# THE GENUS SIGMATOMERA OSTEN SACKEN WITH OBSERVATIONS ON THE BIOLOGY BY RAYMOND C. SHANNON.

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Considering the large size of the flies and the wide distribution of the genus throughout Tropical America, the literature concerning the genus *Sigmatomera* is surprisingly limited. Likewise our knowledge of the immature stages of any member of this genus has been very restricted.

I have recently received from my friend, Mr. Raymond C. Shannon, an adult female belonging to a new species of *Sigmatomera*, together with some surprising observations on the larval habits. I take great pleasure in describing this beautiful crane-fly as *Sigmatomera shannoniana* and am especially grateful for the opportunity of retaining the type. At this same time, I take the opportunity of describing a second new species of this genus based on material from Costa Rica. To this species I have given the name *Sigmatomera séguyi*, as a slight expression of gratitude to my colleague, M. Eugène Séguy, for many kind favors in the past.

## HISTORICAL

The genus *Sigmatomera* was proposed by Osten Sacken (1869) (2) without a type-species, this latter being supplied by the same author (1873) with the description of the genotype, *S. flavipennis*, of Mexico. A second species, *S. amazonica*, was described from Brazil by Westwood (1881). The third and fourth species were described by Alexander (1914 *a*, 1914 *b*), as *S. apicalis* from British Guiana and *S. occulta* from Paraguay. The allotype female of *S. amazonica* from the Amazonian region of Brazil was described by Alexander (1920). Riedel

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2. Dates in parenthesis refer to the Bibliography at end of paper.

(1921) recorded *S. occulta* (as *flavipennis*) from Paraguay and furnished the first indication of the larval habitat. Earlier keys to the known species were supplied by Alexander (1914 *a*) and Riedel (1921).

As stated in the introduction, two additional species are to be described herewith. The type female of *S. shannoniana* submitted by Mr. Shannon was accompanied by the cast pupal skin and three larvae which will be submitted to Professor J. Speed Rogers for study and report.

## AFFINITIES

The genus *Sigmatomera* has always been placed in the tribe Eriopterini. More recently (Alexander, 1927), I have placed the genus in the subtribe Gonomyaria, as a limited group containing only the three genera, *Sigmatomera*, *Astelobia* Edwards and *Austrolimnobia* Alexander. The closest ally of *Sigmatomera* is undoubtedly *Astelobia*, a fact that is confirmed by the structure of the larvae and pupae, insofar as this can be decided from the figures and brief description of the latter (Hudson, 1920). It has become increasingly apparent that the Hexatomoid Eriopterini show many features that approach various members of the tribe Hexatomini and the separation of the two tribes on the basis of presence or absence of tibial spurs is highly artificial. The discovery by Shannon that the early stages of *Sigmatomera* are predacious, a characteristic feature of most known members of the tribes Pediciini and Hexatomini, but not known for the Eriopterini, has again opened the question of the strict position in tribes of these higher Eriopterine crane-flies.

*Sigmatomera* may readily be told from *Astelobia* by the following characters of the adult flies :

1. Antennal segments of both sexes strongly binodose ; tergal valves of ovipositor tridentate at tips ..... *Sigmatomera* Osten Sacken.
   Antennal segments of both sexes simple ; tergal valves of ovipositor simple ..... *Astelobia* Edwards.

## TAXONOMY

The six known species of *Sigmatomera* are before me and the range in structure of various organs may be briefly noted.

Eyes very large in both sexes, the anterior vertex being reduced to a narrow strip. Antennae slightly longer in male than in female ; basal and intermediate flagellar segments (fig. 1) nodose in both

