

NOTES ON *CHRYSOPS*, OR DEER FLIES (TABANIDAE, DIPTERA) OF NEW ENGLAND

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This is the first of a series of reports on insects of public health importance in the New England States as the result of surveys made by the Public Health Service during 1951-53.

The collector's initials are given in parentheses when numerous collections were made: C. P. Alexander (CPA); E. I. Coher (EIC); Herbert Knutson (HK); John C. Kuschke (JCK); and Frank R. Lisciotto (FRL). When only a few collections were made by an individual, or if the collector is unknown, the name of the organization which possesses the specimens is ordinarily given: Maine Forest Service (MFS); University of Massachusetts (UM); University of Rhode Island (URI); Boston University (BU). When data from the literature are included, the source is indicated by a letter in parentheses: Blickle, 1953 (B); Bromley, 1952 (Br); Fairchild, 1950 (F); Johnson, 1925 (J); Philip, 1947, 1950 (P).

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All collection records listed refer to adult specimens. Ordinarily, no indication is given as to the number of specimens collected. The Roman numeral indicates the month, the second number the day of the month, and the third number the year.

Data on the more common species are lumped while those of rarer species are given in detail. Data previously published are only briefly summarized, and are in-

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cluded only when they contribute materially to the geographical and seasonal distribution picture.

The deer flies have not been extensively studied in New England. Blickle (1954) and Fairchild (1950) published annotated lists for New Hampshire and Connecticut, respectively. Johnson (1925) listed certain collection records for New England. The present study lists thirty-seven species and two subspecies for New England. New state records are starred (*).

Of the biting insects which develop in water or very moist conditions, the deer flies generally rank as a human pest behind the mosquitoes, blackflies, and punkies (Heleidae=Ceratopogonidae) and ahead of the horse flies. In southern New England deer flies exceed the punkies in importance except locally along the coast. In general, they are slightly more abundant in northern than in southern New England. In northern New England they are called "moose flies" and locally "dog flies." They like to attack particularly in the head and neck region.

Chrysops aberrans Philip. ME.: Bar Harbor, VII.21.19 (J); Princeton, VII.14.52 (HK); Richville, VII.12.52 (HK). N.H.: six localities, VI.15-IX.9 (B). VT.*: Coventry, abundant VII.23.52 (Shannon Fly Trap, EIC); Sand Bar State Park, VIII.7.52, VII.30.52 (Shannon Fly Trap, 60 specimens entered trap until 8 P.M. and were biting in trap in second growth swampy woods at Lake Champlain, EIC); Grand Isle, VII.9.04 (A. P. Morse). MASS.: Auburndale, VII.16 (J); Fall River, VII.22.05 (J. A. Cushman); Hyannis, VIII.4.40 (CPA); Montague, VII.23.51 (EIC); Newton, VII.23.50 (A. Feldman); Springfield, VII.13.05 (J); Wellesley, VIII.8.07 (BU). R.I.: (P). CONN.: (P). Resume: all states; extreme dates VI.15-IX.9.

The early records above were probably included as *striata* in Johnson's (1925) list.

C. aestuans van der Wulp. VT.*: Sand Bar State Park, VII.30.52 (Shannon Fly Trap, EIC).

C. amazon Daecke. ME.*: Casco, VI.

19.51 (JCK). N.H.: three localities, VI.50-VII.13 (B). MASS.: North Saugus, VII.17.06 (J).

C. atlantica Pechuman. N.H.: Hampton, VII.1-VIII.21 (B). MASS.: nine localities, VII.17 - VIII.31 (Pechuman, 1949). R.I.: Kingston, VII.18.47 (URI); Westerly, VII.18 (Pechuman, 1949). CONN.: Lyme, VI.27 (Pechuman, 1949).

