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# DISTRIBUTION OF *AEDES TRISERIATUS* (SAY) AND *AEDES HENDERSONI* COCKERELL IN SOUTHWESTERN ONTARIO, 1975–76[1]

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ABSTRACT. Tree holes containing water suitable for mosquito larvae were examined throughout southwestern Ontario. Larvae of *Aedes triseriatus* (Say) and *Ae. hendersoni* Cockerell were collected from 165 and 6 tree holes respectively. Both *Ae. triseriatus* and *Ae. hendersoni* were widely distributed in southwestern Ontario with *Ae. triseriatus* more abundant than *Ae. hendersoni.* Larvae of *Anopheles barberi* Coq., *Culex restuans* Theob., and *Orthopodomyia signifera* (Coq.) occurred also in tree holes in Ontario. The majority of the tree holes were cavities between trunks of sugar maple trees (*Acer saccharum* Marsh) and were located less than a meter above the ground. The diameter of the tree holes ranged from 3.0 to 41 cm. and the pH values of the water varied from 4.0 to 8.3.

## INTRODUCTION

Two species of tree-hole mosquitoes, *Aedes triseriatus* (Say) and *Aedes hendersoni* Cockerell, are closely related and were classified as one species, *Ae. triseriatus,* until Breland (1960) resurrected and elevated the name *Ae. hendersoni* to full species level. Zavortink (1972) indicated that *Ae. hendersoni* had been collected from nearly all areas of the United States while *Ae. triseriatus* was present in the Eastern United States from Minnesota to Maine south to Texas and Florida. Records indicate that *Ae. triseriatus* was more abundant over its range and that breeding between the 2 species produces hybrid forms (Truman and Craig 1968, Grimstad et al. 1974). Five reports indicated the presence of *Ae. triseriatus* in Ontario, at 2 locations in southeastern Ontario (James et al. 1969) and from 7 locations in southwestern Ontario (Beckel and Atwood 1959, McLaine 1943, Smith and Trimble 1973, Steward and McWade 1960). *Ae. hendersoni* has not been reported from Ontario except in personal communication with Woods (1976).

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*Ae. triseriatus* has been shown to be the primary vector of the LaCrosse subtype of the California group arboviruses (Gould et al. 1974, Pantuwatana et al. 1972, Parsons 1973; Watts et al. 1972). This group of arboviruses has been the most commonly diagnosed cause of insect transmitted encephalitis of humans in the United States between 1966 and 1974. (Anonymous 1976, Henderson and Coleman 1971, McGowan et al. 1973, Parkin et al. 1972). Watts et al. (1975) showed that *Ae. hendersoni* was not a vector of LaCrosse virus in the laboratory. Therefore, considering the difference in vector potential of these 2 species, an extensive study was done to determine the distribution and relative abundance of *Ae. triseriatus* and *Ae. hendersoni* plus any other tree-hole mosquitoes in southwestern Ontario.

## MATERIALS AND METHODS

Tree holes containing water suitable for mosquito larvae were checked from May to October, 1975 and 1976 in southwestern Ontario. Larvae were collected by removing water from the tree holes with a pipette attached to a piece of flexible tubing. Larvae were taken to the laboratory and reared in transparent, plastic cups containing tree-hole water which was maintained at a constant level with deionized water. Larvae were fed powdered Tetra-Min® fish food daily. Fourth-instar larvae or adults of *Ae. triseriatus* and *Ae. hendersoni* were identified according to the characteristics listed by Truman and Craig (1968); Harmston (1969); and Grimstad et al. (1974), and by the keys of Carpenter and La Casse (1955) for the other species found.

