A Mosquito Taxonomic Glossary
XVI. Vestiture*

Ralph E. Harbach and Kenneth L. Knight**
Department of Entomology
North Carolina State University
Raleigh, North Carolina 27650

This is the final part of the series entitled "A Mosquito Taxonomic Glossary." For a full explanation of this project see Part I (Knight 1970). Part XV dealt with the egg (Harbach and Knight 1978b).

Readers are reminded that this and all previous parts comprise a preliminary presentation. Now that all parts have been completed they will be thoroughly revised and issued in book form. Because of this, individuals interested in mosquito systematics and morphology are encouraged to comment on the included text of any part with which they take exception. If the reader is aware of an earlier use of a particular term, we would appreciate hearing about it.

This part has been prepared in a format similar to that to be used for the revised glossary. Terms recommended for standardized use are capitalized and listed alphabetically at the beginning of the paper. These terms are followed, where appropriate, by (1) a suggested abbreviation, (2) references to figures and (3) the citation of the author(s) who first adopted or defined the term for the Culicidae. The abbreviations and figure references are enclosed in parentheses; author citations are enclosed in angled brackets.

Synonyms and terms used in error are arranged alphabetically in a list beginning on page 560 (these will be included in the index of the revised glossary). Terms in languages other than English which were previously enclosed in parentheses following their English counterpart are listed herein without an English translation. As before, an appendix presenting supplementary information is included.

Presently, terms applicable to the vestiture of mosquitoes generally lack specificity and acceptability because a logical and hierarchical organization for them has not been conceptualized. This has been attempted here. Any use of this part of the mosquito anatomical glossary should begin with an examination of Chart 1. All terms shown there in capitals are major terms and begin in the glossary portion at the left-hand margin. Italicized words are modifiers of the capitalized terms and are indented below the terms which they modify.

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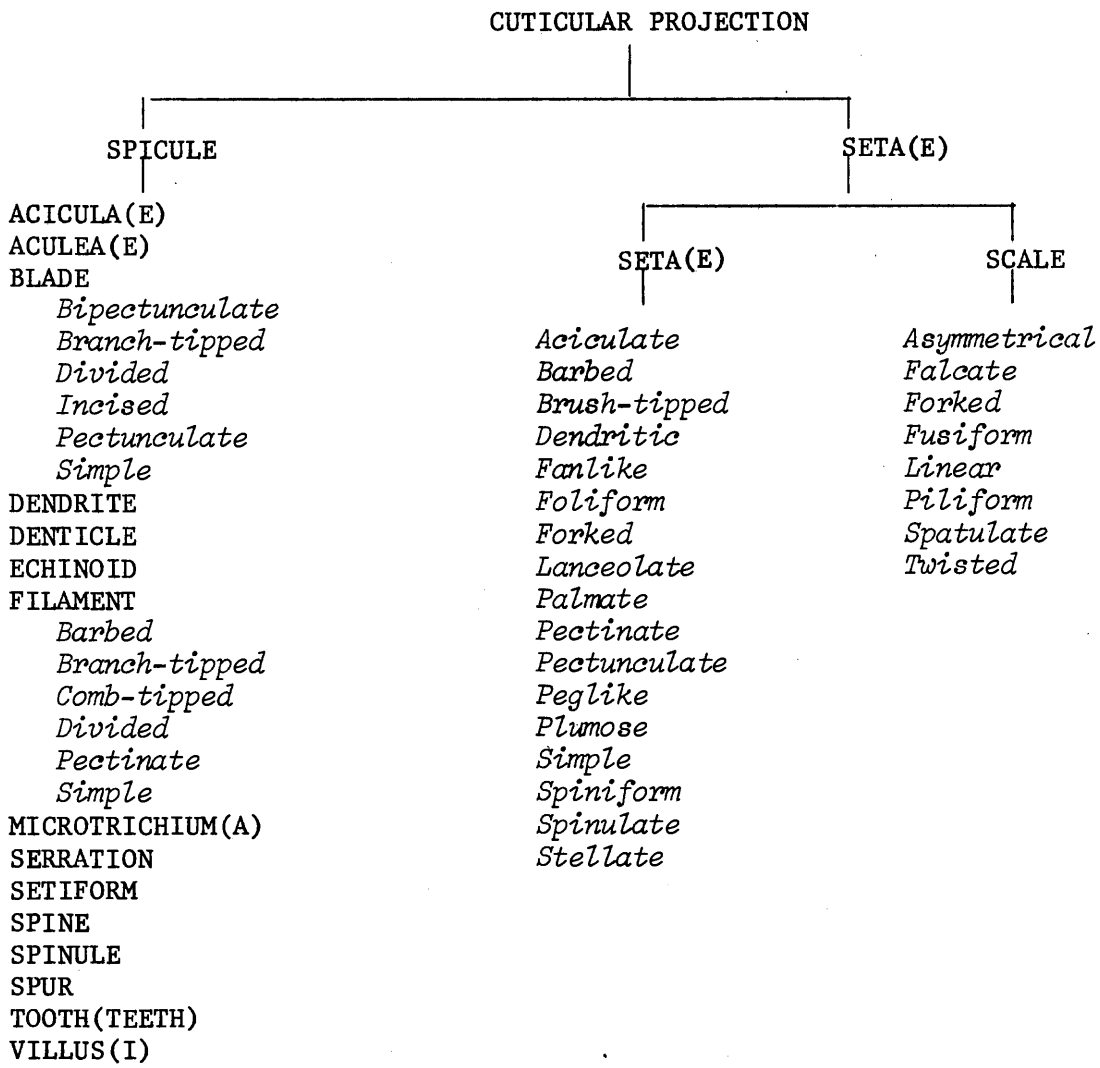
CHART 1


CUTICULAR PROJECTION
SPICULE
SETA(E)
ACICULA(E)
ACULEA(E)
BLADE
Bipectunculate
Branch-tipped
Divided
Incised
Pectunculate
Simple
DENDRITE
DENTICLE
ECHINOID
FILAMENT
Barbed
Branch-tipped
Comb-tipped
Divided
Pectinate
Simple
MICROTRICHIUM(A)
SERRATION
SETIFORM
SPINE
SPINULE
SPUR
TOOTH(TEETH)
VILLUS(I)
SETA(E)
SCALE
Aciculate
Barbed
Brush-tipped
Dendritic
Fanlike
Foliform
Forked
Lanceolate
Palmate
Pectinate
Pectunculate
Peglike
Plumose
Simple
Spiniform
Spinulate
Stellate
Asymmetrical
Falcate
Forked
Fusiform
Linear
Piliform
Spatulate
Twisted

GLOSSARY

ALVEOLUS (a) (Figs. 90b; 91a). -- A cuplike depression (socket) from which a seta arises. The floor of the alveolus is formed by the membrane which supports the seta; the wall is formed by a ringlike swelling of the cuticula (collar).

ACICULA (Fig. 91c). -- A small, slender, rigid, needle- or thornlike spicule.

ACULEA (Fig. 90b,d,g,m,n). -- One of the microtrichiumlike spicules comprising the tomentum which covers the cuticula (except the wing membrane); aculeae usually form a dense covering in adults but are normally sparse or absent in immatures.

