

Finally, it should be emphasized that the temperatures of figure 2 apply primarily to continental regions, and represent merely the average thermal condition at various depths; the possibility of locally higher temperatures is not excluded.

#### SUMMARY

In order to calculate the temperatures within the Earth it is necessary to determine the initial temperature-distribution, that is, the thermal condition at the time the Earth began to cool as a solid body. Then—as pointed out by Holmes—from the age of the Earth as fixed by the lead-uranium ratio in the oldest known rocks, from the present thermal gradient at the surface, and from the known amount of radioactive elements in superficial rocks the temperatures within the Earth can be calculated, due allowance being made for the heat produced by radioactive disintegration.

The present calculation extends to 300 km. depth and is based on an initial temperature-distribution arising from the crystallization, from the bottom upwards, of the primitive magma, which is believed to consist almost entirely of iron-magnesium silicates, corresponding to a peridotite rock. It is shown that if the material at great depths is not crystalline, but glassy, then the initial thermal condition would have been approximately the same. It is also shown that the initial temperature in the upper 50 or 100 km. could have no effect on the present-day temperatures—the temperatures at moderate depths are determined almost entirely by the original temperature at depths greater than 100 km.

The temperature curve here given makes no pretense of finality, but it may be a useful guide in discussions involving the deeper parts of the Earth's crust.

ENTOMOLOGY.—*The subfamilies, tribes, and genera of American Culicidae.* HARRISON G. DYAR and RAYMOND C. SHANNON, U. S. National Museum (Communicated by S. A. ROHWER.)

The Culicidae are a homogeneous group of insects presenting, particularly in the adult stage, a paucity of characters, so that their classification, on a natural basis, has been exceedingly difficult. A natural grouping for the family was finally effected by a study<sup>1</sup> based principally on larval characters. Characters mainly genitalic were also

<sup>1</sup> DYAR and KNAB; Journ. N. Y. Ent. Soc. 14: 170. 1906.

used for the adults and the subgroups were thereby correlated with those recognized in the larval stage. However, keys based on external adult characters were difficult and rather unsatisfactory.

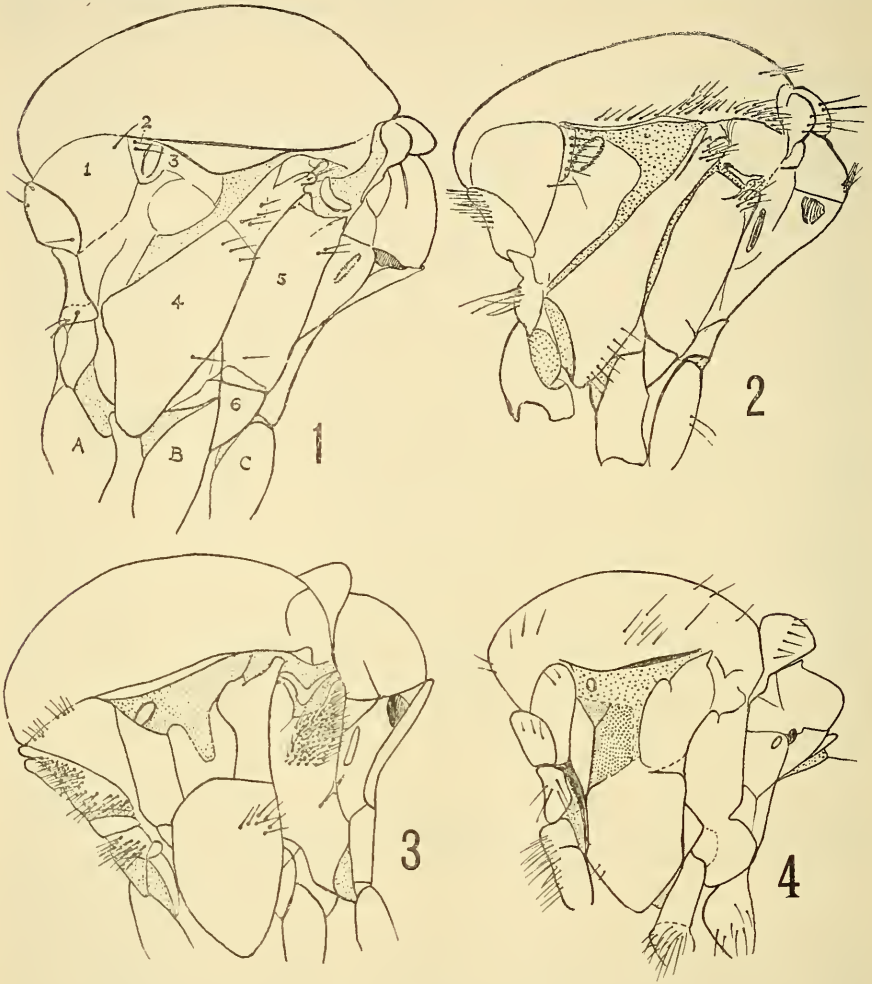
Gradually our knowledge of the external, generic, tribal, and subfamily characters of the adults has increased. Recent publications by Edwards add important characters, and studies made by the present authors have revealed more. In view of this, it appears worth while to publish a revised synopsis of the subfamilies, tribes, and genera of the American Culicidae. The characters here used are based primarily on the American forms.

