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# NOTE ON A COLLECTION OF ANOPHELINE AND CULICINE MOSQUITOES FROM MADEIRA AND THE CANARY ISLANDS.

BY

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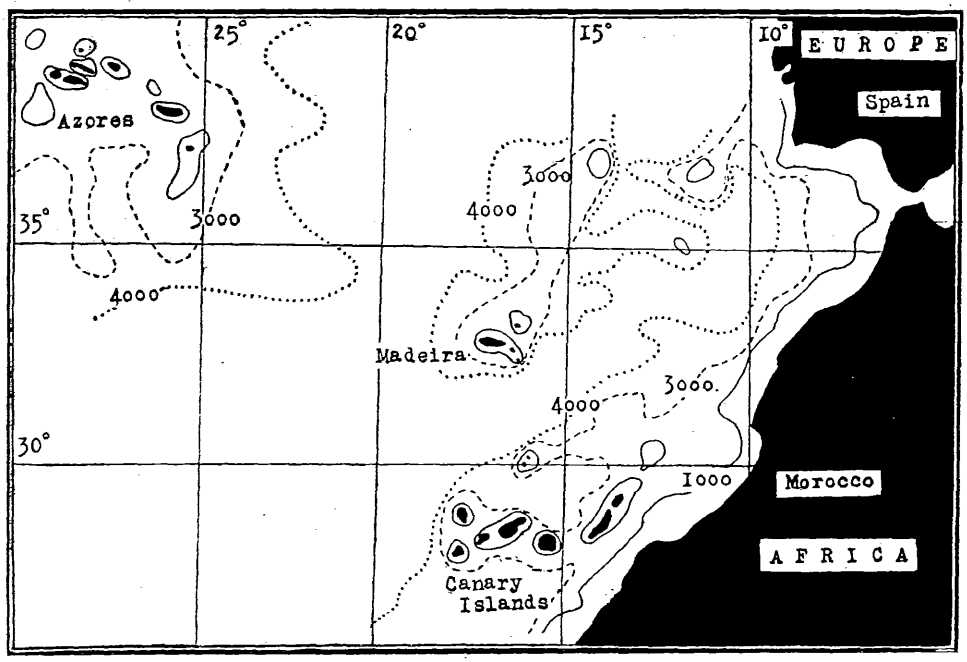
IN the summer of 1928 I visited Madeira and the Canary Islands (Teneriffe and Grand Canary) with the object primarily of ascertaining the Anopheline fauna of these islands. A number of culicine mosquitoes were also obtained and are dealt with in this note.




Showing geographical relationship of the Canary Islands and Madeira with the contours of the ocean bed in fathoms. After Gagel.

The geographical position of Madeira and the Canary Island group is shown in the sketch Map, which also shows the contours of the ocean bed in this part of the Atlantic. All the islands mentioned are volcanic and represent the summits of volcanic accumulations built up from the bed of the ocean from great depths. Nevertheless, according to Gagel (1913) the Cape Verde and Canary Islands show relics of a basement of old continental rocks and on geological and faunal grounds are to be regarded as outlying parts of the European-African continents separated in comparatively recent times. That there might have been a land connection it will be seen is of interest in relation to the origin of the culicid fauna.

In regard to Anophelini from these islands the only references in the literature appear to be the following. Theobald (1903, p. 50) when first describing *A. hispaniola* (from Spain) notes that he has also received specimens of this species from Teneriffe, bred out by Dr. Grabham from reservoirs above Santa Cruz (Teneriffe). Edwards (1921, p. 280) among localities for *A. multicolor* gives Teneriffe. This would appear to be based upon a specimen in the British Museum collection of a female Anopheles collected by Dr. Graham-Smith from Orotava (Teneriffe) in 1909. This specimen has a rather heavily scaled mesothorax and has been regarded up to the present as *A. multicolor;* it will be shown to be more probably *A. hispaniola.* Brown, Guide to Madeira, Canary Islands and Azores, Edition 1926, states that 'Varieties of the Anopheles mosquito are found in the Canaries though they do not seem to be present in Madeira.' Mr. Sammler Brown has very kindly informed me that his information came from the late Dr. George Perez of Puerto Orotava (Teneriffe) who had told him that the genus was endemic in certain valleys in the north of Teneriffe, but Mr. Brown did not know whether any species had been definitely identified. This seems to be up to the present the state of knowledge regarding Anopheles in these islands.

In regard to culicine mosquitoes there are a certain number of references in the literature. Macquart (1839) in his article on Diptera in Webb and Berthelot's 'Histoire Naturelle des Iles Canaries' records for the Canaries without giving precise localities, *Culex calopus* Macq. [= *Aedes argenteus* (Poiret)], *Culex pipiens* Macq. ( = *C. pipiens* L.) and *Culex longiareolatus* Macq. [= *Theobaldia longiareolatus* (Macq.)]. Among localities for *C. pipiens* Theobald (1903, p. 224) gives Funchal and Quinta Val, Madeira and Santa Cruz and La Laguna, April and March, Teneriffe. Becker (1908*a*) records from the Canaries the following species for which the synonomy is given according to Edwards (1921).

