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Marion Smith

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**A NEW NORTHERN Aedes MOSQUITO, WITH
NOTES ON ITS CLOSE ALLY, Aedes DIAN-
TAEUS H., D., & K. (DIPTERA, CULICIDAE).¹**

By MARION E. SMITH, Amherst, Mass.

In late April and early May of 1949, a number of larvae of a small *Aedes* mosquito were collected by the writer in a sphagnum bog in Belchertown, Mass. By means of available keys and descriptions, these larvae and their reared adults could be referred only to *Aedes diantaeus* H., D., & K., a rare and local northern species first described from Dublin, N. H., but not reported from Massachusetts. However, certain differences, particularly in the larval chaetotaxy, raised some doubts as to the validity of the determination. Accordingly, specimens of larvae and adults were sent to Dr. Robert Matheson of Cornell University, who kindly compared them with his material and wrote, "As far as I can determine, your material is undoubtedly *A. diantaeus* unless you wish to break up the species on the basis of larval characters as found in Massachusetts."

In 1951, however, Mr. John Weidhaas, a graduate student in this department, discovered a rich mosquito breeding pool in Westhampton, Mass., about twenty-five miles north of Belchertown, from which were collected a single larva of the Belchertown type, and other larvae whose structure corresponded rather closely with Dyar's description of the larva of *A. diantaeus*. Adults reared from these larvae possessed terminalia so markedly different from the Belchertown mosquitoes that it became clear that two species were involved, both of which could be keyed out only to *A. diantaeus*.

The question now arose as to which of these two species was the true *diantaeus*. Through the kindness of Mr. C. F. W. Muesebeck and Dr. Alan Stone of the U. S. National Museum, the entire museum collection of adults and larvae of *A. diantaeus*, most of them determined by Dyar, was made available for study. Of nearly 200 adults, all but one proved to be identical in coloration and in structure of the male genitalia with the Westhampton species; the only exception was a single "topotypic" male from Dublin, N. H., which corresponded nearly exactly in size, coloration, and genitalic structure with the Belchertown species. Of the larvae, a single Alaskan specimen was identical with those

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from Belchertown; the others fitted Dyar's description of *diantaeus*, but showed sufficient range of variation so that the Westhampton specimens clearly fitted here. It was obvious, therefore, that both species had been collected before, that both had been referred to *diantaeus*, even by Dyar, and that of the two species, the Westhampton form was represented by the majority of specimens, the Belchertown type being even more rare and local than the other.

A collection of adults made at the type locality of *A. diantaeus* in early June yielded five females, captured while biting, and referable to this species. All of these agreed with the Westhampton form, and were clearly distinct from the "topotypic" male. Finally, comparison with Dyar's types in the U. S. N. M. positively confirmed the Westhampton mosquito as the true *diantaeus*, and the Belchertown species as a new one.

Very little confusion between the two species has occurred in the literature. With a few exceptions, references to *A. diantaeus* undoubtedly apply to that species. Unfortunately, one of the exceptions is in Matheson's *Handbook of the Mosquitoes* (1944), in which the description and figure of the male genitalia of *A. diantaeus* are referable to the new species, although the descriptions of the larva and female apply to the true *diantaeus*. This confusion of the two species explains Matheson's confirmation of the Belchertown mosquito as *A. diantaeus* through comparison with his own material; and the slight and not obvious differences between the two species make such confusion understandable and possibly explain why Dyar included only two of the three males collected in Dublin, N. H., in 1909 as types of *diantaeus*, but did not describe the third male as a new species.

Only two other writers, Irwin (1943) and Freeman (1949) indicate by their keys and descriptions that they have encountered the new species. The larvae (presumably from Canada) described briefly by Freeman differ from local specimens only in the antennae, which he says may be "as long as or longer than the head"; in all specimens seen by this writer the antennae are about as long as but not longer than the head. Irwin (1943) discusses the probable occurrence in Michigan of two or more species in the *diantaeus* complex, based upon three types of larvae which were referable to *diantaeus* in keys. As *Aedes* sp. 23, near *diantaeus*, he unmistakably describes larvae of the new species in some detail, considering them sufficiently distinct from known described larvae to warrant a separate description. Unfortunately, only a few specimens were collected, with no adults that could be declared correctly associated. His *Aedes* sp. 22, near *diantaeus*, is essentially identi-

cal with specimens collected in Westhampton, and represents one of the larval variations within this species, differing from other published descriptions of *diantaeus* in the numbers of the lateral abdominal hairs.

With considerable numbers of specimens of most stages of both species available, from numerous localities, it has seemed advisable not only to describe the new species in detail, but to re-describe *A. diantaeus* itself. This procedure affords a better basis for comparison of the two species, and also makes possible inclusion of several characters and a range of variation not considered in previous studies of *A. diantaeus*.

In the descriptions of the larvae, Belkin's (1950) terminology has been adopted; for the pupae, Darsie's (1951) descriptions have been followed; and for the adults, the terminology of Matheson (1944) and of Gjullin (1946). Drawings of comparable parts of the two species are on the same scale.

***Aedes* (*Ochlerotatus*) *pseudodiantaeus* n. sp.**

Aedes diantaeus H., D., & K.—Matheson, 1944, Handbook Mosq. N. A., rev., pp. 167-8 (male genitalia only), pl. XVI, fig. 6; Freeman, 1949, Instructive guide for northern insect survey parties, Can. Dept. Agr., Div. Ent., mimeo.: 20, 23 (larva); Barnes, Fellton, & Wilson, 1950, Mosq. News 10: 71 (Dryden, N. Y., reference).

Aedes sp.—Irwin, 1943, Pap. Mich. Acad. Sci., Arts, & Lett. 28: 390 (sp. 23, larva); Weidhaas, 1952, Mosq. News 12 (1); publ. pending.

