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(DIPTERA: MYCETOPHILOIDEA)

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NOTES ON THE GENUS *LYGISTORRHINA* SKUSE WITH THE
DESCRIPTION OF THE FIRST NEARCTIC SPECIES
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ABSTRACT—A new species of *Lygistorrhina* Skuse (Diptera: Mycetophiloidea), *sanctacatharinae*, is described from southeastern United States. The genus is redescribed; its placement within the Mycetophiloidea is discussed; and it is considered to represent a separate family.

Fungus gnats of the genus *Lygistorrhina* Skuse are extremely rare in insect collections and are known from only a few localities (map 1). *Lygistorrhine* gnats differ rather strikingly from other fungus gnats because of their greatly elongate mouthparts and reduced wing venation. The apparent scarcity of these flies coupled with their peculiar structure has led to much uncertainty and controversy about their classification. Recently I was able to collect for the first time a large number of specimens of *Lygistorrhina* from southeastern Georgia and have taken this opportunity not only to describe a new species of *Lygistorrhina* but to attempt to elucidate some of the points of uncertainty about *lygistorrhine* fungus gnats.

Lygistorrhine fungus gnats have previously been considered to belong to a single genus, *Lygistorrhina* Skuse. *Lygistorrhina* has usually been recognized as representing a separate entity in the higher classification of fungus gnats, either a subfamily or a family.² Only Tuomikoski (1966) has combined *lygistorrhine* fungus gnats with another group and his work is discussed below. Matile (*in litt.*) is currently revising the *lygistorrhine* gnats of the world and is planning to divide these gnats into about 7 genera (2 based on new species). Thus, I have restricted my work to a review of the previously published literature of *Lygistorrhina* in order to place the description of my new species in proper perspective.

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² The use of either subfamilial or familial category for *Lygistorrhina* Skuse is dependent on whether one considers the fungus gnats as a whole to represent a family (Edwards, 1925; Tonnoir, 1929; Okada, 1937; Shaw and Shaw, 1951; Laffoon, 1965) or a superfamily (Brauns, 1954a, 1954b; Hennig, 1948, 1954, 1966, 1968, 1969; Matile, *in litt.*; Stackelberg, 1969; Rohdendorf, 1964). The question of the proper category for fungus gnats is dependent largely on one's taxonomic philosophy and, thus, is outside the scope of the present paper.

Genus *Lygistorrhina* Skuse

Lygistorrhina Skuse, 1890:598, pl. 19, figs. 1 (wing), 2 (head). Type-species: *insignis* Skuse by monotypy. Subsequent references: Edwards, 1912:203 (discussed differences between *Probolaeus* and *Lygistorrhina* and synonymized the former under the latter); Senior-White, 1922:197 (discussed generic limits of *Lygistorrhina*, broadened them to include his new species, *asiatica*); Edwards, 1925:530 (proposed a new subfamily for *Lygistorrhina*; discussed its relationships and distribution); Tonnoir, 1929:590 (key reference, general notes); Okada, 1937:46 (description, synonymy; discussion of relationships); Lane, 1946:345 (note); Shaw & Shaw, 1951:16 (as *Lygistorrhina*, misspelling, note on relationships); Johannsen, 1909:62, pl. 1, fig. 23 (head), pl. 4, fig. 18 (wing) (description, distribution); Hennig, 1954:309 (discussed phylogenetic relationships of), 1966: 50, fig. 16 (distribution); Tuomikoski, 1966:254–260 (discussed relationships, placed the genus in Keroplatidae).

Subgenus *Probolaeus* Williston, 1896:261, pl. 8, figs. 15 (wing), 15a (head), 15b (mouthparts), 15c (genitalia). Type-species, *singularis* Williston by monotypy. Subsequent reference: Johannsen, 1909:93 (description, distribution); Edwards, 1912 (synonymy of the genus under *Lygistorrhina*).

