

# FLIGHT PERIODS OF ODONATA INHABITING A BLACK SPRUCE-SPHAGNUM BOG IN SOUTH-EASTERN QUEBEC, CANADA

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**Abstract** — The flight periods (1980) of 31 spp. are presented. The start of each species' flight period is compared with the seasonal onset of flowering for selected bog-dwelling plants. Eleven of the Odonata have flight periods that coincidentally commence at the same time as flowering begins for 6 species of plants.

## Introduction

In order to provide background information for a study on the behavioral ecology of dragonflies inhabiting a sphagnum bog near Bishop's University, the flight periods were recorded for all species occupying this habitat during the summer of 1980. In addition, an attempt was made to see if the beginning of flight periods can be coincidentally correlated with flowering initiation for selected species of bog plants.

## Study site

This study was carried out at a black spruce-sphagnum bog known locally as the Johnville Bog. It is located about 13 km SE of Sherbrooke, Quebec (45°20'N, 71°45'W) in an area classified vegetationally as an hemlock-white pine-northern hardwood region. Habitats and vegetation characteristic of this bog are very common in the boreal (= taiga) regions of Canada but occasional, isolated bogs do occur further south in the middle of a completely different vegetation type. Such relict boreal habitats had their origins in impeded drainage resulting from landscape effects left by retreating glaciers of the Wisconsinian (= Würm, = Weichselian). These glaciers receded northward from this part of Quebec about 12,000 years ago (MATTHEWS, 1979; OGDEN, 1980). A full description of the vegetation and physical features of the Johnville bog can be found in BOWERS (1966) and PALMER (1970). Three brown-water ponds typical of acidic, sphagnum bogs occur within the Johnville bog area and the

majority of collections were made at the one furthest north (designated as pond A).

## Results and discussion

Table I lists the flight periods for the 31 species of Odonata collected. All species have previously been recorded from Quebec (HUTCHINSON, 1977; LAROCHELLE, 1978, 1979; PILON, 1980; ROBERT, 1963; WALKER, 1953, 1958; WALKER & CORBET, 1975), but not from this particular locality. The species listed in Table I can be divided into three main groups based upon

Table I — Flight periods during 1980 for species of Odonata inhabiting the Johnville Bog

SPECIES	FLIGHT PERIOD									
	MAY	JUNE	JULY	AUG.	SEPT.					
	10 20	10 20	10 20	10 20	10 20					
<i>Enallagma boreale</i>										
<i>Epitheca canis</i>										
<i>Cordulia shurtzeffi</i>										
<i>Libellula julia</i>										
<i>Lestes eurinus</i>										
<i>Gomphus spicatus</i> *		x								
<i>Libellula lydia</i>										
<i>Leucorrhinia glacialis</i>										
<i>L. hudsonica</i>										
<i>Anax junius</i>										
<i>Nehalennia irene</i>										
<i>N. gracilis</i>										
<i>Ischnura verticalis</i>										
<i>Leucorrhinia intacta</i> *			x							
<i>Lestes d. disjunctus</i>										
<i>Leucorrhinia frigida</i> *			x							
<i>Calopteryx maculata</i>										
<i>Dorocordulia libera</i>			.							
<i>Sympetrum obtrusum</i>										
<i>Libellula quadrimaculata</i> *			x							
<i>Leucorrhinia proxima</i> *			x							
<i>Aeshna canadensis</i> **										
<i>A. constricta</i> **										
<i>A. interrupta</i> **										
<i>A. umbrosa</i> **										
<i>Sympetrum vicinum</i>										
<i>Somatochlora williamsoni</i> *				x						
<i>Lestes unguiculatus</i> *				x						
<i>L. rectorianus</i> *										
<i>L. congener</i>										
<i>Somatochlora walshii</i> *					x					

\* Species represented by a single male only; \*\* genus present from 14.VII-24.IX but individuals not routinely collected for species determination

their breeding requirements. Unless otherwise noted, all habitat and breeding information is taken from ROBERT (1963), WALKER (1953, 1958) and WALKER & CORBET (1975).

(A) Species Breeding in the Johnville Bog Ponds — The following species maintain breeding populations: *Lestes congener*, *L. d. disjunctus*, *L. eurinus*, *Nehalennia gracilis*, *N. irene*, *Enallagma boreale*, *Ischnura verticalis*, *Aeshna canadensis*, *A. interrupta*, *Cordulia shurtleffi*, *Epitheca canis*, *Libellula julia*, *Symptetrum obtusum*, *S. vicinum*, *Leucorrhinia glacialis* and *L. hudsonica*. In addition, *Dorocordulia libera* may breed here since it has been recorded from sphagnum bogs. If a breeding population of this species does occur it must involve very small numbers since I caught only 3 males and 1 female, all on July 10. WALKER (1953) says that although *Nehalennia irene* occurs in sphagnum bog ponds, *N. gracilis* is the predominant *Nehalennia* in this habitat in eastern Canada. My data support this observation since I caught 25 *N. irene* (8 females and 17 males) and 105 *N. gracilis* (38 females and 67 males). Individuals of the genus were randomly netted on each date indicated in Table I in order to identify the species with certainty since I was unable to visually separate them in the field. The high percent of males (64% for *N. gracilis*, 68% for *N. irene*) in these samples conforms with the common situation among Zygoptera wherein the presumed 1:1 sex ratio deviates towards a larger proportion of males at the breeding sites (WAAGE, 1980). *Leucorrhinia hudsonica* is reported to have a very long flight period from the first week of May to the last week of August (depending upon locality). Surprisingly, they were present at the Johnville bog only from June 6-26 (Tab. I) and just at the east end of pond A where there was a small, adjacent, sphagnum meadow.