ADULT FEMALE.—A small black-legged mosquito with paired brown thoracic stripes; wings 3-3.5 mm. long; abdomen 2.5-3 mm. Proboscis and palpi black-scaled. *Torus* (pedicel of antenna) with integument deeply infuscated, a few minute black setae on mesal surface. *Occiput* clothed laterally with flat white scales; dorsally with pale yellow, narrow, curved, procumbent scales, the nape with pale yellow scales shallowly bifid or trifid at apices; with sub-dorsal patches of dark brown flat and erect scales, usually distinct, rarely reduced to a few dark erect scales; setae pale yellow or dark brown. *Anterior pronotal lobes* and *post-pronotum* clothed in their lower portions with flat white scales; postpronotum with patch or stripe of dark brown scales usually distinct, or represented by at least a few dark scales; *mesonotum* dark, clothed with narrow, curved, golden to very pale yellow scales; a pair of narrow well-defined longitudinal stripes of very dark brown scales extending to ante-scutellar area or surrounding

it, the stripes separated by a stripe of pale yellow scales narrower than dark stripe; in a few specimens the stripes are less distinctly separated, or less clearly defined from the yellow sides; short posterior half-stripes of dark scales between ante-scutellar area and wing bases often distinct, usually represented by at least a few dark scales; setae golden or brown; *scutellum* with yellow scales and setae; *pleural region* with patches of flat white scales; hypostigial spot of scales absent; post-spiracular setae 2-8 in number; lower mesepimeral setae absent; sternopleural setae (Pl. I, fig. 2) few, usually 5 or 6, not more than 10, with only 1-4 just anterior to the lower edge of mesepimeron, arranged in a vertical line. *Wings* with dark scales, or with a few pale scales restricted to base of second vein; *halteres* with pale stems, knobs pale or slightly infuscated, clothed with flat white scales. *Legs* with very dark purple-brown scales except for coxae, trochanters, and femora ventrally, which are pale with white scales; hind femur with dark scales only on apical half or less, the rest pale-scaled; femora usually with a few pale scales at apices. *Abdominal segments* with dark purple-brown scales dorsally; apical setae pale dorsally, dark ventrally; segments 2-7 basally with lateral triangular spots of white scales, not united; ventrally, the segments white-scaled, each with an apical band of dark scales which is distinctly produced basad as a triangle, the white bands sometimes reduced to lateral basal spots.

FEMALE GENITALIA.—Mr. E. I. Coher, who has kindly examined the female genitalia of the two species, states that they are typically *Ochlerotatus* in appearance (see Coher, 1948). *A. pseudodiantaeus* is smaller, and the few specimens examined (all topotypic) had no more than 5 setae on each posterior lobe. *A. diantaeus* showed a slight broadening of the postgenital plate (noticeable when only the two species are compared) and no specimen examined had less than 7 setae on a posterior lobe nor more than 12. No other differences were noted that were not highly variable.

ADULT MALE.—Similar to female in coloration, but with white scaling of abdomen reduced, patches of dark scales on occiput and postpronotum usually reduced to a few scales, and posterior half-stripes absent or poorly developed.

MALE GENITALIA (Pl. I, fig. 1).—*Dististyle* (clasper) slightly expanded medianly, with usually four sub-apical setae about as long as claw; claw short, tapered. *Basistyle* (side-piece) slender, nearly three times as long as wide, outer margin only slightly concave; *dorsal surface* (fig. 1A) clothed with scales,

spicules, and numerous long and short setae; *apical lobe* short, broadly rounded, reaching almost to basal lobe, its dorsal surface edged mesally with short retrorse setae; ventral surface (fig. 1B) just beyond middle with a brushlike tuft of fine, closely-set setae, golden-brown to black in color, which arise from a narrow elongate patch on the mesal edge, are directed meso-caudad, and surpass apex of basistyle; a smaller patch of similar setae on mesal margin between basal tuft and dististyle; a few very long stout setae near basal tuft and toward apex of basistyle, and a cluster of short setae basad of hair-tuft; *basal lobe* large, quadrangular, surpassing middle of basistyle, clothed with small setae and minute setulae, and bearing at its apex two stout curved spines rising from a common tubercle, mesal spine longer, more angulate, and much flattened; at its base, a long stout spine, borne on a weak protuberance, directed somewhat cephalad, and far surpassing meson. *Claspette stem* stout, curved sharply outward, angulate and curved dorsad beyond middle, narrowed apically, finely setose with a small spine at outer angle; *filaments of claspettes* approximate, each with a slender base and a greatly expanded and arcuate terminal portion armed with sharp recurved dorsal and ventral points. *Tenth sternites* slender, with recurved approximate tips; *anal membrane* with a few small setae at apex; *mesosome* cylindrical, not heavily chitinized, narrowed and constricted at apex, ventral side almost closed, dorsal side closed for a very short distance, the base forming a very thin ring. *Ninth tergite* with small, nearly approximate lobes, each with 4 (sometimes 5) stout spines; *ninth sternite* with caudal margin scarcely invaginated, usually with 2 small setae on each side and a single mid-ventral one.

Females of *A. pseudodiantaeus* can usually be distinguished from those of *A. diantaeus* by the presence of dark scales on the occiput, and also on postpronotum (very rarely present in *diantaeus*); by the often well-developed posterior half-stripes (rare in *diantaeus*); by the deeply infuscated tori; by the smaller size; and by the reduced sternopleural setae. The latter character seems to be most helpful in distinguishing between small specimens, or between *diantaeus* with increased dark markings and *pseudodiantaeus* with reduced dark scales. Separation of the males is not always possible by coloration alone, but the sternopleural setae are helpful.

The genitalia of the males are readily distinguishable; *pseudodiantaeus* lacks the sharply-produced apical lobe of *diantaeus* and the sharp inner angle of the claspette stem; the claspette stem is curved sharply outward, and its filament, broadly expanded in both species, is less flattened and terminates in two, rather than in one,

recurved points; the dense hair-tuft, so conspicuous in both species, is more elongate and is directed more nearly caudad; the ninth tergite lobes bear fewer spines, and the basal spines, the spines at the apex of the basal lobe, the arrangement of the setae on the basistyle, and other characters show constant differences.

