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IDENTIFICATION KEY TO FINNISH MOSQUITO LARVAE (DIPTERA, CULICIDAE)

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IDENTIFICATION KEY TO FINNISH MOSQUITO LARVAE (DIPTERA, CULICIDAE)

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The IV instar larvae of Finnish mosquitoes are classified according to genera and species; most of them are illustrated from Finnish specimens. Altogether 36 species are included, of which *Aedes punctodes* Dyar and *Culiseta silvestris ochroptera* (Peus) are reported as new to Finland.

Index words: *Culicidae*, mosquito larvae, key.

Introduction

Apart from the nuisance they cause, mosquitoes have been found to be vectors of arboviruses widespread among man, cattle and wildlife in Finland (see BRUMMER-KORVENKONTIO and SAIKKU 1975). However, knowledge about Finnish mosquitoes is still far from adequate, and much more information is needed to obtain a clear picture of the ecology and distribution of these insects. The larval stage is very suitable for the study of mosquito distribution, since most of the larvae are readily identified (unlike females), and large samples are easily obtained (unlike males).

In the present paper the IV instar larvae of Finnish mosquitoes are classified according to genera and species. A few species have been found only in adult stage in Finland; these are included in the key on the bases of foreign descriptions, mainly those of NATVIG

(1948), MOHRIG (1969) and GUTSEVICH et al. (1974). The nomenclature follows the catalogues composed by STONE et al. (1959) and STONE (1967). Only synonyms which appear as valid names in the reference papers are given.

As far as it is known, regional distribution in Finland of each species is given according to the available literature (FREY 1921, NATVIG 1948, TIENSUU 1951, 1952, HIRVENOJA 1961, 1962, 1967, KOSTAMA 1964, BRUMMER-KORVENKONTIO et al. 1971, ULMANEN and BRUMMER-KORVENKONTIO 1971, UTRIO 1975), and on the bases of collections in the Department of Virology and Zoological Museum, University of Helsinki. In this connection, the following arbitrary designations are used: South Finland 60°–62° N, Central Finland 62°–64° N, North Finland 64°–66° N, South Lapland 66°–68° N, and North Lapland 68°–70° N. A more detailed account