C. beameri Brennan. MASS.: Woods Hole (F).

C. callidula Osten Sacken. ME.: Morrill, VII.15.52 (MFS). N.H.: six localities, VI.12-VIII.4 (B). VT.*: Sand Bar State Park, VII.30.52 (EIC). MASS.: Amherst, Boston, Chatham, Chicopee, Eastham, Holyoke, Hyannis, Longmeadow, Mt. Tom, Montague, Northampton, Northboro, Springfield, Stockbridge, Sunderland, West Springfield, West Yarmouth, Winchendon, VI.16-VIII.1 (J, UM, EIC, C. A. Frost). R.I.*: Coventry, Kingston, Providence, Rockville, VI.12-VII.7 (HK, URI, Dow and Blake). CONN.: many localities, VI.4-VIII.2 (F); Putnam, V.15.33, V.18.33 (CPA); Willimantic, VII.2.52 (HK). Resume: all states; extreme dates V.15-VIII.2.

This is one of the most abundant species in southern New England in the open woodlands. It is less common in northern New England.

Philip (1931) listed the larval habitat as temporary ponds, marshes with indefinite shoreline, and running water.

C. carbonaria Walker. ME.: Casco, VI.19.51 (JCK); Mt. Desert, VI.21.35, VI.23.35 (CPA); Norway (P). N.H.: Lower Pantook, VI.25.52 (FRL); Third Connecticut Lake, VI.24.52, VII.9.52 (EIC and FRL); Twin Mt., VI.22.50 (HK); White Mts., VI.13.36, VI.22.36 (CPA); Mt. Monadnock, VI.22.52 (A. Feldman); twelve localities, V.7-VII.14 (B). VT.*: Downer State Forest, VI.16.52 (EIC); Groton State Park, VI.5.52 (EIC); Lake Willoughby, VI.17-29.45 (CPA); South Troy, VI.12.52 (EIC). MASS.: Amherst, Brewster, Chicopee, Leverett, Mt. Toby, Mt. Tom, Sunderland, V.31-VII.3 (UM, EIC). R.I.: Kingston, VI.15.19, VI.16.42 (URI). CONN.: New Haven, VI.6.36

(UM); eight localities, V.31-VI.27 (F, Br). Resume: all states; extreme dates V.7-VII.14.

Blickle (1954) lists this as an abundant and economic species in New Hampshire in early summer. It is much more abundant in northern than in southern New England. This species usually heralds the beginning of the deer fly season.

Stone (1930) collected larvae in mud among dead leaves and sticks, often under the water, and along the margins of streams and ponds. He took pupae in compact mud, several feet back from the water, just below the surface.

C. celer Osten Sacken. ME.: Casco, VI.19.51 (JCK); Mt. Desert, VI.27.38 (UM); Princeton, VII.14.52 (biting in rain, HK); Roxbury, VII.13.52 (HK), VII.18.51 (JCK). N.H.: eight localities VI.1-VII.23 (B). VT.: Cornwall, VI.13.36 (R. Dow); Groton St. Park, VII.1.52 (EIC); Jacksonville, VI.28.37 (H. D. Pratt); Missisquoi Refuge, VII.15.52 (EIC); Sand Bar State Park, VII.30.52 (Shannon Fly Trap, EIC). MASS.: Amherst (UM); Ashland, VI.10.41 (C. A. Frost); Chicopee (UM); Holyoke (UM); Sunderland, VI.6.51 (EIC); Waltham (UM). R.I.: Cumberland, VI.3 (URI); Kingston, VI.23, VI.29 (URI); Providence (URI). CONN.: many localities VI.26-VII.4 (F, Br). Resume: all states; extreme dates VI.1-VII.30. It occurs at about the same density throughout New England.

Stone (1930) took larvae in muddy margins of ponds and sluggish woodland streams, among decaying vegetation. Philip (1931) classified the larval habitat as running water and temporary ponds.

