surface of valves glabrous, dark setae on inner surface of hypovalves near base. Furca of moderate length, extending to intersegmental region. Sternum IX (fused valvulae) with pigmented and sclerotized transverse band; medially with elongate, narrow blade, sclerotized and dark pigmented. Infra-anal lobe broad, rounded, with long setae scattered along apical half.

Primary Type.—Holotype ♂ (Zoological Museum of Amsterdam, The Netherlands). Verbatim label data: "GUADELOUPE: Basse Terre. Small streamlet in secondary forest near Maison du Volcan (La Soufrière), 950m above sea level,

27 May 2000, L. Botosaneanu leg. Hypothermal water (27.5 C)" / "HOLOTYPE ♂ *Leptotarsus (Tanypremna) guadeloupensis* C.W. Young."

Paratypes.—**GUADELOUPE. Basse-Terre:** Gourbeyre ("Moscou"), at light, 16 April 1992 (*L. Botosaneanu*), 1 ♀ (Zoological Museum of Amsterdam, Netherlands); Deuxième Chute du Carbet, at light, 10 April 1992 (*L. Botosaneanu*), 1 ♂ (teneral) (CMNH).

Etymology.—The new species is named in reference to the type locality of this species, the island of Guadeloupe.

Remarks.—*Leptotarsus (T.) guadeloupensis* appears most closely related to the only other Antillean species, *L. (T.) hodgei* from Dominica, based on the basal morphology of the male hypopygium, especially the large posterior spine on the outer basal lobe of the inner dististyle. Males of the new species can be easily distinguished morphologically from *L. (T.) hodgei* by having an additional distinct dorsal spine in the middle of the inner dististyle, and by having the outer dististyle fused more than half its length to the inner dististyle. Females of the new species have the posterior border of Tergum X extended medially, reaching inner base at about one-half length of the paired cerci.

Leptotarsus (Tanypremna) hodgei (Alexander) 1939 (Fig. 1C–E)

Tanypremna (Tanypremna) hodgei Alexander, 1939:92–93.
Leptotarsus (Longurio) hodgei (Alexander): Alexander, 1970:3.
Leptotarsus (Tanypremna) hodgei (Alexander): Alexander and Alexander, 1970:14.

Diagnosis.—This species can be distinguished from all other *Tanypremna* by the large posterior spine on outer basal lobe of the inner dististyle in male specimens. The female of this species is redescribed here to include the illustration of ovipositor.

Description.—Body length: ♂, 14 mm; ♀, 18 mm. Wing length: ♂, 12 mm; ♀, 12 mm.

Head: Occiput and rostrum reddish brown, slightly pruinose at vertex; rostrum short; nasus inconspicuous; palpi yellowish brown, with distal segment subequal in length to preceding ones combined. Eyes widely separated dorsally and ventrally. Antenna short, 13 segmented, subequal to length of palpi; scape cylindrical, twice as long as wide; pedicel globular; flagellomeres simple, with dorsal and ventral verticillar setae twice as long as corresponding flagellomeres; first flagellomere distinctly enlarged, narrowed at base, expanded distally; remainder of flagellomeres shorter than first and tapered apically.

Thorax: Mesonotal praescutum yellowish brown, with four nitidulous, dark brown stripes, the intermediate pair separated by a long and slender darker vitta, the posterior interspaces faintly indicated; posterior sclerites of notum dark brown, sides of mediotergite pale brown. Pleura medium brown, without pattern. Wings grayish subhyaline, with brown suffusion; subcostal cell and stigma dark brown; discal cell hexagonal; vein Rs one and half length of crossvein m-cu. Haltere well developed, with yellowish, cylindrical basal pedicel and darker, conspicuous blade-like capitulum. Legs long and slender in both sexes; coxae and trochanters pale brown; femora and tibiae brownish black with darker tips; tibial spur formula 1-1-1; tarsi black; tarsal claws each with one basal tooth and one middle tooth in both sexes (Fig. 1E).

