ON THE IDENTITY OF CULEX PIPIENS LINNÆUS.

[Diptera, Culicidæ.]

[PLATES I TO III.]

By Harrison G. Dyar and Frederick Knab.

The family Culicidæ, comprising the mosquitoes, is based upon the genus *Culex* of Linnæus, of which the generally recognized type is *Culex pipiens* Linnæus. The genus and species date from the beginning of binomial nomenclature, the tenth edition of the Systema Naturæ. In this work, page 602, Linnæus treats the genus thus:

VI. DIPTERA.

224 Culex. Os aculeis setaceis intra vaginam flexilem.

pipiens. 1. C. cinereus, abdomine annulis fuscis octo. *Fn. svec.* 1116.
Fl. Lapp. 363, 364.
Blank ins. t. 15. *f. A-D.*
Reaum. ins. 4. *t.* 43, 44.
Swamm. quart. t. 23.
bibl. t. 31. *f.* 4-8. *t.* 32. *f.* 1-5.
Joblot. micr. 1. *pp.* 2. *t.* 13. *f. A. B. C. D. E. H. I. L.*
β. *Kalm. itin.* 2. *p.* 268. Musquetoés.
Habitat in Europæ *aquosis; copiosissima in* Lapponia; *etiam in* America *obvia. Kalm.*
Mas antennis plumosis vix pungit aut sugit sanguinem.
Larva in Aquis; Pupa bicornis reversa; Insectum pipiens, pungens; in Indiis magis venenata. Anseres allicit, pullos Gallinarum nutrit Lapponum *calamitas felicissima.*

bifurcatus. 2. C. fuscus, rostro bifurco. *Fn. svec.* 1115.
Raj. ins. 74. *n.* 4.
Reaum. ins. 4. *t.* 40. *f.* 1, 2.
Habitat in Europa.

pulicaris. 3. C. alis hyalinis: maculis tribus obscuris. *Faun svec.* 1117.
Fl. Lapp. 365.
Derh. phys.-th. l. I. *c.* II, *f,* 5, 6.
Habitat in Europa; *in* America. *Kalm.*
Cursitat, mordet, relinquit punctum fuscum. Amoen. acad. 3. *p.* 343.

reptans. 4. C. niger, alis hyalinis, pedibus nigris annulo albo. *Fn. svec.* 1118.
Habitat in Europa, *reptatu molestus tempore vespertino.*

equinus. 5. C. ater, abdomine fusco, fronte alba. *Fn. svec.* 1120.
Fl. Lapp. 359.
Habitat circum Equos, *quorum sanguinem haurit, inter crines eorum cursitans.*

stercoreus. 6. C. testaceus, alis reticulatis, linea thoracis, tribusque abdominis nigricantibus.
Habitat in stercoribus.

As above stated, *Culex pipiens* has generally been recognized as the type of the genus, and that no doubt correctly, as this would seem to be the most common, and in a sense, officinal species included, and would thus be intended as the type on Linnæus' own ideas. Moreover, it is the first species. Of the others, *bifurcatus* has been recognized as a mosquito, an European species of *Anopheles;* but very little is said about it, and it was obviously subordinated in Linnæus' conception of the group. The other species are not mosquitoes at all; *pulicaris* is a *Ceratopogon, reptans* and *equinus* are species of *Simulium,* and *stercoreus* is apparently some Cyclorhaphid fly. They do not agree with Linnæus' definition "Os aculeis setaceis intra vaginam flexilem," and he could not have had any of them in mind as typical of the genus. The only species so agreeing are the first two, of which the first is much the commoner and better known. We therefore see no reason for attempting to reverse the generally accepted procedure, and would confirm *Culex pipiens* Linnæus as the type of the genus and family.

The next point to be determined is the identity of *Culex pipiens.* Linnæus obviously intended the term to cover all mosquitoes known to him, directly or indirectly, except the *Anopheles,* with long palpi in the female, which he separates under the name *Culex bifurcatus.* Linnæus had experienced mosquitoes in Lapland, and they evidently made a lasting impression upon his mind, as he speaks of them as "most abundant" and as a terrible plague in that country. He also includes the common domestic forms, as he speaks of their furnishing food to chickens, and he also refers to their occurrence in America and "The Indies," but not by personal observation. The first separation of species from this aggregate was by Linnæus himself, in the following manner: Previous to the date of the tenth edition of the Systema Naturæ, Linnæus had published *Culex vulgaris* (Act. Ups., 31, 1736) and *Culex alpinus* (Flor. Lapp., 364, 1737); but as these antedate the beginning of zoological nomenclature, they are excluded from consideration. Moreover, Linnæus himself refers these species as synonyms of *pipiens* in the second edition of the Fauna Suecica, 1761. However, the descriptions reappear in the second edition of the Flora Lapponica, 1792, so the names may be considered to become valid on that date. Under ordinary conditions, the fact that the names first appeared as synonyms would render their subsequent use inadmissible; but in Linnæus' case we hold that an exception should be made, and the resurrection of the names allowed. Linnæus first proposed the names to represent valid species, and subsequently referred