The keys to the genera of adult mosquitoes given in F. W. Edwards' publications, *A revision of the mosquitoes of the Palearctic Region* (1921) and *A synopsis of adult oriental Culicine, including Megarhinine and Sabethine, mosquitoes* (1922), include many excellent characters based on the distribution of the setae in the adult. The use of these characters, while bringing about very little change in the status of the genera as already established, frequently proves very helpful as a further means of defining the genera. However, their use is limited, and apparently does not furnish the means for a natural classification throughout. The spiracular setae, which Edwards considers the most important for taxonomic purposes, are sporadic in their occurrence. These occur in *Megarhinus*, *Anopheles*, *Uranotaenia*, *Culiseta*, *Psorophora*, and the Sabethini except *Limatus*, and are absent in *Culex*, *Mansonia*, *Aedes*, *Haemagogus*, *Orthopodomyia*, *Aedeomyia*, and *Limatus*. Obviously this would be an unnatural grouping.

This indicates the necessity of using the setal characters with caution, as Edwards has done, especially as other sets of setae are still less reliable. The pronotal (proepimeral) setae in some instances are unreliable even for specific purposes; but Matheson<sup>2</sup> on the strength of this character would raise the subgenus *Janthinosoma* to generic rank and include in it all the species of *Psorophora* possessing pronotal setae. He believed that *P. howardii*, which has pronotal setae, should be transferred to *Janthinosoma*. However, *howardii* is a typical *Psorophora*, even in the restricted sense, and accordingly the presence or absence of pronotal setae fails here to have generic value. As a matter of fact, this character proves too variable even for specific purposes, for in the species *ciliata*, upon which Matheson bases his observations, they are present or absent. A similar condition occurs in *Isostomyia*; pronotal setae are present in certain species and absent in others.

<sup>2</sup> Canad. Ent. 56: 160.

Edwards has divided the genus *Mansonia* (*Taeniorhynchus*) into two groups, *Coquillettidia*, with the postspiracular setae absent, and *Mansonia* (*Taeniorhynchus*) + *Mansonides*, with these setae present.



LATERAL VIEW OF THE THORAX OF CHARACTERISTIC GENERA OF CULICIDAE

Fig. 1. *Uranotaenia*. 1, Pronotum (proepimeron of Edwards); 2, spiracular sclerite and setae; 3, mesopleural (bears the postspiracular setae if present); 4, stenopleura; 5, mesepimeron; 6, lateral sclerite of metasternum; A, B, C, fore, mid, and hind coxae. Fig. 2. *Joblotia*. Fig. 3. *Eucoethra*. Fig. 4. *Dira*.

He places the American species (*fasciolatus*, *nigricans*, *arribalzagae*, *justamansonia*, *?hypocindynia*, *?albicosta*) in *Mansonia* on account of the presence of these setae. Based on genitalic and scale characters

of the adult there are also two groups, though the American species above mentioned belong to *Coquillettidia* and not to *Mansonia*. This forms an unnatural association as these American species are more nearly allied to *Coquillettidia* than to *Mansonia* in general characteristics. They can be accommodated by the erection of a fourth subgenus, but the setal character by itself is seen to be of less than subgeneric value.

The character of the lateral metasternite in reference to the hind coxa, here used to separate the Megarhinini and Sabethini from the other mosquitoes, is constant for the American forms, and for this reason the Sabethini have been maintained as a tribe apart from the Culicini.

The generic names are here used in the same sense as in the Monograph<sup>3</sup> by Howard, Dyar and Knab, except in cases of subsequent changes.

The Chaoborinae (Corethrinae) and Dixinae, which are now generally regarded as true Culicidae, have been included in the key. Formerly they were usually omitted from the family because of the non-biting habits and mouthparts.

The wing venation is the outstanding feature of all Culicidae, which, in its essential elements, is homogenous throughout the family and is not duplicated in other Diptera. The family may be characterized as follows: Antennae fifteen to sixteen jointed; ocelli absent; mesonotum without "V"-shaped suture; wing with ten longitudinal veins reaching the margin which are: Sc, R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4+5</sub>, M<sub>1+2</sub>, M<sub>3</sub>, Cu<sub>1</sub>, Cu<sub>2</sub> and 2d A. The radial sector branches from the radius basad of r-m crossvein; second basal cell present; discal cell absent; anal cell widening toward wing margin; one anal vein present.

SUBFAMILIES OF CULICIDAE

- A1. Eyes reniform; flagellum 13-jointed; proboscis extending far beyond clypeus; mesosternum ridged; sternopleura not divided by transverse suture (except Uranotaenini); lateral sclerite of metasternum triangular, in line with (Megarhinini, Sabethini) or below (Uranotaenini, Anophelini, Culicini), the base of hind coxa; wings scaled, hind margin with fringe of scales; Rs forking far before tip of Sc; upper squama bare or ciliated.....*Culicinae*.
- A2. Eyes more or less emarginated on mesal line; flagellum 13-jointed; proboscis extending very short distance beyond clypeus; mesosternum without ridge; sternopleura divided by transverse suture; lateral sclerite of metasternum much reduced, not triangular; wings with hair-like scales, hind margin with fringe of scales; Rs forking far before tip of Sc; upper squama ciliated.....*Chaoborinae*.

<sup>3</sup> *The mosquitoes of North and Central America and the West Indies.* 1912.

