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ON THE STATUS OF *GOMPHAESCHNA ANTILOPE*
(HAGEN) (ODONATA)

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WHETHER or not *Gomphaeschna antilope* (Hagen, 1874) is distinct from *G. furcillata* (Say, 1839) has been in doubt for more than forty years. In the original description Hagen (1874: 354-55) compared these two species in considerable detail, but unfortunately several of the characters used, while sometimes of specific value in other genera, have proved to be rather variable or, in poorly preserved specimens, practically useless. The distinctness of the two species was first questioned in 1893 by P. P. Calvert, who listed *antilope* as a variety of *furcillata* with the following explanation (p. 248):

N.B.—This was originally described as a distinct species from *furcillata* Say, the chief differences being that the latter had the ♂ sup. app. curved inwards and downwards, apex of inf. app. more widely emarginated, 7 (*antilope* 4) postcubitals on front wings; ♀ wings unspotted 12-13 antecubitals on front wings (*antilope* 9-10), abdomen of slightly different shape. As additional specimens are examined, the differences between the two forms becomes less and less.

In subsequent papers, various authors have placed *antilope* in categories of nomenclature ranging from full specific rank to complete synonymy with *furcillata*, with little or no explanation for the status assigned to it.

The purpose of this paper is not to redescribe *antelope* and *furcillata* in full detail, but to present the results of a study of the relative merits, in 192 specimens, of certain characters which have been used in the past, and to call attention to other characters which strongly indicate that *antelope* is a distinct species.

The specimens examined, which are listed below, have been assembled through the courtesy of Nathan Banks of the Museum of Comparative Zoology (M.C.Z.), D. J. Borror (D.J.B.) of Ohio State University (O.S.U.), C. S. Brimley of the North Carolina State Department of Agriculture (N.C.D.A.), C. F. Byers of the University of Florida (C.F.B.), P. P. Calvert and J. A. G. Rehn of the Academy of Natural Sciences of Philadelphia (A.N.S.P.), E. A. Chapin of the United States National Museum (U.S.N.M.), E. M. Davis of the Thomas R. Baker Museum, Rollins College (E.M.D.), W. T. Davis, Staten Island, New York (W.T.D.), F. M. Gaige of the Museum of Zoology, University of Michigan (Williamson Collection—E.B.W.), T. B. Mitchell of North Carolina State College (N.C.S.C.), B. E. Montgomery, Purdue University (B.E.M.), J. G. Needham of Cornell University (C.U.), and M. Wright of Ohio State University.

Gomphaeschna antelope (Hagen)

(16 ♂, 29 ♀)

Florida.—Thaxter [collector ?], 1 ♀ (Hagen, M.C.Z.). Alachua Co.: Agric. Exp. Sta., Gainesville, 1 ♀, March 7, 1914, J. R. Watson; Gainesville, 1 ♀, 1932 (?); Newnan's Lake, 1 ♂, May 19, 1931, C. F. Byers (all C.F.B.). Madison Co.: Greenville, 1 ♀, April 23, 1924, T. H. Hubbell (E.B.W.). Orange Co.: Orlando, 1 ♀, March 29, 1938, M. J. Westfall, Jr. (E.M.D.); Winter Park, 1 ♂, March 22, 1937, C. H. Paige, 1 ♀, April 25, 1937, K. Scudder (E.B.W. from E.M.D.), 1 ♀, June 1, 1936, J. A. Fluno (E.M.D.). Seminole Co.: 1 ♂ 2 ♀, April 2, 1938, E. M. Davis (E.M.D.). Volusia Co.: Ormond, 1 ♀, April 1 [1899?], 1 ♀, March 30, 1899, W. S. Blatchley (E.B.W.).