*C. longiareolatus* Macq. (Teneriffe, Jan.) = *T. longiareolatus* Macq.
*C. serratipes* n. sp. (Teneriffe, Mar. and June) = ditto.
*C. anguste-alatus* n. sp. (Teneriffe, Dec.) = *A. argenteus* (Poiret).
*C. albopalposus* n. sp. (Santa Cruz, Teneriffe, Mar.) = ditto.
*S. fasciata* Fabr. (recorded by Macquart) = ditto.

*C. pipiens* L. (La Palma, Grand Canary and Teneriffe, Jan. to June) = *C. pipens* L.

Becker's list therefore is the same as Macquart's and includes only three species, two of which have an almost world-wide distribution. More recently Seguy (1921) has given a list of mosquitoes collected by P. Lesne in the Canaries as follows:—

*Culex pipiens* L. (Las Palmas, Tafira).
,, *laticinctus* Edw. (Las Palmas).
,, *hortensis* Fic. (Las Palmas).
*Aedes argenteus* (Poiret) (Las Palmas).
,, *detritus* Hal. (Tafira).
,, *caspius* Pallas (Tafira).
*Theobaldia annulata* (Schrank) (Las Palmas).
,, *longiareolata* (Macq.) (Tafira).

All these localities are in Grand Canary.

In Madeira, only three species of culicine mosquitoes appear hitherto to have been recorded, viz., *T. longiareolata* (Macq.) and *C. pipiens* L., which are given by Becker (1908*b*) and *Aedes* (*Finlaya*) *eatoni* Edw. described by Edwards (1916) from Monte, Madeira.

With those species obtained by me on the present occasion there are now 2 species of Anopheles and 10 of culicine mosquitoes known from the Canaries and 5 species of culicines from Madeira. These are shown in the following list, those marked with an asterisk being recorded by others and not seen by me. Details regarding localities are given under each species later:—

| | Madeira. | Teneriffe. | Grand Canary. |
|---|---|---|---|
| *Anopheles hispaniola* Theo. .. .. .. | .. | × | × |
| *Anopheles sergenti* Theo. .. .. .. | .. | × | × |
| *Theobaldia longiareolata* (Macq.) .. .. | × | × | × |
| * *Theobaldia annulata* (Schrank) .. .. | .. | .. | × |
| *Aedes argenteus* (Poiret) .. .. .. | .. | × | × |
| * *Aedes detritus* Hal. .. .. .. | .. | .. | × |
| * *Aedes caspius* Pallas .. .. .. | .. | .. | × |
| * *Aedes eatoni* Edw. .. .. .. | × | .. | .. |
| *Culex hortensis* Fic. .. .. .. | × | .. | × |
| *Culex theileri* Theo. .. .. .. | × | × | × |
| *Culex laticinctus* Edw. .. .. .. | .. | × | × |
| *Culex apicalis* Adams .. .. .. | .. | × | .. |
| *Culex pipiens* L. .. .. .. | × | × | × |

In Madeira rainfall is fairly abundant (Brown gives an average of 26·7 annual) and numerous pools are found in the courses of the mountain streams. These pools, though they appeared eminently suitable for the breeding of Anopheles, gave a negative result in all parts of the island examined (Funchal, St. Vincent, Santa Anna and the mountains generally between these points). Indigenous woods and also trees in gardens were examined for tree-holes but none were found holding water. *T. longiareolata, C. hortensis* and *C. theileri* were

very generally present in pools in the stream-beds, etc. *C. pipiens* was taken only about the hotel and gardens.

In Teneriffe the climate is extremely dry (Brown gives an average of 11·7 inches annual). At the time of my visit the natural breeding-places were as a rule confined to strings of small, often saline, pools in the deep ravines, often mere clefts in the rocks, in the mountains. Here, however, Anopheles larvæ were usually found without difficulty, as also in small pools formed by leaks from water channels, near reservoirs, etc.

In Grand Canary climatic conditions were less desert-like and the presence of running-water in the stream-beds was more frequent, the breeding-places of Anopheles being correspondingly more numerous. Both in Grand Canary and in Teneriffe *C. theileri* and *C. laticinctus* were the common culicines in natural breeding-places. *C. apicalis* also occurred under the same conditions. *T. longiareolata* was common in cement tanks and occurred much less freely than in Madeira in pools in stream-beds. *C. pipiens* was commonly present in cement tanks in gardens, etc., and the adults in hotel bed-rooms or gardens. *A. argenteus* was taken by me only at Santa Cruz, Teneriffe (the chief port of Teneriffe), where the adults were at times sufficiently numerous to be troublesome. Las Palmas, where this species was taken by P. Lesne, is the chief port of Grand Canary. Both at Santa Cruz and at Las Palmas a great many vessels call on their way to and from West Africa, South America and elsewhere.

### A. (Myzomyia) hispaniola.

*Myzomyia hispaniola* Theobald, *Mono. Cul.*, III, p. 49, 1903.