Subgenus *Palaeognoriste* Meunier, 1904:87, pl. 7, figs. 9 (habitus), 10 (genitalia), 11 (wing), 12 & 13 (antenna). Type-species, *sciariforme* Meunier by monotypy. Subsequent reference: Johannsen, 1909:61 (description, distribution); Edwards 1925:530 (synonymy).

Head: Small, rounded, frequently somewhat flattened in males, narrower than thorax; front rather narrow, about $\frac{1}{3}$ head width at antennal bases, with sides diverging above, about $\frac{1}{4}$ head width at anterior ocellus; face narrow, about $\frac{1}{2}$ head width; vertex slightly broader than front; ocelli 3; median ocellus small; lateral ocelli distinctly separated from lateral margins of eyes, but closer to eyes than to each other; eyes very large, pubescent, separated; mouthparts greatly elongate, about half as long as body, consisting of 5 slender parts. Antennae: With scape, pedicel, and 14 flagellomeres, with all parts cylindrical and with dorsal macrotrichia.

Thorax: Small, ovate, with very short appressed hairs; long bristles on propleuron, humerus, above wing (supra-alar), postalar callus, in front of scutellum; on scutellar margin; mesonotum strongly convex; scutellum small, with marginal row of bristles; pre-procoxal bridge incomplete; prosternum laterally expanded, only narrowly separated from proepisternum; posterior pronotum without bristles, not distinctly differentiated; separation of pronotum from propleuron incomplete; mesanepisternum large, about $\frac{2}{3}$ as high as mesokatepisternum, without a "dorsal cleft" (Shaw, 1948b: 192, #2); anepisternal suture transverse, at level of bare propleura; mesokatepisternum completely fused to pleurotergites, with postero-dorsal extension; mesoanepimeron virtually absent, reduced to a narrow internal flange at base of dorsal wing process; meron absent; pleurotergite enlarged, keellike, with a marginal row of bristles. Legs: Elongate, slender; anterior 4 coxae large, slender, elongate, about equal in length, with 1st pair very slightly longer, with bristles on anterior edges; hind coxa short, broader, about $\frac{2}{3}$ as long as anterior coxa, with scattered bristles; anterior 4 femora, long, slender, with a row of ventral spines; anterior 4 tibiae, long, slender, with a single apical spur and an apical and simple comb on anterior pair, with 1 or 2 apical spurs on middle

pair; tarsus long, slender, with basitarsus long and about as long or longer than rest of tarsus; hind femur slightly swollen, without ventral spines; hind tibia clubbed apically, expanded on apical $\frac{1}{3}$ or less, with 2 apical spurs and with outer spur almost twice as long as inner spur. Wing: Short, shorter than abdomen, broad; macrotrichia restricted to C, R1, and Rs; C ending before apex of wing; Sc very short, not reaching C; R1 slightly curved anteriorly on apical $\frac{1}{2}$, ending in C at middle of wing; Rs apparently arising independently at base of wing, almost straight, ending in C near wing apex; M1 and M2 separate, without bases, straight, arising from middle of wing and extending to wing margin; M3 + 4 without base, slightly curved, also arising from middle of wing and extending to wing margin; Cu arising from base of wing, curved posteriorly on apical $\frac{1}{4}$, ending at wing margin; A short, straight, extending only along basal $\frac{2}{3}$ of Cu.

Abdomen: Slender, elongate and narrow in males, shorter and broader in females, with 7 apparent segments, with narrow insertion with thorax; female cercus simple, elongate oval; female with 2 spermathecae, male genitalia with simple stylus.