- A3. Eyes not emarginated, nearly circular in outline; flagellum 14-jointed; proboscis not extending beyond clypeus; mesosternum without ridge; sternopleura nearly divided by a median transverse suture; lateral sclerite of metasternum much reduced, not triangular; wings with only inconspicuous hairs on veins, hind margin with fringe of sparse hairs; Rs forking approximately opposite tip of Sc; upper squama not ciliated.....*Dixinae*.

KEY TO THE GENERA OF AMERICAN CULICIDAE

- A1. Proboscis extending far beyond clypeus:.....Subfamily *Culicinae*.  
 B1. Base of hind coxa in line with upper margin of lateral metasternal sclerite; upper squama incompletely ciliated to bare; spiracular setae not absent when pronotal setae are present; (exclude *Haemagogus*, *Culicini*, by: spiracular setae absent; proepimeral setae present).....**Series A.**  
 C1. Clypeus much broader than long; scutellar post margin evenly rounded; a spurious vein in  $Cu_1$  cell; squama not ciliated; post notal setae absent.....MEGARHININI, *Megarhinus*.  
 C2. Clypeus at least as long as broad; scutellum trilobed; no spurious vein in  $Cu_1$  cell; post notal setae present; abdomen usually compressed and with few setae.....SABETHINI.  
 D1. No pronotal setae (lobes widely separated, see *Isostomyia espini*).  
 E1. No prealar setae.  
     F1. No propleural setae.....*Sabethes*.  
     F2. Propleural setae present.....*Sabethoides*.  
 E2. Prealar setae present.  
     F3. No spiracular setae.....*Limatus*.  
     F4. Spiracular setae present.  
         G1. Lower sternopleurals distinctly below upper margin of lateral metasternal sclerite.  
             H1. Wing scales especially the outstanding scales on bases of  $R_2$  and  $R_3$  broad.....*Miamyia*.  
             H2. Wing scales narrow.....*Wyeomyia*.  
         G2. Lower sternopleurals, extending as far as, usually above, upper margin of lateral metasternal sclerite.  
             H3. Wing scales narrow (rare).....*Menolepis*.  
             H4. Wing scales broad.....*Prosopolepis*.  
 D2. Pronotal setae present (except *Isostomyia espini*).  
 E3. Clypeus without setae.  
     F5. Lower sternopleurals distinctly below upper margin of lateral metasternal sclerite; palpi very small in both sexes.....*Isostomyia*.  
     F6. Lower sternopleurals extending above upper margin of lateral metasternal sclerite; palpi not small.....*Goeldia*.  
 E4. Clypeus setose.....*Joblotia*.  
 B2. Base of hind coxa distinctly below upper margin of lateral metasternal sclerite; postnotum rarely setose; abdomen rarely compressed and with reduced setae. (The Sabethid-like genus *Haemagogus* is retained here on basis of absence of spiracular setae and presence of pronotal setae).....**Series B.**  
 C3. Scutellum trilobed with marginal setae only on the lobes.

- D3. Anal vein extending well beyond fork of cubitus; wings villose; upper squama ciliated (partially so in *Haemagogus* and *Carrollia*).....CULICINI.
- E5. Prescutellar setae absent; wings narrower than width of thorax; postspiracular setae absent.....*Haemagogus*.
- E6. Prescutellar setae present; wings broader than width of thorax.
- F7. Post spiracular setae present.
- G3. Spiracular setae absent.
- H5. Wing scales mostly narrow, or when broad (rare), setae are present on upper side of base of first vein....*Aedes*.
- H6. Wing scales broad; setae absent on upper side of base of first vein. (See *Mansonia*.)
- G4. Spiracular setae present, sometimes small.....*Psorophora*.
- F8. Post spiracular setae absent.
- G5. Lower side of base of first vein distinctly pilose; spiracular setae present.....*Culiseta*.
- G6. Lower side of base of first vein scaly or bare; spiracular setae absent.
- H7. No setae on upper side of base of first vein; wing scales broad, black and pale mixed (all black in some species of *Mansonia* which have post spiracular setae).
- I1. No mid-mesepimeral setae; fourth tarsal joint of fore tarsus somewhat thickened, as broad as long, or broader.....*Orthopodomyia*.
- I2. Mid-mesepimeral setae present; fourth fore tarsal joint longer than broad.
- J1. Post marginal wing scales longer than width of anal cell; antennal joints but little longer than broad.....*Adomyia*.
- J2. Post marginal wing scales shorter than width of anal cell; antennal joints much longer than broad.....*Mansonia*.
- H8. Setae present on upper side of base of first vein; wing scales mostly narrow, dark colored.
- I3. Mid-mesepimeral setae numerous.....*Lutzia*.
- I4. Mid-mesepimeral setae 0-3.
- J3. Antenna much longer than length of proboscis.  
*Deinocerites*.
- J4. Antenna approximating length of proboscis...*Culex*.
- D4. Anal vein ending opposite or basad of cubital fork; squamae not ciliate; wings without villi.
- URANOETAENINI, *Uranotaenia*.
- C4. Scutellum crescent-shaped, with marginal setae evenly distributed.....ANOPHELINI, *Anopheles*.
- A2. Proboscis not elongate, extending but little beyond clypeus.
- B3. Radial sector forking far before tip of subcosta; wings with hair-like scales; hind margin with fringe of scales. Subfamily *Chaoborinae*.
- C5. Anal vein ending basad of cubital fork.....*Eucoethra*.
- C6. Anal vein ending beyond fork of cubitus.
- D5. Basitarsal joint shorter than following joint.....*Corethra*.
- D6. Basitarsal joint longer than following joint.