them to the synonymy. He had clearly the right to again resurrect them. The only reason why he had apparently not that right is because the arbitrarily established beginning of zoological nomenclature, 1758, happened to intervene between the proposal of the names and their reference to the synonymy, which caused their first valid appearance as synonyms without accompanying description. We think that in this case the fact of their previous description may justly be considered.

Of these species, *Culex vulgaris* is apparently a *Simulium,* but *Culex alpinus* is a mosquito, and judging from its place of occurrence, an *Aedes* in the broader sense. This constituted a restriction of the original conception of *Culex,* by the elimination of the *Aedes* element, the forms abundant in Lapland, and leaves for our consideration only the common domestic species. We exclude also the exotic forms as not personally known to Linnæus. In this course we follow and confirm the conclusions of F. V. Theobald in his monograph of the mosquitoes of the world, who recognizes as *Culex pipiens* the common domestic mosquito of Europe.

Having arrived at this point, we next inquire what is the common domestic mosquito of Europe and does it occur in America? We find in America no less than five closely allied but distinct species living as larvæ in artificial accumulations of water and infesting dwellings as adults, which have been known to us collectively as "*Culex pipiens,* the house mosquito." It is probable that there are likewise in Europe several species mixed under the name *Culex pipiens.* Ficalbi (Bull. Soc. Ent. Ital., XXVIII, 289, 1896) takes as *Culex pipiens* the common house mosquito of Italy and describes it fully. He had, however, some doubt as to the correctness of his identification and suggests the alternative name *Culex haematophagus.* Now his description indicates that the house mosquito of Italy is not the same species as the one of northern Europe. This latter should clearly be recognized as the true *Culex pipiens,* while the other may bear the name *Culex haematophagus* Ficalbi. It appears to be especially distinguished by the lateral expansion of the abdominal bands on the last two segments, which does not occur in the true *Culex pipiens,* nor in *Culex fatigans,* which Theobald recognizes from the Mediterranean region. It suggests in this character the American *Culex similis* Theobald, an Antillean species resembling the *pipiens* group.

Theobald recognizes that *Culex pipiens* extends to North America, and he separates under the name *Culex fatigans* the more southerly distributed form, extending through the tropics

of both the new and old worlds. He does not, however, go into the matter in sufficient detail and his presentation is not convincing. We find in the male genitalia excellent characters of specific definition. It is true that Theobald describes these structures, but he has not illustrated with accuracy the basal parts that show the specific distinctions to the best advantage, having confined his attention chiefly to the appendages of the side pieces, which are practically alike in all the species.

The exact definition of *Culex pipiens,* therefore, still remains in some obscurity, and we propose now to resolve it. We would restrict *Culex pipiens* to that species with the basal clasps of the male genitalia as shown in our figure 4, plate II. We omit the side pieces in our figures as they are alike in all the species referred to. Our specimens are from Copenhagen, Denmark, (Dr. F. Meinert), St-Remy-la-Varenne, Maine et Loire, France (R. du Buysson), and Buda-Pesth, Hungary (Dr. C. Kertesz). We have bred specimens with similar genitalia in America, and are able to confirm the occurrence of the species here, no doubt as an importation.

Our common rain-barrel and house mosquitoes comprise the following, as defined by the male genitalia. The adults are generally separable on minor characters of coloration, which we shall describe fully elsewhere; but the colorational characters of these species are unstable and unreliable to a large extent; neither are the venational differences pointed out by Theobald of any value.

Culex pipiens Linnæus.

The harpes (Plate II, fig. 4, *a*) with a crown of spines as in all the species here discussed, but with rudimentary basal process (fig. 4, *b*). Harpagones divided into four plates, the upper one (fig. 4, *c*) rather narrow, long, exceeding the tip of the harpes, often bent nearly at right angles near the middle; second piece (fig. 4, *d*) a rather broad plate narrowed at the tip, with a rounded point; third piece a thin, often obscure plate, similar to the second piece but smaller and weaker; fourth piece (fig. 4, *f*) a broad, concave stout plate with a narrow rounded tip.

