ILLUSTRATED TAXONOMIC KEYS TO GENERA
AND SPECIES OF FEMALE
MOSQUITOES OF KOREA

PART I

BY

KWAN WOO LEE AND PETER J. EGAN

JUNE 1985
# Illustrated Taxonomic Keys to Genera and Species of Female Mosquitoes of Korea. Part 1

**Performing Organization Name(s) and Address(es):**
Department of the Army, 5th Preventive Medicine Unit, 18th Medical Command, APO, AP, 96301

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PREFACE

Lee and Lien's (1970) "Pictorial Keys to the Mosquitoes of Korea" has been utilized for 15 years as the most comprehensive taxonomic manual for identification of the non-Anopheline mosquitoes of Korea. During this period many species have been recorded as new to Korea. However, much of this new taxonomic information has been distributed in a number of scientific publications. This work attempts to combine this information into a single document, as well as synthesize revised taxonomic synonyms of species occurring in Korea. Based on the available publications, the total number of mosquitoes recorded in Korea is now 51 species representing 9 genera. At present, the 5th Preventive Medicine Unit, U.S. Army is continuing its mosquito surveillance program on the taxonomy, biology and distribution of the mosquito fauna.

The preparation of these new illustrated keys is part of this ongoing study. An attempt has been made to produce a key as simple and accurate as possible. The illustrations, to include key characteristics, were selected from a composite of several specimens representing all species listed.

As collections of specimens continue, there is a possibility that additional species will be found in Korea. We hope this publication will provide useful information for all army and civilian entomologist, including pest control operators.

The authors wish to express their sincere thanks to Colonel Francis L. O'Donnell, Commander, and Major James W. Carroll, Executive Officer, 5th Preventive Medicine Unit (PMU), U.S. Army, for their support and editorial review of the manuscript, and also to Major Robert L. Frommer, U.S. Army E.H.E. Agency Pacific, for his advice and review.
FIGURE 1. MORPHOLOGY OF ADULT MOSQUITO (FEMALE)

A. FEMALE - LATERAL ASPECT

HEAD
1. eye (compound eye)
2. vertex
3. tempus
4. clypeus
5. pedicel ] - antenna
6. flagellum ] - antenna
7. palpifer
8. palpus
9. labium ] - proboscis
10. labellum ] - proboscis

THORAX
11. anterior pronotal lobe
12. posterior pronotal lobe
13. scutum
14. scutal suture
15. scutellum
16. postnotum
17. paratergite
18. propleuron
19. spiracular area
20. mesothoracic spiracle
21. postspiracular area
22. subspiracular area
23. prealar knob
24. sternopleuron
25. mesepimeron
26. mesomerion
27. metathoracic spiracle
28. metepisternum ] - metapleuron
29. metepimeron ] - metapleuron
30. metameron

WING
31. wing (left)
32. halter

LEG
33. hindcoxa
34. hindtrochanter
35. hindfemur
36. hindtibia
37. hindtarsus
38. claw

ABDOMEN
39. tergum
40. laterotergite
41. sternum

GENITALIA
42. cercus
43. postgenital plate

B. FEMALE HEAD - DORSAL ASPECT

1. eye (compound eye)
2. vertex
3. interocular space
4. tempus
5. nape
6. vertical bristles
7. temporal bristles
8. clypeus
9. scape
10. pedicel ] - antenna
11. flagellomere 1
12. palpifer
13. palpus
14. proboscis (labium)

C. THORAX - DORSAL ASPECT

1. anterior promontory
2. scutal angle
3. scutal suture
4. fossal area
5. prescutellar space
6. acrostichal bristles
7. anterior dorsocentral bristles
8. posterior dorsocentral bristles
9. humeral bristles
10. angular bristles
11. posterior fossal bristles
12. supraalar bristles
13. prescutellar bristles
14. scutellum
15. anterior pronotal lobe

D. FORETARSOMERE 5 - MALE

1. ventrobasal swelling
2. midventral process
3. anterior claw
4. posterior claw
5. empodium

E. FORETARSOMERE 5 - FEMALE

1. claw
2. pulvillus
3. empodium
F. WING

A. apex of wing
a. alula
B. base of wing
C. costa
~cv. cross vein
F. fringe
h. humeral cross vein
r. remigium (or stem vein)
Sc. subcosta
S. squama

