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RELATIVE ABUNDANCE OF *CULEX PIPIENS* AND *CULEX RESTUANS* IN CATCH BASINS IN JEFFERSON COUNTY, KENTUCKY [1]

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An epidemic of St. Louis encephalitis in Jefferson County, Kentucky, in 1956 prompted the establishment of a Mosquito Control Project as an arm of the Louisville –Jefferson County Department of Public Health. Details of the survey and control operations of this unit are reported by Covell (1968).

The survey of mosquito species in Jefferson County was begun in earnest in 1958 and continues today. Sampling for both larvae and adults is done with emphasis upon the breeding sites of *Culex pipiens*—the probable vector of SLE in the Louisville area.

Particularly important as potential breeding areas for *C. pipiens* are the storm sewer catch basins with which the streets in the city and suburbs are equipped. These basins have been constructed in Jefferson County over a period of many years, but they generally conform to the following description: The distance between the grating at street level to the bottom of the chamber is about 6 feet; an inlet pipe empties into the basin 4 feet from the bottom; and on the opposite wall there is an outlet pipe that eventually empties into a main storm sewer (the outlet pipe is 3 feet from the floor of the chamber). The catch basins are thus designed so that the grit admitted through street inlets is collected at the bottom and not permitted to pass into the storm sewer system.

The data for this study were compiled from catch basin larval samples taken from about 30 selected basins scattered throughout the County from mid-May to mid-October during 1967, 1968, and 1969. A total of 1,408 larvae from 217 samples were determined and counted by Covell. Sanitarians who took the samples also measured water and air temperature at each locality, and larvicided these and all other catch basins at intervals each summer.

Only three species were identified from these samples: *Culex pipiens, Culex restuans,* and *Aedes vexans.* The first of these is well known as inhabiting catch basins (Carpenter and LaCasse, 1955; King *et al.,* 1960; Maddock *et al.,* 1963); *restuans* is perhaps less known as a catch basin breeder. *Aedes vexans* is extremely abundant in Jefferson County but is not nor-

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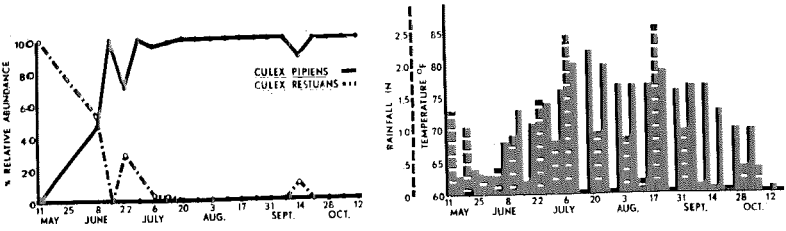
mally a catch basin species. Only one sample in the 3-year period contained *A. vexans;* we consequently suggest that its occurrence in a catch basin was accidental (possibly eggs or larvae were washed in from some external source during the 2.03 inches of rainfall during the week previous to the sample date). We assume, therefore, that *Culex pipiens* and *C. restuans* are the only regular catch basin breeders in any appreciable numbers in Jefferson County.

The simultaneous occurrence of these two species has been reported by other authors (Ross, 1947; Newhouse and Siverly, 1965). The breeding season of *C. restuans* begins in early spring, continues throughout the summer, and ends in early autumn (Ross, 1947). According to Carpenter and LaCasse (1955), *restuans* "reaches its greatest abundance in the spring and early summer throughout most of its range, and occurs in lesser numbers during the late summer and autumn." *C. pipiens,* on the other hand, slowly builds to increasingly higher numbers as the summer progresses, and in our general area breeds in great numbers in late summer and early fall (Siverly, 1966; Covell, 1968). Females of both species hibernate in protected places when cold weather arrives (Main *et al.,* 1968).