*Pyretophorus myzomyfacies* Theobald, *Mono. Cul.*, IV, p. 69, 1907.

Teneriffe: reservoirs above Santa Cruz, Dr. Grabham; common throughout the hills around Santa Cruz in August; Orotava, Graham-Smith. Grand Canary: common in streams about Santa Brigida, San Mateo, etc., near Las Palmas, in August.

The Canary specimens all have distinct scales on the mesonotum with 6 or 7 striations. Leaflets were present on the ædœagus in all specimens examined and the larval characters are those of *A. hispaniola* as given by Langeron (1921).

According to Edwards (1921, p. 279) the adult of *A. hispaniola* differs from *A. multicolor* only in having leaflets on the ædœagus and hairs instead of narrow scales on the scutum. In specimens, however, of *A. hispaniola* in the British Museum collection (including the type) the mesonotum usually has a vestiture of narrow but distinct scales. The scaling is doubtless broader and denser in *A. multicolor* and extends more on to the lateral portions of the mesonotum, but it would be difficult to make the mesothoracic scaling a final test between the species (*see* Plate XLIII) *A. turkhudi*, whilst closely related to *A. hispaniola*, as seen in India, has the mesonotal scaling sufficiently narrow (false scales of James) to separate this species fairly readily from the other two mentioned.

A very useful differentiating character in these very similar species is the appearance of the female palpi. In *A. hispaniola* the female palpi are extra

ordinarily long and *thin*. They reach twice the length of the thorax and are noticeably longer and thinner than in *A. multicolor,* where they are about 1·5 times the thorax and much stouter. There is also a difference in the appearance of the last segment and the extent of the dark area at the tip (*see* Plate XLIII). The length of the dark tip in *A. hispaniola* is about 4 times the preceding apical pale band, in *A. multicolor* it does not usually much exceed in length the pale band. In *A. turkhudi* the female palpi are about 1·7 times the thorax and more like those of *A. multicolor* than *A. hispaniola* (*see* Plate XLIII). The greater extent of the dark area in the latter species was noted by Theobald in his original description.

The specimen from Orotava in the British Museum collection has the female palpi as described above for *A. hispaniola* and, as only this species has been taken by me in the Canaries, it is probable that Dr. Graham-Smith's specimen is also *A. hispaniola* (which I consider it to be after examination) and that up to the present *A. multicolor* is not known from the Canaries.

The larval characters of the Canary Islands species were studied from a number of preserved skins from adults hatched out. The posterior clypeal hairs are distinctly long but shorter than the anterior internal hairs, whereas in *A. turkhudi* they are as long as the anterior internal and in *A. multicolor* they are relatively short. Palmate hairs are present on abdominal segments 2 to 7, that on the 2nd segment being imperfectly developed. The leaflets of the palmate hairs are fairly broad (basal portion about 6 to 7 times as long as broad) with several notches at the origin of the filament. The palmate hairs of *A. multicolor* have distinctly narrower leaflets (length of basal portion about 8 to 10 times the breadth) and there is usually a single notch only on either side at the origin of the filament. In *A. turkhudi* palmate hairs are present only on segments 4 to 6 and the leaflets have short, blunt pointed processes in place of elongated filaments.* The anal papillæ in the Canary species are elongate, regular and well developed, not stumpy and irregular as described by Langeron for *A. multicolor*.

The pleural hairs (*see* Puri, 1928) of the larva of *A. hispaniola* (Canaries) resemble those of *A. turkhudi* as described by Puri, i.e., unlike all others in its group so far examined it has the dorsal anterior mesothoracic hair feathered and the ventral anterior mesothoracic sparsely feathered, instead of sparsely feathered and simple respectively as, for example, in *A. multicolor*.

The buccal cavity armature (*see* Sinton and Covell, 1927, Barraud and Covell, 1928) of *A. hispaniola* (Canary) seems indistinguishable from that of *A. turkhudi,* but is markedly distinct from that of *A. multicolor*.

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* Edwards (1921, p. 279) expresses some doubt as to the correctness of the supposed larval characters of *A. turkhudi* as the description in James and Liston's account are discrepant. The larva of *A. turkhudi* was originally described by Stephens and Christophers (1901) in reports to the Malaria Committee of the Royal Society (Seventh Series, p. 11), and the description there given is in every respect correct as shown by subsequent observations.

*A. hispaniola,* therefore, seems very closely related to *A. turkhudi,* much more so than to *A. multicolor,* and *A. hispaniola* and *A. turkhudi* may very reasonably be regarded as western and eastern representatives respectively of a common recent ancestor. The recently described *A. italicus* (Raffaele, 1928) appears to be also closely related to, though distinct from, these two forms.

The specimens of *A. hispaniola* from the Canaries appear to be much darker in respect to wing ornamentation than the specimens from Spain, Algiers and Tunis in the British Museum. This difference may be defined by saying that the pale areas on the outer half of the costa are usually less in extent than the corresponding distally situated dark areas, whereas in the species as seen from elsewhere the reverse relation holds good. I hesitate at present, however, to name the Canary species as a distinct named variety though it may later be advisable to do so. In any case the darkness of the wing would appear to indicate some local departure from type.

