CATCH BASIN SPRAY JEEP. The newly assembled "standard" catch basin spray Jeep (Fig 2, right) has been evolved through the experience of the District in building and operating a number of units designed for maximum safety and convenience. An average of about 400 catch basins per day are treated on the congested high-traffic streets of Oakland and other urban centers. The basis of the unit is a right-hand drive Jeep Dispatcher, with automatic transmission. The 50-gallon insecticide supply tank is of fiberglass, rectangular in shape, and designed to fit the space in the back of the Jeep. It has a quickly-removable locking bronze cap and base, rated at up to 250 psi as manufactured by the OPW Manufacturing Co., Cincinnati, Ohio, and specified as follows: Cap, #OPW 633-F 1½" bronze base, #OPW 634-B 1½" bronze. The plumbing includes the usual line strainers, pressure regulators, recirculating agitators, etc. The pump is a ½" bronze gear pump, mounted under the hood of the Jeep. It is driven at crankshaft speed through a vee-belt, the driven sheave of which is mounted on a magnetic clutch (Fig. 2, left), manufactured by Pitts Industries, Inc., P. O. Box 14233, Dallas 34, Texas. Clutches of this type have given very good service in similar spray pump installations. They were first used in California mosquito control by the Orange County Mosquito Abatement District.

To contribute to safe operation, a rotating, flashing, yellow safety signal which operates continuously when the Jeep is in spray service is mounted on the roof of the cab. The signal light was made by the Trippe Manufacturing Company, Chicago, Illinois. A large "caution" sign for the rear of the Jeep is supported by pipe sockets welded to the back bumper. When the Jeep is not in spraying service, the caution sign is reversed, and the opposite side carries only the decal insignia which identifies the District.

CULICOIDES (DIPTERA: CERATOPOGONIDAE) ASSOCIATED WITH POULTRY IN VIRGINIA [1]

DONALD H. MESSERSMITH [2]

This study was a part of a research project being conducted at Virginia Polytechnic Institute to determine the arthropod vectors of avian infectious synovitis, a disease of poultry. Therefore, this investigation was concerned with determining which species of *Culicoides* are associated with poultry and to what extent they are feeding on domestic chickens and turkeys. This information would indicate which species, if any, might serve as potential vectors of this disease, because they are known to be vectors of other diseases. In addition, a survey of *Culicoides* in Virginia was made to investigate their distribution, bionomics and life histories. A report of this work is in press.

It is known that several species of *Culicoides* are avian feeders. Reports of *Culicoides* feeding on wild birds have been published by Painter (1927), Arnaud (1956), and by Hicks (1959). More specifically Jellison and Philip (1933) re-

[1] This research was supported by the National Institutes of Health as Project No. AI-05947 (formerly E-2717) in cooperation with the Departments of Entomology and Veterinary Science, Virginia Agricultural Experiment Station, Blacksburg, Virginia.

[2] Present address: Department of Entomology, University of Maryland, College Park, Maryland.

TABLE 1.—*Culicoides* trapped in poultry houses, by Virginia locality.

Species	Bent Mountain	Blacksburg	Elkton	Ferrum	Poplar Camp
C. arboricola	0	18	120	177	27
C. baueri	0	14	0	0	0
C. biguttatus	0	1	0	0	0
C. chiopterus	0	4	2	1	1
C. crepuscularis	1	223	19	132	2
C. debilipalpis	0	3	1	10	0
C. guttipennis	0	102	61	121	24
C. haematopotus	0	13	0	12	0
C. hinmani	0	0	0	2	0
C. nanus	0	0	0	2	0
C. obsoletus gp.[a]	10	37	370	1147	127
C. ousairani	0	0	2	55	0
C. paraensis	0	0	0	3	0
C. piliferus gp.[b]	2	2	1	15	0
C. spinosus	0	1	1	1	0
C. stellifer	0	45	0	57	1
C. travisi	0	11	0	2	2
C. variipennis	0	5	0	2	0
C. venustus	2	20	1	34	1
C. villosipennis	0	4	4	117	3
Totals	15	503	582	1890	188

[a] Includes *C. obsoletus* and *C. sanguisuga.*
[b] Includes *C. piliferus* and *C. scanloni.*

ported them feeding on crows *(Corvus brachyrhynchus).* Judd (1954, 1957) collected them from catbirds *(Dumetella carolinensis).* They were found feeding on house finches *(Carpodacus mexicanus)* according to Wirth and Hubert (1960) and Ryckman (1960). Fallis and Bennett (1960) collected *Culicoides* from spruce grouse *(Canachites canadensis)* and ruffed grouse *(Bonasa umbellus)* and Bennett (1960) later reported them on 11 different species of birds. Examples of *Culicoides* feeding on domestic birds including chickens, turkeys, ducks and unidentified fowls have been given by Tokunaga (1937), Pickard and Snow (1955), Lee (1956), Arnaud (1956), Snow *et al.* (1957, 1958), Fallis and Wood (1957), Jones (1959), Campbell and Pelham-Clinton (1960), and Turner *et al.* (1963).