BLADE. -- An elongate, flattened, usually stiff spicule; may lie in a single plane or be wavy, curved and/or twisted; sometimes movable. The more common types of blades occurring in mosquitoes are named by the adjectives listed below.

Bipectunculate (Fig. 91e). -- With two rows of acicula- or small toothlike processes.

Branch-tipped. -- With a few short branches arising apically or subapically. (Syn.: branched hair, Gardner *et al.* 1973, 168.)

Divided (Fig. 89*l*). -- With long branches of relatively equal diameter arising below the distal third.

Incised (Figs. 89p; 91d) < Gardner *et al.* 1973, 168 >. -- With apical or subapical notches; the notches are usually rounded as are the toothlike processes between them. (Syn.: incised hair, Gardner *et al.* 1973, 169.)

Pectunculate (Figs. 89o,q; 91e). -- With a row of acicula- or toothlike processes arising along one side. (Syn.: pectinate spine, Shalaby 1957a, 157; pectinate hair, Shalaby 1957b, 278.)

Simple (Fig. 91d) < Pao and Knight 1970, 128 >. -- Without lateral or apical processes. (Syn.: simple spine, Pao and Knight 1970, 128; xiphoid hair, Gardner *et al.* 1973, 168.)

CUTICULAR PROJECTION < Belkin 1962, 554 >. -- Any elongate process jutting from the outer surface of the cuticula. Belkin recognizes two basic types of cuticular projections: (1) SETAE (see), which are articulated processes arising from a basal alveolus, and (2) SPICULES (see), which are non-articulated, continuous processes of the cuticula. This classification is accepted here.

DENDRITE (Fig. 89m). -- A spicule branched to resemble a tree in form; having a basal stem bearing irregular or dichotomous branches which may be repeatedly branched in turn. (Syn.: dendritic hair, Gardner *et al.* 1973, 168.)

DENTICLE (Fig. 91f) < Belkin 1962, 555 >. -- A small toothlike spicule.

ECHINOID (Fig. 89n). -- A spicule consisting of numerous spinelike rays projecting at various angles from a tuberclelike base. (Syn.: echinate tubercle, Harbach and Knight 1977a, 31.)

FILAMENT. -- A long, slender, flexible spicule which gradually tapers to a point or is of equal or near equal diameter throughout. The more common types of filaments occurring in mosquitoes are named by the adjectives listed below. (Syn.: filamentous spicule, Belkin 1962, 555.)

Barbed (Fig. 89h) < Gardner *et al.* 1973, 169 >. -- With minute, short, pointed processes projecting obliquely from the surface. (Syn.: spinulated hair, Shalaby 1957a, 157; barbed hair, Gardner *et al.* 1973, 169.)

Branch-tipped (Fig. 89i). -- With a few subdivisions arising apically; the subdivisions may be short and thick or long and slender. (Syn.: branched-tipped simple hair, Pao and Knight 1970, 128; branched spine, Pao and Knight 1970, 128; brush-tipped hair, Gardner *et al.* 1973, 169.)

Comb-tipped (Fig. 89j). -- With a short row of small rigid processes located at the side near the apex. (Syn.: comb-toothed hair, Marshall 1938, 37; pectinate hair, Shalaby 1957a, 148.)

Divided (Fig. 91g). -- With long branches of equal diameter usually arising within the basal two-thirds. (Syn.: plumose hair, Pao and Knight 1970, 128.)

Pectinate (Fig. 89k). -- With long or short branches arising at regular intervals along one side. (Syn.: basal pectinate hair, Pao and Knight 1970, 128.)

Simple (Fig. 89g) < Shalaby 1957a, 157 > . -- Without lateral or distal processes, usually sharply pointed. (Syn.: simple hair, Shalaby 1957a, 157; pointed-tipped simple hair, Pao and Knight 1970, 128.)

hair. -- In addition to being applied to a seta in a broad sense, Belkin (1962, 555) used the term "hair" for a specific type of seta, "a seta with long, slender stem and attenuate apex." Note that a seta with these characteristics is by definition a simple single seta. It may be described as a long slender simple single seta with an attenuate apex.

MICROTRICHIUM (Fig. 90a,f,h-k). -- One of the minute slender, tapered, flexible spicules closely covering the wing membrane; microtrichia are characteristically bent so that they extend more or less parallel to the longitudinal veins with their apices pointed toward the wing margin.

PEDICEL (p) (Fig. 90g,i) < Christophers 1960, 401 >. -- The slender basal stalk of a scale which supports the squame. The pedicel may or may not bear longitudinal ridges.

SCALE. -- A modified seta comprised of a slender basal stalk, pedicel, and an expanded and/or flattened distal portion, squame. All scales have longitudinal ridges and arise from alveoli which are usually minute.

Two main types of scales are recognized in mosquitoes by cross section of the squame. If the squame is round or elliptical, the scale is piliform; if it is thin and flat, the scale is lamellar. Many forms of lamellar scales exist but only one type of piliform scale. The piliform and the more common types of lamellar scales which occur in mosquitoes are defined below. (Syn.: squama.) See appendix.

Asymmetrical (Fig. 90a). -- A lamellar scale which is obviously unevenly developed on opposite sides of a plane which is parallel to the longitudinal axis of the pedicel and perpendicular to the plane of the squame. (Syn.: asymmetrically broadened [scale], Theobald 1901a, 231; broad asymmetrical winged scale, Theobald 1901a, 235; broad wing scale, Theobald 1901b, 9; broad Aedeomyia scale, Theobald 1905, 2; broad Mansonia scale, Theobald 1905, 2; Taeniorhynchus-like scale, Theobald 1905, 3; schiefe Schuppe, Martini 1923, 26; fahnenförmige Schuppe, Martini 1923, 26.)

Falcate (Fig. 90b). -- A sickle-shaped lamellar scale; the squame narrow and curved with a sharp or narrowly rounded apex. (Syn.: narrow curved scale, Theobald 1901a, 231; Sichelschuppe, Martini 1923, 26; haarförmige Schuppe, Swellengrebel and Rodenwaldt 1932, 12.)

Forked (Fig. 90g) < Theobald 1901a, 231 >. -- A lamellar scale which is cuneate or gently flared distally; with a long thick pedicel which gradually merges into the squame; distal margin of the squame cut off squarely or notched. (Syn.: trumpet scale, Hogg 1871, 192; trumpet-shaped scale, Hogg 1871, 193; upright forked scale, Theobald 1901a, 231; fork scale, Theobald 1901b, 414; Gabelschuppe, Martini 1923, 26; erect scale, Bonne and Bonne-Wepster 1925, 14.)

Fusiform (Fig. 90d-f). -- Widest at the middle and tapered toward the ends; apex sharply pointed or narrowly rounded; ranging from short and broad to long and slender. (Syn.: pointed scale, Hogg 1871, 192; spindle shaped curved scale, Theobald 1901a, 231; lanceolate scale, Theobald 1901a, 231; spindle shaped scale, Theobald 1901a, 235; small spindle-shaped scale, Theobald 1901a, 235; flat spindle-shaped scale, Theobald 1901b, 9; spindle-shaped scale, Theobald 1901b, 11; small spindle shaped scale, Theobald 1905, 3; lancettförmige Schuppe, Martini 1923, 26; spitze linealische Schuppe, Martini 1923, 26.)