C. cuclux Whitney. ME.: Augusta, VI.18.27 (UM); Casco, VI.18.51, VI.19.51, VI.20.51 (JCK). N. H.: nine localities, V.10-VII.14 (B). VT.: Bradford, VI.5.53 (HK). MASS.: Acton, VI.7.30 (BU); Amherst, V.26.33 (UM); Sunderland, VI.6.51 (EIC). CONN.: eight localities, V.20-VI.24-29 (Br, F). Resume: all states but Rhode Island, extreme dates V.10-VII.14. It occurs at a higher density in northern New England and has been

observed attacking in large numbers near Casco, Maine.

C. cursum Whitney. N. H.: Milford (J). MASS.: W. Peabody, VII.13.11 (I); R.I.: Coventry, VII.19.52 (HK); Providence, VII.4 (URI).

C. delicatula Osten Sacken. ME.: Bethel, VII.12.52 (HK); Naples, VII.12.52 (hovering near skin before biting, HK); Richville, VII.11.52 (HK). N. H.: nine localities, VII.12 - VIII.14 (B). MASS.: Amherst (UM); Martha's Vineyard, VI.27.30 (BU). CONN.: three localities, VI.14-VII.4 (F). Resume: all but Vermont and Rhode Island, extreme dates VI.14-VIII.14.

C. dimmocki Hine. N. H.: Lee, VII.8 (B). MASS.: East Sandwich, VI.20-VIII.28 (UM); Falmouth, VI.15 (UM); Harwich, VII.29.51 (HK); Longmeadow (J). R.I.: Kingston, VI.29.52 (HK). CONN.: Stamford, VI (Br). Resume: all but Maine and Vermont; extreme dates VI.15-VIII.28.

C. excitans Walker. ME.: Brownville Junction, VII.14.52 (HK); Mt. Desert, VI.18, VI.23 (CPA); Mt. Katahdin, VII.14.52 (MFS). N. H.: Third Connecticut Lake, VI.24.52 (EIC and FRL), VII.9.52 (EIC); Lower Pantook, VI.25.52 (EIC and FRL); sixteen localities, VI.3-VII.12 (B). VT.: East Roxbury, VI.26.52 (EIC); Groton State Park, VII.1.52, VII.16.52 (EIC); MASS.: Barnstable, VI.22 (UM); Chicopee, V.31 (UM); Mt. Toby, VI.10 (H. D. Pratt); Provincetown, VI.19 (UM). R. I.: Kingston, VI.18.42 (HK). CONN.: Avon and Putnam, VI.15-VI.27 (F). Resume: all states; extreme dates V.31-VII.18.

Blickle (1954) lists this as an abundant and economic species in New Hampshire in early summer. It is much less common in southern New England. In New Hampshire this species was very abundant and attacked fiercely.

C. flavida Wiedemann. MASS.: Long Pond, VII (UM); Martha's Vineyard VI.27.30, VII.23.30, VIII.11.35, VIII.13.35 (BU); Nantucket, VII.19.26, VIII.6.28, VIII.8.29, VIII.20.29, IX.8.26 (BU); IX.5

(UM). R. I.: (P). CONN.: five localities, VI.9-VIII.8 (F).

This species seems to be confined to the coastal area of New England.

C. frigida Osten Sacken. ME.: Eastport, VII.15.52 (HK); Orono (UM). N. H.: six localities, VI.11-VII.14 (B). VT.*: Groton State Park, VII.1.52, VII.31.52 (EIC). MASS.: Belchertown, (UM); Martha's Vineyard, VI.4.32 (BU); Natick, VI.13.37 (C. A. Frost); Nantucket, VI.23.27, VI.24.29, IX.14.28, VII.25.28 (BU); Peru, VI.4, VI.7 (FRL); Sherborn, VI.18.29 (♂ and ♀ in coitus, C. A. Frost). R. I.: Kingston, VI.12.19 (URI), VI.18.42 (HK), VI.23.06 (URI); Providence, VII.2 (URI). CONN.: New Haven and Stamford, VI.11 (F). Resume: all states, extreme dates VI.4-IX.14. It was observed to be numerous in morning, gradually reduced in numbers during afternoon, and then briefly active again at sunset.