The species is especially characterized by having the harpagones divided into four plates, all the allied species having at most three. In the lowest forms here shown the harpones are divided into two separate plates, the outer one variously toothed, as in *proximus* (fig. 6), *salinarius* (fig. 7), *similis* fig. 8), and *lachrimans* (fig. 9); next they become divided into three plates, as in *restuans* (fig. 5), the second division still

toothed, although in a simpler manner; next there are three divisions, as in *quinquefasciatus* (fig. 1), *comitatus* (fig. 2), and *dipseticus* (fig. 3), but without teeth, and finally four in *pipiens*. Moreover the plates are of moderate length, none especially elongated or shortened; all have rounded pointed tips, without any teeth.

We are not sufficiently acquainted with the European fauna to say whether *Culex pipiens* develops local races or allied species in outlying countries adjoining its range, as *quinquefasciatus* and *similis*, hereinafter discussed, do; but such is probably the case. In America it does not, and this furnishes additional support for the opinion that the species has been introduced comparatively recently into America.

Culex quinquefasciatus Say.

This seems to be the earliest name for the widely distributed species called *Culex fatigans* by Theobald. We have prepared mounts of the genitalia of specimens from various parts of North and South America, Hawaii, the Philippines, and India, and find them constant. Theobald's distribution for this species is therefore evidently, in the main, correct. His citation of the North American localities which have been given under the name *pungens* do not show the exact distribution. In general, the "*pungens*" from northern localities are either *pipiens* or *restuans*, those from points south of Washington are *quinquefasciatus*, although the ranges of the species overlap to a certain extent. Just how much we do not know.

Specimens from the moist parts of North America, the southern Atlantic States to Mississippi Valley, and from eastern Mexico have genitalia of the normal form (fig. 1), like those of specimens from the West Indies, Guiana, and Brazil, as well as the Philippines and India. In the arid parts of the United States and the western coast of Mexico a modified form of genitalia is seen (fig. 3), representing a distinct race of the species. We are not acquainted with the line of separation of the forms, as our material is insufficient. Our specimens of the race, for which we propose the name *dipseticus*, are from Indio and Coachella, Cal. (in the Salton Sink), La Paz, Baja California, Acapulco and Salina Cruz, Mexico. On the coast of California the species has become modified to a specific degree, and we characterize it here under the name *comitatus* (fig. 2).

In Jamaica we have recognized this species under another name, *revocator*, because the palpi and the proboscis are more or less distinctly white-tipped. The genitalia are however, unmodified from the normal *quinquefasciatus* form, showing

that the species is but narrowly separated from *quinquefasciatus,* if, indeed, it is a true species at all.

In the genitalia of the typical form (Plate I, fig. 1) the harpes have a small basal projection, larger than in *pipiens,* but still in a rudimentary condition. The harpagones are divided into three plates; the second (fig. 1, *c*) is a rather slender plate about as long as the harpes, with rounded pointed tip; first plate (fig. 1, *d*) broad, very long, with bluntly rounded tip; third plate (fig. 1, *f*) essentially as in *pipiens.*

The species is especially characterized by the great length of the central plate of the harpagones, which is not divided into two portions, as in *pipiens.*

In the genitalia of the race *dipseticus* (fig. 3), the first branch of the harpagones is not especially elongated (fig. 3, *c*). The other characters remain essentially the same, including the flat and pointed condition of the second plate (fig. 3, *d*).

Type—No. of the race *dipseticus,* 12229, U. S. Nat. Mus.

Culex comitatus, new species.

The genitalia (Plate I, fig. 2) have the general characters of *quinquefasciatus,* race *dipseticus,* but differ especially in the character of the second plate of the harpagones (fig. 2, *d*), which is no longer a plate, but a tubular structure, with oblique open tip. The first plate of the harpagones is broad and rather long, with rounded tip, essentially as in *dipseticus.* The basal projection of the harpes is very short, but this cannot be especially emphasized, as its apparent condition varies greatly with the position of the mount.

Our specimens are from National City, San Diego, Sweetwater Junction, Laguna, Avalon, Los Angeles, San Pedro, San Luis Obispo, and Stanford University, California, all these places being on the coast, south of San Francisco, or on the adjacent islands.

It is somewhat curious that the species *Culex quinquefasciatus,* after ranging throughout the warmer parts of the world unchanged, should, in the arid parts of America, develop first a distinct race and finally a species. This must be of significance in regard to the original home of the species. Evidently *quinquefasciatus* is of tropical American origin, and has latterly spread, no doubt through the agency of commerce, to all the warmer regions of the world. In these places it has not been resident long enough to develop local races and species, as it has done in America. Conversely, it is probably that *Culex pipiens* is of European origin, and has only latterly spread to America through the agency of commerce.