Linear (Fig. 90h) < Theobald 1901a, 235 >. -- A straplike lamellar scale; much longer than broad with parallel sides; always truncate. (Syn.: linear and narrow [scale], Theobald 1901a, 231; ligulate [scale], Howard *et al.* 1912, 72; stumpfe linealische Schuppe, Martini 1923, 26.)

Piliform (Fig. 90n). -- Any scale in which the squame is circular or elliptical in cross section, normally narrow, curved and pointed; seta-like. (Syn.: narrow hair-like curved scale, Theobald 1901a, 231; curved hair-like scale, Theobald 1901a, 235; Härchenschuppe, Martini 1923,

26; narrow curved scale, Patton and Evans 1929, 38; haarförmige Schuppe, Swellengrebel and Rodenwaldt 1932, 12.)

Spatulate (Fig. 90i-m) < Theobald 1905, 2 >. -- A lamellar scale which is very broad distally, attenuate at the base; top rounded or truncate, rarely emarginate (heart-shaped); the squame may be parallel-sided, obovate or accrescent. (Syn.: battledore scale, Hogg 1871, 192; flattened out scale, Hogg 1871, 192; spade-shaped scale, Theobald 1901a, 231; broad flat scale, Theobald 1901a, 231; pyriform [scale], Theobald 1901a, 231; elongated oval [scale], Theobald 1901a, 231; inflated parti-coloured scale, Theobald 1901a, 235; flat scale, Theobald 1901b, 9; inflated scale, Theobald 1905, 3; parti-coloured scale, Theobald 1905, 3; Melanoconion scale, Theobald 1905, 3; Cyclo-leppteron scale, Theobald 1905, 3; heart shaped scale, Theobald 1905, 3; breite flache Schuppe, Martini 1923, 26; erweiterte Schuppe, Martini 1923, 26; elliptical [scale], Bonne and Bonne-Wepster 1925, 14; ovate [scale], Bonne and Bonne-Wepster 1925, 14; broad appressed scale, La-Casse and Yamaguti 1948, 3.)

Twisted (Fig. 90c). -- A curled lamellar scale with a spiral or winding form; the squame is usually accrescent. (Syn.: long twisted scale, Theobald 1901a, 231; upright twisted scale, Theobald 1901a, 235; twisted upright scale, Theobald 1901b, 9; Lockenschuppe, Martini 1923, 26.)

SERRATION (Fig. 91h) < Belkin 1962, 555 >. -- A recurved denticlelike process; a series of such processes is termed serrations.

SETA. -- A cuticular projection which arises from a basal alveolus. Flattened setae with longitudinal ridges are known as SCALES (see) and are so modified as to be worthy of separate consideration. Other setae fall under two groups: single (unbranched) and branched. Single setae < Marshall 1938, 36 > may be simple or bear short lateral processes that are not to be considered as branches. Single setae may have longitudinal ridges but unlike scales they are broadest at the base and taper distally. Branched setae have branches radiating from the base, originating as divisions of the main stem or arising along the length of the main stem. The descriptors used to name single setae include aciculate, barbed, brush-tipped, foliform, lanceolate, pectunculate, peglike, simple, spiniform and spinulate; those used to name branched setae include dendritic, fanlike, forked, palmate, pectinate, plumose and stellate. The single setal names are used to describe the branches of branched setae. The types of setae are listed and defined below. (Common syn. include: bristle, chaeta, hair, macrotrichium and spine.) See appendix.

Aciculate (Fig. 88j). -- Furnished with slender needlelike processes along the stem; the processes are somewhat flexible but often appear to be rigid. (Syn.: branched hair, Nuttall and Shipley 1901, 53; plumose hair, Wesché 1910, 9; laterally branched hair, Evans 1938, 25; spiculate seta, Belkin 1962, 555.)

Barbed (Fig. 89c) < Marshall 1938, 37 >. -- With minute, short, heavy, pointed processes projecting obliquely from the surface. (Syn.: subplumose hair, Wesché 1910, 9; gewimperte Borste, Martini 1931, 11; frayed hair, Evans 1938, 25; barbed hair, Marshall 1938, 37.)

Brush-tipped (Fig. 88k). -- With numerous moderately long, slender processes arising apically. (Syn.: frayed hair, Nuttall and Shipley 1901, 53; brush tip seta, Belkin 1962, 555.)

Dendritic (Fig. 88e) < Belkin 1962, 555 >. -- Branched to resemble a tree in form; having a stemlike part bearing irregular or dichotomous branches which may be repeatedly forked or branched in turn. (Syn.: besenförmige Borste, Martini 1931, 11; dendroid hair, Evans 1938, 25; broom-like hair, Marshall 1938, 37.)

Fanlike (Figs. 87a-c; 88g). -- With branches spreading out in a single plane from a short stem; in the case of some ventral brush setae the branches successively arise on one side of the stem (see Fig. 88g). Branches may be simple, barbed, aciculate or dendritic. (Syn.: branched hair, Wesché 1910, 9; tufted hair, Lang 1920, 20; geteilte Borste, Martini 1931, 11; furcate hair, Marshall 1938, 36; hair-tuft, Marshall 1938, 36; bifid hair, Marshall 1938, 37; dendroid hair, Marshall 1938, 37; bifurcated hair, Marshall 1938, 37.)

Foliform (Figs. 88f; 91b) < Belkin 1962, 553 >. -- Flattened and leaflike; similar to some scales but lacking longitudinal ridges. (Syn.: einfache blättchenförmige Borste, Martini 1931, 11; leaf, Belkin 1962, 553.)

Forked (Fig. 88b,c) < Belkin 1962, 555 >. -- With a few branches arising beyond the basal third of the main stem. (Syn.: split hair, Evans 1938, 25; furcate hair, Marshall 1938, 36.)

Lanceolate (Fig. 89e,f) < Belkin 1962, 553 >. -- Oblong or spear-shaped; tapering distally to a point.

Palmate (Fig. 87e) < Nuttall and Shipley 1901, 61 >. -- With flattened, movable, usually horizontal branches radiating from a common point on a short stem. (Syn.: palmate hair, Nuttall and Shipley 1901, 61; Strahlenborste, Tsuzuki 1907, 530; Quirlhaar, Tänzer 1921, 142; Palmhaar, Martini 1931, 12; palmate tuft, Lee and Woodhill 1944, 30; float hair, Marshall 1938, 36.)

Pectinate (Fig. 88d) < Belkin 1962, 555 >. -- With long branches arising at regular intervals from one side of the main stem; a few small, sparsely arranged branches may arise from the opposite side. (Syn.: pinnate hair, Evans 1938, 25; feathered hair, Evans 1938, 25; unequally-feathered hair, Marshall 1938, 37.)

Pectunculate (Fig. 88h). -- With a row of short rigid processes resembling the teeth of a comb.