C. frigida xantha Philip. N. H.: Milford and Franconia, VII.8 (B).

C. fuliginosa Wiedemann. ME.: Eastport, VII.15.52 (HK); Southwest Harbor, VII.9.10 (UM). N. H.: Durham, Hampton, Lee, VI.6-VII.2 (B). MASS.: East Sandwich, VII.2 (UM); Scituate, VI.53 (EIC); Yarmouth, VI.21 (UM). R. I.: Jamestown, VI.6.51 (HK). CONN.: New Haven, Rowayton and Stratford, VI.6-VII.9 (F). Resume: all states but Vermont; extreme dates VI.6-VII.15.

This species develops in salt marshes and is probably more common than the number of collections indicate. Johnson (1925) gives additional records without specific localities.

C. geminata Wiedemann. ME.*: Portland, VII.14.52 (HK); Richville, VII.12.52 (abundant with *univittata* and *montana*, HK). N. H.: eleven localities, VII.5-VII.25 (B). VT.: Moscow, VII.15.52 (EIC); Warren Mt., VII.17.52 (EIC, male feeding upon *Spiraea*); Winooski, VII.20 (URI). MASS.: Amherst, VI.30, VII.6, VII.17 (EIC and UM); Cushman, VII.8.51 (EIC); Leverett, VII.13.52 (EIC); South Amherst, VII.2.51 (EIC); Stockbridge, VII.18.51 (EIC). R. I.:

Coventry, VII.14.52 (FRL); VII.19.52 (HK); Kingston, VII.10.50, VII.28.50, VIII.2.05 (URI); Washington County, VI.29.37 (URI); Wickford, VII.18.52 (FRL). CONN.: five localities, VI.19-VII.26 (F). Resume: all states; extreme dates VI.19-VIII.20. In Massachusetts this is the most abundant species in some localities, attacking very actively.

C. geminata impunctata Kröber. N. H.: Durham, VII.18 (B).

C. hinei Daecke. MASS.: West Peabody, Wellesley, Dover, Wellfleet, New Bedford, VII.8-VIII.30 (J). R. I.: (P).

C. inda Osten Sacken. N. H.: Milford and Pittsburg, VI.20-VII.1 (B). VT.: Downer State Forest, VI.10.52, VI.30.52, VII.8.52, VII.14.52 (EIC); Groton State Park, VII.1.52 (EIC); Montgomery, VII.15.52 (EIC); Shoreham, VI.12-13.36 (R. Dow). MASS.: Amherst, VI.14.40 (at light, M. E. Smith); Chicopee, VII.4 (UM); Longmeadow, VI.18 (UM); Melrose, VII.4 (UM); Mt. Toby, VI.16.34 (UM). R. I.*: Kingston, VII.13.51 (HK). CONN.: Suffield, VI.13.37 (Dow and Blake); four localities, VI.12-VI.26 (Br, F). Resume: all states but Maine; extreme dates VI.1-VII.15.

This species is never very abundant at one place but is common at least in Vermont.

C. lateralis Wiedemann. ME.: Bethel, VII.7 (Banks); Byron, VII.13.52 (HK); Eastport, VII.15.52 (HK); Kingfield, VII.13.52 (very abundant with *vittata*, HK); Lakewood, VII.13.52 (HK); Parkeman, VII.13.52 (HK); Millinocket, VII.14.52 (HK); Mt. Desert, VII.25, VII.28 (CPA); North New Portland, VII.13.52 (abundant in hemlock, arbor-vitae, tamarack bog, HK); Pillston, VII.11 (Banks); Rangeley, VII.13.52 (HK); Richville, VII.12.52 (HK); Salem, VII.13.52 (HK); South West Harbor, VII.26.10 (Banks); Springfield, VII.14.52 (HK); Stockton Springs, VII.15.52 (HK); Whitefield, VII.11 (Banks); Yasselboro, VII.15.52 (JCK); York Beach, VII.11.52 (HK). N. H.: Dixville Notch, VII.10.52 (biting), VII.23.52 (EIC, biting in open areas, not in woods); Third Connecticut Lake, VII.9.

