

second basal cell shorter than the first, petiole of first submarginal cell nearly one-half as long as that cell. Length, 4 mm.

Habitat.—Chester, New Jersey.

Two female specimens collected September 10 and 14 by Prof. J. B. Smith. Type No. 6702, U. S. N. M.

ILLUSTRATIONS OF THE LARVÆ OF NORTH AMERICAN CULICIDÆ.—II.

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(PLATES XVI-XIX.)

I have previously published illustrations of four species of Culicidæ in this journal (Journ. N. Y. Ent. Soc., IX, 177-182, 1901); the present paper is a continuation of the subject.

***Culex canadensis* Theobald.**

Egg.—Laid singly, not adherent, scattered or adhering in irregular masses by surface tension only. Fusiform, the ends rounded, the greatest diameter at the third nearest the micropyle; one side flattened. Entirely black, covered with clear granules which rest in reticular hollows of the surface; a small colorless cushion at the micropyle. Length, .8 mm.; diameter, .2 mm.

Stage I.—Head rounded, darkly infuscated, antennæ slender, uniform, the tuft at the middle of the joint slight; dark throughout. Body hairs normal, simple; air tube colorless at the base, the terminal third darkly infuscated, the line dividing these areas sharp, oblique; a sparse double pecten on the clear part. Anal segment with a dorsal dark plate and terminal tuft; no ventral brush. Lateral comb of the eighth segment a series of simple thorn-shaped spines, about 6 in number, in a straight transverse row.

Stage II.—The head is pale brown rather than blackish. Antennæ all brown, the slight tuft at the middle of the joint. Body hairs stouter, with distinct basal tubercles on the thorax. Air tube completely chitinized, brown with a double pecten on the posterior basal half, followed by a little hair tuft. Tube conically tapered, about two and a half times as long as wide. Anal segment with a broad dorsal dark plate, terminal tuft and small ventral brush arising from a transversely barred area at the tip of the segment; also several small

tufts preceding this barred area. Lateral comb a patch of spines, low triangular in shape, about three rows deep in the center.

Stage III.—Head slightly paler, the base of the antennæ paler than the tip, the tuft arising a little before the middle. Otherwise as before, but the ventral brush stronger, and the comb of the eighth segment contains more numerous spines.

Stage IV.—(Pl. XVI, Fig. 1.) Head pale brown, the antennæ darker on the outer third, but brownish throughout; tuft arising a little before the middle, slight, not long enough to reach to the tip of the joint. Thoracic hairs finely, weakly barbed, arising from large infuscated tubercles. Abdominal hairs simple, moderate, double as far back as the seventh segment. Anal segment with a broad dorsal plate which reaches nearly to the ventral line but does not enclose the segment. Dorsal tuft and ventral brush normal, the latter with small tufts before the barred area. Tube conic, tapered, about two and a half times as long as wide, with two rows of pecten at the base (Fig. 1, A), followed by a little tuft. Lateral comb of the eighth segment a patch of small spines in triangular form, over three rows deep (Fig. 1, B).

Pupa.—The usual shape and appearance, rather large, the air tubes moderate, funnel-shaped narrowed at base.

Dr. John B. Smith has given an account of the life-history of this species (Ent. News, XIII, 267, 1902). His conclusions agree in the main with my observations except in regard to the matter of hibernation, which is in the egg stage (Science, N. S., XVI, 672, 1902).

Culex atropalpus Coquillett.

Egg.—Elliptical, the ends abruptly narrowed, making them round pointed, the antemicropylar one more sharply so and a slight narrowing of the whole egg toward this end. Deep black, the coarse reticulations filled by clear granules and a clear annular cushion at the micropylar end, the whole covered by a layer of mucilage. Length, .6 mm.; width .2 mm. Laid separately in groups adherent to the surface on which they are deposited.

Stage IV.—(Pl. XVI, Fig. 2.) Head rounded, dark brown, nearly black; antennæ slender, small, uniform, the tuft at the middle of the joint and reduced to but one inconspicuous hair. Body hairs normal, moderate, thoracic ones slightly barbed, abdominal ones simple, several-haired. Tube short, not over twice as long as wide,

slightly tapered, infuscated; a double posterior pecten, small tuft and several pecten teeth beyond the tuft. Anal segment with a small dorsal plate, dark, not reaching the middle of the sides; ventral brush confined to the barred area* which is roundedly elevated. Anal finger-shaped processes long, sometimes very long, with conspicuous tracheal branches. Lateral comb a long triangular patch of small spines about five rows deep.

