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XXIII. — *NUDICLAVA MONOCANTHI*, THE TYPE OF A NEW GENUS OF HYDROIDS PARASITIC ON FISH.

By R. E. LLOYD, *M.B., B.Sc., Captain, I.M.S., Surgeon Naturalist, Marine Survey of India.*

While examining some tow net material collected in 1897 from the Andaman Sea by the naturalist of the R.I.M. Survey Ship "Investigator," my attention was arrested by a small fish, to the side of which was attached a curious lobulated growth. The fish (plate xvi, fig. 1), which measured only 18 mm. in length, was one of a number of specimens belonging to the species *Monocanthus tomentosus*, recently recorded by Johnstone from Indian seas for the first time (1). A portion of this growth was detached, stained and mounted. On examining the specimen microscopically, the following details were noticed (fig. 2) :—

(1) The most conspicuous feature was the presence of a large number of elongated club-shaped bodies, much resembling the contracted hydranths of *Clava* or *Coryne*, but entirely devoid of tentacles.

(2) At the base of these bodies, usually one to each, were a number of small globular objects. These, from the type of their structure and contents, were at once recognised to be closed gonophores or sporosacs.

(3) These structures arise from a basal plate, which is attached to the skin of the fish. This plate consists of a labyrinthine system of irregular spaces and tubules.

As a result of this preliminary examination, the growth was recognised to be most probably a hydroid colony of new type. Other small portions were detached and mounted, others again were cut into serial sections. Although the amount of material was very limited, and its state of preservation none of the best, yet it was found possible to elucidate the principal features of its structure. The material being so limited in quantity, in order to obtain sections of the male gonophore, it was found necessary to carry out the following procedure : A small portion of the growth was lightly stained and mounted *in toto* ; as this showed some good examples of the male gonophore, and no further material was available, the slide on which the specimen was mounted was placed upright in xylol. After a few hours the cover-glass became detached by its own weight, leaving the specimen adhering to the slide : the specimen itself soon after fell away from the slide. After

soaking it freely in fresh xylol for about six hours it was imbedded in paraffin and cut into sections. Sections so obtained seemed quite as good as others, treated in the usual way. Owing to the heat of Calcutta, high-melting paraffin had to be employed in making these sections. Portions of the colony were placed in paraffin of 55° C. melting point for half an hour; this interval of time was found to be long enough for complete penetration.

The Hydranth—

Each hydranth is a club-shaped body measuring about ·75 mm. in length in the contracted state. In internal structure it differs remarkably from other hydroid colonies, but it seems difficult to arrive at any other conclusion than that the form in question is a hydranth and part of a hydroid colony. It resembles the genus *Protohydra* (2) and the parasitic *Hydrichthys mirus* (3) in that it is entirely devoid of tentacles or any trace thereof; but apart from this, the internal structure, as seen in sections, shows some most unusual features.

The ectoderm is relatively thin and, owing perhaps to want of proper fixation, does not show much structure. The appearance it presents in section is that of a somewhat irregular layer of protoplasm, containing a single series of nuclei (plate xvii, figs. 1 and 4). This layer is easily distinguished from the mass of endoderm cells, which show peculiar structural features. Careful search failed to demonstrate the presence of nematocysts in this ectoderm.

The endoderm is, in these contracted specimens, very much lobulated, so that the central cavity, which can be clearly made out both in optical and actual section, usually takes a sinuous course. The opening of the central cavity at the distal end of the hydranth can be clearly seen, and there is usually a slight external depression at its site. The endoderm cells, which make up the bulk of the hydranth, are of a peculiar structure: they are ovoid or spherical and have well-defined outlines. After staining with hæmatoxylin a nucleus cannot be demonstrated in them, but each cell contains a large number of small spherical granules, arranged round the periphery with great regularity. These granules take the stain exactly like nuclei, and they are probably composed of chromatin and perform the functions of nuclei. These large cells do not actually line the central cavity, but are separated therefrom by a pavement epithelium—a single delicate layer of flat cells in which nuclei are easily demonstrable. This epithelium not only lines the central cavity but is continued outwards through the mass of the spherical cells and joins the peripheral ectoderm. Where it lines the central cavity, this epithelium is composed of one layer of cells, but where it passes out to join the ectoderm it is, like a mesentery, composed of two layers. This is clearly seen on examining favourable sections under a $\frac{1}{12}$-inch objective (fig. 4). As shown in figs. 1 to 3, the endoderm of the hydranth is divided by this epithelium into two separate parts,

The bilateral symmetry thus established is further emphasized by the presence of what appears to be a strand of muscle-fibres which occupies the central axis of each half. These fibrous strands are clearly seen in both longitudinal and transverse sections. They commence below, in the very base of the hydranth, which is largely made up of them, and pass upwards through the spherical cells of the endoderm nearly to its apex. Throughout their length they distribute fibres among the peripheral endoderm cells in the manner shown in figs. 3 and 4. Under a $\frac{1}{12}$-inch objective longitudinal sections of these structures show a fibrillated appearance which is well defined, and the individual fibres can be seen distributed between the spherical endoderm cells. These fibrils do not show nuclei. There can be little doubt that they have a muscular function.

The simple arrangement shown in the transverse section (fig. 1) in which the hydranth is divided into two separate halves, each of which contains a muscle-strand, was found in the proximal part of every individual examined in section, but in their distal parts the number of these "mesenteries" is increased. Some sections show three, others four or more. Figure 2 is of a somewhat oblique section showing four such mesenteries. At the base of the hydranth the specialised endoderm ceases abruptly in a sharply-defined line, which can be readily seen in optical section (pl. xvi, fig. 4). The central cavity is continued below into a tube of small dimensions composed of somewhat delicate cells. This tube, which usually has the form of a dice-box, its calibre being smallest in the middle of its length (fig. 4), opens into a long straight tube with thick walls composed of regular columnar cells. The other end of this straight tube opens into one of the irregular endodermal spaces of the cœnosarc.

The Basal Plate or Cœnosarc—

The basal plate is so closely attached to the skin of the fish that on removing a portion of it an outer layer of the fish's skin is often detached with it. In structure the plate is not the same throughout its whole extent. As a whole it is very like the attachment plate or cœnosarc of *Hydractinea* (4), but without the strong chitinous element so characteristic of that genus. Throughout most of its extent it is composed of two layers of ectoderm widely separated by irregular tubules and spaces with endodermal walls which communicate with one another freely and form a complex labyrinthine structure. The outer layer of ectoderm does not everywhere pass over this endodermal labyrinth in a smooth and unbroken fashion, but dips down between the layers of endoderm in places, and occasionally the cuticle is carried along with the ectoderm into the same situation. Although most of the cœnosarc has this complex structure, parts of it show the more primitive type consisting of an open meshwork of irregular trabeculæ, each of which is a tube composed of two layers—ectoderm and endoderm with an external cuticle.

Considerable difficulty was experienced in interpreting the structure of the basal plate, for although the histological detail was fairly well preserved, there was little or no difference in the appearance of the endodermal and ectodermal layers; both varied in thickness, to a great extent, in different parts. Figure 5 (pl. xvii), which was drawn with the camera lucida from a favourable section, shows the principal features in the structure of the cœnosarc. It will be noticed that the cuticle is relatively very thin, in some parts of the colony it is hardly recognisable.

Gonophores—

The colony shows both male and female gonophores. With hardly an exception, one gonophore is situated at the base of each hydranth. Careful examination shows, however, that the endodermal layers of the gonophores are not directly connected with the endodermal canal at the base of the hydranth, but spring from the irregular endodermal spaces of the neighbouring cœnosarc. This is shown in pl. xvi, fig. 4. The gonophores are of the closed type known as sporosacs. They show no traces of tentacles, radial canals or ectodermal invagination.

The female gonophore was only studied in optical section, but as its structure was much simpler than that of the male ones, a comprehensible plan of the structure can be made out after study by this means alone. Figure 5 shows the principal features of the structure of these organs. They are spherical bodies, measuring ·17 mm. in diameter, and are each attached to the cœnosarc near the base of a hydranth. Their endodermal contents, which arise from the cœnosarc and not from the special endodermal canal of the neighbouring hydranth, split into two layers on entering the gonophore. The outer of these layers forms an uninterrupted sheet, closely applied to the ectoderm ; the inner forms a spadix of characteristic shape. This spadix, the walls of which are, by invagination, composed of a double layer of endoderm, forms a globular body separated by a considerable space from the wall of the sporosac. There is an opening in one side of the spadix due to the invagination, so that in longitudinal sections it forms a characteristic C-shaped figure. Developing ova can be seen between the layers of the spadix : in at least two cases ova of larger size than the others can be clearly seen in the canal of the neck of the spadix. Perhaps this is a preliminary position before the ovum passes into the central cup-like hollow. When the surface of a large ovum is examined under a high power of the microscope, it shows a delicate hexagonal pattern, caused by the approximated ends of the long columnar cells of the spadix pressing on it. Ova more advanced than the one shown in fig. 5 were not found.

The male Gonophores—

While the part of the colony seen in fig. 3 showed female gonophores chiefly, other parts showed the male form. This is of about the same size as the female gonophore, but is shaped like a

pointed fir cone; it is more opaque than the female one, and consequently can only be properly studied in serial sections. Figures 6 to 8 show three of a series of such sections. The endodermal contents are more complex than those of the female form and do not seem quite the same in every case, but like that form there is a spadix which shows a more or less C-shaped figure in longitudinal section. No male gonophore was met with in a ripe condition; they mostly contained spermatoblasts.

Theoretical considerations—

In spite of the anomalous structure of the hydranth, this genus should, I think, find a place among the gymnoblastic hydroids, and a comparison with two hydroid genera, *Hydrichthys mirus* and *Stylactis minoi*, which are also parasitic on fish, leads to some interesting conclusions.

Stylactis minoi was described by Alcock in 1892 (5) and has been since found several times in Indian seas, always attached to the skin of the small rock perch *Minous inermis*. It is a typical hydroid in every way.

The peculiar form *Hydrichthys mirus* discovered in 1887 by Fewkes growing to the carangoid fish *Seriola zonata* at Newport, U.S.A., cannot be called a typical hydroid. It resembles the present genus very closely in some respects, in others it differs widely from it. *Hydrichthys* is described as follows by its discoverer:—

"The base of attachment to the fish is a flat, thin plate with ramifying tubes, by means of which the colony is fastened to the fish, and upon it separate clusters of sexual bodies (gonosomes) and filiform structures (hydranths ?) are united together."

The author compares this basal plate to that of *Hydractinea*, without the chitinous projections, and it is obviously very like that of the genus described here. *Hydrichthys*, however, has long arborescent gonosomes to which medusæ in all stages of development are attached. The fish, with its parasite, was kept alive in an aquarium and "thousands of these medusæ were raised." The medusæ swim freely, and each has four tentacles. The generative organs are therefore totally different from those of the new genus, in which these organs are represented by a few closed sporosacs, sessile on the basal plate. Turning now to the hydranth, the comparison between the two forms is of such interest that it seems well to quote Fewkes's account *in extenso*, especially as the nature of the hydranth of *Hydrichthys* is regarded somewhat doubtfully by that author:—

"In addition to the botryoidal clusters of gonosomes there also arise from the basal plate by which the colony is fastened to the fish, long, flask-shaped bodies, recalling in their external form the tasters of the Siphonophores. These bodies, like the gonosomes, arise from the upper walls of the basal plate of tubes attached to the body of the fish. Like the gonosomes they are numerous in the hydroid colony. The filiform bodies are elongated flask-shaped

structures, of about uniform size throughout, arising from different points of attachment at the base from the gonosomes They are, like the gonosomes, destitute of appendages, but they probably have an opening at the free extremity. The walls of the filiform bodies are composed of an outer thin and an inner thickened layer. There is a cavity within. The walls are dotted with pigment spots, which are especially numerous around the free extremity. In one of these filiform bodies there is a spherical mass, which resembles half-digested food. It is doubtful whether this mass is food. The free end of the filiform bodies is sometimes trumpet-shaped, but ordinarily rounded, the opening being concealed by the contraction of the lips. The bodies of the filiform structures move backwards and forwards on their attachments, and are sometimes spirally coiled in a single turn. They recall in general appearance the spiral zoöids of Hydractinia and the tasters of Siphonophora, but, unlike either of these structures, have an orifice at their free end. They are thought to have close likenesses to the ' central polyp ' of Velella."

The difficulty of interpreting the nature of the flask-shaped bodies of *Hydrichthys*, becomes lessened in the light of the new genus *Nudiclava*; and the present writer is strongly of the opinion tnat the flask-shaped bodies of the former and the club-shaped bodies of the latter are both hydranths devoid of tentacles. Furthermore, that it is by means of these hydranths that the colonies obtain their food. In his description of *Hydrichthys*, the author expresses the following view of its mode of nutrition, a view expressed, necessarily at that time, somewhat doubtfully :—

" The absence of tentacles, or organs the function of which is the capture of food, would seem to deprive *Hydrichthys* of those means of capturing and drawing food to the mouth which are almost universal among fixed hydroids. Possibly in its parasitic life the hydroid obtains its sustenance from the fish on the sides of which it lives."

The close resemblances in the structure of the two forms now under comparison make it most probable that, whatever the mode of nutrition, it is of a similar nature in both cases. It seems from the following observations, that the genus *Nudiclava* does not obtain sustenance from the fish to which it is attached. It was previously mentioned that on removing a portion of the colony, an outer layer of the fish's skin was removed with it. Part of this was separated from the hydroid and examined microscopically ; it was found to be quite intact ; there was no sign of perforation by any radical organs. In the absence of any such special organs, it does not seem likely that the fish would be so accommodating as to diffuse nutriment, uncompelled, through its own skin into the tissues of the hydroid.

How, then, do these colonies obtain their food ? The assumption is made here, that *Hydrichthys* and *Nudiclava* obtain nutriment in the same way. The absence of tentacles in these

parasitic hydroids deprives them of the power of catching their prey in the manner common to all other hydroids. Their mode of life is identical in both cases. Both were found adhering like a tuft to the skin of small fishes which were caught near the surface of the sea. Judging from Fewkes's well-executed illustration of the fish with its parasite, the superficial appearance of both would be very similar.

From the relatively large size of the hydranths of *Nudiclava* it is difficult to suppose that they are degenerate bodies of little functional value to the colony. The peculiar features of the endoderm of *Nudiclava*, the well-developed muscle strands, and the special pavement epithelium lining the central cavity, suggest that the methods by which these hydranths obtain food is as follows :—

It is supposed that in their natural state, they assume, by expansion of the mouth, the shape of a wide-spreading funnel (pl. xvi, fig. 2). As the host speeds through the surface waters, the small members of the plankton, such as copepod nauplii, etc., must come within the grasp of these funnel-shaped mouths. The well-developed muscles, situated in the endoderm, which are peculiar to the genus, point to a special power of rapid and forceable retraction, an act which would be very necessary when anything comes within the grasp of the funnel. The special pavement epithelium is perhaps developed as a protection and covering to the endodermal cells which would otherwise be exposed to the water, when the mouth is gaping widely.

We can illustrate the possible efficiency of this mode of food-capture thus : It is not unlikely that the hydranth, which measures ·75 mm. in length when completely contracted, could expand its mouth into a circle ·5 mm. in diameter The hydranths in the colony, which number about 50, would together present an area of about 10 square mm., which is at least as great as that of the gaping mouth of the fish host itself.

In the case of *Hydrichthys*, the hydranths, from their size, must also be considered important members in the colony. And there is some evidence in Fewkes's account that it obtains its food in this manner. Thus we read above, that the free or oral ends of the filiform bodies of this genus are sometimes trumpet-shaped, and one of these bodies contained a mass resembling food. *Hydrichthys* was kept alive in an aquarium for some time, but it would have been impracticable to examine the colony without catching the fish, a procedure which would cause at least partial contraction of the parasite : consequently it would be very difficult to observe the state of the oral apertures in their expanded condition, and the fact that some few were observed to be trumpet-shaped, makes it most likely that all would possess, in their expanded condition, a wide funnel-shaped mouth.

Let us pass now to a consideration of the third genus of hydroids which is found on fish. The case of *Stylactis minoi* on the fish *Minous inermis* is quite different from that of the others. The hydranth has a well-developed circle of long

tentacles and a hypostome, and clearly catches its food like other hydroids. The hydrophyton is in the form of a creeping stolon which may almost entirely cover the fish. These differences point to a different mode of life from the other parasitic forms. An explanation of these differences seems to be found in the different nature of the fish. *Minous inermis* has been found many times in the Bay of Bengal in company with such teleostean genera as *Uranoscopus*, *Platycephalus*, *Lophius*, *Pterois*, which are essentially bottom fish: whereas the fish hosts of the other two genera under discussion were both captured in the tow net. The extent to which the Minous is coated with the hydroid growth, caused its discoverer to hold the opinion that the hydroid must benefit the fish by concealing it to some extent. On this assumption, we can imagine the Minous remaining still for considerable periods of time during which the *Stylactis* could pursue its vocation of catching prey, in the fashion of other hydroids which are attached to rocks.

We see, therefore, that whereas the modes of life of *Hydrichthys* and *Nudiclava* seem essentially similar, they both differ considerably in this respect from *Stylactis minoi*: although all three forms appear to be hydroids parasitic on small teleostean fish.

Affinities—

Comparison with other more normal hydroid types has not led to any definite conclusions as to which particular type this new genus may have been derived from. It undoubtedly resembles the abnormal genus *Hydrichthys* in some ways, in the structure of the basal plate and the absence of tentacles, and in its mode of life generally. Here the similarity stops, and the two genera are separated by the great differences in the gonophores, and in the internal structure of the hydranth, which in *Hydrichthys* is quite of the usual hydroid type. The conclusion arrived at is that the similarities have been acquired in adaptation to the circumstances of the peculiar life which are alike in both cases; while the differences are due to the fact that the ancestors of both forms which took to this parasitic life were essentially different, especially as regards the nature of the gonophores. The genus *Nudiclava* has, however become more specialised than *Hydrichthys*, as the result of this mode of life.

Stylactis minoi presents a third example of a hydroid, which has scarcely been modified at all by its association with a fish. Being attached to the skin of a sluggish rock-haunting species, it is capable of obtaining food in the same manner as most other hydroids. Consequently its structure has not been modified.

Definition of the genus—

The hydrophyton is a compact plate-like structure composed of an irregular labyrinthine cœnosarc with very poorly developed perisarc.

The hydranths are claviform when contracted, and totally devoid of tentacles ; their cavities are lined by a special layer of pavement epithelium, and they contain well-developed muscle-fibres among the endoderm.

The gonophores are closed sporosacs, without radial canals, tentacles, or ectodermal invaginations.

The species is parasitic on the skin of a surface-swimming fish.

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EXPLANATION OF PLATE XVI.

FIG. 1.—The fish, *Monocanthus tomentosus*, with the parasite attached: drawn from the spirit specimen, natural size.

FIG. 2.—Diagram of the supposed appearance of the same, when the parasite is fully expanded: viewed from above and enlarged.

FIG. 3.—A portion of the colony showing eleven hydranths and gonophores attached to the disc: drawn from mounted specimen under $\frac{2}{3}$-inch objective with the camera lucida. Internal structure of the disc represented diagrammatically.

ST = "Straight tube."

FIG. 4.—View in optical section of a portion of the same, more highly magnified, showing the lower part of a single hydranth and a gonophore.

L = The lower limit of the specialized endoderm of the hydranth; this line is very clear in the specimen, for the cells above it (endoderm) are somewhat opaque and dark.

CT = The "connecting tube" which communicates on the one hand with the cavity of the hydranth and on the other with the "straight tube."

The connecting tube lies within what appears to be a closed spherical chamber, the thin walls of which are reflected on to the tube itself. This chamber was seen in the case of all hydranths available for examination both in optical and actual section, but the quality of the material was not sufficiently good to enable one to elucidate this structure with certainty.

ST = The "straight tube" which is embedded in the disc. One end of it communicates with the "connecting tube," the other opens into one of the cavernous spaces of the disc.

The curved dotted lines at the upper and left-hand part of the figure are to indicate an appearance due to "muscle fibrils" lying among the specialized endoderm cells.

FIG. 5.—Optical section of a female gonophore showing two ova. On the left side of each ovum the cell-outlines were indicated, but the "hexagonal pattern" mentioned in the text has been lost in the reproduction of the figure.

FIGS. 6, 7 AND 8.—Three of a series of sections through a male gonophore. Cell-outlines and spermatoblasts have been omitted in figs. 6 and 7, in order to show the arrangement of the endodermal layers with greater clearness. In fig. 8 the spermatoblasts and cell-outlines of the layers are indicated, but the detail is somewhat diagrammatic. The spermatoblasts are in places merged into the cells of the endodermal layers, but the continuity of the latter can be traced with assurance: drawn with camera lucida under $\frac{1}{6}$-inch objective.

PLATE XVI.

Fig. 1.

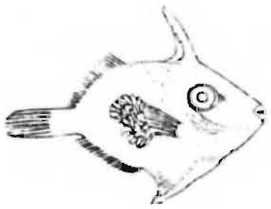


Fig. 2.

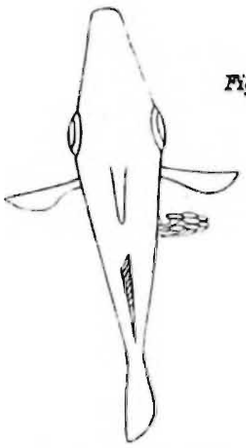


Fig 3.

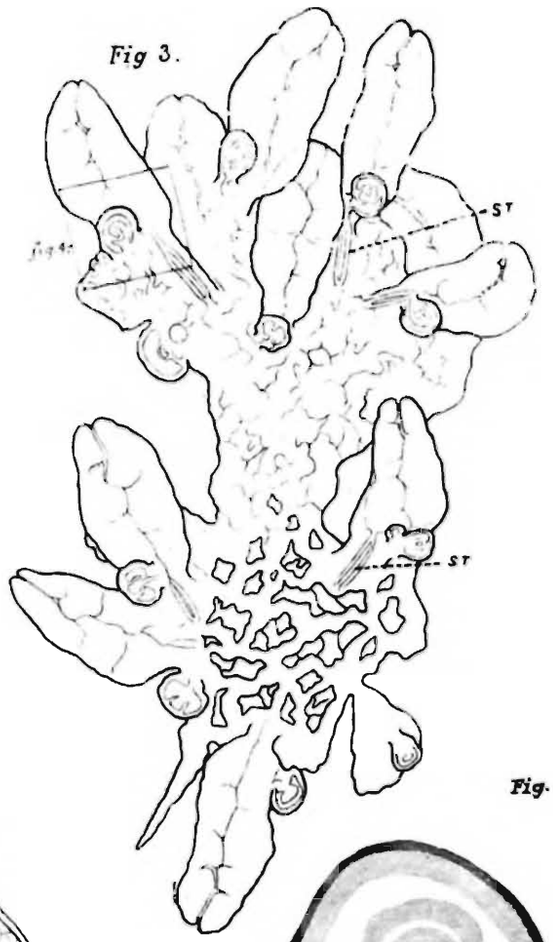


Fig. 4.

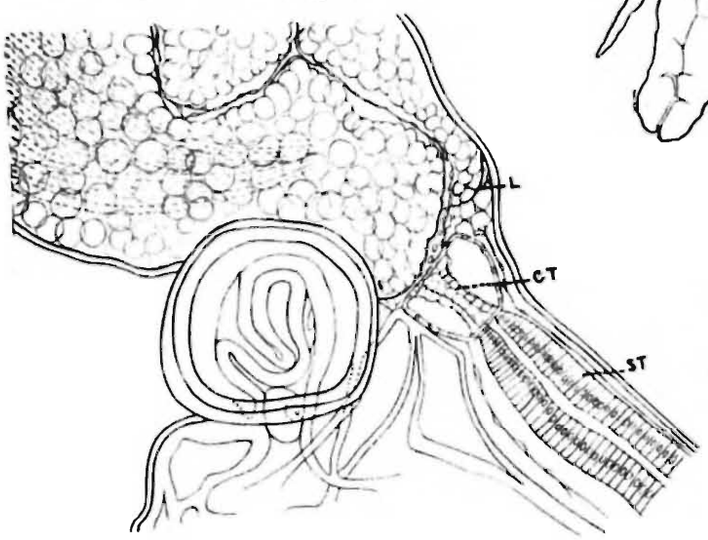


Fig. 5.

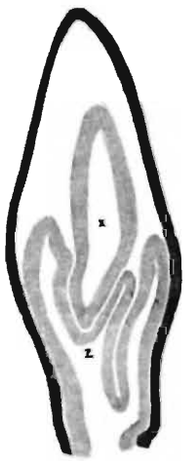


Fig. 6.

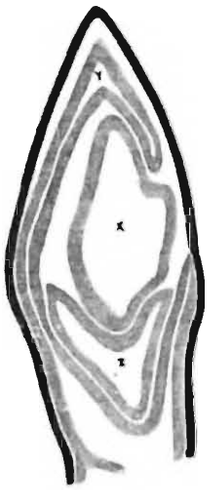


Fig. 7.

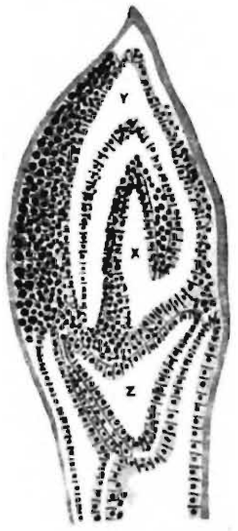


Fig. 8.

EXPLANATION OF PLATE XVII.

FIG. 1.—Transverse section of the lower part of a hydranth.
CC = Central cavity. M = Muscle strands.
The " mesenteries " which unite the lining of the central cavity to the ectoderm lie in a shrinkage space.

FIG. 2.—A somewhat oblique section at a higher level through another hydranth. Four " mesenteries " are seen ; those on the left are cut obliquely.

FIG. 3.—A longitudinal section of a hydranth through the oral aperture.
The outlines for figs. 1, 2 and 3 were drawn under $\frac{1}{6}$-inch objective with the camera lucida. The muscle fibres are represented conventionally by dots and black lines. The real appearance is of a delicate fibrillation more accurately portrayed in fig. 4.

FIG. 4.—A small portion of a section from the same series as the one shown in fig. 2 under $\frac{1}{12}$-inch objective.
Ec = Ectoderm. CC = Central cavity. M = Muscle fibrils.
This figure shows that each " mesentery " is composed of two layers of delicate, nucleated cells which separate to form the central cavity. These features are best seen in the mesentery on the right ; the one on the left being cut somewhat obliquely. The characters of the " specialized endoderm cells " are shown ; the well-marked outlines, the peripheral granules, and the absence of nuclei.

FIG. 5.—A small portion of the disc in section under $\frac{1}{12}$-inch objective.
On the right a " straight tube " is seen opening into the common spaces of the disc.
The ectoderm is seen dipping down among the other layers : this is not usual.

Fig.1.

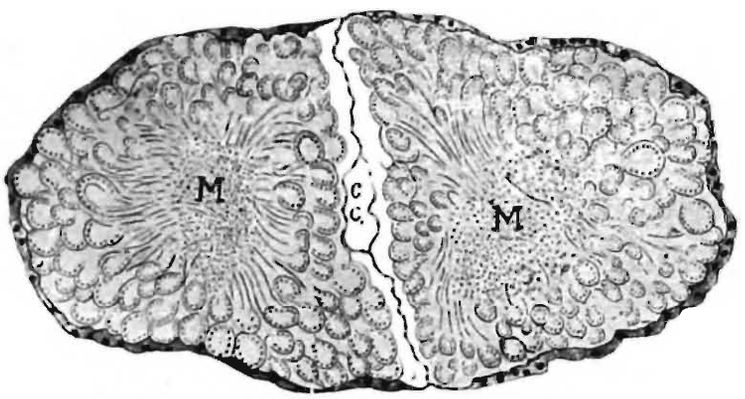


Fig. 2.

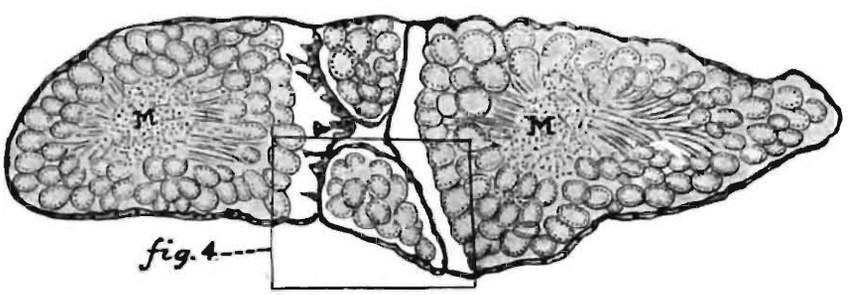


Fig. 4.

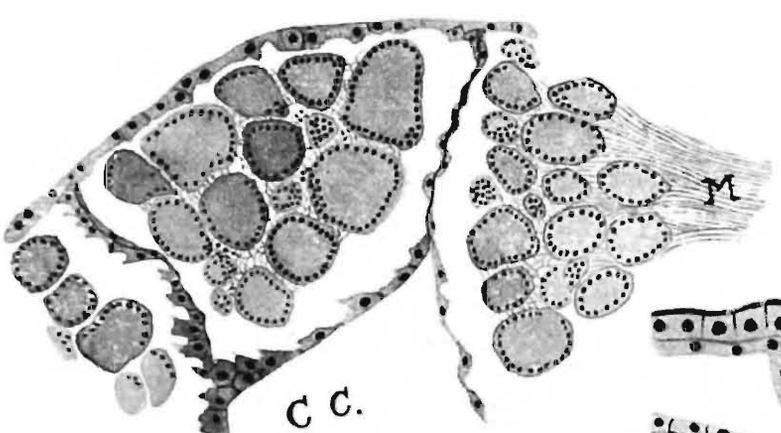


Fig.3.

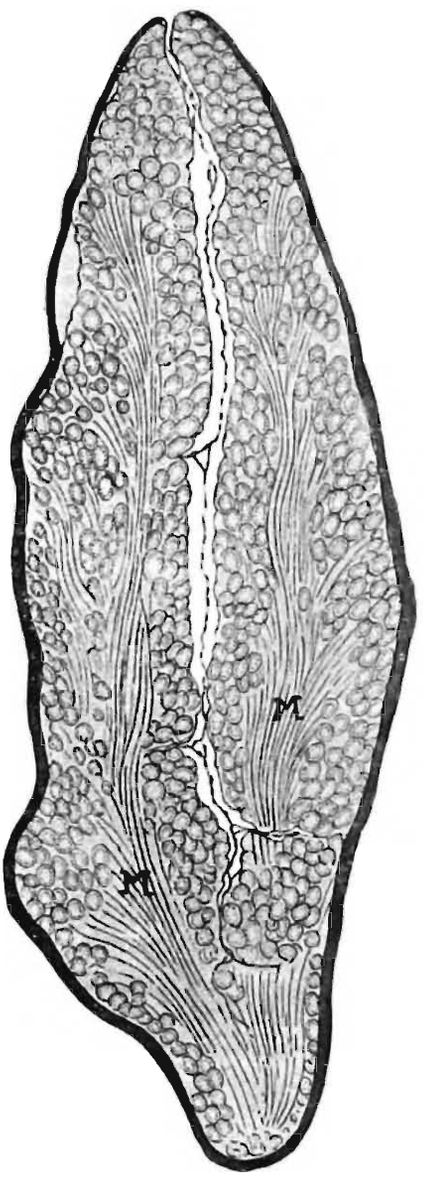
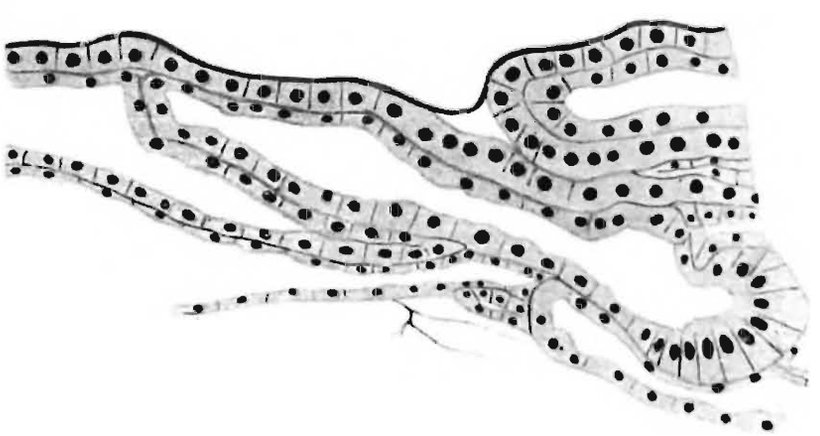


Fig 5.