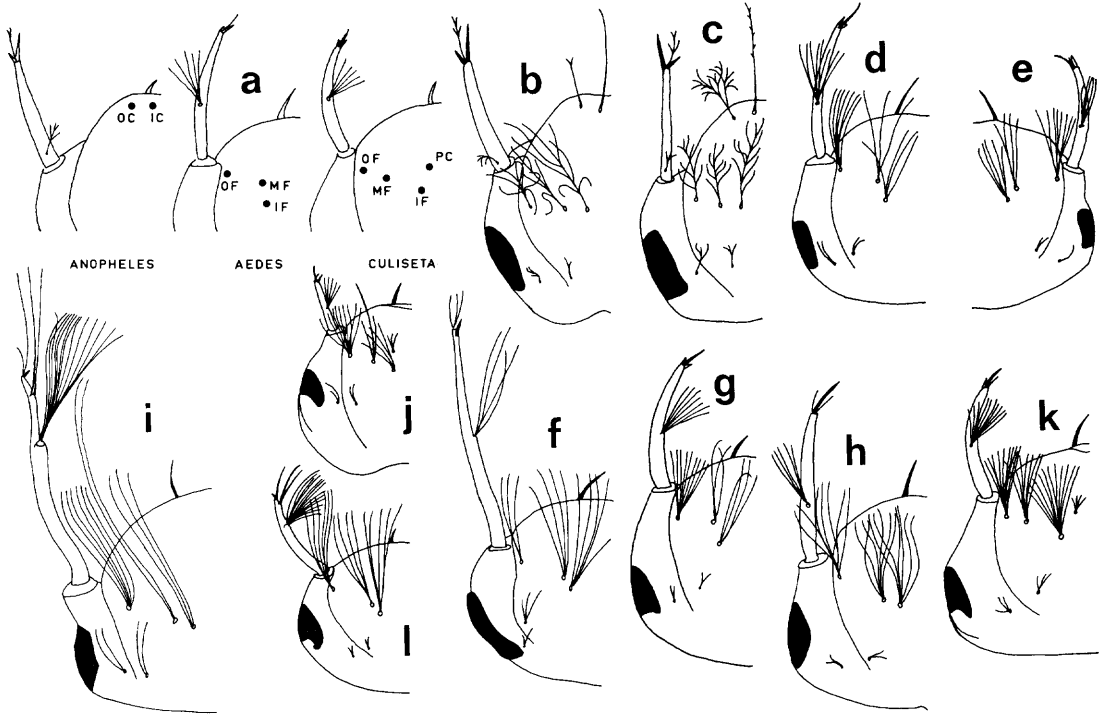


Fig. 1. Heads of mosquito larvae, dorsal view. — a, Situations of the main hair groups: OC, outer clypeal; IC, inner clypeal; PC, postclypeal; OF, outer frontal; MF, midfrontal; IF, inner frontal — b, *Anopheles claviger*. — c, *A. maculipennis*-group. — d, *Aedes pionips*. — e, *A. pullatus*. — f, *A. diantaeus*. — g, *A. vexans*. — h, *A. cinereus*. — i, *Culiseta morsitans*. — j, *C. annulata*. — k, *C. bergrothi*. — l, *Culex pipiens*.

on the distribution of Finnish mosquitoes will be published in the future.

The terminology concerning diagnostic morphological characteristics applied in the key is given in Fig. 1—2. The size and color of mosquito larvae are very variable within one species; hence these characteristics are omitted in the key.

Key to the genera

- 1 (2) Siphon absent (Fig. 2n) 1. *Anopheles*
- 2 (1) Siphon present (Fig. 2a—m, 3a—l)
- 3 (4) Siphon asymmetric in lateral view (Fig. 2b) 2. *Mansonia*
- 4 (3) Siphon cylindrical (Fig. 2a, c—m, 3a—l)
- 5 (8) Siphon with one pair of siphonal tufts (Fig. 2c—l, 3a—l)
- 6 (7) Siphonal tufts situated in the mid region of the siphon (Fig. 2c—l, 3a—i) 3. *Aedes*

- 7 (6) Siphonal tufts situated at base of the siphon (Fig. 3j—l) 4. *Culiseta*
- 8 (5) Siphon with several pairs of siphonal tufts (Fig. 2m) 5. *Culex*

Key to the species

1. *Anopheles*

- 1 (2) Outer and inner clypeal hairs simple or with 2—4 branches in their apical portions (Fig. 1b) *A. claviger*
- 2 (1) Outer clypeal hairs richly branched near the base, bush-shaped; inner clypeal hairs richly branched in their apical portions or with short branches along the stems (Fig. 1c). *A. maculipennis* — group

2. *Mansonia*

Only one species in Finland, *M. richiardii* (Fig. 2b).