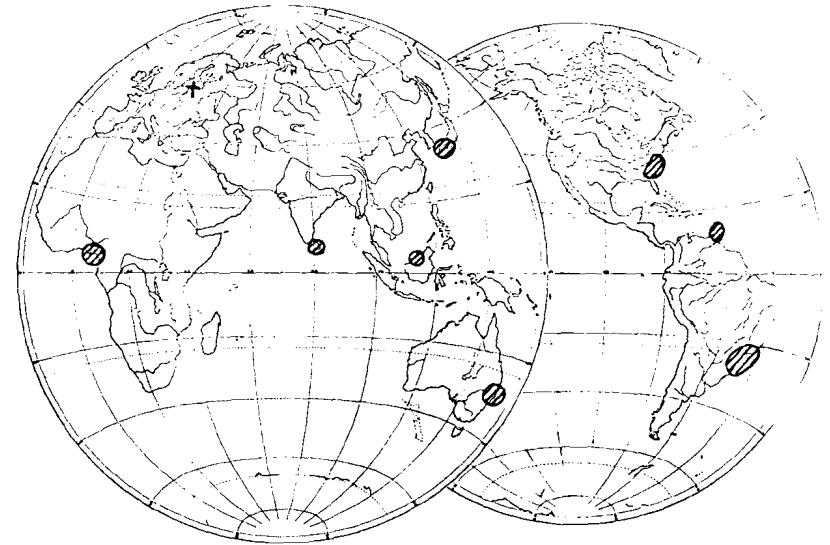
Material examined: The above generic description is based on a detailed study of *L. sanctaecatharinae*, previously published data, and examination of pinned material of *asiatica*, *singularis*, *brasiliensis*, *edwardsi*, *urichi* and *pictipennis* (including the types of all these species).

Distribution: The present known distribution of *Lygistorrhina* is given in map 1. Hennig (1966) described the distribution of *Lygistorrhina* as a relict pattern. However, the present data suggest a pattern resulting from inadequate collecting.

The availability of an abundance of material has allowed me to do a more detailed study of *Lygistorrhina* than has previously been possible. During the course of this study it has been possible to correct a few erroneous observations about lygistorrhine fungus gnats.

The absence of ocelli was 1 of the principal characters on which Williston based his new genus, *Probolaeus*. Later Edwards (1912) noted that this condition was restricted to males and only due to their enlarged and holoptic eyes. For this reason, Edwards synonymized *Probolaeus* under *Lygistorrhina*. However, the apparent absence of ocelli in the males of lygistorrhine fungus gnats is simply an artifact. Apparently as the specimens dry the frons and sometimes the vertex collapse, and thus the ocellar triangle is concealed between the 2 large compound eyes. In my long series of *sanctaecatharinae* about $\frac{1}{2}$ of the males have the lateral ocelli visible in the dried condition (fig. 1, 2, 5). Why the same thing does not happen when the female specimens dry is not apparent.

The previous descriptions and discussions of the mouthparts of *Lygistorrhina* and its synonyms are confusing and contradictory when compared to each other. Skuse (1890) and Williston (1896) described the mouthparts of *Lygistorrhina* as consisting of 5 elongate filaments. Both thought the palpi were absent. Meunier (1904), Senior-White



Map 1. Distribution of *Lygistorrhina* Skuse (modified from Hennig, 1966:50, fig. 16).

(1922) and Okada (1937) all mentioned short, single-segmented palpi in addition to the elongate filaments in the descriptions of their respective new taxa. Tuomikoski (1966) described his material of *L. brasiliensis* as having no palpi and only 4 elongate filaments, which he identified as a single, haired labrum, a pair of bare and more flexible labellae, and a single central hypopharynx. He noted that the labrum must be bipartite in Skuse's and Williston's species. From a detailed study of *sanctaecatharinae* and an examination of the above mentioned species (*cf.* material examined), it is apparent that the mouthparts of all known species (with the possible exception of the fossil, *sciariformis* Meunier) of *Lygistorrhina* are of the same basic structure and consist of a single small triangular labrum and 5 elongate filaments (fig. 5). I identify these 5 filamentous parts as follows: the 2 dorsal hairy filaments as the true maxillary palpi; the 2 ventral filaments as the labella; and the single central filament as the hypopharynx.