1, first longitudinal vein (Radius, R1)
2, Second longitudinal (Radius sector, Rs)
2.1, upper or anterior branch of 2nd longitudinal (R2)
2.2, lower or posterior branch of 2nd longitudinal (R3)
3, third longitudinal (R4+5)
4, fourth longitudinal (Media, M)
4.1, upper branch of 4th longitudinal (M1)
4.2, lower branch of 4th longitudinal (M2)
5, fifth longitudinal (Cubitus, Cu)
5.1, upper branch of 5th longitudinal (Cu1)
5.2, lower branch of 5th longitudinal (Cu2)
6, sixth longitudinal (Anal, An)
KEY TO THE GENERA OF CULICIDAE

1. Palpus about as long as proboscis (Fig. 2); abdominal tergites never entirely covered with scales but with sparse hairs (Fig. 3) .................. Anopheles

Palpus much shorter than proboscis (Fig. 4); abdominal tergites entirely covered with scales (Fig. 5) .................. 2

2. Proboscis rigid, apical 1/2 more slender and bent downwards, or hooked (Fig. 6); a V-shaped thickening in hindmargin of wing between branches of vein 5 (Fig. 7) ................. Toxorhynchites christophi

Proboscis more flexible, usually of uniform thickness, but sometimes swollen at tip, not hooked (Fig. 8); no V-shaped thickening in hind margin of wing between branches of vein 5 (Fig. 9) .................. 3
3. Pulvilli present (Fig. 10) ................. Culex

Pulvilli absent or rudimentary (Fig. 11) ................. 4
4. Postspiracular bristles absent (Fig. 12) ................. 5
   Postspiracular bristles present (Fig. 13) .................. 8

5. Fairly numerous hairs on underside of wing at base of subcosta (Fig. 14); femora unspotted (Fig. 15) ......... 6
   Base of subcosta without such hairs (Fig. 16); femora spotted or speckled (Fig. 17) ....................... 7
6. Tarsal segments dark throughout (Fig. 18). . . Culiseta kanayamensis
   Tarsal segments with faint-white bands at base
   and sometimes also at apex (Fig. 19) . . . . . . Culiseta nipponica

7. Femora spotted with white scales (Fig. 20);
   body almost dark on dorsal part . . . . . . . . . . . . Tripteroides bambusa
   Femora speckled with dark brown scales (Fig. 21);
   body entirely ochreous . . . . . . . . . . . . . . . . . . . . . . . . Mansonia ochracea
8. Anterior pronotal lobes of normal size and well separated; postnotum without hairs (Fig. 22) .................................. 9

Anterior pronotal lobes enlarged and close together; postnotum with a group of small hairs (Fig. 23) ... *Heizmannia lii*

![Figure 22](image1)
![Figure 23](image2)

9. Wing scales narrow and not asymmetrical (Fig. 24); scutum varied in markings (Fig. 25) ........................................ 10

Wing scales broad and mostly asymmetrical (Fig. 26); scutum with broad creamy to pale-greenish longitudinal sub-lateral stripes (Fig. 27) .................. *Mansonia uniformis*

![Figure 24](image3)
![Figure 25](image4)
10. Proboscis slender and straight (Fig. 28) . . . . . . . . . . Aedes

Proboscis rather stout, outer half tapered and turned downward (Fig. 29) . . . . . . . . . . Armigeres subalbatus
KEY TO THE SPECIES OF ANOPHELES

1. Palpus with white bands (Fig. 30) ........................................... 2
   Palpus without bands (Fig. 31) .............................................. 6

2. Apical fringe spot present (Fig. 32) ................................. 3
   Apical fringe spot absent (Fig. 33) ............................. Anopheles pullus

---

FIGURE 30

FIGURE 31

FIGURE 32

FIGURE 33
3. Two pale spots on costa; vein 6 with 1 median dark spot (Fig. 34) ........................................... 4

Three pale spots on costa; vein 6 with 2 median dark spots (Fig. 35) .......................... *Anopheles sineroides*

4. Pale basal band of palpal segment 3 at most as wide as other bands (Fig. 36) ....................... 5

Pale basal band of palpal segment 3 broader than other bands (Fig. 37) .................... *Anopheles yatsushiroensis*
5. Midcoxa with a distinct upper patch of pale scales (Fig. 38); pale fringe spot at termination of vein 5.2 present (Fig. 39) . . . . . . . Anopheles sinensis

