

The Determination of Mosquito Females by  
Microscopic Preparations of the Head<sup>1/</sup>

II. Key to Genera and Subgenera

A. V. Gutsevich  
Zoological Institute, Leningrad

A key to the genera and subgenera of mosquitoes of the Soviet Union is given here, along with basic quantitative indices for each of the 19 groups of mosquitoes.

In Part I of this series (Gutsevich 1972), a concise description of systematic indications is given as well as a description of generic differentiation. The significance of indices used in this part of the work is also explained: P/P is the relationship of the length of the palps to the length of the proboscis; P/A is the relationship of the length of the 4th segment of the palps to the total length of the 5th and 6th segments of the antenna. One more index may be used, which is figured without supplementary measurement: A/P is the relationship of the total length of the 5th and 6th segments of the antenna to the length of the proboscis (see Table). By the width of the frons we mean the smallest diameter of its anterior portion, compared to the diameter of the facet of the eye, which is, on the average, equal to 20 mk.

The identification key presented below was compiled by taking into account only the faunal types of the Soviet Union. Also given are brief observations on the distinguishing characters of the subgenera, in the determination of which difficulties can arise.

KEY FOR DETERMINING GENERA AND SUBGENERA BY  
MICROSCOPIC PREPARATIONS OF THE HEAD OF THE FEMALE

- 1 (4). Palps are approximately the same length as proboscis. . .  
. . . . . Genus *Anopheles* Mg.
- 2 (3). Frons is moderately wide (2-3 facets). Oral cavity is unarmed, that  
is, without a row of teeth. . . . . Subgenus *Anopheles* Mg.
- 3 (2). Frons is very wide (4-7 facets). Oral cavity is armed  
. . . . . Subgenus *Cellia* Theob.

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- 4 (1). Palps are several times shorter than proboscis.
- 5 (6). Proboscis is approximately 7 mm in length, curved, and is 2-3 times wider at the base than at the apex. The frons is very narrow and long, more than 300 mk (17-20 facets). .Genus *Toxorhynchites* Theob.  
 . . . . .(one species - *T. christophi* Ports.)
- 6 (5). Length of proboscis is not more than 4.5 mm, is normally straight, and is approximately the same width along the whole length. Length of frons does not exceed 200-220 mk (not more than 10 facets).
- 7 (8). Palps are very short, consisting of 2 sections: proximal - without scales and hairs, and distal - with scales and hairs. On the spinal side of the head the eye lobes, turned to the center line of the body, are very constricted; the frons is not pronounced. . . . .  
 . . . . .Genus *Uranotaenia* Arrib.  
 . . . . .(one species - *U. unguiculata* Edw.)
- 8 (7). Palps are of 4 or 5 segments. Eyes are separated by frons or are approximated along a significant length.
- 9 (10). Palps are long (0.40-0.45 the length of the proboscis), thin; the proximal half of the 4th segment of the palps is not thicker than the segments of the antenna located on the same level. . . . .  
 . . . . .Genus *Orthopodomyia* Theob.  
 . . . . .(one species - *O. pulchripalpis* Rond.)
- 10 (9). Palps are shorter (0.15-0.35 the length of proboscis), are not so thin; proximal half of the 4th segment of the palps is as a rule thicker than the segments of the antenna located on the same level.
- 11(12). The scales of the palps and proboscis are principally wide. Proboscis has bright ring in the middle. . . . . Genus *Mansonia* Blanch.  
 . . . . .(one species - *M. richiardi* Fic.)
- 12(11). The scales of the palps and proboscis are principally "ordinary", that is, narrow. Proboscis does not have bright ring, but if there is one (as in several types of *Culex*,) then the oral cavity is armed.
- 13(20). Oral cavity is armed, that is, with spines (teeth) arranged in one row or several rows. The rear section of the pharynx, more often faintly enlarged (widened), is shorter than the anterior section; more infrequently both sections are approximately the same length. Frons is narrow; the smallest distance between the eyes of most types is less than the diameter of a facet . . . . . Genus *Culex* L.
- 14(15). Palps are long, especially the 4th segment; P/P is 0.26-0.28; P/A forms more of a unit . . . . . Subgenus *Lutzia* Theob.
- 15(14). Palps are short or of medium length; P/P is 0.16-0.24; P/A forms less of a unit.