Culex comitatus has the same habits as its congener, *quinquefasciatus*. The larvæ occur in all sorts of artificial accumulations of water, and the adults frequent houses and attack the inmates at night.

Type—No. 12201, U. S. Nat. Mus.

Culex restuans Theobald.

The genitalia (fig. 5) have the harpes with a distinct, though short basal projection (fig. 5, *b*). Harpagones divided into three plates; first plate (fig. 5, *c*) narrow, rather short, with rounded pointed tips; second plate broad, short, the tip broadly rounded, with small reversed teeth near the middle and a large, sharp, angular spine projecting outward from near the base; third plate (fig. 5, *f*) essentially as in *pipiens*, but shown foreshortened from side view in the figure.

The genitalia agree with those of *quinquefasciatus* in the number of divisions of the harpagones, but are readily distinguished by the peculiar form of the second division, with its large lateral tooth.

This species agrees with the foregoing ones in the vestiture of the mesonotum, which consists of the ordinary narrow, curved scales, which cover the surface rather completely. In all of the following the vestiture is of minute, hair-like scales, not covering the surface. The dentation of second division of the harpagones allies the species with the next group, typified by *Culex similis* Theobald. This species, therefore, stands by itself, allied to both the *pipiens* and *similis* groups, but more closely to the former.

Culex salinarius Coquillett.

The genitalia (Plate III, fig. 7) have the harpes with a long curved arm from the outer base (fig. 7, *b*). Harpagones divided into two plates; the outer one (fig. 7, *d*) a broad plate with a series of long teeth, which lie nearly in a plane, a large tooth above, partly separated, and an upcurved one below are separated by a row of smaller, more even teeth; inner plate concave, tapering to a rounded tip (fig. 7, *f*).

The species is especially characterized by the absence of the long lateral tooth of the outer plate of the harpagones, which is present in the two following species.

This species, together with the following ones, *similis* Theobald, *factor* Dyar and Knab, and *proximus* Dyar and Knab, form a distinct group, separate from the *pipiens* group. We should not discuss them in this connection, except that the similarity of coloration of the adults has led to confusion. The

vestiture of the mesonotum is distinctly different in this group from that of the foregoing *pipiens* group, and serves readily to distinguish them, without the criterion of the male genitalia.

Culex salinarius is a close ally of *similis* Theobald, and may be considered to take its place in North America. *Culex similis* inhabits the Antilles, while *salinarius* is found throughout the eastern part of North America, from Maine to Florida and westward to the Mississippi Valley. The two species are doubtless derived from a common American stock, but have been long separated, and have developed well-marked specific characters. *Culex factor* represents these species along the Pacific coast of Mexico and Central America.

Culex factor Dyar and Knab.

In this species, which we have not figured, the genitalia are of the type seen in *salinarius* and *similis*. The outer plate of the harpagones has above a large tooth, followed by three slender, well-separated ones below, the lower angle forming a large rounded angle, too large and broad to be described as a tooth; a long horn-like tooth arises in a different plane, and exceeds the other teeth in length. The lower plate of the harpagones is of the usual form. The harpes have the erect portion crowned with spines as usual, the basal projection very long and curved, as in our figure of *salinarius* (fig. 7, *b*).

The species is especially characterized by the fewness of the central teeth of the outer plate of the harpagones, and the long horn-like tooth, which exceeds the other teeth in length. The scales of the mesonotum are hair-like and sparse, but they are larger and coarser than those of *salinarius* and *similis*.

The species inhabits the west coast of Mexico and Central America, seeming especially at home in salt water. Most of our specimens were bred at Salina Cruz, Mexico, from salt pools behind the beach, and Mr. Jennings has obtained the species in the La Boca swamp in the Canal Zone, Panama, which is a low swamp on the Pacific side of the Isthmus. We have also specimens from Tehuantepec and Santa Lucrecia, Mexico, bred from fresh water, showing that the species is not confined to salt water. It is evidently much like our *salinarius*, which is most abundant near salt marshes, although generally distributed throughout the country, but perhaps this is more addicted to actually salt water than *salinarius* is.

Culex similis Theobald.