sexes ; basal flagellar segment elongate, with only an apical node ; succeeding segments with the ventral face binodose ; dorsal face at base likewise strongly protuberant ; nodes of ventral face provided with two or three short setae ; on dorsal face of segments the setae are more elongate, especially on the basal segments, there being two long bristles on the basal node and a single bristle near the constricted part of the segment ; outer flagellar segments less constricted, the terminal segment small, oval; antennae with 16 segments, apparently with only 15 in *S. amazonica*. All legs long and slender. Venation : $Sc_1$ and $R_{1+2}$ approximated on costal margin ; *Rs* straight ; $R_{2+3+4}$ gently arcuated (*apicalis*, *amazonica*), weakly angulated, to strongly angulated and spurred (*occulta*) ; *r-m* connecting with *Rs* before the fork of the latter (*occulta*), at the fork (*séguyi*, *shannoniana*) or beyond the fork on $R_5$; cell 1*st* $M_2$ closed or open by atrophy of *m* (*amazonica*); *m* usually short and straight, in many cases with a short spur jutting basad into cell 1 *st* $M_2$ ; anterior cord nearly transverse (*flavipennis*, *amazonica*, *séguyi*) to strongly oblique (*occulta*, *shannoniana*) ; *m-cu* ator before (*shannoniana*) or shortly beyond the fork of *M*. The venation of these species is shown in text-figures 3-8. Ovipositor with the tergal valves expanded and weakly tridentate at tips (fig. 2).

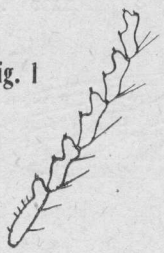




Fig. 1. — Basal five segments of flagellum of *Sigmatomera shannoniana*, sp. n. ; female.

Fig. 2. — Apex of tergal valve of ovipositor of *Sigmatomera amazonica* Westwood.

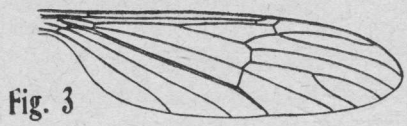
## KEY TO THE SPECIES OF SIGMATOMERA

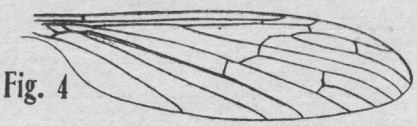
1. Cell 1 *st* $M_2$ open ; thorax black. (fig. 3) (Brazil) ... *amazonica* Westwood
   Cell 1 *st* $M_2$ closed ; thorax yellowish ..... 2
2. A supernumerary crossvein in cell $R_3$ ; *m-cu* some distance before fork of *M*. (fig. 4) (Brazil) ..... *shannoniana*, sp. n.
   No supernumerary crossvein in cell $R_3$ ; *m-cu* at or beyond the fork of *M*. 3
3. Wings with a broken dusky crossband near base and with apex broadly darkened (fig. 5) (British Guiana) ..... *apicalis* Alexander
   Wings without darkening at base and apex ..... 4
4. Veins of wings proximad of cord, with the exception of *Rs*, bright yellow ; a distinct dark brown crossband along cord. (fig. 6) (Costa Rica)..... ..... *séguyi* sp. n.

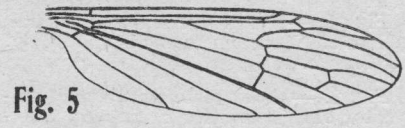
Certains veins of wing proximad of cord, including *Cu* and *2nd A*, blackened ..... 5

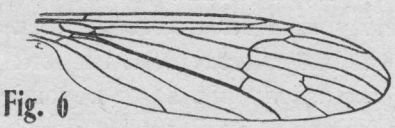
5. Wings with a pale yellow ground-color, the base and costal region a little brighter ; cord very oblique, the inner end of cell 1 *st* $M_2$ pointed ; dark coloration of wings virtually confined to the veins ; legs yellow, the tips of the tibiae and outer tarsal segments infuscated (fig. 7) (Paraguay). .....*occulta* Alexander.

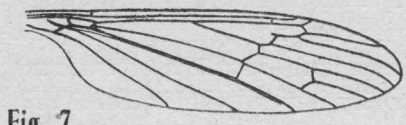
Wings with the ground-color brighter yellow, the base and costal region bright yellow ; cord transverse, with a narrow dark seam that includes the adjoining membrane as well as the veins ; legs clear yellow, including the tarsi. (fig. 8) (Mexico) ..... *flavipennis* Osten Sacken.



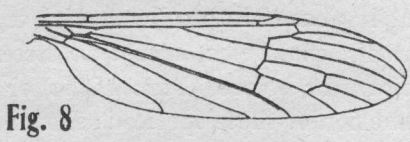




Fig. 3. — *Sigmatomera amazonica* Westwood ; venation.
Fig. 4. — *Sigmatomera shannoniana*, sp. n. ; venation.
Fig. 5. — *Sigmatomera apicalis* Alexander ; venation.
Fig. 6. — *Sigmatomera seguyi*, sp. n. ; venation.
Fig. 7. — *Sigmatomera occulta* Alexander ; venation.
Fig. 8. — *Sigmatomera flavipennis* Osten Sacken ; venation.