LARVA: *Fourth instar* (Pls. II, III).—Length 6–7 mm. *Head* (Pl. II, fig. 1) wider than long. *Antenna* nearly as long as head, at least as long as frontal suture to occiput, tapered and strongly spiculated beyond tuft, sparsely spiculated basad; *antennal tuft* (1) inserted just before middle, double and reaching apex of shaft or 3- to 5-branched and shorter; *apex of antenna* (fig. 2) with inner subapical seta (2) one-fourth to one-fifth as long as antenna, outer subapical (3) and terminal (4) setae and segmented finger process (6) about half as long as first spine, hyaline process (5) very short. *Head hairs: preantennal* (7) 1- to 4-branched, usually double, half as long as antenna or longer; uppers (5) and lowers (6) single or double and more than half as long as antenna, rarely all single or all double or an upper triple; hairs often incompletely branched or split toward apex, when single markedly stouter and longer than double hairs; other head hairs minute, 1- to 4-branched, post-clypeals (4) between and nearly in a line with the lower head hairs; all macroscopic head and body hairs very coarse and stout (fig. 3), of nearly uniform diameter throughout, scarcely tapered at apex, and sparsely barbed, the barbs scarcely longer than diameter of hair, and visible only under high magnification. *Prothoracic hairs* (fig. 4): #1 single, as long as antenna; #2–4 minute; #5–7 usually single, 5 or 7 very rarely double or triple, all surpassing the head in length. *Lateral abdominal hairs* (6 and 7) both developed and single on segments I and II, #6 single on III–VII, #7 reduced to a small multiple tuft. *Comb* (Pl. III, fig. 1) of eighth segment consisting of 5–7 (usually 6) thorn-shaped scales in a curved even row, much as in *A. implacabilis* Wlk., rarely with some scales out of line; individual scales (figs. 1B, 1C) with a narrow central spine as long as base or longer, the base fringed laterally with spinules which are stronger distally. *Siphon* 3.5–4 times as long as basal width, tapering gradually; *pecten* reaching to middle of siphon or slightly beyond, consisting of 9–12 closely-set teeth and 1–3 stronger somewhat detached teeth; individual tooth with 3 or 4 small denticles on basal half, outermost tooth smooth; *siphonal tuft* (1) 3- to 7-branched, at least as long as width of siphon at point of insertion, inserted about a tooth's length beyond pecten; *dorsal preapical hair* (2) single, minute. *Dorsal plate of anal segment* usually distinctly longer than wide,

incomplete, sometimes touching at points along mid-ventral line but never completely fused; *lateral saddle hair* (1) single, shorter than plate; *anal gills* tapered, $1\frac{1}{2}$ -2 times as long as dorsal plate; *dorsal brush* consisting of a single lower or outer hair (3), and a tuft of 2-4 upper or inner hairs (2) about half as long as lower hair or longer; *ventral brush* (4) sparsely developed, with 10-12 paired tufts in the barred area, preceded by about 3 small tufts.

Second and third instars.—Essentially as in fourth instar, except that head hairs are single; antennae are somewhat shorter; anterior thoracic hairs are proportionately shorter, not surpassing the head; hair tufts of thorax and abdomen are generally reduced; dorsal plate of anal segment does not extend more than halfway down segment; and pecten often does not reach middle of siphon.

A. pseudodiantaeus can readily be distinguished from *A. diantaeus* in its larval stage by its shorter antennae, the single long seta at apex of antenna, the coarser head and body setae which have such short barbs that they appear almost bare, the reduced number of comb scales, and by other less obvious differences.

PUPA. (Pl. III, fig. 2).—*Cephalothorax*: *Seta 6* simple, moderately short; *seta 8* long, 2- to 4-branched; metathoracic setae (fig. 2A) medium long, *seta 10* with 2-4 branches, *seta 11* usually double, *seta 12* single or double. *Respiratory trumpet* (fig. 2C) gradually widened apically, constricted at base, somewhat truncate and notched at apex, most of surface reticular; 3.25-3.87 times as long as its greatest width, 4-7 times its own pinna. *Abdomen*: on tergum I, reticulation between float hairs present; *seta K* medium long, usually double (1-3); *seta S* longer, single or double; *seta U* small simple. On terga II-VIII: *seta A* minute, simple, lateral on II-VI; medium long, usually double (1-3) on VII; sparsely plumose, 1- to 3-branched on VIII. *Seta B* medium long on II and VII, longer on III, very long, as long as following tergite, on IV-VI; usually double (1-4) on II-VI, single on VII. *Seta C* small, multiple (2-6) on II; medium long on III-VII, seldom more than half as long as following tergite, single or double. *Seta 1* medium long, usually simple on II-VI, 1- to 4-branched on VII. *Seta 2* medium long and simple or double on II, small on III-VI, medium on VII; 2- to 5-branched on III, usually single (1-4) on IV-VI, double (1-2) on VII. *Seta 3* small on II, usually double (1-4). *Seta 4* small on II-VI, medium on VII; 2- to 4-branched on II, usually double (1-4) on III-IV, usually single on V-VI, single or double on VII. *Seta A'* on VIII medium long, single or double, sparsely plumose. *Seta v* on IX absent. *Paddle* (fig. 2B) ovoid, posterior margin mostly smooth, several rows of well-de-

veloped submarginal denticles of various sizes present, often protruding beyond margin; surfaces sparsely clothed with minute denticles; midrib almost reaching apex; *terminal seta x* well-developed, single, slightly laterad of apex.

A. pseudodiantaeus differs from *A. diantaeus* in the pupal stage most noticeably in the branching of *seta A* on VIII, having only 1-3 simple branches as compared with the 3-5 major branches and 7-15 sub-branches of *diantaeus*; it also differs in its usually smaller size, its shorter and less-branched setae, in the more numerous and relatively larger submarginal denticles of the paddle, and in other points.

In Darsie's pupal key to the species of *Aedes* (1951, p. 9) this species keys out with *A. diantaeus* to couplet 6. It agrees with *A. triseriatus* Say in having *seta C* usually reduced in length, but does not agree in its other characters, nor with the second part of the couplet.

TYPES.—*Holotype*, ♂, Belchertown, Mass., May 10, 1950 (reared), M. E. Smith. *Allotype*, ♀, same, May 29, 1951. *Paratopotypes*: 20 ♂♂, 46 ♀♀, May 4-15, 1949, May 10-16, 1950, May 11-29, 1951, M. E. Smith; in alcohol, about 50 additional imperfect specimens, same data. Other *paratypes*: 1 ♂, Dublin, N. H., A. Busck (USNM); 1 ♂, Ringwood, Dryden, N. Y., June 11, 1923 (Cornell Univ.); 1 ♂, with associated larval exuviae, Goose Bay, Labrador, June 19, 1948; 1 ♂, same, July 3, 1948; 1 ♀, same, with associated larval & pupal exuviae, June 23, 1948; 1 ♀, same, July 2, 1948; all by H. C. Friesen (CNC); 1 ♀, same, 1949 (CNC). *Nepionotype* (larva), Belchertown, Mass., May 9, 1951, M. E. Smith. *Neanotype* (pupa), same, May 11, 1950, M. E. Smith. Other larval & pupal paratypes: about 100 larvae and larval exuviae, 20 pupae and pupal exuviae, Belchertown, Mass., March-May, 1949-51. M. E. Smith; Fairbanks Circle M. P. 35, Alaska, single larval & pupal exuviae, May 29, 1947 (Gjullin, Wilson, & Stone). *Holotype*, *allotype*, *nepionotype*, and *neanotype* deposited in USNM; *paratypes* deposited in USNM, USPHS collections, Canadian National Collection, and collections of Cornell University and the University of Massachusetts.