XXIV.—PRELIMINARY DESCRIPTIONS OF THREE NEW *NYCTERIBIIDÆ* FROM INDIA

By P. SPEISER, *M.D.*

From the collection of the Indian Museum I recently examined three *Nycteribiidæ* which I considered to be new. But one of these species has already been mentioned in literature. Rondani gives in the *Ann. Mus. Genova* (1878), vol. xii, a short description of a parasite of the bat *Rhinolophus euryotis*, Temm., from Amboina, which he considered to be *Nycteribia jenynsii*, Westw. In my dissertation "Über die Nycteribiiden, Fledermausparasiten aus der gruppe der pupiparen Dipteren" (*Arch. Naturges.*, vol. lxvii, p. 11, 1901), I have demonstrated that *N. jenynsii*, Westw., is a *Penicillidia*, Kol. I had examined Rondani's very badly-preserved specimen, and provisionally determined it as *N. minuta*, Wulp. This latter name, as I have since learned, is a mere synonym of *Cyclopodia ferrarii*, Rond., and I am now very pleased at having before me a good specimen of the parasite of *Rhinolophus euryotis*, Temm., also from Amboina.

I give here a short description of it under the name *Nycteribia* (*Acrocholidia*) *phthisica*, sp nov., together with short descriptions of the two other new species. The detailed descriptions of these will be published in a larger monograph on this family, which I have in preparation. It would be of the greatest interest to examine more species from India of this extraordinary family, especially with good notes on the species of bats which harbour them. There are but very few known from East India, and there is a wide gap between the better known regions of the Sunda Archipelago and the African coasts, with Madagascar. We must expect some very interesting discoveries from the intermediate regions.

Nycteribia (*Acrocholidia*) *phthisica*, sp. nov., ♀

Head and thorax without characteristics, the breast being almost twice as long as broad, being thus long and narrow (phthisic!). The lateral quarters of the basal tergite are bare, the middle bristly. In the middle of the dorsum is an irregular horizontal row of longer bristles; above the anal segment, a more chitinized rectangular shield, which bears three very long bristles on each of its rounded hind corners. The basal sternite has a linear hind margin, with a ctenidium of fine spines. Before the anal segment lie two band-like segments with wavy hind margins, the former of which has two pairs of bristles on each side of the middle line, and three on each side at the end; the posterior has but two separate bristles on each side of the middle, and but two

on each side at the end. The plate above the genital opening bears a group of three bristles on the side lobes, and a single one a short distance before these. Long. corp. 2·3—2·4 mm.

Basilia bathybothyra, sp. nov., ♂

Calcutta, 6th April 1905.[1] Head without characteristics. The thorax has conspicuous deep grooves above the halteres; the breastplate is somewhat broader than long. The second tergite has a broad middle lobe slightly produced backwards. All the tergites bear on the hind margins, scattered rows of thin, moderately long bristles; on the fourth, fifth and sixth tergite groups of bristles of double length occur which beset the margin a short distance each side from the middle. The basal sternite is large and long, its ctenidium having short, thin teeth; the succeeding sternites are very short, except the fourth and fifth which are slightly longer. The hind margins of these are slightly wavy in the middle, and bear there a little group of very short, black spines, or spine-like knobs. The following ones are thin, slightly curved, beset with bristles.

Cyclopodia amiculata, sp. nov., ♀

Calcutta, on *Taphozous longimanus*. This is the most slender *Cyclopodia* I have seen, its length being 2·1 mm.; the single legs 3 mm.: the latter are thin, especially the femora, by which this species differs from the two other *Cyclopodiæ*. The abdomen is very singularly shaped. Besides a basal tergite, it shows but two broad and long tergites, and an anal segment. The posterior tergite bears on its anterior half a pair of very pistilliform styles, with bristly tips, as in the ♀ of *Nyct.* (*Stylidia*) *biarticulata*, Herm. The hind margin has, in the middle, a deep triangular notch, on the inner margins of which are a few bristles. The basal sternite bears a very dense linear ctenidium of fine spines; the ends of all the following segments are well marked by rows of bristles, the remaining surface (except in the second sternite) being bare

[1] [On *Vespertilio muricola*.—ED.]

XXV.—ANNOTATED CATALOGUE OF ORIENTAL *CULICIDÆ*

By E. BRUNETTI.

INTRODUCTION.

IN presenting this Catalogue I desire to mention that its preparation has been entirely a matter of compilation, and that I do not hold myself responsible for the validity of either the genera or species contained herein As a matter of fact, not having studied the *Culicidæ* except to a most limited extent, I should not feel competent either to support or contest the views of such experienced students of the group as those upon whose labours the present work is, in the main, compiled. A casual examination, however, of the slender characters upon which many of the recent genera and species are established, coupled with the fact that a large number of the latter have been described from single specimens only, leads me to the presumption that a few more years' careful study of the family is more likely to result in the reduction than otherwise of the total number of what to-day are regarded as distinct species. This is, of course, quite apart from new species to be hereafter discovered.[1]

The object of the Catalogue is to provide a systematic list of the mosquitoes recorded from the Oriental Region, and therefore, the comments are confined to questions of synonymy, or notes of general interest, and do not touch upon either of those vast sides of the subject, the biological and the medical. Brief information regarding the life-history, if known, and bare statements regarding the power, or otherwise, of any particular species to convey malaria, will be found; but detailed reports of experiments or researches of an entirely medical or bacteriological nature, would be out of place in a purely systematic list. Mr. Theobald's excellent monograph of this family provides a lengthy list of works and essays, on the medical aspect, and nearly all the recent works of any size afford extensive information respecting life-histories, generally with copious illustrations.

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[1] The collection of the Indian Museum in this group has not yet been worked out, except as regards *Anopheles*, and a few species amongst the other genera. It is of considerable extent, and is being rapidly enlarged by continual acquisitions, and at present is being worked out by Mr. Theobald.

I may add here that during my three years' sojourn in the East I have myself collected upwards of 1,500 specimens of *Culicidæ*.

A general study of this family may be obtained from Robineau Desvoidy's "*Essai sur les Culicides*" (1827), and, more recently Ficalbi's "*Revis. sistem. di famiglia d. Culicidæ*" (1896). Concerning exclusively oriental species, the following list may be found useful, in which is included a limited number of general works on the family, which, by reason of their importance, the student would do well to consult, even if interested only in oriental species.

LITERATURE ON ORIENTAL CULICIDÆ.

Adie, Major, 1905. "Mosquitoes and Malaria in the Ferozepore District." Ind. Medic. Gaz. xl, 5.

Banks, Ch. S., 1906. "A List of Philippine *Culicidæ*, with descriptions of new species." Phil. Jour. Sci. i, pt. 2, pp. 977 to 1005.

Id., 1906. "A new genus and species of *Culicidæ*." Loc. cit. i, pt. 2, p. 780, with plate.

Blanchard, R., 1905. "Les Moustiques."

Christy, C., 1900. "Mosquitoes and Malaria, Summary of Knowledge on the subject."

Ficalbi. (This author's papers are not on Oriental species, but will be found useful.) Bull. So. Ent. It. chiefly in vols. xxi, xxii.

Id. "Revisione sistematica di famiglia della *Culicidæ* Europee."

Giles, 1900. "Handbook of Gnats and Mosquitoes.' 1st Ed.

Id., 1902. 2nd Ed. of same work, much enlarged.

Id., 1901. "Six new species of *Culicidæ* from India." Entom., xxxiv, 192.

Id., 1901. "Descrip. of 4 new spp. of *Anopheles* from India." Ent. Month. Mag., xxxvii, 196.

Id. 1904.[1] Jour. Trop. Med., vii.

James, Capt. S. P., 1889. "The collection of Mosquitoes and their Larvæ." Ind. Medic. Gaz., xxxiv, No. 12.

Id. id., 1902. "Malaria in India." Sci. Mem. Offic. Medic. and Sanit. Dep. Gov. India, No. 2.

James and Liston, 1904. "The *Anopheles* Mosquitoes of India."

Liston, 1901.[1] Ent. Month. Mag., xxxvii.

Id., 1901.[1] Ind. Medic. Gaz.

Ludlow, Miss C. S., 1904. "Concerning some Philippine Mosquitoes." Can. Ent., xxxvi, 69.

Id. id., 1904. "Mosquito Notes" No. 1, loc. cit., 233; No. 2, l.c., 297.

Id. id., 1905. Id. id., No. 3, l.c., xxxvii, 94, 129; No. 4, l.c., 385.

[1] I have been unable to obtain the names of the papers thus referred to.

Neveu Lemaire, 1902. "Classification de la famille de *Culicidæ*."

Patton, W. S., 1905. "The Culicid fauna of the Aden Hinterland." Jour. Bomb. Nat. His. So. xvi, 623 to 637 with 4 plates and map.

Robineau Desvoidy, 1827. "Essai sur la tribu des *Culicidæ*." Mem. So. l'Hist. Nat. Paris, iii.

Theobald, F. V., 1900. "Report on the collections of Mosquitoes received at the British Museum."

Id., 1901. "Monograph of the *Culicidæ* of the World," vols. i, ii.

Id., 1903. Id., vol. iii.

Id., 1902. "A short descr. of the *Culicidæ* of India; with descr. of new spp. of *Anopheles*." Proc. Roy. So. Lond., lxix, 367 to 394 with 1 plate.

Id., 1902. Jour. Trop. Medicine, v.

Id., 1903. "New *Culicidæ* from the Federated Malay States." Entom. xxxvi, 256.

Id., 1904. Id. (continuation). Entom., xxxvii, pp. 12, 36, 77, 111, 163, 211, 236.

Id., 1905. "Some new Mosquitoes from Ceylon." Jour. Bomb. Nat. His. So., xvi, 237 to 249 with 2 plates.

Id., 1905 "A catalogue of the *Culicidæ* in the Hungarian National Museum; with desc. of new gen. and spp." Ann. Mus. Hung. iii, 61 to 120, with 4 plates.

Id., 1905. Genera Insectorum; Fascicule 26. *Culicidæ*.

Mr. Theobald's "Monograph of the *Culicidæ* of the World" (in 3 vols.), from its magnitude holds prior place in the literature of this family. Volumes i and ii appeared in 1901, and contained, besides about 400 pages each of text, liberally augmented by figures, 37 plates (i to xxxvii) (bound up in a separate volume), each plate giving coloured figures of the full insects of four species. Five additional plates marked A to E gave photographic reproductions of wing-scales. At the beginning of vol. i is shown how to mount and examine a mosquito. The first 60 pages give endless information regarding structure, life-history, food, habits, pairing, hybernation, natural enemies, geographical distribution, etc. From p. 84 the malarial aspect of the subject is treated of. On p. 97 is a synoptic table of sub-families and genera followed by a list of the world's species (up to 1901); those present in the British

[1] I have been unable to obtain the names of the papers thus referred to.

Museum collection being marked. Further lists of species follow, arranged according to their geographical distribution. Volume iii (1903) gives 17 more plates of photos of wings and wing-scales; the last two, however, being of larvæ and pupæ.

In Fascicule No. 26 of the "Genera Insectorum" (1905), Mr. Theobald gives a table of sub-families, admitting eight, as follows: *Anophelinæ, Megarhinæ, Toxorhynchitinæ, Culicinæ, Joblotinæ, Ædeomyinæ, Heptaphlebomyinæ* and *Corethrinæ*. Sixty-seven genera (described) are recognised, containing slightly over 500 species, being the total number known including a few new ones. He also gives 2 coloured plates showing 24 full insects.

Lieutenant-Colonel Giles's work, "Handbook of Gnats, or Mosquitoes" is a valuable one. First published in 1900, it attained a second edition in 1902. Chapter i (2nd Ed.), concerns the position and terminology of the *Culicidæ*; chap. ii, collecting and preserving; chaps. iii to vi, the anatomy of the larva, pupa and adult, with many figures; chap. vii, life-history. Plate vi gives photos of living *Anopheles* and *Culex* resting on glass. Conditions influencing prevalence is treated of on p. 152, and a valuable diagram is fig. 38 (facing p. 256), giving a key to generic distinctions based on the characters of the scales.

Although confined to *Anopheles* (sensu latu), Messrs. James and Liston's "*Anopheles* Mosquitoes of India" is also of great value, if only for the splendid plates. The earlier part deals with general notes, eggs, larvæ (figured), habitats, collecting, mounting, preserving, larva-mounting, classified table of *Anopheles* larvæ; distribution and classification of Indian species, and a very excellent diagrammatic plate showing the structure of the various parts of the adult, with their technical terms. The work terminates with 14 other splendid plates (tinted) of large size, illustrative of that number of Indian species.

Mr. Banks' catalogue of the Philippine *Culicidæ* is most useful. Many of the Oriental species, if correctly determined, have an excessively wide range. From Africa (South and West Coast), Mauritius, and Australia, from China, and from Europe, certain species are regarded as identical with forms indigenous to the Orient. It will be noticed that I have included the few Arabian species mentioned in Mr. Patton's paper on the Aden hinterland Culicid fauna; this is because, owing to their wide range of distribution, any of those species may easily occur in India, and not from a desire to include Arabia in the Oriental Region.

To avoid repetition in the catalogue, I append here a brief list of such localities as constantly occur, with particulars added.

Bakloh	4,500 to 5,000 ft. Punjab, Lower Himalayas.
Bhim Tal	4,500 ft. Kumaon Dist., Western Himalayas.
Canara District	On Goa Frontier, W Coast of India, S. of Bombay.
Cavite	Close to Manila (Luzon, Phil. Islands).
Coonoor	6,000 ft. Nilgiri Hills, Madras Presidency.

Dacca	Eastern Bengal.
Dindings	Straits Settlements.
Ellichpur	Berar, Central India.
Ferozepore	Punjab.
Fort McKinley	Luzon, Phil. Islands.
Goa	District on West Coast of India.
Gonda	N. India, S. of Nepal.
Jalpaiguri	N. Bengal, a little south of Darjiling.
Jeypore	State in Madras Presidency.
Jhansi	North-West Provinces, India.
Jolo Island	Philippines.
Karachi	City on extreme West Coast of India, near Baluchistan.
Karwar	Coast Town, Bombay Presidency.
Kuala Lumpur	Capital of Selangor State (Federated Malay States).
Kurseong	5,000 ft. South of Darjiling.
Lushai Hills	On the N.-E. Indian Frontier of Assam.
Makerian	Hoshiarpur District, Punjab.
Mian Mir	Punjab, about 6 miles from Lahore.
Mussoorie	6,000—7,000 ft. Punjab Himalayas, near Simla.
Nagpur	District in Central Provinces, India.
Naini Tal	6,400 ft. Kumaon Dist., W Himalayas.
Negros (Negros Occidental)	Island in the Philippines.
Nilgiri Hills	Madras Presidency.
Old Calabar	West Coast of North Africa.
Orissa	East Coast India.
Pampanga	One of the Philippine Islands.
Pangasinan	One of the Philippine Islands.
Peradeniya	Ceylon.
Perak	Federated Malay States.
Port Canning	30 miles from Calcutta, on Matla River.
Purneah	North Bengal.
Quilon	Coast town in Travancore State, extreme S. of India.
Ranikhet (Reneghat)	4,000 ft. North-West Provinces, India.
Rizal	Near Manila.
Selangor	Federated Malay States.
Shahjahanpur	North-West Provinces, India.
Shaohyling	China.
Simla	7,000 ft. Western Himalayas.
Sylhet	District in Assam ; adjoining Darjiling.
Taiping	Capital of Perak Federated Malay States
Trincomalee	(Hot Wells) East Coast of Ceylon.

N.B.—In Messrs. James and Liston's "*Anopheles* Mosquitoes of India," their references to Jeypore I infer to relate to that city and State in the Madras Presidency, from their spelling of the name.

There is, however, another town and state of the same name, in the Rajputana District of N.-W. India, but this latter place is usually spelt Jaipur.

N.B.—In Mr. Theobald's Monograph, the following data appear, attached to a number of species: "Perak (Wray), 22nd November 1899 and 21st December 1899." As it is not obvious whether the dates refer to two separate days only, or are intended to include the intervening period between them, I have omitted them from my catalogue.

It will be seen that I have admitted four sub-families only,—*Anophelinæ*, *Culicinæ*, *Ædeomyinæ*, and *Corethrinæ*,—and I am strongly inclined to the opinion that the first two would be in every way sufficient. It has not been considered necessary to include every reference known, and cases where simply the name of a species is mentioned, have always been avoided. It has, however, been my object to include all possible diagrams or plates, and to give all the dates and localities available.

I desire to express my obligations to Dr. Annandale of the Indian Museum for his permission to use the Museum Library, without which the compilation of this catalogue would have been impossible.

CATALOGUE.

Sub. Fam. **ANOPHELINÆ.**

ANOPHELES Meig., 1818. (sensu strictu)

Sys. Besch., i, 10; pl. x, 5, 6.

Macq.	1834,	Hist. Nat. Dip., i, 32.
Wlk.	1848,	List Dip. Brit. Mus., i, 9.
Sch.	1864,	F. Austr., ii, 624.
Wulp	1877,	Dip. Neer., 329.
Skuse	1889,	Pr. Linn. So., N.S. Wales, p. 1751
Ficalbi	1896,	Bull. So. Ent. It., 221.
Theob.	1901,	Mon. Culic., i, 115 (sensu latu).
Id.	1903,	Loc. cit., iii, 11 (sensu stricto).
Giles	1902,	Handbk., 2nd Ed., 283 (as restricted by Theobald); table of spp. p. 289.
Theob.	1902,	Proc. Roy. So. Lond., lxix, 368; table of Indian spp.
Theob.	1905,	Gen. Ins. Fasc. 26, p. 6.

Giles in "Handbook," 2nd Ed., 283, gives as a reference of "*Anopheles* as restricted by Theobald," Theob. Mon. Culic., i, 115; but this is incorrect. That reference is of the genus in its wide (Meigen's) sense; as Theobald had not created his other genera till 1902. All the *Anopheles* in the first volume of the Monograph are placed under "*Anopheles*" genus. Theobald's first reference in that work to the restricted genus is in vol. iii, p. 11. Most of the new genera were published in the "Jour. Trop. Med." (1902), vol. v.

A vast amount of information on the life-histories and habits of the species of this genus may be obtained from the recent works. Mr. Theobald, in Monog. Culic., i, 115, gives general information; a list of districts from which various species of *Anopheles* have been received and recorded by the British Museum. On p. 118 is a map of the geographical distribution of the genus, on p. 120 a synoptic table of the world's species up to 1901. In vol. iii, p. 107, is a list of species arranged according to the countries they inhabit; on p. 1 a chart, comparing the relative frequency of *Anophelina* and *Culicina*. Plate v gives wing-scales of *Anophelina*; p. 14 the differences between the ova and larvæ of the two groups *Anophelina* and *Culicina*.

1. **A. aitkenii** James in Theob., 1903.

Theob. Mono. Culic. iii, 22 ♀

James and Liston, Anoph. Mosq. Ind. 119, pl. ix, 3, wing-scales; pl. xiii, larva figs. and wing.

LOCALITIES: Goa Frontier [*Aitken*] Karwar [*Aitken, Dr. Cogill*].

2. **A. arabiensis** Patton, 1905.

Jour. Bomb. So., xvi, 623 ♂ ♀; pl. A, wing, palpus, egg.

"The commonest species in the district" (Aden hinterland) [Patton].

The larva breeds in pools, streams and wells, apparently breeding at different times of the year in different localities.

The adult is certainly a malaria-transmitter, and, as far as the writer (Patton) knows, is the only certain one under natural conditions in this district.

LOCALITY: Aden hinterland [*Patton*].

3. **A. dthali** Patton, 1905.

Jour. Bomb. So., xvi, 627 ♂ ♀; pl. A, wing, palpus, egg.

A free biter, and probably a malaria-carrier; found breeding all round the native camps (alt. 5,000 feet).

LOCALITY: Aden hinterland [*Patton*].

4. **A. gigas** Giles, 1901.

Ent. Month. Mag., xxxvii, 196 ♂ ♀

Theob. Mon. Culic., ii, 308 ♂ ♀

James and Liston, Anoph. Mosq. Ind. 118 (Theob.'s desc. copied).

Giles Hdbk., 2nd Ed., 316 ♂ ♀; pl. x, 2, wing ♂ ♀

Types in British Museum.

The larva appears to prefer clear, shallow water, and the species is said to be not rare in the hills, although I can only find one definite reference.

LOCALITY: Coonoor (5,000 to 6,000 feet) in the Nilgiri Hills [*Price*].

5. A. immaculatus Theob., 1903.

Mon. Culic., iii, 23 ♀

James (1902) Sci. Mem. Ind. No. 2, 35.
James and Liston, Anoph. Mosq. Ind., 120.

This species was *named* by James in the "Sci. Mem. Ind." (1902), but *not described* there, as the words "wings entirely unspotted, legs unbanded" cannot be considered a description. Theobald first *described* it in his "Monog., iii, 23" from a single perfect ♀, adding as a locality "India, evidently from Goa." However, in James and Liston's "Anoph. Mosq. Ind.," they say (p. 120) "Mr. Theobald says the specimen is evidently from Goa, and that it was given him by Capt. Liston. This is incorrect. It was captured at Ennur, a small village on the East Coast, about ten miles from Madras, and sent to Mr. Theobald by Dr. Stephens." The ♂ is unknown; it is distinct from all other *Anopheles* by the unspotted, yellowish wings, and will probably require the erection of a new genus.

LOCALITIES: Ennur (East Coast, near Madras) [*James and Liston*].

6. A. lindesayii Giles, 1900.

Hdbk. Gnats, 1st Ed., 166 ♀

Giles l.c., 2nd Ed., 323 ♀; pl. x, 8, wing ♀.
Theob. Mon. Culic, i., 203; pl. v, 19 ♀ Full ins. col.
James and Liston, Anoph. Mosq. Ind., 117. Col. pl. xv, full ins. ♀

I find no references to this species from other than hill localities. Dr. Christophers has studied the larva. Capt. James found it breeding in natural pools along with *Nyssorhynchus maculatus* Theob., at Raneghat, and Dr. Annandale found it breeding in water butts close to the houses of Europeans at Bhim Tal in September.

LOCALITIES: Bakloh (Punjab, July, 4,585 feet) [*Lindesay*]; Naini Tal (6,500 to 7,000 feet) [*Giles*]; Kurseong, Mussoorie, Raneghat (4,000 ft.) [*James*]; Bhim Tal (4,500 feet, Sept. 1906) [*Annandale*].

7. A. wellcomei Theob., 1904.

Theob. Rep. Gordon Coll. Labor. Sudan, p. 64.

LOCALITIES: Aden hinterland and Sudan.

MYZOMYIA Blanchard, 1902.

Comp. rend. Soc. Biol. Paris, xxiii, 795.

nom. nov. for *Grassia* Theob. preoc. Fisch., 1885.

There is also a *Grasia* Mich., 1854, in Echinodermata.
Grassia Theob., 1902, Jour. Trop. Med., ii, 181.
Myzomyia Theob. Mon. Culic., iii, 24.
Id. *id.* Gen. Ins. Fasc. 26, p. 7.

The larvæ in this genus are mostly found in flowing water, more rarely in ponds or stagnant water, except *rossii* and a non-oriental species, *superpictus* Grassi.

1. M. aconita Donitz, 1902.

Beit. Kennt. 3, d. Anoph., p. 70, ♀

Theob. Mon. Culic., iii, 30, fig. (p. 31), wing ♀

Theobald's description is a translation of Donitz's, whose description was apparently drawn up from a unique ♀ in spirits.

LOCALITIES: Kajoe Tanam, Willen Is., Soekaboemi (Java) [*Donitz*].

2. M. albirostris Theob., 1903.

Mon. Culic., iii, 24 ♂ ♀ Fig. 11, p. 25, palpi and proboscis.
Described from a perfect ♂ and ♀

LOCALITY: Malay States (May) [*Durham*].

3. M. azriki Patton, 1905.

Jour. Bomb. So., xvi, 630 ♂ ♀ Pl. C, wing, palpus.

Patton says it is a wild species breeding in pools with *tibani* Patton, and that it is closely related to "*turklandi* Liston," but I know of no such species as the latter. Perhaps he means *turkhudi* Liston.

LOCALITY: Azriki, (Aden hinterland, 5,000 ft.) [*Patton*].

4. M. culicifacies Giles, 1901.

Ent. Month. Mag., xxxvii, 197 ♀ (*Anopheles* id.).

N.B.—The ♂ in above reference = *turkhudi* Liston ♂

Anoph. culicifacies ♀ non ♂ Theob. Mon. Culic., ii, 309 (t. Th. l.c., iii, 48).
Id. *id.* James & Liston, Anoph. Mosq. Ind. 106, pl. ix, 2, wing scales; pl. viii, 1, larva figs.; col. pl. xi, full ins. ♀
Id. *id.* ♀ non ♂ Giles, Handbk., 2nd Ed., 317; pl. ix, 12 ♂ ♀

Myzomyia culicifacies ♀ Theob. Pr. Roy. So. Lond., lxix, 379.
Id. *id.* ♀ Theob. Mon. Culic., iii, 39, fig. (p. 40) frontal larva hairs; pl. iii, wing, pl. viii, wing scales.

Anoph. listoni Giles, 1901, Ent. Month. Mag., xxxvii, 197 ♂ ♀.
Id. *id.* Giles, Handbk., 2nd Ed., 319 ♂ ♀; pl. x, 4, wing ♂ ♀, head ♂ ♀
Id. *id.* ♀ Theob. Mon. Culic., ii, 311 (App.).
Id. *indica* Theob., 1901, Mon. Culic., i, 183 ♀
Id. *indicus* Giles, Handbk., 2nd Ed., 320 ♀

Type in British Museum.

A common and well distributed species throughout India, the larva breeding freely in canals, streams, ditches and irrigation watercourses in the Punjab throughout the year, although the adults only occur there (in houses) from March to December. In the Deccan it is commonly found throughout the year in river beds, and in S. India it is common in rice fields and pools.

Experiments show that the three kinds of malaria parasites readily develop in it, and Dr. James states that it has been proved to carry malaria in Mian Mir and Ennur.

This species assumes the characteristic position of *Culex* when at rest, and is related to *listoni*, and *jeyporensis* James.

LOCALITIES: Madras (Dec.) [*Cornwall*]; Ferozepore, nearly all the year except Jan. and Feb. [*Adie*]; Rajmahal (N. Bengal) 31-vii-1907 [Ind. Museum]; Armageon (E. Coast, India) [*James*]; Ellichpur (Berar, India) [*Liston*]; Etawah, (N.-W. Prov.); Hoshangabad (Cent. Prov.); Mian Mir; Nagpur, Jeypur State.

5. **M. elegans** James in Theob., 1903.

Mon. Culic., iii, 51, ♀ fig. 28, wing scales, cross veins; fig. 29, wing.

Anoph. elegans James and Liston. Anoph. Mosq. Ind. 82 ♀. pl. ix, 4, wing scales: pl. xii, wing, palpus, leg, larva.

This species is considered as only a variety of *leucophyrus* Donitz, by James and Liston, but Theobald considers it distinct. It has been bred by Dr. Cogill from larva from pools and jungle springs in Karwar. The adults are said not to frequent houses. The ♂ is unknown, and the type is in the British Museum.

LOCALITY: Karwar (April) [*Cogill*].

6. **M. funesta** Giles, 1900.

Jour. Trop. Med., ii, 50 (*Anopheles* id.).

Anopheles *id.* Giles Handbk., 2nd Ed., 318, ♂ ♀; pl. x, 3, wing ♂ ♀, claws ♂, head ♀

Anopheles funestus Theob. Mon. Culic., i, 178 ♂ ♀ ; fig. (p. 53) cross veins ; fig. (p. 180), genitalia ♂, fore ungues ♂, cross veins ; pl. iv, 13 ♀, full ins. col.
Myzomyia id. Theob. l.c., iii, 34, pl. ii, wing ♀
Id. id. Theob. Gen. Ins. Fasc. 26, pl. i, 2 ♀, full ins. col.

Two varieties from West Africa (Gambia), the home of the species, are known, both taken by Dr. Dutton.

var. *umbrosa* Theob. Mon. Culic., iii, 34 ; pl. ii, wing ♀

var. *subumbrosa* Theob. Mon. Culic., iii, 34 ; pl. ii, wing ♀

This latter variety has considerable resemblance to *listoni* Liston.

? *kumasii* Chalmers. Lancet, 1900 (Novem.) ♂ ♀ (*Anopheles* id.).

This latter description is repeated in Theob. Mon. Culic., i, 214 ♂ ♀, where the author adds, "I believe to be a new species. It might, however, be a var. of *A. funestus.*"

Practically an African species.

Taken in dwelling-houses at Kumasi ; Ashanti, where Dr. Chalmers found the larvæ on the margin of the marsh surrounding that place. Abundant on the Gambian Coast, and at the Cape (near Bathurst), the larva being found in rice swamps. It occurs in November in Lagos and in December in Gambia, and Giles reports it from British Central Africa at an altitude of 5,600 feet.

It figures in this Catalogue only on the authority of Banks, although it has been doubtfully recorded from the Philippines before.

LOCALITY : Pampanga (Phil. Is.) [*Banks*].

7. **M. jehafi** Patton, 1905.

Jour. Bomb. So., xvi, 630 ♂ ♀ ; pl. C, wing, egg, palpus ♂ ♀

The eggs were found in springs at Dthali, Arabia, and the species (which appears to be a local one) was bred, and found to bite freely.

LOCALITIES : Jehaf and Dthali 5,000 ft. (Aden hinterland) [*Patton*].

8. **M. leptomeres** Theob., 1903.

Mon. Culic., iii, 38 ♀

Described from a single ♀
Locality : India [*Christophers*].

9. **M. leucophyrus** Donitz, 1901.

Insectenborse, v, 37 ♀ (*Anopheles*).

Theob. Mon. Culic., ii, 307 (*App.*) ♀
James & Liston, Anoph. Mosq. Ind., 82.
Giles Handbk., 2nd Ed., 312 ; fig. 44, wing.

James and Liston regard *elegans* James. (*loc. cit.*) as a variety of this species. However, Theobald considers *elegans* a valid species.

LOCALITIES: Kajoe Janam (Sumatra); Moerah Teweh (Borneo) [*Donitz*].

10. M. listoni Liston, 1901.

Ind. Med. Gaz., xxxvi, 12 ♀ (*Anopheles* id.).

non listoni ♀ *Giles.*

Theob. Mon. Culic., iii, 27 ♀ ; fig. 12, palpus ♂ and scale of wing; fig. 13, wing; p. 40, fig. 17, hairs of larva.

Anoph. christophersi Theob., 1902, Pr. Roy. So. Lond., lxix, 378 ♀ ; pl. v, 3, wing ♀ ..

Id. *id.* James & Liston, Anoph. Mosq. Ind., 103; pl. vii, 1, larva figs ; col. pl. x, full ins. ♀

Id. *fluviatilis* Christophers, 1901, in MS.

Id. *id.* James, Sci. Mem. Ind. No. 2, p. 31, fig. 9.

" Described by me in Pr. Roy. So. Lond., lxix, 378 ♀ as *christophersi* from 2 ♀ ♀ sent to that Society by Drs. Christophers and Stephens, but just previously described as Giles's '*Listoni*' by Capt. Liston." (Theob. Mon. Culic., iii, 28.)

The species is very near *culicifacies* Giles, and *jeyporensis* James.

Aitken has studied the larva (*vide* Theob. Monog. iii, 29) which occurs in rice fields and small rocky streams, but abounds most in boggy ground near rice fields.

James and Liston report the larva from clear streamlets with grassy edges, and state definitely that the species is a malaria carrier as proved both by experiment and under natural conditions.

Messrs. Alcock and Adie, in the Proc. Roy. So. Lond., lxxvi, 319, give a short, interesting account of breeding this species from larvæ (collected 7-ii-1905) from the Indian Museum tank. They bred 7 adults from 26 larvæ, the remaining 12 larvæ (placed in a separate vessel) being voraciously devoured by the larva of a very common oriental dragon fly (*Ceriagrion coromandelianum*). The existence of *Listoni* in Calcutta is important, owing to the malaria-carrying powers of this insect. The Malaria Commission found the species absent during their investigations in June, July and August, and attributed the absence of malaria from Calcutta, to the absence during those months of known malaria carriers. Messrs. Alcock and Adie, taking it in December and January (no adults were found in February), will make it desirable for the species to be searched for diligently by other observers.