## Sigmatomera shannoniana, sp. n.

General coloration reddish yellow ; legs orange-yellow, the tips of the tibiae and the tarsi light brown ; wings yellow, the base and costal region more orange-yellow ; veins chiefly black ; a supernumerary crossvein in cell $R_3$ ; *m-cu* before the fork of *M*.

*Female.* — Length about 18 mm. ; wing, 15,5 mm.

Rostrum reddish brown ; palpi yellow. Antennae with the basal

segment reddish brown, the remainder black. Head testaceous yellow ; anterior vertex very narrow, at narrowest point about equal to one-fourth the diameter of the basal segment of scape.

Mesonotum chiefly obscure greenish yellow, the color more or less obscured by internal discoloration showing through the chitin. Pleura reddish yellow. Halteres yellow. Legs orange-yellow, the tips of the tibiae infuscated ; tarsi similarly darkened, the coloration in large part due to dark setae. Wings (fig. 4) yellow, the base and costal region more orange-yellow ; veins black, the coloration involving the veins and slight extensions on to the membrane ; prearcular veins, *C*, *Sc*, *R*, $R_1$, basal half of *M* and 1 *st A* yellow. Venation : A supernumerary crossvein in cell $R_3$ at near midlength ; $R_{2+3+4}$ angulated and short-spurred near midlength ; *r-m* at fork of *Rs* ; *m* with a short spur into cell 1 *st* $M_2$ ; *m-cu* nearly its own length before the fork of *M* ; inner end of cell 1 *st* $M_2$ pointed ; cord unusually oblique.

Abdomen reddish yellow, clear yellow at base. Ovipositor dark reddish brown, the tergal valves tridentate at tips, as in genus.

*Hab.* Brazil.

*Holotype*, ♀, Bahia, April 1929, emerged as adult July 3, 1929, reared from larvae living in tree-holes (*N. C. Davis and R. C. Shannon*).

Type preserved in the author's collection.

I take great pleasure in naming this species in honor of my friend, Mr. Raymond C. Shannon. The species is most closely related to *Sigmatomera occulta* Alexander.

**Sigmatomera séguyi**, sp. n.

General coloration yellow ; legs yellow, the tips of the tibiae and the tarsal segments brown ; wings yellow, with a conspicuous brown crossband along the cord ; veins basad of cord, with the single exception of *Rs*, bright yellow ; cord nearly transverse ; *m-cu* shortly beyond the fork of *M*.

*Female.* — Length about 16-17 mm. ; wing 15-16,5 mm.

Antennae with both segments of scape yellow, the flagellum black.

Thorax reddish yellow. Halteres yellow. Legs yellow, the tibiae passing into brown at tips, the tarsi chiefly dark brown. The holotype shows two distinct brown rings on all femora, the first before midlength, the second subterminal in position ; these areas are not indicated on the paratypes. Wings (fig. 6) bright yellow with a narrow but conspicuous brown crossband along the cord ; veins basad of the cord, with the exception of *Rs*, entirely bright yellow ; veins beyond the cord a little darkened. Venation : $R_{2+3+4}$ arcuated to weakly

angulated before midlength ; *m-cu* shortly beyond the fork of *M* ; cord nearly transverse.

*Hab.* Costa Rica.

*Holotype*, ♀, May 16, 1920 (*Paul Serre*).

*Paratopotypes*, 2 broken females.

Type in the National Museum of Natural History, Paris.

This beautiful *Sigmatomera* is dedicated to my colleague, M. Eugène Séguy. The species is most closely allied to *S. flavipennis* Osten Sacken.

## BIOLOGY

The first indication of the larval habitat was given by Riedel (1921) when he discussed the material of *Sigmatomera occulta* (recorded as *S. flavipennis*) that was taken in 1914-15 by Zürcher. These notes are as follows : « Larvae in tree-holes, principally *Poinciana regia*, October 13, 1914 ; Forest, larvae from a tree-hole, November 6, 1914 ; Larvae from tree-holes, — the large yellow larvae transformed from mid-April to the end of May ».

