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Annals of the Entomological Society of America 12:25-30 (1919) <http://biostor.org/reference/53089>

Keywords: Dicranomyia; Dicranomyia foliocuniculator; Dicranomyia stygipennis; Dicranomyia swezeyi; Gonomyia; Limnobia; Peripheroptera; Rhipidia miosema; Styringomyia didyma; Trimicra



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NOTES ON THE CRANE-FLIES OF THE HAWAIIAN ISLANDS (Tipulidæ, Diptera).

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During the past few years some extensive collections of Hawaiian crane-flies have been received from Dr. James F. Illingworth and Mr. O. H. Swezey, to both of whom I am indebted for many favors. The records of these collections, together with a few additional specimens from other sources, are herein recorded to supplement our scanty knowledge of the Hawaiian Tipulidæ. A few general statements of the faunal constituents may be given.

As might be expected, the crane-fly fauna of the Islands is strongly endemic. The dominant genus is *Dicranomyia* with about a dozen species, all of which are apparently confined to the Islands. The remaining genera, *Libnotes*, *Styringomyia*, *Gonomyia* and *Trimicra*, are represented each by a single species, all, with the exception of *Styringomyia didyma*, apparently being endemic. This last mentioned species breeds in decaying organic matter, such as manure, and has probably been spread over the Australasian islands through the agency of man. The entire lack of the larger, vigorous Tipuline forms is striking, but entirely in agreement with the fauna of many other oceanic islands, where the Tipulinæ are entirely lacking and the dominant genera are *Dicranomyia* and related groups, (Seychelles, Guam, Fiji, etc.)

The following transcription of a letter received from Dr. Illingworth will give a clear idea of the conditions under which Hawaiian crane-flies are found. Under date of March 6, 1917, he writes as follows:

"Last week end I spent in the Waianae Mountains, which are at the far end of the Island. The range is much older than the mountains near Honolulu (Koolau) and the native insect fauna appears to be more abundant.

"I have never seen crane-flies more abundant, but I fear they belong to a few species. I followed along the stream which had many falls—every wet cavern was filled with them. I tried sweeping the grass along the banks but with no success. One only gets crane-flies in the mountains here and it is a rather difficult matter to get to the places where they are abundant. One or two common species come to the lamps in the low lands—these I have sent before."

Since the appearance of the Fauna Hawaiiensis (1901) in which Grimshaw describes practically all of the Hawaiian crane-flies, a new species, *Dicranomyia foliocuniculator*, has been described by Swezey. This latter species is of extreme interest because of the leaf-mining habits of its larvæ—a habitat that is unique in the family so far as at present known.

The types of the new species, with the exception of *Dicranomyia swezeyi*, are in the writer's collection; the latter type and paratypes of the other species were returned to Mr. Swezey.

FAMILY TIPULIDÆ.

SUB-FAMILY LIMNOBIINÆ.

Genus *Libnotes* Westwood.

Libnotes perkinsi (Grimsh.)

This handsome crane-fly is common and apparently well distributed throughout the Islands. It was described as a *Limnobia* but the reference to *Libnotes* seems more nearly correct. The following additional records from Oahu are at hand:

Honolulu, April 10, 1914 (O. H. Swezey).

Nunanu Valley, May 4, 1915 (A. H. Case).

The exotic genera that center around *Limnobia* and *Dicranomyia* include members which run very close to the above groups. In their typical condition these genera (such as *Libnotes*, *Dapanoptera*, *Peripheroptera*, etc.) are well defined, but the presence of less clearly differentiated species tends to break down all distinctions. Speiser (1909) described three African species of *Limnobia* (*Limonia*) that are, in my opinion, referable to two other genera, *Libnotes*, (*rhizosema* and *oresitropha*) and *Rhipidia* (*miosema*). Other authorities, as Bergroth, Edwards, etc., include the species of *Dicranomyia* that possess a long subcosta in the genus *Limnobia*, disregarding all other features of organization, and despite the fact that Osten Sacken in his classic monograph of a half century ago clearly differentiated these two groups of *Dicranomyia*. In determining the generic limits of this division of flies, other features of structure must be considered, and the entire burden not placed on a single character. When this is done, the habitus of the insect and the smaller details of structure that are perceivable but difficult of definition, will aid in separating various groups. It is admittedly true that in many such cases the reference of species to genera becomes largely a matter of personal opinion. The

suggestion has been made that it would perhaps be better to consider these diverse Limnobiine genera as lesser groups, such as sub-genera, but in my opinion no benefit would be derived from such an action, since it would be exactly as difficult to separate and define these sub-genera. These various exotic genera are probably valid, but *Goniodineura* van der Wulp is doubtfully distinct from *Libnotes*.

Genus **Dicranomyia** Stephens.

Dicranomyia stygipennis, sp. n.

Coloration dark brown throughout, including the wings.

Male: Length, 6–7.5 mm.; wing, 7.5–8 mm.