- E7. Tip of  $R_1$  much nearer tip of  $R_2$  than to Sc. . . . . *Chaoborus*.  
 E8. Tip of  $R_1$  much nearer tip of Sc than to  $R_2$ . . . . . *Corethrella*.  
 B4. Radial sector forking approximately opposite tip of subcosta; wings with only inconspicuous hairs on veins, hind margin with fringe of sparse hairs. . . . . Subfamily *Dixinae*, *Dixa*.

### Subfamily CULICINAE.

#### Series A.

Series A contains the tribes Megarhinini and Sabethini. The grouping apparently is not a natural one and for this reason no name is proposed. The species are all day-fliers which probably accounts for the brilliant metallic colors of the scales and their extensive development, which in turn has brought about a decrease in the setae. The position of the lateral metasternal sclerite and absence of squamal cilia may be due to similar causes.

#### Tribe MEGARHININI.

The American species of this tribe are all contained in the genus *Megarhinus*. This group in many respects is the most peculiar of the Culicinae. It possesses many striking characters which set it well apart from all other genera.

It is interesting to compare a female of this non-bloodsucking group with the female of such a strong biter as *Psorophora ciliata*. In *Psorophora* there is a chitinous collar-like development from the lower part of the head which, with the clypeus, surrounds the base of the proboscis. It is completely absent in *Megarhinus* and apparently absent in all non-biting Culicinae.

#### Tribe SABETHINI.

The Sabethini are among the most recent of the Culicidae and the most highly specialized in respect to vestiture and structure, yet apparently derived separately from a point low in the phylogeny, not improbably in the general vicinity of *Megarhinus*, which we associate in the same series on other characters. The *Joblotia* group is the least specialized of the Sabethini and in this group we find the male genital structures resemble not only those of *Megarhinus*, but also the lower genera of the Culicine series, *Bancroftia* and *Culiseta*. There is a correspondingly high degree of specialization in the life history, many of them being adapted to very peculiar habitats, such as aerial bromelias, in their immature stages, yet again, the specialization apparently originated from a point low in phylogeny, and the original Sabethine was doubtless a tree-hole breeder, as is the case with the lowest members of the Culicine series.

#### The Sabethes Group.

In *Sabethes* and *Sabethoides* the scale vestiture has been carried to the highest development, with a corresponding decrease of setae, that has been attained in the American Culicidae. A few exceptions are found in *Limatus*. The scales are mostly shining bluish black with violet and greenish reflections. The pleurae are more or less silvery, while the abdominal sternum has white scales, and certain species have white scales on the legs.

All mesonotal setae are absent except those on the post alar calli and the anterior margin; the prealar, pronotal and propleural (present in *Sabethoides*) are likewise absent, while the sternopleural setae are lacking except for the lowermost ones, and the mesepimeral setae are confined to a tuft on the upper posterior corner; squamal margins bare; abdomen compressed, almost

devoid of setae except on first tergite and terminal segments; wings narrower than width of thorax, with broad scales; second anal (axillary) cell broader than length of hind marginal fringe.

Genus *Sabethes* Robineau-Desvoidy.

*Sabethes* Robineau-Desvoidy, Mém. Soc. d'hist. Nat. Paris **83**: 411. 1827.

Characters for defining *Sabethes* are: propleural without setae; fore femur shorter than middle one; mid tibia with greatly developed, outstanding scales; hind leg elongate, its tarsus nearly three times as long as tibia.

Genus *Sabethoides* Theobald.

*Sabethoides* Theobald, Mon. Culic. **3**: 328. 1903.

*Sabethinus* Lutz in Bourroul, Mosq. do Brazil 48, 57. 1904.

This genus differs from *Sabethes* mainly by the presence of lower propleural setae; front femur as long as the middle one; absence of "paddles" on mid tibia.

The senior author was of the opinion<sup>4</sup> that *Sabethes* and *Sabethoides* were of not more than subgeneric value, and this view may yet obtain. However, in correspondence with the characters as here used, it seems best to give them full generic rank.

Genus *Limatus* Theobald.

*Limatus* Theobald, Mon. Culic. **2**: 349. 1901.

*Lemmamyia* Dyar, Ins. Ins. Mens. **7**: 140. 1919.

*Limatus* is a small group of brilliantly colored mosquitoes. The vestiture is composed of dense flat and appressed scales, with greatly variegated metallic colors, black, purple, golden, silvery, green, dark blue and reddish bronze. Mesonotum with setae only on anterior margin and post alar calli; spiracular and sternopleural setae present; prealar, propleural and tuft of mesepimeral setae present; wings as broad as thorax; wing scales broad; axillary cell but little broader than length of hind marginal fringe; hind tarsus with a single claw. The tip of the anal vein in some species ends opposite the cubital fork, as in *Uranotaenia*.

*Limatus* divides into two subgenera on the characters of the male hypopygium as follows:

Side piece short and unspecialized; clasper with two arms, one semiarticulate and opposed to the other.....*Limatus*.