Georgia.—Charlton (?) Co.: Okefenokee Swamp, 1 ♂ 1 ♀, May 15, 1937, P. W. Fattig (B.E.M.); Billy's Island, 1 ♀, June, 1912, Cornell Univ. Lot 746, 1 ♀ (C.U.). Dekalb Co.: Decatur, 1 ♀, Agnes Scott (U.S.N.M.). Also 1 ♂, labeled "Cumberland," is probably from Camden Co., Georgia (C.U.).

Louisiana.—Orleans Parish: near New Orleans, 1 ♂, summer of 1932, P. Viosca (L.K.G. from Mike Wright).

Maryland.¹—Wicomico Co.: Great Wicomico River, 1 ♂ (no date given), 1 ♀, June 19–20, 1890, Charles W. Johnson (A.N.S.P.).

New Jersey.—?, 1 ♀, from Charles W. Johnson (A.N.S.P.). Camden Co.: Clementon, 1 ♂ (S. F. Gross, Jr., A.N.S.P.). Cape May Co.: Sea Isle, 1 ♀, incomplete, "picked up on beach," June 25, 1892, Philip P. Calvert (A.N.S.P.).

North Carolina.—Moore Co.: Southern Pines, 1 ♂, May 1, 1918, 1 ♀, May 31, 1917, A. H. Manee (E.B.W.).¹ Wake Co.: Raleigh, 1 ♂, May 26, 1903, C. S. Brimley, and 1 ♀, mid-April, 1 ♀, early June, 1907, 1 ♀, June 5, 1901, F. Sherman (N.C.D.A.); 1 ♀, May 22, 1903 [C. S. Brimley] (N.C.S.C.).

Ohio.—Franklin Co.: Col[umbu]s, 1 ♂, June 13, 1895 (O.S.U.). The data for this specimen were kindly furnished by D. J. Borrer.

Pennsylvania.—Allegheny Co.: Pittsburgh, 1 ♀, May 29, 1899, J. L. Graf (E.B.W.). Philadelphia Co.: Philadelphia, 1 ♀, May 23, 1908, 1 ♂, July 10, 1902 (A.N.S.P.).²

¹ After this manuscript was accepted for publication, some additional specimens were examined. Septima Smith and Robert S. Hodges of the University of Alabama have kindly permitted me to include the following records based on specimens in their collection: Maryland—Annapolis, Anne Arundel Co.: 1 ♂, 1936, Ernest Martin. North Carolina—Maxton, Robeson Co.: 1 ♂, 1936, Otto Walter Ferrene.

² Dr. P. P. Calvert states (*in lit.*) that the Zoological Laboratory of the University of Pennsylvania has a male of *furcillata* from Woods Hole, Barnstable Co., Mass., collected July 16, 1917, by W. R. T. [William R. Taylor ?], and a female of *antilope* found on the ninth floor of the Flanders Building, Philadelphia, June, 1935. He writes: "This building was at 15th and Walnut Streets in a thickly built up section, near the center of the city, but has since been taken down." It may be of interest to note here that the specimens from the District of Columbia collected by N. R. Wood and Misses Scheber and Hunt were also taken in buildings, one of them on the floor of the third story of the National Museum.

Virginia.—Nelson Co.: 1 ♀, June 25, 1928, W. Robinson (U.S.N.M.). Norfolk Co.: Lake Drummond, Dismal Swamp, 1 ♂, June 9, 1905, H. S. Barber (U.S.N.M.).

District of Columbia.—Washington, 1 ♂, June, 1910, William T. Davis (W.T.D.); 1 ♂, 1 ♀, May, H. S. Barber, 1 ♂, May 23, 1899, N. R. Wood, 1 ♀, June 24, 1920, Miss Scheber, 1 ♀, June 25, 1920, Misses Scheber and Hunt (U.S.N.M.).

“Patrie? (R. Amazon) von S. Stevens, London”: 1 ♀ (Hagen, M.C.Z.). The locality is evidently an error.

Gomphaeschna furcillata (Say)

(121 ♂, 26 ♀)

Arkansas.—Lincoln Co.: 1 ♂, April 2, 1936, L. H. Bridwell (E.B.W.).