Female: Length, 6.4–8.5 mm.; wing, 7.8–9 mm.

Rostrum and palpi dark brown. Antennæ dark brown throughout, the flagellar segments elongate-oval. Head dark brown.

Thorax dark brown, the pronotum a little yellowish. Legs dark brown, the extreme base of the femora a little paler. Halteres dark brownish black throughout. Wings with a strong brown suffusion; stigma rather distinct, of a somewhat darker brown. Venation: *Sc* ending about opposite the origin of the sector, *Sc*₂ close to the tip of *Sc*₁; *Rs* about twice the length of the basal deflection of *R*₄₊₅; cell 1st *M*₂ closed; basal deflection of *Cu*₁ at the fork of *M*.

Abdomen dark brown. Hypopygium of male with the ninth pleurite small, only about four-tenths the length of the ventral pleural lobe; ventral lobes large, fleshy, the basal inner angle suffused inwardly, near its base with two powerful spines; dorsal lobes short, stout, slightly curved, the tip of each produced into a slender, blackened spine.

Holotype, ♂, Waianae Mountains, Oahu, altitude 2000 feet, March 5, 1917 (J. F. Illingworth).

Allotype, ♀, with the type.

Paratypes. Very numerous specimens of both sexes, from the type locality; Kaupo, Maui, altitude 2000 to 4000 feet, January 1, 1915 (H. T. Osborn); Haleakala, Maui, altitude 9000 feet, September 27, 1914 (H. T. Osborn).

This common fly is notable by its dark coloration. I would have identified it as being *D. brunnea* Grimsh. (1901) except for the discrepancy in the coloration of the wings. In any case, Grimshaw's name is preoccupied by *D. brunnea* Doane (Journ. Ent. N. Y. Soc., Vol. 8, p. 184; 1900), a fact that was pointed out by the author several years ago (Psyche, Vol. 18, p. 194; 1911).

Dicranomyia grimshawi, nom. n.

New name for *D. apicalis* Grimsh. (1901), not *D. apicalis* (Wied.) (1828).

Two males from Olaa, Hawaii, altitude 2500 feet (W. H. Ashmead), in the collection of the U. S. Nat. Museum.

***Dicranomyia hawaiiensis* Grimsh.**

This beautiful *Dicranomyia* is widely distributed in the Islands. The following additional records of distribution are available. Island of Oahu: Honolulu, February 7, 1913 (O. H. Swezey); Palolo, February 8, 1914 (O. H. Swezey); Olympus, September 8, 1912 (O. H. Swezey); Waianae Mountains, altitude 2000 feet, March 5, 1917 (J. F. Illingworth).

***Dicranomyia foliocuniculator* Swez.**

This recently described species is apparently common and widely distributed in the Islands. As stated before, it is unique in the leaf-mining habits of the larva, a habitat that will probably be found to be shared by other species of the Islands, especially *D. jacobus*, *D. swezeyi*, etc., forms that are undoubtedly related to *D. foliocuniculator*.

Numerous specimens are available from the Waianae Mountains, Oahu, altitude 2000 feet, March 5, 1917 (J. F. Illingworth) associated with *D. hawaiiensis*, *D. stygipennis*, etc. This locality has been mentioned in the introductory paragraph of this article. Waimano, Oahu, January 5, 1913, (O. H. Swezey). Iao Valley, Maui, altitude 700 feet, January 3, 1914 (J. F. Illingworth).

***Dicranomyia jacobus*, sp. n.**

Size larger than in *foliocuniculator* (length of the male over 4 mm.); coloration of the body darker brown; wings with a decided brownish tinge.

Male: Length, 4.3–4.4 mm.; wing, 5.2–5.5 mm.

Female: Length, 5.1–6.5 mm.; wing, 5.8–6.2 mm.

Rostrum and palpi dark brownish black. Antennæ rather short, dark brownish black, the flagellar segments short, suboval to rounded, the apical segments more elongated. Head dark brown.

Neck rather elongated. Thorax very high and gibbous, dark brown, without stripes (in alcohol). Halteres rather short, the knobs large, the stem pale, the knobs darker, brown. Legs with the coxæ and trochanters brown; remainder of the legs rather dark brown. Wings light brown, the stigma indistinct, only a little darker than the remainder of the wings; veins dark brown. Venation: *Sc* short, *Sc*₁ ending about opposite or slightly beyond the origin of *Rs*; *Sc*₂ removed from the tip of *Sc*₁ for a distance about equal to cross-vein *r*; *Rs* long, somewhat arcuated, from two to three times as long as the basal deflection of *R*₄₊₅; cell 1st *M*₂ large, as long as the veins issuing from it; basal deflection of *Cu*₁ just before, at, or even slightly beyond, the fork of *M*.