2, VII.22.52 (EIC); twenty-two localities, VI.11-VIII.24 (B). VT.: Avery's Gore, VII.15.52 (in open area, EIC); Coventry, VII.23.52 (abundant, EIC); Downer State Park, VII.14.52 (EIC); Groton State Park, VII.1.52 (abundant), VII.16.52 (abundant), VII.23.52, VII.31.52 (EIC); Ackonville, VI.24.34 (H. D. Pratt); Aissisquoi Refuge, VII.15.52 (EIC); Montgomery Center, VII.15.52 (EIC); Moscow, VII.15.52, VII.24.52 (EIC); Mount Holly, VII.18.52 (EIC); Newport, VII.10.52 (EIC); Warren Mt., VII.17.52, VII.25.52 (male feeding on *Spiraea*, EIC). MASS.: Amherst, VII.22.23 (UM); Montague, VII.23.51 (EIC); Prescott; Rowe, VII.11.51, VII.26.51 (EIC); Templeton, VII.9.51 (EIC); Winchendon, VII.7.51 (EIC). CONN.: three localities, VII.13-VII.20 (F). Resume: all states but Rhode Island; extreme dates VI.11-VIII.24, with great majority in VII.

Blickle (1954) lists this as one of the four most important species in New Hampshire. It was the most commonly collected species in Maine and Vermont. It is less common in southern New England.

C. lugens Wiedemann. CONN.: (Brenan, 1935).

C. mitis Osten Sacken. ME.: Katahdin, VII.14.52 (MFS); Mt. Desert, VI.19.29 (UM). N. H.: Lower Pantook, VI.25.52 (EIC and FRL); Third Connecticut Lake, VI.24.52 (EIC and FRL); six localities, VI.11-VII.7 (B). VT.: Bradford, VI.5.53 (HK); Downer St. Forest, VI.16.52 (EIC); Groton St. Park, VI.5.52 (very otherstone, EIC). MASS.: Belchertown, VI.12.39 (UM). R. I.: Kingston, VI.15.52 (HK). CONN.: Canaan, VI.14-VI.29 (F). Resume: all states; extreme dates VI.5-VII.14, with majority of collections in VI.

This species attacked very severely, often with *carbonaria*.

Blickle (1954) reports this as an abundant and economic species in New Hampshire in early summer.

C. moeche Osten Sacken. ME.: North New Portland, VII.13.52 (HK); Waterville (J). N. H.: one locality (J); five

localities (B), VI.1-VIII.25. VT.*: Bennington, July, 1950 (HK). MASS.: Sharon (J); Winchendon, VII.9.51 (EIC). R. I.: Kingston, VII.13.51 (HK); Providence, VII.13 (URI). CONN.: Hop River, VII.2.52 (HK); four localities, VI.21-VIII.8 (F). Resume: all states; extreme dates VI.1-VIII.25.

This species appears to attack without the usual buzzing and warning typical of the genus *Chrysops*.

C. montana Osten Sacken. ME.*: Bethel, VII.12.52 (HK); Richville, VII.12.52 (HK). N. H.: three localities, VII.6-VII.18 (B). VT.: Bennington, July, 1950 (HK). MASS.: Montague, VII.23.51 (EIC); Newton, VII.2.50, VII.14.51, VII.23.50 (A. Feldman); Northboro, VI.24.37 (C. A. Frost). R. I.: Kingston, VII.4.52 (HK). CONN.: four localities, VII.4-VII.6 (F). Resume: all states; extreme dates VI.4-VIII.20 (J).

Stone (1930) found it to be practically confined to the vicinity of lakes and ponds. Abundant in Hammond's Wood near Hammond's Pond, Newton, Massachusetts on VII.14.