Side piece angled, with a spine and large tuft of hairs at base; clasper capitate, indistinctly divided.....*Lemmamyia*.

*Limatus* contains *durhami* Theob. and *paranensis* Theob., possibly but varieties of one species.

*Lemmamyia* contains *asullepta* Theob. and *pseudomethysticus* B.-W. & B., possibly but varieties of one species.

The *Wyeomyia* Group.

This is a large group of species of unusual difficulty to classify. Usually only one genus, *Wyeomyia*, is recognized, but a large number of subgenera are in use. An attempt has been made here to divide *Wyeomyia* into four groups having generic rank on the basis of the pleural setae and wing scales.

Genus *Wyeomyia* Theobald.

*Wyeomyia* Theob., Mon. Culic. **2**: 267. 1901.

*Phoniomyia* Theob., Mon. Culic. **3**: 311. 1903.

<sup>4</sup> Ins. Ins. Mens. **12**: 97. 1924.



*Pentemyia* Dyar, Ins. Ins. Mens. 7: 122. 1919.

*Diphalarange* Dyar, Ins. Ins. Mens. 7: 126. 1919.

*Dyarina* Bonne-Wepster and Bonne, Ins. Ins. Mens. 9: 6. 1921.

*Phyllozomyia* Dyar, Ins. Ins. Mens. 12: 112. 1924.

*Wyeomyia* may be defined: Mesonotum with setae on anterior margin, on lateral margins, on post alar calli and with or without prescutellar setae; the spiracular, propleural and prealar setae present; sternopleura with setae only on lowermost portion; wing a little broader than thorax; wing scales narrow; second anal cell as broad or slightly broader than hind marginal fringe; abdomen with few setae except on first tergite and apically.

The following subgenera may be recognized on the characters of the male hypopygium:

A1. Clasper with capitate tip, a short arm on either side, in a few species absorbed into the head.

B1. Stem of clasper short and stout. . . . . *Phyllozomyia* Dyar.

B2. Stem of clasper long and slender. . . . . *Wyeomyia* Theob.

A2. Clasper with 3 arms, which are separate and without capitate tip.

B3. The 3 arms approximate, 2 erect, 1 at right angles

*Pentemyia* Dyar.

B4. The 3 arms long and widely separated. . . . . *Dyarina* B.-W. & B.

*Phyllozomyia* contains the species *smithii* Coq., *vanduzeei* D. & K. *bahama* D. & K. and *chrysomus* D. & K.

*Wyeomyia* contains *pertinans* Will., *abebela* D. & K., *melanopus* Dyar, *quasiluteoventralis* Theob., *telestica* D. & K., ? *oblita* Theob., ? *celaenocephala* D. & K., *scotinomus* D. & K., *simmsi* D. & K., *camptocomma* Dyar., *mitchelli* Theob. and *guatemala* D. & K.

*Pentemyia* contains *bromeliarum* D. & K.

*Dyarina* contains *lassalli* B.-W. & B., ? *pallidoventer* Theob. and *leontinia* Brèthes.

(*Menolepis*) *culebrae* Dyar falls into *Wyeomyia* and may be the female of *melanopus* Dyar in case the slight postnotal scaling proves to be sporadic. It is not present in the single male of *melanopus* before us.

#### Genus *Miamyia* Dyar.

*Phoniomyia* Theo., Mon. Culic. 3: 311. 1903.

*Miamyia* Dyar, Ins. Ins. Mens. 7: 116. 1919.

*Cleobonnea* Dyar, Ins. Ins. Mens. 7: 105. 1919.

*Dodecamyia* Dyar, Ins. Ins. Mens. 7: 138. 1919.

*Shropshirea* Dyar, Ins. Ins. Mens. 10: 97. 1922.

The chief difference to be noted between *Miamyia* and *Wyeomyia* is that in the former the wing scales are broad, and narrow in the latter.

The subgenera of *Miamyia* separate as follows:

A1. Clasper with 3 short arms and a fourth downturned one; tenth sternite produced with tuft of spines or long hairs; lateral angles of 8th segment roundly produced. . . . . *Miamyia* Dyar.

A2. Clasper varied but otherwise; tenth sternite normal; angles of 8th segment not produced.

B1. Clasper with 3 or 4 similar arms, one of them triangularly widened. . . . . *Cleobonnea* Dyar.

B2. Clasper with the arms irregular and unlike, a tuft of hair from near apex of side piece. . . . . *Shropshirea* Dyar.

B3. Clasper simple, without branches. . . . . *Dodecamyia* Dyar.

*Miamyia* contains: *codiocampa* D. & K., *serrata* Theob. and *hosautus* D. & K.

*Cleobonnea* contains: *occulta* B.-W. & B., *argenteorostris* B.-W. & B. and *negrensis* G. & E.

*Shropshirea* contains: *ypsipola* Dyar.

*Dodecamyia* contains: *aphobema* Dyar (wing scales broadly ligulate), *bodkini* Edw., *longirostris* Theob. (if this species actually falls here, the subgeneric name must be changed to *Phoniomyia* Theob.), *splendida* B.-W. & B., *trinidadensis* Theob., *quasilongirostris* Theob., *roucouyana* B.-W. & B., *grenadensis* Edw.

The senior author proposed to unite *clasoleuca* D. & K., *grenadensis* Edw. and *roucouyana* B.-W. & B. as one species (Ins. Ins. Mens., XII, 109, 1924); but according to the setal characters *clasoleuca* and *roucouyana* must be separated; *grenadensis* is not before us.