Other records: Westhampton, Mass., April 22, 1951, M. E. Smith (larva, instar IV); Sunderland, Mass., April 28, 1951, E. I. Coher (larva); Bryant's Bog and Mud Lake, Cheboygan Co., Michigan, April-May, 1937-39, W. H. Irwin (larvae described).

DISTRIBUTION.—It is to be expected that the species will follow approximately the same distribution as *A. diantaeus*, through northern United States, Canada, and Alaska, since the two species

have been taken in the same localities in Massachusetts, New Hampshire, Labrador, Michigan, and in close proximity in Alaska.

BIOLOGY.—Larvae and pupae of *A. pseudodiantaeus* were collected in a sphagnum bog-swamp in Belchertown, Mass., in 1949, 1950, and 1951 in considerable numbers, often 15 or 20 to the dip. Associated with the species were *A. implacabilis* Wlk., *A. ex-crucians* Wlk., *A. canadensis* Th., *Mochlonyx culiciformis* DeG., and *Culiseta morsitans* Th. in abundance; a few *A. cinereus* Mg. and *Corethrella brakleyi* Coq.; single specimens of *Culex apicalis* Ad. and *Culiseta melanura* Coq.; and numerous larvae of *Wyeomyia smithii* Coq. in the pitcher plant leaves. First instar larvae of *A. pseudodiantaeus* were collected with first instar *implacabilis* as early as March 24 (1951), before the ice had completely disappeared from the swamp. By April 1, both first and second instars were present, along with first instar *A. ex-crucians* and *M. culiciformis*. Third instars were collected on April 18, with first instar *A. canadensis* and *C. morsitans*; some larvae of *implacabilis* had reached fourth instar by this time, and their pupae were found a few days later. Fourth instar *pseudodiantaeus* were found from April 20 (1949) and May 4 (1951) through May 15 (1951); pupae were found from May 7 (1949) through May 15 (1951) but must have been present for a few more days as fourth instar larvae were collected on the latter date. All larvae and pupae of *pseudodiantaeus* had disappeared by May 29. *A. implacabilis* adults had all emerged before the last *pseudodiantaeus* larva pupated; *A. ex-crucians* pupated almost simultaneously with *pseudodiantaeus*; *A. canadensis*, *A. cinereus*, *C. morsitans*, *M. culiciformis*, and *C. apicalis* were present in second, third, and fourth instars during the pupal period of *pseudodiantaeus*, although by May 29 many of these had pupated.

The swamp lies in an extensive low area, at altitude 425', about one mile south of Belchertown on the Bondsville Road. It is densely overgrown throughout with swamp shrubs such as high-bush blueberry, with numerous spruces, many of them dead, and is shaded by bordering hemlocks and hardwoods. Several feet of water stand in the swamp in the spring; by early summer the edges dry, and the center becomes a quaking bog; late in the season it dries completely. The edges are characterized by tufts of sedges and by shallow shaded or sunlit pools filled with fallen leaves, where *A. implacabilis*, *A. ex-crucians*, and *A. canadensis* are particularly abundant. The central area, reached safely in spring only on fallen logs or by hopping from one island of shrubby vegetation to another, is filled with dense pockets of sphagnum moss, with scattered clumps of pitcher plant. It is in the deepest and coldest sphagnum

pools that *pseudodiantaeus* occurs. While any of the mosquito species of the swamp may occur in these pools, often *pseudodiantaeus* occurs alone or with only a few larvae of *A. excrucians* or *C. morsitans* intermixed. Although the larvae taken from this Belchertown swamp were associated with the deep sphagnum pools, the single specimens collected in Westhampton and Sunderland came from quite different types of habitats, a woodland pool and a permanent bog, neither one characterized by sphagnum moss; possibly the absence of more suitable conditions was the reason for the number collected.

In the early afternoon of May 29, 1951, a warm overcast day, many adult females were captured in the central area of the swamp. They came in numbers to clothing, stockings, face, and arms, attacking readily but with a scarcely noticeable bite, and were easily captured before biting. Their song is a very thin high whine, much higher than that of their associates, *A. canadensis* and *A. implacabilis*. Males were noted hovering about females in the shrubbery, singly; no swarming was observed.

(To be concluded in the April issue)

**A NEW NORTHERN AEADES MOSQUITO, WITH
NOTES ON ITS CLOSE ALLY, AEADES DIAN-
TAEUS H., D., & K. (DIPTERA, CULICIDAE).¹**

By MARION E. SMITH, Amherst, Mass.

(Continued from the February issue)

Aedes (Ochlerotatus) diantaeus H., D., & K.

Aedes diantaeus H. D., & K., 1917, Mosq. No. & Cent. Am. IV: 758; II: pl. 24, fig. 167.—Dyar, 1919, Ins. Ins. Mens. 7: 20 (larvae, Ont.).—Dyar, 1920, Ins. Ins. Mens. 8: 7 (Br. Col.).—Edwards, 1921, Bull. Ent. Res. 12: 311 (Finland, Denmark).—Dyar, 1921, Trans. Roy. Can. Inst. 13: 92 (Pt. 1).—Wesenberg-Lund, 1921, Danske Vid. Selsk. Skr. nat.—mat. Afd. 7(1): 88–91 (Denmark, fig. larva).—Dyar, 1922, Proc. U.S.N.M. 62: 54 (Montana).—Dyar, 1922, Ins. Ins. Mens. 10: 68; 85 (Glacier Park).—Dyar, 1923, Ins. Ins. Mens. 11: 43 (Yellowstone Park).—Dyar, 1928, Mosq. Amer. p. 174, pl. 39, fig. 128 (larva, male genitalia).—Mondschadsky, 1930, Zool. Jahrb. Allg. Zool. 58: 601–603 (Russian Far East; larva, instars I–IV).—Martini, 1930, *In* Lindner, Flieg. Paleark. Reg. 11 and 12, p. 274 (fig. larva).—Edwards, 1932, Gen. Ins. Fasc. 194: 144.—Mail, 1934, Mont. Agr. Exp. Sta. Bull. 288: 24.—Mondschadsky, 1936, Faune URSS Moscow #24: 253–255 (figs.).—Owen, 1937, Minn. Agr. Exp. Sta. Tech. Bull. 126: 35–36, fig. 4 (distribution, Minn.).—Tulloch, 1939, Psyche 46: 122, 123 (keys).—Irwin, 1941, Ent. News 52: 102 (Michigan).—Irwin, 1942, Ecol. 23: 472–476.—Irwin, 1943, Pap. Mich. Acad. Sci., Arts, & Lett. 28: 384–385, 389–390 (*Aedes sp.* 22).—Matheson, 1944, Handbook Mosq. N. A., rev., pp. 167–168 (larva & female only).—Gjullin, 1946, Proc. Ent. Soc. Wash. 48: 215–221.—Natvig,

¹ Contribution from the Department of Entomology, University of Massachusetts.