Tuomikoski (1966) made a detailed study of the phylogenetic relationships of *Lygistorrhina* and concluded that the taxon, *Lygistorrhina*, does not warrant family status (nor subfamily status in the traditional system of Edwards (1925)) but should be included in the family Keroplatidae—"In the writer's opinion, *Lygistorrhina* cannot be included in any other family than the Keroplatidae." (Tuomikoski, 1966:259). A review of his analysis convinces me that his conclusion

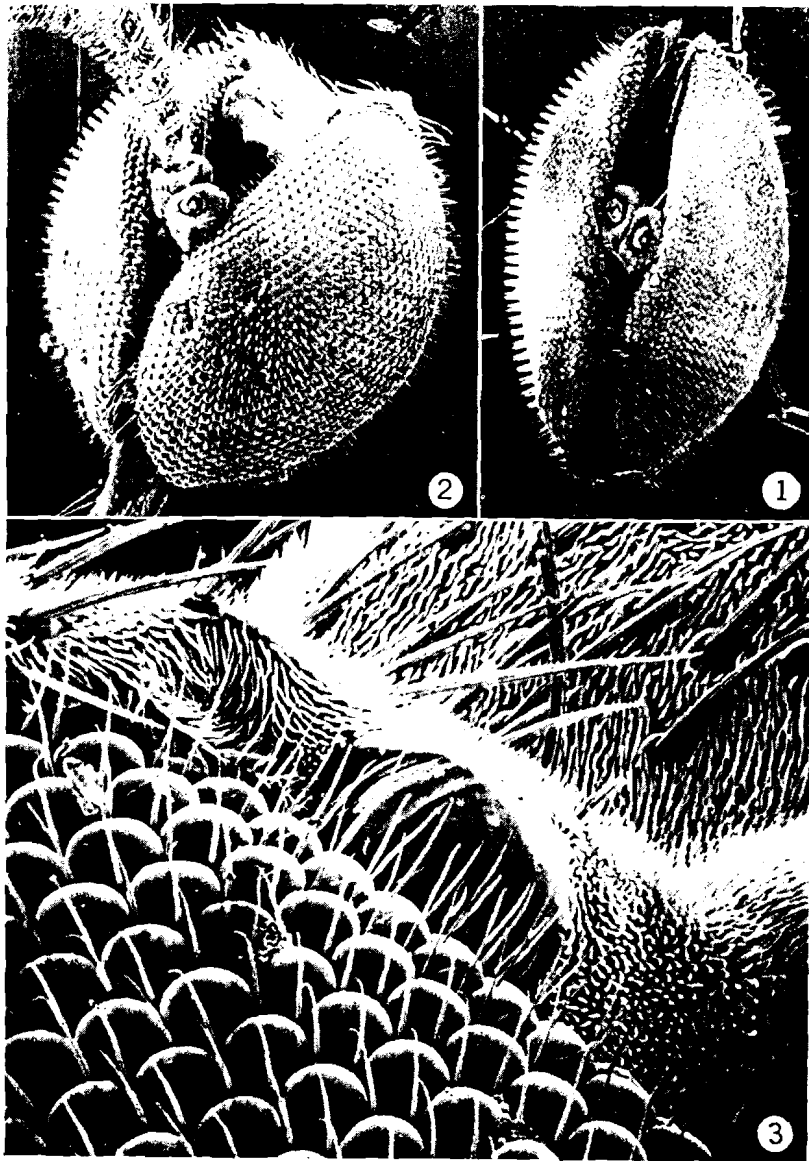


Fig. 1-3. Head of *Lygistorrhina sanctaecatharinae*, male, oblique frontal view. 1, slightly collapsed condition (90X, 5 kv). 2, completely collapsed condition (95X, 5kv). 3, enlargement of fig. 1 showing right lateral ocellus against compound eye (approximately 800X, 6 kv).

as to the relationships of *Lygistorrhina* is in error. Each of the characters discussed by Tuomikoski is reviewed in detail below and is shown to be either the result of symplesiomorphy or erroneous interpretations of the character states in *Lygistorrhina* or related taxa.