Connecticut.—Hartford Co.: West Hartford, 1 ♂, June 13, 1928, P. Garman (B.E.M.). New Haven Co.: North Guilford, 1 ♂, June 14, 1929, P. Garman (B.E.M.). New London Co.: Lyme, 1 ♀, June 27, 1918, W. S. Fisher (U.S.N.M.).

Florida.—Alachua Co.: Buzzard's Roost, 10 miles west of Gainesville, 1 ♂, March 22, 1936, R. E. Bellamy (C.F.B.). Orange Co.: Wekiwa River, 12 miles northwest of Winter Park, 2 ♂, January 8, 1937, E. M. Davis (E.M.D.).

Georgia.—Thomas Co.: Thomasville, 1 ♂, March 25, 1904, Morgan Hebard and J. A. G. Rehn (A.N.S.P.).

Maine.—Hancock Co.: Mount Desert Island, 1 ♂, June 12, 1935, William Procter (B.E.M.). Kenebec Co.: Manchester, 1 ♂, July 2, 1892, 1 ♂, July 2, 1895, and 1 ♀, July 6, 1897, Miss M. Wadsworth (A.N.S.P.). Lincoln Co.: McCurdy's Pond, 3 ♂, June 12, 1938, D. J. Borrer (D.J.B.).

Massachusetts.—1 ♂, July 20, and 1 ♂, July 17, B. Gerhard (E.B.W.).³ Hampshire Co.: Northampton, 1 ♂, May 22, 1896 (C.U.). Middlesex Co.: Bedford, 1 ♀, June, 1902, J. P. B. Henshaw (M.C.Z.); Sherborn, 1 ♂ (A. P. Morse, M.C.Z.). Norfolk Co.: Blue Hills, 2 miles south of Milton, 1 ♀, April 30, 1922, W. J. Clench (E.B.W.); Wollaston, 1 ♀, June, 1902, F. H. Sprague (M.C.Z.). Wooster Co.: Princeton, 1 ♂, May 30, 1897, F. H. Sprague (M.C.Z.).

³ See footnote 2.

Michigan.—Wayne Co.: Detroit River, 1 ♀, August, [H. G.] Hubbard (Hagen, M.C.Z.).

New Jersey.—Gloucester Co.: Malaga, 1 ♂, May 21, 1911 (A.N.S.P.), and 1 ♂, May 30, 1911 (W.T.D.). Ocean Co.: Lakehurst, 1 ♂, May 8, 1915, 2 ♂ 1 ♀, May 24, 2 ♀, May 30, 1 ♀, May 31, 1 ♂, June 1, 1918, and 1 ♂, June 13, 1909, W. T. Davis (W.T.D.). Passaic Co.: Hewitt, 2 ♂, June 19, W. T. Davis (W.T.D.); Newfoundland, 1 ♂, May 28, 1910, W. T. Davis (W.T.D.).

New York.—Orange Co.: Crow's Nest, West Point, 1 ♂, June 5, 1921, W. T. Davis (W.T.D.). Rockland Co.: Ramapo, 1 ♂, May 31, and 1 ♂ 1 ♀, June 12, W. T. Davis (W.T.D.); Sterlington, 1 ♀, June 19, 1904 (W.T.D.). Suffolk Co.: Yaphank, Long Island, 1 ♂, June 10, 1912, W. T. Davis (W.T.D.). Tompkins Co.: Ithaca, 2 ♂, C. H. Kennedy (N.C.S.C.); Ringwood (near Ithaca), 6 ♂, June 28, 1917, C. H. Kennedy (E.B.W.); Ilex Pond (near Ithaca?), 1 ♀, June 27, 1916 (C.U.). Westchester Co.: Nyaack, 1 ♀, June 11, W. T. Davis (W.T.D.).