Peglike (Fig. 91b). -- A small cylindrical, usually blunt-tipped simple seta.

Plumose (Fig. 87d) < Evans 1938, 25 >. -- With numerous usually regularly-arranged branches arising on either side of the main stem. The branches on either side may be directly opposite one another or alternate. (Syn.: feathered hair, Nuttall and Shipley 1901, 53; gefiederte Borste, Martini 1931, 11; kurze dickschaftige Feder, Martini 1931, 11; pinnate hair, Evans 1938, 25; plumose hair, Evans 1938, 25.)

Simple (Fig. 89a,b) < Nuttall and Shipley 1901, 53 >. -- Without lateral or apical processes. (Syn.: simple pointed hair, Nuttall and Shipley 1901, 53; simple hair, Wesché 1910, 10; einfaches Haar, Martini 1923, 11.)

Spiniform (Fig. 88i) < Belkin 1962, 555 >. -- Thick, spinelike, and usually not markedly attenuate or sharply pointed. (Syn.: spike, Belkin 1962, 555.)

Spinulate (Fig. 89d). -- Beset with small spinelike processes. (Syn.: spike, Belkin 1962, 555.)

Stellate (Figs. 87f; 88a) < Wesché 1910, 10 >. -- Tufted; with numerous stiff branches projecting at various angles from a single base. Branches may be simple, barbed or aciculate. (Syn.: tuft, Wesché 1910, 10; stellate hair, Wesché 1910, 10; plume, Wesché 1910, 10; tufted hair, Lang 1920, 20; furcate hair, Marshall 1938, 36; hair-tuft, Marshall 1938, 36; stellate tuft, Marshall 1938, 37.)

SPICULE < Belkin 1962, 555 >. -- A non-articulated cuticular projection, directly continuous with the cuticula. Spicules are named by nouns. The common types which occur in mosquitoes include (see): ACICULAE, ACULEAE, BLADES, DENDRITES, ECHINOIDS, FILAMENTS, MICROTRICHIA, SERRATIONS, SETIFORMS, SPINES, SPINULES, SPURS, TEETH and VILLI. Spurs and some filaments and blades are movable, i.e., they have a ring of unsclerotized cuticle at the base. (Common syn. include: hair, seta and spine.) See appendix.

SPINE (Fig. 91j) < Belkin 1962, 555 >. -- A very large, sturdy, immovable spicule; with a sharp or narrowly rounded tip.

SPINULE (Fig. 91k) < Belkin 1962, 555 >. -- A minute spinelike spicule; always stiff.

SPUR. -- A movable spinelike spicule; with a ring of unsclerotized cuticle at the base.

SQUAME (s) (Fig. 90g,i) < Christophers 1960, 401 >. -- The expanded and/or flattened distal portion of a scale supported by the pedicel. The squame invariably has longitudinal ridges.

TOMENTUM (Fig. 90b,d,g,m,n). -- In Diptera, a covering of aculeae on the body and its appendages, except the wings.

TOOTH (Fig. 91h) < Belkin 1962, 555 >. -- A very stout heavy spicule with a blunt apex.

VILLUS (Fig. 91*l*). -- A minute, slender, flexible, filamentlike spicule; usually with a blunt tip.

VESTITURE. -- The general surface covering of insects comprised of cuticular projections, i.e., setae and spicules.

Figure 87.

a. Fanlike seta with aciculate dentritic branches. Seta 1-I of larva of *Aedes (Finlaya) novoniveus* Barraud.

b. Fanlike seta with aciculate branches. Unidentified seta from larva of *Aedes (Skusea) pembaensis* Theobald.

c. Fanlike seta with dendritic branches. Seta 4-C of larva of *Aedes (Finlaya) albolateralis* (Theobald).

d. Plumose seta. Seta 1-M of larva of *Anopheles (Cellia) stephensi* Liston.

e. Palmate seta. Seta 1-IV of larva of *Anopheles (Cellia) sundaicus* (Rodenwaldt).

f. Stellate seta with simple branches. Seta 4-P of larva of *Topomyia* sp.

Fig. 87

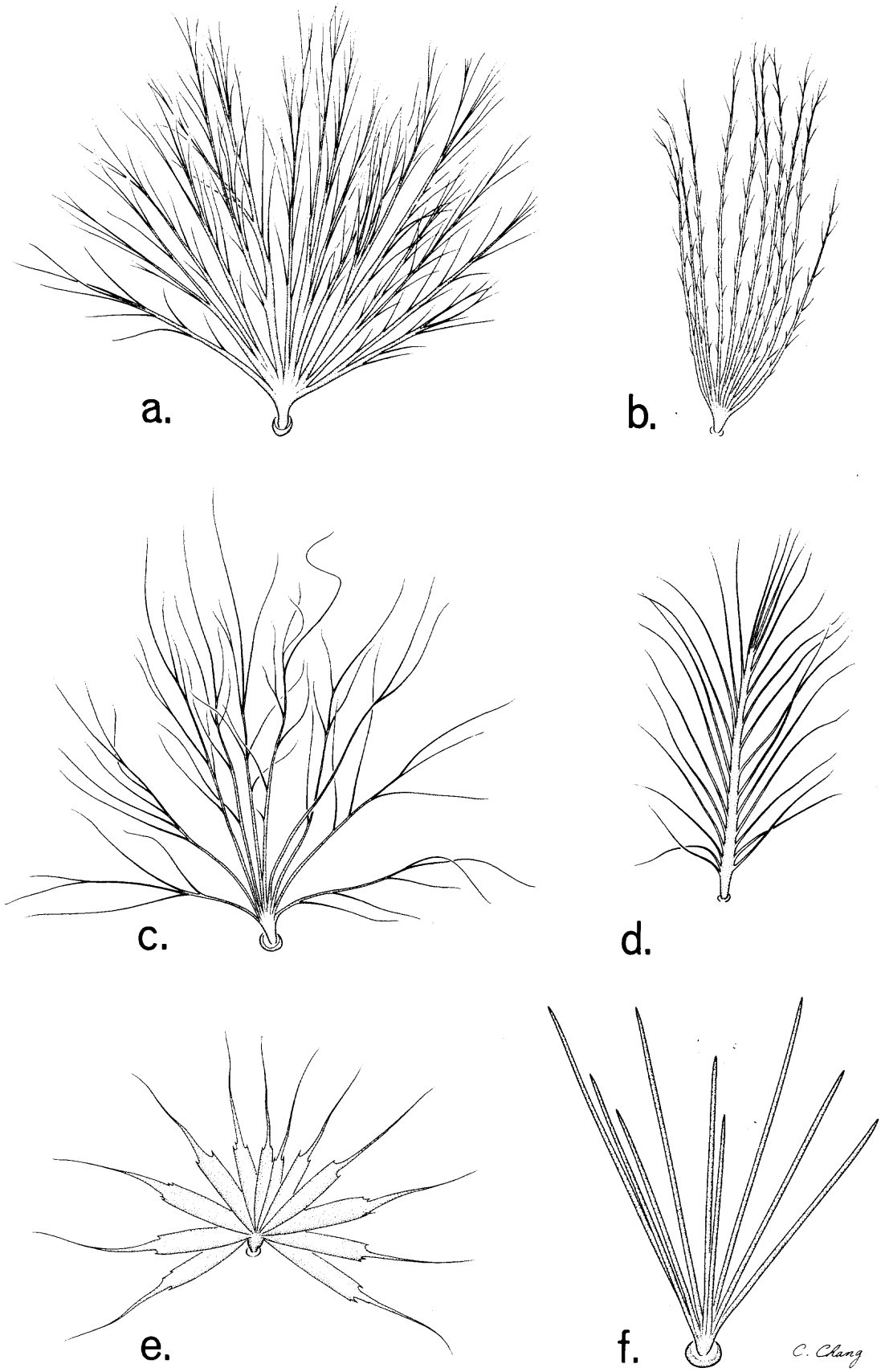


FIGURE 88.