C. nigra Macquart. ME.: Madrid, VII.13.52 (HK); Mt. Desert, VI.16.35, VII.21.35 (CPA); Upper Ebeemee Lake, VII.14.52 (HK). N. H.: Dixville Notch, VII.23.52 (EIC); Lower Pantook, VI.25.52 (EIC, FRL); Third Connecticut Lake, VI.24.52 (EIC). VT.: Downer St. Forest, VI.14.52, VI.16.52, VI.23.52 (biting, EIC); Groton St. Park, VI.16.52, VII.1.52 (EIC); Guildhall, VI.26.52 (EIC). MASS.: Amherst, VI.35, VI.6.19 (FRS); Cushman, VII.8.51 (EIC); Lee, VI.7.34 (FRS); Springfield, VI.18.99 (UM); Waltham, 1952; West Falmouth, VI.12 (UM); Winchendon, VI.22.51 (EIC). R. I.: Exeter, VI.18.52 (HK); Greene, VII.1.52 (HK); Kingston, VI.17.05 (URI); Providence (Roger Williams Park), VI. VI.2 (Davis); Washington Co., VII.4.42 (URI). CONN.: Lyme and North Haven, VI.16-VII.1 (F) and Stamford (Br). Resume: all states; extreme dates V.30-VIII.2 (J). A formidable pest appearing with *carbonaria* and *mitis* in large numbers.

C. nigribimbo Whitney. N. H.: Milford, VII.9-VII.21 (B). MASS.: Martha's Vineyard, VI.27.30 (CWJ); Fall River, Hyannisport, Springfield, Wellesley, V.24-VII.19 (J).

C. nigripes Zetterstedt. ME.: (P).

C. obsoleta Wiedemann. MASS.: Chocopee, VII.26.96 (UM). R. I.*: Providence, IX.2 (URI). CONN.: four localities, VI.19, VIII.23 (F, J).

C. pudica Osten Sacken. N. H.: Durham and Lee, VII.4 (B). MASS.: Eastham (UM); Northboro, VI.24.37 (C. A. Frost). R. I.: Kingston, VI.26.42, VII.49, VII.2.53, VII.7.50, VII.19.48 (HK), VIII.5.50 (JCK), VIII.9.50 (URI); Narragansett, VIII.9.50 (URI). CONN.: New Haven, VII.4 (?) (F); Stamford (F). Resume: all states but Maine and Vermont; extreme dates VI.24-VIII.9.

Johnson (1925) reports the species, in particular, along the coast of Massachusetts south of Boston.

Stone (1930) took larvae in wet mud, usually in unshaded places and in boggy meadows fed by springs, and one in a creek bank and one at the margin of a swamp. Philip (1931) classified the habitat as marshes with an indefinite shoreline, and running water.

C. sackeni Hine. N. H.: five localities, VI.17-VIII.8 (B). VT.: Sand Bar State Park, VII.30.52 (EIC, Shannon Fly Trap). MASS.: Woburn, VII.11.07 (UM). R. I.: Kingston, VII.17.50 (HK). CONN.: Putnam, VI.15.33 (CPA).

C. sequax Williston. MASS.: (Brennan, 1935).

C. shermani Hine. ME.*: Byron, VII.13.52 (very common, HK); Old Spec Mt., VII.18.51 (JCK). N. H.: Berlin, Dixville, VI.19.20 (URI); Dixville Notch, VII.23.52 (EIC). VT.*: Avery's Gore, VII.15.52 (EIC); Downer State Forest, VII.21.52, VIII.1.52, VIII.8.52 (EIC); Groton State Park, VII.1.52, VII.16.52, VII.31.52, VIII.14.52 (EIC, Shannon Fly Trap); Maidstone State Forest, VII.23.52, (abundant, EIC). Resume: Maine, New Hampshire, and Vermont; extreme dates VI.19-VIII.14.

This species, generally considered rare,

was locally abundant. It is a persistent attacker.