### Genus *Prosopolepis* Lutz.

*Prosopolepis* Lutz, Imp. Med. 312. 1905.

*Dinomyia* Dyar, Ins. Ins. Mens. 7: 117. 1919.

*Triamyia* Dyar, Ins. Ins. Mens. 7: 120. 1919.

*Heliconiamyia* Dyar, Ins. Ins. Mens. 7: 123. 1919.

*Decamyia* Dyar, Ins. Ins. Mens. 7: 135. 1919.

*Hystatomyia* Dyar, Ins. Ins. Mens. 7: 140. 1919.

*Calladimyia* Dyar, Ins. Ins. Mens. 7: 151. 1919.

*Prosopolepis*, as here defined, differs from *Wyeomyia* by having the lower sternopleural setae extending upwards as far as, or above, the dorsal margin of the lateral metasternal sclerite, and broad wing scales. In addition the wings in some species are comparatively larger with a broader second anal cell; the metanotum may be scaly (*Eunicemyia*); the clypeus may be scaly (*Prosopolepis*) and in certain species of *Hystatomyia* and *Prosopolepis* the number of spiracular setae are reduced to one or two. A number of species have 1-3 squamal setae.

*Prosopolepis* divides into the following subgenera on the characters of the male hypopygium:

A1. Clasper much complicated and branched. . . . . *Dinomyia*.

A2. Clasper not much complicated, not over 3-branched.

B1. Clasper short-stemmed, the division reaching near base

*Prosopolepis*.

B2. Clasper long-stemmed.

C1. Clasper with a short branch near mid stem. . . . . *Triamyia*.

C2. Clasper with expansions and arms terminal or simple.

D1. Clasper with three distinct separated arms at tip

*Heliconiamyia*.

D2. Clasper with 3 arms short and capitate

E1. 3 setae near base of side piece normal. . . . . *Calladimyia*.

E2. 2 of these 3 setae separated and modified. . . . . *Decamyia*.

D3. Clasper with long stem and expanded, irregular tip

*Eunicemyia*.

D4. Clasper simple or triangularly expanded at tip.

E3. Angles of side pieces greatly produced, the clasper subterminal. . . . . *Hystatomyia*.

E4. Side pieces normal, subspherical, clasper terminal

*Janicemyia*.

*Dinomyia* contains: *phroso* H. D. & K., *mystes* Dyar.

*Prosopolepis* contains: *confusus* Lutz, *flui* B.-W. & B., *jocosa* D. & K. and *prolepidis* D. & K., but the male of the genotype is unknown, the characters being taken from *prolepidis*.

*Triamyia* contains: *apronoma* D. & K., *personata* Lutz.

*Helioconiamyia* contains: *chalocephala* D. & K.

*Calladimyia* contains: *melanocephala* D. & K.

*Decamyia* contains: *ulocoma* Theob., *pseudopecten* D. & K., *eloisa* H., D. & K.

*Eunicemyia* n. subgen., contains: *albosquamata* B.-W. & B. subgenotype and *hemisognosta* D. & K.

*Hystatomyia* contains: *intonca* D. & K., *circumcincta* D. & K., *coenonus* H. D. & K., *lamellata* B.-W. & B. and *autocratica* D. & K.

*Janicemyia* n. subgen. contains: *clasoleuca* D. & K. subgenotype.

#### Genus *Menolepis* Lutz.

*Menolepis* Lutz (Bourroul) Mosq. do Brazil 67. 1904.

This genus contains only a single species, *leucostigma* Lutz. The eyes are fairly well separated; the spiracular sclerite is densely scaly and only one seta is present; postnotum has a large patch of white scales; the wing scales are narrow and the upper squama has two setae. The male is unknown to us.

We are unable to place the following species: *luteoventralis* Theobald (genotype of *Dendromyia* Theob.), *bourrouli* Peryassú, *arthrostigma* Peryassú and *flavifacies* Edwards.

#### The Joblotia Group.

The genera *Isostomyia*, *Goeldia*, and *Joblotia* form a rather generalized group of Sabethini. The scale development and reduction of setae is not as extensive, while the wings are comparatively larger and squamal setae are usually present; the eyes are contiguous, and the male palpi are elongate and fairly long in the female (very small in both sexes of *Isostomyia*). One to four pronotal setae are usually present. The eyes are more or less separated in *Wyeomyia*, et al. (practically contiguous in *Prosopolepis prolepidis* D. & K.), and the prothoracic lobes are more approximated in the *Wyeomyia* group than in the *Joblotia* group, although *I. homotina* D. & K. has them somewhat approximated.

#### Genus *Isostomyia* Coquillett.

*Isostomyia* Coquillett, Class. Mosq. 16. 1906.

This genus includes *perturbans* Williston (genotype), *homotina* D. & K., *espini* Martini, and possibly *Dendromyia paranensis* Brèthes. It is separated from *Goeldia* by the small palpi in both sexes; and the sternopleura setae being distinctly below the upper margin of the lateral metasternal sclerite. The pronotal setae are absent in *espini* and *paranensis*; in *homotina* the second anal cell is broader than the length of the hind marginal fringe, in *espini* the cell is slightly narrower and in *paranensis* it is about equal to the length of the fringe.