Information recorded each time larvae were found included species associations, geographical location, species of the trees, diameter of the tree-hole opening, height above the ground of the opening, pH of

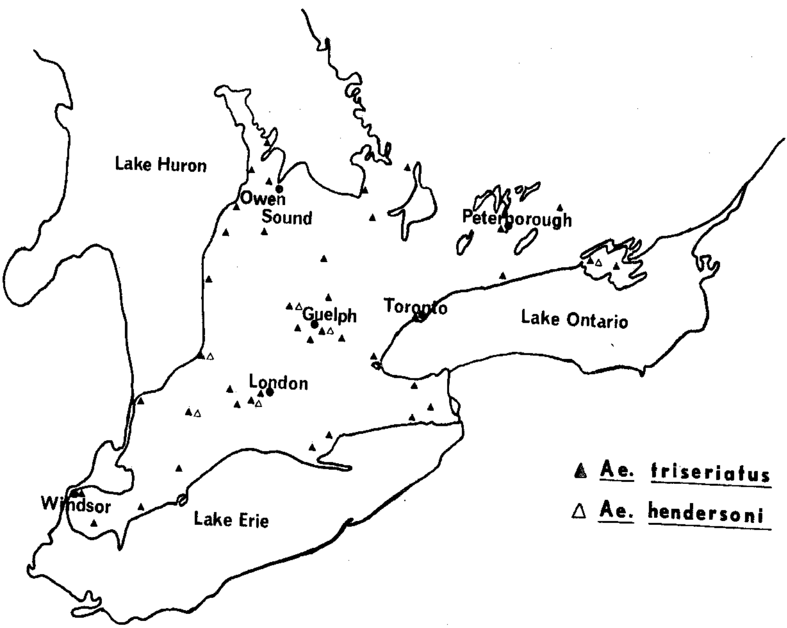


Fig. 1. Distribution of *Aedes triseriatus* (Say) and *Aedes hendersoni* Cockerell in southwestern Ontario, 1975–76.

the tree-hole water and an estimate of whether or not the water was permanent.

## RESULTS AND DISCUSSION

*Ae. triseriatus* was widely distributed throughout upland wooded areas in southwestern Ontario (Figure 1). Larvae were found in 165 tree holes which represented over 80% of those that contained water. Most of the tree holes, containing water suitable for *Ae. triseriatus* larvae were cavities between trunks of trees growing in a clump with the tree hole opening less than a meter above ground. Larvae were most often found in tree holes in sugar maple (*Acer saccharum* Marsh) and American beech (*Fagus grandifolia* Ehrh.), but were present in tree holes in 11 tree species (Table 1). *Ae. hendersoni* larvae were found in 6 tree holes in six separate geographical locations (Figure 1) and were associated with *Ae. triseriatus* larvae in each instance. *Ae. triseriatus* adults were locally abundant within wooded areas and were often collected in biting catches whereas *Ae. hendersoni* adults were rarely collected. (Shipp 1977).

Table 1. Tree species that contained tree holes with *Aedes triseriatus* (Say) and *Aedes hendersoni* Cockerell larvae in southwestern Ontario 1975–1976.

| *Aedes triseriatus* | *Aedes hendersoni* |
|---|---|
| sugar maple (*Acer saccharium* Marsh) | sugar maple (*Acer saccharum* Marsh) |
| American beech (*Fagus grandifolia* Ehrh.) | red oak (*Quercus borealis* Michx.) |
| white oak (*Quercus alba* L.) | |
| red oak (*Quercus borealis* Michx.) | |
| silver maple (*Acer saccharinum* L.) | |
| basswood (*Tilia americana* L.) | |
| Canada plum (*Prunus nigra* Ait.) | |
| hickory (*Carya* Nutt.) | |
| white ash (*Fraxinus americana* L.) | |
| white cedar (*Thuja occidentalis* L.) | |
| yellow birch (*Betula lutea* Michx.) | |

*Anopheles barberi* Coq. and *Orthopodomyia signifera* (Coq) larvae were collected from 1 tree hole at Guelph that contained *Ae. triseriatus*. *Culex restuans* larvae were found in several tree holes that did not contain *Ae. triseriatus* and in 1 tree hole at Guelph that contained *Ae. triseriatus* and *Or. signifera* larvae.