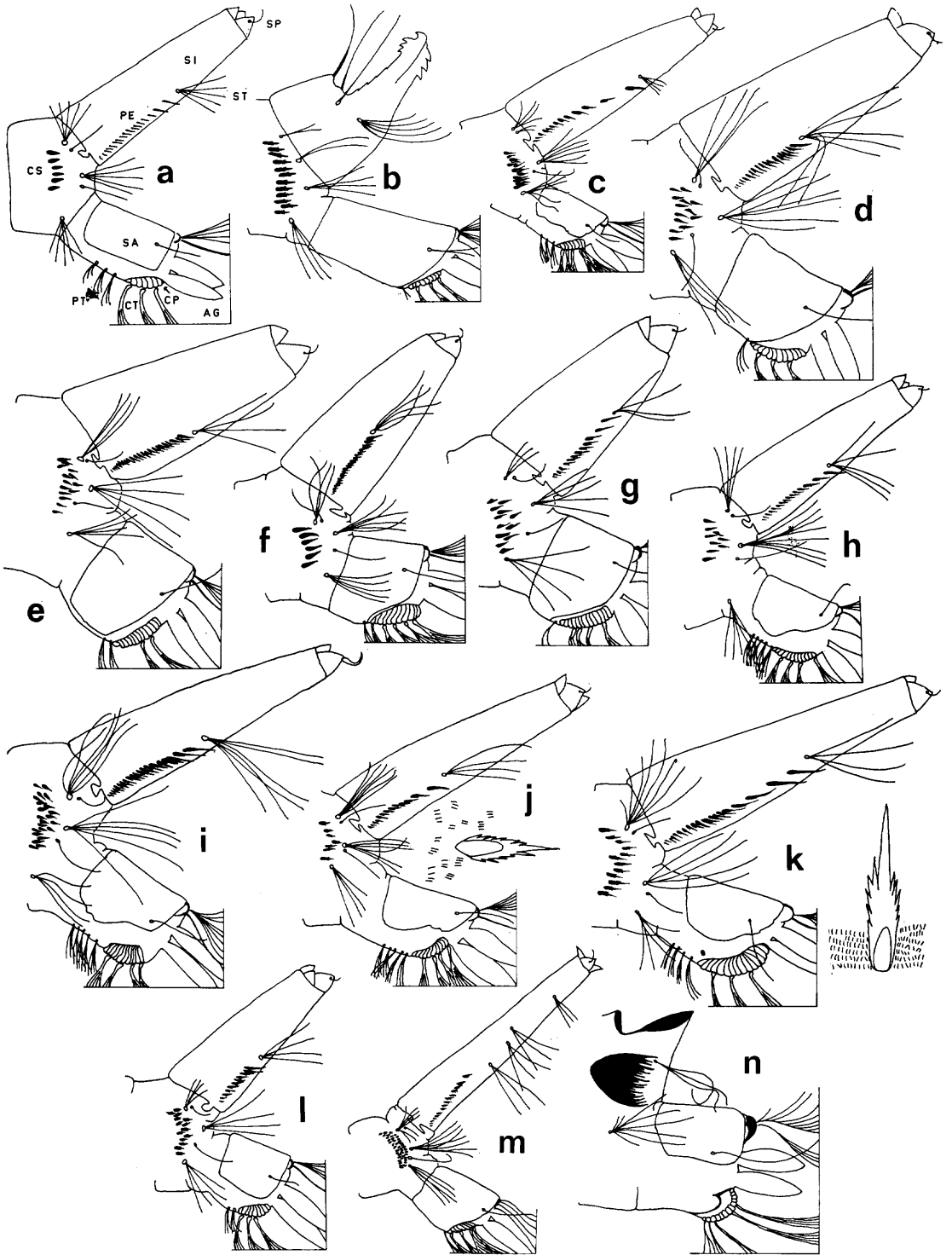


Fig. 2. Terminal segments of mosquito larvae, lateral view. — a, *Aedes*, schematic: AG, anal gills; CS, comb scales; CT, cratal tufts; CP, cratal plate; PE, pecten; PT, precratal tufts; SA, saddle; SI, siphon; SP, siphonac tuft. — b, *Mansonia richiardii*. — c, *Aedes cinereus*. — d, *A. punctor*. — e, *A. punctodes*. — f, *A. hexodontus*. — g, *A. nigripes*. — h, *A. dianiaeus*. — i, *A. excrucians*. — j, *A. riparius*, with a comb scale and surface spines. — k, *A. cyprius*, with a comb scale and surface spines. — l, *A. impiger*. — m, *Culex pipiens*. — n, *Anopheles claviger*.