These previous generalizations about the population dynamics of the species were borne out by the data presented here (Fig. 1). The graphs for each of the 3 years studied show relative abundance in catch basin larval samples for the two species during the months sampling was done. Data on weekly prescription in inches of rainfall and water temperature in the catch basins, averaged for the week, are also presented. Although the sampling began rather late each season due to rather cool water temperature in catch basins, it can be seen (especially in graphs for years 1967 and 1969) that *C. restuans* tends to be dominant in catch basins until about the end of the first week of June. After a period of fluctuation in relative abundance, *C. pipiens* begins by the first week in July to comprise nearly 100 percent of larvae until the end of the season. Slight increases in *C. restuans* can be seen, especially after the middle of September. Covell has noted that late in the summer enormous quantities of *C. pipiens* may be found in samples from catch basins, ditches, and other sources. There are, however, often one or a few *restuans* included in these large *pipiens* populations. As far as catch basin samples are concerned, the relative abundance of *C. pipiens* and *C. restuans* seems to follow the seasonal pattern noted by previous authors.

In seeking to explain the reversal in dominance by these two species, standard deviations were calculated for the weekly abundance of both species for each of the 3 years. While they were very small for most of each season, the standard deviations were very great during the last 3 weeks in June, when relative abundance of the two species was most unstable. These high standard deviations (15.6 to 19.3) suggest that an extrinsic factor or factors may be responsible for the restriction of *restuans* and the increase of *pipiens* in Jefferson County catch basins during that unstable period.

In all cases, rainfall seemed adequate in middle May to provide ample water for breeding late in that month. It was not precipitation but temperature that seemed the most logical parameter to consider. In all 3 years water temperature in the catch basins remained below 65° F up to (1968, 1969) or through (1967) the first week in June. We suggest, therefore, that between 60° and 70° F there is some critical temperature point or range above which conditions in catch basins (as probably in other waters where both species breed) become increasingly unfavorable for *C. restuans* and favorable for *C. pipiens.* The fact remains, however, that *restuans* does maintain a low-level population throughout the season, and probably increases in the fall as temperatures drop and a build-



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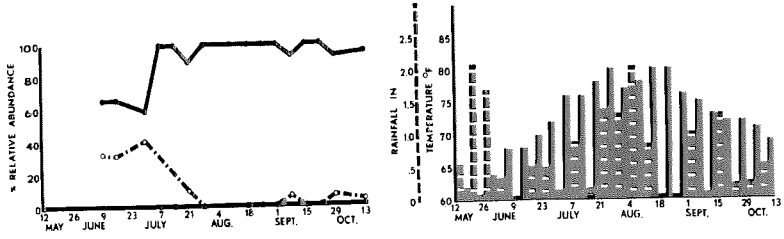

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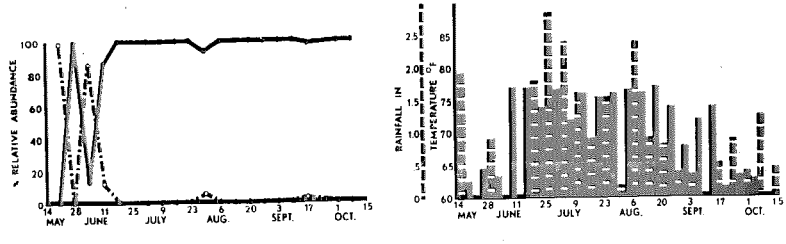

1967

FIG. 1.—Relative abundance of *Culex pipiens* and *Culex restuans* in catch basins in Jefferson County, Kentucky, 1967–1969, and corresponding rainfall and catch basin water temperature averages.

up of adult numbers for overwintering occurs. The small numbers of *restuans* in middle and late summer may also be partially due to actual competition with *pipiens* in breeding areas utilized by both species. Perhaps in cooler bodies of water *restuans* breeds more abundantly throughout the season than one would deduce from the data presented here. Such locally high densities of larval or adult *C. restuans* are not, however, indicated in over-all larval samples and weekly light trap captures for 1965–1967 in Jefferson County. Rather, the pattern of a decrease in *restuans* larvae and adults in July and corresponding great rise in *pipiens* in June (larvae) and July (adults) also corroborates the predicted seasonal cycle of abundance for the two species (Covell, 1968, Tables 2 and 3).

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