A number of species were collected inside poultry houses by Tokunaga (1937), Snow *et al.* (1957, 1958), Wirth and Bottimer (1956) and others.

Using light traps in chicken coops at Ferrum and at Poplar Camp, Virginia, it was found that the following species of *Culicoides* were present in predominant numbers: *arboricola, crepuscularis, debilipalpis, guttipennis, haematopotus, obsoletus* group,[3] *ousairani, piliferus* group,[4] *stellifer, venustus,* and *villosipennis.* One to four individuals of seven other species were also taken. Those of the *obsoletus* group were more numerous than all other species combined. Four of the above species were also trapped in small numbers at Bent Mt., Virginia, the same summer (1959).

The following year, a continuous trapping program at Blacksburg over a period of six months yielded the following predominant species: *arboricola, baueri, crepuscularis, guttipennis, haematopotus, obsoletus* group, *stellifer, travisi, variipennis,* and *venustus.* One to four individuals of six other species were also taken. *Crepuscularis* was the most abundant. Trapping at Elkton, Virginia, gave similar results. Here again, the *obsoletus* group specimens were the most abundant. These results are summarized in Table 1.

[3] Includes *C. obsoletus* and *C. sanguisuga.*
[4] Includes *C. piliferus* and *C. scanloni.*

At each of the trapping sites it was found that more *Culicoides* were taken in poultry houses located near a woods which could serve as their breeding site than in houses farther away from woods.

The specimens were stored in alcohol and later mounted in phenol-balsam on microscope slides. They were then examined to determine sex and whether the females were engorged with blood or not.

At least a few individuals of every species listed above except *venustus* contained blood in their abdomens. Table 2 summarizes this for all specimens in poultry houses during this study. Examination of the table reveals that *arboricola, baueri, crepuscularis, piliferus* group, *travisi*, and *villosipennis* had rather high percentages of engorged females. The low numbers of *baueri, piliferus* group and *travisi* taken would tend to eliminate them as suspects leaving just *arboricola, crepuscularis* and *villosipennis*. Our future investigations will initially concentrate on these species as possible vectors of infectious synovitis.

Because the very large numbers of *obsoletus* group specimens taken tend to place them under suspicion, we hope to investigate their role as potential vectors also.

TABLE 2.—*Culicoides* trapped in poultry houses in Virginia.

	Total number collected				
Culicoides	Males	Unengorged females	Engorged females	Total	Percent of engorged females
arboricola	13	156	173	342	52.58
baueri	2	7	5	14	41.66
biguttatus	0	1	0	1	0
chiopterus	0	7	1	8	12.50
crepuscularis	40	230	107	377	31.56
debilipalpis	0	11	3	14	21.42
guttipennis	21	255	32	308	11.15
haematopotus	0	20	5	25	20.00
hinmani	0	2	0	2	0
nanus	0	2	0	2	0
obsoletus gp.	7	1517	167	1691	9.91
ousairani	0	50	7	57	12.28
paraensis	0	3	0	3	0
piliferus gp.	2	12	6	20	33.33
spinosus	0	3	0	3	0
stellifer	10	86	7	103	7.52
travisi	4	7	4	15	37.50
variipennis	5	2	0	7	0
venustus	11	47	0	58	0
villosipennis	0	49	79	128	61.78
Totals	115	2467	596	3178	19.45

Literature Cited

ARNAUD, P. 1956. The heleid genus *Culicoides* in Japan, Korea and Ryukyu Islands (Insecta: Diptera). Microentomology 21:84–207.

BENNETT, G. F. 1960. On some ornithophilic blood-sucking Diptera in Algonquin Park, Ont., Can. Can. Jour. Zool. 38:377–389.

CAMPBELL, J. A. and PELHAM-CLINTON, E. C. 1960. A taxonomic review of the British species of *Culicoides* Latreille (Diptera: Ceratopogonidae). Roy. Soc. Edinburgh Proc. 67:181–302.