The range of the diameter of the tree holes containing *Ae. triseriatus* larvae was 3.0 to 41.0 cm. and for those containing *Ae. hendersoni* was 5.0 to 23 cm. These ranges of tree hole opening sizes are similar to those found by Lunt and Peters (1976) and Sinsko (1976). The heights of the tree hole openings containing *Ae. triseriatus* larvae were from ground level to 2.4 m. and for *Ae. hendersoni* ground level to 1.8 m. Tree holes which opened at ground level extended several centimeters into the root systems.

Measurements of pH were made for water from 115 tree holes containing *Ae. triseriatus*. The pH range was from 4.0 to 8.3 and both extremes included tree holes containing *Ae. hendersoni* larvae. The majority of the pH values were between 6.0 and 8.0 with pH values below 6.0 in four tree holes and above 8.0 in three. The range of pH values was similar to that found in tree holes in Louisianna by Petersen and Chapman (1969) but was a wider range and more acidic than the 7.4 to 9.1 range for *Ae. triseriatus* and the 6.8 to 9.3 range for *Ae. hendersoni* reported by Lunt and Peters (1976) in Colorado, Iowa, Nebraska, and Wyoming.

Based on the size of the tree hole and depth of the water, it was estimated that 142 of the tree holes in which *Ae. triseriatus* larvae were found were temporary, i.e. dried up at least once a year and that 23 were permanent, maintaining a water level year round. *Ae. hendersoni* larvae were found in 5 temporary and 1 permanent tree hole.

The wide range of the diameter of tree hole openings and the pH levels of the water in which *Ae. triseriatus* and *Ae. hendersoni* have been found in this and other studies indicate that these factors are not seriously limiting factors to the selection or suitability or tree holes as a larval habitat.

This study indicates that *Ae. triseriatus* is widely distributed through upland, woodland areas of southwestern Ontario and that it is often locally abundant. Since this species is the known vector of the La Crosse subtype of the California Group Arboviruses which cause human disease, there is the possibility of the transmission of this virus between wild, mammal hosts and humans if the virus is present in Ontario.

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# COMPARISON OF SEVERAL SLIDE SAMPLING TECHNIQUES USED FOR COLLECTING ULV DROPLETS[1]

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ABSTRACT. Droplets of 95% malathion from a ULV aerosol generator were collected on silicone coated slides, using the "slide pendulum" and 4 hand waving techniques. The droplet distribution was characterized by calculating 7 parameters. These parameters were analyzed to determine the most consistent droplet distribution among the slide waving techniques examined. The vertical swing and "slide pendulum" samples taken 4 ft. from the nozzle showed the most consistent droplet distribution patterns. The vertically waved slides, taken at 25 ft., and the diagonally waved slides, taken at 8 ft., showed the least consistent droplet distribution patterns. In addition, the aerosol cloud was sampled at 3 vertical levels. The data suggest a relatively homogeneous droplet distribution within the cloud, 4 ft. from the nozzle.

Field sampling methods for collecting droplets produced by ultra low volume (ULV) aerosol generators should be quick, simple to conduct, relatively inexpensive, give repeatable and comparable data, and minimize the exposure of the sampler to the insecticide. Hand waving of treated slides is the most common technique currently in use, principally because it is quick, simple, inexpensive and specified by insecticide labels. To determine whether a machine is atomizing the insecticide properly, the collected droplets are compared based on the calculated volume median diameter (VMD). Other droplet parameters which may be analyzed include: the average drop diameter, and the percent of droplets in the 1–6 $\mu$ range, 6–18 $\mu$ range, 1–24 $\mu$ range and 32–48 $\mu$ range. A variety of different hand waving techniques have been reported in the literature. Peterson et al. (1976) used a horizontal swing at 25, 20 and 15 ft. Anonymous (1977) directed that cythion droplets may be collected by waving the slide perpendicular to the movement of the aerosol, 25 ft. from the nozzle. G. A. Mount, U.S.D.A. (personal communication) utilized a swing at a distance of 8 ft. from the nozzle at approximately a 45 degree angle to the move-

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