Pupa.—As usual, rather small, dark, the tubes funnel-shaped, moderate. The pupa is heavier than usual, rising but slowly and sometimes even resting on the bottom of the pool without moving.

***Culex sylvestris* Theobald.**

Egg.—Laid singly or in groups, adherent by capillary action only, floating for a time, ultimately sinking to the bottom. Elliptical, fusiform, the ends rounded, pointed and about alike, the micropylar one differentiated by a slight apical flattening; one side more flattened than the other. Smooth, shining black, free of mucilage and without granules, coarsely reticulate, the reticulations much elongated in the length of the egg, forming long lines or chains. Length, .6 mm.; width, .2 mm.

Stage IV.—(Pl. XVI, Fig. 3.) Head rounded, light brown; antennæ slender, moderate, slightly tapering, the small tuft before the middle; infuscated outwardly, pale at base. Body hairs short, stout, the thoracic ones from large infuscated tubercles, the abdominal ones double. Tube moderate, about two and a half times as long as wide, slightly tapered, with double posterior pecten on basal half, their spines dark and three-branched (Fig. 3, *A*), the terminal two usually detached and larger, the tuft beyond rudimentary. Anal segment very broadly plated, almost, but not quite ringed, the plate pale brown. Dorsal tuft and ventral brush normal, the latter with several small tufts before the barred area. Lateral comb of about twelve large thorn-shaped spines in an irregular, partly double row (Fig. 3, *B*). Anal finger-shaped processes normal, tapered, but the tips rather bluntly rounded.

Pupa.—Normal, rather large, the tubes slender, funnel-shaped, moderate.

* There are tufts before the barred area in stages II and III, but they are absent in stage IV in all larvæ examined except one. These small tufts are present in *canadensis*, with which this species is nearly allied, in stage IV as well as earlier.

***Aedes fuscus* Osten Sacken.**

Stage I.—Head rounded, darkly infuscated, antennæ proportionately large, slightly tapered, with long terminal hairs; tuft a little before the middle, slight. Body hairs few and weak. Tube with the tip darkly infuscated, the basal two thirds colorless with a small sparse double pecten. Anal segment with a small, dark, oval dorsal plate and terminal brush; no ventral hairs. Comb of six spines in a straight transverse row.

Stage II.—Head paler brown than before, the terminal antennal hairs shorter; tuft at the middle. Body hairs stouter and more numerous. Tube completely infuscated, conic tapered, rather less than two and a half times as long as wide, with double posterior basal pecten, not followed by any visible tuft. Anal segment dorsally plated as before but with a small ventral brush arising from the barred area. Comb of about nine spines in an irregular transverse row.

Stage III.—Head about as before, the outer half of the antennæ infuscated, the basal half pale, tuft at the middle. Body hairs quite stout, moderate, the posterior abdominal ones single. Tube light brown. Dorsal plate of anal segment larger, the ventral brush also larger and with some small tufts before the barred area. Comb a little larger, having ten to twelve spines.

Stage IV.—(Pl. XVII, Fig. 1.) Head pale brown; antennæ slender, slightly tapering, the outer half darker; tuft a little before the middle, not long enough to reach to the end, slight. Body hairs moderate, stout, not long, the thoracic ones slightly barbed, the posterior abdominal ones single. Tube longer, about three times as long as wide, a double posterior pecten of pale, single-toothed spines (Fig. 1, B), the last three larger and remote, followed by a rudimentary tuft. Anal segment broadly plated, reaching to the middle of the sides or a little below; tuft and brush normal, the latter with small tufts before the barred area. Anal finger-shaped processes long, narrowly taper-pointed.

Pupa.—Normal, small, the air tube cylindrical, slightly bent but not windened into funnel shape.

***Culex sollicitans* Walker.**

Stage IV.—(Pl. XVII, Fig. 2.) Head rather dark brown, the antennæ slender, slightly tapered, with the tuft at the middle of the joint. Body hairs rather stout and short from infuscated basal tuber-

cles. Tube about twice as long as wide, conic-tapered, brown infuscated, with posterior double pecten and small tuft. Anal segment completely ringed, brown with normal tuft and ventral brush, the latter without tufts before the barred area. Latera comb of the eighth segment a small patch of rather large thorn-shaped spines scarcely more than two rows deep. Anal finger-shaped processes often very small, scarcely longer than wide.