(B) Species Recorded as Inhabitants of Bogs — The following species are considered typical inhabitants of peaty, boggy waters. However, I only collected 1 male of each species on the dates indicated: *Libellula quadrimaculata* (July 11), *Leucorrhinia frigida* (July 9) and *L. proxima* (July 14). These specimens probably represent wandering

males that may have come from an unknown breeding locality within the Johnville region.

(C) Species Not Breeding in the Johnville Bog Ponds — These can be divided into two subcategories according to whether they are pond or stream breeders.

(i) Species Breeding in Streams — *Calopteryx maculata*, *Aeshna constricta*, *A. umbrosa*, *Somatochlora walshii* and *S. williamsoni* breed in small, shaded, forest streams or slow streams and ditches running through open marshes and bogs. Habitats such as these occur either within the bog area or adjacent to it. Consequently, these species are represented by individuals wandering from their breeding sites.

(ii) Species Breeding in Non-sphagnum Ponds and Marshes — Depending upon the species' requirements, one can expect to find the following species breeding in marshes, backwaters of quiet streams, puddles or open, unshaded ponds and lakes with emergent vegetation, none of which have acid, peaty waters: *Lestes rectangularis*, *L. unguiculatus*, *Anax junius*, *Gomphus spicatus*, *Libellula lydia* and *Leucorrhinia intacta*. Conditions suitable for breeding by these species occur in the fields, farmland and wooded regions surrounding the Johnville bog. *Leucorrhinia intacta* was recorded by WALKER (1932) as occurring in a typical sphagnum bog near Lake Nipissing, Ontario but its usual breeding habitats are farm ponds, marshy bays and slow streams. Even though *Anax junius* occurs in a variety of still waters with emergent vegetation it probably doesn't breed in the Johnville bog ponds. Only mature adults were seen patrolling over the ponds and their numbers gradually dwindled during late July and August, a time when newly emerged teneral should begin appearing, but did not.

CORBET & WALLEY (1969) recorded 32 species of Odonata from the Mer Bleue peat bog which is part of the National Capital Commission green belt adjacent to Ottawa, Ontario. I collected 17 species they didn't find at the Mer Bleue bog and they in turn listed 18 species not present at the Johnville bog. The 14 species common to both localities are: *Nehalennia irene*, *Ischnura verticalis*, *Aeshna canadensis*, *A. constricta*, *Epitheca canis*,

*Somatochlora walshii*, *Libellula quadrimaculata*, *L. julia*, *L. lydia*, *Sympetrum obtrusum*, *S. vicinum*, *Leucorrhinia hudsonica*, *L. intacta* and *L. proxima*. The fact that slightly less than 50% of the Odonata are common to both localities is not surprising when one notes the differences in physiography (BIK, 1974) and vegetation (SMALL, 1974) of the Mer Bleue bog.

Table II - Flowering periods during 1980 for certain plants inhabiting the Johnville Bog

SPECIES	FLOWERING PERIOD				
	MAY 15 20	JUNE 10 20	JULY 10 20	AUG. 15 20	SEPT. 15 25
<i>Chamaedaphne calyculata</i>	—	—	—	—	—
<i>Kalmia polifolia</i>	—	—	—	—	—
<i>Rhododendron canadense</i>	—	—	—	—	—
<i>Ledum groenlandicum</i>	—	—	—	—	—
<i>Andromeda glaucophylla</i>	—	—	—	—	—
<i>Sarracenia p. purpurea</i>	—	—	—	—	—
<i>Nuphar variegatum</i>	—	—	—	—	—
<i>Kalmia angustifolia</i>	—	—	—	—	—
<i>Habenaria blephariglossis</i>	—	—	—	—	—
<i>Calopogon pulchellus</i>	—	—	—	—	—
<i>Vaccinium spp.*</i>	—	—	—	—	—
<i>Drosera rotundifolia</i>	—	—	—	—	—

\* *Vaccinium* spp. includes both *V. macrocarpon* and *V. oxycoccos*

Odonata, like all insects, show seasonal variation from year to year in periodic aspects of their life cycles such as times of emergence (KORMONDY & GOWER, 1965). Since insects are poikilotherms whose rates of development are governed by environmental temperatures, this seasonal variation is to be expected. Times of emergence can be predicted by computing degree-days, when these are known, but such work is very time-consuming and is usually restricted to economically important species. The developmental times of plants are also subject to environmental temperatures, and it might be possible to predict when a particular insect will emerge if this periodic event is coincidentally linked with a certain aspect of the life cycle of a plant which occurs in the same habitat. In order to test this hypothesis for the Odonata in Table I, the flowering periods of conspicuous, but typical, bog plants inhabiting the area around pond A were recorded (Tab. II). When flowering initiation is compared with flight period onset, the following correlations emerge:

Odonata	Plants
<i>Epithea canis</i>	<i>Rhododendron canadense</i>
<i>Lestes eurinus</i>	<i>Sarracenia p. purpurea</i>
<i>Cordulia shurtleffi</i>	
<i>Libellula julia</i>	
<i>Leucorrhinia glacialis</i>	
<i>L. hudsonica</i>	
<i>Nehalennia gracilis</i>	<i>Kalmia angustifolia</i>
<i>Ischnura verticalis</i>	
<i>Aeshna canadensis</i>	<i>Calopogon pulchellus</i>
	<i>Habenaria blephariglossis</i>
	<i>Drosera rotundifolia</i>
<i>A. interrupta</i>	
<i>Sympetrum vicinum</i>	

It must be emphasized that the correlations, if real, are coincidental only since there is no known relationship to the flowers of these plants with any of the Odonata listed. These correlations, in order to be widely applicable, need to be verified in sphagnum bogs under different temperature regimes from other parts of North America and the information presented here is intended to stimulate such studies.

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