a. Stellate seta with aciculate branches. Unidentified seta from larva of *Sabethes (Sabethinus) undosus* (Coquillett).

b. Forked seta. Seta 5-MP of larva of *Malaya* sp.

c. Forked seta. Seta 12-VII of larva of *Anopheles (Anopheles) crucians* Wiedemann.

d. Pectinate seta. Seta 12-CT of pupa of *Aedes (Finlaya) niveus* (Ludlow).

e. Dendritic seta with aciculate branches. Seta 1-II of larva of *Aedes (Finlaya) pexus* Colless.

f. Foliform seta from subapical lobe of male genitalia of *Culex (Culex) antennatus* (Becker).

g. Fanlike seta with simple branches successively arising on one side of main stem. Ventral brush seta (seta 4-X) of larva of *Aedes (Finlaya) novoniveus* Barraud.

h. Pectunculate seta. Seta 2-S of larva of *Mansonia (Mansonioides) uniformis* (Theobald).

i. Spiniform seta. Seta 9-V of pupa of *Anopheles (Anopheles) punctipennis* (Say).

j. Aciculate seta. Seta 5-IV of pupa of *Aedes (Finlaya) pseudoniveus* (Theobald).

k. Brush-tipped seta. Seta 5-MP of larva of *Phoniomyia splendida* (Bonne-Wepster and Bonne).

Fig. 88

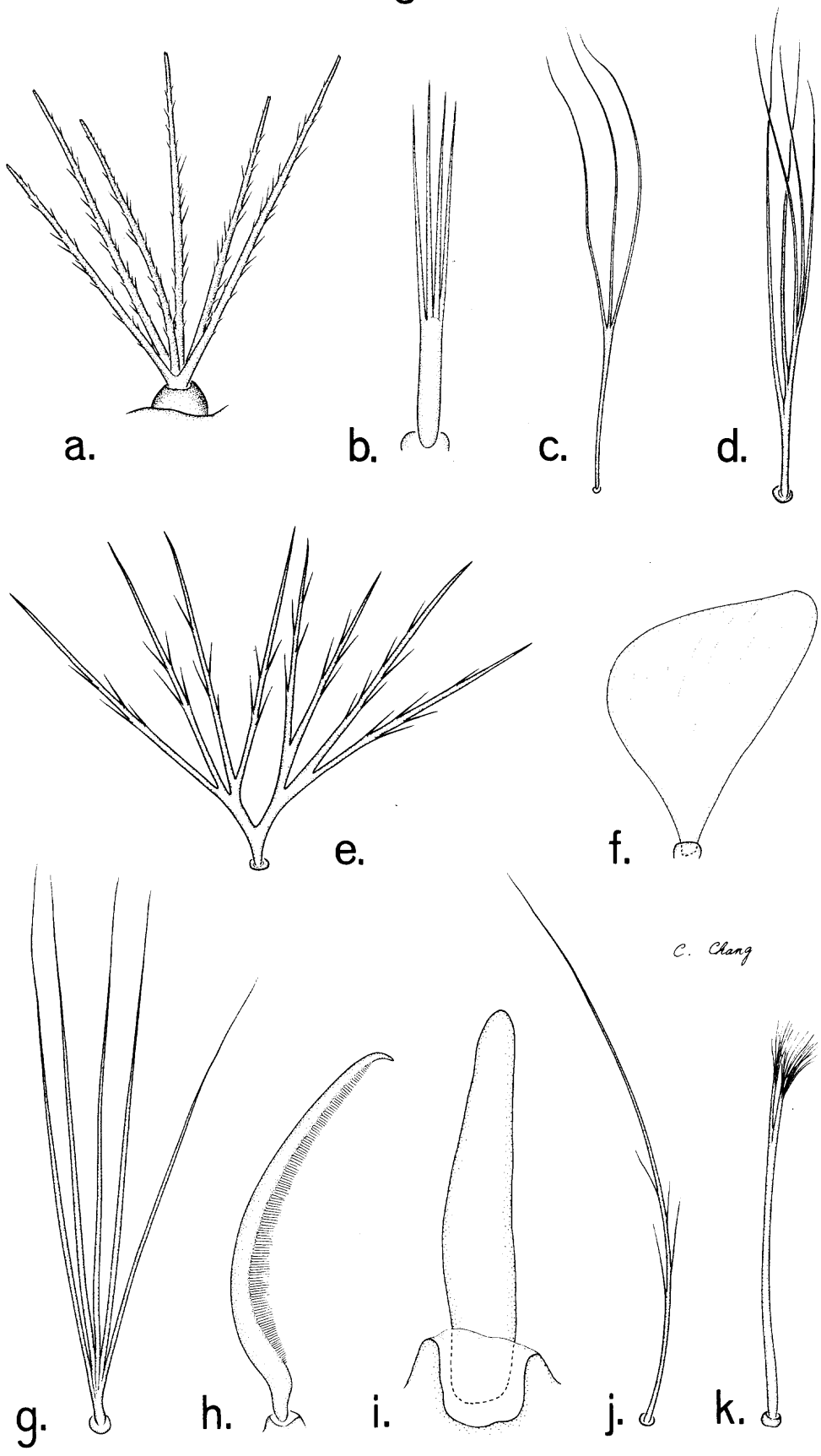


Figure 89.

a. Simple seta. Seta 9-III of larva of *Toxorhynchites (Toxorhynchites) brevipalpis* Theobald.

b. Simple seta. Seta 5-MP of larva of *Hodgesia solomonis* Belkin.

c. Barbed seta. Seta 6-II of larva of *Eretmapodites chrysogaster* Graham.

d. Spinulate seta. Seta 9-M of larva of *Toxorhynchites (Lynchiella) rutilus* (Coquillett).

e. Lanceolate seta from gonocoxite of male genitalia of *Haemagogus (Haemagogus) argyromeris* Dyar and Ludlow.

f. Lanceolate seta from gonocoxite of male genitalia of *Aedes (Finlaya) melanopterus* (Giles).

g. Simple filament from maxillary brush of larva of *Malaya genurostris* Leicester.

h. Barbed filament from mandibular sweeper of larva of *Toxorhynchites (Toxorhynchites) brevipalpis* Theobald.

i. Branch-tipped filament from maxillary brush of larva of *Haemagogus (Haemagogus) panarchys* Dyar.

j. Comb-tipped filament from palatal brush of larva of *Zeugnomyia* sp.

k. Pectinate filament from maxillary brush of larva of *Hodgesia solomonis* Belkin.

l. Divided blade from mandibular comb of larva of *Limatus durhamii* Theobald.

m. Dendrite from mandibular comb of larva of *Culex (Culex) pipiens quinquefasciatus* Say. (Redrawn from Harbach and Knight 1977a)

n. Echinoid from mandibular comb of larva of *Culex (Culex) pipiens quinquefasciatus* Say. (Redrawn from Harbach and Knight 1977a)

o. Pectunculate blade from laciniarastrum 1 of maxilla of larva of *Psorophora (Janthinosoma) mathesoni* Belkin.

p. Incised blade from laciniarastrum 1 of maxilla of larva of *Eretmapodites chrysogaster* Graham.

q. Pectunculate blade. Mandibular rake blade 1 of larva of *Sabethes (Sabethinus) undosus* (Coquillett).

