

flowers. In addition, Maguire *et al.* (1968) reported 2 other dipterous species as well as copepods, ostracods, and protozoa living in the bracts of *Heliconia* in Puerto Rico.

The cercopid here reported presumably feeds on the vascular tissue of the thick flower bracts since it has typical homopteran mouthparts. Many situations in the tropics could conceivably provide suitable habitat for an aquatic homopteran considering the abundance of plant-contained ponds (phytotelmata) such as bromeliads, leaf axils of certain Araceae, and flower bracts of *Heliconia*. However, this insect may be restricted to *Heliconia* as its red markings are suggestive of cryptic coloration: Most *Heliconia* flower bracts are bright red, an adaption to hummingbird pollination (Stiles, 1975).

Kershaw (1914) described the respiratory system of immature Cercopidae. The pleural sclerites are extended ventrally over the sternal sclerites enclosing them to form an air tube the length of the abdomen. This abdominal air tube is open at the posterior end allowing gas exchange with the lateral spiracles on each abdominal segment. It is by means of this specialized air tube that terrestrial immature spittle bugs aerate anal secretions to produce large amounts of the familiar spittle (Gahan, 1918).

The respiratory modifications of the insect found in *Heliconia* bracts were essentially the same as those described by Kershaw (1914) for terrestrial forms. Thus, immature spittle bugs appear to be pre-adapted to plant associated aquatic habitats as an alternative to a terrestrial existence enveloped in protective anal secretions. Respiration through a posterior air tube in contact with the water surface is a recognized adaptation to an aquatic environment found also in immature mosquitoes and water scorpions. The discovery of an aquatic form in the order Homoptera is an addition to the 10 insect orders that Usinger (1971) recognized as having aquatic forms.

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## INSECTS ASSOCIATED WITH FLOWERING BLOODROOT, *SANGUINARIA CANADENSIS* L., AT FANSHAWE LAKE, ONTARIO<sup>1</sup>

W. W. Judd<sup>2</sup>

ABSTRACT: Insects in Hemiptera, Coleoptera, Diptera and Hymenoptera were collected from flowering bloodroot, *Sanguinaria canadensis* L., at Fanshawe Lake, Ontario in April, 1975. The most prevalent pollinators (83%) were bees in Andrenidae, Halictidae, and Apidae.

DESCRIPTORS: Hemiptera, Coleoptera, Diptera, Hymenoptera, Fanshawe Lake, Ontario, Bloodroot flowers.

Fanshawe Lake is an artificial lake, a few miles northeast of London, produced by the building of Fanshawe Dam on the North Branch of the Thames River in London and West Nissouri Townships, Middlesex County, Ontario, Canada (Fig. 1). In an earlier account (Judd, 1961) the association of insects and other invertebrates with flowering skunk cabbage, *Symplocarpus foetidus* (L.) Nutt., on the north shore of the Lake was described. In April, 1975 a study was made of the insects found at flowers of bloodroot, *Sanguinaria canadensis* L.

At its north end Fanshawe Lake is bordered by an abrupt clay cliff rising to a crest 900 feet above sea level. Along this crest are deciduous woods. In openings in these woods grows the bloodroot. Insects were collected from the flowers on April 30, 1975, a day of clear skies with a light southerly breeze. The temperature at 9:30 a.m. was 10°C and rose to its maximum for the day of 21°C by 1.00 p.m. At 10.00 a.m. all the flowers of bloodroot were still closed. At 10.30 a.m. they began to open, when the first insect, a bee, was collected from a flower. By 11.00 a.m. all flowers were open to the sun with their petals extended horizontally. From 10.30 a.m. to 2.00 p.m. insects were collected from the flowers by netting, by use of an aspirator or by clapping them between the lid and jar of a cyanide jar.

The insects were pinned and labelled and sent to the Biosystematics Research Institute, Agriculture Canada, Ottawa where they were identified by the following taxonomists: D. E. Bright (Curculionidae), J. M. Campbell (Oedemeridae), Bruce Cooper (Calliphoridae), G. Gibson (Andrenidae, Apidae, Halictidae, Tenthredinidae), L. A. Kelton (Miridae), W. R. M. Mason

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(Pompilidae), J. F. McAlpine (Milichiidae), J. McNamara (Coccinellidae), J. R. Vockeroth (Muscidae, Syrphidae). All specimens are deposited in the collection of the Department of Zoology, University of Western Ontario except the sawfly, *Dolerus* sp., kept in the National Collection, Ottawa.

### ACCOUNT OF INSECTS COLLECTED

#### Hemiptera

##### Miridae

*Lygus lineolaris* (Beauv.) - 2 bugs. This insect hibernates and appears on flowers in spring, e.g. on dandelions (Judd, 1971) and wild carrot (Judd, 1970).

##### Coleoptera

##### Oedemeridae

*Asclera ruficollis* Say - 2 beetles. Adults of this species visit flowers where they feed on nectar and pollen (Arnett, 1968). It is common on willow catkins in early spring and is found on other spring-blooming flowers (Dillon and Dillon, 1961).

##### Coccinellidae

*Coleomegilla maculata lengi* Timb. - 2 beetles. This is a common polyphagous species (Hodek, 1973) that occurs on plants in spring, e. g. dandelions (Judd, 1971) and wild carrot (Judd, 1970).

##### Curculionidae

*Hypera postica* (Gyll.) - 1 weevil. This weevil (*Phytonomus posticus* Gyll.) occurs on various plants, specially *Medicago*, alfalfa (Titus, 1911).