The genitalia (Plate III, fig. 8) have the harpagones and harpes essentially as in *salinarius*, but are especially distin-

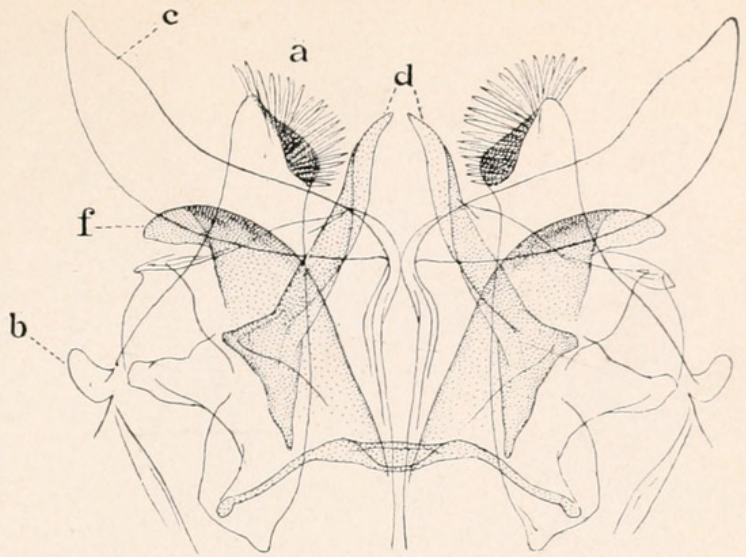
guished therefrom by the long lateral tooth of the harpagones (fig. 8, *e*), which arises in a different plane from the other teeth. This species ranges throughout the Antilles; we distinguish the form occurring upon the mainland in the Guianas under the name *lachrimans*. This is probably not more than a geographical race, yet the genitalia (fig. 9) apparently differ in the shape and proportions of the teeth of the harpagones. These apparently differ in different slides, owing to the position of the parts, and too much stress should not be laid upon these apparent differences. Nevertheless, there are no doubt some actual differences, and the race is a good one, as we note certain slight differences in the coloration of the adults.

The name *lachrimans* was proposed by us (Smiths. Misc. Colls., quart. iss., LII, 259, 1909) as a substitute for *Culex aikenii* Dyar and Knab (Proc. U. S. Nat. Mus., XXXV, 61, 1908, which was preoccupied by *Gnophodeomyia aikenii* Aiken (Brit. Guian. Med. Ann., 1906, 60, 1907), since *Gnophodeomyia* falls as a synomym of *Culex*. The name *Culex lachrimans* was founded upon adults and larvæ. It has since transpired that there was a mixture of material, the adults being *Culex quinquefasciatus*, the larvæ *Culex similis*. We have concluded to restrict the name *lachrimans* to the larvæ, and it will thus stand for the local race of *similis* inhabiting the Guianas.

Culex proximus, new species.

The genitalia (Plate II, fig. 6) have the basal projection of the harpes (fig. 6, *b*) long and curved. Harpagones divided into two plates, the upper one very irregularly shaped and toothed, a large blunt tooth at the bottom, long and curved, a similar but shorter one at the top with a group of smaller ones between; a long sharp tooth arising in a different plane from the others (fig. 6, *e*) and exceeding any of them in length; lower plate concave, broad, with narrowed rounded tip (fig. 6, *f*). The plate is shown fully extended in the figure and appears very broad in comparison with some of the other figures, for example *restuans* (fig. 5, *f*), but this difference is due to the position of the parts in the slide. The species is especially distinguished by the length of the lateral tooth of the harpagones (fig. 6, *e*), which exceeds all the other teeth in length.

Our specimens of this species come from the Canal Zone, Panama, and are in part those referred to by Mr. Busck as *Culex regulator* (Smiths. Misc. Colls., quart. iss., LII, 67, 1908). *Culex regulator* is a synonym of *Culex similis*, to which this species is closely allied, but we believe that the



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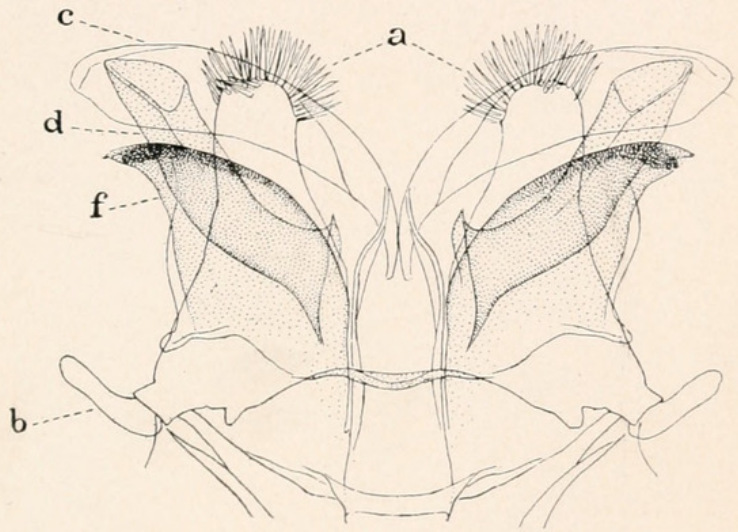