- 16(17). Palps are short; P/P is 0.5-0.6. Frons is without scales or has scales only on the rear margin. . . . . Subgenus *Barraudius* Edw. . . . . (and *C. (Neoculex) martini* Med.)
- 17(16). Palps are of medium length; P/P is 0.7 or greater (now and then 0.6). Frons has scales, scattered at least along the entire length of the rear half.
- 18(19). The smallest width of the frons is roughly equal to the diameter of the facet, sometimes is a little greater. Scales or hairs are also developed on the anterior part. . . . Subgenus *Neoculex* Dyar.
- 19(18). The smallest width of the frons is as a rule less than the diameter of the facet. There are usually no scales on the anterior part. . . . . Subgenus *Culex* L.
- 20(13). Oral cavity is unarmed. Rear section of pharynx is greatly enlarged (widened), is longer than the anterior section; more infrequently both sections are approximately the same length. The width of the frons may vary.
- 21(22). A row of 5-7 large/coarse hairs is arranged behind the eyes on each side; there are no other hairs behind them (there are tiny scales) . . . . . Subgenus *Stegomyia* Theob. of Genus *Aedes* Mg.
- 22(21). In addition to the row of coarse/large hairs behind the eyes (if it is pronounced), there is an even greater or lesser number of hairs on the occiput.
- 23(24). The segments of the antenna are relatively long but the palps are short; P/A is 0.5-0.6. . . . . Subgenus *Aedes* Mg. . . . . (one species - *A. (A.) cinereus* Mg.)
- 24(23). Palps are not very short; P/A is 0.7 or greater, is as an exception 0.65.
- 25(26). The hairs of the whorls at the base of the segments of the antenna are very long; the length of the hairs of the 5th segment is at least twice as great as the length of the segment. Palps are thickly covered with primarily narrow and upright or semi-adherent scales. . . . . Subgenus *Finlaya* Theob. of Genus *Aedes* Mg.
- 26(25). The hairs of the whorls of the antenna are not so long; the hairs of the 5th segment are not more than 2-2.5 times longer than the length of the segment. The scales of the palps are primarily adherent or semi-adherent.
- 27(28). The 1st segment of the antenna has a fascicle of scales, located closer to the exterior side of the segment. . . . . Subgenus *Allotheobaldia* Brol. of Genus *Culiseta* Felt . . . . . (one species - *Culiseta (Allotheobaldia) longiareolata* Macq.)

- 28(27). The 1st segment of antenna has no fascicle of scales.
- 29(30). Frons is narrow, is smaller in diameter than the facet, is without scales or they are located (individually) only on the rear third. Segments of antenna are narrow and long; A/P is 0.16-0.17. . . . .  
 . . . . . Subgenus *Culicella* Felt of Genus *Culiseta* Felt.
- 30(29). Frons is not less in diameter than facet. If the frons is narrow, then the scales on it are located not only in the rear, but also in the middle third. The segments of the antenna are relatively thicker and shorter; A/P is not greater than 0.14 and is usually less.
- 31(32). The 4th segment of the antenna has microtrichia, sometimes not numerous (Fig. 1). . . . . Subgenus *Culiseta* Felt.
- 32(31). The 4th segment of the antennae is as a rule without microtrichia .  
 . . . . . Subgenus *Ochlerotatus* Arrib. of Genus *Aedes* Mg.  
 . . . . . and also *Aedes (Aedimorphus) vexans* Mg.  
 . . . . . and *Aedes (Neomelaniconion) aureus* Guts.

#### NOTES TO THE KEY

Some genera and subgenera are easily determined "at first glance" by preparations of the head of females (genera *Toxorhynchites*, *Uranotaenia*, *Orthopodomyia*; subgenera *Anopheles*, *Cellia*, *Lutzia*, *Stegomyia*, *Allotheobaldia*). In other cases, difficulties in determination can arise; therefore brief explanations of the key are necessary.

GENUS *Mansonia*. Here one species (*M. richiardii* Fic.) is meant. The other (*M. buxtoni* Edw.) is found in the USSR only in the region of Chernovitz. The bright ring in the middle of the proboscis, peculiar to *M. richiardii*, is not very clearly visible in the preparations. The relatively wide scales are also characteristic. On the palps and proboscis there are many scales with the number of longitudinal lines around 10 and higher. In mosquitoes of other genera there are not, as a rule, such wide scales, or else there are very few. There are a few exceptions, in particular *A. detritus* Hal. and *A. kasachstanicus* Guts. Some other characters, the combination of which is characteristic for *M. richiardii*, are: the palps are of 5 segments, the 4th segment has a characteristic slight binary flexure; relatively large/coarse hairs are concentrated on the 3rd segment of the palps in the exterior corner of the apical part of the segment. The frons is long, very narrow in the front, does not have coarse hairs, not counting two which are located on the level of the rear margin of the eyes.