### A. (Myzomyia) sergenti.

*Pyretophorus sergenti* Theobald, *Mono. Cul.,* IV, p. 68, 1907.

*A.* (*Myzomyia*) *culicifacies* (in part) of Edwards (1912) and Langeron (1921).

Teneriffe: Santa Cruz and neighbourhood. Grand Canary: Santa Brigida, San Mateo, etc., near Las Palmas.

This species was found breeding along with or independently of *A. hispaniola* but was less common. It was frequently found in quite small pocket-like pools in rocks, whereas *A. hispaniola* usually favoured larger pools with alga.

The Canary Islands specimens are distinctly darker than this species from Palestine and some other areas from which specimens have been studied. In fact they have at first glance a very close resemblance to *A. funestus* differing, however, in having a completely dark 3rd longitudinal vein (*see* Plate XLIII). Some specimens from Tunis in the British Museum collection are almost equally dark and the larval characters seem to place the Canaries form definitely as *A. sergenti.* Edwards (1921) has remarked on the general resemblance of *A. sergenti* to *A. funestus* and stated that the tergal plates of the larva should serve to show whether this species is in reality more closely related to *A. funestus* or to *A. culicifacies* which it also resembles. The relatively small tergal plates quite definitely exclude any real relation to the *A. funestus* group.

The pleural hairs of the specimens from the Canary Islands are as described by Puri (1928) for *A. sergenti* from North-West India where it was found recently by this author, i.e., the anterior dorsal hair of the mesothorax is sparsely feathered instead of being simple as in *A. culcifacies* and all other species in its group so far examined. Larvæ from the Canary Islands also showed the small hair on the antenna very close to the base (1|5 to 1|6 of the shaft from the base) as it is in *A. sergenti.*

**Theobaldia (Allotheobaldia) longiareolata.**

*Culex longiareolatus* Macquart, Dipteres, in Webb and Berthelot, Histoire Naturelle des Iles Canaries, T. 2, 2nd part, *Zoologie,* p. 99, 1836—44*; also *Dipteres Exotiques,* T. 1, Part I, p. 34, 1838.
*Culex spathipalpis* Rondani, *Bull. Soc. Ent. Ital.,* IV, p. 31, 1872.
*Culex serratipes* Becker, *Mitt. Zool. Mus. Berlin,* IV, p. 78, 1908.
*Culex annulatus* var. *morocanus* d'Anfreville, *Bull. Soc. Path. Exot.,* IX, p. 140, 1916.

(For above synonymy *see* Edwards, 1921.)

Canary Islands: Macquart. Teneriffe: Rev. Eaton and Dr. Grabham (Theobald, III, p. 155), Becker (*C. longiareolatus, C. serratipes*), Jan., March, June; Santa Cruz, Orotava in August. Grand Canary: Tafira, near Las Palmas, P. Lesne (Seguy, 1921); Santa Brigida, San Mateo in August. Madeira: Dr. Grabham (Theobald, III, p. 155); Becker (*C. longiareolatus*); Funchal, Monte, Santa Anna in July. Azores: St. Michael, Dr. Grabham (Theobald, III, p. 155).

Very great variation in size occurred but very large and very small forms appeared to be the same species which conformed to the descriptions of adult and larva given by Langeron and others for this species.

**Theobaldia (Theobaldia) annulata.**

*Culex annulatus* Schrank, *Beitr. z. Naturg.,* p. 97, 1776.

(For synonymy *see* Edwards, 1921.)

Grand Canary: Las Palmas, P. Lesne (Seguy, 1921).

**Aedes (Stegomyia) argenteus.**

? *Culex aegypti* L., *Hasselquist's Reise nach Palestine,* p. 470, 1762, *vide* Dyar.
*Culex argenteus* Poiret, *Jour. de Phys.,* XXX, p. 245, 1787.
*Culex fasciatus* Fabricius, *Syst. Antl.,* p. 36, 1805.
*Culex albopalposus* Becker, *Mitt. Zool. Mus. Berlin,* IV, p. 80, 1908.
*Culex anguste-alatus* Becker, *ibid.,* p. 79, 1908.

(Other synonymy not given, *see* Edwards, 1921.)

Canary Islands: Macquart. Teneriffe: Becker (*C. anguste-alatus*) in Dec., Santa Cruz, Becker (*C. albopalposus*) in March: Santa Cruz in hotel in August. Grand Canary; Las Palmas, P. Lesne (Seguy, 1921).

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* The second reference is that usually given for the first description, but as this is referred to by Macquart in the first of the two works mentioned the description in Webb and Berthelot possibly has priority.

Sufficiently numerous to be annoying at times. Probably breeding in large water storage cisterns with which the hotel was supplied. Becker's species are sunk by Edwards as above.

**Aedes (Ochlerotatus) caspius.**

*Culex caspius* Pallas, *Reise versch. Prov. Russ. Reichs.*, I., p. 475, 1771.

(For synonymy *see* Edwards, 1921.)