#### Genus *Goeldia* Theobald.

*Goeldia* Theobald, Mon. Culic. 3: 330. 1903.

The genus *Goeldia* is characterized by the presence of pronotal setae, widely separated prothoracic lobes, contiguous eyes; clypeus without setae; sternopleural setae extending above the upper margin of lateral metasternal

sclerite; palpi of female as long as or longer than width of head; palpi of male nearly as long as proboscis.

The species included are: *fluviatilis* Theob. (genotype), *longipes* Fabr., *lampropus* H. D. & K., *leucopus* D. & K., *rapax* D. & K., *lunata* Theob., *pallidiventer* Lutz, *trichopus* Dyar, *vonplesseni* D. & K. See also B.-W. & B. (Ins. Ins. Mens. 10: 38. 1922), whose table of species includes also *Ispostomyia*.

*G. fluviatilis* has the pronotal setae on the anterior portion of the pronotal sclerites. The thorax of *vonplesseni* presents peculiar features. It appears to be unusually elongated, from above appearing nearly three times as long as wide; in side view it is subquadrate instead of the usual wedge-shape; the roots of the wings instead of being directly above the hind coxae, are placed well behind them.

#### Genus *Joblotia* Blanchard.

*Joblotia* Blanchard, Comp. Rend. Soc. Biol. 53: 1046. 1901.

The setose clypeus of *Joblotia* is a character peculiar to this genus.

#### Series B.

In this series of tribes and genera the base of the hind coxa is distinctly below the line of the upper margin of the lateral metasternal sclerite, except certain species of *Haemagogus*; pronotal (proepimeral) setae usually present; back of head usually with narrow erect scales (exceptions in *Uranotaenia*, *Haemagogus*, and certain species of *Aedes* and *Culex*); body scales usually sparse and rarely with metallic colors; upper squama ciliated (except *Uranotaenia*, and partly so in *Haemagogus* and *Carrollia*); postnotum rarely with setae.

All of the known disease-carriers as well as the obnoxious species occur in this series.

#### Tribe CULICINI

The tribe Culicini contains two well marked groups, *Aedes* group and *Culex* group, with a number of intermediate genera. The shape of the female abdomen frequently offers a more ready means towards generic diagnosis than other characters used in the key. In the *Aedes* group, *Psorophora*, *Aedes*, and *Haemagogus*, the tip of the abdomen tends to be pointed, with the cerci exerted. Usually the other genera, *Culex*, *Lutzia*, *Deinocerites*, *Mansonia*, *Aedeomyia*, *Orthopodomyia*, and *Culiseta* have the tip of the abdomen markedly blunted. *Carrollia*, subgenus of *Culex*, has the abdomen strongly compressed. The *Aedes* group has the eyes separated on the lower side of the head; in the *Culex* group they are contiguous; in the other genera the eyes are nearly touching below. The *Culex* group, *Culex*, *Lutzia*, and *Deinocerites* as recorded by Edwards, have distinct pulvilli.

The palpi of the females of Culicini are distinctly shortened, usually small.

#### Genus *Haemagogus* Williston.

*Haemagogus* Williston, Trans. Ent. Soc. Lond. 271. 1896.

*Stegoconops* Lutz, Imprensa Medica 83. 1905.

*Haemagogus* is remarkable for its most striking resemblance to the Sabethini, particularly the Sabethes group. Nearly all of the peculiarly Sabethine characters are duplicated in one or more species of *Haemagogus* and on the basis of external adult characters it can hardly be differentiated.

The extensive scale development with the resultant decrease of setae and the coloration is practically the same as in *Sabethoides*; likewise the prothora-

cic lobes are closely approximated, the metanotum frequently bears setae, the base of the hind coxae in some species is in line with the upper margin of the lateral metasternal sclerite, and the squamae are incompletely ciliated.

The main character by which *Haemagogus* is separated from the Sabethini is that the pronotal (proepimeral) setae are present while the spiracular setae are absent. Other characters are the more elongate head, narrower wings and shorter legs.

*Stegoconops* is retained as a subgenus of *Haemagogus* and may eventually have to be raised to generic rank.

*Haemagogus leucomelas* Lutz, on the basis of setal characters, postnotal and prescutellar setae present, must be referred to *Aëdes*. It represents a close intermediate stage between the two genera. As the name *leucomelas* is preoccupied the new name *Aëdes leucocelaenus* is proposed for it.

#### Genus *Aëdes* Meigen.

*Aëdes* Meigen, Syst. Besch. bek. Eur. zweifl. Ins. 1: 13. 1818.

The generic diagnosis for *Aëdes* remains as given in the Monograph (H. D. & K.) with the additions: pronotal and postspiracular setae present; spiracular setae absent; mesonotal setae rarely reduced; wing scales narrow, rarely broad, when broad, the base of the radius, upper surface, has well developed setae.

#### Genus *Psorophora* Robineau-Desvoidy.

*Psorophora* Robineau-Desvoidy, Mem. Soc. Hist. Nat. Paris 3: 412. 1827.

Setal characters of generic significance are: pronotal setae present or absent; spiracular setae present, sometimes small in *Janthinosoma*; postnotal setae present.

#### Genus *Culiseta* Felt.

*Culiseta* Felt, N. Y. State Mus. Bull. 79, 391c. 1904.