SUBGENUS *Barraudius* GENUS *Culex*. Tiny mosquitoes with short palps; P/A as a rule does not exceed 0.6; the same low index is characteristic for *C. (Neoculex) martinii* Med. Scales on the frons are lacking or are present only at the rear margin. On the lower side of the head, the eyes are separated by a distance of 2.5-4 facets (Fig. 2).

SUBGENUS *Neoculex* GENUS *Culex*. This genus distinguishes itself from other specimens by a wider frons (up to 1.5-2 facets), covered only by scales or scales and hairs. On the lower side of the head, the distance between the eyes is 1.5-2 facets.

SUBGENUS *Culex*. This genus is characterized by a very narrow frons, covered with scales which are absent on the anterior third. On the lower side of the head the eyes are separated by a narrow space, not exceeding the diameter of the facet in most types.

SUBGENUS *Aedes* (one species - *A. cinereus*). Along the rear surface of the eyes, a row of large hairs is located; behind them there are in all only a few small ones; the larger part of the occiput is free of hairs. The frons is of medium width (1.5-2.5 facets), with a longitudinal suture. On the lower side of the head, the eyes are widely separated (6-7 facets). The hairs at the base of the segments of the antenna are long.

SUBGENUS *Finlaya* GENUS *Aedes*. The greater length of the antennal hairs is characteristic. Many of the scales covering the palps stick out at approximately 45° from the surface (semi-adherent); therefore, upon slight increase (of the hairs), the palps appear thick and "shaggy". The 4th segment of the palps is relatively thin. The distance between the eyes on the lower side of the head is usually greater than the width of the frons; more infrequently it is of equal width.

SUBGENUS *Culicella* GENUS *Culiseta*. Features resembling the genus *Culex* include a very narrow frons and a narrow space between the eyes on the lower side of the head. In differentiation from *Culex*, however, the oral cavity is unarmed, scales are absent from the frons or else exist (individually) only at its rear margin, and the palps are of 5 segments.

SUBGENUS *Culiseta*. This subgenus is distinguished from the preceding one by a somewhat wider frons with scales and a larger space between the eyes on the lower side of the head - 2.5-5.0 facets. The segments of the antennae are shorter; A/P = 0.11-0.13 (in types of the subgenus *Culicella* it is 0.16-0.17). Microtrichia are as a rule developed not only on the 3rd but also on the 4th segment of the antennae. The palps are of 5 segments. If microtrichia are lacking on the 4th segment of the antennae (often in *Culiseta bergrothi*, now and then in *C. annulata*), this subgenus is distinguished from *Ochlerotatus* by the narrower frons, which is usually less in diameter than the facet.

SUBGENUS *Ochlerotatus* GENUS *Aedes*. The majority of types of this subgenus are characterized by a combination of the following: palps of 5 segments, frons of medium width or wide (usually wider than the facet), with scales and several coarse hairs, and also with a longitudinal suture; microtrichia only on the 3rd segment of the antennae. There are, however, exceptions: the 5th segment of the palps may be poorly developed, now and then it is lacking altogether; the longitudinal suture on the frons is in some types thin and broken. On the 4th segment of the antennae there may be individual microtrichia, particularly in *A. caspius*.

According to head structure, *A. (Aedimorphus) vexans* strongly resembles mosquitoes of the subgenus *Ochlerotatus*. *A. (Aedimorphus) vexans* is characterized by a relatively poor development of microtrichia on the 3rd segment of the antennae: in the apical quarter of the segment they are individual or lacking altogether; the longitudinal suture on the frons is sometimes broken or lacking altogether.

The results of our research showed that every genus and subgenus of Culicidae in the Soviet Union is characterized by definite peculiarities in the structure of the head and its appendages. By microscopic preparations of the head, the belonging of females to this or that genus and subgenus can be determined with almost the same certainty as with preparations of the genitalia of males.

The description of type peculiarities in structure of the heads of females, ascertained by microscopic preparations, will form the contents of subsequent research.

#### LITERATURE

- Gutsevich, A. V. 1972. The determination of mosquito females by microscopic preparations of the head. I. Systematic indications and description of genera. *Parazitologiya* 6(4): 320-325.