North Carolina.—Beaufort Co.: Washington, 1 ♀, April 4, 1922, T. B. Mitchell (N.C.D.A.). Birdie Co.: Cashie River, 1 ♂, April 12, 1929, J. G. Needham (C.U.). Columbus Co.: Lake Waccamaw, 18 ♂, April 10, and 47 ♂ 5 ♀, April 11, 1929, J. G. Needham (C.U., except 1 ♂, B.E.M., 3 ♂, E.B.W., 1 ♂, L.K.G.⁴), 1 ♂ 1 ♀, April 23, 1920, R. W. Leiby (N.C.D.A.); Whiteville, 1 ♂, April 20, 1937, D. L. Wray (N.C.D.A.). Moore Co.: Southern Pines, 1 ♂, April 11, 1917, A. H. Manee (E.B.W.), 1 ♂, April 12, 1914, W. T. Davis (W.T.D.). New Hanover Co.: Wilmington, 1 ♂ 2 ♀, April 7, 1914, Greenfield Pond, 1 ♀ (caught with its prey—a *Tetragoneuria semiaquaea*) April 11, 1914, W. T. Davis (W.T.D.). Pitt Co.: Chicod Swamp, 1 ♂ (C.U.). Wake Co.: Raleigh, 1 ♀, March 31, 1903, and 1 ♂, late April, 1907, F. Sherman (N.C.D.A.), 1 ♂, April 3, 1903 [C. S. Brimley] (C.U.), 2 ♂, April 9, 1903, C. S. Brimley (E.B.W. and N.C.S.C.).

Pennsylvania.—Crawford Co.: Linesville, 2 ♂, June 9, 1906,

⁴ An additional male of this series in the collection of Septima Smith and Robert S. Hodges was recently examined.

D. A. Atkinson (E.B.W.). Philadelphia Co.: Philadelphia, 1 ♀, April 27, H. Hornig (A.N.S.P.).

Vermont.—Orleans Co.: Newport, 1 ♂ (M.C.Z.). No specific locality, 1 ♂, Mrs. Slosson (A.N.S.P.).

In dried specimens the pattern of the thorax is usually so indistinct or so nearly obliterated by post-mortem changes that a comparison would be highly unsatisfactory. On the abdomen, however, even in poorly preserved specimens, the extent of the dark areas can usually be discerned.⁵ In *antelope* the dark brown or black lateral areas of segments 3–7 posterior to the transverse carina are small or obscure and are usually separated from the basal and subapical ventral dark areas (Fig. 7); in *furcillata*, these spots are large, distinct, and broadly joined to the basal area and on segments 4–9 are usually continuous with the lateroventral subapical dark areas (Fig. 14).

As pointed out by Calvert (1893: 248) the number of antenodal and postnodal crossveins, although indicative, is not a good diagnostic character. The range for each series overlaps considerably (Table I), except in the postnodals of the front wing. The brown spots in the nodal area may be present in either species but appear more frequently in the forewings of *antelope* females.

The wings, however, do have two characters of a high degree of constancy: (1) In *antelope* the width of the hind wing at the level of the nodus is equal to, or greater than, the costal postnodal length (i.e., the distance from the nodus to the proximal end of the pterostigma) of the front wing, and in *furcillata* the former is distinctly less than the latter (compare Figs. 1 and 8). (2) *Antelope* has 1 row of cells between M_2 and R_s except near wing margin, or if there are 2 rows, the second row begins distal to the proximal end of the pterostigma, whereas *furcillata* has 2 rows of cells beginning proximal to, or at proximal end of, the pterostigma. Only two exceptions have been found for this second character, viz., in one North

⁵ If the surface is brushed with 85–95 per cent alcohol, the true pattern will be visible for a few seconds.

