Culex (Culex) torrentium Martini and *Cx. (Cx.) pipiens* L. in a Southern English County, 1974-1975

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ABSTRACT. Identification of *Culex* egg-rafts from natural breeding sites in a district of southern England in 1974-75 showed that some 80% were *Culex (Culex) torrentium* and the remainder were *Cx. (Cx.) pipiens*. The status of this species in earlier times is discussed in view of the absence of pre-World War II records, despite intensive study of the mosquito fauna.

INTRODUCTION

The discovery by Mattingly (1951) that *Culex torrentium* Martini occurred in Britain stimulated interest in the status of this species and in its ecological relationships with *Cx. pipiens* L. However, the only published accounts of surveys to follow up this finding have been those of Lever (1954), Service (1968) and Jupp (1979). Onyeka (1980) made a very detailed study of the problem in one locality in Berkshire, but the results have yet to be published. It seemed useful, therefore, to record the results of our own findings on the status of this species in the County of Sussex in the mid 1970s. The surveys were on a limited scale in 8 localities within the county and in one area, Hayling Island, just across the border in Hampshire.

METHODS

Sampling was primarily carried out by the collection of egg-rafts from breeding sites, supplemented by larval collections and the capture of hibernating females. Since the presence of pre-alar scales in the female may not always be diagnostic for *Cx. torrentium* Jupp (1979), Onyeka (1980), identification was based exclusively on the terminalia of reared males.

Collecting sites were very largely small containers such as plastic buckets, water tanks and animal water troughs, together with a small number of ground-pools. Most of the localities were rural or suburban. The hibernating females came from a brick-lined tunnel formerly used for transporting chalk, and from the cellar of a house.

RESULTS

BREEDING SITES. Of 118 egg-rafts collected and reared in 1974, and 518 in 1975, 79.7% and 83.6%, respectively, were *Cx. torrentium*. On the other hand,

only 32.6% of 187 male larvae collected and reared in 1974, and 24.7% of 146 larvae in 1975, were *Cx. torrentium*. We also examined the question of the overlap in choice of sites by the two species. Of 32 sites sampled, *Cx. torrentium* occurred alone in 8, both species in 20 and *Cx. pipiens* in 4. There was a tendency for *Cx. torrentium* to dominate the catches in the earlier part of the summer (Table 1). This was particularly marked in the first season.

HIBERNATION. We examined 871 females in the winter of 1974-75, and 891 in 1975-76. Pre-alar scales were present in 11.5% of specimens in the first season and in 11.7% in the second season. However, egg-rafts were not obtained from these females and the results cannot be taken as evidence for the hibernation of *Cx. torrentium*. They confirm, nevertheless, the findings of other workers that the main hibernating sites of this species have yet to be discovered.

MATING AND BLOOD-FEEDING. Stock cages of both species were established from reared egg-rafts, supplemented at intervals during the summer by further wild-caught material. The fertilization in the *Cx. torrentium* cage was found to be of the order of 20-25% in both seasons. In 1975, the rate in the *Cx. pipiens* cage was 29%. In October 1975, the cages were placed in a wooden box and left in an unheated shed for the winter. The following April, a number of survivors were dissected, when 3 out of 7 *Cx. torrentium* and 14 out of 69 *Cx. pipiens* were found to be fertilized. Females of the former failed to lay. On being brought back into the insectary, maintained at 25° C, many *Cx. pipiens* took a blood meal and a small number of viable egg-rafts were laid. However, in the following generation no further offspring were produced and the colony died out.

Attempts at blood-feeding on birds and mammals had little success when the adults were kept in a constant temperature room on a 12h/12h day/night regime. When kept at room temperature and in a natural summer light regime, however, and with the food source presented between 2030 and 2300h, a variable proportion could be induced to feed on a human arm, an anaesthetized guinea pig or a chick.

DISCUSSION

These findings underline the abundance and ubiquity of *Cx. torrentium* in domestic and rural surroundings, where it formed some 80% of *Culex* egg-rafts collected. If, as Onyeka (1980) has suggested, *Cx. pipiens* is found more frequently in vegetated ponds, the absence of the latter from our sampling routine could have biased the results in favor of *Cx. torrentium*. However, in many areas suitable ponds appear to form a minority of the available habitats, especially since modern agricultural practice favors the filling in and elimination of such places. In fact, this could be invoked as a possible factor in the decline of *Cx. pipiens*, relative to *Cx. torrentium*, in recent decades, observed by ourselves and by other workers.

It is not immediately obvious why, when larvae rather than egg-rafts were sampled from apparently similar sites, this proportion fell to 25-30%. However,

from inspection of the data it appears that the figures are weighted by a few larval sites from which relatively large numbers were collected and identified. It is not known whether this was fortuitous or whether ovipositing *Cx. pipiens* females tend to aggregate. But, whatever the reason, it seems to us that identification of egg-rafts gives a truer picture of the relative abundance of the two species since it is, in effect, a measure of the ovipositing female population in an area. In a detailed study, Service (1968) found 30-40% of *Culex* larvae from various localities in southern England to be *Cx. torrentium*. If the same difference in *torrentium:pipiens* ratios between larval and egg-raft samples were to apply to his findings, his results are broadly similar to ours. Thus, throughout much of this part of England it appears that *Cx. torrentium* is now the commonest peri-urban and perhaps rural mosquito.

There remains the question as to how long this state of affairs has existed. From examination of male *Culex* in museum collections, Service showed that *Cx. torrentium* was present in Britain half a century before it was recognized. It hardly seems possible that it would have been missed had it been as common as nowadays. This supposition is strongly reinforced by our findings in Hayling Island in 1974-75. This island, which is separated from the mainland by a narrow channel, was the home of the British Mosquito Control Institute, set up as a private institution by J. F. Marshall in the 1930s for the study of the British fauna. There can be little doubt but that his surveys of the island were exhaustive, and it is reasonably certain from this that his failure to find *Cx. torrentium* Marshall (1938), indicates its absence or extreme rarity at that time. Yet, some 40 years later we recovered *Cx. torrentium* egg-rafts or larvae from 8 out of 9 sites sampled, and this species formed 36% of *Culex* rafts identified. Thus, it appears that the extension of the range of this species to the South coast at Hayling Island has taken place relatively recently, even though it was apparently common in Middlesex, 56 miles to the northeast, when Dr. P. F. Mattingly found it breeding in water tanks in 1950.

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TABLE 1. Monthly percentages of identified egg-rafts of *Cx. (Cx.) pipiens* and *Cx. (Cx.) torrentium* in 1974 and 1975.

	Up to May 15	May 16 - June 15	June 16 - July 15	July 16 - Aug. 15	Aug. 16 onwards	Total no. of egg-rafts
1974						
Cx. (Cx.) pipiens	-	8	4	34	54	24
Cx. (Cx.) torrentium	4	11	26	56	3	94
1975						
Cx. (Cx.) pipiens	-	4	16	75	5	85
Cx. (Cx.) torrentium	-	3	26	68	3	433