LOCALITIES: Ellichpur (Berar, India); Nagpur; Bengal Duars; Calcutta (Dec. and Jan.) [*Alcock, Adie*]; Jeypur; Goa; Bombay; Aurangabad (Hyderabad State) [*James*]; The Duars, India [*Christophers*]; Perak [*Wright*]; North Canara District (Goa) [*Aitken*]; Sylhet, 21-i-1905 and 2-ii-1905 [*Hall*].

11. **M. ludlowii** Theob., 1903.

Mon. Culic., iii, 42.

Fig. 19, *b*, palpus ♂ ; fig. 20, wing ♀ ; fig. 21, vars. in wing marks and cross veins ; figs. 22, costal spots.

By far the commonest of the malaria group in the Philippines, breeding readily in salt water around Manila.

LOCALITIES : Pampanga (Phil. Is.) [*Whitmore*] ; Manila [*Banks, Schultze, Wooley*] ; Luzon (April) [*Ludlow*] ; Singapore [*Biro*].

12. **M. mangyana** Banks, 1906.

Phil. Jour. Sci., i, 991 ♀

Described from several ♀ ♀ Type No. 3290 in the Entomological collection, Bureau of Science, Manila. The species is near *ludlowi* Theob.

LOCALITIES : Rio Baco, Chicago (in Mindoro, Phil. Is., May) [*McGregor*].

13. **M. punctulata** Donitz, 1901.

Insectenborse, v, 37.

non Anoph. id. Theob., Mon. Culic., i, 175.

? Anoph. id. James & Liston Anoph. Mosq. Ind. 84 ; pl. xi, wing, palpus, leg.

As the above authors (*loc. cit.*) give " Theob. Monog., i, 175 " as a synonym of their species, and as Theobald's "*Anoph. punctulata* Don." is not that species, but a distinct one, *tessellatus* Theob., I am rather uncertain which species James and Liston had before them at the time of writing.

They add, " very closely resembling *leucophyrus*, and may be a seasonable variety of that species."

LOCALITIES : Kajoe Janam (Sumatra), Moerah Teweh (Borneo) [*Donitz*] ; Friedrich Wilhelmshafen, Stephansort, Astrolabe Bay and Deslac Is. (all Papua) [*Biro*].

Regarding James and Liston's species, these authors give Karwar (in house), Bombay (August, in house)," Straits, Sumatra and Borneo."

N.B.—*Vide* notes under *Myzomyia tessellata* Theob.

14. **M. rossii** Giles, 1899.

Jour. Trop. Med., ii, 63 ♂ ♀ (*Anopheles*).

Anopheles id. Theob. Mon. Culic., i, 154 ♂ ♀
Fig. 37, wing and cross veins; fig. 38, palpus ♂, thorax ♀, costal border ♂ ♀, ungues ♂; pl. A, wing scales ; pl. iii, 10 ♂, 9 ♀, both full ins. col.

Id. id. Giles Handbk., 2nd Ed., 311, ♂ ♀, pl. ix, 11, wing ♂ ♀, claws.

Anopheles rossii James and Liston, Anoph. Mosq. Ind. 109; pl. vi, .1, larva figs.; pl. x, 3, wing scales; col. pl. xii, full ins. ♀

Myzomyia id. Theob. Mon. Culic., iii, 45, fig. 23, wing ♀, figs. (pp. 46, 47) hairs of larva; pl. iii, wing; pl. vi, wing scales.

Anoph. vagus Donitz, 1902, Beit. z. Kennt. Anoph., p. 80.

The larva is easily noticed, often being found in great numbers together, and breeds anywhere in pots, puddles, pools, from running clear water to very foul water, and water containing 2·8 per cent of salt, but Chatterjee found that larvæ from water containing less than half this amount of salt died on being placed in fresh water. The species occurs up to an altitude of 5,000 feet. In Madras it breeds in rice fields nearly all the year round, and James and Liston say the adults are in the habit of frequenting "railway carriages and almost every kind of road conveyance." The former found it abundant in October at Mian Mir, breeding in muddy, shallow pools and tanks, but not in the irrigation canal. In Perak it has been bred during February from larvæ. It is variable and occurs apparently all over India, the Malay Peninsula, South China, the East India Islands and the Philippines. Captain James never found a specimen in a natural state infected with malaria, although he examined nearly 800 from various parts of India, but he proved, that experimentally, *Filaria sanguinis-hominis* would develop in the species (*vide* "Lancet" Aug. 11th, 1900, p. 451). Theobald (Pr. Roy. So. Lond. lxix, 377) also regards it as a non-malaria carrier. It has been recorded from the Philippines by its place in Banks' Catalogue, but he gives no data, nor have I seen any definite record from these Islands.

LOCALITIES: Sylhet (Jan., Feb., Apr., May, June) [*Hall*]; Rajmahal, Bengal (31-vii-1907) [Ind. Museum]; Lucknow (Apr.) [*Giles*]; Mian Mir (Oct., Nov., "very abundant") [*James*]; Mozufferpur (Behar) [*Green*]; Dacca [*Macrae*]; Etawah, N.-W Prov., and Canara District [*Aitken*]; Mukerian (Hoshiarpur, India) [*Datta*]; Madras (Nov. to March) [*Cornwall*]; Quilon (7-iii-1900) [*James*]; Calcutta (April) [*Annandale, Daniels*]; Port Canning (17-iii-1907, 21-vii-1907) [*Annandale*, Dec., "common," *Chatterjee*]; Kuala Lumpur [*Durham*]; Ferozepore (late July to mid. Dec.) [*Adie*]; Perak [*Wray, Wright*]; Penang [*Freer*]; Padang (Sumatra) [*Donitz*]; Singapore (22-vii-1899) [*Hanitsch*]; Jalpaiguri (June 1907); Sambalpur (Cent. Prov.); Bombay.

Sub. species **indefinita** Ludlow, 1904.

Can. Ent., xxxvi, 299 ♀

LOCALITIES: Bayambang in May (Pangasinan, Philippine Islands) [*Chamberlain*]; Mangarin (September), Guimaras Islands (December) (both Philippine Islands).

15. **M. tessellata** Theob., 1901.

Mon. Culic., i, 175 ♀ (as *Anoph. punctulatus* Donitz).

Loc. cit. fig. 49, thorax, wing, hind leg; pl. xxxvii, 148 ♀, full ins. col.

Anoph. tesselatus (lapsus) Giles, Handbk., 2nd Ed., 305 ♀; pl. ix, 7, wing ♀, dorsum of thorax, hind tarsus.

Respecting this species, Mr. Theobald had prepared for his monograph a new species which he had named *tessellatum*, but which, just previous to publication, he considered to be synonymous with *A. punctulata* of Donitz, recently published. He therefore used the description of his species as that of *A. punctulatus* Donitz in Mon. i, 175, and confirmed this opinion in vol. ii, 306 (Appendix), for the sake of those correspondents who already possessed the species under his MS. name. However, in vol. iii, 55, he says that Donitz had informed him that the two species were quite distinct. Therefore, Theobald's description in Mon. i, 175, for what he there called *A. punctulatus* Donitz, stands good as the original description and reference of his own *tessellata*, which now ranks as a good species.

LOCALITIES: Taiping (Straits) in May, 22-xi-1899 and 21-xii-1899 [*Wray*].

16. **M. thorntoni** Ludlow, 1904.

Can. Ent., xxxvi, 69 ♀.

Described from two ♀ ♀ only, and said to be near *M. albirostris*.

LOCALITIES: Cottabato (Mindanao, June, Philippine Islands) [*Thornton*]; Oras (Samar Islands, Philippine Islands).

17. **M. turkhudi** Liston, 1901.

Ind. Med. Gaz. xxxvi, 441 ♀ (*Anopheles turkhudi*).

Anoph. turkhudi Giles, Handbk., 2nd Ed., 320 ♀ (footnote).
Id. *id.* James Sci. Mem. Ind. No. 2, p. 49., fig. 27, wing; fig. 28, larval chars.
Id. *id.* James & Liston, Anoph. Mosq. Ind. 115; pl. viii, 2, larva figs.; col. pl. xiv, full ins. ♀.
Myzomyia *id.* Theob. Mon. Culic. iii, 48 ♀; pl. iii, wing.
Anoph. culicifacies Giles, Ent. Month. Mag., xxxvii, 197.
Id. *id.* ♂ Theob. Mon. Culic., ii, 309.
Id. *id.* Theob. Pr. Royal So. Lond., lxix, 379 ♂, fig. 2 (p. 380) genitalia ♂.
Id. *id.* ♂ Giles, Handbk., 2nd Ed., 317; pl. ix, 12, ♂ ♀.

Dr. Christophers has studied the larva and, under experimental conditions, human malarial parasites will develop in the adult.

LOCALITIES: Ellichpur (Berar, India), Nagpur and Cashmir [*James*]; Andaman Islands [*Maj. Anderson*]; Hoshangabad (Cent. Prov., India); Lahore; Ferozepore, rare [*Adie*].

STETHOMYIA Theob., 1902.

Jour. Trop. Med., v, 181.

Theob. Mon. Culic., iii, 62: pl. viii, wing scales of *S. nimba*, an African species.
Theob. Gen. Ins. Fasc. 26, p. 8.

1. S. culiciformis James and Liston, 1904.

Anoph. Mosq. Ind. 122 ♂, ? ♀ (*Anopheles*); pl. xv, larva figs.

Apparently both sexes are intended to be included in the description, although only the ♂ is specially mentioned. The authors say that Theobald would place it in this genus. Dr. Cogill bred the species at Karwar from larvæ.

LOCALITY: Karwar [*Cogill*].

2. S. fragilis Theob., 1903.

Entom., xxxvi, 257 ♂

Described from two ♂ ♂ bred by Dr. Durham from larvæ found in a clear water jungle pool. Types in British Museum.

LOCALITY: Kuala Lumpur in Dec. and Jan. (Fed. Malay States) [*Durham*].

3. S. pallida Ludlow, 1905.

Can. Ent. xxxvii, 129 ♀

Described from a single ♀, "taken in the woods."

LOCALITY: Pampanga (Luzon) [*Whitmore*].

PYRETOPHORUS Blanchard, 1902.

Comp. rend. So. Biol: Paris, xxiii, 795.

nov. nom. for *Howardia* Theob. preoc. by Dalla Torre in 1897.
Howardia Theob., 1902, Jour. Trop. Med., v, 181.
Pyretophorus Theob. 1903 Mon. Culic., iii, 66.
Id. Theob. Gen. Ins. Fasc. 26, p. 8.

1. P. freerae Banks, 1906.

Phil. Jour. Sci. i, 993 ♀

Type specimen in the Entomological Collection (Type No. 5975) of the Bureau of Science, Manila.

LOCALITY: Manila (Oct.) [*Banks*].

2. P. jeyporensis James, 1902.

Sci. Mem. Ind. No. 2, p. 32 (*Anopheles id.*).
Fig. 11, wing; fig. 12, larval characters.
Pyretophorus id. Theob. Mon. Culic., iii, 66; pl. viii, wing scales, fig. (p. 67) palpus ♂
Anopheles id. James & Liston Anoph. Mosq. Ind. 101; pl. vii, 2, larva figs.; col. pl. ix, full ins. ♀

Near *listoni* and *culicifacies*; the larva living mostly in rice fields, but also in streams.

LOCALITIES: Jeypur State [*Christophers* and *Stephens*]; Jakot (S. India) [*Aitken*]; Nagpur and Bombay.

3. P. minimus Theob., 1901.

Mon. Culic., i, 186 ♀ (*Anopheles*), fig. 55, wing, thorax, cross-veins.
Anopheles. id. Giles Handbk., 2nd Ed., 321 ♀; pl. x, 7, wing ♀, thorax, scale.
Pyretophorus id. Giles, Jour. Trop. Med., vii, 365.
Described from a unique ♀ in Dr. Rees's collection.

LOCALITIES: Pokfulam, Hongkong [*Dr. Rees*]; Pampanga (Luzon) [*Whitmore*].

4. P. philippinensis Ludlow, 1905.

Can. Ent. xxxvii, 135.

LOCALITY: Pampanga (Luzon) [*Whitmore*].

5. P. pitchfordi Giles, 1904.

Jour. Trop. Med., vii, 365.

This species is said (by Banks) to have been reported from Uganda, but I find no reference to that effect.

LOCALITY: Pampanga (Luzon) [*Whitmore*].

MYZORHYNCHUS Blanchard, 1902.

Comp. rend. So. Biol. Paris, xxiii, 795.

nom. nov. for *Rossia* Theob. preocc. Owen 1838 in Mollusca.
Rossia Theob. Jour. Trop. Med., v, 181.
Myzorhynchus Theob. Mon. Culic., iii, 84; pl. v, wing scales.
Id. Theob. gen. Ins. Fasc. 26, p. 9.

The larva of this genus is said to breed mostly in swampy ground.

1. M. albotæniatus Theob., 1903.

Mon. Culic., iii, 88 ♀ pl. i, wing; pl. v, wing scales.

LOCALITY: Perak [*Dr. Wright*].

2. **M. annularis** Wulp, 1884.

Notes Leyden Museum, vi, 249 ♂ ♀ (*Anopheles*), and Tijd. v. Ent., xxviii, 80. Pl. iv, 2 (*Anopheles*).

Theobald, in Mon. Culic. i, 142, makes this a sub-species of *sinensis* Wied., but in vol. iii, 90, he notes his error and states that *his* "*annularis* V d. Wulp" = *vanus* Wlk.

3. **M. barbirostris** Wulp, 1884.

Notes Leyden Museum, vi, 248 ♀ (*Anopheles*), and Tijd. v. Ent., xxviii, 79 ♀; pl. iv, 1 (*Anopheles*).

Anopheles barbirostris Theob. Mon. Culic., i, 146 ♀, fig. 33 head; fig. 24, wing; also see p. 151. Pl. A, wing scales.

Id. *id.* Giles, Handbk., 2nd Ed., 308 ♂ ♀; pl. viii, 13*a*, wing ♂ ♀

Id. *id.* James & Liston, Anoph. Mosq. Ind. 77 ♀, pl. x, i, wing scales; pl. v, larva figs.; col. pl. ii, full ins. ♀

Myzorhynchus id. Theob. Mon. Culic. iii, 86, fig. 25, larva hairs, pl. iii, wing.

Id. *id.* Theob. Gen. Ins. Fasc. 26; pl. i, 3 ♀, full ins. col.

Aitken found the larva amongst grass and weeds in rocky pools, in lily ponds, in the public gardens of Lahore. Not common in houses; Capt. James doubts if it carries disease.

LOCALITIES: Sylhet, Jan., Feb., May, June [*Hall*]; Calcutta [*Annandale*, and 13-xi-1905, bred in the Indian Museum]; Port Canning, Dec. 1906 [*Chatterjee*]; Calcutta outskirts, Lahore and Bombay [*James* and *Liston*]; Canara Dist. [*Aitken*]; Selangor [*Wray*]; Upper Burma, June 1894, and in August [*Watson*]; Kuala Lumpur [*Dr. Durham*]; Mt. Ardjoeno (East Java) [*Hekmeyer*]; Papua [*Biro*]; Shaohyling (China); Pampanga [*Whitmore*]; Rizal [*Banks, Schultze*]; Manila [*Banks*]; Fort McKinley [*Craig*] all in the Phil. Is. Also occurs in (Old Calabar in April) [Annett] West Africa, and in Japan.

4. **M. minutus** Theob., 1903.

Mon. Culic., iii, 91 ♀

Described from a unique from Lahore, taken by Dr. Christophers.

5. **M. nigerrimus** Giles, 1900.

Handbk., 1st Ed., 161 ♀ (*Anopheles*).

Theob. Mon. Culic., i, 150.

Giles Handbk., 2nd Ed., 306.

James & Liston Anoph. Mosq. Ind., 79 ♀; col. pl. iii full ins. col.

The larva has been found in deep, shady pools, amongst grass and weed. The adults are said to be less common in houses, and James and Liston assert that the *Filaria bancrofti* can develop in this species. They also are inclined to think that, in addition to *nigerrimus*, *vanus*, *minutus*, *indiensis*, *pseudopictus*, *alboannulatus* and *sinensis* may all represent the same species.

LOCALITIES: Naini Tal [*Giles*]; Sylhet (Jan., Feb., May, June) [*Hall*]; Calcutta (7-iv-1899) [*Alcock* and *Daniels*], 7-vii-1907 [*Annandale*]; 22-iii-1907 [*Indian Museum*]; Travancore [*James*]; Port Canning, 6-i-1907 [*Annandale*]; Jalpaiguri [June 1907]. Dacca, Lahore, Madras.

6. **M. plumiger** Donitz, 1901.

Insectenborse, v, 37 (*Anopheles*).

Described by that author from East India and Hongkong.

7. **M. pseudobarbirostris** Ludlow, 1902.

Jour. New Yk. Ent. So., x, 127.

LOCALITIES: Hagonoy (Bulacan) in Luzon (Oct.) [*Dr. Kellogg*]; Cottabato (June) in Mindanao [*Dr. Thornton*]; Pampanga (Luzon) [*Whitmore*].

8. **M. sinensis** Wied., 1828.

Auss. Zweifl. Ins., i, 547 ♂ ♀ (*Anopheles*).

Frnfld. 1867. Ver. zool. bot. Wien., xvii, 449.
Anopheles id. Theob., Mon. Culic. i, 137 ♀; fig. 30, wing scales; pl. xxxvii, 146 ♀, type form, full ins. col.; pl. A, wing scales.
Id. id. Giles, Handbk., 2nd Ed., 305; pl. viii, 9, wing ♀, scales.
Myzorhynchus id. Theob. Mon. Culic. iii, 89, fig. 53, palpus ♀
Id. id. Giles, Jour. Trop. Med. vii, 365.

Mr. Theobald (who does not appear to have met with a ♂, a sex which apparently has not been seen since Wiedemann's original type) gave as sub-species of *sinensis* (*vide* Mon. i, 140 *et seq.*), *pseudopictus* Grassi, Italy; (*Anoph. pictus* Ficalbi); "*annularis* V d. Wulp" ♂ ♀ (= *vanus* Wlk.); *indiensis* Theob. Mon. i, 145, and *nigerrimus* Giles.

In the "Genera Insectorum" he admits *pseudopictus* Grassi, and *nigerrimus* Giles, as good species; but sinks his "*annularis* Wulp" as a synonym of *vanus* Wlk., whilst *indiensis* does not appear; the only species of that name in that work being given as a variety of *Nyssorhynchus maculipalpis* Giles, and apparently has nothing to do with *sinensis* Wied.

James has shown that *Filaria sanguinis hominis* will experimentally develop in this species, the larvæ of which were found by the same observer in deep, natural ponds on swampy ground at some distance from houses in Jalpaiguri.

LOCALITIES: Calcutta and Jalpaiguri [*James*]; Ferozepore [*Adie*]; Shaohyling in June (China) [*Cornford*]; Taipo Pokfulam (China) [*Dr. Rees*]; Foochow (August) [*Rennie*]; Tamsui 2-viii-1899 (Formosa) [*Dr. G. Mackay*]; Pampanga (Luzon) [*Whitmore*].

9. **M. umbrosus** Theob., 1903.

Mon. Culic. iii, 87 ♀; fig. (p. 87) wing.

Taken by Dr. Durham in October at Pahang (Fed. Malay States).

10. **M. vanus** Wlk., 1860.

Pr. Linn. So. Lond. iv, 91 ♀ (*Anopheles id.*).

non annularis Wulp. (*vera*) 1884; Notes Leyden Mus. vi, 249.

" *Annularis* V. Wulp." Theob. Mon. Culic. i, 142 ♂ ♀; fig. 32, head; pl. v, 18 ♀, full ins. col. (as *Anopheles sinensis* Wied., sub-species " *annularis* v. d. Wulp"); pl. A, wing scales (as *sinensis* Wd., sub.-sp. *annularis* v. d. Wulp).

Myzorhynchus sinensis annularis. Theob. Mon. Culic., iii, 90; *vide* also Theob. Mon. Culic. i, 151, for comparisons with other species.

The larva of this species has been studied. (*Vide* Theob. Mon. Culic. iii, fig. 4 (p. 18).)

" Walker's types are very damaged, but enough remains to identify the species." (Theob.)

LOCALITIES: Sambalpur (Cent. Prov. Ind.) [*D. O'C. Murphy*]; Quilon (27-vii-1901) [*James*]; Perak [*Wright*]; Taiping [*Wray*]; Madras [*Cornwall*]; Lahore [*Christophers*]; Penang [*Freer*]; Kuala Lumpur [*Durham*]; Luzon, 7-ix-1901 [*Ludlow*]; Bayembang (Pangasinan, Phil. Is.) [*Chamberlain*]; Manila [*McGregor, Wooley*]; Dindings (Straits).

LOPHOCELOMYIA Theob., 1904.

Entom., xxxvii, 12.

Theob. Gen. Ins. Fasc. 26, p. 10.

" Near *Nyssorhynchus*, but so far I have seen no Anopheline approaching it in general appearance." (Theob.)

1. **L. asiatica** Leicester, 1904.

Entom., xxxvii, 13 ♂ ♀

Types in British Museum. Taken by Dr. Leicester in the "ambang" jungle at Kuala Lumpur in the Federated Malay States.

NYSSORHYNCHUS Blanchard, 1902.

Comp. rend. Soc. Biol. Paris, xxiii, 795.

nom. nov. for *Laverania* Theob., preoc. by Grassi and Feletti, 1900.
Laverania Theob., Jour. Trop. Med.
Nyssorhynchus Theob. Mon. Culic. iii, 92; pl. v, wing-scales.
Id. Theob. Gen. Ins. Fasc. 26, p. 10.

The larvæ are mostly "pot and puddle" breeding species, but some breed in marshes; the adults are mostly domestic, but some are wild. (Theob.)

1. **N. fuliginosus** Giles, 1900.

Handbk., 1st Ed., 160 (*Anopheles*).

Anopheles fuliginosus Giles, Handbk., 2nd Ed., 298 ♂ ♀; pl. viii, 7, wing, palpus ♂ ♀, scutellum scale.
Id. *id.* Theob. Mon. Culic. i, 132 ♀; fig. 27, scutellum and scale; fig. 28, a, wing; pl. i, 3 ♀ full ins. col.
Id. *id.* James. Sci. Mem. Ind. No. 2, fig. 18 (p. 39) larva chars.
Id. *id.* James & Liston, Anoph. Mosq. Ind. 91; pl. v, 2, larva figs; pl. x, 4, wing-scales; col. pl. v, full ins. ♀
Anoph. jamesii Liston, Ind. Med. Gaz. (1901), p. 411.
non jamesii Theob. I, 134.
Anoph. leucopus Donitz, Insectenborse v, 37.
Nyssorhynchus fuliginosus Theob. Mon. Culic., iii, 93.
Var. *pallida* Theob. *loc. cit.* i, 134; fig. 28 *b* (p. 133) wing.

This species is subject to great variety both in wing and leg markings (Theob.). In some places (Calcutta and Nagpur) it is common in houses, whereas in others it is said to seldom visit them.

The larva has been observed by Capt. James and others. In Bombay it is often found in tanks; in Nagpur and Madras in open tanks, also in grassy or weedy ponds; in the Punjab in shady, weedy pools.

Under natural conditions it is non-malarious, but experimentally, parasites have been demonstrated to develop in it (James); although Theobald (Monog., i, 134) said that up to then "experiments with human malaria (crescent and tertian)" had failed.

LOCALITIES: Sylhet (Jan., Feb., May) [*Hall*]; Kurseong 5,000 ft. [*Indian Museum*]; Ferozepore, all the year round except Jan. and Feb. [*Adie*]; Lahore in June [*Giles*]; Nagpur [*Stephens*]; Goa and the "Madras Coast, several places" [*James*]; Chingelput (Madras) [*Cornwall*]; Quilon [*James*]; Calcutta 7-iv-1899 [*Daniels*], 13-xi-1905 [bred in *Indian Museum*], 6-vii-1907 and 2-viii-1907 [*Annandale*]; Dacca [*Lt.-Col. Macrae*]; Behar [*Cornwall, Green*].

2. **N. jamesii** Theob., 1901.

Mon. Culic., i, 134 ♀ (*Anopheles*); pl. i, 2 ♀, full ins. col.

Anopheles jamesii Giles, Handbk., 2nd Ed., 299, ♀

Id. *id.* James Sci. Mem. Ind. No. 2, 41.

Id. *id.* James & Liston, Anoph. Mosq. Ind. 93; col. pl. vi, full ins. ♀

Said to be allied to *maculipalpis*, *theobaldi* and *fuliginosus*, and not to be a common species.

The larva live amongst grass and weeds at the edges of lakes. Captain James reared the species from larvæ in Nagpur.

LOCALITIES: Shahjahanpur in Oct. (Punjab) [*Giles*]; Ferozepore, rare [*Adie*]; Quilon in Feb. and 7-iii-1900 [*James*]; Calcutta, 23-vii-1907 [*Annandale*] Port Canning, Dec. 1906 [*Chatterjee*]; also from Ellichpur in Feb. (Berar), Bombay, Deccan and Ceylon.

3. **N. karwari** James in Theob., 1903.

Theob. Mon. Culic., iii, 102 ♀; l.c. fig. 61 (p. 103) wing.

Anopheles karwari James & Liston, Anoph. Mosq. Ind. 89; pl. xiv, palpus, leg, head, larva; p. 90, fig. of wing.

Near *maculatus*.

LOCALITIES: Karwar in June (Bombay Pres.) [*Cogill*]; Goa in Feb., 2,000 ft. [*Aitken*].

4. **N. maculatus** Theob., 1901.

Mon. Culic., i, 171 ♂ ♀ (*Anopheles maculata*).

Fig. 48, palpus ♂, head ♂, wing, tip of abdomen and various scales.

Anopheles maculatus James, Sci. Mem. Ind. No. 2, 47, fig. 25, wing and leg.

Id. *id.* Giles, Handbk., 2nd Ed., 301 ♂ ♀; pl. ix, 2, head, wing ♂ palpus ♂

Nyssorhynchus id. Theob. Mon. Culic. iii, 96.

Described from two ♀ ♀ in Hongkong. Types in Dr. Rees's collection.

It is very near *theobaldi*, of which James and Liston think it may be a variety. The larva lives in shallow pools and marshy grounds on granite soil near Hongkong. James bred it in March from larvæ found in clear, sandy or rocky pools ; it disappearing in April and May ; and he considers it probably not a malaria carrier. In the Duars, the larva occurs in clear pools in rice fields.

LOCALITIES: Lahore, March, April [*Christophers*]; Kurseong [*James*]; Jalpaiguri (N. Bengal), 13-vii-1907 [*Wallich*]; Jeypur Hill Districts [*James*]; Perak [*Wright*]; Hongkong in Sept. and Oct. [*Rees* and *James*] also from Dindings in Nov. (Straits).

5. **N. maculipalpis** Giles, 1902.

Handbk., 2nd Ed., 279 ♂ (*Anopheles*).

Anopheles maculipalpis James and Liston Anoph. Mosq. Ind. 95, pl. iv, larva figs.; pl. x, 5, wing-scales ; col. pl. vii, full ins. ♀.

Nyssorhynchus id. Theob. Mon. Culic., iii, 96 ♀, fig. 56, antenna ♀, palpus ♀, cross veins ♀ ; pl. ii, two wings ♀; fig. p. 98, hairs of larva.

Var. *indiensis* Theob. Mon. Culic., iii, 99.

Giles described only the ♂, Theobald's description of the ♀ is from a single, nearly perfect, specimen taken by Grandpre and Daruty.

LOCALITIES : India [*Christophers* and *Stephens*]; Nagpur, Karwar, Goa and Travancore [t, *James* and *Liston*]; Bayembang (Pangasinan, Phil. Is.) [*Chamberlain*]. Also frequents Mashonaland and Mauritius.

6. **N. nivipes** Theob., 1903.

Entom. xxxvi, 258 ♂

Near *stephensi* and *maculatus*.

Taken by Dr. Durham in January at Kuala Lumpur in the Federated Malay States.

7. **N. philippinensis** Ludlow, 1902.

Jour. New Yk. Ent. So., x, 128 (*Anopheles*) ; also Jour. Amer Med. Assn. (1902) xxxix, 426.

Occurs at San Jose, Abra, in the Philippines [*Banks*].

8. **N. stephensi** Liston, 1901.

Ind. Med. Gaz., xxxvi, 12 (*Anopheles*).

Anopheles stephensi James, Sci. Mem. Ind. No. 2, 45; fig. 23, wing ; fig. 24, larva chars.

Anopheles stephensi Giles, Handbk., 2nd Ed., 331 ♀ (footnote).
Id. *id.* James ♀ Liston, Anoph. Mosq. Ind. 113; pl. vi, 2, larva figs.; pl. x, 6, wing scales; col. pl. xiii, full ins. ♀
Nyssorhynchus id. Theob. Mon. Culic. iii, 93 ♀; fig. 54, variation in wing marks; fig. 55, wing; figs. pp. 40 and 47, larval hairs.
Anoph. metaboles Theob. Proc. Roy. So. Lond., lxix, 374 ♀; pl. v, 1, wing ♀.

Captain James found it breeding at Mian Mir in water reserves (used only in case of fire), also in Madras City in almost unused wells.

Experimentally, human malaria parasites have been developed in this species.

LOCALITIES: Mian Mir and Madras City [*James*]; Ferozepore, May to mid-Nov. [*Adie*]; Calcutta, 1-viii-1907 [*Annandale*]; Lushai Hills, Assam, 9-vii-1904 [*Capt. Macleod*]; Karachi "common"; Nagpur and Ellichpur (Berar).

9. **N. theobaldi** Giles, 1901.

Ent. Month. Mag., xxxvii, 198 ♀ (*Anopheles*).

Anopheles theobaldi Giles, Handbk., 2nd Ed., 300 ♀
Id. *id.* Theob. Mon. Culic., ii, 311 (App.) ♀
Id. *id.* James & Liston, Anoph. Mosq. Ind., 97; col. pl. viii, full ins. ♀
Nyssorhynchus id. Theob. Mon. Culic., iii, 95.

In the Punjab the larva occurs in rice fields and streams; James and Liston state that experimentally the species will develop malaria parasites.

LOCALITIES: Ellichpur (Berar) [*Liston*]; Shahjahanpur 19-x-1900 (N.-W Prov.) [*Giles*]; Dacca [*Macrae*]; Nagpur [*Stephens*]; Sambalpur [*Murphy*]; Lahore in October, also at Bombay and in the Aden hinterland.

10. **N. tibani** Patton, 1905.

Jour. Bomb. So., xvi, 629 ♂ ♀; pl. B., wing, palpus ♂ ♀, hind leg, egg, head of larva.

The larva breeds in all the rivers and springs up to Jehaf (6,800 ft.), but is found neither in wells, nor near man.

Experiments to develop "*Benign tertian*" failed.

The species is closely related to *theobaldi*.

LOCALITY: Aden hinterland.

11. **N. willmori** James in Theob., 1903.

Theob. Mon. Culic., iii, 100 ♀; fig. 59, palpus ♀, fig. 60, various scales.

Lt. Willmore found the larva in a clear puddle by a spring in Kashmir (4,800 ft.). It is allied to *stephensi* and *maculatus*; Dr. Christophers records it from Lahore.

CELLIA Theob., 1903.

Mon. Culic., iii, 107 ♀
Theob. Gen. Ins. Fasc. 26, p. 11.

"Easily told by their dense coating of irregular scales, totally unlike a typical Anopheles" [*Theob.*], *vide* Theob. Monog., iii; pl. viii, wing scales.

1. **C. pulcherrima** Theob., 1902.

Proc. Roy. So. Lond., lxix, 396 ♀; pl. v, 2 wings ♀
Theob. Mon. Culic., iii, 107.

Anopheles pulcherrima James & Liston Anoph. Mosq. Ind., 86, col. pl. iv, full ins. ♀
Id. *id.* James Sci. Mem. Ind. No. 2, p. 48, fig. 26, wing.
Id. *id.* Giles, Handbk., 2nd Ed., 510 ♀

Type in British Museum.