1948, Norsk. Ent. Tidsk. Suppl. I: 362-363 (fig.).—Barnes, Felton, & Wilson, 1950, Mosq. News 10: 71 (Lake Placid, N. Y., reference); Hennig, 1950, Die Larvenformen der Dipteren, Teil 2: 152.—Rempel, 1950, Can. Journ. Res. (D) 28: 224, fig. 25 (larva) (Alaska).—Mondschadsky, 1951, Larvae of bloodsucking mosquitoes of Russia and neighboring countries, Moscow, #37: 174-175 (fig.).—Yamaguti and LaCasse, 1951, Mosquito Fauna N. A. Pt. V (Aedes): pp. 13, 14, 25, 67-69; pls. XXI, XXII (larva & adults); Office of the Surgeon, HQ Japan Logistical Command.—Weidhaas, 1952, Mosq. News 12 (1); publ. pending.

Aedes serus Martini, 1920, Arch. f. Schiffs.—u. Trop. Hyg. 24: 96-99, figs. 27-29 (Germany; larva & male).—Synonymized by Edwards, 1921, loc. cit.; Dyar, 1922, Ins. Ins. Mens. 10: 68.

ADULT FEMALE.—A medium-sized, black-legged mosquito with paired brown thoracic stripes; wings 4-6 mm. long, usually 5-6 mm.; abdomen 3-3.5 mm. Proboscis and palpi black-scaled. *Torus* (pedicel of antenna) with integument of outer posterior side yellow to light brown, rarely infuscated; infuscated mesally, with a cluster of small dark setae and sometimes a few dark scales. *Occiput* clothed with pale yellow scales, without spots or stripes of dark scales; dorsally with narrow, curved, procumbent scales, the nape with narrow erect scales shallowly bifid; laterally with flat scales; setae pale or brownish. *Postpronotum* usually pale-scaled, sometimes with a few dark scales or rarely (4 specimens out of 200) with a large distinct patch of dark scales; *mesonotum* dark, clothed with narrow curved scales, golden to pale yellow in color; a pair of narrow, well-defined, longitudinal stripes of very narrow dark brown scales extending to ante-scutellar area or surrounding it, the stripes sometimes coalesced into a single broad, median one, but usually separated by a band of pale scales not wider than one of the brown stripes; posterior half-stripes of dark scales rarely distinct, sometimes represented by a few dark scales intermediate between ante-scutellar area and wing-base; thoracic setae golden or brown; *scutellum* with yellow scales and setae; anterior pronotal lobes and postpronotum clothed in their lower portions with flat white scales; *pleural region* with patches of flat white scales; hypostigial spot of scales absent; post-spiracular setae 8-10 in number; lower mesepimeral setae usually absent, single in 13 and double in 4 specimens out of 200; sternopleural setae (Pl. I, fig. 4) well-developed, 12-20, with 7-12 in a patch just anterior to and below lower edge of mesepimeron. *Wings* with dark scales, pale

scales restricted to base of second vein, costa entirely without pale scales; *halteres* with pale stems, knobs pale or slightly infuscated, clothed with flat white scales. *Legs* with very dark purple-brown scales, except for coxae, trochanters, and femora ventrally, which are white-scaled; hind femur with dark scales only towards its tip, remainder white-scaled; femora usually with a few pale scales at apices. *Abdominal segments* with dark purple-brown scales dorsally; segments 2-7 laterally with basal triangular spots of white scales, sometimes united by a narrow basal white band; ventrally, the segments white-scaled, with apical dark bands slightly produced basad medianly.

ADULT MALE.—Similar to female, usually smaller in size; tori often deeply infuscated.

MALE GENITALIA (Pl. I, fig. 3).—*Dististyle* (clasper) broadly expanded medianly, armed with about four sub-apical setae; claw short, tapered. *Basistyle* (side-piece) stout, about twice as long as wide, outer margin markedly concave; *dorsal surface* (fig. 3A) clothed with scales, spicules, and long and short setae; *apical lobe* conical, well-developed, sharply projecting mesally, clothed with small retrorse setae on dorsal surface and mesal margin; *ventral surface* (fig. 3B) just beyond middle with a brush-like tuft of fine, closely-set setae, golden-brown to black in color, which arise from an oval patch near mesal edge, are directed mesad, and surpass margin of apical lobe; a few short and a few very long setae between hair-tuft and outer margin; apex and mesal margin distad of hair-tuft without setae, basal portion with scales and a cluster of fine short setae just basad of hair-tuft; *basal lobe* prominent, conical, reaching to middle of basistyle, clothed with small setae and minute setulae, bearing at its apex two stout curved spines rising from a common tubercle, mesal spine slightly longer and somewhat flattened; at its base, a long stout spine, borne on a distinct sclerotized protuberance, directed somewhat caudad and scarcely reaching meson. *Claspette stem* long, setose, apical fourth slender; basal portion stout, constricted and narrowed before apex so as to form a sharp mesally-projecting shoulder armed with several small setae; *filaments of claspettes* approximate, large, each with a short slender base and a broadly expanded but flattened apical portion roughly triangular in shape and ending in a dorsally recurved tip. *Tenth sternites* stout, with recurved approximate tips; *anal membrane* densely covered apically with minute setae; *mesosome* cylindrical, not heavily chitinized, narrowed and constricted before apex, narrowly open along median ventral line, dorsal side

closed for a short distance, and base forming a very thin ring. *Ninth tergite* with large approximate lobes, each with 6 or 7 stout spines; *ninth sternite* with caudal margin deeply invaginated, usually with 3 small setae on each side.