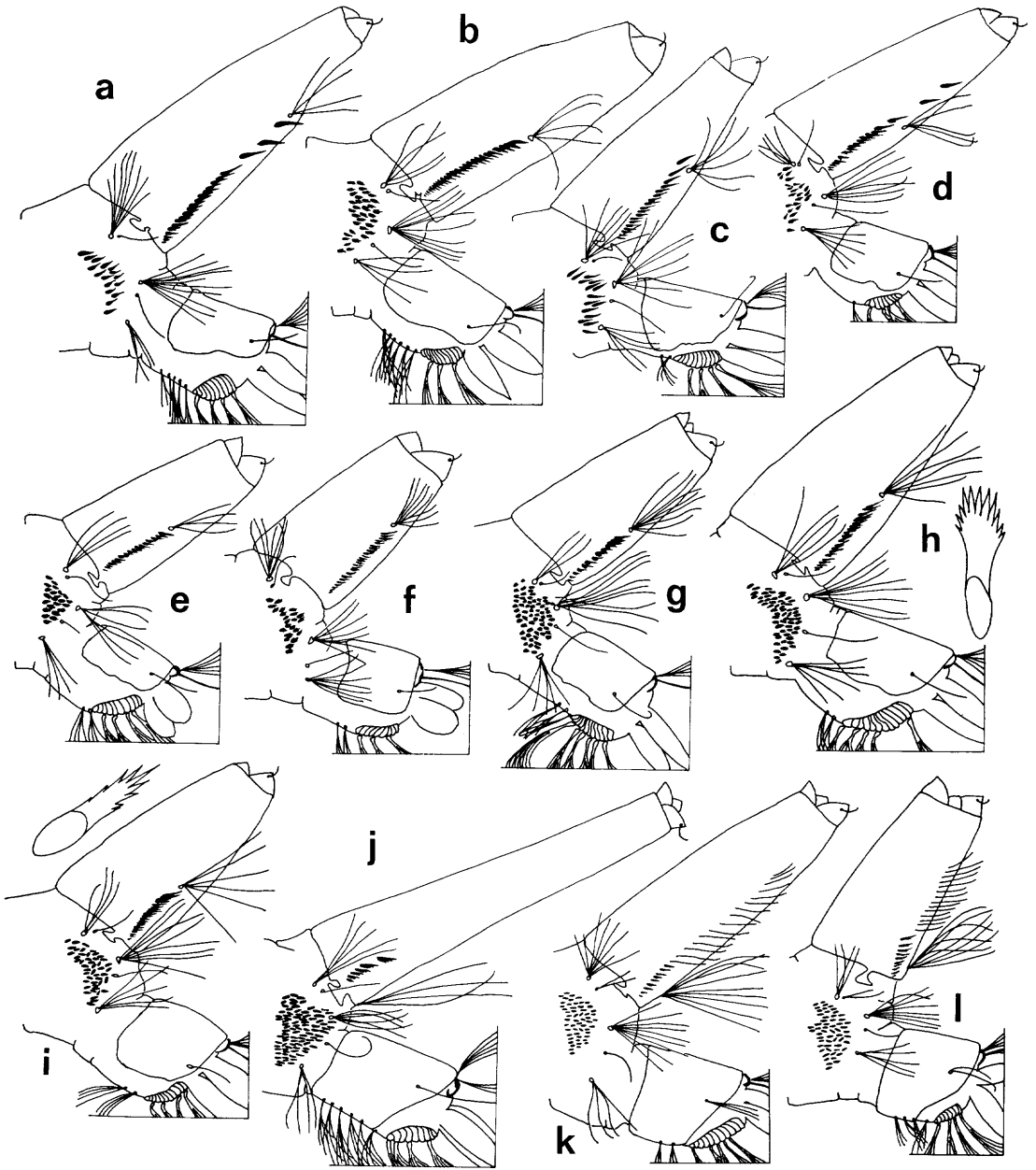


Fig. 3. Terminal segments of mosquito larvae, lateral view. — a, *Aedes beklemishevi*. — b, *A. cantans*. — c, *A. intrudens*. — d, *A. cataphylla*. — e, *A. dorsalis*. — f, *A. caspius*. — g, *A. communis*. — h, *A. pionips*, with a comb scale. — i, *A. pullatus*, with a comb scale. — j, *Culiseta morsitans*. — k, *C. annulata*. — l, *C. alaskaensis*.