Theobald's descriptions are from 3 ♀ ♀ sent by Capt. James and Drs. Christophers and Stephens.

The larvæ have been found during September in an overflow pool of an irrigation watercourse at Mian Mir.

"It appears to be one of the few species which can tide over the Punjab winter in the adult condition (James and Liston).

LOCALITIES: Mian Mir [*James*]; Ferozepore, early July to early Dec. [*Adie*]; Goa [*James & Liston*]; Purneah (N. Bengal) 7-viii-1907, in bedroom [*Paiva*].

2. **C. kochi** Donitz, 1901.

Insectenborse, v, 36 (*Anopheles*).

Anopheles kochi Theob. Mon. Culic., i, 174 ♀; pl. iv, 16 ♀, full ins. col.
Anoph. ocellatus Theob. (MS.) l.c., i, 174 (t. Theob., vol. ii, 306).
Id. *id.* Giles, Handbk., 2nd Ed., 315 ♀; pl. ix, 5, wing ♀, dorsum of thorax.

Theobald's description (in Monog. i, 174) was written to apply to his species in MS. named *ocellatus*, but Donitz's species was

published just before, and takes precedence (confirmed by Theob. in vol. ii).

LOCALITIES: Taipang [*Wray*]; Perak [*Wright*]; Singapore [*Biro*]; Sylhet, 4-ii-1905; 7-vi-1905; 31-vii-1905; and 15-xii-1905 [*Hall*]; Padang (Sumatra) and Serang Tjimahi (Java) [*Donitz*]; Philippines.

ALDRICHIA Theob., 1903.

Mon. Culic., iii, 353 (App.).
Theob. Gen. Ins. Fasc. 26, p. 13.

"One of the most marked genera of the Anophelina, the squamose armature of the abdomen exactly resembling *Culex*" (Theob.).

1. A. error Theob., 1903.

Mon. Culic., iii, 353 ♀

Described from a perfect unique specimen. Locality given as "India, probably Calcutta."

BIRONELLA Theob., 1905.

Ann. Mus. Hung., iii, 69.

"Near *Anopheles*."

1. B. gracilis Theob., 1905.

Ann. Mus. Hung., iii, 69 ♂; fig. 3, scales; pl. ii, wing ♂, pl. iii, wing scales ♂ ("♀" lapsus).

The photo, figure of wing scales, in pl. iii, is marked, "♀" This is an error, as in the text, the author distinctly states he could not find this sex present in the Hungarian Museum Collection, in which are the types (3 ♂ ♂) from which the description is taken.

Taken by Biro Dec. 31st, 1900, at Muina in Papua.

"ANOPHELES" sensu latu.

In Mr. Theobald's revision of the family in Genera Insectorum he includes the following three species which he is unable to place in any of the modern genera.

1. Anopheles vincenti Laveran, 1902.

Comp. rend. So. Biol. Paris, xxiii, 993.

Recorded by Laveran from Tonkin.

Theobald's quotation "1901, vol. 53" is, of course, an obvious error for vol. xxiii.

2. Anopheles formosaensis.

To this name, Theobald simply adds Tsuzuki—whether this is the author, and from what locality it comes, or where described he does not say. I have not met with the name of the species elsewhere.

3. Anopheles deceptor Donitz, 1902.

Beit. Kennt. 3. d. Anoph., p. 60.

Recorded from Sumatra. May belong to *Nyssorhynchus*.

There are two other species of "*Anopheles*" not alluded to in Theobald's revision ("Gen. Ins."); these are :—

4. Anopheles culiciformis Cogill, 1903.

Jour. Bomb. So., xv, 333.

Recorded from India.

5. Anopheles subpictus Grassi, 1899.

Atti. R. Accad. Lincei. Rendic., viii, 1.

"India Orientalis." So given in Kertesz's "Catalogue of Diptera" (I. 254), but I have not seen the species mentioned elsewhere.

MEGARHINUS Rob. Desv, 1827.

Ess. Culic. in Mem. Soc. His. Nat. Paris, iii, 412.
Macq. 1827 Hist. Nat. Dipt.
Wlk. 1848 List. Dip. Br. Mus., i, 1.
Skuse 1889 Pr. Linn. So. N. S. Wales, iii, p. 1720.
Theob. 1901 Mon. Culic., i, 215, fig. 63, various parts insect, fig. 64, map of distribution, p. 218, table of species.
Theob. 1905 Gen. Ins. Fasc. 26, p. 12.

1. M. amboinensis Doles., 1857.

Nat. Tijd. Ned. Ind., xvi, 381 ♂ ; pl. v, 5 (*Culex* id.).
Giles, Handbk., 1st Ed., 133 (translation of Doleschall).
Id. id., 2nd Ed., 276.
Theob. Mon. Culic., i, 243 ♂

Not uncommon in the bush in the dry season in Amboina, according to Doleschall. Osten Sacken (Berl. Ent. Zeit., xxvi, 96) questioned if this species was distinct from *immisericors* Wlk., but it is accepted as such by Kertesz (Cat. Dipt.) and Theobald (Gen. Ins.).

An allied species *subulifer* Doleschall (*Culex* id.) is given by Kertesz as a synonym of this species, but Theobald regards it as

the same as *immisericors*, and I therefore follow him as the latest authority in this group. Moreover he thinks the present species may be a *Toxorhynchites*.

LOCALITY: Amboina [*t. Doleschall*].

2. M. lewaldii Ludlow, 1904.

Can. Ent., xxxvi, 223 ♂

The type was bred in the laboratory, but no notes were kept; the specimen is a unique and is perfect. Not mentioned by Theobald in "Genera Insectorum."

LOCALITY: Salog (April), Guimaras Island (Philippines) [*LeWald*].

3. M. minimus Theob., 1905.

Jour. Bomb. So., xvi, 237 ♂; pl. A, fig. 1, palpus, wing, abdomen tip.

Described from a unique ♂ taken in March at Yatiyantota, Ceylon. Theobald ignores this species in the "Gen. Ins."

4. M. splendens Wied., 1819.

Wied. Zool. Mag., iii, 2 (*Culex* id.) ♂
Wied. 1828 Auss. Zweifl., i, 3 (*Culex*). ♂
Macq. Hist. Nat. Dipt., i, 33 (*Culex*).
Sch. 1868 Reise Novara 31 (*Megarhinus*).
Wulp. 1881 Dipt. Mid. Sumatra 8; pl. i, 2, wing.
Theob. Mon. Culic., i, 235 ♀; pl. viii, 31 ♀, full ins. col.
Giles Handbk., 2nd Ed., 271.

Types in Wiedemann's and Westermann's collections.

LOCALITIES: Java [*Wiedemann*]; Sumatra [*Schiner*]; Singapore [*Wallace*]. Rawas, (Mid. Sumatra) and Batavia [*t. Wulp.*].

TOXORHYNCHITES Theob., 1901.

Mon. Culic., i, 244.
Loc. cit. iii, 120, notes on larva, pupa, etc., of non-oriental species.
Theob. Gen. Ins. Fasc. 26, p. 13.

1. T. immisericors Wlk., 1860.

Pr. Linn. So., iv, 90 ♂ (*Megarhina*).

Megarhinus *id.* Theob. Mon. Culic., i, 225 ♂ ♀; pl. vii; 28 ♂, full ins. col. (*Megarhinus* id).; pl. ix, 33 ♀; full ins. col. (*M. gilesii*).
Id. *id.* Giles, Handbk., 2nd Ed., 273.

Toxorhynchites id. Theob. Mon. Culic., iii, 123, fig. 67, larva, pupa.
Megarhinus " *id.* or *amboinensis* Dol." Os. Sack. Berl. Ent. Zeit., xxvi, 96.
Id. or Giles, Handbk. *id.*, 2nd Ed., 273.
Id. gilesii Theob. Mon. Culic., i, 227 ♂ ♀
Id. subulifer Doles. 1857 Nat. Tijd. Ned. Ind., xiv, 382 ; pl. v, 2 (*Culex*).
Id. id. Giles, Handbk., 2nd Ed., 272.
Culex regius Thwaites (1864) Pr. Linn. So. Lond., viii, 102.

This very large and handsome mosquito occurs apparently all over the Oriental region, in parts of India being known as the " stinging elephant mosquito." Mr. Ernest Green of Ceylon has bred it from larvæ living in the collected water in stems of the giant bamboo. The larvæ prey solely on the larvæ of other *Culicidæ*.

The adult shows some variation, and it appears fairly common in Calcutta in particular spots in gardens and on walls and tree trunks during July and August, and both sexes have been taken there frequently by Dr. Annandale. I captured a specimen in a wine shop in Calcutta, July 1904, the only one I have seen alive.

LOCALITIES : Calcutta, July, August [*Annandale and others*] ; Upper Burma [*Watson*] ; Sikhim, 1,800 feet, June [*Dudgeon*] ; Bhim Tal, Sept. 1906 [*Annandale*] ; Sylhet, May, June [*Hall*] ; Celebes, Mysol, North Ceram and Waigion [*t. Walker*] ; Settleberg (Huon golf) (Papua) [*Biro*] ; Ceylon [*Hope Coll. Oxford*] : also recorded from Trincomalee Hot Wells, Macassar and Travancore.

2. T. inornatus Wlk., 1865.

Pr. Linn. So. Lond., viii, 102 ♂ (*Megarhinus*).

Theob. Mon. Culic., i, 223 ♂ ♀ ; pl. vii, 26 ♂ 25 ♀ (both full insects coloured, as *Megarhinus* id.).
Megarhinus inornatus Giles, Handbk., 2nd Ed., 271 ♂ ♀

Theobald's description is from two specimens in the British Museum of which I presume one is Walker's type (♂).

3. T. leicesteri Theob., 1804.

Entom., xxxvii, 36 ♂ ♀

Types in British Museum. Taken by Dr. Durham at Kuala Lumpur.

4. T metallica Leicester in Theob., 1904.

Entom., xxxvii, 37 ♂ ♀

Types in British Museum. Taken by Dr. Leicester at Kuala Lumpur.

WORCESTERIA Banks, 1906.

Phil. Jour. Sci., i, 779.

Near both *Megarhinus* and *Toxorhynchites*, but quite distinct.

1. W. grata Banks, 1906.

Phil. Jour. Sci., i, 780 ♂ ♀; plate, palpus ♂, genitalia ♂, cross veins ♂ ♀, scales, etc.

The adult does not bite. The species was bred during June.

Types (♂ ♀ No. 6071) in the Entomological Collection, Bureau of Science, Manila.

LOCALITIES: Bago, (150 metres alt.; June and July) (Negros Occidental Philippine Islands) [*Banks*]; and Cebu [*McGregor*], both places in the Philippines.

Sub-Fam. CULICINÆ.

Theob. Gen. Ins., Fasc. 26, p. 14. Chars. of sub-family, also analytical table of 30 genera.
Theob. Mon. Culic., i, 97, table of genera.
Giles Handbk., 2nd Ed., 334, table of genera.

MUCIDUS Theob., 1901.

Mon. Culic., i, 268.

Theob., Gen. Ins., Fasc. 26, p. 17.

A table of species given by Theobald. Monog., i, 269.

1. M. alternans Westw., 1881.

Tr. Ent. So. Lond., iii, 384.

Mucidus alternans Giles Handbk., 2nd Ed., 347 ♂ ♀; pl. xii, 2, wing ♀
Culex commovens Wlk. Ins. Saunds. Dipt. 432.
C. hispidosus Skuse. Tr. Linn. So. N. S. Wales, p. 1726.

The only oriental locality seems to be Papua [*Hungarian Museum*].

2. M. laniger Wied., 1821.

Dipt. Exot. 9 (*Culex id.*) ♀

Auss. Zweifl., i, 5 ♀
Culex laniger Macq. Dip. Ex., i, pt. 2, 176.

Type in Westermann's Collection. Recorded from Java and Coromandel.

3. **M. mucidus** Karsch, 1887.

Ent. Nachr. (1887) 25 (*Culex id.*).

Mucidus mucidus Theob. Mon. Culic., i, 272 ♀ ; pl. xi, 42 ♀ full ins. col. ; pl. B, wing scales.
Id. *id.* Giles, Handbk., 2nd Ed., 349 ♀ ; pl. xii, 3 wing ♀

4. **M. scatophagoides** Theob., 1901.

Mon. Culic, i, 277 ♀ ; pl. E, wing scales ; fig. 81 (p. 278) wing, thorax, scales.

Giles, Handbook, 2nd Ed., 348 ♀ ; pl. xii, 1,*a*, full ins., 2,*a*, venation.

An attempt by Major Close to breed the species from eggs laid by a ♀ in captivity, failed. He records that for a week in September in the Police Hospital at Moradabad (N.-W Prov.), it bit viciously. It is also recorded from Myingan in Burma.

DESVOIDYA Blanchard, 1901.

Comp. rend. So. Biol. Paris, No. 37, liii (*Desvoidea*). nom. nov. for *Armigeres* Theob., preoc.

Armigeres Theob. 1901 Mon. Culic., i, 322.
Desvoidea id. loc. cit., iii, 134.
Desvoidya emendation by Theob. in Gen. Ins. Fasc. 26, p. 17.

1. **D. fusca** Theob., 1903.

Mon. Culic, iii, 135 ♂ ♀ Fig. 75 mid-ungues ♂, palpus ♂ ; fig. 76, pupa figures.

Theob. Mon. Culic., iii, pl. xvii, larva figs.

Dr. Durham found the larva in a tub, and Miss Ludlow records it as being bred in the Philippines, " from larvæ taken from the water-filled joints of bamboo poles in the fence."

LOCALITIES : Kuala Lumpur [*Dr. Durham*] ; Angeles (Pampanga, Phil. Is.) [*Whitmore*].

2. **D. joloensis** Ludlow, 1904.

Can. Ent., xxxvi, 236.

Described by Miss Ludlow as a variety of *fusca*, mentioning that the variation was constant throughout the 23 ♂ ♂ ♀ ♀ examined, and as Banks admits it as a good species, I follow him. Taken by an unrecorded collector at Jolo (Jolo Island, Philippines).

3. D. obturbans Wlk., 1860.

Pr. Linn. So. Lond. iv, 91 ♀ (*Culex*).

Armigeres obturbans Theob. Mon. Culic., i, 323 ♂ ♀ Fig. 104, wing; fig. 105, palpus ♂ (incorrect), ungues ♀, ♂ genitalia; fig. 106 ♂ ungues.

Desvoidea obturbans Theob. Mon. Culic., iii, 138, fig. 75, 1 mid ungues ♂; fig. 77, corrected ♂ palpus; fig. 78, ♂ clasper.

Armigeres ventralis Wlk., Theob. Mon. Culic.; pl. xv; 57 ♀ full ins. col.

Id. *id.* Giles, Handbk., 2nd Ed., 385 ♂ ♀; pl. xiv, 11 venation, 12 claws.

Culex ventralis Wlk. 1861. Pr. Linn. So. Lond., v, 144.

The type (♀) is in the British Museum. A common species from the East Coast of India, through the Straits, and up the Chinese Coast. Capt. James has observed the whitish woolly larva breeding in pots and tubs of dirty water in the open and under trees. The adult is common in woods, rarely visiting houses. Miss Ludlow records it as having been bred in the Philippines, from larvæ from deep pools in a clear running stream.

Originally described from Amboina.

4. D. panalectoros Giles, 1901.

Jour. Bomb. So. xiii, 608,

and (1901) in Theob. Mon. Culic., ii, 317 ♂ ♀ (*Armigeres*).

Desvoidea panalectoros Theob. Mon. Culic, iii, 136; fig. 75, 3, palpus ♂ Loc. cit. iii; pl. xvii, larva figs.

Desvoidya *id.* Theob. Gen. Ins. Fasc. 26, p. 18.

Armigeres *id.* Giles, Handbk., 2nd Ed., 386 ♂; pl. xiv, 13 venation, 14 head ♂, 15 claws, 16 thorax.

The types are in the Indian Museum, and were captured by Col. Alcock of that Institution, at Calcutta, during the rainy season.

LOCALITIES: Calcutta [*Alcock*]; Perak [*Wright*]; Pampanga (Phil. Is.) [*Whitmore*].

STEGOMYIA Theob., 1901.

Mon. Culic, i, 283.

Theob. loc. cit. tab. spp., p. 285; map of distribution, p. 284.

Theob. Gen. Ins. Fasc. 26, p. 18.

Giles, Handbk., 2nd Ed., 368; table spp. 369.

1. S. amesii Ludlow 1903.

Jour. New Yk. Ent. So., xi, 139 (*Stegomyia nivea amesii*).

Described from the Philippines, but I can find no definite data except that Banks includes it in his Catalogue.

NOTE.—Banks mentions in addition to this species a "*Scutomyia nivea* Ludl. (*Stegomyia nivea*)" with exactly the same reference as this species, and adds: "There appears to be a confusion of this species with *Stegomyia amesii* Ludl. in the Genera Insectorum." I have not seen the New York journal, but I infer that Miss Ludlow described two species on the same page, *viz.*, (1) *Stegomyia nivea* Ludl., which Banks places as a good species in *Scutomyia*; and, (2) *Stegomyia nivea amesii* Ludl. (probably intended, to judge by the triplet of names, to be a sub-species), which Banks also ranks as a good species under the title *amesii* only, in *Stegomyia*.

2. S. annulirostris Theob., 1905.

Jour. Bomb. So., xvi., 239 ♀

Described from a unique ♀ from Peradeniya, Ceylon, taken in January.

3. S. aurostriata Banks, 1906.

Phil. Jour. Sci., i, 995, ♀

Type No. 6082 in the Entomological Collection, Bureau of Science, Manila, taken in June on the Canlaon Volcano, Negros Island (Philippines) at an altitude of 760 metres.

4. S. brevipalpis Giles, 1902.

Handbk., 2nd Ed., 384 ♂ ♀; pl. xiv, 17, 18, 19, wings, 20 head ♂

Theob. Mon. Culic., iii, 146 (*Culex id.*) ♂ ♀

Types in British Museum. Theobald said (Monog. iii, 146) that he had examined the types in the British Museum, and had found them to be not a *Stegomyia* but a typical *Culex*; but (in the Gen. Ins.) he replaces the species in the present genus. The ♀ bites during the daytime in houses.

Recorded in October from Shahjahanpur (N.-W Prov.).

5. S. crassipes Wulp, 1892.

Dip. Sum. Exp. 9, pl. i, 4, head (*Culex*).

Stegomyia crassipes Theob. Mon. Culic. i, 320 ♀; pl. xxxiv, 134 ♀ full ins. col.

Id. *id.* Giles, Jour. Trop. Med., vii, 367.

Id. *id.* Giles, Handbk., 2nd Ed., 381.

Described from 2 ♀ ♀ from Sumatra.

LOCALITIES: Soeroelangoen (Sumatra) (t. *Wulp*); Thayetmyo in August (Upper Burma) [*Watson*]; Pampanga (Phil. Is.) [*Whitmore*].

6. S. fasciata F., 1805.

Sys. Antl. 36 (*Culex*).

Stegomyia fasciata Theob. Mon. Culic., i, 289 ♂ ♀; figs. 86 to 89, var. chars; map of distribution, p. 292; pl. xiii, 49 ♂, 50 ♀, both full ins. col. Pl. B, wing scales; also of a Queensland var.

Id. *id.* Theob. Gen. Ins. Fasc. 26; pl. i, fig. 11, ♀ full ins. col.

N.B.—In this plate are given two full insects, and figures of a thorax and a leg. The full insects figures apply to *fasciata* F., typical form ♂ ♀, the figure of the thorax to the variety *mosquito* Rob. Desv., and the figure of the leg to Theobald's variety *luciensis*.

Stegomyia fasciata Giles, Handbk., 2nd Ed., 372; pl. xiv, 2, venation; 3 thorax.

Synonyms (*Culex*)—

calopus Meig. 1818, Sys. Bes., i, 3.
Desv. 1827, Ess. Culic., 407.
tæniatus Wied. 1828, Auss. Zweifl., i, 10 ♂ ♀
Konoupi Brullé 1832, Exped. Morea. Ann. So. Nat. Paris, xxiii.
formosus Wlk. 1848, List Dip. Br. Mus. i, 4 ♀
viridifrons Wlk. 1848, l.c., p. 3, ♀
inexorabilis Wlk. 1848, l.c., p. 4, ♀
excitans Wlk. 1848, l.c., p. 4, ♀
exagitans Wlk. 1856, l.c., p. 430, ♀
impatabilis Wlk. 1860, Pr. Linn. So. Lond., iv, 91 ♂
zonatipes Wlk. 1860, l.c., v, 229 ♂
annulitarsis Macq. 1838, Dip. Ex. Supp., i, 136 ♀.
toxorhynchus Macq. l.c., i, 25.
bancroftii Skuse 1886, Pr. Linn. So., N. S. Wales, iii, p. 1740.
mosquito Arrib. 1891, Dipt. Argent, 60.
elegans Ficalbi 1896, Bull. So. Ent. Ital. (1896), p. 251.
rossii Giles 1899, Jour. Trop. Med., p. 64.
var. *mosquito* Rob. Desv. 1827, Ess. Culic., 407. Theob. Mon. Culic. i, 295; pl. xiii, 50 (the separate figure of thorax only).
luciensis Theob. Mon. Culic. i, 297 ♂ ♀; pl. xiii, 50 (the separate figure of a leg only).
queenslandensis Theob., l.c., i, 297 ♀

Theobald in his report on the Buda Pesth Museum *Culicidæ* (Ann. Mus. Hung., iii, 73) mentions a var. *mosquito* Arribalzaga as occurring at Port Said and Singapore (collected at both places by Biro, the specimens being in the Hungarian National Museum

collection), but in the " Genera Insectorum " he sinks Arribalzaga's "*mosquito*" as an absolute synonym of *fasciata* F., typical form, and gives *mosquito* R. Desv. as a good variety.

This is one of the most variable species in the family.

Banks says " all parts of the tropical world," but this may be doubted, as I can obtain only Biro's record from Oriental latitudes—except those of Banks.

Australian ♀ ♀ are said to be larger than Asiatic, East Indian or West Indian ones, but Australian ♂ ♂ are of no larger size than usual. The eggs are laid separately and not in rafts. Dr. Low says they begin to breed the first day they emerge from the pupa, one ♂ fertilising many ♀ ♀, and pairing by night freely as well as by day. The eggs possess great vitality and do not lose it, even if completely dried for some weeks. He calls it an " essentially domestic mosquito " breeding in any receptacle holding water near the house, and in company with *C. fatigans* Wied.

In the West Indies it bites viciously between 1 and 3 p.m.

LOCALITIES: Singapore and Friedrich Wilhelmshafen (Papua) [both *Biro*]: Pampanga (Phil. Is.) [*Whitmore*]. Also occurs at Port Said and Muscat (Arabia).

Sub-species **persistans** Banks, 1906.

Phil. Jour. Sci., i, 996.

The type ♂ and ♀ of this variety are in the Entomological Collection (Type No. 5773), Bureau of Science, Manila.

He says it is the "most abundant day flying mosquito in this region and a vicious biter, appearing generally, and biting fiercely, just before a storm."

LOCALITIES: Manila, Iloilo and Bago (Negros Is.); (all Phil. Is.) [*Banks*]; Fort McKinley (Phil. Is.) [*Craig*]; and taken by various collectors elsewhere in these Islands.

7. S. gardneri Ludlow, 1905.

Can. Ent., xxxvii, 99 ♂ ♀.

LOCALITIES: Bulaco in August (Mindoro Is. Philippines) [*Gardner*]; Pampanga (Luzon) [*Whitmore*].

8. S. mediopunctata Theob., 1905.

Jour. Bomb. So., xvi, 240 ♀

Described from a unique ♀ in perfect condition taken in November at Peradeniya (Ceylon).

9. S. microptera Giles in Theob., 1901.

Mon. Culic., ii, 281 ♂ ♀ (*Wyeomyia* (?) *micropterus*).

Stegomyia microptera Giles, Handbk., 2nd Ed., 380 ♂ ♀ ; pl. xiv, 24, head, thorax ; 25, head ; 26, venation.

Id. id. Theob. Mon. Culic., iii, 147 (note).

Culex micropterus Giles Jour. Bomb. So., xiii, 609.

Theobald (Monog., ii, 281 ♂ ♀, fig. 291, wing) publishes Giles's description with " Allahabad and Lucknow, in houses," as data.

Giles suggested that the species belonged to Theobald's *Wyeomyia*, but the latter replied, " Some mistake has been made here ; the insect referred to is undoubtedly a typical Culex." In vol. iii (Monog.), p. 147, he writes that " it is now said by Giles to be a *Stegomyia*, *vide* his Handbk., 2nd Ed., 380." Theobald continues (l.c.), " I have not seen the specimen, which appears to have been lost. Another locality is given, *viz.*, Jhansi." Probably the fact of what is apparently the type being lost, accounts for Theobald not including the species in the " Genera Insectorum." Moreover he speaks of " the specimen," but from Giles's original description (in Theob. Monog., i, 281), the author appeared to have several examples.

LOCALITIES : Allahabad, Jhansi, Lucknow [*Giles*].

10. S. periskelata Giles, 1902.

Handbk., 2nd Ed., 371 ♂; pl. xiv, 22, head ♂

Theobald in Mon. Culic., iii, 145, describes the ♂, but it does not appear in his revision in the " Genera Insectorum."

Recorded from Shahjahanpur (October) in the N.-W Provinces.

11. S. pipersalata Giles in Theob., 1901.

Mon. Culic., ii, 316.

Giles, Handbk., 2nd Ed., 372 ♂; pl. xvi, 1*a*,*b*, venation ♂

Type in British Museum. The species is ignored by Theobald in the " Genera Insectorum."

LOCALITIES : Jhansi and Gonda (N.-W. Provinces).

12. S. pseudonivea Theob., 1905.

Ann. Mus. Hung., iii, 75 ♀

Described from a unique ♀ taken by Biro in January at Singapore and now in the Hungarian Museum Collection.

13. S. punctolateralis Theob., 1903.

Entom., xxxvi, 156, ♂ ♀

Giles, Jour. Trop. Med., vii, 367.

LOCALITIES: Pampanga (Philippines) [*Whitemore*]; Queensland in January [*Dr. Bancroft*].

14. S. scutellaris Wlk., 1859.

Pr. Linn. So. Lond., iii, 77, ♂ (*Culex id.*).
Theob. Mon. Culic., i, 298 ♂ ♀, fig. 91 ♂ ungues; pl. xiv, 53, ♀, full ins. col.

Stegomyia id. Giles, Handbk., 2nd Ed., 374 ♀; pl. xiv, 4, venation, 5 head, thorax ♂
Culex variegatus Doles. Nat. Tijd. Ned. Ind., xvii, 77.

The larva of this species has been continually observed.

Theobald mentions it as breeding in standing water near houses at 500 feet altitude; Aitken reared it in Bombay, the larvæ living amongst rotten leaves; and he found it abundant in the Canara District, living in forest streams.

One of the most widely distributed species. Mr. Aitken says it bites during the day in the Canara District, whilst Mr. B. G. Corney declares it disappears at night at Fiji (Bera Is.).

Type in British Museum, in good condition.

Mr. Theobald has omitted this species from the "Genera Insectorum." Presumably this is an oversight, as he does not account for the species in any way.

LOCALITIES: Madras and Naini Tal [*Giles* and *Cornwall*]; Canara District [*Aitken*]; Sombalpur (Cent. Prov.) [*Dr. O'C. Murphy*]; Ceylon November and 12-xi-1899 [*Bartholomew*]; Selangor 28-x-1899 "very common" [*Butler*]; Upper Burma (March) [*Watson*]; Siam (abundant) [*Skeat*]; Penang [*Freer*]. Perak [*Wright*]; Singapore, 4-ix-1899 [*Raffles Museum*], also "27-vi-1899," and from "Singapore" [*Biro*]; Celebes and Aru [*t. Walk.*]; Ins. Deslacs and Ins. Graget [*Biro*]; Selve, Berlinhafen, Stephansort and Muina (all Papua) [*Biro*]; Amboina [*t. Doles.*]; Hongkong 27-ix-1899 [*Ford*]; Foochow 9-viii-1900 [*Rennie*]; Shaohyling (China) (*Cornford*); Tamsvi (*Formosa*) 2-viii-1899 [*Mackay*]; Japan [*Wood*]; Bayambang (Pangasinan, Phil Is. [*Chamberlain*]; North Borneo. Outside the Orient it occurs in Mauritius, 22-xi-1899 [*Sir Ch. Bruce*]; Fiji 30-xii-1899 [*Black*]; Victoria (Seychelles) [*Dr. Denman*]; and on Christmas Island [*Dr. Durham*].

Sub-species samarensis Ludlow, 1903.

Jour. New Yk. Ent. So., xi, 138.

also in Can. Ent., xxxvi (1904), 71 for difference between typical form (*scutellaris* Wlk.) and this var.

Banks says that *scutellaris* Wlk. (typical) has not been seen by him from the Philippines, but that this variety is widespread there, and that he has bred several varieties of it, all reared from the same lot of eggs. He suggests " intergradation between (*scutellaris* and *samarensis*."

Although Theobald places this sub-species under *Scutomyia notoscripta*, Skuse, I retain it under *scutellaris* Wlk., following the more recent authority of Banks (Phil. Jour. Sci., i, 985) who raises it to the dignity of a species.

LOCALITIES: Samar, Leyte, Mindoro, Iloilo, Negros (all Phil. Is.) [*t. Banks*]; Manila, Fort McKinley [*Craig*].

NOTE.—**albopictus** Skuse, Ind. Mus. Notes, iii, 20.

I find some difficulty in deciding where to place the above form.

Theobald in his Monograph (i, 298) sinks it as a synonym of *Stegomyia scutellaris* Wlk., as does Giles (Handbk., 2nd Ed., 374). Yet in the Genera Insectorum, Theobald omits *scutellaris* Wlk. altogether (this must surely be an omission by error), and gives *albopictus* Skuse as a synonym of *Scutomyia notoscripta* Skuse. Moreover, his reference to Skuse's description in " Ind. Mus. Notes " should be vol. iii, pt. 5, and not " vol. 35."

Whether a good species or whether synonymous with *scutellaris* or *notoscripta*, the form *albopictus* is common throughout the summer in Calcutta, I myself having bred it during August from larvæ found in the bathroom. They metamorphosed quite readily in an empty biscuit tin, and I believe developed a second generation therein, but I could not be quite certain that this latter was not due to other specimens obtaining access to the water.

Dr. Annandale took it at Bhim Tal (Kumaon 4,500 ft.) in Sept. 1906, where it was freely breeding in water butts near European houses, also in cavities holding water in jungle trees. From a comparison of the descriptions, and an examination of specimens it seems to be a form of *scutellaris* Wlk., under which specific name I therefore retain it.

15. S. sexlineata Theob., 1901.

Mon. Culic., i, 308 ♀, fig. 94, head, thorax, abdomen, ungues, wing scales, etc.

Giles Handbk., 2nd Ed., 377.
Id. Jour. Trop. Med., vii, 367.

Described by Theobald from a unique perfect ♀, taken at Agua Santa (Trinidad) in December. Giles is uncertain of the identity of his species with Theobald's.

Taken by Whitmore at Angeles (Pampanga, Phil. Is.).

16. S. thomsoni Theob., 1905.

Gen. Ins. Fasc. 26, p. 18.

Theobald does not mention the sex of this species, which comes from the North-West Provinces of India. The " description " is confined to five lines.

17. S. w-alba Theob., 1905.

Ann. Mus. Hung., iii, 74 ♀, fig. 4, thorax, head, femur.

Type in Hungarian Museum. Described from a perfect unique ♀, which was taken by Biro at Matheran (India, near Bombay) at an altitude of 800 metres.

NOTE.—The following species, described as *Stegomyia* are not accounted for by Theobald in his " Gen. Ins. " revision.

18. S. desmotes Giles, 1904.

19. S. leucomeres Giles, 1904.

20. S. striocrura Giles, 1904.

All three species are described in the " Jour. Trop. Med." VII, 367, and all three were taken by Whitmore at Angeles (Pampanga, Phil. Is.).

SKUSEA Theob., 1903.

Mon. Culic., iii., 291 ;
also in Gen. Ins. Fasc. 26, p. 19.

1. S. culiciformis Theob., 1905.

Ann. Mus. Hung. iii, 77 ♀ ; pl. i, wing ; pl. iv, wing scales.

Described from a unique ♂ which is in the Hungarian Museum, and was collected by Loria on the Paumomu River in Papua.