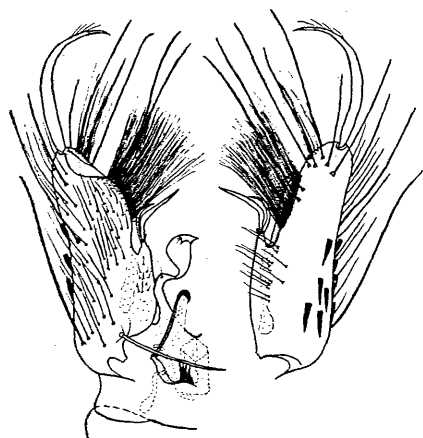
Adults of *A. diantaeus* are usually distinguished from similarly-marked individuals of *A. communis* DeG., *A. sticticus* Mg., and other black-legged mosquitoes by the absence of pale scales on torus, base of costa, and legs beyond femora; by the absence of dark scales on occiput and on lateral edge of mesonotum just anterior to wing-base; by the well-defined dark thoracic stripe or stripes; usually by the complete absence of lower mesepimeral setae; and by the abdominal markings: the white basal band usually reduced to lateral spots, and the sternites banded apically with dark scales.

LARVA: *fourth instar* (Pls. II, III).—Length 8–10 mm. *Head* (Pl. II, fig. 5) wider than long. *Antenna* strikingly longer than head, slender, curved, uniformly tapered, well-spiculated throughout; *antennal tuft* (1) inserted at or slightly before middle, 3- to 7-branched, reaching apex of shaft or beyond; *apex of antenna* (fig. 6) with a terminal (4) and two sub-apical (2, 3) setae about equal in length, and about one-fifth as long as antenna, a segmented finger process (6) about half their length, and a very short hyaline process (5) or papilla. *Head hairs: preantennal* (7) 3- to 6-branched; *uppers* (5) with 3 or 4 branches, rarely 2 or 5; *lowers* (6) 2- or 3-branched; all about half as long as antenna; other head hairs minute, *post-clypeals* (4) multiple and on a line with or slightly anterior to upper head hairs; all macroscopic head and body hairs (fig. 3) densely barbed, the barbs long and easily seen, the hairs fine and tapered. *Prothoracic hairs* (fig. 4): #1 single, as long as head hairs; #2–4 minute; #5 and 6 single, #7 double, not surpassing the head. *Lateral abdominal hairs* variable: double or triple on segment I, single, double, or triple on II, and single or double on III–VII; on segment I, upper (6) and lower (7) lateral hairs may be single or double (rarely both double), or upper hair single and lower double; on segment II, upper hair single or

EXPLANATION OF PLATE I.

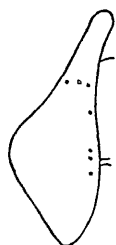
FIGS. 1, 2. *Aedes pseudodiantaeus*, adult. FIG. 1, male genitalia: 1A, dorsal aspect; 1B, ventral aspect. FIG. 2, left sternopleuron, showing arrangement of setae.

FIGS. 3, 4. *Aedes diantaeus*, adult. FIG. 3, male genitalia: 3A, dorsal aspect; 3B, ventral aspect. FIG. 4, left sternopleuron, showing arrangement of setae.



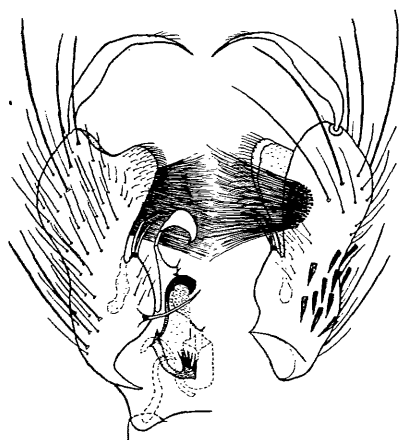
1A

1B



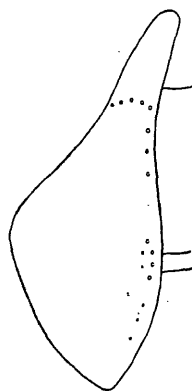
2

AEDES PSEUDODIANTAEUS



3A

3B



4

AEDES DIANTAEUS

double, lower hair single or represented by a minute multiple-branched tuft; combinations may differ on the two sides of a single specimen, and on specimens from the same locality; on III-V upper hair may be single or double, lower usually a tuft. *Comb* (Pl. III, fig. 3A) of eighth segment consisting of 6-13 thorn-shaped scales in a curved irregular row or double row; individual scale (fig. 3B) with long central spine as long as its base, without lateral fringes of small spinules. *Siphon* usually 2.5-3 times as long as wide, tapering slightly; *pecten* usually not quite reaching middle of siphon, with 12-16 closely-spaced teeth and 1-3 larger somewhat detached teeth; individual tooth including outermost with 4-7 small denticles from base to beyond middle; *siphonal hair tuft* (1) 4- to 8-branched, seldom longer than diameter of siphon at point of insertion, inserted just beyond pecten, close to middle of siphon; *dorsal preapical hair* (2) minute, single. *Dorsal plate of anal segment* as long as wide or longer, lower edges rounded, nearly meeting along mid-ventral line; *lateral saddle hair* (1) simple, very short; *anal gills* tapered, 1.5-2 times as long as anal plate; *dorsal brush* consisting of a single inner or lower hair (3), and a tuft of 5-12 upper or outer hairs (2) not half as long as lower hair; ventral brush (4) well-developed, with about 17 paired hair tufts in the barred area, preceded by 2 or 3 small tufts.

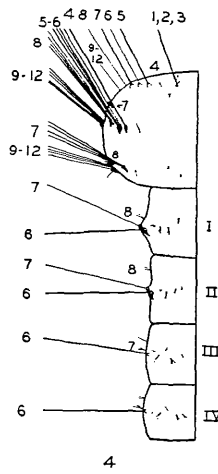
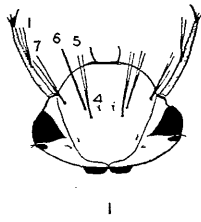
Second and third instars: Essentially as in fourth instar, except that upper and lower head hairs are single or double, antennae are shorter, but as long as the head; hair tufts of thorax and abdomen are generally reduced; dorsal plate of anal segment does not extend more than half-way down side of segment.