Abdomen: Abdomen elongate; tergum bicolored with apical half black and outer portion of basal half yellow with a narrow blackened ring at base; black including more than the outer half of segments IV-VII; sternum yellowish brown, basal dark ring indistinct, basal yellow area extending into more than half of each segment; Tergum VIII and hypopygium uniformly black; setae scattered only over darker areas of the terga.

Hypopygium (Fig. 1C): Posterior margin of Tergum IX emarginated. Basistyle long, slightly narrowed apically. Both dististyles elongate, fused at bases. Outer dististyle, simple, spatulate, with setae of moderate length, fused with inner dististyle about one-half of its length. Inner dististyle dilated at base, bent mesocaudally near middle forming elongate beak, beak with one or two small blackened spinoid setae on outer margin before apex (only one spinoid setae was indicated on Fig. 1C); outer basal lobe long, curved inward from base into long, recurved, black terminal spine.

Ovipositor (Fig. 1D): Ratio of (length Tergum VIII + cerci) / (length Sternum VIII + hypovalves) = 1.0 in cleared specimens. Tergum VIII rectangular, posterior border straight. Tergum IX not clearly separated by intersegmental membrane from Tergum X; length of Tergum IX two-thirds that of Tergum VIII; length of Tergum X twice that of Tergum IX. Posterior border of Tergum X extended medially, reaching about one-third length of inner base of paired cerci. Cerci of moderate length, dorsal surface flat, broad at base and narrowed to rounded apex. Outer surface of cerci glabrous, large setae scattered over basal half on inner surface. Hypovalves basally with dark brown, transverse band. Outer surface of valves glabrous, dark setae on inner surface of hypovalves near base. Furca of moderate length, extending to intersegmental region. Sternum IX (fused valvulae) with pigmented and sclerotized transverse band. Medially with elongate, narrow blade, sclerotized and darkly pigmented. Infra-anal lobe broad, rounded, with long setae scattered along apical half.

Primary Type.—Holotype ♂ [on paper point pinned on same pin with paratype female] (NMNH). Verbatim label data: "Dominica Morne Trois Pitons 4500' VIII-15-'38 W. H. Hodge" [handwritten in black ink] / "HOLOTYPE ♂ Tanypremna hodgei C. P. Alexander" [red paper label].

Other Material Examined.—**DOMINICA. St. Andrew Parish:** d'Leau Gommier, 17 March 1956 (J. F. G. Clarke), 1 ♂ (NMNH); d'Leau Gommier, 16 March 1965 (W. W. Wirth), 1 ♂ (NMNH). **St. George Parish:** Fresh Water Lake, 2500 ft, 5 April 1966 (R. J. Gagne), 1 ♂ (NMNH). **St. Paul Parish:** Morne Trois Pitons, 4,500 ft, 15 August 1938 (Hodge), 2 ♂, 2 ♀ [paratypes of *Tanypremna (Tanypremna) hodgei* Alexander] (NMNH); Pont Cassé, 23 November 1964 (P. J. Spangler), 1 ♂ (NMNH); 0.5 km NE Pont Cassé, NW slope of Trois Pitons, 15-22N, 61-21W, 560m, 12 June 1991 (J. E. Rawlins, S. A. Thompson), 2 ♂, 1 ♀ (CMNH); 0.5 mi E Pont Cassé, 11 April 1966 (R. J. Gagne), 1 ♂ (NMNH); 3 mi E Pont Cassé, 13–16 October 1966 (A. B. Gurney), 1 ♂ (NMNH). All specimens collected between 1964 and 1966 were from the Bredin-Archbold-Smithsonian Biological Survey of Dominica.

Remarks.—The original description of *L. (T.) hodgei* was based on specimens collected from Morne Trois Pitons, Dominica (Alexander, 1939). Alexander (1970) provided supplementary remarks on variation when additional specimens became available, but he regarded all specimens as belonging to a single species. Examination of material collected in 1991 demonstrated further variation in the overall shape of the male inner dististyle and the number of apical spinoid setae ranging from 1 to 2 on the dististyle beak. However, I concur with Alexander that these are differences between individuals within a single species on Dominica.