TABLE I
 NUMBER OF ANTENODAL AND POSTNODAL CROSSVEINS IN 192 SPECIMENS
 OF *GOMPHAESCHNA ANTILOPE* AND *G. FURCILLATA*

Crossveins	<i>antilope</i>		<i>furcillata</i>	
	Number of Front Wings	Number of Hind Wings	Number of Front Wings	Number of Hind Wings
Antenodal:				
5 .....	.....	1	.....	.....
6 .....	.....	63††	.....	6
7 .....	.....	23**	.....	65
8	2	3	.....	154
9	19††	.....	.....	53
10	44	.....	5	15
11	20	.....	36	.....
12	5**	.....	119	.....
13 .....	.....	.....	104	.....
14 .....	.....	.....	25	.....
15 .....	.....	.....	2	.....
Incomplete .....	.....	.....	2	1
Postnodal:				
2	1	.....	.....	.....
3	5†	.....	.....	.....
4	38**	4†	.....	.....
5	44†	45*†	5	4
6	2	33*	96	40
7 .....	.....	8	125	89
8 .....	.....	.....	58	111
9 .....	.....	.....	7	42
10 .....	.....	.....	.....	7
Incomplete .....	.....	.....	3	1

* Position of number for each wing of type ♂, as recorded by Hagen (1874: 355).

† Position of number for each wing of type ♀ as recorded by Hagen (1874: 355).

Carolina specimen of *antilope* 2 rows were present beginning $\frac{1}{2}$ cell proximal to the pterostigma, and in the figure of a pair of wings of *furcillata* by Martin (1901: 121, Fig. 115)

only 1 row of cells is indicated in this area in the front wing.

Measurements of the hind wing in each species also show that *antilope* has a proportionately broader wing. In *antilope* the width of the hind wing is 8.8–12.0 mm., length, 30.0–35.5 mm.; in *furcillata*: width, 8.0–9.5 mm., length, 29.0–34.0 mm. The ratio of width to length of hind wing for *antilope* is: ♂, 0.281–0.323, average, 0.303; and ♀, 0.304–0.343, average, 0.319; for *furcillata*: ♂, 0.250–0.297, average, 0.278; and ♀, 0.265–0.294, average, 0.283. These figures in themselves are not sufficient to separate the two species, but they are significant.

The generally smaller number of antenodal and postnodal crossveins in *antilope* and the less extensive division of the cells between M_2 and Rs, associated with broader wings, adequately explain Hagen's statement (1874: 355): "All the areolets in the wings larger than in *Æ*, *furcillata*."

The degree of curvature in the superior appendages varies, as well as their relative length in terms of segments 9 + 10. All the males of *antilope* examined have the superiors straight, but a sufficient number of *furcillata* also have the superiors straight to make this distinction unreliable. In three other respects, however, the appendages of *antilope* exhibited constant differences (compare Figs. 4–6 with Figs. 11–13): (1) In dorsal view, at the apical margin of segment 10, the superiors are separated by a distance equal to, or only slightly greater than, the basal width of 1 appendage, while in *furcillata* the distance is twice, or more than twice, that of 1 appendage. (2) At $\frac{1}{3}$ the length, the basal subcylindrical portion flattens rather abruptly, forming a distinct inferior angle which is lacking in *furcillata*. (3) The midrib of each appendage is approximately equidistant from each margin, whereas in *furcillata* it is nearer the inner margin.

The apex of the inferior appendage is usually much less widely forked in *antilope* (compare Figs. 6 and 13), but in a few individuals of *furcillata* the angle formed by the divaricate branches is almost as acute as the maximum for *antilope*. In the small series of *antilope* males examined, the apical width was only slightly greater than the basal (usually twice, or more

than twice, as wide in *furcillata*), and the lateral margins were subparallel, or slightly convex, to the level of the fork, then diverging (margins straight or slightly concave from base to apex of each fork in *furcillata*).

The genitalia of the second abdominal segment are remarkably similar in the two species except for the shape and color of the hamules. In *antilope* the hamules are only slightly expanded apically (Fig. 2, *h*) and are pale in color; in *furcillata* they are almost twice as wide at apex as at mid-length (Fig. 9, *h*) and are usually dark.