3. *Aedes*

- | | |
|--|---|
| <p>1 (2) Antennae distinctly longer than the head, with 3 apical spines of about equal length (Fig. 1f) <i>A. diantaeus</i></p> <p>2 (1) Antennae shorter than the head, with one apical spine longer than the others (Fig. 1d—e, g—h)</p> | <p>3 (6) Siphonal tuft small, shorter than the width of the siphon in the insertion region (Fig. 2c)</p> <p>4 (5) Outer, mid and inner frontal hairs situated in a line, forming a curved row across the head (Fig. 1h). Pecten teeth with 1—2 basal denticles <i>A. cinereus</i></p> |
|--|---|

- 5 (4) Inner frontal hairs situated obliquely behind the midfrontal hairs (Fig. 1g). Pecten teeth with 3–5 basal denticles *A. vexans*
- 6 (3) Siphonal tuft large, about as long or longer than the width of the siphon in the insertion region (Fig. 2d–l, 3a–i)
- 7 (14) Saddle ring-shaped, surrounding the anal segment completely or leaving only a narrow slit uncovered in the ventral midline (Fig. 2d–g)
- 8 (9) 1–3 distal pecten teeth more widely spaced than the others (Fig. 2g) *A. nigripes*
- 9 (8) Pecten teeth evenly spaced, close together (Fig. 2d–f)
- 10 (11) Number of comb scales 6–9, scales larger (Fig. 2f) *A. hexodontus*
- 11 (10) Number of comb scales 10–30, scales smaller (Fig. 2d–e)
- 12 (13) Saddle surrounding the anal segment completely, at least in its anterior part (Fig. 2d). Inner and midfrontal hairs with 1–3 branches *A. punctor*
- 13 (12) Saddle not surrounding the anal segment completely but leaving a narrow slit uncovered in the ventral midline (Fig. 2e). Inner and midfrontal hairs simple *A. punctodes*
- 14 (7) Saddle plate-shaped, leaving the ventral part of the anal segment uncovered (Fig. 2h–l, 3a–i)
- 15 (28) Number of precratal tufts 4–7 (Fig. 2h–k, 3a–b)
- 16 (17) Hairs in the ventral valves of the stigmal plate thick, hooks-haped (Fig. 2i) *A. excrucians*
- 17 (16) Hairs in the ventral valves of the stigmal plate thin, evenly curved (Fig. 2j–k, 3a–b)
- 18 (25) 1–5 distal pecten teeth more widely spaced than the others (Fig. 2j–k, 3a)
- 19 (20) Body surface in the comb area tightly covered with small spines arranged in long rows (Fig. 2k) *A. cyprius*
- 20 (19) Body surface in the comb area sparsely covered with small spines arranged in groups of 2–5 (Fig. 2j)
- 21 (22) Number of comb scales 6–9 (Fig. 2j) *A. riparius*
- 22 (21) Number of comb scales 14–40 (Fig. 3a)
- 23 (24) Siphonal tuft and the distal pecten tooth situated well above the middle of the siphon (Fig. 3a) *A. beklemishevi*
- 24 (23) Siphonal tuft and the distal pecten tooth situated in the middle of the siphon *A. flavescens*
- 25 (18) Pecten teeth evenly spaced, close together (Fig. 3b)
- 26 (27) Inner and midfrontal hairs with 2–4 branches *A. cantans*
- 27 (26) Inner and midfrontal hairs simple *A. nigrinus*
- 28 (15) Number of precratal tufts 1–3 (Fig. 2l, 3c–i)
- 29 (32) 1–4 distal pecten teeth more widely spaced than the others (Fig. 3c–d)
- 30 (31) Inner and midfrontal hairs simple. 2–4 distal pecten teeth situated above the siphonal tuft (Fig. 3d) *A. cataphylla*
- 31 (30) Inner and midfrontal hairs with 3–5 branches. 1 or none of the distal pecten teeth situated above the siphonal tuft (Fig. 3c) *A. intrudens*
- 32 (29) Pecten teeth evenly spaced, close together (Fig. 2l, 3e–i)
- 33 (38) Anal gills shorter than the saddle (Fig. 3e–f)
- 34 (35) Spines in the ventral side of the antenna arranged in rows. Pecten teeth with one big basal denticle. The common shaft of each cratal tuft longer than the ridges in the middle of the cratal plate *A. leucomelas*
- 35 (34) Spines in the ventral side of the antenna not arranged in rows. Pecten teeth with 2–4 small basal denticles. The common shaft of each cratal tuft about as long as the ridges in the middle of the cratal plate
- 36 (37) Siphonal tuft with 3–5 branches, situated in the middle of the siphon (Fig. 3e) *A. dorsalis*
- 37 (36) Siphonal tuft with 5–10 branches, situated above the middle of the siphon (Fig. 3f) *A. caspius*
- 38 (33) Anal gills longer than the saddle (Fig. 2l, 3g–i)
- 39 (42) Inner and midfrontal hairs simple (rarely 1 or 2 is bifurcated)
- 40 (41) Number of comb scales 7–16, scales pointed (Fig. 2l) *A. impiger*
- 41 (40) Number of comb scales 40–80, scales blunt-ended (Fig. 3g) *A. communis*
- 42 (39) Inner and midfrontal hairs with 3–5 branches (Fig. 1d–e)
- 43 (44) Antennae about 2/3 as long as the head (Fig. 2d). Comb scales blunt-ended, with margin of several spines of equal length (Fig. 3h) *A. pionips*
- 44 (43) Antennae about half as long as the head (Fig. 1e). Comb scales elongated, many of them bearing a midspine distinctly longer than other spines (Fig. 3i) *A. pullatus*