Pupa.—Normal, not distinguishable from allied species.

***Culex pipiens* Linnæus.**

Stage IV.—(Pl. XVII, Fig. 3.) Head rounded, full at the sides, pale; antennæ large and long, completely infuscated or, in pale specimens, somewhat lighter at the base, the tuft at the outer third of the joint and the part beyond it more slender than the basal part. Abdominal hairs stout, moderate, the thoracic ones with infuscated tubercles and scarcely barbed, abdominal ones double, but slight. Tube four times as long as wide, strongly tapered on terminal half, pale brown; a small weak double posterior pecten followed by several tufts of hair. Anal segment completely ringed by the plate, pale brown; tuft and brush normal, the latter confined to the barred area. Comb a large patch of small spines in a low triangle about four rows deep (Fig. 3, *B*).

***Culex melanurus* Coquillett.**

Egg.—Laid singly and separate, floating on the surface. Elliptical, rounded rather bluntly at one end, tapering to the other which is smaller, but also rounded; one side flattened; finely granular with rounded, projecting granules which are larger at the ends, conspicuously so at the big end, forming a sort of cap which terminates on the flattened side in a slight ridge. On the central part of the egg the sculpturing resembles a fine shagreen. Opaquely sordid white, the ends black. Length, .9 mm.; width, .15 mm.

Stage III.—Head rounded, pale brown, the antennal tuft at the outer fourth of the joint, the short terminal part slenderer than the basal part, all infuscated and darker than the head. Body hairs numerous on the thorax but rather short and with small basal tubercles, slightly barbed; abdominal ones becoming smaller posteriorly. Tube rather more than four times as long as wide, a little bent and only slightly tapering, being three fourths as wide at tip as at base; a small weak double pecten, unusually closely placed and followed by several slight irregular tufts. Comb a single row of spines produced

into long pointed bars. Anal segment with a dark brown oval dorsal plate, not reaching the middle of the sides; brush and tuft normal; rather slight, the latter confined to the barred area.

Stage IV.—(Pl. XVIII, Fig. 1) Head dark brown, the long slender curved antennæ with the tuft at the outer fourth as before, the basal part rather coarsely spined; all dark brown. Body hairs rather stout, short, the abdominal ones slighter posteriorly. Tube about five times as long as broad, slightly uniformly tapered, dark brown, the tip black; double basal pecten, closely placed as before and followed by scattering tufts. Comb a single row of long bars (Fig. 1, *B*).

Pupa.—Normal, small, the air tubes short funnel-shaped, narrowed at base.

***Culex dyari* Coquillett.**

Stage IV.—(Pl. XVIII, Fig. 2.) Head rounded, pale brown; antennæ stout, the tuft at the outer third and the part beyond it smaller, strongly infuscated at the tip and very narrowly so at the base, the center of the joint broadly pale whitish. Body hairs stout, rather long, from infuscated tubercles on both thorax and abdomen. Tube about four times as long as broad, tapering rather abruptly beyond the middle, the tip not tapered; a small, double, approximate basal pecten, not followed by any hair tufts. Anal segment completely ringed, the chitin darker and covered with numerous little spines dorsally, pierced ventrally by seven little holes for a series of tufts that precede the barred area; brush and tuft normal. Comb a large patch of numerous small spines, many rows deep (Fig. 2, *B*).

Pupa.—Normal, the air tubes funnel-shaped.

***Culex restuans* Theobald.**

Egg.—Laid in a large boat-shaped mass as in *C. pipiens*, the eggs adhering by their sides and standing perpendicularly to the water, the mass floating freely. Elliptical, fusiform, the end sharply tapered, the micropylar one less so; smooth, finely shagreened, brown black without mucilage, the shell rather thin. Length, .6 mm.; width, .2 mm.

Stage I.—Head rounded, nearly colorless, the eyes round, scarcely transverse; antennæ moderate, rather stout, with long terminal hairs, uniform, the tuft a little before the middle of the joint, composed of two hairs which are long enough to reach beyond the tip. Body hairs slight but rather numerous. Tube somewhat fusiform, about three

times as long as wide, the outer half infuscated, the basal half colorless with slight double pecten followed by several hairs; division of the infuscated area irregular. Anal segment with a rather large dorsal plate; terminal tuft double, normal; no ventral hairs. Comb of nine spines in a straight transverse row.