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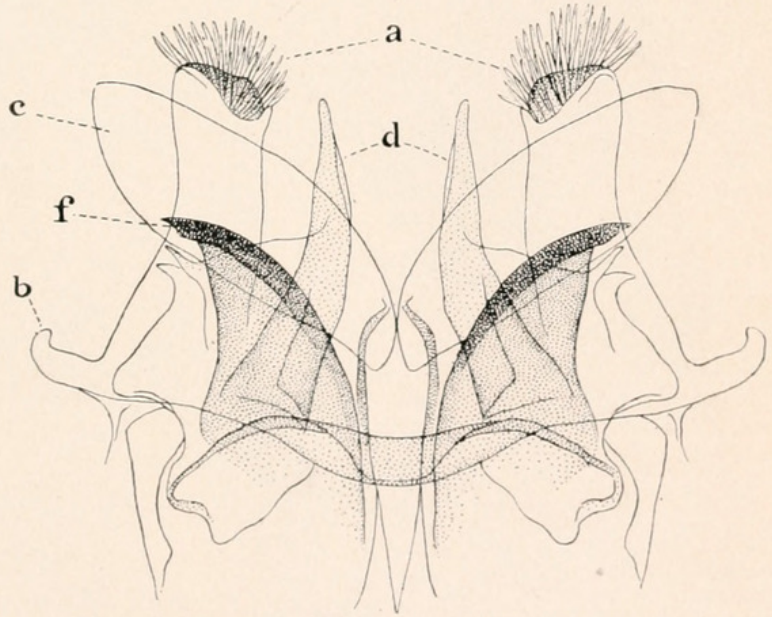
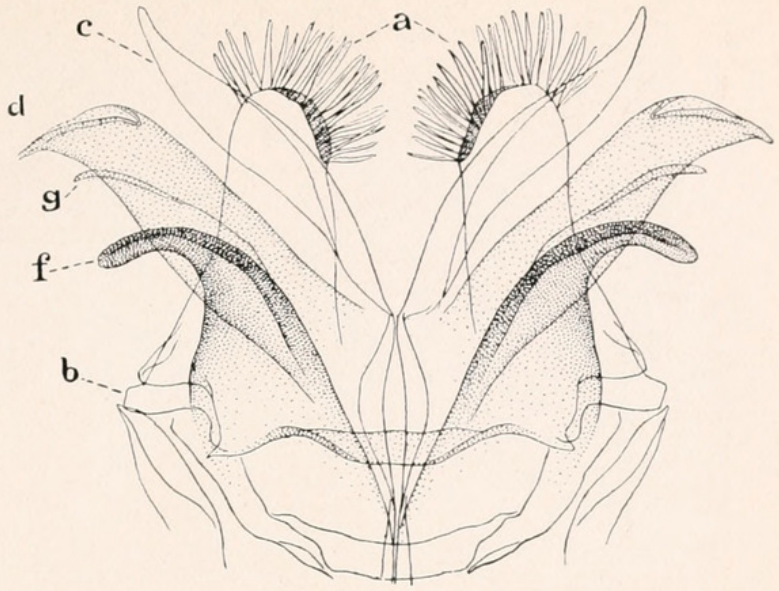


3

GENITALIA OF MOSQUITOES.



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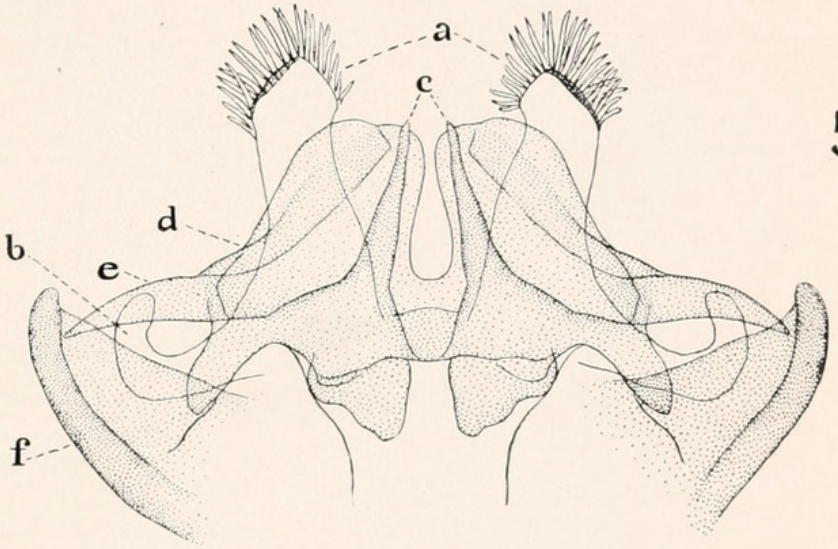