Midcoxa without upper patch of pale scales (a few scales occasionally present, but not forming a definite patch) (Fig. 40); pale fringe spot at termination of vein 5.2 absent (Fig. 41) . . Anopheles lesteri
6. Hindfemur banded (Fig. 42); vein 6 with dark scales except tip (Fig. 43). . . . . *Anopheles lindesayii japonicus*

Hindfemur not banded (Fig. 44); vein 6 with basal, median and apical dark spots (Fig. 45). . . . *Anopheles koreicus*
KEY TO THE SPECIES OF CULEX

1. Lower mesepimeral bristles numerous (subgenus Lutzia) (Fig. 46) .................................................. 2

At most three lower mesepimeral bristles,
usually one or none (Fig. 47) ........................................ 3

2. Second to fourth abdominal tergites with narrow apical bands or dark, fifth to seventh broadly pale golden (Fig. 48) .................................................. Culex fuscanus

Abdominal tergal bands all about the same width (Fig. 49) .................................................. Culex halifaxii

15
3. Proboscis with a pale band in the middle (Fig. 50) ............ 4
   Proboscis without a pale band (Fig. 51) ..................... 12

   ![Figure 50](image)

   ![Figure 51](image)

4. Wing spotted with pale scales (Fig. 52) ....................... 5
   Wing not spotted (Fig. 53) ..................................... 7

   ![Figure 52](image)

   ![Figure 53](image)
5. Wing with a basal pale spot on costa and vein 1; first pale costal spot extending over vein 4; vein 5.2 broadly pale at tip (Fig. 54)........... Culex orientalis

Wing without a basal pale spot on costa and vein 1; first pale costal spot extending only onto subcosta; vein 5.2 entirely dark or narrowly pale at tip (Fig. 55)................................................. 6

6. Abdominal terga IV-VI frequently with a pair of distal spots; VII with pale apical band usually broad (Fig. 56)................................. Culex jacksoni

Abdominal terga without distal spots; VII with pale apical band narrow or reduced (Fig. 57)........ Culex mimeticus
7. Abdominal tergites with pale apical bands, or both apical and basal (Fig. 58) ................. 8

Abdominal tergites with basal pale bands, dark scaled apically (Fig. 59) ......................... 9

8. Wing veins distinctly speckled with pale brownish and dark scales (Fig. 60) Culex bitaeniorhynchus

Wing veins not speckled, scales all dark (Fig. 61). Culex sinensis
9. Anterior two-thirds of scutum almost entirely clothed with white scales (Fig. 62) ............... Culex whitmorei
Scutum uniformly brown with pattern of golden scales (Fig. 63) ........................................... 10

10. Anterior surface of midfemora speckled with pale scales (Fig. 64) .......................... Culex sitiens
Anterior surface of midfemora not speckled (Fig. 65) ............... 11
11. Upright forked scales on median area of vertex pale (Fig. 66) hind femur with dark stripe of scales on dorsal border (Fig. 67) . . . . . . . Culex pseudovishnui

Upright forked scales on median area of vertex dark (Fig. 68); hind femur without dark stripe of scales on dorsal border (Fig. 69) . . . . Culex tritaeniorhynchus

12. Tergal bands absent (Fig. 70) . . . . . . . . . . . . . . . . . . . . . . . . . . . . 13

Tergal bands present (Fig. 71) . . . . . . . . . . . . . . . . . . . . . . . . . . . . 14
13. Sternites entirely dark (Fig. 72); segment 1 of hindtarsi slightly longer than tibia or almost the same (Fig. 73)... Culex hayashii hayashii

Sternites pale ochreous scaled, makes pale ochreous lateral patches (Fig. 74); segment 1 of hindtarsi distinctly shorter than tibia (Fig. 75)... Culex inatomii

14. Tergal bands apical (Fig. 76)... Culex rubensis

Tergal bands basal (Fig. 77)... 15
15. Pleuron with prominent scale patches; thorax without dark patch (Fig. 78) ............... 16

Pleuron without prominent scale patches; thorax with dark patch from posterior pronotal lobe to halter (Fig. 79) ........................................ 18

16. Fore and midfemora and tibia palestriped on anterior or dorsal margin (Fig. 80) ........ Culex vagans
Fore and midfemora and tibia not striped on anterior or dorsal margin (Fig. 81) ............... 17
17. Basal tergal bands medially broaded, usually not connected with laterobasal patches on anterior segments, confluent with laterobasal patches on one or a few posterior segments (Fig. 82); palpus not pale-tipped dorsally (Fig. 83). 