1. The presence of strong stiff macrotrichia on the flagellomeres is a plesiomorphic condition. Their absence is apomorphic. The concentration of these hairs on the dorsal surface as in *Lygistorrhina* and *Burmacrocera* (Keroplastidae) is an intermediate condition. These macrotrichia are present or absent in keroplastids as well as in mycetophilids. Therefore, their loss has probably occurred at least a few times in each family. Thus, the existence of the intermediate condition in *Lygistorrhina* and *Burmacrocera* cannot be construed as synapomorphy without other supporting evidence.

2. Some keroplastids have elongate mouthparts like *Lygistorrhina* but some genera of other families likewise have elongate mouthparts. Thus, the similarity in the length of mouthparts is irrelevant without a detailed comparison of the mouthparts of all these different genera. Unfortunately Tuomikoski did not make a detailed comparison.

3. The tibial trichiation of *Lygistorrhina* is stated to be "more like that of some 'lower' Mycetophiloidea . . ." (Tuomikoski, 1966:257) (i.e., plesiomorphic). The fact that ". . . a similar type is also characteristic of *Macrocera* and the other 'macrocerine' genera of Keroplastidae" (Tuomikoski, 1966:257) is symplesiomorphy and not synapomorphy. After making such statements Tuomikoski then says that *L. asiatica* has the tibial setulae arranged in fairly distinct longitudinal rows, an apomorphic condition common to "many Keroplastidae and some Mycetophilidae." However, this similarity could be either synapomorphy or convergence. That *not* all keroplastids, mycetophilids nor species of *Lygistorrhina* have this specialized condition strongly suggests that its occurrence in *Lygistorrhina* and other groups is due to convergence.

4. *Lygistorrhina* has a simple fore tibial comb, consisting of a single transverse row of setulae. This is the primitive condition for all Mycetophiloidea. Thus, the fact that the macrocerine keroplastids and *Lygistorrhina* are the only groups among the "higher" fungus gnats to have retained this primitive condition is not proof of their close relationship.

5. The hind coxae of *Lygistorrhina* are "distinctly shorter than the middle coxae" (Tuomikoski, 1966:257), and this condition is also found in *Macrocera* (including *Fenderomyia*, a synonym of *Macrocera* (Coher, 1963)), a keroplastid. I consider this point only of trivial importance as a perusal of Shaw and Shaw (1951) will show that the short hind coxae are found in a few other genera in other families besides just *Macrocera*.

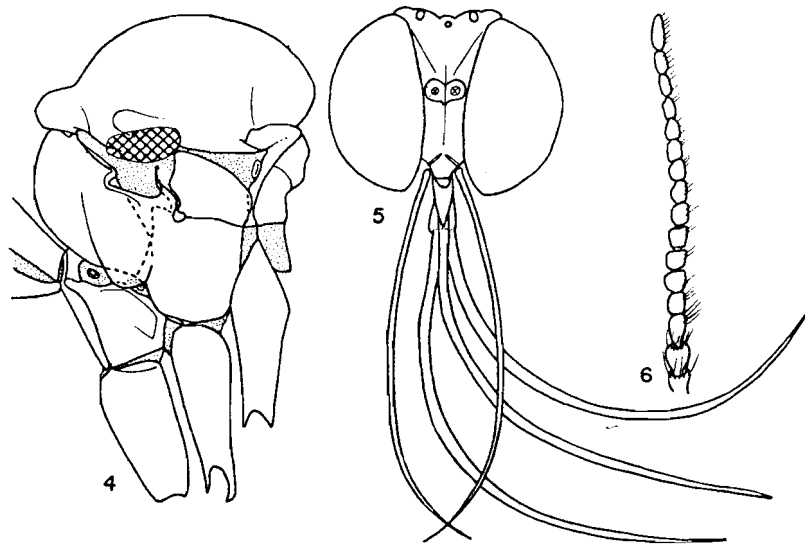


Fig. 4-6. *Lygistorrhina sanctaecatharinae*. 4, thorax, lateral view. 5, head, frontal view. 6, antenna, lateral view.