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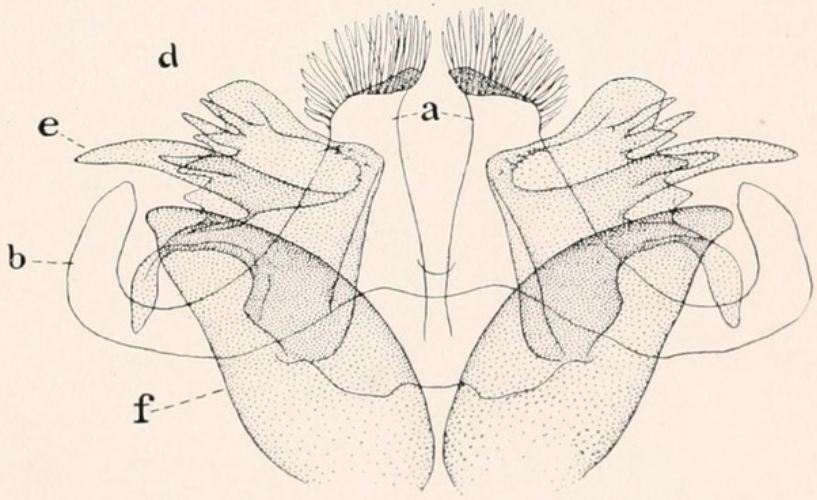

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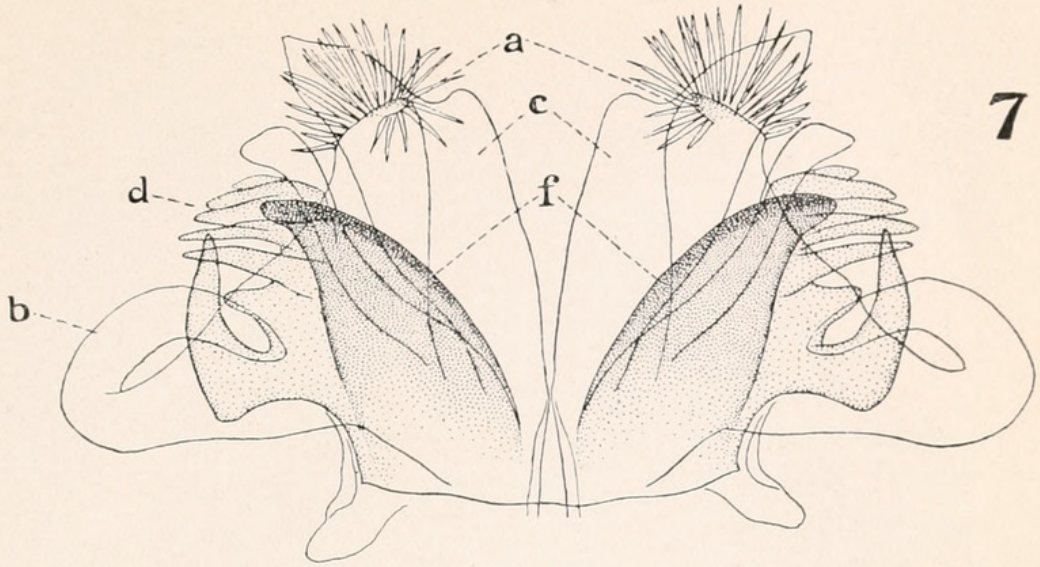
GENITALIA OF MOSQUITOES



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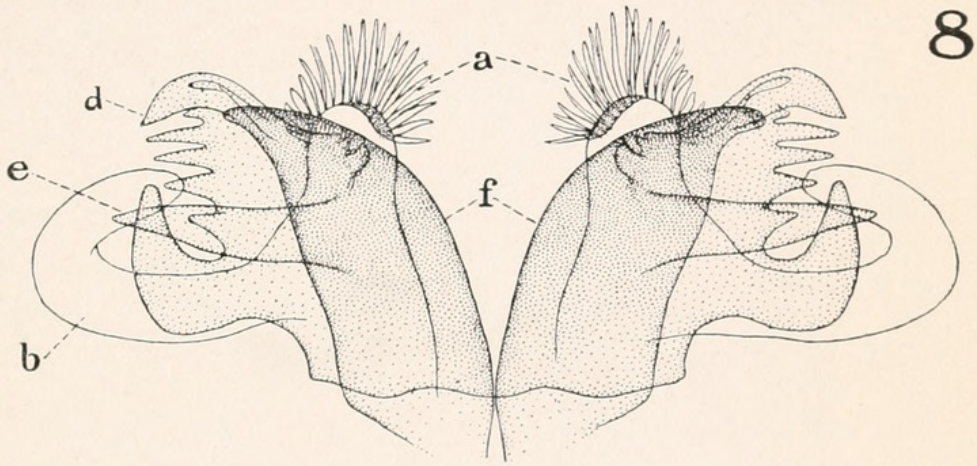