2. S. diurna Theob., 1903.

Entom., xxxvi, 259 ♀

Described from a single perfect ♀ taken by Dr. Durham in September at the hospital reservoir at Jugra (Kuala Lumpur). It is a day flyer and near *S. multiplex.*

3. S. funerea Theob., 1903.

Mon. Culic., iii, 292 ♀, fig. 164 (p. 292), head, abdomen.

Types in British Museum.

Var. **ornata** Theob., 1905.

Ann. Mus. Hung., iii, 79, ♀ ; pl. i, wing.

Described from 8 ♀ ♀ Captured by Biro at Sattelberg (Huon Golf) and Friedrich Wilhelmshafen, both places in Papua.

4. **S. multiplex** Theob., 1903.

Mon. Culic., iii, 293 ♀, fig. 165, head ungues.

Original description from 3 ♀ ♀ from Australia, but Theobald found it in the Hungarian Museum from four Papuan localities (the specimens collected by Biro), *viz.*, Friedrich Wilhelmshafen, Stephansort, Muina and Ins. Graget.

SCUTOMYIA Theob., 1904.

Entom., xxxvii, 77.

Has affinities with *Stegomyia*, *Macleaya* and *Leicesteria*.

1. **S. albolineata** Giles, 1901.

Jour. Bomb. So., xiii, 609.

India. I can find no further data.

2. **S. albolineata** Theob., 1904.

Entom., xxxvii, 77 ♀

Apparently a case of a second species of the same name, as Theobald does not account for Giles' species in any way in the Genera Insectorum.

Described from a unique ♀ taken by Dr. Leicester during June in jungle, six miles from Kuala Lumpur.

Type in British Museum. "Close to *scutellaris* Wlk."

3. **S. nivea** Ludlow, 1903.

Jour. New Yk. Ent. So., xi, 139 (*Stegomyia id.*).

Federated Malay States and Philippine Islands.

N.B.—*Vide* Note under *Stegomyia amesii*.

4. **S. notoscripta** Skuse, 1889.

Pr. Linn. So., N. S. Wales, iii, p. 1738 (*Culex*).

Sub-species **samarensis** Ludl., 1903.

Jour. N. Yk. Ent. So., xi, 138.

Philippine Islands.

Mr. Theobald in the "Gen. Ins." gives *albopictus* Skuse as a synonym of *notoscripta* Skuse. *Vide* my notes under *Stegomyia scutellaris* Wlk.

5. **S. fusgens** Wied., 1828.

Auss. Zweifl., i, 545 ♀ (*Culex*).

Theob. Mon. Culic., i, 300.
Patton Jour. Bomb. So., xvi, 634; pl. D, head of larva, male clasper.
Giles, Handbk., 2nd Ed., 375 ♂ ♀

First described by Wiedemann from West and Central Africa, but it has been found quite recently by Patton in Arabia, breeding in tanks, barrels, wells or any still water, being a very common species at Aden, its bite being very irritating. The ♂ is said not to bite.

LEICESTERIA Theob., 1904.

Entom., xxxvii, 211.

Theob., Gen. Ins. Fasc. 26, p. 20.

Near *Eretmapodites*, *Macleaya*, *Scutomyia*, etc.

1. **L. longipalpis** Leicester in Theob., 1904.

Entom., xxxvii, 211 ♂ ♀

Types in British Museum. Taken at Kuala Lumpur by Dr. Leicester.

HULECOETOMYIA Theob., 1904.

Entom., xxxvii, 163.

Theob., Gen. Ins. Fasc. 26, p. 20.

These *Culicidæ* have the appearance of *Stegomyiæ*.

1. **H. pseudotaeniata** Giles, 1901.

Entom., xxxiv (*Stegomyia*).

Theob. Mon. Culic., i, 312 ♀, fig. 96, thorax, head ♀, wing scales.
Larva descr. loc. cit., i, 314; iii, fig. 16 (p. 28), larva.
Stegomyia id. Giles, Handbk., 2nd Ed., 379 ♂ ♀; pl. xiv, 8, venation; 9, body; 10, larva.

Apparently a hill species. Theobald says it occurs in May; Banks found it common in January at the Manila Waterworks at Rizal, and he bred the species under similar conditions to those of Giles, who took it in the hills.

Localities: Bakloh (Punjab) and Lower Himalayas 6,000 to 8,000 feet, Naini Tal [*Giles*]; Manila [*Banks*].

2. **H. trilineata** Leicester in Theob., 1904.

Entom., xxxvii, 163 ♂ ♀

Types in British Museum.

LOCALITY: Kuala Lumpur in April [*Leicester*].

PHAGOMYIA Theob., 1905.

Gen. Ins. Fasc. 26, p. 21.

1. **P. gubernatoris** Giles, 1901.

Entom., xxxiv, 194 ♀ (*Stegomyia*), and Jour. Bomb. So., xiii, 607.

Theob. Mon. Culic., i, 314 ♀, fig. 97 (p. 315), thorax ♀

Giles, Handbk., 2nd Ed., 380 ♀

Recorded from Allahabad (July) and "North India." The single specimen forming the type was accidentally damaged, after being described [*Giles*].

HOWARDINA Theob, 1903.

Mon. Culic., iii, 287; pl. xv, wing scales.

Theob., Gen. Ins. Fasc. 26, p. 21.

1. **H. greenii** Theob., 1903.

Mon. Culic., iii, 289 ♀, fig. 160 (p. 289), head, fig. 161, wing.

Described from a unique.

LOCALITY: Peradeniya (Ceylon) in Feb.

2. **H. himalayana** Giles, 1904.

Jour. Trop. Med., vii, 384.

Recorded from Naini Tal.

DANIELSIA Theob., 1904.

Entom. xxxvii, 78.

Theob. Gen. Ins. Fasc. 26, p. 21.

Near *Scutomyia*, *Macleaya* and *Catageiomyia*.

1. **D. albotaeniata** Leicester in Theob, 1904.

Entom., xxxvii, 111 ♂ ♀

Bred in April by Dr. Leicester from larvæ taken in bamboo jungle six miles from Kuala Lumpur. Resembles *Stegomyia nivea*. Types in British Museum.

LEPIDOTOMYIA Theob., 1905.

Ann. Mus. Hung., iii, 80, and Gen. Ins. Fasc. 26, p. 22.
" Intermediate between *Culex* and *Stegomyia*."

1. L. alboscutellata Theob., 1905.

Ann. Mus. Hung., iii, 80 ♀

Described from two ♀ ♀ Types in the Hungarian National Museum at Buda Pesth.

LOCALITIES: Simbang (Huon Golf) and Friedrich Wilhelmshafen; both in Papua and collected by Biro.

2. L. magna Theob., 1905.

Gen. Ins. Fasc. 26, p. 22.

Recorded from Bombay.

THEOBALDIA Nev. Lemaire, 1902.

Comp. rend. Soc. biol. Paris (1902).

Theob. Mon. Culic., iii, 148; pl. x, wing scales, var. spp.
Theob. Gen. Ins. Fasc. 26, p. 23.

1. T. annulata Schrk., 1776.

Beitr. z. Naturg. 97 (*Culex*).

Culex annulatus Fab. Ent. Sys., iv, 400 (Culex).
Id. *id.* Meig. Sys. Besch., i, 3.
Id. *id.* Macq. Hist. Dipt., i, 35.
Id. *id.* Sch. F. Austr., ii, 626.
Id. *id.* Zett. Dip. Scand., ix, 3640.
Id. *id.* V Wulp. Dip. Neer, 325.
Id. *id.* Theob. Mon. Culic., i, 331 ♂ ♀, fig. 108, abd. segments, ungues ♂ ♀, palpus ♂; pl. xv, 58, full ins. col.
Id. *id.* Giles Handbk., 2nd Ed., 391; pl. xv, abd. seg.; claws ♂ ♀, wing ♀; head ♂; genitalia ♂
Theobaldia *id.* Theob. Gen. Ins. Fasc. 26; pl. i, 12 ♀ full ins. col.
Culex affinis Stephens 1825, Zool. Jour. No. 1 (type in Hope Coll., Oxford).
C. variegatus Schrk. 1781, Enum. Ins. Austr. 482.

Ficalbi says it does not bite man or animals, but feeds on plant juices. This author and Giles have considered *Culex penetrans* Rob. Desv. a variety of *annulata*, but Theobald (Monog. i, 334) thinks

it distinct, adding that both sexes hybernate, and that he has taken it (presumably in the adult stage) at all seasons of the year, but gives no data.

LOCALITIES: Punjab (November), Bakloh (Punjab), 5,000 ft. [*Lindesay*]. The species is common in Europe from April to October, and it also occurs in North America.

2. T. spathipalpis Rond., 1886.

Prod. Dipt. Ital., i, ♀ (*Culex*).

Theob. Mon. Culic, i, 339 ♂ ♀ ; iii, 154 ♀; pl. x, wing scales.

Giles Handbk., 2nd Ed., 392 ♂ ♀; pl. xv, 23, wing ♀, 24, head ♂; 25, genitalia ♂

Ficalbi Venti. spec. Zan. Ital., p. 146, in Bull. Soc. Ent. Ital.

A south European species, occurring from Italy through Cyprus and Palestine to North India, being recorded from Gibraltar in September and from India in June and July. Ficalbi describes the ♂

Giles thinks this species may be identical with *longiareolatus* Macq., in which case the latter name takes precedence.

Theobald mentions receiving a ♂ from India, but gives no locality. Dr. Grabham, writing from Madeira, says it is not found in houses, but that he has bred them from larvæ found in great abundance in stagnant water, especially horse ponds.

Giles records finding the species in a bathroom at Naini Tal (7,000 ft.), this being the only definite oriental locality I can find. Outside this region it occurs at Cyprus (5,000 ft.), S. Africa (1,300 ft.), Algeria, Teneriffe, Madeira, etc.

PECOMYIA Theob., 1905.

Jour. econ. biol., i.

1 P. maculata Theob., 1905.

Jour. econ. biol., i ; pl. iv, 7.

Described from India.

PSEUDOGRABHAMIA Theob., 1905

Jour. Bomb. So., xvi, 243.

1. P. maculata Theob., 1905.

Jour. Bomb. So., xvi, 243 ♂ ♀

Described from 1 ♂ and 2 ♀ ♀, perfect specimens from Galgamuwa, Ceylon (August).

GRABHAMIA Theob., 1903.

Mon. Culic., iii, 243 ; pl. xi, wing scales.

Theob. Gen. Ins. Fasc. 26, p. 23.

1. G. ambiguus Theob., 1903.

Mon. Culic., iii, 248 ♂

A unique, taken by Capt. James in July at Quilon (Travancore, S. India).

2. G. deniedmanni Ludlow, 1904.

Can. Ent., xxxvi, 234.

Philippines.

3. G. ochracea Theob., 1905.

Jour. econ. biol., i, 25.

India.

? 4. G. sollicitans Wlk., 1856.

Ins. Saunds. Dipt., 427.

Theob. Mon. Culic., i, 368 ♀ ; pl. xvi, 64 ♀ ; full ins. col.
Id. id. iii, fig. 130 (p. 248), wing ♀

This species may possibly not be oriental, being mainly a North American one. I include it on the ground that an example from Formosa received by Theobald appears to him to be probably *sollicitans*.

The larva breeds in brackish water and is common on the Atlantic seaboard of America.

5. G. spenceri Theob., 1901.

Mon. Culic., ii, 99 ♀ ; pl. xxvi, 104, full ins. col. (*Culex*).
Theob. loc. cit. ii, fig. 198 (p. 100) wing abdominal segment, base of antennæ.
Grabhamia spenceri Theob. loc. cit. iii, 250.
Culex id. Giles Handbk., 2nd Ed., 431.

Theobald quotes this as from the Philippines, although it is a North American species, but Banks doubts its occurrence in those Islands. (*Vide* Phil. Jour. Sci. i, 986.)

Theobald describes a var. *idahoensis* from Idaho in Monog. ii, 250.

LOPHOCERATOMYIA Theob., 1905.

Jour. Bomb. So., xvi, 245, and Ann. Mus. Hung., iii, 93.

1. **L. brevipalpus** Theob., 1905.

Ann. Mus. Hung., iii, 96 ♂, fig. 9 (p. 96),
palpus ♂, proboscis base of antennæ, ungues.

A unique specimen, in the Hungarian Museum taken by Biro at Singapore.

2. **L. fraudatrix** Theob., 1905.

Ann. Mus. Hung. iii, 94 ♂ ♀, fig. 7 (p. 94),
palpus ♂ ♀, fig. 8, antennal organs.

Types in Hungarian Museum. Described from a good series of both sexes.

LOCALITIES: Friedrich Wilhelmshafen and Stephansort (both Papua).

3. **L. uniformis** Theob., 1905.

Ann. Mus. Hung., iii, 93 ♂ ♀
Pl. A, 3, antenna; pl. B, 4, palpus.

Described from 2 ♂ ♂ and several ♀ ♀
Recorded from Peradeniya (Ceylon) during May.

CULEX Linn., 1758.

Linn. Sys. Naturæ, Ed. x, 602.
Meig. 1818, Sys. Besch., i, 1.
Macq. 1834, Hist. Nat., i, 33.
Sch. 1864, Fn. Aust., ii, 625.
V. Wulp 1877, Dip. Neer, 323.
Theob. 1901, Mon. Culic., i, 326.
Culex, restricted by Theobald, Gen. Ins. Fasc. 26, p. 24.

1. **C. albolineatus** Giles, 1902.

Handbk., Gnats, 2nd Ed., 430 ♀; pl. xvii, 10 a, venation ♀
Theob. Mon. Culic., iii, 192 ♀

Described from a single ♀ taken in a bungalow.

LOCALITY: Shahjahanpur (N.-W Prov.), Oct. 20th.

2. **C. angulata** Theob., 1901.

Mon. Culic., ii, 324 ♀

Very near *fatigans* Wied. Described from 2 ♀ ♀ in Col. Giles's coll., taken by him in June at Naini Tal (4,000 ft.).

3. C. annuliferus Ludlow, 1903.

Jour. New Yk. Ent. So., xi, 141 (*annulifera*).

Theobald's reference to vol. 2 instead of xi is an error. (Gen. Ins.)

LOCALITY: Bayembang (Pangasinan Phil. Is.) [*Chamberlain*].

4. C. annulus Theob., 1901.

Mon. Culic., i, 358 ♀
Giles Handbk., 2nd Ed., 405 ♀

Described from several ♀ ♀ in Dr. Rees's collection.

LOCALITIES: Tai Po (Pokfulam), Hongkong, Straits (Dindings, Oct. to Dec.), Lamma.

5. C. biroi Theob., 1905.

Ann. Mus. Hung., iii, 82 ♂ ♀ ; pl. i, wing ♂ ♀.

Closely allied to *C. vishnui* Theob. Types in Hungarian Museum.

LOCALITY: Bombay [*Biro*].

6. C. caecus Theob., 1901.

Mon. Culic., i, 413 ♀, fig. 147, head; fig. 148, scutellum and scales; pl. xx, 77, full ins. col.

Giles, Handbk., 2nd Ed., 415 ♀

LOCALITIES: Selangor 28-x-1899 [*Butler*]; Klang Mangrove Swamps.

7. C. cantans Meig., 1818.

Sys. Besch. i, 6.
C. stimulans Wlk. List. Brit. Mus. Dip. i, 4 ♀
C. fumipennis Steph. Zool. Jour. i, 453.

Culex maculatus Meig. is erroneously given as a synonym by Theobald in Proc. Roy. So. Lond., lxix, 388. Walker's species was described from Nova Scotia.

LOCALITY: Coonoor, 6,000 ft. (Nilgiri Hills), North India [*Dr. Price*].

8. C. concolor Rob. Desv. 1825.

Mem. So. His. Nat. Paris, iv, 405.

Theob. Mon. Culic., ii, 107 ♂ ♀, fig. 203 ♂, palpus.
Id. id. Pl. xxviii, 109 ♂, 110 ♀, both full ins. col.
Giles, Jour. Trop. Med., vii, 368.
Id. Handbk., 2nd Ed., 454 ♂ ♀ ; pl. xvii, 8 *a,b*, venation ♂ ♀

Generally distributed through India and the Straits, common during the rains. Theobald says that owing to the type having apparently been lost, a comparison is impossible, but the species identified by him with it is generally known as Desvoidy's *concolor*. The original description is too meagre for satisfactory determination, and Theobald and Banks both concur in considering it must be removed from the genus *Culex*.

Patton found it breeding in a tank in the Aden hinterland, and Capt. James and Aitken have also studied the larvæ (Theob. Monog., iii, 231) which voraciously fed on other *Culicidæ* larvæ and were, moreover, cannibalistic. They come from grassy pools and (occasionally) wells. A species named "*C. fuscanus*" amongst the old specimens at the British Museum is identified as *concolor* by Theobald.

LOCALITIES: Sylhet 1-ii-1905 and 1-xii-1904 [*Hall*]; Purneah (N. Bengal), 6-viii-1907 [*Paiva*]; Rajmahal (Bengal) 1-viii-1907 [Ind. Mus. Coll.]; Damukdia (E. Bengal) 22-vii-1907 [Ind. Mus. Coll.]; Calcutta, common July, Aug. [*Annandale*]; Gopkuda Is., Chilka Lake, Orissa (E. Coast, India), August 1907 [Ind. Mus. Coll.]; Canara District [*Aitken*]; Quilon [*James*]; N.-W. Provinces [*Giles*]; Madras, 25-xi-1900 [*Cornwall*]; Mozufferpur (Behar, Bengal) [*Green*]; Upper Burma (August) [*Watson*]; Selangor, 28-x-1899 [*Butler*]; Kuala Lumpur [*Durham*]; Perak, 22-xi-1899 and 21-xii-1899 [*Wray* and *Wright*]; Hongkong [*Rees*]; Pampanga (Phil. Is.), [*Whitmore*]; also Foo Chow in China.

9. C. fatigans Wied., 1828

Auss. Zweifl. i, 10 ♂ ♀

Theob. Mon. Culic., ii, 151 ♂ ♀, fig. 234 ♂, wing, fig. 235 ♂ genitalia, fig. 236, wings; p. 155, map of distribution; pl. xxix, 114 ♂, 115 ♀, both full ins. col.; pl. D, wing scales.

Id. id. ii, 156 *et seq.*, long list vars. and locs.; fig. 238, 10 variations of wings; as an intermediate host, p. 161.

Id. Gen. Ins. Fasc. 26; pl. ii, 2 ♀, full ins. col.

Giles Handbk., 2nd Ed., 438 ♂ ♀ fig. 45, wings, head, etc., p. 440, list of sub-species.

Culex æstuans Wied. Auss. Zweifl., i, 11.

? *C. pungens* Wied., l.c. i, 9.

C. pallipes Meig. Sys. Besch. Suppl. (1838).

C. anxifer Coquerel (Big.) Ann. So. Ent. Fr. (1858).

C. skusii Giles, Handbk., 1st Ed., 292.

Heteronycha dolosa Arrib. Dipt. Argent, p. 56.

? *Culex macleayi* Skuse Pr. Linn. So. N. S. Wales (1896), p. 1745.

Sub. sp. **luteoannulatus** Theob. Mon. Culic., ii, 159.
Id. **trilineatus** *id.* l.c., ii, 159.
id. Giles Handbk., 2nd Ed., 464 ♀ (Thayetmyo, Upper Burma).

The characters of these two subspecies are defined by Theobald but no special localities are given.

If *Culex pungens* of Wiedemann is identical with this species, that name takes precedence. Type presumably in Wiedemann's coll. A widely distributed, common species throughout the Orient, and occurs as far north as Italy. Patton reports it as very common in the Aden hinterland, breeding everywhere in springs, wells and puddles. Banks describes it as the most common night mosquito in the Philippines, hiding during the day in clothes. Dr. Low has seen them pairing by night.

LOCALITIES: Naini Tal [*Giles*]; Sambalpur [*Murphy*]; Etawah, (N.-W Prov.) [*Maj. Scotland*]; Mozufferpur (Behar, Bengal), [*Green*]; Calcutta 6-iii-1899 [*Daniels*; also by *Dr. Annandale*]; Madras 12-xii-1899 [*Goodrich*]; Madras [*Biro*]; Quilon [*James*]; Kurmregalla, Badulla, Balangoda and Keleni Valley (all four in Ceylon; Jan., March and November, taken by Green); Straits (Dindings) [*Wray*]; Perak [*Wright*]; Singapore, 4-ix-1899 and July [*Hanitsch* and *Biro*]; Papua (Friedrich Wilhelmshafen, and Stephansort) [*Biro*]; Hongkong, 8-i-1900 and July [*Ford*]; Foo Chow [*Rennie*]; Shaohyling (China) [*Cornford*]. Also occurs in very many places in North, Central and South America, many West India Islands, Africa, Fiji, etc., etc.

10. C. foochowensis Theob., 1901.

Mon. Culic., ii, 137 ♂ ♀
Fig. 224, wing ♀, cross veins, scutellum, ungues ♂, fig. 225, palpus and proboscis ♂, genitalia, abdomen, bristles and wing scales.

An August species from Foo Chow (China); [*Rennie*].

11. C. fragilis Ludlow, 1903.

Jour. New Yk. Ent. So., xi, 143 ♀.

Philippines.

12. C. fuscanus Wied., 1828.

Auss. Zweifl., i, 6.

Theob., Mon. Culic., ii, 167.
Id. Gen. Ins. Fasc. 26, p. 30 (quotation incorrect).
Giles, Handbk., 2nd Ed., 455 (no sex given).
The author gives no sex, nor any reference to the type.

Theobald's references to "*C. fuscanus* Wied." are not at all definite. Under his accepted species of *Culex* (*sensu strictu*), he gives "*fuscanus* Wied. 1821, Dip. Ex. p. 9," adding East India, Malacca, Singapore and Sarawak as localities (the latter three, probably on the authority of Walker). Then under his " species unidentifiable, except from types," he places " *C. fuscanus* Wied., 1838, Dip. Ex. 4th supp., p. 9." First of all, the two quotations, by their similarity, appear to refer to the same reference, but, apart from that, Wiedemann in his " Auss. Zweifl." (1828), in describing the species (i, p. 6) does not give any earlier reference, as is usual with him when dealing with species previously described by him elsewhere. This makes me doubt the reference to " Dip. Ex.," more especially as Van der Wulp's Catalogue quotes the " Auss. Zweifl." description as the original one. By the way, Theobald's 2nd quotation is not an error for Macquart's " Dipt. Exot.," as this latter author does not mention the species at all. I therefore include the species *fuscanus* as a good one under Wiedemann's " Auss. Zweifl." reference and under *Culex*. " No specimen has yet been received at the British Museum answering to the description of this species." (Theob.)
LOCALITIES: E. India, Singapore, Malacca, Sarawak.

13. C. gelidus Theob., 1901.

Mon. Culic., ii, 20 ♀; pl. xxiv, 93 ♀, full ins. col.; fig. 158, thorax and hind tarsus.

Giles, Handbk., 2nd Ed., 421 ♀
Theob. Mon. Culic., ii, 20 ♀ fig. 158, thorax and hind tarsus.

Described from a single perfect ♀ taken by Mr. Butler amongst plantains, Oct. 23rd, 1899, in Selangor.

The species is said to be near *C. confirmatus* Arrib.

What appears to be the ♂ of the typical form (hitherto undescribed) was captured at light by Dr. Annandale in Calcutta, 30-vii-1907, and is now in the Indian Museum collection. During July and August this year (1907) this gentleman has taken both sexes fairly commonly on mossy walls of gardens adjoining the Museum.

LOCALITIES: (Typical form) Purneah (N. Bengal), 6-viii-1907 [*Paiva*]; Peradeniya (July and Sept.) and Kelani Valley (both Ceylon) [*Green*]; Selangor [*Butler*]; Dindings (Straits) in November; Bayembang (Pangasinan, Phil. Is.) [*Chamberlain*]; Perak, Dacca, Calcutta.

Var. *sinensis* Theob., 1903. Monog. (iii, 180 ♀).

This variety taken by Mr. Cornford at Shaohyling, China.

Sub. species **cuneatus** Theob., 1901.

Mon. Culic., ii, 22 ♀, fig. 159, wing, head, proboscis, abdomen marks.

Culex gelidus cuneatus Giles, Jour. Trop. Med., vii, 368.

Banks says it is a fairly common mosquito, flying at early evening.

LOCALITIES: Calcutta, July, Aug. [*Annandale*]; Quilon in July [*James*]; Ceylon [*Green*]; Taipang (Perak), 21-xii-1899 [*Wray*]; Manila [*Banks*]; Pampanga (Phil. Is.) [*Whitmore*].

14. C. gnophodus Theob., 1903.

Mon. Culic., iii, 163 ♀

Closely related to *microannulatus*. Described from a unique from Dindings (Straits), taken in November.

15. C. halifaxii Theob., 1903.

Mon. Culic., iii, 231 ♀

The type is unique, and from Dindings (Straits) in December.

16. C. hirsuteron Theob., 1901.

Mon. Culic., ii, 98 ♀; fig. 196, ungues ♂, fig. 197, wing ♀

Theob. Gen. Ins. Fasc. 26, p. 27.
Culex hirsuteros Giles, Handbk., 2nd Ed., 451.
Id. *id.* Jour. Trop. Med., vii, 368.

Described from 4 specimens from Virginia sent by Prof. Howard of the United States National Museum. I include it in this Catalogue provisionally. Banks includes this species from the Philippines in his Catalogue, but doubts the identity of Giles's species with Theobald's American species from Virginia. I find no other record of any oriental locality.

LOCALITIES: Pampanga [*Whitmore*]. Also Virginia, U.S.A.

17. C. hirsutum Theob., 1901.

Mon. Culic., i, 392 ♂ ♀; pl. xx, 80 ♀, full ins. col.; fig. 137, palpus ♂, apex antennæ ♂

Types in British Museum. Theobald gives the Philippines as its habitat (Gen. Ins.), but Banks's catalogue ignores it.

18. C. impellens Wlk., 1860.

Pr. Linn. So. Lond., iv, 91 ♀

Theob. Mon. Culic., i, 362 ♀, fig. 122, head, 123, wing.
Id. l.c. iii, 161 ♂, descr.
Giles, Handbk., 2nd Ed., 405 ♂ ♀; pl. xvi, 3*a*, head, *b*, venation ♂

Theobald feels certain of having recognised this species correctly, although the thorax and wings are all that is left of the type. It is near *sitiens* and *microannulatus*; Dr. Durham has observed the larva. " Bites and breeds to a moderate extent through the cold weather in the N.-W Provinces and Punjab " (Giles).

LOCALITIES: Kuala Lumpur in July [*Durham*]; Perak [*Wray, Wright*]; Kelani Valley, Batticolora in April (Ceylon) [*Green*], N.-W. Provinces [*Giles*]; Makerian (26-x-1900) (Hoshiarpur) [*Dr. Datta*]; Makessar (Celebes) [*t. Walker*]; Pampanga, Philippines [*Whitmore*], and Calcutta.

19. C. imprimens Wlk., 1861.

Pr. Linn. So. v, 144 ♀

C. imprimiens Giles, Handbk., 2nd Ed., 411 ♀

Described from Amboina. It does not figure in Theobald's Monograph, but he mentions it in the " Gen. Ins." (incorrectly) as *imprimiens*.

20. C. infula Theob., 1901.

Mon. Culic. i, 370 ♀

Giles, Handbk., 2nd Ed., 407 ♀

A unique, from Taipang, taken by Mr. Wray jun. The usual two dates are added by Theobald (22-xi-1899 and 21-xii-1899) that appear to attend all species taken by this collector.

21. C. japonicus Theob., 1901.

Mon. Culic, i, 385 ♀

Theob. Mon. Culic., iii, 158.
? *Culex aureostriatus* Doles.

Described from a series of ♀ ♀ from Japan. Theobald says it appears in June and July (Monog. i, 386), although the only date he gives in that work is that of the Tokio examples (March).

LOCALITIES: Peradeniya (Ceyl.), 1 ♀, October [*Green*]; Tokio (8-iii-1899) [*Woods*].
N.B.—Doleschall's species is from Amboina.

22. C. longipalpis Wulp, 1892.

Mid. Sum. Dipt. 9; pl. i, 3, head.
Giles, Handbk., 2nd Ed., 423 ♀

Described from 2 ♀ ♀ from Soeroelangoen (Sumatra).

23. C. longipes Theob., 1901.

Mon. Culic., ii, 68 ♀
Giles, Handbk., 2nd Ed., 468 ♀

Described from a unique taken by Hanitsch in a house at Singapore, 4-ix-1899. Since recorded from Singapore, July 27th.

24. C. luteolateralis Theob., 1901.

Mon. Culic., ii, 71 ♂ ♀ ; pl. xxvii, 108 ♀ , full ins. col.
Giles, Handbk., 2nd Ed., 448 ♂ ♀

LOCALITIES: Perak [*Wray*]; Pampanga (Phil. Is.) [*Whitmore*]; Manila, "fairly abundant" [*Banks*]. Also in January at Durban and in March in Mashonaland.

25. C. mediolineatus Theob., 1901.

Mon. Culic., ii, 113 ♀
Giles, Handbk., 2nd Ed., 431 ♀

A unique ♀ in the British Museum from Thayetmyo (Upper Burma) [*Watson*].

26. C. microannulatus Theob., 1901.

Mon. Culic., i, 353 ♂ ♀ ; pl. xviii, 69 ♀ , full ins. col. ; fig. 118*b*, head ; *d* fore ungues ♂

Described from a good series from South India taken by James. A vicious biter, breeding in brackish water near Manila and Cavite, and allied closely to *vishnui* Theob., *sitiens* Wied., and *impellens* Wlk.

LOCALITIES: Quilon, 7-iii-1900 [*James*]; Madras [*Cornwall*]; N.-W Prov., "common" [*Giles*]; Shahjahanpur (December) [*Giles*]; Mukerian (Hoshiarpur) [*Dr. Datta*]; Peradeniya (Ceyl.) [*Green*]; Manila [*Banks*]; Cavite (Phil. Is.), close to Manila [*Stiff*]; Pangasinan (Phil. Is.) [*Chamberlain*]; also from Calcutta and the Federated Malay States.

27. C. mimeticus Noe, 1899.

Bull. Ent. So. Ital., xxxi, 240.
Giles, Handbk., 2nd Ed., 389; pl. xv, 16, wing ♀ ; 17 palpi and proboscis ♂; 18 tarsal claws ♂
Theob. Mon. Culic., i, 329 ♀ ; pl. xvi, 63 ♀ ; full ins. col.
? *hyrcanus* Pallas, Reisen Russ. Reich (1871), near Caspian Sea.

The larva has been observed in Cyprus. Giles says it "appears common in the hills of India, especially in the Nilgiri Hills, and also appears in the plains in the cooler season."

LOCALITIES: Punjab in March, 6,000 ft. [*Lindesay*]; Canara District [*Aitken*]; Theog (Simla Hills, 8,000 ft., 2-v-1907) [*Annandale*]; Kuala Lumpur [*Durham*]; Perak [*Wright*].

28. C. nigripes Zett., 1838-1840.

Ins. Lapponica, 807.

Culex nigripes Ficalbi (1896), Bull. So. Ent. Ital., 292.
Id. id. Theob. Mon. Culic., ii, 93 ♂ ♀; fig. 194, wing, ungues; ii, fig. 260 (p. 219) map of distribution.

An arctic species spreading out around the North Pole to about 35° latitude, occurring in Lapland, Greenland, Alaska, Hudson's Bay and many parts of North America, possibly also, California; its bite being said to be almost poisonous.

NOTE 1.—*Culex impiger* Wlk., List Dipt.Br. Mus. i, 6, is regarded by Theobald (Gen. Ins., p. 27) as synonymous with *nigripes* Zett., but Giles considers that it is but *pipiens* L. For wing scales see Theob. Monog.; pl. D (*impiger* Wlk.).

NOTE 2.—*Culex implacabilis* Wlk., List Dipt. Br. Mus., i, 7, is given as a synonym of *nigripes* in the Gen. Ins. (p. 27).

Dr. Neve took *nigripes* Zett. (21-viii-1899) on the Deosai Plateau between Kashmir and Shardo at an altitude of over 13,000 feet.

NOTE 3.—*Culex incidens* Thoms. (Eugenie Reise 443) was queried by Theobald in the 1st volume of his monograph as *nigripes* Zett., but in the 3rd volume (p. 193) he definitely decides that they are both distinct. This latter is not oriental.