*Culex pipiens quinquefasciatus*

Basal tergal bands even in width, connected with laterobasal patches (Fig. 84); palpus pale-tipped dorsally (Fig. 85). 

*Culex pipiens pallens*

![Figure 82](image)

![Figure 83](image)

![Figure 84](image)

![Figure 85](image)

18. Vertex with a large triangular median patch of pale narrow curved scales (Fig. 86). 

*Culex kyotoensis*

Vertex with pale bronze-yellowish narrow curved scales at middle and with numerous dark brown erect forked scales (Fig. 87). 

*Culex sasai*

![Figure 86](image)

![Figure 87](image)
KEY TO THE SPECIES OF Aedes

1. Tarsi not banded (Fig. 88) ........................................ 2
   Tarsi banded (Fig. 89) ........................................... 6

2. Scutum with white or yellow shoulder patches
   (Fig. 90) .......................................................... 3
   Scutum without definite markings (Fig. 91) .................... 4

Figure 88

Figure 89

Figure 90

Figure 91
3. Scutum with white shoulder patches; scutellum with broad dark scales (Fig. 92) ....... Aedes nipponicus

Scutum with yellow shoulder patches; scutellum with curved white scales (Fig. 93) ....... Aedes lineatopennis

4. Scutellum with narrow curved scales (Fig. 94) ....... 5

Scutellum with broad white appressed scales (Fig. 95) ....... Aedes alboscutellatus
5. Anterior and posterior pronotal lobe with white broad appressed scales; subspiracular area with a patch of broad white scales (Fig. 96) ............... \textit{Aedes oreophilus}

Anterior and posterior pronotal lobe with narrow curved yellowish scales; subspiracular area without a patch of scales (Fig. 97) .............. \textit{Aedes esoensis}

6. Scutellum with broad appressed scales (Fig. 98) ............... 7
Scutellum with narrow curved scales (Fig. 99) ............... 10
7. First two segments of fore and midtarsi banded; tibia without a patch (Fig. 100) ........................................ 8

First three segments of fore and midtarsi banded; all tibiae with a narrow white patch at basal third (Fig. 101) ......................... Aedes chemulpoensis

8. Scutum with anterior median stripe and short paired posterior submedian stripes (Fig. 102) .......................... 9

Scutum with median stripe and long paired, anteriorly curved outer stripes (Fig. 103) ........ Aedes galloisi

Figure 100

Figure 101

Figure 102

Figure 103
9. Scales above wing base yellowish pale, narrow and curved (Fig. 104) . . . . . . . Aedes flavopictus flavopictus

Scales above wing base silvery white and more or less broad (Fig. 105) . . . . . . . . . . . . . Aedes albopictus

10. Eighth abdominal segment narrow and completely retractile (Fig. 106); wings speckled at least on terminal portion of subcosta and vein 1 or on basal portion of costa, vein 1, 5 and 6 (Fig. 107) . . . . . . . 11

Eighth abdominal segment not completely retractile (Fig. 108); wings not speckled (Fig. 109). . . . . . . . . . . . . . 12
11. Scutum with two pale submedian stripes forking posteriorly (Fig. 110); last segment of mid and hindtarsi entirely white (Fig. 111) ............... Aedes dorsalis

Scutum uniformly covered with yellowish to brown scales (Fig. 112); last segment of mid and hindtarsi dark apically (Fig. 113) ............ Aedes vexans nipponii
12. Hindtarsus with pale band at base of segments only (Fig. 114) .......................... 13

Hindtarsus with pale bands at both ends of some segments (Fig. 115) ...................... 14

13. First three tarsal segments of hindleg basally banded (Fig. 116); subspiracular area without scales (Fig. 117) ............ Aedes japonicus japonicus

First four tarsal segments of hindleg basally banded (Fig. 118); subspiracular area with a line of broad white scales (Fig. 119) ........ Aedes koreicus
14. Scutum mostly dark with the pale scales arranged in more or less definite lines (Fig. 120, 121) ... Aedes seoulensis

Scutum with a large area of white or whitish scales (Fig. 122) ...

15. Palpus entierly dark (Fig. 123) ... Aedes alektorovi

Palpus pale at tip (Fig. 124) ... 16
16. Last segment of hindtarsus entirely white; last two segments of foretarsus entirely dark (Fig. 125) ........................................... *Aedes hatorii*

Last segment of hindtarsus dark at apex; last two segments of foretarsus banded (Fig. 126) ........................................... *Aedes togoi*