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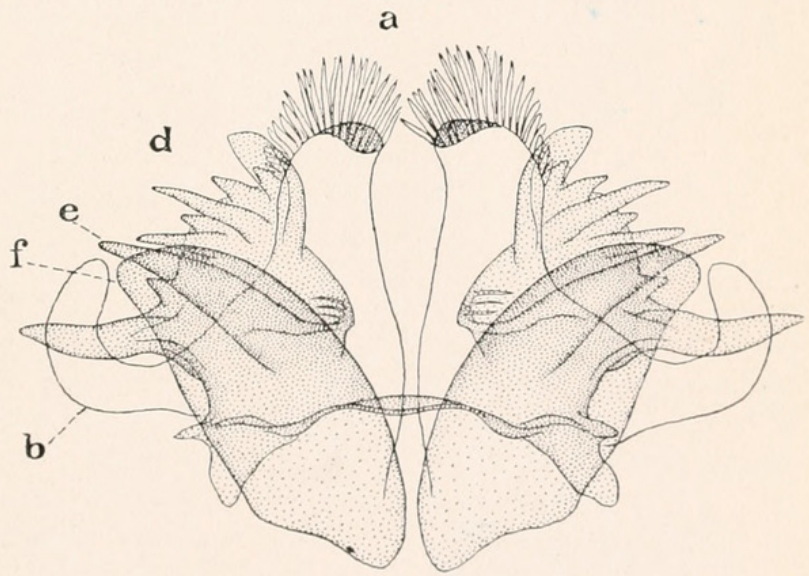

9

GENITALIA OF MOSQUITOES.

Central American form has departed widely enough from the common stock to deserve specific distinction. *Culex similis,* therefore, exists in the Antilles, gives rise to a race, *lachrimans,* in the Guianas, and develops a separate, but closely allied species, *proximus,* in Central America. This is a parallel development to that of *Culex quinquefasciatus,* referred to above, with its race in the arid regions of North America, developing a separate species upon the Pacific coast.

We have before us, besides the forgoing, several other species of the *salinarius* group, but of which we either do not possess males or they are so obviously distinct in markings that we do not consider it necessary to go further with them in this connection.

EXPLANATION OF PLATES I TO III.

Figures of the basal parts (harpes and harpagones) of the male genitalia of certain species of *Culex.*

1. *Culex quinquefasciatus* Say, Iloilo, P. I. (G. W. McCoy).
2. *Culex comitatus* Dyar and Knab, Los Angeles, Cal. (Dyar and Caudell).
3. *Culex quinquefasciatus* variety *dipseticus* Dyar and Knab, Salina Cruz, Mex. (A. Dugès).
4. *Culex pipiens* Linnæus, Urbana, Ill. (F. Knab).
5. *Culex restuans* Theobald, West Springfield, Mass. (F. Knab).
6. *Culex proximus* Dyar and Knab, Taboga I., Panama (A. H. Jennings).
7. *Culex salinarius* Coquillett, Chesapeake Beach, Md. (H. G. Dyar).
8. *Culex similis* Theobald, Santo Domingo, W. I. (A. Busck).
9. *Culex similis* variety *lachrimans* Dyar and Knab, Georgetown, British Guiana (E. D. Rowland).

DESCRIPTION OF A NEW MOSQUITO FROM CUBA.

[Diptera, Culicidæ.]

BY HARRISON G. DYAR and FREDERICK KNAB.

Culex ignobilis, new species.

Proboscis and legs without pale rings; proboscis swollen toward the tip; abdomen without dorsal pale bands, dull blackish, lateral spots yellowish white, basally situated on the segments; venter pale-scaled, with indistinct dark bands toward the tip. Occiput with pale scales and erect black forked ones. Scales of the wings broad, many obliquely subtruncate.

Four specimens, San Antonio de los Baños, Cuba (J. H. Pazos).

Type—No. 12239, U. S. Nat. Mus.