4. *Culiseta*

- 1 (4) Siphon long, about 5 times as long as width at base (Fig. 3j). Antennae distinctly longer than the head (Fig. 1i)
- 2 (3) Inner frontal hairs with 2–3 branches (Fig. 1i). Comb scales without dark longitudinal midridge *C. morsitans*

- 3 (2) Inner frontal hairs with 5–9 branches. Comb scales in the posterior margin of the comb with dark longitudinal midridges
 *C. silvestris ochroptera*
- 4 (1) Siphon shorter, about 2.5–3.5 times as long as width at base (Fig. 3k–l). Antennae shorter than the head (Fig. 1j–k)
- 5 (6) Antennae more than half as long as the head. Midfrontal hairs with 5–9, inner frontal hairs with 9–13 branches (Fig. 1k)
 *C. bergrothi*
- 6 (5) Antennae shorter than half of the length of the head. Midfrontal hairs with 2–3, inner frontal hairs with 4–8 branches (Fig. 1j)
- 7 (8) Number of precratal tufts 4. Siphon about 2.5 times as long as width at base (Fig. 3l)
 *C. alaskaensis*
- 8 (7) Number of precratal tufts 2–3. Siphon about 3.5 times as long as width at base (Fig. 3k)
- 9 (10) Distance between the postclypeal hairs as long as the distance between the inner frontal hairs (Fig. 1j) *C. annulata*
- 10 (9) Distance between the postclypeal hairs shorter than the distance between the inner frontal hairs *C. subochrea*