Fig. 89

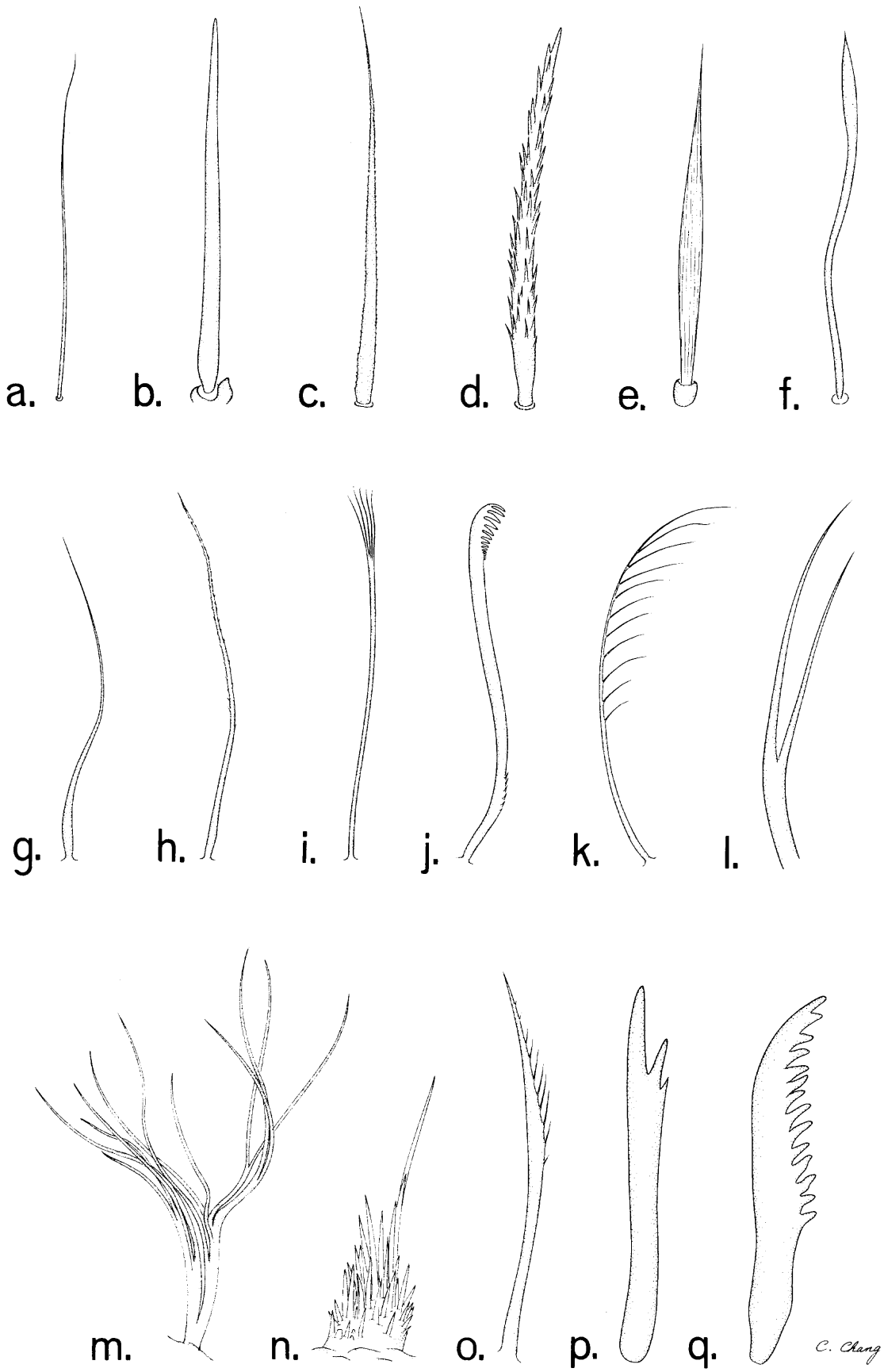


Figure 90.

a. Asymmetrical scale from wing of *Mansonia (Mansonioides) uniformis* (Theobald). Note microtrichia on wing membrane.

b. Falcate scales from vertex of *Mansonia (Mansonioides) uniformis* (Theobald). Note empty alveoli and covering of aculeae.

c. Twisted scales on mesepisternum of *Aedes (Mucidus) scatophagoides* (Theobald).

d, e. Fusiform scales on scutum of *Psorophora (Psorophora) ciliata* (Fabricius). Note covering of aculeae.

f. Fusiform scales on wing of *Anopheles (Anopheles) quadrimaculatus* Say. Note microtrichia on wing membrane.

g. Forked scales on vertex of *Aedes (Mucidus) scatophagoides* (Theobald). Note covering of aculeae.

h. Linear scales on wing of *Culex (Ochlerotatus) deserticola* Zavortink. Note microtrichia on wing membrane.

i. Spatulate scales on wing of *Orthopodomyia signifera* (Coquillett). Note microtrichia on wing membrane.

j. Spatulate scale on wing of *Aedes (Mucidus) scatophagoides* (Theobald). Note microtrichia on wing membrane.

k. Spatulate scales on wing of *Anopheles (Cellia) cinereus* Theobald. Note microtrichia on wing membrane.

l. Spatualte scales on wing of *Orthopodomyia signifera* (Coquillett).

m. Spatulate scale on scutum of *Toxorhynchites (Lynchiella) rutilus septentrionalis* (Dyar and Knab). Note covering of aculeae.

n. Piliform scales on scutum of *Aedes (Finlaya) banksi* Edwards. Note covering of aculeae.