C. sordida Osten Sacken. ME.: Madrid VII.13.52 (HK); Mt. Katahdin, VII.13.2. (J). N. H.: Zealand Camp, Twin Mt. VI.26.52 (FRL); seven localities, VI.19-VII.16 (B); two localities, VII.4.28 (J) Third Connecticut Lake, VI.24.52 (EIC FRL). VT.*: Lake Willoughby, VI.17.29.45, 1800 ft. (CPA). Resume: Maine New Hampshire and Vermont; extreme dates VI.17-VII.16.

Blickle (1954) lists it as an abundant and economic species in New Hampshire in early summer.

C. striata Osten Sacken. ME.: Burnham, VIII.13.51 (HK); Orono (URI) N. H.: Berlin (URI); eight localities VI.22-VII.30 (B). VT.*: Sand Bar State Park, VII.30.52, VIII.7.52 (EIC, Shannon Fly Trap). MASS.: Holyoke, VII.31.96 (UM); Montgomery, VII.2.98 (UM) R. I.: Kingston, VII.17.50 (HK). CONN.: four localities, VI.21-VII.18 (F). Resume: all states; extreme dates VI.21-VIII.13.

Blickle (1954) lists this as one of the four most important species in New Hampshire. Although rather abundant in Vermont on July 30, it was rare in the same area by August 7.

C. univittata Macquart. ME.: Bethel VII.12.52 (HK); Richville, VII.12.5 (HK); N. H.: ten localities, V.21-IX.1 (B). MASS.: Amherst, VII.20.52, VIII.6.51 (EIC); Coltsville, VII.18.51 (EIC) Danvers, VII.29.50 (A. Feldman); Levrett (EIC); Montague, VII.23.51 (EIC) Montgomery, VII.7.98 (UM); Mt. Toby VI.18.51 (EIC); Springfield (UM); South Amherst, VII.2.51, VII.23.51 (EIC); West Springfield, VI.27.96 (UM); Winchendon, VIII.1.51 (EIC). R. I.: Cumberland VII.3.10 (URI); Exeter, VII.13.39 (URI) Greene, VII.13.14 (URI); Kingston, VI.29.51, VII.8.52, VI.12.50, VII.17.50, VII.21.47 (HK). CONN.: Stonington, VII.8.52 (HK); Winthrop, VI.20.52 (HK) many localities, VI.16-VIII.3 (F). Resume: all states except Vermont; extreme dates V.21-IX.11.

Blickle (1954) lists it as one of the four most important species in New Hamp

hire. This species, *C. vittata* and *C. eminata*, are the most important species in southern New England. It has not been reported from Vermont, despite rather intensive collecting.

C. vittata Wiedemann. ME.: Kingfield, VII.13.52 (HK); Mt. Desert, VII.25.38, VII.27.38 (CPA); Richville, VII.12.52 (HK); Springfield, VII.14.52 (attacking severely, with *C. lateralis*, HK). N. H.: vely localities, VI.19-IX.9 (B). VT.*: Downer State Forest, VIII.1.52 (EIC); Groton State Park, VII.31.52 (EIC); Jackson, VI.28.37 (H. D. Pratt); Moscow, VII.24.52 (EIC); Shoreham, VI.13.5 (R. Dow); Winooski, VIII.01 (URI). MASS.: Amherst, Chicopee, Chilmart, Coltsville, Cushman, Montgomery, Mt. Tom, Northampton, Orient Springs, Pittsfield, Salem, South Amherst, Stockbridge, Wenham, Westhampton, Westbury, Williamstown, Winchendon, I.6-VIII.28 (EIC, UM, R. Dow, A. P. Morse). R. I.: Coventry, VIII.5.51 (A. Thomas); Kingston, VII.25.50 (JCK), II.28.50 (Campbell), VIII.1.52, VIII.2.50 (HK), VIII.2.06 (URI), VIII.5.46 (HK), Peace Dale, VIII.1.51 (D. J. Zinn). CONN.: many localities, VII.19-VIII.8 (F). Resume: all states; extreme dates I.6-IX.9.