Grand Canary: Tafira near Las Palmas, P. Lesne (Seguy, 1921).

**Aedes (Ochlerotatus) detritus.**

*Culex detritus* Haliday, *Entom. Mag.*, p. 151, 1833.

(For synonymy *see* Edwards, 1921.)

Grand Canary: Tafira, near Las Palmas, P. Lesne (Seguy, 1921).

**Aedes (Finlaya) eatoni.**

*Ochlerotatus eatoni* Edwards, *Bull. Ent. Res.*, VI, p. 358, 1916.

Madeira: Monte, Funchal, Rev. A. E. Eaton (Edwards *loc. cit.*) in March 1902.

**Culex hortensis.**

*Culex hortensis* Ficalbi, *Bull. Soc. Ent. Ital.*, XXI, p. 27, 1889.
*Maillotia pilifera* Theobald, *Mono. Cul.*, IV, p. 274, 1907.
*Culex geniculatus* Theobald (nec Olivier), *Mono. Cul.*, III, p. 216, 1903.

(Synonymy from Edwards, 1921.)

Grand Canary: Las Palmas, P. Lesne (Seguy, 1921); San Mateo in August. Madeira: Funchal, Monte, St. Vincent, Santa Anna in July.

The Madeira specimens show scarcely any apical banding of the abdominal segments, but the remarkable sub-apical process on the side-piece shows that the species is either identical with or very closely related to *C. hortensis* Fic. Drawings by some authors of the projections from the process on the inner aspect of the side-piece (i.e., basal to the process first referred to) in the European form differ considerably from the appearances seen in the Canary species but are possibly due to an imperfect view of the parts. As figured by Seguy (1924) for *C. hortensis* these processes are, however, obviously identical. The larval characters appear to conform to the descriptions given of the European species.

As the abdominal banding in *C. hortensis* is known to be somewhat variable and as there is an exact correspondence of the very peculiar sub-apical process of the side-piece and of the equally peculiar processes on the more basally situated prominence (as figured by Seguy) it does not seem at present likely that the Madeira and Canary species is anything more than possibly a locally less banded variety than usual. The correspondence in the processes on the second prominence

ought, however, to be verified in case Seguy's figure is from material from the Canary Islands.*

This was an extremely common and widely distributed species in Madeira.

### Culex apicalis.

*Culex apicalis* Adams, *Kansas Univ. Sci. Bull.*, II, p. 26, 1903.
*Culex sergenti* Theobald, *Mono. Cul.*, III, p. 218, 1903.
*Culex pyrenaicus* Brolemann, *Ann. Soc. Ent. France*, LXXXVII, p. 427, 1919.
*Culex territans* Howard, *Dyar and Knab, Monog.*, IV, p. 293, 1912 (nec *C. territans* Walker).

(For synonymy *see* Edwards, 1921.)

Teneriffe: in pools in stream from Aguirre springs, near Santa Cruz in August.

The hypopygeal characters conform closely to the figures given by Brolemann for *C. pyrenaicus* (*see* Plate XLIV).

### Culex theileri.

*Culex theileri*, Theobald, *Mono. Cul.*, III, p. 187, 1903.
*Culex pettigrewi* Theobald, *Rec. Indian Mus.*, IV, No. I, p. 15.

(For synonymy *see* Barraud, 1924.)

Teneriffe: Santa Cruz and country around in August. Grand Canary: Santa Brigida, San Mateo near Las Palmas. Madeira: Funchal, Monte.

The details of the genitalia and larval characters are identical with those given by Barraud (1924) for this species in India.

### Culex laticinctus.

*Culex laticinctus* Edwards, *Jour. Proc. Asiatic Soc. Bengal*, IX, p. 49, 1913.

Teneriffe: Orotava, Graham-Smith (Edwards, 1921, p. 342); Santa Cruz and country around in August. Grand Canary: Las Palmas, P. Lesne (Seguy, 1921); Las Palmas, Santa Brigida in August.

The hypopygeal characters of the Canary Island specimens conform closely to the figures given for this species by Brolemann (1919) and Seguy (1924) (*see* Plate XLIV).

### Culex pipiens.

*Culex pipiens* Linnaeus, *Syst. Nat.*, Ed. X, p. 602, 1758.
*Culex azoriensis* Theobald, *Mono. Cul.*, III, p. 210, 1903. *Vide* Edwards, 1921, p. 345.

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* Specimens from the Canaries have been very kindly examined by Mr. Edwards who very kindly informs me that the hypopygeal characters are, as I suspected, identical.

*Culex varioannulatus* Theobald, *Mono. Cul.*, III, p. 198, 1903. *Vide* Edwards, 1921, p. 345.

(Other synonymy not given.)

Canary Islands: Macquart. Teneriffe: Becker, Jan. to June; La Laguna, Santa Cruz, April and March, Theobald; Santa Cruz, Orotava in August. Grand Canary: Becker, Jan. to June; Las Palmas, Tafira, P. Lesne (Seguy, 1921); Las Palmas, Santa Brigida in hotels, gardens, etc., in August. La Palma: Becker, Jan. to June. Madeira: Funchal, Quinta Val, Theobald, Monte in July. Azores: St. Michaels, Theobald, III, p. 211 (*C. azoriensis, C. varioannulatus*).