29. C. pallidithorax Theob., 1905

Jour. econ. biol., i, 32.

India.

(?) 30. C. pipiens Linn., 1758.

Sys. Nat. Ed., x, 602.

Sch. F. Austr., ii, 628.
(For synonyms *vide* Theob. Gen. Ins. Fasc. 26.)

I do not add all the European references and synonyms to this common and typical species of the family, as it appears to me not to occur in the Orient at all.

Patton records it breeding in springs, wells and rainwater pools round D'thala and Jehag (Arabia), at an altitude of 7,000 feet, but the only claim it has to being an oriental species is the Padre Casto Elera's "Cat. de toda la faunna Filip." (1895), ii, 490, which includes it as part of the Philippine fauna; as, however, no one else has verified the species as from this region, I include it in my catalogue with a query.

NOTE.—Prof. Kertesz's Catalogue has *Culex domesticus* Germar (1817, Reise nach Dalmatien, 290) as a good species from South

Europe and the Orient, but Theobald (Gen. Ins., p. 28) sinks it as a synonym of *pipiens* L. It seems strange that a species quite common over the greater part of Europe and North America besides other regions, should be absent entirely from all parts of the Oriental Region. Possibly Theobald's *quasipipiens* may be an oriental form of this species.

31. C. pulchriventer Giles, 1901 (emendation mihi).

Jour. Bomb. So., xiii, 608 (*pulcriventer*).

Theob. Mon. Culic., ii, 48 ♂ ♀, pl. xxiii, 92 ♀, full ins. col.; fig. 170 ♂ ♀, abdominal segments, wing scales and ungues; fig. 172, wing ♂; fig. 171, wing ♀; fig. 173, larva.

Giles, Handbk., 2nd Ed., 449 ♂ ♀; pl. xvii, 1, claws, *a*, venation, *b*, head ♂, *c*, abdomen ♀, *d*, abdomen ♂, *e*, larva.

The larva has been observed by Giles in June at Naini Tal, where it breeds in clean water pools in the course of hill torrents. A sylvan species.

32. C. pullus Theob., 1905.

Ann. Mus. Hung., iii, 87 ♀, fig. 6, head.

Type in Hungarian Museum (a unique). Taken by Biro at Muina in Papua.

33. C. quasipipiens Theob., 1901.

Mon. Culic., ii 136 ♀, fig. 223, head, wing veins.
Giles, Handbk., 2nd Ed.,.438.

" Very near *pipiens* L., but differs in the venation, and in the form of the head scales, which are smaller in that species; and in the larger thoracic scales " (Theob.).

LOCALITY: Sambalpur (Cent. Prov., India) [*Murphy*].

34. C. quasiunivittatus Theob., 1901.

Mon. Culic., ii, 32 ♀, fig. 164, head.

Near *univittatus*. Described from a unique female from Mashonaland, taken in February, but Banks now records it from Pampanga in the Philippines [*Whitmore*].

35. C. reesii Theob., 1901.

Mon. Culic., ii, 145 ♂ ♀; fig. 232 palpus ♂, thorax ♀, ungues ♂

Giles, Handbk., 2nd Ed., 449 ♂ ♀

Described from 2 ♂ ♂ and 2 ♀ ♀ in Dr. Rees's collection taken by him in October at Hongkong. " Very near *pipiens*."

36. C. rizali Banks, 1906.

Phil. Jour. Sci., i, 999 ♀

Very near *japonicus* Theob. Described from two ♀ ♀ Type in Entomological Collection (No. 6083), Bureau of Science, Manila. Taken on Negros Island (Philippines) by Banks in June, on the Siya Siya Mt. of the Canlaon Volcano.

37. C. rubrithorax Macq., 1850.

Dip. Exot. Supp., iv, 9 ♀

Theob. Mon. Culic., i, 416 ♀, fig. 150, thorax, head, apex, abdomen.
Giles, Handbk., 2nd Ed., 412 ♀
Id. Jour. Trop. Med., vii, 368.
Skuse, Pr. Linn. So. N. S. Wales (1896), p. 1735.

Type in Paris Museum. At one time it was considered a spotted variety of *concolor* R. Desv., but in the "Gen. Ins." Theobald ranks it as distinct. It has been more than once incorrectly referred to as *rubithorax*. Really an Australian species, but Whitmore has taken it at Pampanga (Philippines).

38. C. sericeus Theob., 1901.

Mon. Culic., ii, 147 ♀; fig. 233, palpus, wing scales, cross veins, scutellum, thorax scale.
Giles, Handbk., 2nd Ed., 452 ♀

Described from a unique ♀ in Dr. Rees's collection taken by him at Hongkong during October.

39. C. sitiens Wied., 1828.

Auss. Zweifl., i, 542 ♀

Theob. Mon. Culic., i, 360, fig. 121, wing, proboscis.
Giles, Handbk., 2nd Ed., 400 ♀

Theobald cannot trace the type, which, when Wiedemann described it, was in Dr. Trentepohl's collection. Several species are closely allied to this, *microannulatus*, for one. Giles records it as from Taiping, but gives no exact data.

40. C. tigripes de Grandpre and de Charmay 1900.

Planters' Gazette Press.

Giles, Handbk., 2nd Ed., 407 ♂ ♀; pl. xvi, 4, wing ♂ ♀; head ♂, thorax var.
Id. Jour. Trop. Med., vii, 368.
Theob. Mon. Culic., iii, fig. 120, 121, 122, larva, pupa diagrams.

Culex maculicrura Theob., 1901, Mon. Culic., ii, 34 ♂ ♀ ; pl. xxii, 85 ♀ , full ins. col.

First described from Mauritius. Theobald, in a footnote on same page, confirms *maculicrura* as synonymous.

LOCALITIES : Dindings in December (Straits), Pampanga (Phil. Is.) [*Whitmore*] ; also Mauritius, West Africa, Natal, Queensland.

41. C. tipuliformis Theob., 1901.

Mon. Culic., ii, 327 ♀ ; fig. 306, wing, leg, abdomen.
Giles, Handbk., 2nd Ed., 443 ♂

" A very distinct species, its long legs giving it the appearance of a Tipulid " (Theob.) Described from a single female taken by Lindesay in March at Bakloh (N.-W Prov., India), 5,000 ft.

42. C. trimaculatus Theob., 1905.

Ann. Mus. Hung., iii, 86 ♀ ; fig. 5, thoracic marks.

A unique. Type in Hungarian Museum. Bombay [*Biro*].

43. C. uncus Theob., 1901.

Mon. Culic., ii, 53.
Giles, Handbk., 2nd Ed., 452 ♀

In plantains in Klang Jungle (Straits).

44. C. univittatus Theob., 1901.

Mon. Culic., ii, 29 ♂ ♀ , fig. 161, head, abdomen, leg ; pl. xxii, 86 ♀ , full ins. col.

Giles, Handbk., 2nd Ed., 428 ♂ ♀ (*univitatus*, lapsus).

A vicious biter. Really an African species, but Hanitsch has taken it at Singapore. It occurs there in July and September.

45. C. vagans Wied., 1828.

Auss. Zweifl., i, 545 ♀

Theob. Mon. Culic., i, 411 ♀ , fig. 146, wing, scutellum.
Giles, Handbk., 2nd Ed., 414 ♀ ; pl. xvi, 14, venation ♀
Id. Jour. Trop. Med., vii, 368.

The species does not appear in the " Gen. Ins." Theobald's description of it is from a single ♀ in Giles's coll.

LOCALITIES : Hongkong (October) Shanghai [*Lindesay*] ; Pampanga (Phil. Is.) [*Whitmore*].

46. C. viridiventer Giles, 1901.

Jour. Bomb. So., xiii, 609.

Theob. Mon. Culic., ii, 128 ♂ ♀, fig. 219, ungues ♂ ♀, abdominal segs., wing scales, ♂ palpus and proboscis; fig. 220, larva; pl. xxix, 116 ♀, full ins. col.

Giles, Handbk., 2nd Ed., 445 ♂ ♀; pl. xvii, 12, claw ♂, venation, abdomen, larva.

A sylvan species, bred by Giles in June and July at Naini Tal (7,000 ft.) from larvæ from pools which were open to great floodings by torrents, the recorder noting that it was difficult to understand how the larvæ could maintain their position.

LOCALITIES: Naini Tal, Katmandu (Nepal) [*Ind. Mus. Coll.*].

47. C. vishnui Theob., 1901.

Mon. Culic., i, 355 ♂ ♀, fig. 119, ungues, wing tips; fig. 120, wing ♀, 120*a* three forms of abdomen ♂ ♀; ungues ♂; pl. xvii, 66 ♀, full ins. col.

Giles, Handbk., 2nd Ed., 399 ♂; pl. xvi, 5*a* abdomen vars., 5*b* fore tarsal claws ♂

Very near *microannulatus*. In rice fields at Sambalpur.

LOCALITIES: Sambalpur, 26-x-1900 (Cent. Prov., India) [*Murphy*]; Madras, Nov., Dec. [*Cornwall*]; Quilon, 27-vii-1900 and Feb. [*James*]; Ceylon, Nov. and 27-xii-1899 [*Bartholomew*], also Dacca.

CULEX spp.

Unrecognisable except from types.

48. C. doleschalli Giles, 1900.

Handbk., 1st Ed., 338.

nom. nov. for *cingulatus* Doles. 1856, Nat. Tijd. Ned. Ind., x, 405; pl. vii, 2; from Java. (*Culex id.*)

Cingulatus was preoccupied in *Culex* by Fabricius (1805 in Sys. Antl. 36) for a species from Brazil, the type being in Copenhagen Museum. Giles adds that it is very common all the year round in houses at Ambarawa (Java). Kertesz retains both Doleschall's and Fabricius's species under *cingulatus* (as two distinct species) without comment (Cat. Dipt., 1902).

49. C. filipes Wlk., 1861.

Pr. Linn. So. Lond., v, 229 ♀

? = *molestus* Wied.

Type in British Museum, but too decayed to be recognisable. Described from Dorey (Papua).

50. C. luridus Doles., 1857.

Nat. Tijd. Ned. Ind., xiv, 384 ; pl. v, 1.
Giles, Handbk., 2nd Ed., 469.
? *inflictus* Theob., 1901, Mon. Culic., ii, 115.

Theobald ranks his *inflictus* as a good species (from Grenada) in "Gen. Ins.," but retains the queried synonymy with *luridus*.

" During dry season in houses " (Doleschall, referring to Java).

LOCALITY : Gombong, Mid-Java (*t. Doleschall*).

51. C. molestus Wied., 1821.

Dip. Exot., i, 39, and also Auss. Zweifl., i, 542.
Giles, Handbk., 2nd Ed., 470.

Type in Dr. Trentepohl's collection (defective), Sumatra.

52. C. setulosus Doles., 1857.

Nat. Tijd. Ned. Ind., xiv, 384 ; pl. v, 4.
Giles, Handbk., 2nd Ed., 470.

" During the dry season, in houses " (Doleschall), Mid-Java.

CULEX spp.

Not accounted for by Theobald in the " Genera Insectorum. "

53. C. arabiensis Patton, 1905.

Jour. Bomb. So., xvi, 633 ♂ ♀ ; pl. D, ♂ palpus, ♂ clasper.

Found breeding in rainwater tank in May on the plain near Ulub Camp. Also found in the Crater, Aden.

54. C. aureostriatus Doles., 1857.

Nat. Tijd. Ned. Ind., xvi, 385 ♀ ; pl. vi, 1.
Theob., Mon. Culic., i, 387 ♀

Included in Kertesz's " Cat. Dipt., i " ; but not in the " Genera Insectorum."

Doleschall describes it from Amboina, saying " in dwelling rooms."

Theobald queries it as a possible synonym of his *Culex japonicus*, but, pending a decision on its specific validity, I retain it as a separate species.

55. C. tritaeniorhynchus Giles, 1901

Entom., xxxiv, 192.
Jour. Bomb. So., xiii, 606.

Theob., Mon. Culic., i, 364 ♂ ♀, fig. 124, wing ♂ ♀
Giles, Handbk., 2nd Ed., 401 ♂ ♀

Theobald said (Monog., i) that he had not seen a specimen himself, but that he had seen a "rubbed example of *vishnui*" which had the appearance of *tritæniorhynchus*; repeating this opinion in Pr. Roy. So. Lond. (1902), p. 388; but he is silent on the species both in the 3rd volume of his Monograph and in the "Genera Insectorum."

LOCALITY: Travancore (South India).

56. C. ventralis Wlk., 1865.

Pr. Linn. So. Lond., viii, 103 ♀.

The second species of this name in *Culex* by Walker. Both species are given as distinct in Prof. Kertesz's Catalogue of Diptera, and the descriptions read distinct, but Theobald does not mention this second species; described from Papua. The other *ventralis* Wlk. (186 loc. cit. v, 144) is a synonym of *Desvoidya obturbans* Wlk.

TRICHOPRONOMYIA Theob., 1905.

Ann. Mus. Hung., iii, 98.

1. T. annulata Theob., 1905.

Ann. Mus. Hung., iii, 98 ♂, fig. 10 apex of proboscis, scales.

Type in Hungarian Museum (a unique).

LOCALITY: Friedrich Wilhelmshafen (Papua) [*Biro*].

TRICHORHYNCHUS Theob., 1905.

Jour. Bomb. So., xvi, 241.

1. T. fuscus Theob., 1905.

Jour. Bomb. So. xvi, 242 ♀; pl. A, fig. 2, head, palpus, clypeus, antenna, scutellum.

Described from a single perfect ♂ taken in December at Peradeniya (Ceylon).

TAENIORHYNCHUS Arrib., 1891.

Revista Mus. La Plata ii, 147, and Dipt. Argent, 47.

Tæniorhynchus as modified by Theob., 1901; Mon. Culic., ii, 190; also table of species.
Id. Giles, Handbk., 2nd Ed., 358.
Id. Theob. Gen. Ins. Fasc. 26, p. 30

The species in this genus are said to be mainly sylvan.

Prof. Goeldi has studied the life-history of *T fasciolatus*, a South American species.

1. T. acer Wlk., 1848.

List. Dipt. Br. Mus., i, 8 ♀ (*Culex*).

LOCALITIES: Friedrich Wilhelmshafen, Mt. Hanseman (Astrolabe Bay) and Yomba, all in Papua, and taken by Biro. Also occurs in Queensland and New Zealand.

2. T. ager Giles, 1901.

Entom, xxxiv, 196 ♂ (*Culex bitæniorhynchus*), and Jour. Bomb. So., xiii, 607 (*id.* *id.*).

Tæniorhynchus ager Giles in Theob., Mon. Culic., ii, 199 ♂; fig. 248, abdomen, palpus, proboscis, wing scales.

Id. *id.* Giles, Handbk., 2nd Ed., 365 ♂ ♀

The larva occurs in rice fields, April and December being given as the periods when the imago appears.

LOCALITIES: Shahjahanpur, N.-W Prov., Travancore, Ceylon, Madras [all *Giles*]; Madras [*Cornwall*].

3. T. argenteus Ludlow, 1905.

Can. Ent., xxxvii, 98 ♀

Pampanga (Luzon) [*Whitmore*].

4. T. aurites Theob., 1901.

Mon. Culic., ii, 209 ♀; fig 253, proboscis, palpus, clypeus, scutellum, scales; fig. 254, wing, wing scales; pl. xxii, 88 ♀, full ins. col.

Giles, Handbk., 2nd Ed., 362 ♀

Described from a series of ♀ ♀ in Dr. Annett's collection.

LOCALITIES: Dindings (December), Perak [*Wright*].

5. T. brevicellulus Theob., 1901.

Mon. Culic., ii, 212 ♂ ♀; fig. 255, wing (faulty), wing scales; fig. 256 ♂ ungues, ♂ palpus, ♂ antenna apex; pl. xxiii, 89 ♂ full. ins. col.; vol. iii, 268 corrects error in position of a vein in fig. 255, vol. ii.

Giles, Handbk., 2nd Ed.,363 ♀

Described from 1 ♂ and 2 ♀ ♀ from Burmese and Malay localities.

LOCALITIES: Selangor, Perak, Thayetmyo (in August), Upper Burma.

6. T. conopas Frnfld., 1867.

Ver. zool. bot. Wien., xvii, 451.

Theob. Mon. Culic., ii, 202 ♂, fig. 249, wing, wing scales, scutellum; pl. xxiii, 90 ♀, full ins. col.; pl. E, wing scales.
Giles, Handbk., 2nd Ed., 360 ♂

Described from a ♀ taken on board ship in the China seas.

LOCALITIES: Selangor 28-x-1899 [*Butler*]; Kuala Lumpur (*Durham*); Perak [*Wray*]; Formosa 8-i-1900 and June [*Ford*]; also Dindings in June and December.

7. T. lineatopennis Ludlow, 1905.

Can. Ent. xxxvii, 133.

Described from 2 perfect ♀ ♀

LOCALITIES: Bayembang in September (Pangasinan, Phil. Is.) [*Chamberlain*]; Luzon.

8. T. ochraceus Theob., 1903.

Mon. Culic., iii, 263 ♀, fig. 140, scutellum.
Very near *aurites* Theob. Described from 2 perfect ♀ ♀ from Kuala Lumpur [*Dr. Durham*].

9. T. tenax Theob., 1901.

Mon. Culic., ii, 198 ♀; pl. xvii, 65, full ins. col.
Theob. loc. cit., iii, 259, fig. 236, wing.
Giles, Handbk., 2nd Ed., 365 ♀

Very near *annulioris* Theob. The larva was found in springs and in the river by Patton in Arabia, from which land that author describes a variety as *maculipes arabiensis*.

LOCALITIES: Perak [*Wray, Wright*]; Shaohyling (China) [*Cornford*]; also from South and West Africa.

10. T. whitmorei Giles, 1904.

Jour. Trop. Med., vii, 367.

Pampanga Phil. Is.) [*Whitmore*].

MANSONIA Blanchard, 1901.

Comp. rend. So. biol. Paris, xxiii, p. 1046.
nom. nov. for *Panoplites* Theob. preoc. Gould 1853 in Aves.

Panoplites Theob., 1901, Mon. Culic., ii, 173.
Mansonia Theob. 1903, Gen. Ins. Fasc. 26, p. 31.

1. **M. annulifera** Theob., 1901.

Mon. Culic., ii, 183 ♀ (*Panoplites*), fig. 224, wing; pl. xxx, 120 ♀, full ins. col.
Panoplites annulifera Giles, Handbk., 2nd Ed., 356 ♀; pl. xiii, 8, hind leg.
Mansonia id. Theob. Mon. Culic., iii, 274.

"Occurs all over India, the Malay Peninsula and East Indies." (Theob.)

LOCALITIES: Behar (Bengal) [*Lt.-Col. Macrae*]; Madras 12-xii-1899 [*Goodrich*]; Quilon [*James*]; Perak [*Wright*]; Singapore [*Durham*]; Ceylon [t. *Banks*]; Bayembang (Pangasinan, Phil. Is.) [*Chamberlain*]; Manila [*Banks*] and *Araneta*; also Dacca.

2. **M. annulipes** Wlk., 1857.

Pr. Linn. So. Lond., i, 6 ♀ (*Culex id.*).

Theob. Mon. Culic., ii, 185 ♀; pl. xxx, 119 ♀, full ins. col. (*Panoplites*).
Panoplites dives Giles, Handbk., 2nd Ed., 356 ♀
Culex dives Sch. Reise Novara, 31.
Culex nero Doles. 1857, Nat. Tijd. Ned. Ind., xiv, 383; pl. v, 3.

Type in British Museum in fair condition. A common jungle species in the Straits; abundant at Perak.

Culex nero of Doleschall may not be synonymous, as that author says that his species is very troublesome in houses in Java, whereas *annulipes* is a sylvan species.

LOCALITIES: Selangor, 28-x-1899 and Sept. [*Butler*]; Perak, "very abundant nocturnal species" [*Wright*]; Dindings in Nov. and Dec. [*Wright*]; Kuala Lumpur [*Durham*]; Batavia [t. *Schiner*]; Rio Baco (Mindoro, Phil. Is.) [*McGregor*]; Gombong (Mid-Java) [t. *Doleschall*].

3. **M. septempunctata**, Theob., 1905.

Ann. Mus. Hung., iii, 107 ♀

Type in Hungarian Museum.

LOCALITY: Friedrich Wilhelmshafen in November (Papua) [*Biro*].

4. **M. uniformis**, Theob., 1901.

Mon. Culic., ii, 180 ♀ (*Panoplites*); pl. xxx, 118 ♀, full ins. col.
Theob. Mon. Culic., iii, 270, fig. 144, pupa.
Panoplites africanus Theob., 1901 l.c., ii, 187.
Mansonia africana id. Gen. Ins. Fasc. 26, pl. ii, 6 ♀, full ins. col.

Panoplites australiensis Theob., in MS., Giles, Handbk., 2nd Ed., 355.
var. *reversus* Theob. Mon. Culic., ii, 189.
Panoplites uniformis Giles, Handbk., 2nd Ed., 353; pl. xiii, 3, venation ♂ ♀, leptoaxis of wing vein, ♂ head.

Near *annulifera* Theob. and *titillans* Wlk. The most abundant species of the genus in the Philippines. An abundant species in South India, and occurs in the Malay Peninsula.

LOCALITIES: Shahjahanpur (N.-W Prov., India) early Oct. [*Giles*]; Quilon 7-iv-1900 [*James*]; Taiping [*Wray*]; Dilo, Friedrich Wilhelmshafen, and Ins. Graget (all Papua) [*Biro*]; Bayembang, Pangasinan, Phil. Is. [*Chamberlain*]; Manila, Rizal, Ft. McKinley [*Banks, Schultze, Craig, Araneta*].

MELANOCONION Theob., 1903.

Mon. Culic., iii, 238; pl. xii, wing scales.

Theob. Gen. Ins. Fasc. 26, p. 32.

Described by Theobald as "small black gnats which bite viciously, and which occur in swamps and woods."

1. M. ornatus, Theob., 1905.

Ann. Mus. Hung., iii, 100 ♀

Type (unique) in Hungarian Museum; taken in December by Biro at Friedrich Wilhelmshafen in Papua.

2. M. pallidiceps Theob., 1905.

Ann. Mus. Hung., iii, 101 ♀

Type in Hungarian Museum. Taken at Friedrich Wilhelmshafen (Dec.) by Biro.

POPEA Ludlow, 1905.

Can. Ent., xxxvii, 95.

Miss Ludlow says "near *Finlaya*"; Banks quotes it, "*incerta sedis.*"

1. P. lutea Ludlow, 1905.

Can. Ent. xxxvii, 96 ♂

A unique, perfect specimen taken amongst banana trees by Whitmore at Pampanga (Luzon, Phil. Is.).

FINLAYA Theob., 1903.

Mon. Culic., iii, 281; pl. xiii, wing scale.

Theob. Gen. Ins. Fasc. 26, p. 32.

1. **F. anopheloides** Giles, 1903.

Jour. Trop. Med. vi., 315 (*Mansonia id.*).

I follow Theobald in this, not having seen the above paper, but I have seen somewhere a reference to an *anopheloides* Thomson.

2. **F. aranetana** Banks, 1906.

Phil. Jour. Sci., i, 1001 ♂ ♀

Types (♂ ♀) No. 6066 in Entomological Coll., Bureau of Science, Manila. The species breeds in water in the axils of banana leaves, and the adult does not bite. Taken at Bago (Negros Is.) in the Philippines during June at an altitude of 700 metres on the Siya Siya Peak of the Canlaon Volcano.

3. **F. flavipennis** Giles, 1904.

Jour. Trop. Med., vii, 366.

Not given in the Genera Insectorum by Theobald.
LOCALITY: Pampanga (Luzon) [*Whitmore*].

4. **F. kochi** Donitz, 1901.

Insectenborse, v, 38 ♀ (*Culex*).

Theobald's description of this species in Monog., ii, 217 is from a single damaged ♀, and he notes in vol. ii, that the erection of a new genus may be required for it, but in vol. iii he decides on *Finlaya*, and also retains it here in the "Gen. Ins."

5. **F. melanoptera** Giles, 1904.

Jour. Trop. Med., vii, 367.

Not mentioned by Theobald in the "Genera Insectorum."
LOCALITY: Pampanga (Luzon) [*Whitmore*].

6. **F. poicilia** Theob., 1903.

Mon. Culic., iii, 283 ♀, fig. 156, wing scales.
poial.a Giles Jour. Trop. Med., vii, 366 (lapsus).

Described from a single, nearly perfect example.
"There is no species with which it can be confused." (Theob.)
"The ♂ will shortly be described in the "Entomologist." (Theob.)
"Bred from larvæ taken from banana trees." (Ludlow.)

LOCALITIES: Penang, 24-x-1907 [*Dr. Freear*]; Friedrich Wilhelmshafen, Seleo Berlinhafen, and Mt. Hansemann (Astrolabe Bay), all in Papua [*Biro*]; Pampanga (Luzon) [*Whitmore*]; Negros Is. (Phil. Is.) [*Banks*].

ORTHOPODOMYIA Theob., 1904.

Entom., xxxvii, 236.

" Near Finlaya."

1. **O. albipes** Leicester in Theob., 1904.

Entom., xxxvii, 237 ♂ ♀

Described from examples taken by Dr. Leicester during April in bamboo jungle, 5 miles from Kuala Lumpur.

Type in British Museum.

NOTE.—Neither this species nor the genus are included in the " Gen. Ins."

REEDOMYIA Ludlow, 1905.

Can. Ent., xxxvii, 94.

Banks considers the genus of uncertain position in the family, including it, however, in the *Culicinæ*.

1. **R. niveoscutellata** Theob., 1905.

Jour. econ. biol., i, 22; pl. iii, 5.

India.

2. **R. pampangensis** Ludlow, 1905.

Can. Ent. xxxvii, 94 ♀

Described from 3 ♀ ♀ " taken in the woods, and in the Military Quarters."

LOCALITY: Pampanga (Luzon), Sept. [*Whitmore*].

Sub. Fam. AEDEOMYINAE.

Table of Genera Giles, Handbk., 2nd Ed., 475.
Id. id. Theob. Gen. Ins. Fasc. 26, p. 34.

LEPTOSOMATOMYIA Theob., 1905.

Ann. Mus. Hung., iii, 80.

1. **L. lateralis** Theob., 1905.

Ann. Mus. Hung., iii, 110 ♂; fig. 13, head, scutellum, ungues.
Type in Hungarian Museum.

LOCALITY: Muina (Papua), Dec. 31st [*Biro*].

FICALBIA Theob., 1903.

Mon. Culic., iii, 296.
Theob. Gen. Ins. Fasc. 26, p. 36.

Allied to *Skusea*, *Verrallina* and *Uranotænia*.

1. **F. simplex** Theob., 1903.

Mon. Culic., iii, 297 ♂

Described from a perfect, unique specimen, taken by Mr. Green in September at Kurunegalla (Ceylon).

2. **F. minima** Theob., 1901.

Mon. Culic., ii, 262 ♂ (*Uranotænia id.*) ; fig. 281, wing, costal border, wing scales.
Giles, Handbk., 2nd Ed., 488 ♂

"A very distinct species" (Theob.). Described from 2 ♂ ♂

LOCALITY : Quilon, 7-iii-1900 and Febr. (*James*).

ANISOCHELEOMYIA Theob., 1905.

Entom., xxxviii, 52.

Theobald says, "near *Uranotænia*" ; Banks says, "*incerta sedis.*"

1. **A. alboannulata** Theob., 1905.

Entom., xxxviii, 55.

India.

2. **A. (?) albitarsis** Ludlow, 1905.

Can. Ent., xxxvii, 131 ♀

Described from a perfect unique. In all probability it belongs to this genus.

LOCALITY : Pampanga (Phil. Is.) [*Whitmore*].

URANOTAENIA Arrib., 1899.

Dipt. Argent. 63 (in Revista Mus. La Plata).

Theob. Mon. Culic., ii, 241, p. 241, head fig. ; p. 242 map of distribution ; p. 243 table of spp.; pl. D, wing scales.
Theob. Gen. Ins. Fasc. 26, p. 36.

1. **U. atra** Theob., 1905.

Ann. Mus. Hung., iii, 114 ♀

Type in Hungarian Museum. Described from a unique.

LOCALITY : Muina (Papua) [*Biro*].

2. **U. caeruleocephala** Theob., 1901.

Mon. Culic., ii, 256 ; fig. 276, thorax, scutellum, head, scales.
var. *lateralis* Ludlow 1905, Can. Ent., xxxvii, 385 ♀

Described from 8 ♀ ♀ in Dr. Annett's coll.

Of her variety Miss Ludlow remarks that if Theobald's type was a rubbed specimen it becomes her variety *lateralis*.

LOCALITIES: Cottabatto (Mindanao) (Phil. Is.) [*Vedder*]. Also Gambia, Sudan and old Calabar.

3. U. falcipes Banks, 1906.

Phil. Jour. Sci., i, 1004 ♂ ♀

Types No. 5210 in Entomological Coll., Bureau of Science, Manila.

LOCALITY: Rizal (Manila), February [*Banks, Schultze*].

4. U. malayi Theob., 1901.

Mon. Culic., ii, 258.
Giles, Handbk., 2nd Ed., 494 ♀

A unique.

LOCALITY: The jungle at Selangor, 28-x-1899 (Straits).

5. U. nitidoventer Giles, 1904.

Jour. Trop. Med., vii, 368.

Not given in the "Gen. Ins." by Theobald.

LOCALITY: Pampanga (Luzon) [*Whitmore*].

6. U. testacea Theob., 1905.

Ann. Mus. Hung.; iii, 113 ♀; fig. 14, basal seg. antennæ; pl. ii, wing; pl. iii, wing scales.

Described from two ♀ ♀ Types in the Hungarian Museum. Taken by Biro at Singapore.

MIMOMYIA Theob., 1903.

Mon. Culic., iii, 304.
Theob. Gen. Ins. Fasc. 26, p. 36.

Allied to *Uranotænia*. The larva of a Uganda species (*splendens* Theob.) has been observed by Dr. Low, and noticed to retain a position when in the water somewhat between that of *Anopheles* and *Culex* (*Theob.*).

1. M. chamberlaini Ludlow, 1904.

Can. Ent., xxxvi, 297 ♂

Described from a unique ♂

LOCALITY: Bayambang in Pangasinan (Phil. Is.), May [*Chamberlain*].

PHONIOMYIA Theob., 1903.

Mon. Culic., i i, 311; pl. xiv, xv (*Macrorhynchus longirostris* Theob.), wing scales ♂ ♀

Theob. Gen. Ins. Fasc. 26, p. 38.

1. P. bimaculipes Theob., 1905.

Ann. Mus. Hung., iii, 114 ♀

Described from 3 ♀ ♀ in the Hungarian Museum (types).

LOCALITIES: Moroka, July to Sept. (Papua), 1,300 metres alt. [*Loria*]; Friedrich Wilhelmshafen (Papua) [*Biro*].

2. P. indica Theob., 1905.

Ann. Mus. Hung., iii, 115 ♂ ♀; pl. ii, wing ♀, pl. iii, wing scales ♀

Types in Hungarian Museum. Theobald says "described from a perfect ♂, but though in his description of the species he does not mention the ♀ (unless the abbreviated diagnosis of 6 lines is intended to apply to both sexes) he figures a ♀ wing in pl. ii.

RUNCHOMYIA Theob., 1903.

Mon. Culic., iii, 319.
Theob. Gen. Ins. Fasc. 26, p. 38.

"Near *Dendromyia*."

1. R. philippinensis Giles, 1904.

Jour. Trop. Med., vii, 368.

Not accounted for in the "Gen. Ins." by Theobald.

LOCALITY: Pampanga (Luzon) [*Whitmore*].

WYEOMYIA Theob., 1901.

Mon. Culic., ii, 267: vol. iii, 310 (restricted).
Theob. Gen. Ins. Fasc. 26, p. 38.

1. W. aranoides Theob., 1901.

Mon. Culic., ii, 274 ♀
Giles, Handbk., 2nd Ed., 499 ♀

Straits. A unique, damaged, but Mr. Theobald believes it belongs to this genus.

2. **W greenii** Theob., 1905.

Jour. Bomb. So., xvi, 247 ♂ ♀; pl. B, 5, antenna.

Described from a perfect ♂ and ♀ The species is ignored in the "Gen. Ins." There is a *Howardina greenii* Theob. also from Peradeniya in February, but that appears to be a different species

POLYLEPIDOMYIA Theob., 1905.