##### Diptera

##### Milichiidae

*Madiza glabra* Fallen - 1 fly. This species occurs across Canada from British Columbia to Nova Scotia (Stone *et al.*, 1965).

##### Syrphidae

*Helophilus fasciatus* Walk. - 1 ♂

*Syrphus torvus* O.S. - 1 ♀

*Sphaerophoria* sp. - 1 ♀

*Eristalis dimidiata* Wied. - 1 ♂

Flies of this family are habitual visitors at flowers (Stone *et al.*, 1965). *E. dimidiata* was found on skunk cabbage at Fanshawe Lake (Judd, 1961).

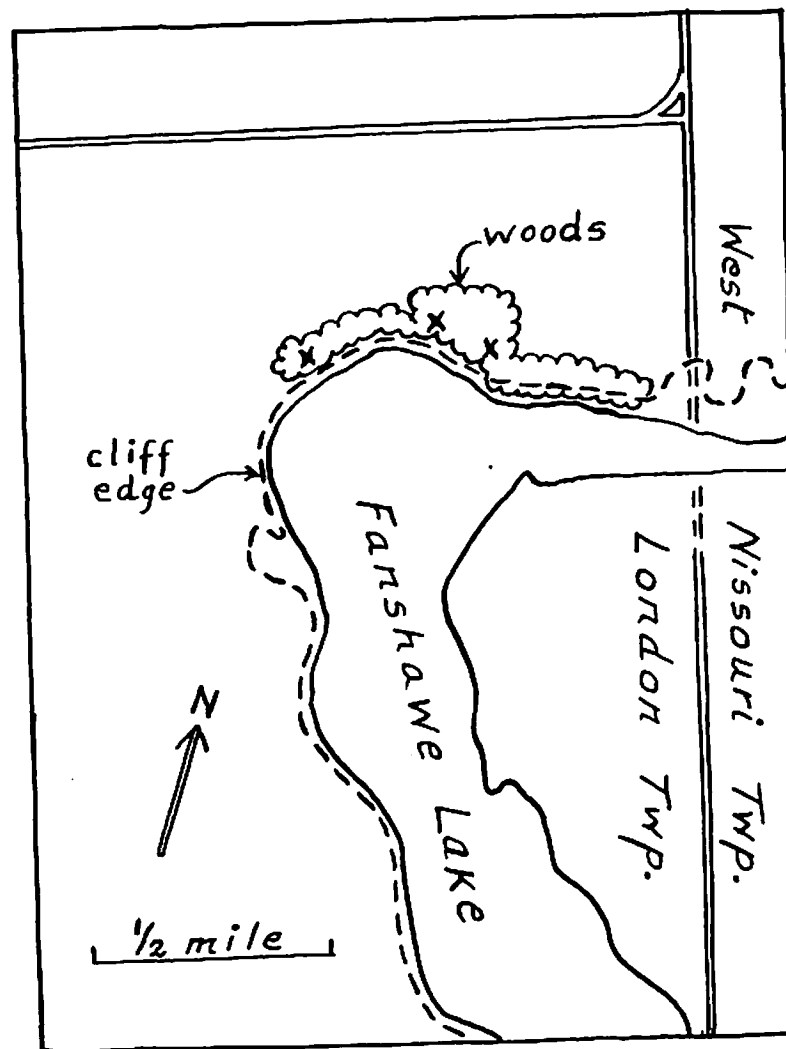


Fig. 1 - Map of Fanshawe Lake, Ontario showing location of bloodroot flowers (X)

## Calliphoridae

*Pollenia rudis* (Fab.) - 1 fly. The cluster fly is a common visitor at flowers, e.g. boneset (Judd, 1969) and wild carrot (Judd, 1970).

## Muscidae

*Musca autumnalis* Deg. - 2 ♂♂. The facefly hibernates and occurs on flowers in spring, e.g. marsh marigold (Judd, 1964), boneset (Judd, 1969) and wild carrot (Judd, 1970).

*Orthellia caesarion* (Mg.) - 1 ♀. This fly is common over much of North America (Stone *et al.*, 1965). It was found previously at London in 1953, mainly in swampy areas (Judd, 1956).

## Hymenoptera

## Tenthredinidae

*Dolerus* sp. - 1 sawfly. G. Gibson, in identifying the specimen, expressed the opinion that it represents a new species. The genus includes sawflies that feed on grasses and sedges (Muesebeck *et al.*, 1951).

## Pompilidae

*Priocnemis cornica* Say - 1 wasp. This wasp occurs in eastern Canada and preys on small spiders (Muesebeck *et al.*, 1951).

## Andrenidae

*Andrena* (*Bythandrena*) *carlini carlini* Cockerell - 9 bees. This bee has been found previously in the vicinity of London on flowers of leatherleaf (Judd, 1966a) and blueberry (Judd, 1966b).

*Andrena miserabilis bipunctata* Cresson - 16 bees. This bee has been found previously in the vicinity of London on flowering marsh marigold (Judd, 1964).

*Andrena* sp. - 43 bees.

## Halictidae

*Lasioglossum* (*Dialictus*) sp. - 10 bees.

*Lasioglossum* (*Evylacus*) sp. - 3 bees.

## Apidae

*Nomada* sp. - 6 bees.

*Ceratina* sp. - 2 bees.

*Apis mellifera* L. - 4 bees. Honeybees were found at Fanshawe Lake on flowers of skunk cabbage (Judd, 1961).

Of the 111 insects collected from the flowers 93 (83%) were bees (Andrenidae, Halictidae, Apidae). They were moving actively among the flowers and were well dusted with pollen and thus were the main pollinators of the bloodroot.

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