Table  
Basic Quantitative Indices

Genus and Subgenus	P/P	P/A	A/P	Quantity	
				Species	Specimens
<i>Anopheles (Anopheles)</i>	0.89-1.03	1.65-2.57	0.07-0.1	5	25
<i>Anopheles (Cellia)</i>	0.93-0.99	2.22-3.69	0.07-0.1	2	10
<i>Toxorhynchites</i>	0.23	1.64	0.08	1	1
<i>Uranotaenia</i>	0.12-0.15	0.53-0.71	0.14-0.17	1	5
<i>Orthopodomyia</i>	0.41-0.45	1.28-1.59	0.17-0.18	1	3
<i>Mansonia</i>	0.23-0.27	0.94-1.04	0.12-0.14	1	8
<i>Culex (Lutzia)</i>	0.26-0.28	1.06-1.21	0.14-0.15	2	4
<i>Culex (Barraudius)</i>	0.17-0.23	0.53-0.62	0.14-0.17	2	15
<i>Culex (Neoculex)</i>	0.18-0.23	0.49-0.86	0.14-0.17	3	15
<i>Culex (Culex)</i>	0.16-0.24	0.54-0.95	0.11-0.19	8	48
<i>Culiseta (Allotheobaldia)</i>	0.27-0.32	1.28-1.51	0.11-0.12	1	7
<i>Culiseta (Culiseta)</i>	0.18-0.23	0.69-1.12	0.11-0.13	3	20
<i>Culiseta (Culicella)</i>	0.22-0.26	0.81-0.93	0.16-0.17	3	8
<i>Aedes (Aedes)</i>	0.16-0.21	0.48-0.65	0.14-0.17	1	12
<i>Aedes (Stegomyia)</i>	0.2 -0.23	0.72-1.11	0.11-0.13	2	15
<i>Aedes (Finlaya)</i>	0.18-0.27	0.86-1.28	0.08-0.13	5	22
<i>Aedes (Ochlerotatus)</i>	0.15-0.32	0.65-1.32	0.07-0.13	32	200
<i>Aedes (Aedimorphus)</i>	0.18-0.24	0.69-0.9	0.11-0.13	1	10
<i>Aedes (Neomelanicolion)</i>	0.22	0.84-0.9	0.13	1	2
Total quantity				75	430

Fig. 1

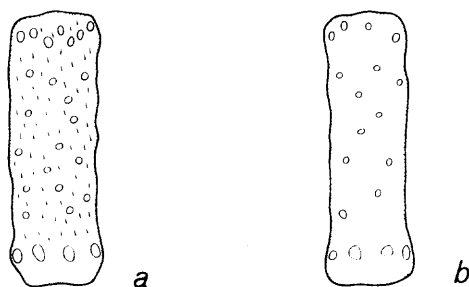


Fig. 1. The 4th segment of the antenna (hairs are not depicted, only the points of their attachment are indicated).  
 a. *Culiseta (Culiseta) alaskaensis* Ludl. (microtrichia are present).  
 b. *Aedes (Ochlerotatus) communis* Deg. (there are no microtrichia).

Fig. 2

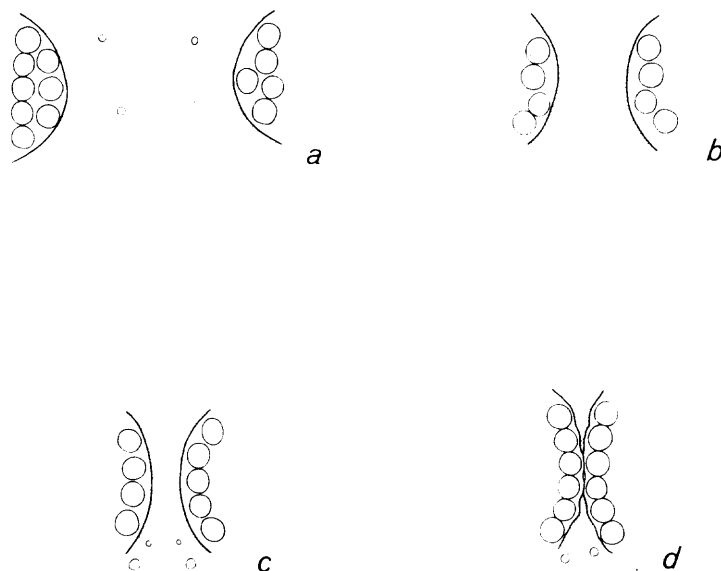


Fig. 2. The distance between the eyes on the lower (ventral) side of the head.  
 a. *Aedes (Ochlerotatus) intrudens* Dyar (eyes widely separated).  
 b. *Culex (Barraudius) modestus* Fic. (space between eyes is of medium width).  
 c. *Culex (Neoculex) hortensis* Fic. (space between eyes is narrow).  
 d. *Culex (Culex) vagans* Wied. (eyes almost adjoin for a significant distance).