Ann. Mus. Hung., iii, 118.

Near *Dendromyia* and *Phoniomyia*.

1. **P. argenteiventris** Theob., 1905.

Ann. Mus. Hung., iii, 118 ♀, fig. 15, head, scutellum, bristles.

Described from 5 ♀ ♀ Types in Hungarian Museum.

LOCALITY: *Paumomu* River (Papua) [*Loria*].

HEINZMANNIA Ludlow, 1905.

Can. Ent., xxxvii, 130 (*Heizmannia*).

Heinzmannia (Ludlow), Banks, Phil. Jour. Sci., i, 99 emendation from *Heizmannia* Ludl. (lapsus).

"Near *Dendromyia* Ludlow: incerta sedis." (Banks.)

1. **H. scintillans** Ludlow, 1905.

Can. Ent., xxxvii, 130 ♀

LOCALITY: Pampanga (Phil. Is.).

AEDEOMYIA Theob., 1901.

Mon. Culic., ii, 218; fig. 259, scales; f. 260, map of distribution.

Theob. Gen. Ins. Fasc. 26, p. 35.

1. **squamipenna** Arrib., 1878.

El. Nat. Argent., i, 151 (*Aedes squammipennis*).

Aedes squammipenna Arrib. 1891. Dip. Argent., 62.

Aedeomyia squammipenna Theob. Mon. Culic. ii, 219 ♂ ♀; fig. 261, leg tuft, wing fringe, apex ♂ antenna, ungues ♂ ♀; pl. xxxi, 124 ♀, full ins. col.; pl. E, wing scales, ol. iii, 307.

Id. *squammipennis* Theob. Gen Ins. Fasc. 26; pl. ii, 9 ♀ full ins. col.

Id. *id.* Giles, Handbk., 2nd Ed., 479.

A slightly variable species, whose bite is not severe. Common at Manila.

LOCALITIES: Madras [*Cornwall*]; Perak [*Wray*]; Seleo Berlinhafen and Friedrich Wilhelmshafen (Papua) [*Biro*]; Manila [*Banks, Schultze, Woolley*]; Ceylon. Also South America, West Indies and the Sudan.

AEDES Meig., 1818.

Sys. Besch., i, 13.
Sch. F. Austr., ii, 630.
Ficalbi Bull So. Ent. It. (1896), p. 299.

1. butleri Theob., 1901.

Mon. Culic., ii, 230 ♀
Giles, Handbk., 2nd Ed., 481 ♀

Theobald is uncertain if the species truly belongs to this genus. Described from Selangor, " Jungle; common and troublesome."

HODGESIA Theob., 1904.

Jour. Trop. Med., vii, 17.

1. H. sanguinea Theob., 1904.

Jour. Trop. Med., vii, 17.
Giles, Jour. Trop. Med., vii, 368.

Mr. Theobald considers the position of this genus uncertain, but he includes it in the *Aedeomyinæ*. Described first from Uganda, and said to be an annoying bloodsucker.

LOCALITIES: Angeles (Pampanga, Phil. Is.) [*Whitmore*]; Luzon.

Sub. Fam. CORETHRINÆ.

Giles, Handbk., 2nd Ed., 500.

CORETHRA Meig., 1803.

Illig. Mag., ii, 260.

Meig. Sys. Besch., i, 14.
Macq. Hist. Nat. i, 47.
Sch. F. Austr., ii, 623.
Wulp, Dip. Neer., 331.
Theob Mon. Culic., ii, 288, figs. 294, 295, various parts.
Id. id. i, 34 *et seq.*, larva and pupa desc. and fig.
Id. Gen. Ins. Fasc. 26, p. 42.
Giles, Handbk., 2nd Ed., 501: table of spp.

The larvæ live in almost any water, but prefer clear water (Theob.). The proboscis is not formed for biting, and they occur usually in the open country or in woods.

1. **C. asiatica** Giles, 1901.

Entom., xxxiv, 196 ♀
Theob. Mon. Culic., ii, 294 ♀; fig. 296, wing, thorax.
Giles, Handbk., 2nd Ed., 506 ♀

Described from a single ♀ in Giles's coll. taken in a house.

LOCALITY: Shajahanpur (N.-W. Prov., India) [*Giles*].

SAYOMYIA Coq., 1903.

Can. Ent., xxxv, 189.

Syn. *Corethra* Loew, *non* Meig.

1. **S. manilensis** Sch., 1868.

Reise der Novara Dipt. 30 ♂ (*Corethra id*).
Corethra maniliensis Th. Mon. Culic., ii, 300 (Sch.'s desc. transl.).
Coreth. manillensis Giles, Handbk., 2nd Ed., 504 (Sch.'s descr. transl.).
Sayomyia manilliensis Th. Gen. Ins. Fasc. 26, p. 43.

Manila.

2. **S. cornfordi** Theob., 1903.

Mon. Culic., iii, 339 ♀ (*Corethra id.*).

Described from several ♀ ♀

LOCALITY: Shaohyling (China) in May and June [*Cornford*].

ETORLEPTIOMYIA Theob., 1905.

Gen. Ins. Fasc. 26, p. 44.

Banks places this in his *Corethrinæ*, adding "*incerta sedis.*"

1. **E. luzonensis** Ludlow, 1905.

Can. Ent., xxxvii, 101 (*Oreillia id.*).
Etorleptiomyia id. Ludlow Can. Ent., xxxviii, 185.

Bayembang (Pangasinan, Phil. Is.) [*Chamberlain*].

RACHIONOTOMYIA Theob., 1905.

Jour. Bomb. So., xvi, 248.

1. **R. ceylonensis** Theob., 1905.

Jour. Bomb. So., xvi, 248 ♀ ; pl. B, 6, scutellum.

Described from a perfect unique. This genus possesses a peculiar scutellar process that differentiates it from all others, and Mr. Theobald seems to regard it as holding an isolated position.

Peradeniya, Ceylon (Oct.).

INDEX.

NOTES ON THE ORIENTAL SYRPHIDÆ

By E. BRUNETTI.

PART I.

[Owing to delay in the receipt of the MS. it has been found necessary to postpone the publication of this paper until the next number of these "Records" appears. As the plates have been already printed, however, they are issued now, with the Author's bare references to the figures.—ED.]

EXPLANATION OF PLATES XI, XII AND XIII.

PLATE XI.

FIG. 1.—*Paragus luteus*, Bru., sp. nov., ♀
" 2.—*Eriozona ruficauda*, Bru., sp. nov., ♀
" 3.—*Baccha robusta*, Bru., sp. nov., ♂ ♀ Abdomen.
" 4.— Id. Head.
" 5.—*B. nigricosta*, Bru., sp. nov. Wing.
" 6.—*B. tinctipennis*, Bru., sp. nov. Wing.
" 7.—*Rhingia laticincta*, Bru., sp. nov. ♂ ♀ Abdomen.
" 8.— Id. var. ♂ ♀ Abdomen.
" 9.—*Volucella nubeculosa*, Macq. Abdomen.
" 10.— Id. Wing.
" 11.—*V basalis*, Bru., sp. nov., ♀ Abdomen.
" 12.— Id. Wing.
" 13.—*V ruficauda*, Bru., sp. nov , ♂ ♀
" 14.—*Lycastris albipes*, Wlk. ♂
" 15.— Id. Wing.
" 16.—*L. flavohirta*, Bru., sp. nov., ♂ Abdomen.
" 17.— Id. Wing.

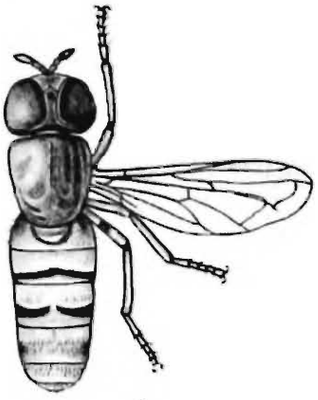
PLATE XII.

FIG. 1.—*Helophilus quadrivittatus*, Wied., ♂ Abdomen.
" 2.— Id. ♀ Id.
" 3.— Id. var. ♀ Id.
" 4.—*H. bengalensis*, Wied. ♂ Id.
" 5.— Id. ♀ Id.
" 6.— Id. var. ♀ Id.
" 7.—*H. insignis*, Dol ♂ Id.
" 8.— Id. ♀ Id.
" 9.— Id. Posterior leg.
" 10.—*H. sp.* ? ♀ Abdomen.

FIG. 11.—*H. sp.* near *pilipes*, Dol. ♂ Abdomen.
,, 12.— Id. Anterior, middle and posterior leg.
,, 13.—*H. sp.*, ♀ Abdomen.
,, 14.— Id. Anterior middle and posterior leg.
,, 15.—*H. aënous*, Bru., sp. nov., ♀
,, 16.—*H. tuberculatus*, Bru., sp. nov., ♂ ♀ Abdomen.
,, 17.— Id. Middle leg.
,, 18.—Bigot's "*H. pilipes*, Dol.," ♂ Abdomen in profile.
,, 19.— Id. Anterior leg.
,, 20.— Id. M ddle leg.
,, 21.—*H. sp.*, ♀ Abdomen.

PLATE XIII.

FIG. 1.—*Azpeytia bifascia*, Bru., sp. nov., ♂ Abdomen.
,, 2.— Id. Wing.
,, 3.— Id. Head.
,, 4.— Id. Thorax and scutellum.
,, 5.— Id. Posterior leg.
,, 6.—*Sericomyia himalayensis*, Bru., sp. nov., ♂
,, 7.— Id. Antenna.
,, 8.— Id. Posterior leg.
,, 9.—*Chrysotoxum sexfasciatum*, Bru., sp. nov., ♀
,, 10.—*Microdon annandalei*, Bru., sp. nov., ♂
,, 11.—*M. ruficaudus*, Bru., sp. nov., ♀
,, 12.—*Ceria obscura*, Bru., sp. nov., ♀
,, 13.—*C. compacta*, Bru., sp. nov., ♀



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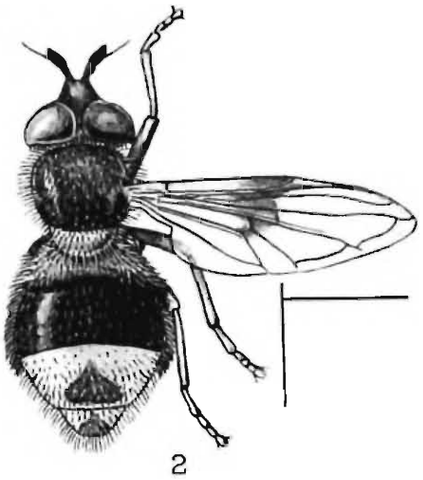

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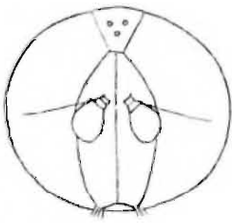

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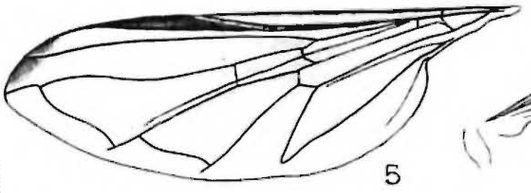

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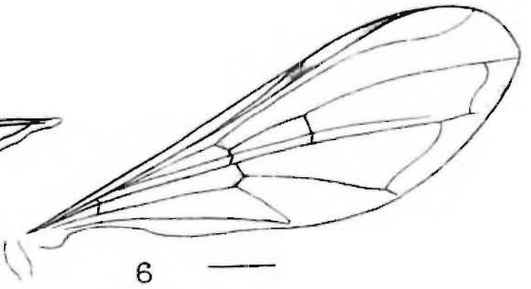

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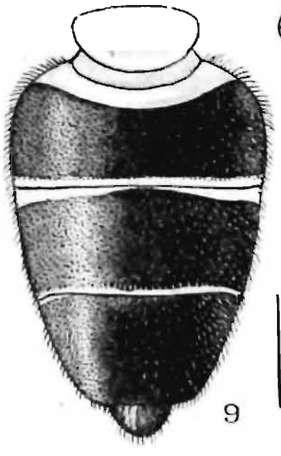

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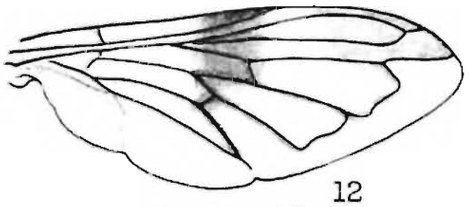

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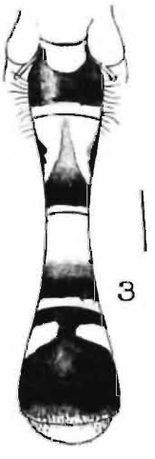

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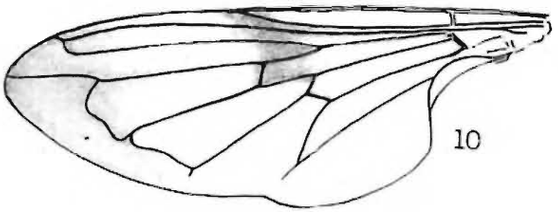

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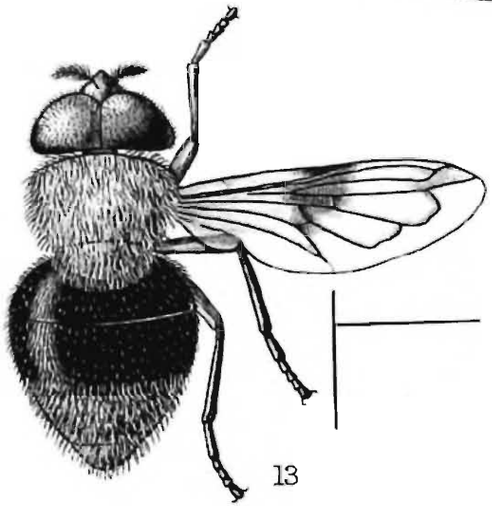

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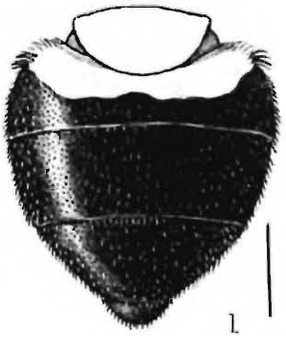

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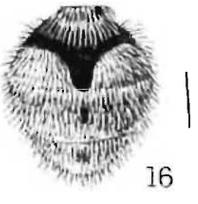

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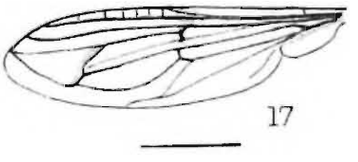

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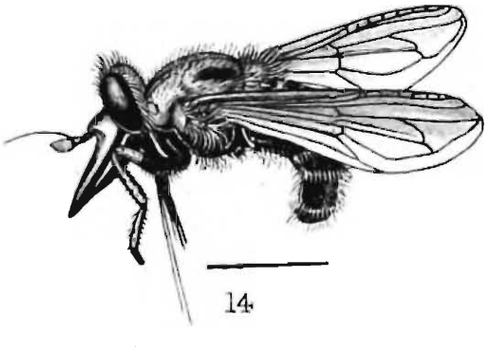

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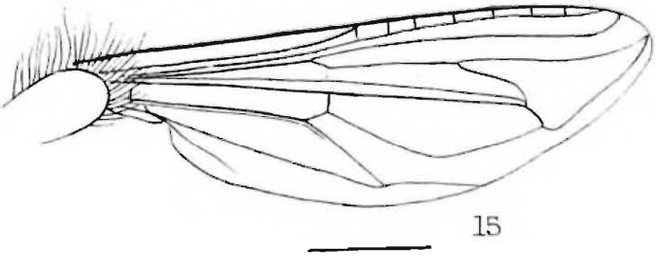

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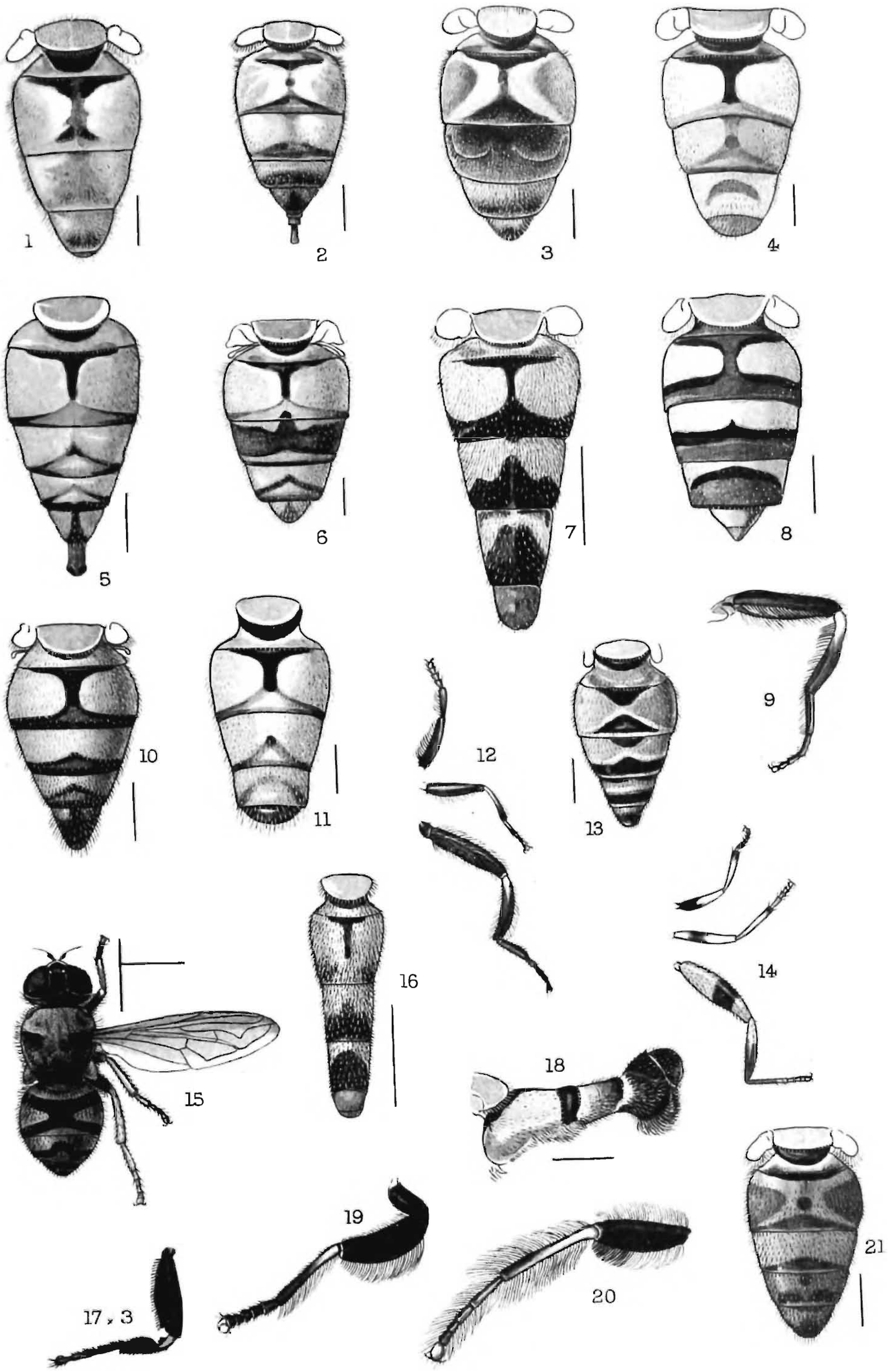
ORIENTAL SYRPHIDÆ.



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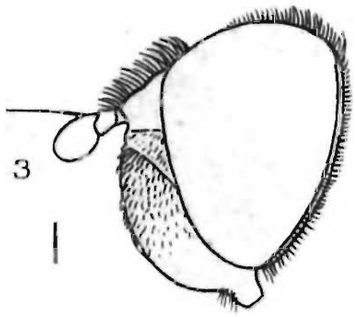

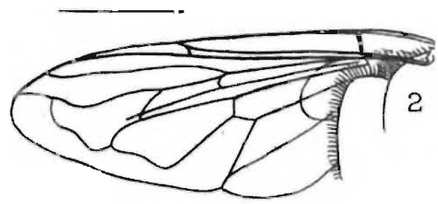

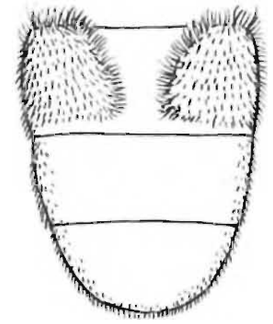

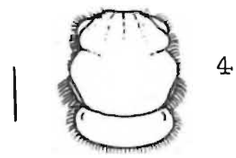

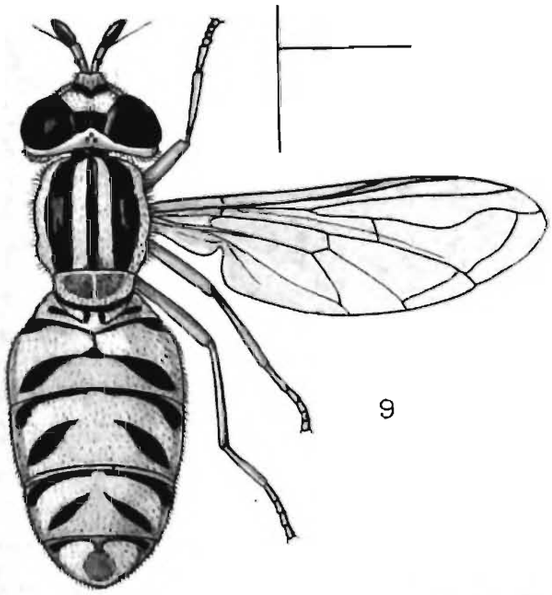

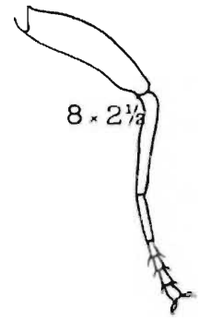

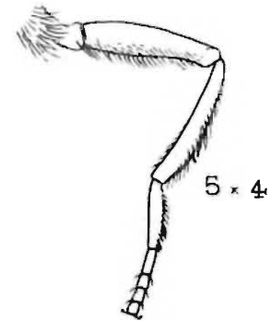

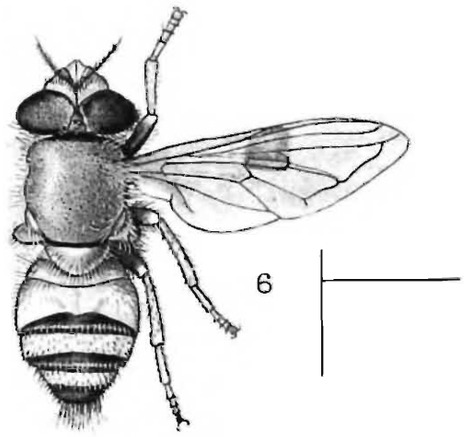

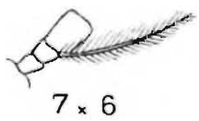

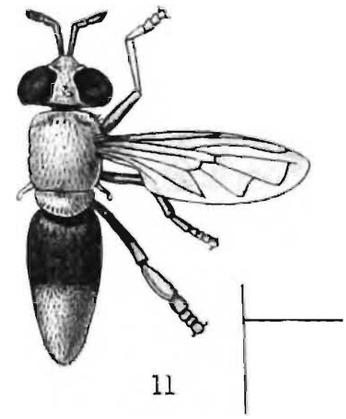

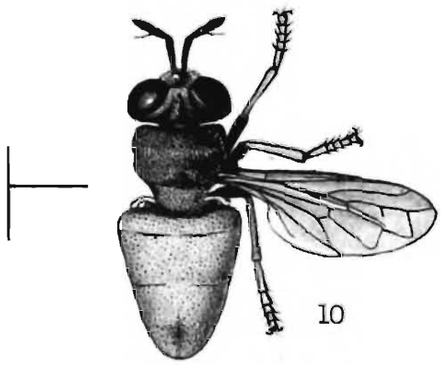

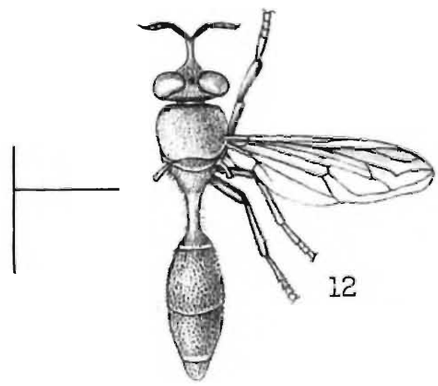

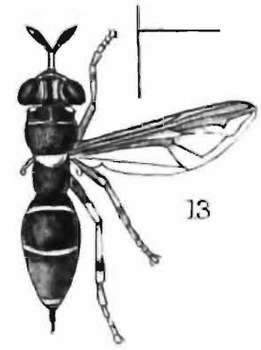

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ORIENTAL SYRPHIDÆ.

XXVI.—NOTES ON ORIENTAL DIPTERA

IV.—ON SOME INDIAN SPECIES OF *LIMNOPHORA* AND *ANTHOMYIA*, WITH A DESCRIPTION OF A NEW SPECIES OF THE FORMER GENUS.

By E. BRUNETTI.

While passing through Lucknow in April last Dr. Annandale found a small, well-marked, black-and-grey Anthomyid fly very common and troublesome in houses, having apparently supplanted the common *Musca domestica*, although a species of *Musca* closely allied to *M. domestica*, but I think distinct, also occurred.

On reference to descriptions I identified the Anthomyid, with very little doubt, as the *Anthomyia tonitrui* of Wiedemann. It would, however, now be placed in the more modern genus *Limnophora*. The species is evidently widely distributed in the East. I found it common at Mhow, Central India, in the middle of April, 1905; in this locality it used to rest, motionless, on the flowerpots in an open-air conservatory, seldom on the plants themselves. At Mussoorie, towards the end of June, 1905, I also found it common in a churchyard garden full of clover, in company with the ordinary European dung fly *Scatophaga stercoraria* L., a species of *Chortophila*, and a small Tachinid.

I have no doubt that the *A. lobalis* of Thomson from China is the same species, my specimens answering even better to this description than to that of *tonitrui*; and as Thomson himself says it is closely allied to Wiedemann's species, the identity of the two is practically assured.

I give a full description, which has been drawn up from a considerable number of freshly captured and well preserved specimens from various localities.

Limnophora tonitrui Wied. (Plate xv; fig. 1, ♂; fig. 2, ♀.)

Anthomyia tonitrui, Wied. Aus. Zweifl., ii, p. 429.

? *Anthomyia lobalis*, Thoms. Eugenie Reise, p. 551.

Head shining silvery grey, vertex and antennæ black, frons in ♀ with a broad central black stripe, bearing a row of strong hairs on its borders, bending strongly inwards; mouth with stiff bristles of different lengths; the posterior orbit of the eyes entirely encircled by similar bristles; eyes subcontiguous in the ♂, just below the lengthened triangular vertex, separated only by the frontal white ocular orbit; proboscis short, thick, black; palpi not apparent.

Thorax ash-grey, with, on the front border, two black spots joined together; a wide jet-black transverse band across the mesothorax, reaching the wing-insertions, where it is slightly produced posteriorly; scutellum unicolorous, basal half black. The whole thorax and scutellum beset with isolated long stiff bristles, including two longer ones at the tip of the scutellum. Sides of thorax whitish grey, with some stiff bristles.

Abdomen pale yellowish; first segment semi-transparent, with an oblong black spot on the posterior border towards each side that is often indistinct or nearly absent; second and third segments with a long linear spot on each side of the posterior border and a small oval spot in the centre of the foreborder; fourth segment ash-grey, with two round black spots in the centre, these spots much wider in the ♀. Belly yellowish white, blackish at tip. Dorsum of abdomen with soft black hair, which is also present at the sides of the segments while at each side on the posterior border of each segment, placed at the extreme edge, are two long black bristles posteriorly deflexed.

Legs black or dark brown; anterior femora curved, with a row of stiff hairs on the upper side and another row on the outside; middle femora with a row of very short hairs below and a few on the upper side and one or two long bristles at the tip; posterior femora very slightly curved, with a row of stiff hairs on the outer side above and on the inner side below; tibiæ practically bare, with a few spiny bristles at the tip; tarsi simple.

Wings clear; the third and fourth longitudinal veins distinctly converging at the tip (as in *Hydrotæa*) but at the extreme tip the fourth slightly deflexed; the internal cross vein placed at two thirds of the distance from the base of the discal cell; external cross vein nearly or quite straight, distant its own length from the internal cross vein and half its length from the wing border. Three or four short, stiff bristles at the extreme base of the costa; alulæ white, iridescent, the lower scale much the larger; halteres pale yellowish.

Described from 5 ♂ ♂ in the Indian Museum collection taken by Dr. Annandale in houses at Lucknow on April 21st, 1907, and from a considerable number of specimens of both sexes taken by me at Mhow, Central India, between April 11th and 16th, 1905, and at Mussoorie between June 20th and 24th, 1905. A ♂ from the Gonda district, Central India, taken between March 3rd and 5th, 1907, is also in the Indian Museum.

Limnophora himalayensis, sp. nov., mihi. (Plate xv, fig 3, ♀.)

♀. This species is allied to the preceding one but quite distinct; it differs from *L. tonitrui* in the following characters:—

The abdominal marks consist of a pair of well separated spots in the centre of the posterior part of each of the first three segments, the first pair small and round, the second elongated, triangular in shape and placed lengthwise, with the bases of the

spots approximate, the third similar but rather shorter ; fourth segment with a row of four bristles.

Minor characters concern the frontal black spot, of which the upper margin takes the form of a V ; also the scutellum, of which only the extreme base is black, whilst the black band in front of it is narrower.

Described from 3 ♀ ♀ in the collection of the Indian Museum, two taken by Dr. Annandale between the 28th and 30th of April, 1907, at Theog (alt. 8,000 feet) in the Simla district, and one from Dharampur in the same district (alt. 8,000 feet), taken between May 6th and 8th.

Types in Indian Museum collection.

NOTE.—The other species of *Limnophora* recorded up to the present from the East are—

L. bengalensis, R. Desv. Essai sur les Myodaires, 518. Bengal.
L. macei, R. Desv. Loc. cit., 519. Bengal.
L. prominens, Stein. Tijd. voor Ent., xlvi, 106. Java.
L. nigripennis, Stein. Loc. cit., 108. Java.

Anthomyia pluvialis, L. (Plate xv, fig. 6, ♀.)

A single male of this pretty species was taken by Dr. Annandale at Theog on May 2nd this year. It is very common throughout Europe and North America, and probably occurs right across the Palæarctic region to Japan and China, and may perhaps be found at many places in the Himalayas. I believe it has not been recorded from India before.

Anthomyia bisetosa, Thoms. (Plate xv ; fig. 4, ♂ ; fig. 5, ♀.)

Anthomyia bisetosa, Thoms. Eugenie Reise, p. 555.

Described first in the " Eugenie Reise " from China (♀), this species has come under my notice several times lately. I took it myself at Mhow, 11th to 16th April 1905, and at Hongkong, 5th March 1906, whilst the Indian Museum possesses specimens from Calcutta taken in May this year. The appearance of the thorax of this species is the same as that of the two species of *Limnophora* described above, while the abdomen is similar to that of *A. pluvialis* ; it is very distinct, and I do not think there can be much doubt about the identification of the species with that of Thomson.

Head—

In the male : eyes separated by only the narrowest possible silver-white dividing line, extending to the vertex ; lower part of face greyish white, more or less silvery seen from above, with, on each side of the lower part of the cheeks, a triangular black spot bearing one strong bristle and some smaller ones ; antennæ black, arista bare ; a row of bristles along under part of head ; vertex

very small with some long bristles; back of head grey, with a single row of small bristles round the eye border. In the female the front equals one third the width of the head, silvery grey, with a quadrate black spot, sometimes appearing as a thick V, just above the antennæ; on either side of this spot is a vertical row of four bristles.

