

**NOTES ON THE BIOLOGY OF *AESHNA SITCHENSIS* HAGEN
(ANISOPTERA: AESHNIDAE)***

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Observations on the little-known *A. sitchensis* were made on Vancouver Island in southwestern British Columbia, Canada. Some details on habitat preference, male behaviour, feeding, copulation, oviposition and larval habitat are noted and some comparisons with other data are made. The species lived in bog pools that dried up in midsummer.

INTRODUCTION

Aeshna sitchensis is a small, Nearctic boreal species closely related to the sympatric *A. septentrionalis* Burm. and the Palearctic *A. coerulea* Ström. Although *A. sitchensis* occupies an extensive range in boreal North America (most of the forested regions of Canada and Alaska) most recorded localities are remote, boggy areas. Since the species is seldom observed, I would like to place the following information on record.

Aeshna sitchensis was observed from August 5 to 13, 1981 in Camassia Bog (50°11'N, 127°47'W) near Cape Cook Lagoon, Brooks Peninsula, on the northwest coast of Vancouver Island, British Columbia, Canada. This locality, along with one 175 km to the east at Campbell River, represents the most southerly record of the species in B.C. and in Canada west of Manitoba (100°W). Observations were made late in the species' flight period, although the species is known to fly as late as September 4 in British Columbia (CANNINGS, 1980) and probably does so until the middle of the month. *A. sitchensis* was one of the most abundant dragonflies in the open bog and was the dominant species of *Aeshna* in the particular habitat it frequented.

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HABITAT

The blanket bogs of the Brooks Peninsula (Fig. 1) are characterized by shallow, well-humified peat deposits. Small pools and channels occur frequently on the irregular surface. Surface wash and soil creep expose mineral substrate in many places producing a mineral-rich nutrient environment. Low, open scrub of lodgepole pine (*Pinus contorta*), yellow cedar (*Chamaecyparis nootkatensis*) and western red cedar (*Thuja plicata*) dominates the vegetation. Small shrubs such as crowberry (*Empetrum nigrum*) and salal (*Gaultheria shallon*) are abundant. Sedges, rushes and grasses as well as a diverse assemblage of herbaceous species cover the ground. Especially important are *Scirpus caespitosus*, *Eriophorum polystachion* and *Rhynchospora alba*. Liverworts and mosses such as *Rhacomitrium lanuginosum* and *Sphagnum* species form mats and hummocks.

Aeshna sitchensis adults occurred in very specific areas of the bog where shallow pools had dried during the recent warm weather (high temperature of up to 30°C). The species

was hardly ever seen around the larger, water-filled ponds or along the sluggish, deeply incised and often intermittent streams that crossed the bog. Ponds were patrolled by *Enallagma cyathigerum* (Charp.), *Aeshna interrupta* Walker, *A. juncea* (L.), *Somatochlora albicincta* (Burm.) and *Libellula quadrimaculata* L. while the streams were dominated by *Aeshna umbrosa* Walker, *A. palmata*



Fig. 1. Dried bog pool patrolled by male *Aeshna sitchensis* and visited by ovipositing females.

Hag. and *Somatochlora semicircularis* (Sel.). *Lestes disjunctus* Sel., *Sympetrum danae* (Sulz.) and *S. pallipes* (Hag.) were found in all habitats. These latter species, along with *Somatochlora semicircularis*, were the only ones to regularly occur with *A. sitchensis*.

The drying pools frequented by *A. sitchensis* had peaty banks 10-20 cm high and the muddy bottoms, mostly dry but sometimes still damp, were covered with drying mats of green algae. These were mainly *Mougeotia* sp. with some *Spirogyra* sp. and *Tabellaria* sp. Stones of 10-30 cm diameter were scattered on the pool bottoms, and *Juncus oreganus*, *Eriophorum polystachion*, *Carex livida* and *Drosera anglica* grew in the mud, often in concentrated patches (Fig. 1).

In Banff National Park, Alberta, on August 3 and 4, 1968, Dennis R. Paulson (pers. comm.) saw males flying over dense, low grass above the water level along with *Somatochlora franklini* Sel., while *Aeshna eremita* Scudder, *A. juncea*, *S. albicincta* (Burm.) and *S. cingulata* (Sel.) patrolled over open water. WALKER (1927) notes males in the same region flying over mossy, spring-fed bogs. The tendency of *A. sitchensis* to associate with *S. franklini* was stressed by WHITEHOUSE (1941). Where *A. sitchensis* occurs with the closely related *A. septentrionalis*, according to Whitehouse the latter emerges two or three weeks earlier. In British Columbia, at least, *A. septentrionalis* is more common northward, and is not found on Vancouver Island.