The specimens showed the characteristic ædœagus and other characters of this species. It was chiefly found about hotels, gardens, etc.

*Nature of the Canary Islands and Madeira Culicid Fauna.*

There can be no doubt that the culicid fauna of the Canary Islands as described above is to be regarded as quite typically 'Mediterranean' in the sense of this term as used by me in another paper to be published in this *Journal*. Considering the species there referred to as having their zoocentre of distribution in the Mediterranean Sub-region and eliminating those which are of only very local occurrence and those which do not appear to occur in the more westerly parts of the sub-region, we should expect as species likely to occur in the Canaries (assuming the Mediterranean character of the fauna) the following:—

| Actually found. | Not as yet recorded. |
|---|---|
| Anophelines. | *A. sacharovi* (*elutus*). |
| *A. hispaniola.* | *A. algeriensis.* |
| *A. sergenti.* | *A. multicolor.* |
| Culicines. | |
| *T. longiareolata.* | *A. echinus.* |
| *C. hortensis.* | *A. mariæ.* |
| *C. theileri.* | *A. zammitti.* |
| *C. laticinctus.* | *C. perexiguus.* |
| *C. apicalis.* | |

The Canary Islands fauna differs from the above only in the addition of the widely disseminated species *A. argenteus, C. fatigans, A. detritus* and *A. caspius* and the widespread northern palæarctic form *T. annulata*. The culicid fauna in Madeira is of a more restricted nature but of the same general character. It is of interest, however, that there should be a species, *Aedes eatoni* Edw., not known from elsewhere.

There arises the question whether the apparently indigenous elements of this fauna, (1) have been introduced recently, e.g., by man, (2) represent a much older colonization by accidental causes, or, (3) are the result of a definite, but possibly complex and temporary land connection. It is obviously impossible to

speak with certainty on these points. The conditions in Madeira (except in respect to *A. eatoni*) are perhaps compatible with a comparatively recent introduction from Africa or Spain, i.e., even possibly by man, through shipping, importation of garden and other plants, etc. As regards the Canaries there is more reason to regard these islands as a part of the normal Mediterranean land with its appropriate culicid fauna however derived. It would be idle to speculate for the present beyond saying that in favour of non-human agency and possibly a land connection at some fairly recent period is, (1) the apparently established character of the fauna, e.g., the two species of Anopheles which appear to occur wherever the conditions are suitable even in remote places in the mountains, (2) *A. hispaniola* in Algeria is more especially a mountain species and is said not to occur commonly in houses (Sergents), and one would not perhaps expect to find it readily spread by accidental means, and (3) there is some evidence of a slight local differentiation in the Canary Island form of *A. hispaniola* in the distinctly dark wings, supposing such a distinction to be confirmed.

The islands themselves are usually considered to date from the Helvetian stage of the Middle Miocene to which horizon certain shallow water marine limestones have been assigned by Lyell and others. If *A. hispaniola* reached the islands by land connection this must therefore have been some time from the Helvetian stage onwards. *A. hispaniola* occurs also in the south of Spain and, presumably, on similar reasoning, reached Spain before the Straits of Gibraltar were formed in the Pliocene. The period of diffusion of *A. hispaniola* might then, very hypothetically, be assigned to the Middle (Helvetian, Tortonian, Sarmatian stages) or Upper (Pontic stage) Miocene. Whilst no stress can be placed on such considerations in the present instance where the significance of the data is very uncertain, yet accumulated considerations of this type may possibly later give some indication when the various Anopheline faunas, e.g., that of the Mediterranean Sub-region, established themselves in their present areas of distribution.

## Conclusions.

1. The culicid fauna of the Canary Islands includes the species *A. hispaniola, A. sergenti, T. longiareolata, T. annulata, Aedes argenteus, A. detritus, A. caspius, C. hortensis, C. theileri, C. laticinctus, C. apicalis* and *C. pipiens*. That of Madeira the species *T. longiareolata, Aedes eatoni, C. hortensis, C. theileri* and *C. pipiens*.

2. This fauna is typical of the Mediterranean Sub-region as defined in respect to culicid distribution by me in another paper to be published in this *Journal*.

3. The culicid fauna of Madeira might be compatible, except for the presence of *A. eatoni* Edw., with recent introduction, even by man. The origin of the Canary Islands fauna is less suggestive of an altogether recent introduction and introduction through a land connection some time in the Miocene is discussed, though there is no certain evidence that a land connection ever existed and the

most that can perhaps be said is that it is probable that the Anopheline fauna is not merely a recent introduction by man.