Another difference which seems to be constant is found in the male on segment 3, where the lateroventral carina diverges anteriorly at about mid-length from the mesal ventral margin in *antilope* and converges in *furcillata* (Figs. 3 and 10).

Of the characters considered above, the following are sufficiently reliable and practicable for use in a key:

Width of hind wing at nodus equal to or greater than the costal postnodal length of the front wing; usually 1 row of cells between M_2 and R_s except near margin; in the male, the anterior hamules of the second abdominal segment club-shaped, and the superior abdominal appendages separated at base by a distance equal to, or slightly greater than, the basal width of one appendage.....	<i>antilope</i>
Width of hind wing at nodus distinctly less than the costal postnodal length of the front wing; two rows of cells between M_2 and R_s beginning proximal to the pterostigma; in the male, the anterior hamules of the second abdominal segment boot-shaped (the toe directed cephalad) and superior abdominal appendages separated by a distance of almost, or more than, twice the basal width of one appendage	<i>furcillata</i>

Since the material studied has included practically all available specimens from areas in which both species have been reported, the status of each in the literature, as understood by the writer, is expressed by the following synonymies.⁶

Gomphaeschna furcillata (Say)

Æschna furcillata Say, 1839: 14. Type locality: Massachusetts. Hagen, 1861: 131; 1874: 351-54; 1875: 33.

⁶ Papers dealing with fossil dragonflies have been omitted in the synonymies but are included in the bibliography.

Gynacantha quadrifida Rambur, 1842: 209-10. Type locality: "l'Amerique septentrionale." Hagen, 1861: 131. Selys, 1871: 413. Hagen, 1875: 33. Selys, 1883: 734. Kirby, 1890: 92. Muttkowski, 1910a: 104.

Aeschna (*Gomphaeschna*) *quadrifida* (Rambur). Selys, 1871: 413.

Æschna (*Gomphaeschna*) *furcillata* (Say). Selys, 1883: 734.

Gomphaeschna furcillata (Say). Hagen, 1873: 272; 1875: 33. Kirby, 1890: 92. Wadsworth, 1890: 37. Calvert, 1893: 248; 1894: 243; 1900: 71. Williamson, 1900: 301 [*partim*]. Harvey, 1902: 8. Brimley, 1903: 152 [*partim*]. Needham, 1903: 762, Pl. 37, Fig. 1. Brimley and Sherman, 1904: 100. Calvert, 1905: 25-26. Brimley, 1906: 91. Muttkowski, 1908: 93. Martin, 1909: 122, Figs. 115-16. Calvert, 1910: 78. Muttkowski, 1910a: 104; 1910b: 174. Martin, 1911: 19, Pl. 3, Figs. 9 and 9a. Davis, 1913: 21. Pierson, 1915: 41. Howe, 1916: 14; 1919a: 43; 1919b: 12; 1920: 92; 1921a: 7; 1921b: 130. Garman, 1927: 177. Byers, 1927: 8; 1928: 5. Needham, 1928: 51. Needham and Heywood, 1929: 125. Kennedy, 1936: 315-22, Figs. 1-33. Brimley, 1938: 38 [*partim*]. Borrer, 1940: 76.

Gomphaeschna antilope (Hagen). Davis and Fluno, 1938: 45 [*partim*].

Distribution.—Eastern United States, west to eastern Michigan, and south to Arkansas and Florida.

Gomphaeschna antilope (Hagen)

Æschna Antilope Hagen, 1874: 354-55. Type locality: Druid Hill, near Baltimore, Maryland. Hagen, 1875: 33.

Gomphaeschna antilope (Hagen). Hagen, 1875: 33. Kirby, 1890: 92. Byers, 1930: 69. Kennedy, 1936: 315. Davis and Fluno, 1938: 45 [*partim*]. Wright, 1939: 204.