6. *Lygistorrhina* male genitalia are "of comparatively simple type" as found in the primitive fungus gnats and *Macrocera*. Thus, again, the similarity between *Lygistorrhina* and *Macrocera* is based only on symplesiomorphy. The fact that just 1 species of *Lygistorrhina*, *asiatica*, has a bifid tip to the dististyle, very similar to those of some macrocerine genera (*Macrocera* and *Paramacrocera*), indicates convergence or at most, parallelism, not recency of common ancestry.

7. Tuomikoski (1966:258) concludes his analysis with a discussion of the similarity of the thoracic pleura of *Lygistorrhina* and *Fenderomyia* Shaw (a synonym of *Macrocera*). This similarity is clearly the central point to his whole argumentation plan and had his interpretation of the structure of *Lygistorrhina* been accurate and had *Fenderomyia* actually had the peculiar pleural structure attributed to it by Shaw (1948a), then this "supposed synapomorphic" condition would have proven Tuomikoski's contentions. However, as described above, the thoracic pleura of *Lygistorrhina* is quite different from Tuomikoski's interpretation. Coher (1963:25) has shown that the peculiar structure of the thoracic pleura upon which *Fenderomyia* was based was a variable condition resulting from distortion during drying of the flies rather than that of actual structure.

The significant point in Tuomikoski's paper is that *Lygistorrhina* has the peculiar narrow insertion of the abdomen, a condition found only in the highly specialized families of fungus gnats (Keroplatidae

and Mycetophilidae). However, whether *Lygistorrhina* can be grouped with either or neither of these 2 families cannot be determined at the present due to the lack of knowledge about the phylogenetic characters and interrelationships of these groups. I feel it is best to treat *Lygistorrhina* as a separate entity (i.e., *Lygistorrhinidae*) in the higher classification of the fungus gnats as has traditionally and almost universally been done since Edwards (1925) pointed out the unique features of the genus.

KEY TO THE SPECIES OF *LYGISTORRHINA* SKUSE³

1. Middle tibia with 2 apical spurs; abdomen usually with basal pale colored bands (subgenus *Lygistorrhina* Skuse) 2
- Middle tibia with 1 apical spur; abdomen usually with apical pale colored bands (subgenus *Probolaeus* Williston) 5
2. Antenna yellow and black; wing with distinct brown markings 3
- Antenna black; wing without distinct brown markings, may have pale gray markings 4
3. Antenna yellow with flagellomeres 7-10 and 13-15 black (Japan) *pictipennis* Okada (1937:45)
- Antenna yellow with flagellomeres 5-6 and 10-15 black (Borneo) *cinciticornis* Edwards (1926:245)
4. Abdomen completely black; mouthparts short, only as long as hind femora; wing hyaline, without grayish markings (Ceylon) *asiatica* Senior-White (1922:196)
- Abdomen with basal yellow bands on segments; mouthparts long, twice as long as hind femora; wing with grayish markings (Australia) *insignis* Skuse (1890:600)
5. Hind femur yellow; coxa yellow; humerus and postalar callus yellow (West Indies) *singularis* (Williston) (1896:261)
- Hind femur dark on apical 2/3 or more; most of middle and all of hind coxae dark brown or black; mesonotum usually all dark 6
6. Abdomen completely black (females) or with only 2 or 3 complete apical yellow bands (males) (southern USA) *sanctaecatharinae*, new species
- Abdomen with 5 or 6 apical light colored bands 7
7. Wing with dark brown markings; abdomen with 6 apical yellow bands (Brazil) *cerquerai* Lane (1958:209)
- Wing hyaline, without markings; abdomen with only 5 apical yellow bands 8
8. Abdomen with narrow apical whitish bands (Brazil) *barrettoi* Lane (1946:346)
- Abdomen with broad apical yellow bands 9
9. Middle and hind tibiae brown (Brazil) *edwardsi* Lane (1946:347)
- Middle tibiae yellow; hind tibia yellow on basal 1/3 10

³ This key is primarily based on original descriptions, although it has been checked against the types of some species as noted above under material examined. The purpose of this key is to serve as a differential diagnosis for my new species and a checklist of the described species of *Lygistorrhina*.