The presence of a peculiar character, base of subcostal, on lower surface, with distinct pile, makes this a well defined genus. In addition pronotal and spiracular setae (usually only one in *melanurus* Coq.) are present, the post spiraculars absent.

#### Genus *Orthopodomyia* Theobald.

*Orthopodomyia* Theobald, Entomologist 37: 236. 1904.

Pronotals present; spiraculars and post spiraculars absent; prealars usually several, a single stout one in *fascipes* Coquillett; antenna longer than length of proboscis, the joints much longer than broad; fourth tarsal joint of fore tarsus distinctly shorter than fifth joint; wing scales broad, bicolored; base of radius without setae.

#### Genus *Aëdeomyia* Theobald.

*Aëdeomyia* Theobald, Journ. Trop. Med. 4: 235. 1901.

Pronotals present; spiraculars and post spiraculars absent; antenna shorter than length of proboscis, the joints but little broader than long; wings densely scaled, scales broad and tricolored; hind marginal scale fringe longer than width of 2nd anal cell.

#### Genus *Mansonia* Blanchard.

*Mansonia* Blanchard, C. R. Soc. Biol. 54: 1331. 1902.

It is particularly difficult to segregate the species of *Mansonia* as a unit in a key. A good outstanding character or even a combination of characters

common to both sexes and applicable to all species seems lacking in the adult stage.

Pronotals present; spiraculars absent; post spiraculars are present or absent; wing scales broad or fairly broad, bicolored or dark (dark scaled species have post spiracular setae); base of radius (American forms) without setae; the leg setae more developed than is usual with other Culicidae.

#### Genus *Culex* Linnaeus.

*Culex* Linnaeus, Syst. Nat., ed. 10, 602. 1758.

Pronotals present; spiraculars and post spiraculars absent; base of radius, upper surface, with setae; mid-mesepimeral setae 0-3; antenna approximating length of proboscis.

The subgenus *Carrollia* Lutz partakes of some of the characteristics of the Sabethini. The abdomen is compressed with patches of brilliantly colored scales; the metanotum may bear setae and the squamal cilia are reduced.

#### Genus *Lutzia* Theobald.

*Lutzia* Theobald, Mon. Culic. 3: 155. 1903.

*Lutzia* differs from *Culex* mainly by its larger size; numerous mid mesepimeral setae and spotted wings.

#### Genus *Deinocerites* Theobald.

*Deinocerites* Theobald, Journ. Trop. Med. 4: 235. 1901.

The unusually elongate antennae characterizes this genus. Metanotal setae are of sporadic occurrence in certain species.

### Tribe URANOETAENINI.

#### Genus *Uranotaenia* Arribalzaga.

*Uranotaenia* Arribalzaga. Rev. Mus. de la Plata. 1: 375. 1892.

This tribe with its single genus is as peculiar in its way as is *Megarhinus*, Megarhinini.

The occiput is densely covered with broad flat scales of metallic colors; the mesonotal setae are well developed and somewhat reduced in number; the pleural setae are prominent but greatly reduced in number, one to two lower propleurals, one lower and one upper prothoracic; one to two pronotals; one spiracular; about two prealars; about five scattered mid sternopleurals; no lower sternopleurals; two upper and one lower mesepimeral; a transverse suture (best seen in slide mount) near upper portion of sternopleura; upper forked cell usually short; anal vein ending opposite or before cubital fork; wings without villi; squamal margins bare; patches of metallic scales on thorax and wings. The palpi are short in both sexes.

### Tribe ANOPHELINI.

#### Genus *Anopheles* Meigen.

*Anopheles* Meigen, Syst. Besch. Bek. europ. zweifl. Ins. 1: 10. 1818.

The scutellum, with its evenly rounded hind margin upon which the setae are evenly distributed, the long palpi of the female and clubbed palpi of the male remain the best diagnostic characters for this group. The American species are more or less naturally divided into two groups by the presence or absence of a tuft of scales on the upper part of the prothoracic lobes. In *A. maculipennis* Mg., however, the tuft of scales may be present or absent.

## Subfamily CHAOBORINAE.

A revision of the Chaoborinae, giving subfamily and generic definitions, is given in *Ins. Ins. Mens.* **12**: 201. 1924 by Dyar and Shannon.

## Subfamily DIXINAE.

Delicate midges with long slender legs, without wing- or body scales and with a fringe of delicate hairs on the hind wing margin. Eyes not reniform, nearly circular in outline; antenna sixteen jointed (flagellum fourteen jointed), not plumose; palpi five jointed; proboscis very short; pronotal (proepimeral) setae few and usually near the upper margin; prealar and mesepimeral setae absent; mid and lower sternopleural setae present or absent; mesosternal ridge absent; base of radial sector approximately opposite tip of the subcosta; wing veins bearing small setae; hind wing margin without scales; squamae not ciliated.

Only one genus, *Dixa* Meigen (*Syst. Besch. zweifl. Ins.* **1**: 316. 1818, genotype, *maculata* Meigen, *ibid.*), hitherto recognized.

The larvae of the Dixinae are aquatic; they are easily characterized among the Culicidae by their parallel sided body; absence of airtube; first two abdominal segments each bearing a pair of dorsal pseudopods. The larva remains on the surface of the water at the edge where the capillary film draws up on the margin. When at rest the larva holds itself in a U-shaped fashion.