5. *Culex*

- 1 (2) Siphon slightly expanded at apex. Inner and midfrontal hairs with 1–2 branches
 *C. territans*
- 2 (1) Siphon tapering towards the apex (Fig. 2m). Midfrontal hairs with 2–7, inner frontal hairs with 4–8 branches (Fig. 1l)
- 3 (4) Siphon about 6 times as long as width at base. The distal siphonal tuft situated more laterally than the others *C. torrentium*
- 4 (3) Siphon about 5–5.5 times as long as width at base. Siphonal tuft next to the distal one situated more laterally than the others (Fig. 3m) *C. pipiens*

Short comments on the biology and distribution of Finnish species

1. *Anopheles* Meigen

Larvae of *Anopheles* occur in varying kinds of permanent or semipermanent bodies of water. The eggs of the *A. maculipennis*-group are deposited by hibernating females. *A. claviger* hibernates as larva.

A. claviger (Meigen)

Found in one locality in South Finland. Palaearctic.

A. maculipennis-group

The group includes several species and subspecies which cannot be identified at larval stage. Mosquitoes belonging to this group occur in whole country. So far, the presence of two species, *A. messeae messeae* Falleroni and *A. maculipennis* Meigen s. str. has been verified in Finland; both are palaearctic.

2. *Mansonia* Blanchard

Larvae of *Mansonia* live as submerged in permanent bodies of water. They obtain their respiratory air from roots and stems of aquatic vegetation. Hibernation occurs as larva.

M. richiardii (Ficalbi)

Found a few times in South Finland. Palaearctic.

3. *Aedes* Meigen

Larvae of *Aedes* usually occur in small bodies of water, especially in temporary or semitemporary pools receiving water from melting snow. The hibernated eggs hatch in spring, and most species attain instar IV in late spring or early summer. Many species have another, though less prominent period of emergence in late summer or autumn.

A. beklemishevi Denisova

Synonyms: *A. grandilarva* Sazonova, *A. barri* Krueger. Found in one locality in North Lapland. Holarctic.

A. cantans (Meigen)

Synonym: *A. maculatus* (Meigen). Common in South Finland, rare in Central and North Finland. Palaearctic. See also under *A. flavescens*.

- A. caspius* (Pallas)
In South Finland, fairly common. Palaearctic.
- A. cataphylla* Dyar
In South Finland, uncommon. Holarctic.
- A. cinereus* Meigen
In whole country and fairly common. Holarctic.
- A. communis* (DeGeer)
In whole country and very common. Holarctic.
- A. cyprius* Ludlow
Synonym: *A. freyi* Edwards. A rare species in South Finland, found once in Central Finland. Palaearctic.
- A. diantaeus* Howard, Dyar & Knab
In whole country, uncommon in south, fairly common in north. Holarctic.
- A. dorsalis* (Meigen)
Uncommon in South Finland, also recorded once in Central Finland. Holarctic.
- A. excrucians* (Walker)
In whole country and fairly common. Holarctic.
- A. flavescens* (Müller)
Synonym: *A. lutescens* (Fabricius). Larva not found in Finland, but adults recorded a few times in South Finland. Holarctic. According to MOHRIG (1969), the pecten teeth of *A. flavescens* may sometimes be evenly spaced so that it keys out as *A. cantans*. However, the number of comb scales is usually less than 30 in *A. flavescens*, and more than 30 in *A. cantans*.
- A. hexodontus* Dyar
Common in North Lapland, fairly common in South Lapland and North Finland, very rare in Central Finland and found once in South Finland. Holarctic.
- A. impiger* (Walker)
Synonyms: *A. nearcticus* Dyar, *A. parvulus* Edwards. Found in a few localities in North Finland, South Lapland and North Lapland; in addition, there is an isolated record from South Finland. Holarctic.
- A. intrudens* Dyar
In whole country, fairly common. Holarctic.
- A. leucomelas* (Meigen)
Larva not found in Finland, but one adult recorded in South Finland. Palaearctic.
- A. nigrinus* (Eckstein)
Larva not found in Finland, but two adults recorded in North Lapland. Palaearctic.
- A. nigripes* (Zetterstedt)
Synonym: *A. alpinus* (Linnaeus). Found in one locality in North Lapland. Holarctic.
- A. pionips* Dyar
Fairly common in Lapland and North Finland, very rare in Central Finland. Holarctic.
- A. pullatus* (Coquillett)
Found in a few localities in North Lapland; in addition, there is an isolated record from Central Finland. Holarctic.
- A. punctodes* Dyar
Found in North Finland and South Lapland; reported here as new to the country. Record data: Kn, Kuhmo, Porkkajärvi, 708:60, 12. VI. 1974, 1 larva (author leg.), and KemL, Pelkosenniemi, Komovaara, 746:51, 15. VI. 1974, 1 larva (author leg.). Holarctic. Very similar to *A. punctor*, for further details see KNIGHT (1951) and DAHL (1974).
- A. punctor* (Kirby)
In whole country and very common. Holarctic.
- A. riparius* Dyar & Knab
A rare species, but recorded from South Finland to North Lapland. Holarctic.