10. Antenna with scape and 1st 4 or 5 flagellomeres yellowish, contrasting with dark remainder of flagellum (Brazil)....*brasiliensis* Edwards (1932:139)
— Antenna black (Trinidad) *urichi* Edwards (1912:204)

Lygistorrhina sanctaecatharinae Thompson, new species

Male: *Head* (fig. 1-2): Dark brownish black, mouthparts pale brownish yellow except darker near tip, about as long as hind tibiae; antennae light brown, with medial flagellomeres slightly yellowish, about twice as long as head, as long as hind basitarsi, with verticals distinct and as long or longer than flagellomere.

Thorax: Dark brownish black, dull; pleuron sparsely grayish pollinose except for large subshiny basoventral area on sternopleuron; mesonotum with 2 sub-medial grayish pollinose vittae, with vittae broadly joined in front of scutellum, from posterior view with these vittae appearing dark; rest of mesonotum very sparsely grayish pollinose except densely pollinose in front of scutellum and postalar callus and behind humerus; halter yellow; scutellum silvery pollinose, with a single row of 6-8 marginal bristles.

Legs: Anterior 4 legs yellow except dark apical 4 tarsal segments, basal $\frac{1}{4}$ in front coxa and all of middle coxa; hind leg dark brownish black except yellow trochanter, basal $\frac{2}{3}$ of femur and basal $\frac{2}{3}$ to $\frac{1}{2}$ of tibia; tibial spurs single on anterior legs, double on hind leg; inner spur of hind leg about $\frac{1}{2}$ as long as outer. Wing hyaline, microtrichose; venation as figured (fig. 10).

Abdomen: Black, with distinct apical yellow bands on only 2nd, 3rd and usually 4th segments (both sterna and terga), with indistinct apical band on 5th sterna and rarely with lateral apical corners of 5th tergum slightly yellowish. Male genitalia (fig. 7-9) black; basistyle about $\frac{1}{4}$ longer than wide; distyle simple, about $\frac{2}{3}$ as long as basistyle, thickened apically and ending in a short capitate seta on upper internal angle, short pilose with 2 long setae on inner margin; 9th tergum very large, as long as basistyle, elliptical.

Female: Quite similar to male, but differs as follows: eyes much smaller and thus front much broader; hind femur much more extensively dark brownish, in some specimens all brownish black; abdomen much shorter and stouter, all black except yellow cerus, without a trace of yellow apical bands.

Measurements: [Average (range; number of specimens measured)]; overall length, 4.86 mm (4.08-5.36; #16); 3.16 mm (2.96-3.36; #4); mouthparts, 1.70 mm (1.42-2.74; #10); wing, 2.41 mm (23.2-26.0; #11); fore femora, .75 mm (.70-.88; #11); middle femora, .86 mm (.82-.96; #11); hind femora, 1.18 mm (1.12-1.28; #11); middle femora, .86 mm (.82-.96; #11); hind femora, 1.18 mm (1.12-1.28; #11). Leg ratios [femora:tibiae:basitarsi:tarsi]: front leg, 1:1.07:0.96:1.04 (#11); middle leg, 1:1.25:0.92:0.99 (#11); hind leg, 1:1.42:0.73:0.95 (#11).

Material examined: GEORGIA, Liberty County, St. Catharines Island, 24-28 April 1972, V. Picchi and F. C. Thompson, 220 ♂♂, 18 ♀♀; 18-21 September 1972, B. J. and F. C. Thompson, 9 ♂♂ (type-series, holotype ♂ and allotype ♀ from the April lot). In addition to the type-series I examined the following males from U.S. National Museum: VIRGINIA, Fairfax County, Dead Run, 29 August 1915, R. C. Shannon, 1 ♂, WEST VIRGINIA, Pocahontas County, Cranberry