ABBREVIATIONS

a = alveolus, p = pedicel, s = squame

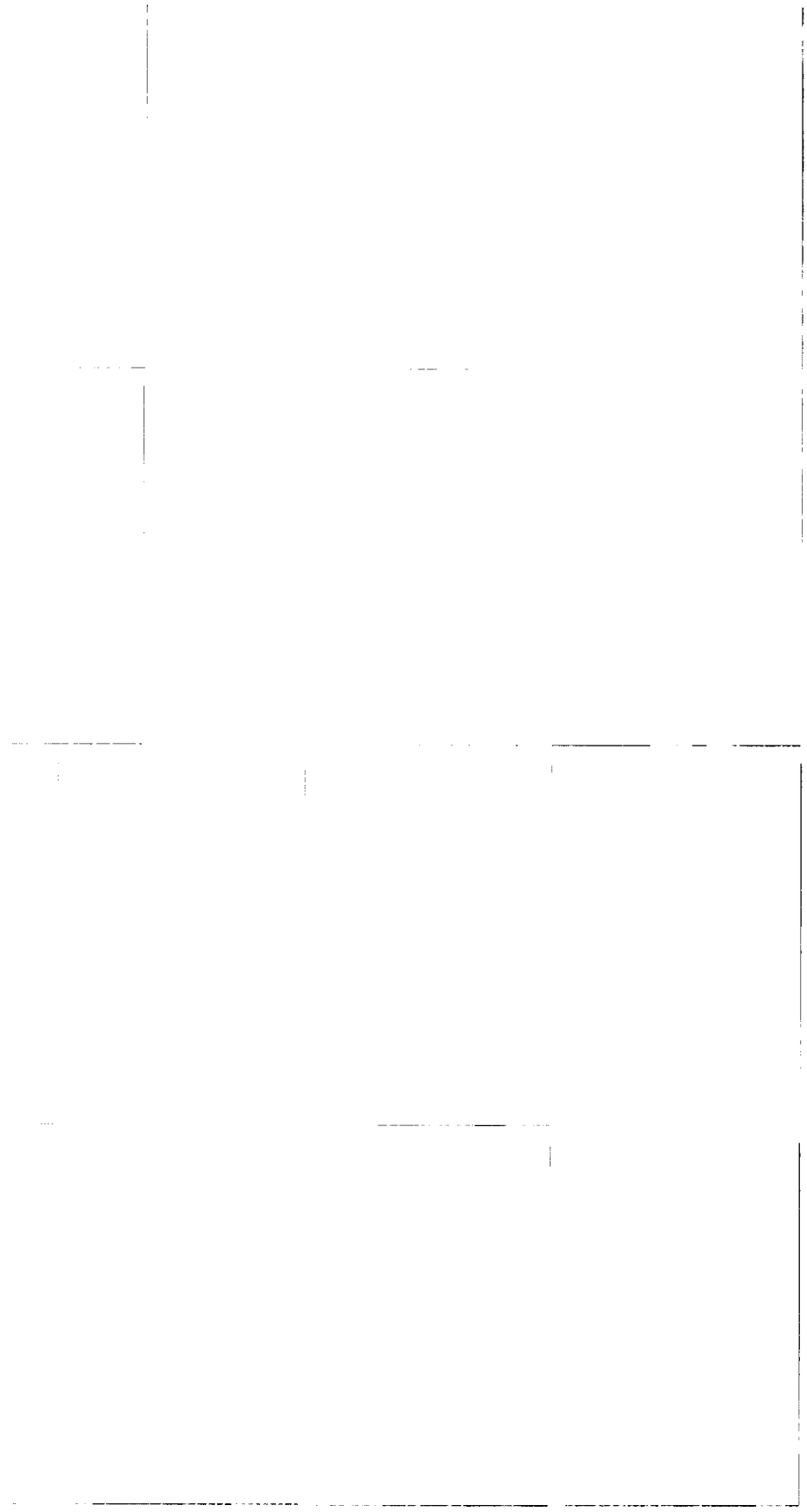


Figure 91.

a. Empty alveolus (a) ("seta 3-S") on anterior spiracular lobe of larva of *Anopheles (Anopheles) crucians* Wiedemann.

b. Apex of maxillary palpus of larva of *Anopheles (Anopheles) crucians* Wiedemann showing 4 peglike and 3 foliform setae.

c. Saddle of larva of *Toxorhynchites (Toxorhynchites) brevipalpis* Theobald with row of aciculae (= marginal spicules of Belkin 1962, 561).

d. Laciniarastrum 1 on maxilla of larva of *Armigeres (Armigeres) subalbatus* (Coquillett) comprised of simple (front rows) and incised blades (back rows.)

e. Mandibular rake of larva of *Anopheles (Anopheles) crucians* Wiedemann with pectunculate (lower arrow) and bipectunculate blades (upper arrow).

f. Denticles of premental mala on labiohypopharynx of larva of *Anopheles (Nyssorhynchus) albimanus* Wiedemann.

g. Divided filaments from primary dorsal fringe in pharynx of larva of *Anopheles (Nyssorhynchus) albimanus* Wiedemann.

h. Apex of spiracular apparatus of larva of *Mansonia (Mansonioides) uniformis* (Theobald). Teeth (upper arrows) (= inner and outer spiracular hooks of Harbach and Knight 1978a, 65 and 69, respectively) and serrations (lower arrows) comprising the saw.

i. Setiforms comprising laciniarastrum 1 on maxilla of larva of *Toxorhynchites (Toxorhynchites) brevipalpis* Theobald.

j. Spines of pecten of larva of *Culiseta (Culiseta) inornata* (Williston).

k. Spinules (= oral spines of Harbach and Knight 1977b, 394) on ventral wall of pharynx of larva of *Toxorhynchites (Toxorhynchites) brevipalpis* Theobald.

l. Villi comprising the mandibular pilose area of larva of *Culex (Culex) pipiens quinquefasciatus* Say.

Fig. 91

APPENDIX

As previously, this part is appended for the purpose of explaining the introduction of new terms, the recommendation of terms currently not widely accepted for use in the Culicidae, and/or the derivation of terms where appropriate.

SCALE. -- The most recent and definitive study on the morphology and nomenclature of scales in insects was conducted by Downey and Allyn (1975) on the wing scales of Lepidoptera. These authors categorized scales as piliform, lamellar or irregular in form. The scales of adult mosquitoes can be classified as either piliform or lamellar. As far as we have been able to determine there is one type of piliform and many types of lamellar scales in culicids. It should be noted that piliform scales tend to grade into the lamellar form and that the types of lamellar scales grade into one another. For this reason we have divided mosquito scales into a number of extreme types with broad definitions in order that the transitional forms may be classified more easily.

SETA. -- The types of setae adopted herein are basically those of Belkin (1962). We recognize, however, two main classes of setae: single and branched. In doing so, Belkin's "branched seta" has become our *fanlike* seta, the term *fanlike* more accurately describing the pattern of branching. Other changes include the introduction of *aciculate* for "spiculate" and *spinulate* for "spike [d]." *Aciculate* more accurately describes this single seta condition since "spiculate" may infer that the lateral processes resemble any of a number of different types of spicules. Since the term "spike" has basically the same definition as a *spinule*, we prefer to describe this single seta condition as *spinulate*. Also, since Belkin's definition of a "spike" is not significantly different from his definition of a *spiniform* seta, we have abandoned the term "spike" entirely.

The terms *pectunculate* and *peglike* are newly added here. Examples of *pectunculate* setae are seta 2-S of some Mansoniini larvae (see Fig. 88h) and the sellar setae on the larval mandibles of various taxa. It is our intention to refer to some of the so-called "sensoria" which occur in particular on the larval mouthparts as *peglike* setae.