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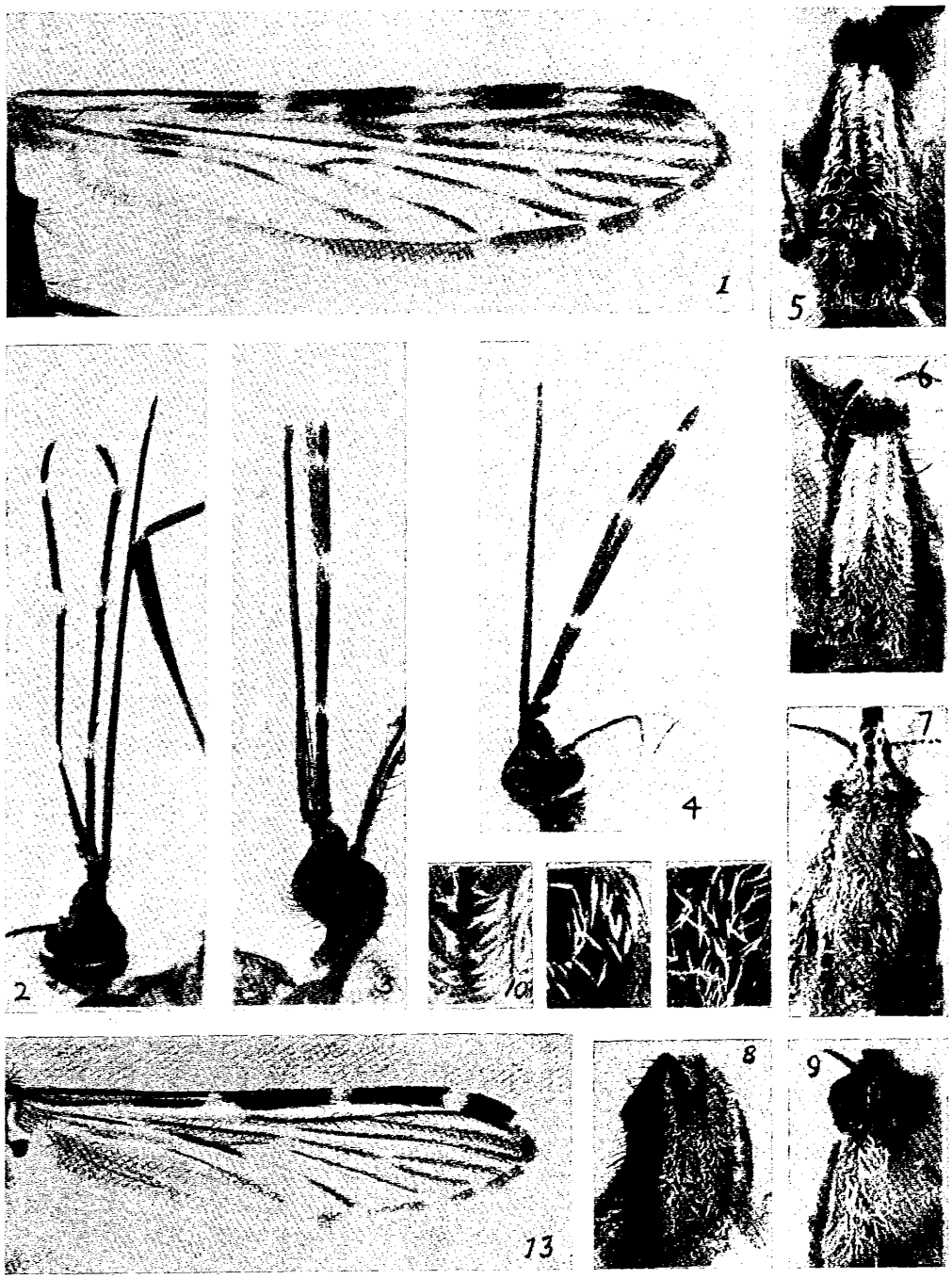
PLATE XLIII.



## Explanation of Plate XLIII.

Fig. 1. Wing (female) of *A. hispaniola* (Canary Islands).
,, 2. Female palpi of *A. hispaniola* (Canary Islands).
,, 3. Ditto *A. multicolor* (East Persia).
,, 4. Ditto *A. turkhudi* (India).
,, 5. Dorsal view of mesothorax of *A. hispaniola* (Canary Islands).
,, 6. Ditto another specimen with somewhat broader scaling.
,, 7. Ditto *A. multicolor* (rubbed specimen).
,, 8. Ditto *A. hispaniola* (Canary Islands), selected for narrow scaling.
,, 9. Dorsal view of *A. turkhudi*.
,, 10. Mesothoracic scales of *A. hispaniola* more magnified.
,, 11. Ditto of *A. multicolor*.
,, 12. Ditto of *A. turkhudi*.
,, 13. Wing (female) of *A. sergenti* (Canary Islands).

The scale is the same in all figures except in figs. 10, 11 and 12 when it is double this.