Stone (1930) found larvae in wet mud margins of ponds and streams, usually shaded. It has also been taken in temporary ponds.

It is the most troublesome *Chrysops* in New England, especially in the southern part. Blickle (1954) lists it as one of the four most important species in New Hampshire.

C. wiedemanni Kröber. ME.: Bradford, II.16.52 (HK); Millinocket, VII.14.52 (HK); Princeton, VII.14.52 (HK); Upper beemee Lake, VII.14.52 (HK). N. H.: eight localities, VI.12-IX.9 (B). VT.*: Downer State Forest, VIII.1.52, VIII.15.52 (EIC); Groton State Park, VIII.14.52, II.31.52 (EIC); Newport, VIII.19.52 (EIC); Winooski, VIII.20.01, VIII.21.01 (Davis, URI). MASS.: Montague, VII.13.51 (EIC); Mt. Tom, VII.16.98 (UM); Attick, VII.29.28 (BU); South Amherst,

VII.14.29, VII.23.51 (EIC), VIII.6.51 (EIC); Wenham, VIII.22.27 (A. P. Morse). R. I.: Exeter, VIII.6.39 (URI); Kingston, VIII.49 (HK). CONN.: many localities, VI.19-VIII.15. Resume: all states; extreme dates VI.12-IX.9.

Adults are very silent when they approach, and they seem to like to bite along the arms as well as the head.

Stone (1930) found larvae in the muddy banks of streams and the margins of small ponds, but always in very wet places. Four pupae were found in a boggy meadow.

SUMMARY. Thirty-seven species and two subspecies are listed for New England. *Vittata* is the most abundant and economic species throughout New England. *Univittata* is abundant except in Vermont, and *celer*, *geminata* and *wiedemanni* are common throughout New England. *Callidula* is abundant in southern New England, while *carbonaria*, *excitans*, *lateralis*, *sordida* and *striata* are of major importance in northern New England. *Shermani*, ordinarily considered rare, was found to be locally abundant in Vermont. Recorded for the first time are ten species for Vermont, three for Rhode Island, and four for Maine. Geographical and seasonal collecting data are given for each species.

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HIGH ALTITUDE OBSERVATION CHAMBER FOR INSECT PHYSIOLOGY STUDIES¹

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A high altitude observation chamber for the observance of gross insect behavior patterns and physiologic changes that may occur at varying altitudes was described by Perry and Webster (1950). The chamber of this equipment was evacuated by means of a Luer syringe. Hiestand and Stemler (1951) studied the acquired tolerance of various insects to repeated decompressions by using test tubes cut to appropriate lengths and explosively decompressed by means of a vacuum pump.

The apparatus developed by Perry and Webster has since been enlarged and modified to provide five observation chambers for the study of a number of insects at two different simulated altitudes simultaneously. It is equipped with a cooling system to maintain lower temperatures (see Figure 1).

The equipment currently in use con-

sists of a plastic box housing five removable, stoppered chambers of pyrex glass. The bases of these chambers fit into cent drilled, inverted Number 6 rubber corks. The openings at the bases of three of the corks are slipped over the ends of one fourth inch copper tubing leading to a common copper duct which passes through a calibrated vacuum gauge to the vacuum source. The remaining two chambers are similarly connected through another gauge. All joints were made vacuum tight with Glyptal.* The vacuum is furnished either by two 100 cc. Luer syringe supported by clamps to the frame, or by an electric vacuum pump. When the syringe is utilized, the registered vacuum is maintained by closing the cut-off valve located below the gauge. When the vacuum pump is used, the leads are removed from the two syringes, brought together through the use of rubber tubing and a glass "Y" to a common rubber duct leading to the pump. The vacuum in each system is maintained by adjusting the air-bleeder valve located below the cut-off valve. Fine adjustment may be made by adjustable metal clamps on the rubber hoses leading from the pump through the valves to the two gauges. By this system vacuum levels can be maintained from one to thirty inches of mercury.

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