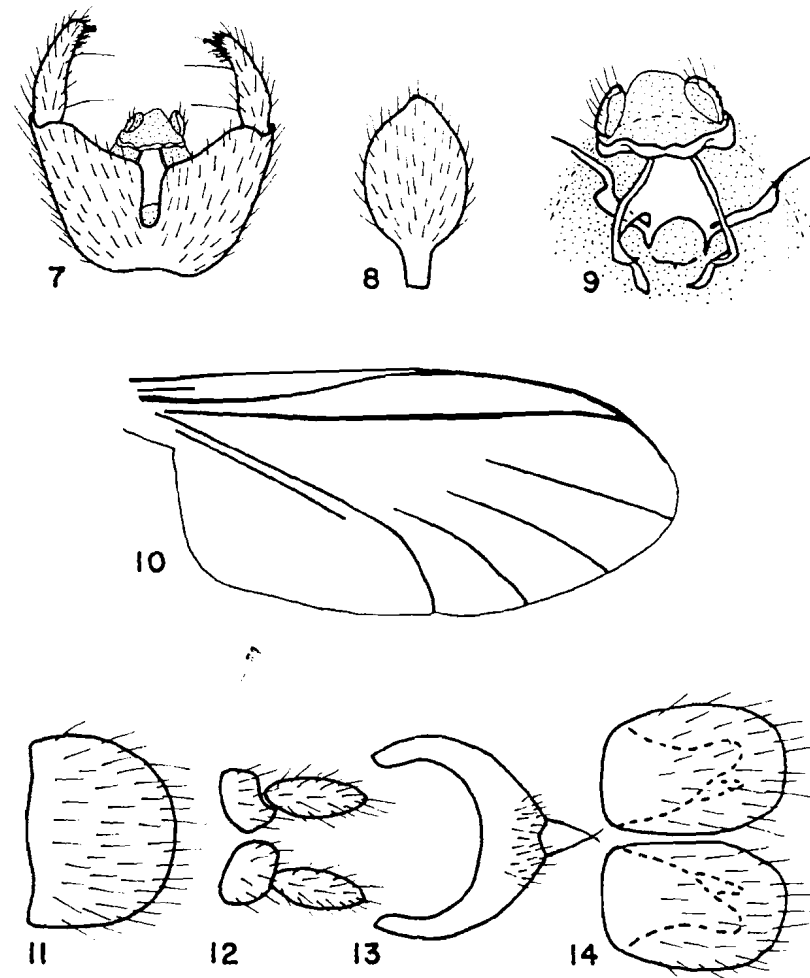


Fig. 7-10. *Lygistorrhina sanctaecatharinae*, male. 7, genitalia, ventral view. 8, 8th tergum, dorsal view. 9, enlarged view of aedeagus and cerci, ventral view. 10, wing. Fig. 11-14. *L. sanctaecatharinae*, female genitalia. 11, 8th tergum, dorsal view. 12, cerci, dorsal view. 13, 9th sternum, ventral view. 14, 5th sternum, ventral view.

Glades, 16 July 1955, W. W. Wirth, 1 ♂; and NORTH CAROLINA, Wake County, 16 June 1955, H. V. Weems, Jr., At *Rhus copallinum*, 1 ♂.

The holotype and most of the paratypes are deposited in The American Museum of Natural History. Other paratypes have been deposited in the following institutions: United States National Museum, Wash-

ington; Canadian National Collection, Ottawa; California Academy of Science, San Francisco; Museum of Comparative Zoology, Cambridge; British Museum (Natural History), London; Museu de Zoologia da Universidade de São Paulo; Muséum National d'Histoire Naturelle, Paris; Natal Museum, Pietermaritzburg; Entomological Institute, Sapporo.

Discussion: The male of *Lygistorrhina sanctaecatharinae* is readily distinguished from all known *Lygistorrhina* by its reduced number of apical abdominal bands. The female of *sanctaecatharinae* with its completely black abdomen is not likely to be confused with any other known New World species. *Lygistorrhina asiatica* from Ceylon also has a completely black abdomen but can be separated by the characters given above in the key and its completely yellow coxae and hind femora. The name, *sanctaecatharinae*, is based on the type-locality of the species and is used as a noun in the genitive case. All the type-material of *sanctaecatharinae* was collected by a Malaise Fly trap.

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