A. vexans (Meigen)

Found a few times in South Finland. Cosmopolitan.

4. *Culiseta* Felt

Larvae of most species of *Culiseta* occur in permanent pools and ponds which do not dry up in the summer, and most of the Finnish species hibernate as adults. *C. morsitans* hibernates as larva and occurs together with larvae of *Aedes* in spring pools.

C. alaskaensis (Ludlow)

In whole country, but rarely found as larva. Holarctic.

C. annulata (Schrank)

Recorded in two localities in South Finland. Palaearctic.

C. bergrothi (Edwards)

In whole country, but rarely found as larva. Palaearctic.

C. morsitans (Theobald)

Common in South Finland, rare in Central Finland. Holarctic.

C. silvestris ochroptera (Peus)

Larva not found in this country, but one adult recorded in South Finland, reported here as new to the country. Record data: U, Tammissaari r. c., Tvärminne Zool. St., 664:28, 22—23. IV. 1975, 1 female (M. Brummer-Korvenkontio leg.). Palaearctic. Very similar to *C. morsitans*, for further details see PEUS (1935).

C. subochrea (Edwards)

Larva not found in Finland, but adults recorded in two localities in South Finland. Palaearctic.

5. *Culex* Linnaeus

Larvae of *Culex* occur in many kind of pools; they are often found in artificial reservoirs. Hibernation occurs at adult stage, and there are two, maybe three generations per year.

C. pipiens Linnaeus

C. pipiens pipiens Linnaeus is common in South and Central Finland. Holarctic. *C. pipiens molestus* Forskål is an antropophilous variety of polyphyletic origin (see e.g. BARR 1967), which breeds especially in urban surroundings; it has been recorded in the larger cities of South Finland. See also under *C. torrentium*.

C. territans Walker

Synonym: *C. apicalis* Adams. Larva not found in Finland, but adult recorded once in South Finland. Holarctic.

C. torrentium Martini

In South and Central Finland. Palaearctic. The key characteristics differentiating the larvae of *C. torrentium* from *C. pipiens* overlap somewhat; hence single specimens cannot be identified with certainty.

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SELOSTUS

Suomen hyttystoukkien (Diptera, Culicidae) tutkimuskaava

PIRKKA UTRIO

Helsingin yliopisto

Suomen hyttysten IV-asteen toukille esitetään sekä suvut että lajit käsittävä tutkimuskaava. Useimmat lajit on kuvattu piirroskuvina kotimaisten yksilöiden

perusteella. Tutkimuskaava sisältää 36 lajia, joista *Aedes punctodes* Dyar ja *Culiseta silvestris ochroptera* (Peus) ilmoitetaan ensi kerran Suomessa tavatuiksi.