PUPA (Pl. III, fig. 4).—*Cephalothorax*: *Seta 6* simple or double, very short; *seta 8* of medium length, 3- to 6-branched; metathoracic setae (fig. 4A) long, *seta 10* plumose, 2- to 7-branched; *setae 11 and 12* usually single or double (1-4). *Respiratory trumpet* (fig. 4C) gradually widened apically, constricted at base, somewhat truncate and notched at apex, most of surface reticular; 3-4.5 times as long as its greatest diameter, 7-9

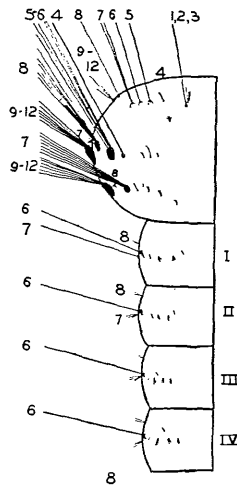
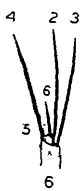
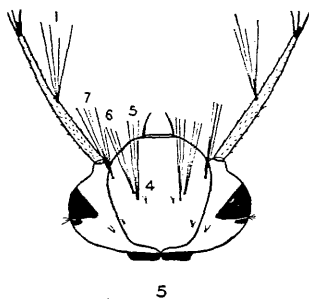
EXPLANATION OF PLATE II.

FIGS. 1-4. *Aedes pseudodiantaeus*, larva. FIG. 1, head, dorsal aspect. FIG. 2, apex of antenna. FIG. 3, portion of a seta. FIG. 4, thorax and abdominal segments I-IV, dorsal aspect.

FIGS. 5-8. *Aedes diantaeus*, larva. FIG. 5, head, dorsal aspect. FIG. 6, apex of antenna. FIG. 7, portion of a seta. FIG. 8, thorax and abdominal segments I-IV, dorsal aspect.



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times its own pinna. *Abdomen*: on tergum I, reticulation between float hairs present; *seta K* medium long, plumose, usually double (1-3); *seta S* very long, single; *seta U* small, simple, rarely double (1-3). On segments II-VIII: *seta A* minute, simple, lateral on II-VI; slightly plumose, 3- to 5-branched on VII; plumose, with 4-7 major branches and 7-15 sub-branches, on VIII. *Seta B* medium long on II and VII, longer on III, very long, longer than following tergite, stout, and slightly plumose on IV-VI; usually double (2-3) on II, chiefly double (1-2) on III-VII. *Seta C* medium long on II-V, seldom more than half as long as following tergite, longer on VI and VII; 3- to 9-branched on II, usually double (2-4) on III, single or double on IV-VII. *Seta 1* small on VII, medium long on II-IV, longer on V-VI; single or double (1-3) on II-IV, single on V-VI, 5- to 8-branched on VII. *Seta 2* very long on II, small on III-V, medium long on VI, long on VII; chiefly double (1-7) on III-VII, simple on II. *Seta 3* small, 2- to 6-branched on II. *Seta 4* small on II-IV, medium long on V-VII; 5- to 9-branched on II, 2- to 8-branched on III-V, double or triple on VI-VII. *Seta A'* on VIII long, single or double. *Seta v* on IX absent. *Paddle* oval, posterior margin (fig. 4B) mostly smooth, with several rows of small submarginal denticles present, a few protruding beyond margin; surfaces sparsely clothed with minute denticles; midrib almost reaching apex; *terminal seta x* well-developed, simple, slightly laterad of apex.

The pupa of *A. diantaeus*, previously undescribed, works out to couplet 6 of Darsie's pupal key to the species of *Aedes* (1951, p. 9), though with some minor difficulties. It differs from either alternative in having *seta C* short on segments III-V, and longer than half the length of the following tergite on VI-VII; it differs from *A. triseriatus* in all characters given.

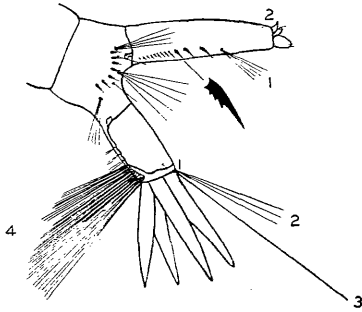
EXPLANATION OF PLATE III.

FIG. 1. *Aedes pseudodiantaeus*, larva: 1A, caudal end, lateral aspect; 1B, comb scale from center of comb; 1C, comb scale from outer portion of comb.

FIG. 2. *A. pseudodiantaeus*, pupa: 2A, metathorax and abdominal segments, dorsal aspect; 2B, paddle, with section of posterior margin enlarged; 2C, trumpet.

FIG. 3. *A. diantaeus*, larva: 3A, caudal end, lateral aspect; 3B, comb scale from center of comb.

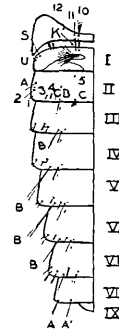
FIG. 4. *A. diantaeus*, pupa: 4A, metathorax and abdominal segments, dorsal aspect; 4B, paddle, with section of posterior margin enlarged; 4C, trumpet.



2 B



2 C



2 A

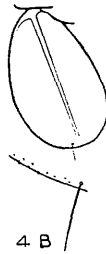
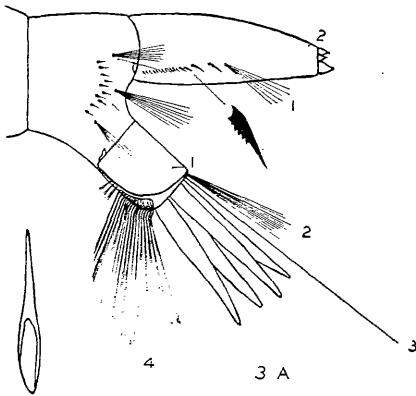
AEDES PSEUDODIANTAEUS



1 B



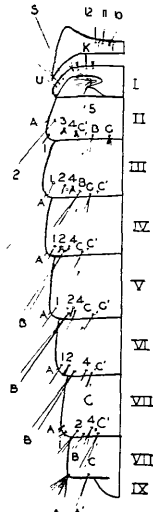
1 C



4 B



4 C



4 A

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DISTRIBUTION.—Forested areas of northern United States from Maine to Montana and Wyoming; Canada, Labrador, and Alaska; northern Europe: Germany, Finland, Denmark; and the Russian Far East.