It should be noted that the term *stellate* refers to a condition where the rays (branches) project in all directions from a single point in the same plane. A better term would be multiradiate but owing to the long use of the term *stellate* in mosquito taxonomy we recommend it for standard use.

SPICULE. -- The term spicule was first used as defined herein by Belkin (1962). Of our 15 main types of spicules, 8 are those of Belkin's original 9 types, his "hairlike" spicule being equivalent in our opinion to *setiform*. We have changed Belkin's "filamentous" to the noun *filament* and listed 6 types of these. We feel that the 7 types newly introduced and defined here are self-explanatory and need no further explanation.

It is our intention that all of the types of spicules be designated by nouns. The term *setiform*, an adjective, should be used as a noun following Belkin (1962, 555).

LIST OF SYNONYMS

Synonym	See
asymmetrically broadened [scale]	*Asymmetrical* under SCALE
barbed hair	*Barbed* under FILAMENT and SETA
basal pectinate hair	*Pectinate* under FILAMENT
battledore scale	*Spatulate* under SCALE
besenförmige Borste	*Dendritic* under SETA
bifid hair	*Fanlike* under SETA
bifurcated hair	*Fanlike* under SETA
branched hair	*Aciculate* and *Fanlike* under SETA and *Branch-tipped* under BLADE
branched spine	*Branch-tipped* under FILAMENT
branched-tipped simple hair	*Branch-tipped* under FILAMENT
breite flache Schuppe	*Spatulate* under SCALE
bristle	SETA
broad Aedeomyia scale	*Asymmetrical* under SCALE
broad appressed scale	*Spatulate* under SCALE
broad asymmetrical winged scale	*Asymmetrical* under SCALE
broad flat scale	*Spatulate* under SCALE
broad Mansonia scale	*Asymmetrical* under SCALE
broad wing scale	*Asymmetrical* under SCALE
broom-like hair	*Dendritic* under SETA
brush tip seta	*Brush-tipped* under SETA
brush-tipped hair	*Branch-tipped* under FILAMENT
chaeta	SETA
comb-toothed hair	*Comb-tipped* under FILAMENT
curved hair-like scale	*Piliform* under SCALE
Cycloleppteron scale	*Spatulate* under SCALE
dendritic hair	DENDRITE
dendroid hair	*Dendritic* and *Fanlike* under SETA
echinate tubercle	ECHINOID
einfache blättchenförmige Borste	*Foliform* under SETA
einfaches Haar	*Simple* under SETA
elliptical [scale]	*Spatulate* under SCALE
elongated oval [scale]	*Spatulate* under SCALE
erect scale	*Forked* under SCALE
erweiterte Schuppe	*Spatulate* under SCALE
fahnenförmige Schuppe	*Asymmetrical* under SCALE
feathered hair	*Pectinate* and *Plumose* under SETA
filamentous spicule	FILAMENT
flat scale	*Spatulate* under SCALE
flat spindle-shaped scale	*Fusiform* under SCALE
flattened out scale	*Spatulate* under SCALE
float hair	*Palmate* under SETA
fork scale	*Forked* under SCALE
frayed hair	*Barbed* and *Brush-tipped* under SETA
furcate hair	*Fanlike, Forked* and *Stellate* under SETA
Gabelschuppe	*Forked* under SCALE
gefiederte Borste	*Plumose* under SETA
geteilte Borste	*Fanlike* under SETA
gewimperte Borste	*Barbed* under SETA

Synonym	See
haarförmige Schuppe	*Falcate* and *Piliform* under SCALE
hair	hair, SETA and SPICULE
hairlike seta	SETIFORM
hair-tuft	*Fanlike* and *Stellate* under SETA
Härchenschuppe	*Piliform* under SCALE
heart shaped scale	*Spatulate* under SCALE
incised hair	*Incised* under BLADE
inflated parti-coloured scale	*Spatulate* under SCALE
inflated scale	*Spatulate* under SCALE
kurze dickschaftige Feder	*Plumose* under SETA
lanceolate scale	*Fusiform* under SCALE
lancettförmige Schuppe	*Fusiform* under SCALE
laterally branched hair	*Aciculate* under SETA
leaf	*Foliform* under SETA
ligulate [scale]	*Linear* under SCALE
linear and narrow [scale]	*Linear* under SCALE
Lockenschuppe	*Twisted* under SCALE
long twisted scale	*Twisted* under SCALE
macrotrichium	SETA
Melanoconion scale	*Spatulate* under SCALE
narrow curved scale	*Falcate* and *Piliform* under SCALE
narrow hair-like curved scale	*Piliform* under SCALE
ovate [scale]	*Spatulate* under SCALE
palmate hair	*Palmate* under SETA
palmate tuft	*Palmate* under SETA
Palmhaar	*Palmate* under SETA
parti-coloured scale	*Spatulate* under SCALE
pectinate hair	*Comb-tipped* under FILAMENT and *Pectunculate* under BLADE
pectinate spine	*Pectunculate* under BLADE
pinnate hair	*Pectinate* and *Plumose* under SETA
plume	*Stellate* under SETA
plumose hair	*Aciculate* and *Plumose* under SETA and *Divided* under FILAMENT
pointed scale	*Fusiform* under SCALE
pointed-tipped simple hair	*Simple* under FILAMENT
pyriform [scale]	*Spatulate* under SCALE
Quirlhaar	*Palmate* under SETA
schiefe Schuppe	*Asymmetrical* under SCALE
seta	SPICULE
Sichelschuppe	*Falcate* under SCALE
simple hair	*Simple* under FILAMENT and SETA
simple pointed hair	*Simple* under SETA
simple spine	*Simple* under BLADE
small spindle-shaped scale	*Fusiform* under SCALE
small spindle shaped scale	*Fusiform* under SCALE
spade-shaped scale	*Spatulate* under SCALE
spiculate seta	*Aciculate* under SETA
spike	*Spiniform* and *Spinulate* under SETA
spindle shaped curved scale	*Fusiform* under SCALE
spindle-shaped scale	*Fusiform* under SCALE
spindle shaped scale	*Fusiform* under SCALE

Synonym	See
spine	SETA and SPICULE
spinulated hair	*Barbed* under FILAMENT
spitze linealische Schuppe	*Fusiform* under SCALE
split hair	*Forked* under SETA
squama	SCALE
stellate hair	*Stellate* under SETA
stellate tuft	*Stellate* under SETA
Strahlenborste	*Palmate* under SETA
stumpfe linealische Schuppe	*Linear* under SCALE
subplumose hair	*Barbed* under SETA
Taeniorhynchus-like scale	*Asymmetrical* under SCALE
trumpet scale	*Forked* under SCALE
trumpet-shaped scale	*Forked* under SCALE
tuft	*Stellate* under SETA
tufted hair	*Fanlike* and *Stellate* under SETA
twisted upright scale	*Twisted* under SCALE
unequally-feathered hair	*Pectinate* under SETA
upright forked scale	*Forked* under SCALE
upright twisted scale	*Twisted* under SCALE
xiphoid hair	*Simple* under BLADE

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