Abdomen dark brownish black, the sternites a little paler. Hypopygium with the ninth tergite almost straight across the caudal margin; pleurites rather short, shorter than the apical lobes; ventral inner side of the pleurite produced entad into a complex lobe which is expanded at its apex and bears at the inner margin a lateral cylindrical lobe with long hairs. Dorsal apical appendage a chitinized rod almost straight basally, toward the tip slightly bent inward and acutely pointed; ventral apical appendage a large fleshy lobe whose inner margin subapically is produced into a long, slender, cylindrical, chitinized point, rather blunt at the apex and here with a few hairs; at its base on the outer side with two sharp chitinized spines which are directed backward. Anal tube short, very broad, projecting slightly beyond the caudal margin of the ninth tergite, its apex feebly concave. Penis guard elongate, narrowed toward the apex which is bent strongly ventrad.

Holotype, ♂, Iao Valley, Island of Maui; altitude 700 feet; January 3, 1914 (J. F. Illingworth).

Allotype, ♀, topotypic.

Paratopotypes, 2 ♂'s, 2 ♀'s.

This insect is respectfully dedicated to Dr. James F. Illingworth, to whom I am indebted for many favors.

***Dicranomyia swezeyi*, sp. n.**

Coloration pale yellow throughout; wings yellow; cell 1st M_2 open by the atrophy of m .

Female: Length, 2.8–3 mm.; wing, 3.7–3.8 mm.

Rostrum and palpi pale yellowish brown. Antennæ short, pale brown. Eyes black. Head light yellow.

Thorax pale yellow, the præscutum a little brownish. Pleura sparsely dusted with gray. Legs with the coxæ pale; femora pale brownish yellow, the tips brown; tibiæ and tarsi yellowish brown. Halteres pale. Wings pale yellow, the stigma pale brown; veins yellow. Venation: Sc short, ending before the origin of R_s ; R_s moderately elongated, about one and one-half the length of the deflection of R_{4+5} ; deflection of R_{4+5} strongly arcuated at origin; cell 1st M_2 large, subquadrate, indistinctly open by the atrophy of m ; basal deflection of Cu_1 just before the fork of M .

Abdomen brownish yellow, dorsal valves of the ovipositor moderately elongated and quite strongly arcuated.

Holotype, ♂, Olympus, Oahu, September 8, 1912 (O. H. Swezey).

Allotype, ♀, with the type.

This interesting little species is dedicated to its collector, Mr. O. H. Swezey, to whom I am indebted for many favors. It is apparently related to *D. foliocuniculator* Swez., but is readily distinguished by its very small size, uniform pallid coloration, and the open cell 1st M_2 .

Genus **Styringomyia** Loew.**Styringomyia didyma** Grimsh.

Specimens are in the collection from Honolulu taken in May, 1914. It is apparently well distributed throughout parts of Australasia.

Genus **Trimicra** Osten Sacken.**Trimicra lateralis** Grimsh.

Specimens from Honolulu, April 10, 1914 (O. H. Swezey).

Genus **Gonomyia** Meigen.**Gonomyia** (Leiponeura) **hawaiiensis**, sp. n.

Coloration dark brown; antennæ dark brown, the first flagellar segment light yellow; thoracic pleura striped with brown and white; wings with a pale brown tinge, longitudinal veins long and slender.

Female: Length, 3.2–3.4 mm.; wing 3.2–3.5 mm.

Rostrum and palpi dark brown. Antennæ dark brown, the first segment of the flagellum yellow. Head gray.

Mesonotal præscutum dark brown, the extreme lateral margin pale; remainder of the thoracic notum dark brown. Pleura white, with a dorsal dark brown longitudinal stripe; a ventral brown stripe occupying the sternum. Legs with the coxæ yellowish; trochanters and femora brown, the apices of the latter and the tibiæ a little darker; tarsi brownish yellow. Halteres dark brown, the knobs conspicuously light yellow. Wings pale brown, iridescent, the stigma indistinctly darker brown; veins brown. Venation: *Sc* short, ending before the origin of the sector; *Rs* long, gently arcuated; basal deflection of *R*₄₊₅ very short; longitudinal veins beyond the cord elongated; basal deflection of *Cu*₁ at or before the fork of *M*.

Abdomen dark brown, the ovipositor with the dorsal valves very long and slender, slightly up-curved, dark brown at the base, horn yellow beyond.

Holotype, ♀, Koolau Mountains, Oahu, altitude 1500 feet, February, 1917 (J. F. Illingworth). Found on a wet bank.

Paratypes, ♀'s, Wailuke, Oahu, January, 1915 (O. H. Swezey); Tantalus, Oahu, October 15, 1911 (O. H. Swezey); Palolo, Oahu, February 8, 1914 (O. H. Swezey).

The type of the subgenus *Leiponeuri* Skuse (Proc. Linn. Soc. New South Wales, ser. 2, vol. 4, p. 795; 1889) is *Gonomyia gracilis* (Skuse); the name is homonymous with *Gonomyia gracilis* (Zett.) (1838) and is here renamed *Gonomyia* (*Leiponeura*) *skusei*, nom. n.