The interesting notes supplied at this time by Mr. Shannon are as follows :

« The larvae occur in the rot holes of trees and we found them by collecting the water from tree-holes in a routine examination for the larvae of the yellow fever mosquito, *Aedes aegypti* (Linnæus) (*Stegomyia*). We quickly discovered in the laboratory that these crane-fly larvae are predacious and in the course of rearing approximately twenty larvae, these latter consumed about 2500 *Stegomyia* larvae. They probably never obtain this number in nature, but must also feed on Nematodes and other insect larvae that inhabit the tree-holes. They lie buried in the muck in the bottom of the holes but can make slimy galleries and in glass bottles extend these galleries along the sides of the bottle up to the surface of the water. In fact, they make a tube of the débris, cementing the particles together with the same slimy substance, making a home very like the case of a caddis-fly. The most interesting single feature in the life of this insect is the following : Apparently it is the same secretion described above that is used both as a bait for insect larvae and for the purpose of capturing them. The *Stegomyia* larvae that were given to them as food in the laboratory are tremendously eager to feed on the substance. Even though they have just been taken from a jar containing an abundance of food and are apparently not hungry at the moment, once

they come in contact with the substance they cannot leave it alone and lose all sense of discretion in the face of the peril that confronts them. While they are feeding, the *Sigmatomera* larvae lie quietly and every now and then touch one of the *Stegomyia* larvae with the substance and immediately it is bound a helpless prisoner. Usually the larva is attached to the debris, but occasionally the head is glued to the caudal end, forming a curled sausage-shaped structure. While in this condition and being devoured by the *Sigmatomera*, the other *Stegomyia* larvae feed on the substance and continue to do this into the very jaws of the Tipulid larva. » Mr. Shannon further remarks that the larval stage is of long duration and probably can be prolonged indefinitely in nature in the absence of sufficient food, but the pupal stage is short.

Mr. Shannon's interesting notes may pe compared with the brief observations available concerning the larval habitat of *Astelobia rufa* Hudson, as recorded by Hudson (1920). The larva lives in and feeds on the semi-liquid vegetable detritus which accumulates in large quantities at the bases of the leaves of *Astelia Solandri*, a common and very conspicuous epiphytic plant in most of the primaeval native forests around Wellington, New Zealand. Apparently only a single larva inhabits the space between the two sheathing leaves of the *Astelia*, and only those leaves which are full of a thick, brown, coffee-like liquid are frequented. The pupa is enclosed in a rather tough, extremely elongate silken tube situated between the sheathing leaves. It rests in an upright position in the midst of the semi-liquid mass. From the relationships with *Sigmatomera*, and the fact that only a single larva is found in a compartment, it may reasonably be suspected that the larvae of *Astelobia* are likwise entirely predacious on smaller organisms living in the environment.

## LITERATURE.

ALEXANDER (C. P.) :

1914 *a*. Transactions American Ent. Soc., 40 : 246, pl 3, fig. 9 (*S. apicalis*).

1914 *b*. Entomol. News, 25 : 209-210, pl .9, fig. 5 (*S. occulta*).

1920. Canadian Entomol., 52 : 142-143 (allotype of *S. amazonica*).

1927. Proc. Linn. Soc. New South Wales, 52 : 55.

HUDSON (G. V.) :

1920. Transactions New Zealand Inst., 52 : 32-33, pl. 1, fig. 7-9 (immature stages *Astelobia rufa*).

Osten-Sacken (C. R.) :

1869. Monographs Diptera North America, 4 : 137-138 (definition of *Sigmatomera*).

1873. *Ibid.*, 3 : addenda, p. lx (*S. flavipennis*).

1887. Berliner Entomol. Zeitschr., 31 : 205.

Riedel (M. P.) :

1921. Archiv für Naturgeschichte, 87, Abt. A : 124-125, fig. a-e (*S. occulta*, as *flavipennis*).

Westwood (J. O.) :

1881. Transactions Entomol. Soc. London, 1881 : 366-367, pl. 17, fig. 3 (*S. amazonica*).

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*Diptera*, t. V, fasc. 4, 15. II. 1930.
(Paris, P. Lechevalier).

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