Thorax—

Ash-grey, lower part rather more whitish, a deep black broad stripe runs transversely across the dorsum from the wing-insertions, and a narrower one immediately in front of the scutellum. The disposition of bristles is not quite consistent, but seems to be as follows: a lateral row of three large ones on the humeral limit of the dorsum; a transverse row of eight bristles immediately in front of the transverse black stripe, of which the two centre ones are smaller than the rest; a row of six then follows, and in front of these again, a rather irregular row of quite small ones of varying number; three or four occur on the black stripe, and between it and the scutellum are ten or twelve others. The unicolorous scutellum bears a few short ones and two long ones at the tip which cross one another; a row of five bristles in front of each wing-insertion with three or four behind; metanotum whitish grey, bare.

Abdomen—

Whitish grey; at the base of the second, third and fourth segments a narrow black band which is produced downwards in the form of three triangles, the centre ones being longest and narrowest, the outer ones not reaching the posterior border, nor the side margins. A row of bristles on posterior edge of each segment, the dorsum of which is covered with scattered hairs. Belly grey.

Legs—

Black; femora with a row of bristly hairs on outer and under sides, longest on fore pair; four posterior tibiæ with a few scattered bristles. Hind femora curved, ♂ ♀

Wings—

Pale grey, with the slightest yellowish tint towards base and foreborder; alulæ whitish, lower scale slightly the larger; halteres pale yellow.

Described from six males and four females in the Indian Museum collection, from Calcutta, May 1907, Mhow (India), 11th to 16th April 1905, Hongkong, 5th March 1906, and from further specimens of both sexes from Mhow and Hongkong in my own collection, the specimens from these two localities having been taken by me.

NOTE.—These four species stand out as conspicuous ones, amongst the generally sombre coloured Anthomyids, yet, although in general appearance resembling one another, they can all be easily recognized.

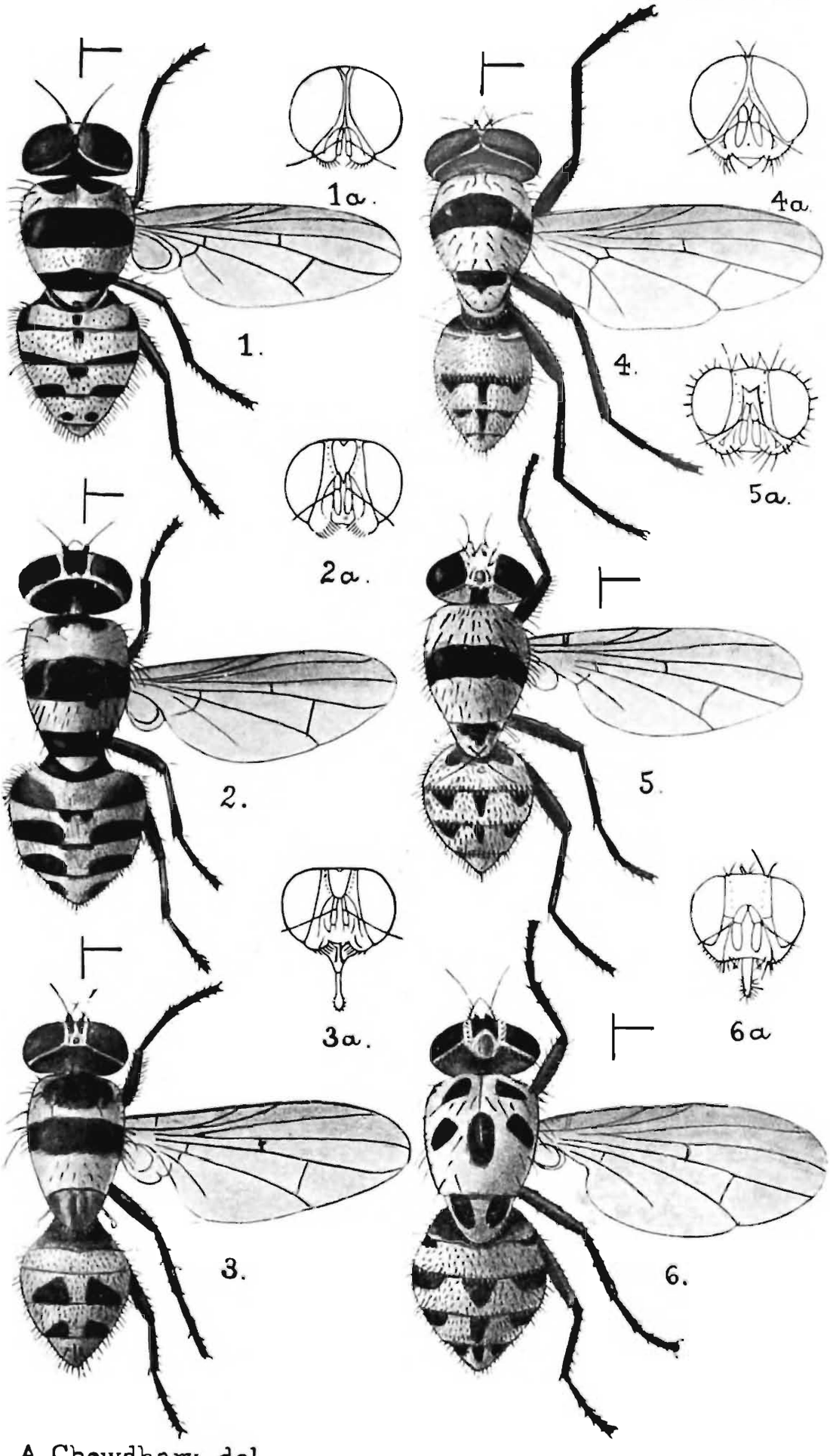
In Van der Wulp's Catalogue of South Asian Diptera, only nineteen species are given, and to these no new ones have since then been added. Of these, *tonitrui*, Wied., is a *Limnophora*, as herein shown; *albicornis*, Wlk., is referred by Kertesz to *Mydæa*; *peshawarensis*, Big., is considered by Künckel d'Herculais (to whom co-types have been sent from the Indian Museum) as synonymous with *Chortophila cilicrura*, Rond.; whilst the remainder may be roughly separated into four groups: A (arista bare; legs black), B (arista bare; legs more or less pale), C (arista plumose; legs black), D (arista plumose; legs more or less pale). A few species in which the arista is minutely pubescent are, as is usual in these cases, classed with those which have the arista bare.

Group A. *metallica*, Wied.; *exigua*, Wied.
Group B. *bina*, Wied.; *flexa*, Wied.; *manillensis*, Frfld. (V d. Wulp's quotation as to page is incorrect; it should be 449).
Group C. *calens*, Wied.; *concana*, Wlk.; *lenticeps*, Thoms.
Group D. *quadrata*, Wied.; *bibax*, Wied.; *trina*, Wied.; *peræ*, Wlk.

The two remaining species I cannot place, as their author gives no information regarding the pilosity or otherwise of the arista. They are *illocata*, Wlk., and *procellaria*, Wlk.

Probably some of the above species belong to the more recently established genera, but this is not the place to deal with the question, nor have I the means at hand to form any opinion on the matter.

Plate XV.



A. Chowdhary, del

XXVII.—NOTES ON FRESHWATER SPONGES.

By N. ANNANDALE, *B.A., D.Sc., Superintendent, Indian Museum.*

VI.—THE MIDDAY SIESTA OF *Spongilla* IN THE TROPICS.

During last winter I was able to keep specimens of *Spongilla crassissima* and *S. proliferens* alive for some weeks in an aquarium. Accidentally, while attempting to demonstrate the currents set up in the water by their activity, I discovered that for some hours in the middle of the day these currents ceased. During their cessation the oscular collars were considerably contracted but not altogether closed, but I have been able to obtain no evidence that the cells that surround the inhalent pores have the power of contraction at all well developed. The cessation of the currents can, therefore, have been due only to cessation of movement on the part of the flagellæ of the collar cells. It is by no means uncommon for cœlenterates to remain in a state of quiescence during the heat of the day in the tropics and even in temperate climates, and it is not surprising that sponges should follow the same course. The great majority of the organisms found in ponds in Lower Bengal appear to be adversely affected by heat and, as it were, imperfectly acclimatized. Winter is the only time at which many of them flourish, although this is by far the driest season in Calcutta, and the majority are most active in the evening and early morning.

VII.—DESCRIPTION OF TWO NEW FRESHWATER SPONGES FROM EASTERN BENGAL, WITH REMARKS ON ALLIED FORMS.

The two new sponges here described were found at Rampur Bhoolia (Rajshahi), Eastern Bengal, in February last. Both of them were abundant on reeds and twigs, together with *Spongilla carteri*, Bowerbank, in several ponds near the European quarter of the town.

Spongilla reticulata, (?) sp. nov.

Subgenus *Euspongilla*, Vejdovsky.

Sponge soft, consisting of a thin layer incrusting the support, and of numerous transversely elongated, laterally compressed, delicate branches, which frequently anastomose so as to form a reticulated structure. Colour bright green. Surface smooth, minutely hispid; oscula surrounded by conspicuous membranous collars, which are supported by a delicate ring of spongin; pores minute. Primary radiating fibres of skeleton delicate, feebly coherent, never with more than a few spicules parallel to one another, secondary (transverse) fibres barely distinguishable as such, irregular; the whole skeleton ex-

tremely fragile, spongin being present in exceedingly small quantities. Skeleton spicules smooth, moderately stout, comparatively large, ampioxous, gradually pointed; flesh spicules numerous both in the dermal membrane and in the parenchyma, slender, abruptly pointed or blunt, curved in a wide arc or nearly straight, covered irregularly with relatively large spines, which tend, especially towards the ends of the spicule, to be bent backwards and inwards; gemmule spicules closely similar but stouter. Gemmules large, spherical, yellow, abundant, both in the basal layer and in the branches, covered with a thick layer of granular substance, which is confined externally by a definite chitinous coat; the gemmule spicules arranged horizontally in the latter and tangentially on the former; the single aperture infundibular, not provided with a chitinous tube.

This Sponge is closely related to the very variable species *Spongilla alba*, Carter, from which it may be distinguished by its external form, by the presence of green bodies in the cells of its parenchyma, and by its soft consistency and fragile skeleton.

Spongilla alba [1] is, again, very closely allied to *S. lacustris*,[1] of which *S. reticulata* may be no more than a specialized race. An examination of a considerable number of specimens from different parts of Bengal convinces me that the only constant differences between *S. alba* and *S. lacustris* are the following :—

Spongilla alba.	*Spongilla lacustris.*
Branches frequently absent, when present, laterally compressed. Colour even in a bright light, white or grey, occasionally dark green owing to the presence in the tissues of extracellular algæ.	Branches rarely absent, when present, cylindrical. Colour, in a bright light, leaf-green owing to the presence of chlorophyl corpuscles in cells of the parenchyma.

The skeleton is also stouter in *S. alba* than in *S. lacustris*, and this is perhaps the most important difference.

Differences in external form and in colour are by no means satisfactory foundations for the creating of species in the Spongillinæ as a rule. The latter is liable to change from a variety of causes, *e.g.*, leaden-grey examples of *Ephydatia indica* become white if kept alive in an aquarium, and it is well known that the chlorophyl corpuscles, which probably start life as independent organisms, become colourless if kept in the dark or even in a dull light. As regards the presence of such bodies in *S. lacustris*, however, and their absence from *S. alba*, it is not sufficient to suppose that the free-living organism does not occur in the

[1] Petr differentiates between the two forms (in Bohemian) in *Abh. Böhmisch Ges.*, viii, p. 27, pl. i. Unfortunately I am unable to read what he says. His figures of the gemmules are clear, if somewhat diagrammatic, but do not, of course, illustrate their range of variation. (Lately I have found the typical *S. lacustris* in W. India. Dec., 1907.)

water of Indian ponds, for the " corpuscles " are found not only in the closely allied *S. reticulata* but also in *S. proliferens*, a form that I have frequently taken in the same pond as *S. alba*. Some peculiarity, structural or physiological, in the cells of the parenchyma is argued by their absence from *S. alba*. Both *S. lacustris* and *S. alba* vary greatly in external form; but it is noteworthy that not only is *S. alba* far more frequently devoid of branches than *S. lacustris*, but in the latter the branches appear never to show any tendency to be laterally compressed —the shape they always take in *S. alba*, if they are present at all. Very often they occur in this species merely as ridges or irregular projections on the surface, but frequently they are well developed. Gemmules of *S. lacustris* generally have a chitinous cup surrounding the aperture; such a cup is sometimes present in those of *S. alba* but often completely absent.

For these reasons I think it advisable to regard *S. alba* conventionally as a species distinct from *S. lacustris*, of which, however, it is a close ally.

My *S. lacustris* var. *bengalensis* is a synonym of *S. alba*, between the typical form of which and Bowerbank's *S. cerebellata* I can draw no line, although Carter recognized *S. cerebellata* as a variety of his species. The arrangement, as well as the proportions, of the gemmule spicules differs even in different gemmules of the same specimen, and I find that flesh spicules are often present in one part of a sponge and absent from another.

Specimens of *S. alba* were obtained during winter in salt water in the Chilka Lake, Orissa, by Babu Gopal Chandra Chatterjee, who has presented them to the Museum. They form a thin layer, without a trace of branches, on and between the shells of mussels (*Mytilus striatulus*), are devoid of flesh spicules and have larger and stouter skeleton spicules than any other form of the species with which I am acquainted. Their finder tells me that they were white in life. I name this form provisionally *S. alba* var. *marina*, but it is possible that it is only a temporary phase. In the Port Canning ponds *S. alba* (*bengalensis*) was devoid of branches in the winter of 1905-1906, but was profusely branched in the succeeding cold weather, all the individuals of the first phase having died down in the intervening seasons. It is worthy of note that *S. alba* resembles *S. lacustris* not only in its structure and its variability, but also in being able to live in salt water, a medium in which the latter species has frequently been found in the Northern Hemisphere.

Spongilla crassior, sp. nov.

Subgenus *Spongilla*, Wierzejski.

Sponge incrusting its support in a thin layer, very hard and firm, of a yellowish colour, the external surface smooth, without projecting spicules, the oscula situated on star-shaped areas, the pores minute. Both vertical and transverse fibres of the

skeleton extremely massive, especially so (but irregularly arranged) towards the external surface ; a large amount of spongin present in the skeleton. Skeleton spicules short, stout, smooth, straight or nearly straight, abruptly rounded at the ends, but often with a very slender and minute terminal projection ; no flesh spicules ; gemmule spicules slender, cylindrical, amphistrongylous, nearly straight, uniformly covered with minute blunt spines ; arranged in distinct layers, one of which lies horizontally on the external surface of the gemmule group, while the other is situated, with the spicules lying tangentially, immediately outside each gemmule. The gemmules small, spherical, grouped together in groups of various sizes ; the " cells " surrounding them large, polygonal in cross section, in many layers ; the main aperture of each gemmule provided with a long, trumpet-shaped, curved tubule, which opens outwards ; subsidiary apertures sometimes present. The gemmules occupying the whole of sponge except a thin external layer, in which the interstices of the skeleton are small.

In external appearance this species closely resembles *S. fragilis*, Leidy, a form widely distributed in Europe and America, recorded from Australia, and lately found by myself in the Museum tank in Calcutta, in which it was growing (together with *S. alba*, *S. carteri*, *Ephydatia fluviatilis* var. *meyeni*, *Trochospongilla phillottiana* and *T latouchiana*) on a brick wall. *Spongilla crassior* is, however, most nearly related to my *S. crassissima*, but its skeleton spicules are stouter. The four Indian representatives of the subgenus are all very close to one another, and I have had much difficulty in separating them. As three of them are common in Calcutta and I have, therefore, been able to examine a considerable number of specimens, I think the following key will be found useful in distinguishing them :—

SUBGENUS *Spongilla* (GEMMULES BOUND TOGETHER IN GROUPS, EACH OF WHICH IS ENCLOSED IN A MASS OF POLYGONAL " CELLS ").

A. *Gemmule spicules apparently not arranged in two layers—*

a. Skeleton spicules amphioxous ; fibres of skeleton delicate—*Spongilla decipiens*, Weber.

B. *Gemmule spicules clearly arranged in an outer and an inner layer—*

b. Framework of skeleton not very stout ; skeleton spicules amphioxous ; sponge incrusting—*Spongilla fragilis*, Leidy.

b . Fibres of skeleton moderate, forming a close, hard reticulation ; sponge forming spherical or spindle-shaped masses—*Spongilla crassissima*, mihi.

b[2]. Fibres of skeleton extremely massive, especially towards the external surface, skeleton spicules sausage-shaped, sponge incrusting—*Spongilla crassior*, sp. nov.

Weber says in his original description of *S. decipiens* that the gemmule tubules are short and straight, but I do not find this feature to be constant in Indian specimens. In the same gemmule group, indeed, short, straight tubules and long curved ones often occur, and although Potts states that in *S. fragilis* the tubules are of equal diameter throughout, I cannot regard this character as of specific value by itself, for in all the species of the subgenus as yet recorded from India the outline of the tubules is frequently irregular. My examples of *S. fragilis* differ from the figures of palæarctic specimens in having stouter skeleton spicules, some of which are pointed so abruptly that they are almost amphistrongylous.

I now see reason to regard my *S. crassissima* var. *bigemmulata* not as a true variety but as a temporary phase of the species. I have only found it at the beginning of the cold season, that is to say, at a date at which the typical *S. crassissima* is still rare, and the very numerous amphioxi and comparative looseness of the skeleton in all my specimens point to immaturity. In several other species, notably in *S. carteri*, I find that the skeleton is less compact at the beginning of the season than it afterwards becomes, although I also find that in *S. carteri* the strengthening of the skeleton, due chiefly to the development of the transverse fibres, does not go so far in some ponds as in others in the same neighbourhood. Indeed, I feel confident in stating, after examining a large number of examples of this species *in situ* in different ponds in Calcutta at different times of the year, and on single occasions at Rajshahi and Lucknow, that the strength of the skeleton is correlated, whether fortuitously or not I cannot as yet say, with the character of the vegetation of the pond; examples from ponds in which Phanerogamic plants are few, have, towards the end of the cold weather, comparatively stout skeletons, whereas those from ponds in which such plants grow luxuriantly, are fragile even at this date; specimens from both are fragile during the hot weather and the rains—seasons during which few individuals of *S. carteri* are found alive and gemmules are rarely formed. Specimens of this species taken at these seasons are, moreover, as a rule smooth and rounded on the surface, with the exhalent apertures few, large and very deep. They are of a pale flesh-colour, rarely tinged with green in life, and have the peculiar property of turning spirit a dark brown and becoming brown themselves in alcohol, a property I have not seen in specimens taken at other times of the year. Although the majority of "hot-weather" specimens are of this form, I have, however, taken others of a more typical one even at this season.

Ephydatia indica also shows seasonal variation as regards its

skeleton spicules, which in May are pointed and irregularly inflated, and in July and August are blunt at the extremities and much more nearly regular in outline; gemmules are found at both seasons but their spicules likewise differ in shape (*Rec. Ind. Mus.*, i, part 3, p. 273).

There can be no doubt, therefore, that considerable seasonal variation occurs in the freshwater sponges of the Ganges delta, and, indeed, this might have been expected from the plastic nature of these organisms and the wide range of temperature to which they are exposed in a district on the verge of the tropics.

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EXPLANATION OF PLATE XIV.

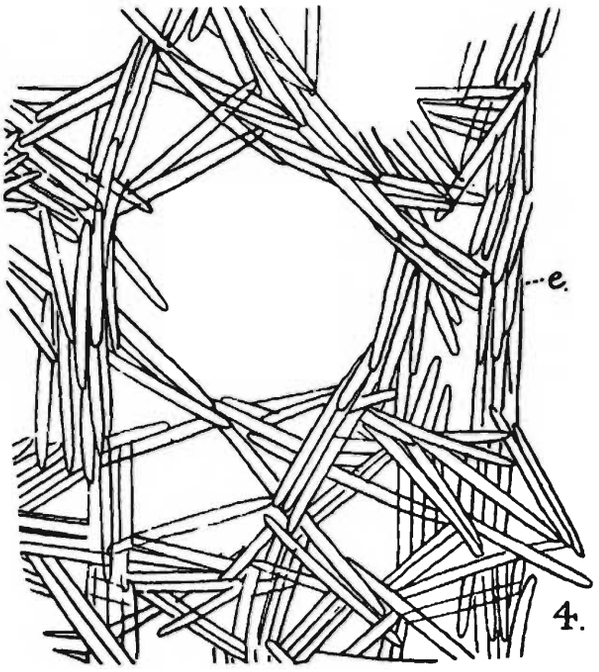
FIG. 1.—*Spongilla reticulata*, (?) sp. nov. (from a dried specimen) nat. size.

FIG. 1a.— ,, ,, ,, ,, gemmule spicules, highly magnified.

FIG. 2.— ,, *alba*, Carter, gemmule spicules (both from the same specimen) at the same magnification.

FIG. 3.— ,, *crassior*, sp. nov., portion of the skeleton near the external surface, magnified (*e*=external surface).

FIG. 4.— ,, *crassissima*, Annandale, ditto.



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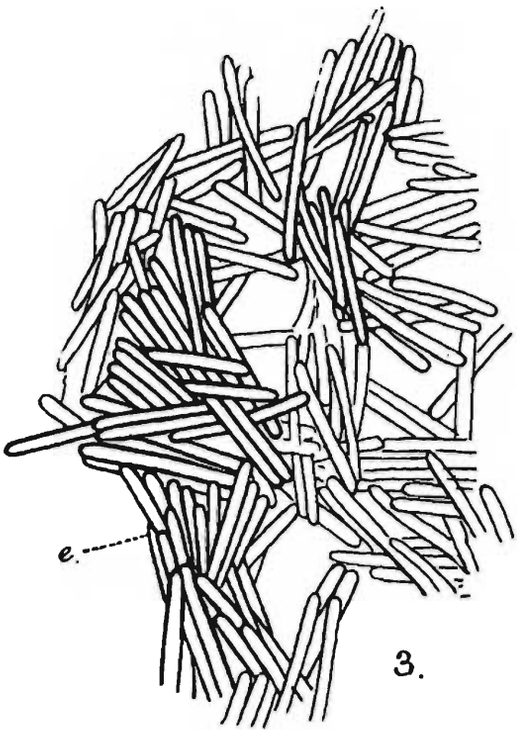

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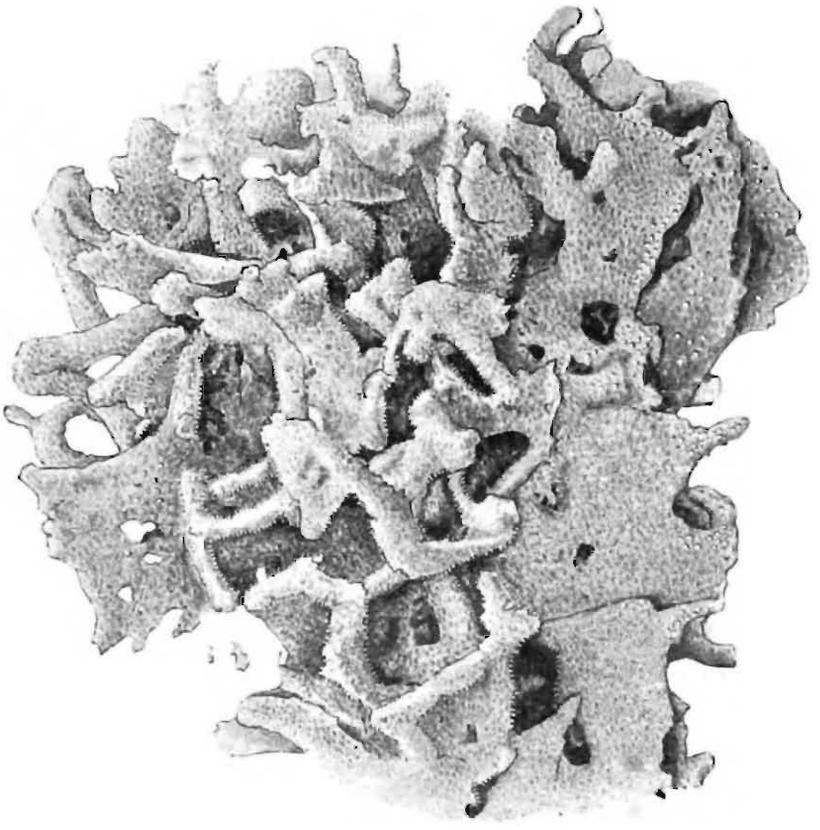

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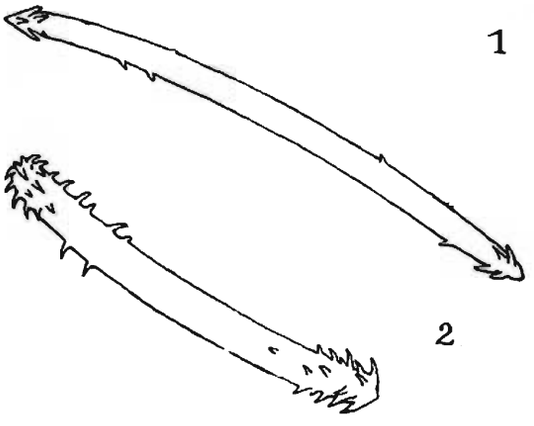

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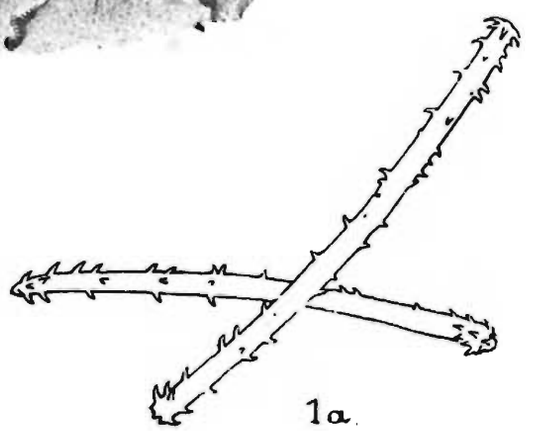

1a.

A. CHOWDHARY, *del.*

XXVIII — DESCRIPTION OF A NEW CYPRINID FISH OF THE GENUS *DANIO* FROM UPPER BURMA

By C. TATE REGAN, *M.A.*

Danio browni, sp. nov.

Depth of body $2\frac{2}{3}$ to $3\frac{1}{5}$ in the length; length of head 4. Snout from nearly as long as to a little longer than the diameter of eye, which is $3\frac{1}{4}$ to $3\frac{3}{4}$ in the length of head; interorbital width $2\frac{1}{4}$ to $2\frac{1}{3}$ in the length of head. Four barbels, the anterior pair $\frac{1}{2}$ to $\frac{2}{3}$ the diameter of eye, the posterior pair much shorter; maxillary extending to the vertical from anterior edge of eye; suborbitals completely covering the cheek. Thirty to 34 scales in a longitudinal series, $6\frac{1}{2}$ to $7\frac{1}{2}$ in a transverse series from origin of dorsal to lateral line, 1 or 2 between lateral line and base of ventral fin. Dorsal of 2 or 3 simple and 9 or 10 branched rays; origin equidistant from vertical limb of præoperculum and base of caudal. Anal of 2 simple and 11 or 12 branched rays; origin below the middle of the dorsal. Pectoral not quite reaching the ventrals. Three to five dark bluish longitudinal lateral stripes, the middle one of which broadens out anteriorly and usually becomes double, forming a loop on the middle of the side above the ventral fins, whilst the stripe below curves upwards in front of the loop.

Hab. Northern Shan States, Upper Burma.

Nine specimens, the largest 70 mm. in total length, collected by J. Coggin Brown.

This species is near to *D. kakhiensis*, Anderson, in which the body is more slender (depth $3\frac{1}{3}$ to $3\frac{2}{3}$ in the length), the mouth is more vertical and the first suborbital consequently much larger, and the middle lateral stripe does not broaden out or form a loop anteriorly.

MISCELLANEA

REPTILES AND BATRACHIA.

A COLOUR VARIETY OF *Typhlops braminus*.—A peculiar *Typhlops* was brought to me some months ago by one of the Museum servants, who had caught it in Calcutta. Thinking that it probably represented a new species, I sent it to Mr. G. A. Boulenger for description. He tells me, however, that he believes it to be *T braminus*. The whole of the body is of a bright bluish grey, which in life was almost blue, the head and the tip of the tail being white. A similar specimen was recently sent to the Museum from Sirsiah, Mozufferpore, Bihar, by Mrs. Bergtheil, but has unfortunately been mislaid.

N. ANNANDALE.

REPTILES AND A BATRACHIAN FROM AN ISLAND IN THE CHILKA LAKE, ORISSA.—In August, 1907, the Museum Collector, Mr. R. A. Hodgart, spent a week on Gopkuda Island, which lies about a mile and a half from the shore in the Chilka Lake, a large, shallow lagoon recently (from a geological point of view) separated from the Bay of Bengal on the coast of Orissa. The lake is not completely shut off from the sea, for a narrow channel still persists; during the rains the water is rendered brackish by the large amount of fresh water brought into it by the small streams that terminate in the lake, but during winter it becomes much salter. The following reptiles and frog were obtained on Gopkuda Island by Mr. R. A. Hodgart :—

1. *Emyda vittata*, Peters.

Three half-grown specimens from the shores of the island. As I have already pointed out (*Journ. Asiat. Soc. Bengal*, 1906, p. 203), this form is no more than a race of *E. granosa*, Schoepff, the typical form of which apparently replaces it in the valleys of the Ganges and the Indus. Two of the three specimens have an irregular reticulation of narrow dark lines on their carapace—a common feature of the form—and all have longitudinal dark lines on the head and neck.

2. *Hemidactylus frenatus*, D. and B.

A single male with two longitudinal rows of pink spots on the ventral surface of the tail. The species occurs all over Bengal.

3. *Hemidactylus brookii*, Gray.

A single male with fourteen præanal pores—not an unusual number—on either side.

4. *Calotes versicolor* (Daud.).

One young specimen.

5. *Varanus nebulosus* (Gray).

One small specimen.

6. *Typhlops acutus* (D. and B.).

One small specimen.

7. *Cerberus rhynchops* (Schneid.).

A specimen was caught off the island holding a small horse-mackerel (*Caranx ire*) by the belly in its jaws.

8. *Rhacophorus maculatus* (Gray).

A single specimen, taken on the wall of a house.

N. ANNANDALE.

Publications of the Indian Museum.

	Rs.	As.
Account of the Deep-sea Brachyura collected by the R.I.M.S. "Investigator." By A. Alcock, M.B., C.M.Z.S. ..	6	0
Account of the Deep-sea Madreporaria collected by the R.I.M.S. "Investigator." By A. Alcock, M.B., C.M.Z.S.	4	0
Account of the Triaxon (Hexactinellid) sponges collected by the R.I.M.S. "Investigator." By F. E. Schulze, Ph.D., M.D.	16	0
Account of the Alcyonarians collected by the R.I.M.S. "Investigator," Part I. By J. Arthur Thomson, M.A., and W. D. Henderson, M.A., B.Sc.	16	0
Aids to the identification of Rats connected with Plague in India. By W. C. Hossack, M D.	0	8
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Catalogue of Coins of the Indian Museum, Parts I to IV. By C. J. Rodgers, M.R.A.S., M.N.S.	24	0
Catalogue of the Coins in the Indian Museum, Calcutta, including the Cabinet of the Asiatic Society of Bengal. Part I.—The Early Foreign Dynasties and the Guptas. Part II.—Ancient Coins of Indian Types. Part III.—Persian, Mediæval, South Indian, and Miscellaneous Coins. By Vincent A. Smith, M.A., F.R.N.S., M.R.A.S., I.C.S., Retd.	22	8
Catalogue of Indian Crustacea. Part I.—Introduction and Brachyura Primigenia. By A. Alcock, M.B., LL.D., F.R.S.	7	0
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Catalogue of Moths of India, Parts I to VII. By E. C. Cotes and C. Swinhoe, F.L.S., F.Z.S., etc.	5	12
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Echinoderma of the Indian Museum: Deep-sea Ophiuroidea collected by the R.I.M.S. "Investigator." By R. Kœhler	10	0
Echinoderma of the Indian Museum: Shallow-water Ophiuroidea collected by the R.I.M.S. "Investigator." By R. Kœhler	4	0
Figures and Descriptions of Nine Species of Squillidæ from the Collection of the Indian Museum. By J. Wood-Mason, F.Z.S., etc., edited by A. Alcock, M.B., C.M.Z.S.	2	0
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Other Publications edited and sold by the Superintendent of the Indian Museum (also obtainable from Messrs. Friedlander & Sohn) issued by the Director of the Royal Indian Marine.

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