MALE BEHAVIOUR

Males appeared as early as 09.30 h (PDT) in the areas described above. They patrolled with a low, investigatory flight, not hovering, slowly working in and out of the indentations and channels in the banks of the pools and associated runnels. As noted by WALKER (1958) the males did not cover a definite beat. During these patrols, flight varied from about 10 cm to 75 cm above the ground, and the insects showed no hesitation in manoeuvring into the low stands of *Carex livida*, *Juncus oreganus* and *Eriophorum polystachion*, presumably searching for ovipositing females. The most striking behaviour was their habit of perching horizontally for considerable periods on white, weathered logs, stones and on the dried mud itself. D.R. Paulson (pers. comm.) noted females, too, consistently perching on flat rocks at Yellowknife, Northwest Territories, on July 12, 1975. This is a habit shared with *A. septentrionalis* (WHITEHOUSE, 1941) and *A. coerulea* (ROBERT, 1958; HAMMOND, 1977), but with no species of *Aeshna* in the study area. *A. eremita* occasionally exhibits this behaviour (D.R. Paulson, pers. comm.). As many as four males simultaneously patrolled the irregular margin of a 10 m diameter pool; little aggression was noted among them even though they frequently passed each other at close range.

FEEDING

While patrolling the dry pools, male *A. sitchensis* frequently pounced on dolichopodid flies resting on the mud surface. The catches were made from a height of 6-8 cm; the flies were scooped up and eaten in flight (11.00 h - 14.00 h (PDT) August 12). The capture of stationary prey by aeshnids evidently is unusual (D.R. Paulson, pers. comm.).

A lakeshore is not a normal habitat for *A. sitchensis*, but on August 11 at 10.20 h (PDT) a male flew over Kalmia Lake near the south edge of the bog and hit the water surface five times. These "dives" were into the midst of

Gyrinus (Coleoptera: Gyrinidae) water beetles. I am not sure any beetles were captured; indeed, it is probable these dives were not predatory. As D.R. Paulson notes (pers. comm.), *Gyrinus* are likely not edible anyway!

COPULATION AND OVIPOSITION

Males frequently discovered ovipositing females low in the patches of pool vegetation. After tandem seizure, copulation was initiated almost immediately and the pair flew into the surrounding low trees. Copulation was noted between 11.40 and 14.30 h (PDT). D.R. Paulson (pers. comm.) noted mating at Banff on August 3 and 4, 1968 as early as 10.00 h.

Females showed both blue-grey and pale green colour phases, the latter predominating about 2:1. Females oviposited alone and secretively, usually in the mud and algal mat on the pool bottom almost always among stands of *Carex*, *Eriophorum* and *Juncus*. Oviposition under the water surface or in standing plants was never observed. Eggs were also laid in the open, lower parts of the peaty, vertical banks of the pools. Oviposition was observed 16 times (August 6 to 12) between 11.50 h and 15.00 h (PDT). Most sightings were around 13.00 h (PDT).

WALKER (1958) observed oviposition at Field, B.C., on August 5, 1921; the females oviposited in mats of wet moss. WHITEHOUSE (1941) noted the same behaviour for *A. septentrionalis* at Atlin, B.C.

During oviposition, the female usually held the base of a rush or sedge, then, arching the abdomen, probed the nearby mud and algal mat. The amount of time spent at a single oviposition site varied greatly, from 20 seconds to eight minutes (mean = 2 min). WALKER (1958) gives 0.5 min as the maximum time females remained at one site during his observations. The tip of the abdomen was moved in an arc, and in cases where there were no obstructions, the female described a complete circle, thrusting the ovipositor into the substrate here and there within the circumference. These probes lasted 1-5 seconds and were placed 1-2 cm apart. Most females visited three or four spots within about 5 m before flying off. One spent 20 minutes within an area of 1 m². Eggs were laid vertically, usually under the dried crust of the algal mat. The eggs stood in the damp spaces between the algae and the mud, the top of the egg about 1 mm under the algal crust. Two sites were examined and contained 10 and 12 eggs; only about 30 per cent of the ovipositor holes contained eggs.

LARVAE

The laying of eggs in the basin of dried pools is a characteristic of dragonflies having an overwintering egg, such as some species of *Lestes* and

Sympetrum (CORBET, 1962; WIGGINS et al., 1980). Some aeshnids, especially in the tropics, also exhibit delayed egg development as an adaptation to seasonal drought (CORBET, 1962). The developmental story in this case of *A. sitchensis* is not known. Since the species presumably has a generation time of at least two years, the question of larval survival in the pool basins in summer is of interest. The pools would refill with the heavy autumn and winter rains. Larvae, both half and almost fully grown, were found under stones embedded in the mud. These larvae were dry to the touch, but still active; the mud under the stones was never more than slightly damp. Larvae of *Somatochlora semicircularis* and *Leucorrhinia hudsonica* were found in the same situation. WILLEY & EILER (1972) recorded larvae of *S. semicircularis* surviving drought under rocks in subalpine ponds in Colorado. One *A. sitchensis* larva, about three-quarters grown, had recently moulted; its exuviae was beside it under the stone.

WALKER (1927) found full grown larvae at Prince Rupert, B.C. on June 2 (?) (no year) in a small bog pool with a very soft bottom and only an inch or two of water. Exuviae, along with those of *S. semicircularis* appeared during June. The climate of this locality is similar to that of the present study area.

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