FALLIS, A. M. and BENNETT, G. F. 1960. Description of *Haemoproteus canachites* sp. (Sporozoa: Haemoproteidae) and sporogony in *Culicoides* (Diptera: Ceratopogonidae). Can. Jour. Zool. 38:455–464.

FALLIS, A. M. and WOOD, D. M. 1957. Biting

midges (Diptera: Ceratopogonidae) as intermediate hosts for *Haemoproteus* of ducks. Can. Jour. Zool. 35:425–435.

HICKS, E. A. 1959. Occurrence of insects in birds' nests, pg. 186. Iowa State College Press, Ames, Iowa.

JELLISON, W. L. and PHILIP, C. B. 1933. Faunae of nests of the magpie and crow in Western Montana. Can. Ent. 65:26–31.

JONES, R. H. 1959. *Culicoides* breeding in human sewage sites of dwellings in Texas. Mosquito News 19:164–167.

JUDD, W. W. 1954. Insects collected from birds' nests at London, Ontario. Can. Field-Naturalist 68:122–123.

JUDD, W. W. 1957. Diptera collected from birds' nests at London, Ontario. Ent. News 68:32–34.

LEE, D. J. 1956. Conference on sandfly research. University of Sidney, Australia. Mimeo.

PAINTER, R. H. 1927. The biology, immature stages, and control of the sandflies (biting Ceratopogonidae) at Puerto Castilla, Honduras. 15th Rept. Med. Dept. Un. Fruit Co. 245–262.

PICKARD, E. and SNOW, W. E. 1955. Light trap collections of punkies (family Heleidae, Genus *Culicoides*) McMinn County, Tennessee, April–September 1952. Tenn. Acad. Sci. Jour. 30:15–18.

Ryckman, R. E. 1960. Biology of cactiphilic species of Ceratopogonidae (Diptera). Ann. Ent. Soc. Amer. 53:659–661.

SNOW, W. E., PICKARD, E., and JONES, C. M. 1958. Observations on the activity of *Culicoides* and other Diptera in Jasper County, So. Carolina. Mosquito News 18:18–21.

SNOW, W. E., PICKARD, E., and MOORE, J. B. 1957. The Heleidae of the Tennessee River Basin. Jour. Tenn. Acad. of Sci. 32:18–36.

STEWARD, J. S. 1933. *Onchocera cervicalis* and its development in *Culicoides nubeculosus* Mg. Camb. Univ. Inst. Ann. Path. 3:272–284.

TOKUNAGA, M. 1937. Sandflies (Ceratopogonidae, Diptera) from Japan. Tenthredo 1:233–337.

TURNER, E. C., WEHRHEIM, N. L., MESSERSMITH, D. H., and DAVIS, J. W. 1963. Transmission studies of avian infectious synovitis by selected arthropod vectors. Poultry Sci. 42:1434–1441.

WIRTH, W. W. and BOTTIMER, L. J. 1956. A population study of the *Culicoides* midges of the Edwards plateau region of Texas. Mosquito News 16:256–266.

WIRTH, W. W. and HUBERT, A. A. 1960. Ceratopogonidae (Diptera) reared from cacti, with a review of the *copiosus* group of *Culicoides*. Ann. Ent. Soc. Amer. 53:639–658.

ILLINOIS MOSQUITO CONTROL ASSOCIATION

EXECUTIVE COMMITTEE

President
WILLIAM LASCHINSKI
North Shore
Mosquito Abatement District
Northfield, Illinois

Past President
FRANKLIN C. WRAY
Des Plaines Valley
Mosquito Abatement District
Lyons, Illinois

Member
RAYMOND A. CARLSON
Macon Mosquito Control District
Decatur, Illinois

Vice-President
HARVEY J. DOMINICK
Illinois Dept. of Public Health
Div. of Sanitary Engineering
Springfield, Illinois

Secretary-Treasurer
EUGENE M. BELLONT
South Cook County
Mosquito Abatement District
Harvey, Illinois

Member
DANIEL DE BIAS
South Cook County Mosquito Abatement District
Harvey, Illinois

VIRGINIA MOSQUITO CONTROL ASSN.

5721 Sellger Drive, P. O. Box 12418, Norfolk, Virginia 23502

Samuel A. Graham, M.D., President, Portsmouth

J. C. Kesler, First Vice President, Virginia Beach

E. P. Wadsworth, Second Vice President, Chesapeake

Roy Tolbert, Third Vice President, Chincoteague

Rowland E. Dorer, Secretary-Treasurer, Norfolk