Gomphaeschna furcillata (Say), var. *antilope* (Hagen). Calvert, 1893: 248. Kellicott, 1896: 108. Calvert, 1900: 71. Martin, 1909: 122. Calvert, 1910: 78. Garman, 1927: 177. Needham and Heywood, 1929: 125.

Gomphaeschna furcillata, form *antilope* (Hagen). Williamson, 1902: 110.

Gomphaeschna furcillata, subspecies *antilope* (Hagen). Muttkowski, 1910a: 104. Davis, 1913: 21.

Gomphaeschna furcillata (Say). Kellicott, 1899: 79 [The ♂ appears to be the same specimen listed in 1896 as *G. furcillata* Say, var. *antilope* Hagen (*supra citato*)]. Williamson, 1900: 302 [*partim?*]. Muttkowski, 1910b: 174 [*partim*]. Blatchley, 1902: 214. Brimley, 1903: 152 [*partim*]. Borrer, 1935: 453; 1937: 188. Brimley, 1938: 38 [*partim*].

Oplonaeschna armata Hagen. Wright, 1937: 259 and 261.

Distribution.—Southeastern United States, west to Louisiana, north to Ohio and Pennsylvania.

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Leonora K. Gloyd

PLATE I

Gomphaeschna antilope (Hagen), male. Southern Pines, North Carolina,
May 1, 1918, A. H. Manee.

FIG. 1. Photograph of left front and hind wings.

FIG. 2. Lateroventral view of second abdominal segment; *h* = hamule.

FIG. 3. Ventral view of third abdominal segment showing lateroventral carina.

FIGS. 4-6. Abdominal appendages in dorsal, lateral, and ventral views, respectively.

FIG. 7. Color pattern of abdominal segments 4-7 in lateral view.

Gomphaeschna furcillata (Say), male. Ringwood, near Ithaca, New York,
June 28, 1917, C. H. Kennedy.

FIG. 8. Photograph of left front and hind wings.

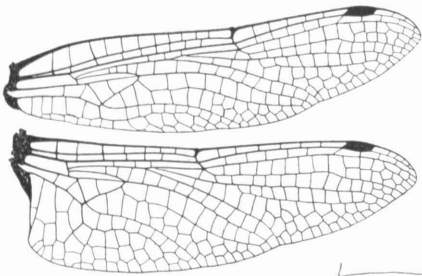
FIG. 9. Lateroventral view of second abdominal segment; *h* = hamule.

FIG. 10. Ventral view of third abdominal segment showing lateroventral carina.

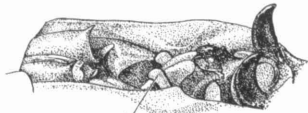
FIGS. 11-13. Abdominal appendages in dorsal, lateral, and ventral views, respectively.

FIG. 14. Color pattern of abdominal segments 4-7 in lateral view.

The drawings are by Miss Grace Eager, Museum Artist.



1



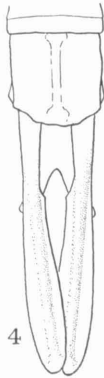
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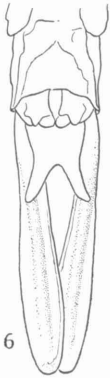
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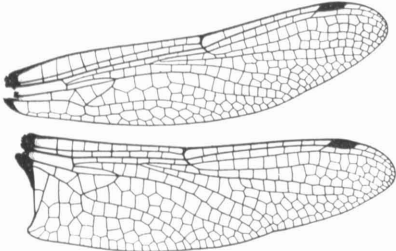
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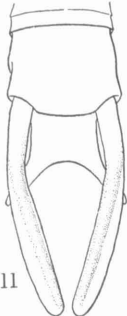
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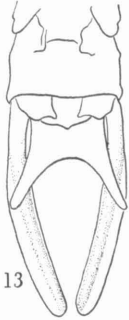
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