DISCUSSION

The crane fly fauna of the West Indies and its relationship to the continental fauna of South America and Central America is poorly understood. Geographical distributions of most tipulid species are inadequately documented. Few surveys have been conducted and only a limited number of specimens are available for examination. Previous studies have been isolated taxonomic papers (Alexander, 1936, 1937*a*, 1937*b*, 1939) or limited to the Greater Antilles (Alexander, 1932, 1964). Only two islands in the Lesser Antilles have been studied in some detail, Saint Vincent (Williston, 1896) and Dominica (Alexander, 1970).

The biogeography of the Caribbean Tipulidae is beyond the scope of the present study without a complete phylogenetic analysis. However, a few tentative hypotheses can be presented based on the newly discovered *L. (T.) guadeloupensis*, and from unpublished results from intensive field research on crane flies currently underway elsewhere in the Caribbean, especially Hispaniola and Puerto Rico.

Two possible dispersal routes have been suggested for the arrival of insects to the oceanic islands of the Lesser Antilles (Liebherr 1989; Smith, Miller and Miller, 1994). One is northern and involves the Greater Antilles, particularly Puerto Rico and the Virgin Islands, and the other is southern from Trinidad and continental

South America. Based on the currently known distribution of described species, the subgenus *Tanypremna* has a southern radiation with 31 species restricted to the Neotropical Region, most in South America. Of these, only two species are Caribbean, both in the Lesser Antilles on Dominica and Guadeloupe. No species of the subgenus is known from the Greater Antilles. Morphologically, *L. (T.) guadeloupensis* and *L. (T.) hodgei* are more similar to each other than to any other mainland species in the subgenus. Both are characterized by a dilated inner dististyle with its outer basal lobe forming a long, curved, black spine, a feature not found in any other species of *Tanypremna*. This character is presumably apomorphic and supports the monophyly of these two species. It further suggests that speciation of Lesser Antillean *Tanypremna* occurred after the immediate common ancestor diverged in isolation from a South American radiation in that genus.

The present study confirms that *Tanypremna* species in the Lesser Antilles may be restricted to individual islands. *L. (T.) guadeloupensis*, with its diagnostic additional spines on the male inner dististyle, might be considered more derived than *L. (T.) hodgei*, and if so supports a scenario in which an ancestral population established from South America on Dominica diverged over time to form *L. (T.) hodgei*, and somewhere during that divergence a population dispersed to Guadeloupe and further evolved to become *L. (T.) guadeloupensis*. But the loss of these additional spines in *L. (T.) hodgei* from Dominica has the same parsimony from a strict phylogenetic point of view and thus presents another equally likely scenario. A third scenario would be that the ancestral population gave rise to both species simultaneously. Testing these hypotheses requires the study of the tipulid fauna on adjacent islands in addition to further revisionary and phylogenetic work on crane flies in general. Tipulidae are not rigorously collected by non-specialists due to their fragility and this is especially true in the Lesser Antilles. It is likely that closely related species will be collected on neighboring islands such as Nevis and Antigua in the north, and Martinique and St. Lucia to the south. Distributional patterns of several other lineages of Tipulinae in the Caribbean region are distinctly different from that of the subgenus *Tanypremna*, and they constitute challenges for further research. For example, the genus *Nephrotoma*, with a northern radiation, is found throughout the Antilles. The genera *Brachypremna* and *Megistocera*, both predominantly with southern radiations, are found in the Greater Antilles but not the Lesser Antilles. Of particular interest is the subgenus *Dolichopeza (Megistomastix)*, because of its high diversity and endemicity to the West Indies, primarily the Greater Antilles, and its likely sister group relationship with the Afrotropical subgenus *D. (Trichodolichopeza)*. Much additional field collecting on all Caribbean islands, and further revisionary work on Caribbean crane flies, will be required to interpret these diverse distribution patterns in the West Indies.

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