## Explanation of Plate XLIV.

Fig. 1. Tip of female palp (scales not shown) of *A. multicolor.*
„ 2. Ditto of *A. turkhudi.*
„ 3. Ditto of *A. hispaniola* (Canary Islands).
„ 4. Ædœagus of *A. hispaniola* (Canary Islands).
„ 5. Harpago of ditto.
„ 6. Leaflet of palmate hair of *A. turkhudi.*
„ 7. Ditto of *A. multicolor.*
„ 8. Ditto of *A. hispaniola* (Canary Islands).
„ 9. *Ædœagus* (posterior view) of *C. laticinctus.*
„ 10. Lateral plate of ædœagus of *C. laticinctus* (flattened preparation, outer aspect).
„ 11. Apex of side-piece of *C. hortensis,* showing clasper and processes.
„ 12. Inner of the two processes seen on the flat.
„ 13. Similarly situated process in *C. apicalis* showing general similarity.
„ 14. Ædœagus of *C. apicalis,* ventral view.
„ 15. Ditto of *C. hortensis,* ventral view.

Except where otherwise indicated scale as for figs. 14 and 15.
Fig. 5 is the same scale as fig. 4.

A Upper bridge of *ædœagus.*
B Neck.
C Lower bridge.
D Bulb of *ædœagus,* partly membranous.

PLATE XLIV.

Fig. 1.

Fig. 2.

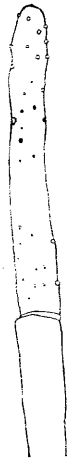


Fig. 3.

0.1 mm

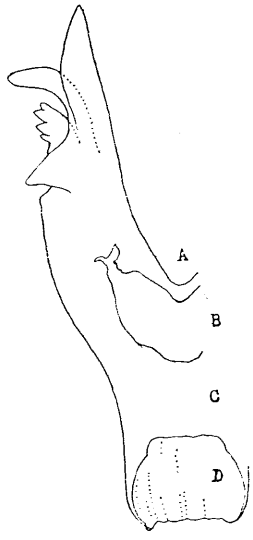



Fig. 9.

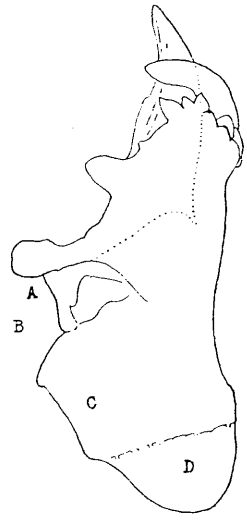
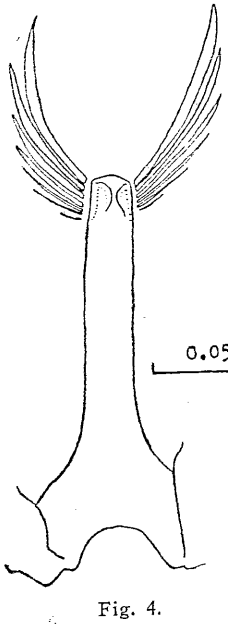



Fig. 10.



0.05 mm.

Fig. 4.

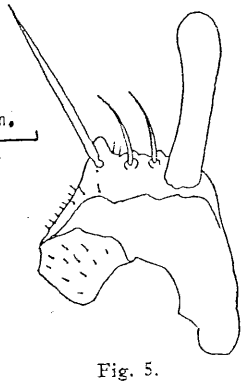


Fig. 5.

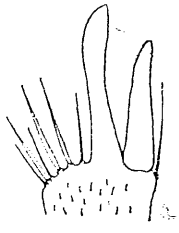


Fig. 12.

Fig. 13.

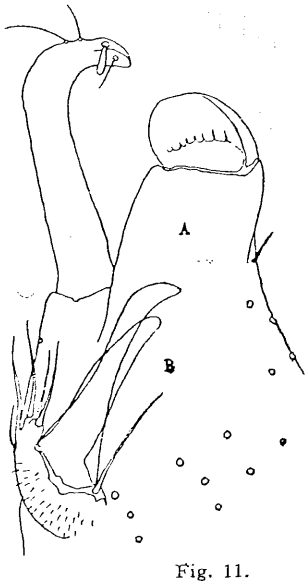



Fig. 11.

0.02 mm.

Fig. 6.

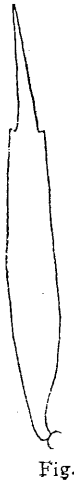


Fig. 7.

Fig. 8.

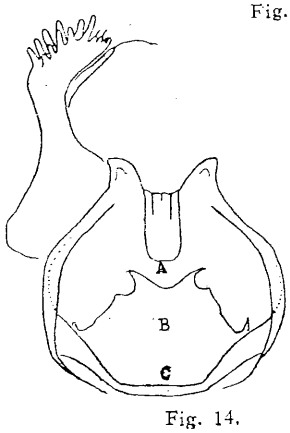
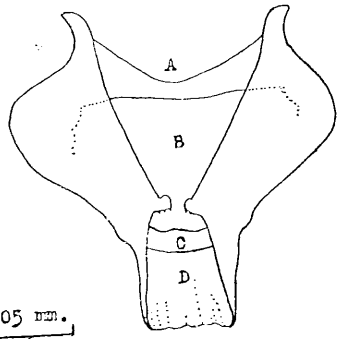



Fig. 14.




0.05 mm.

Fig. 15.