SPECIMENS EXAMINED.—*Maine*: Old Town, May 15, 1949, 5 larvae (instars III & IV), (U.S.P.H.S.). *New Hampshire*: Dublin, May and June, 1909 (A. Busck), 2 male types (USNM); June 2, 1951 (M. E. Smith), 5 females (biting). *Vermont*: Jacksonville, May 17, May, 1947 (H. D. Pratt), 2 larvae (III, IV) (USPHS). *Massachusetts*: Westhampton, April 30–May 4, 1951, (J. Weidhaas, M. Smith), 5 males, 4 females (reared); June 6, 1951 (M. Smith, E. Coher), 2 females (biting). *New York*: Lake Placid, July 26, 1945 (E. Kass), 2 larvae (III, IV), (USPHS). *Michigan*: Douglas Lake, July 1, July 15, 1922 (R. Matheson), 2 females (USNM). Bryant's Bog, Cheboygan Co., May 8, 1937 (W. Irwin), 4 larvae (Cornell Univ.). *Wyoming*, Yellowstone National Park: Yellowstone Canyon, July 2, 1922, (Dyar), 1 male, 1 female (USNM); South Gate, June 14, 1951 (Stotanovich), 2 larvae (IV), (USPHS). *Montana*: Whitefish, July 16, 1921 (Dyar), 3 females (USNM). McDonald Cr., June 23, 1921 (Dyar), 6 females (USNM). No. Fork Ranger Station, Glacier National Park, May 5–29, 1926 (Dyar), 8 males, 13 females, larval & pupal exuviae on slide (USNM). *Labrador*: Goose Bay, June 14, 1948 (H. C. Friesen), 1 male, larval exuviae; June 12, 1950, 1 male (Can. Nat. Coll.). *Ontario*: White River, June 17, 1918 (Dyar), 6 males, 10 females, 3 slides of larval and pupal exuviae (many per slide), (USNM). *Manitoba*: Winnipeg, May 10, 1922 (Dyar), 1 female (USNM). *British Columbia*: Salvus, June 9, 1919 (Dyar), 1 male (USNM). Terrace, Aug. 12–14, 1919 (Dyar), 128 females (USNM). *Northwest Territories*: Norman Wells, June 21, 1949 (W. R. M. Mason), 1 female (CNC). *Alaska*: Anchorage, May 16, 1947 (Stone & Jenkins), 1 female (with larval and pupal exuviae), June 4, 1947, 1 female; Palmer M. P. 23, June 6, 1947, 1 female. Steese Highway, M. P. 28, May 29, 1947 (Gjullin, Wilson, & Stone), 1 male (with larval & pupal exuviae); all in USNM.

Dr. J. R. Vockeroth has kindly examined the specimens of *A. diantaeus* in the Canadian National Collection; the species is there represented from the following additional localities: Moose Factory and Meach Lake, Ontario; Whitehorse, Yukon, Norman Wells, and Yellowknife, Northwest Territories; and Gillam, Manitoba. Larvae described by Irwin (1943) from Bryant's Bog,

Cheboygan Co., Michigan, May 22, 1937, and females (June 12, 1937) and larvae (April 30–May 28, 1938) from Mud Lake, Cheboygan Co., are certainly of this species. So also are those described by Owen (1937) from Minnesota (Cloquet Forest Exp. Station and other unnamed localities); he records adults as occurring from June 26–July 12; larvae from late May to July 3.

Dr. H. D. Pratt states that the U. S. Public Health Service has records of *A. diantaeus* from Belknap, Cheshire, and Coos Co., New Hampshire, and from Hancock Co., Maine. These have not been verified, and might refer to either species, as could Johnson's citation (*List of the Diptera of new England*, 1925) of *A. diantaeus* as occurring on Mt. Desert Island, Maine, July 7–25.

BIOLOGY.—The species is one of the early spring breeding forms with but a single generation a year, and typically occurs in cold shaded pools in forested areas. Dyar reported the larvae as developing in early spring pools left by melting snow (1917), in mossy pools in a spruce bog (1919), and in flood pools in a river valley (1920). Irwin (1943) collected larvae from pools among aspens at the margin of a bog. Kass (Barnes, Fellton, & Wilson, 1950) found them in a stagnant ditch in the woods. Locally, Weidhaas (1952) found them in a shaded and much overgrown woodland pool in a pine forest. Here they matured simultaneously with *A. implacabilis* Wlk., *A. intrudens* Dyar, and *A. excrucians* Wlk., a little later than *A. trichurus* Dyar and *A. communis* DeG., and earlier than *A. canadensis* Th., *A. fitchii* F. & Y., *A. cinereus* Mg., and *Culiseta morsitans* Th. While adults usually appear in late May or early June, larvae have been collected in early July by Owen (1937) in Minnesota, and in late July by Kass (loc. cit.) at Lake Placid, New York.

SUMMARY

A new species of *Aedes* mosquito closely related to *A. diantaeus* has been found in Massachusetts, with other scattered specimens from New Hampshire, Michigan, Labrador, and Alaska. Although a few of the *diantaeus* references in the literature apply to the new species, most references are to the true *diantaeus*, a more abundant species. Descriptions are given, for both species, of the adult male and female, the genitalia (male and female), the pupae, and the last larval instar, with brief synopses of earlier instars. The pupa of *A. diantaeus* has not previously been described. Distributional and literature records, notes on the biologies, drawings of the larvae, pupae, and male genitalia, and differences between the two species are included.

The writer wishes to express deep appreciation to the following for their kindness in supplying material and needed information for this study: Mr. C. F. W. Muesebeck and Dr. Alan Stone of the U. S. National Museum; Dr. W. H. Irwin of Oklahoma A. & M. College; Dr. Robert Matheson of Cornell University; Dr. H. D. Pratt of the U. S. Public Health Service; and Dr. J. R. Vockeroth of the Canadian Department of Agriculture; and to members of this department: Mr. E. I. Coher for his notes on the female terminalia; Dr. F. R. Shaw for introducing me to the mosquito-breeding areas of Belchertown; Mr. John A. Weidhaas, Jr., for his discovery of the breeding place of *A. diantaeus*; and to Dr. C. P. Alexander, for his helpful encouragement and advice.

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AUTHOR'S POSTSCRIPT.—A single male specimen of *Aedes diantaeus* H., D., & K. from Hayward, Wisconsin (May 22, 1934, CCC survey) has been received from the U.S.N.M. This is apparently the first record of the species from that state.

The description of the adult of *A. pseudodiantaeus* (p. 22) implies that the legs are entirely dark-scaled beyond the femora. It should be noted that while they are entirely dark-scaled *dorsally* beyond the femora, and at first examination appear to be entirely so, the ventral surfaces of the tibiae and of the first tarsal segments of the fore and middle legs usually show a thin irregular streak of pale scales overlying the dark ones, not easily distinguishable from light glare, and not evident in rubbed specimens. The remaining tarsal segments and the posterior tibiae and tarsi are dark-scaled.