Stage II.—Head rounded, pale, eyes still round; antennæ proportionately smaller, stout, the outer half a little more slender, the tuft at the middle, weakly infuscated outwardly. Body hairs slight, becoming single posteriorly. Tube pale brown, conically tapered, about three times as long as wide, a double many-toothed pecten followed by several hairs. Anal segment as before with the small ventral brush added. Comb of 16 spines in an irregular double row.

Stage III.—Head as before, the antennæ more distinctly infuscated at tip and more markedly smaller on the outer half. Tube about three and a half times as long as wide with pecten and hairs as before. Anal segment broadly plated, the ventral brush confined to the barred area. Comb a triangular patch of spines about three rows deep.

Stage IV.—(Pl. XVIII, Fig. 3.) Head pale brown, the eyes transverse; antennæ moderate, the tuft at the middle, the basal half pale, the outer half smaller and infuscated. Thoracic hairs numerous, rather short, from infuscated tubercles; abdominal hairs slight, single posteriorly. Tube four times as long as wide, pale brown, gently tapering on the outer half, the pale double pecten (Fig. 3, *A*) followed by a few long hairs. Anal segment completely ringed, a few spines on the posterior half dorsally, tuft and brush normal, the latter confined to the barred area. Comb a triangular patch of little spines four rows deep.

Pupa.—Normal, air tube slender, cylindrical, curved, rather long and not funnel-shaped.

***Coretha brakeleyi* Coquillett.**

This larva has been referred to by Dr. John B. Smith (Can. Ent., XXXIV, 139, 1902) and by myself (Proc. Ent. Soc. Wash., V, 50, 1902). The specimens from which the figure (Pl. XIX, Fig. 1) was made were received from Dr. Smith, who, with Mr. J. Turner Brakeley, is originally responsible for the association of larva and adult. I have recently been able to confirm their work by breeding larvæ kindly sent me by Mr. Brakeley.

The larva is in general of a culicid type, breathing air by a normal air tube and furnished with hair tufts. The peculiarly shaped antennæ suggest a predaceous habit.

Corethra trivittata Loew.

This larva (Pl. XIX, Fig. 2) resembles that of *C. plumicornis* as figured by Westwood (Int. Class. Ins., II, 315, 1840, Fig. 124, 12 and 13). It is not of a culicid type, but resembles the Cheironomids. It has no air tube and never comes to the surface, taking air from the water through the body walls. The head has a peculiar projection in front from which depends a double hook (Fig. 2, *C*), which seems to be the antennæ. It is used for seizing prey, as the larva is predaceous. The thorax is swollen, the segments consolidated and contains a pair of curved air bubbles; a similar smaller pair is situated in the seventh abdominal segment. Abdomen smooth, without hairs, gradually tapering behind, almost perfectly transparent. Anal segment with two dorsal hairs and a large ventral brush composed of single barbed hairs, not tufts; four anal finger-shaped processes.

The pupa is shown side and front views (Fig. 2, *D* and *E*). It remains upright in the water or resting on the bottom, very rarely coming to the surface. Larvæ in dirty marshes, Center Harbor, New Hampshire.

EXPLANATION OF PLATES.

PLATE XVI.

Fig. 1. Larva of *Culex canadensis* THEOB., stage IV. *A*, one of the pecten teeth of the air tube enlarged; *B*, the lateral comb of the eighth abdominal segment enlarged.

Fig. 2. Larva of *Culex atropalpus* COQ., stage IV.

Fig. 3. Larva of *Culex sylvestris* THEOB., stage IV.

PLATE XVII.

Fig. 1. Larva of *Aedes fuscus* O.-S., stage IV.

Fig. 2. Larva of *Culex sollicitans* WALK., stage IV.

Fig. 3. Larva of *Culex pipiens* LINN., stage IV.

PLATE XVIII.

Fig. 1. Larva of *Culex melanurus* COQ., stage IV.

Fig. 2. Larva of *Culex dyari* COQ., stage IV.

Fig. 3. Larva of *Culex restuans* THEOB., stage IV.

PLATE XIX.

Fig. 1. Larva of *Corethra brakeleyi* COQ.

Fig. 2. Larva of *Corethra trivittata* LOEW. *A*, mature larva, side view; *B*, the same, back view; *C*, head of larva, side view, enlarged, the mouth parts in part opened; *D*, pupa, ventral view; *E*, the same, side view.



Dyar, Harrison G. 1902. "Illustrations of the Larvæ of North American Culicidæ. II." *Journal of the New York Entomological Society* 10, 194–201.

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