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THE MINNESOTA SPECIES OF *AESHNA* WITH NOTES ON THEIR HABITS AND DISTRIBUTION (ODONATA: AESHNIDAE)[1]

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Apart from the well-known green darner, *Anax junius*, the species of *Aeshna* are the most familiar Minnesota Aeshnidae. These species are remarkably uniform in appearance. The basic body color is brown with blue, green, or yellow stripes on the thorax and with marks of similar color on the abdomen. Usually the spots of male specimens are blue, whereas green of various shades appears on most females. The individual species are not readily discernible to the novice collector.

Walker (1958) stated that *Aeshna* is the dominant genus of the family in the holarctic region, listing sixteen species as residents of Canada and Alaska. Most of the seven Minnesota species considered in this study enjoy a wide distribution in North America, although only four species are commonly found throughout the state. At least the males of these species may be identified by use of the following key.

KEY TO MINNESOTA *AESHNA* SPECIES

1. Face with definite black or dark brown line on fronto-clypeal suture (Fig. 1) . . . 2
1′. Face with fronto-clypeal suture yellow, thinly brown or unmarked 3
2. First lateral thoracic stripe sinuous with basal half distended; large species (Fig. 2) . . . . . *eremita*
2′. First lateral thoracic stripe narrow without distention, parallel sided, sometimes interrupted (Fig. 3) . . . . . *interrupta*

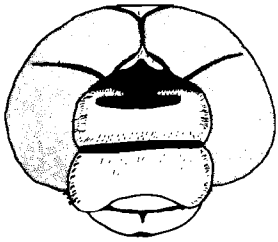

Fig.1 Aeshna head

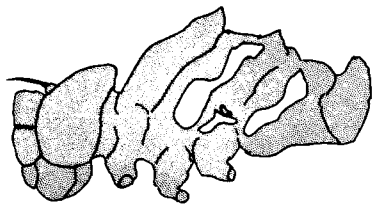

Fig.2 Aeshna eremita

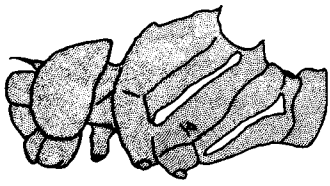

Fig.3 Aeshna interrupta

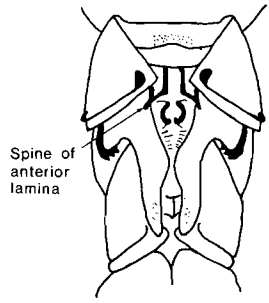

Fig.4

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3. Male specimens 4
3′. Female specimens 8
4. Anal triangle with two cells, spines of anterior lamina directed downward (Fig. 4). 5
4′. Anal triangle with three cells, spines of anterior lamina pointed upward 7
5. Basal tubercle on superior appendages, abdominal segment 10 black, lateral stripes of medium width and parallel sided (Fig. 5) . . . . . *tuberculifera*
5′. Basal tubercle absent; first lateral stripe sinuous with basal half distended. 6
6. Denticles on upper margin of superior appendages (Fig. 6). . . . . *canadensis*
6′. Denticles absent, upper margin of superior appendages smooth . . . . . *verticalis*
7. First lateral stripe sinuous with basal half distended; spines of anterior lamina noticeably pointed; underside of head entirely black . . . . . *constricta*
7′. Lateral stripes parallel sided usually with dark outlines, anterior lamina with spines appearing rounded; underside of head mostly tawny, black mesially . . . . . *umbrosa*
8. First lateral stripe sinuous with basal half distended. 9
8′. First lateral stripe of medium width, parallel sided 11
9. Styli each as long as segment 10 (about 2 mm) or slightly longer, apices of genital valves without a pencil of hairs (Fig. 7) . . . . . *constricta*
9′. Styli each less than the length of segment 10 (0.6-0.7 mm), apices of genital valves bearing a pencil of hairs 10
10. Anterior margin of first thoracic band almost rectangularly sinuate; sulcation of ventral surfaces of the genital valves not distinctly delimited posteriorly. . *canadensis*
10′. Anterior margin of first thoracic band obtusangularly sinuate; sulcation of ventral surfaces of genital valves terminating more or less abruptly some distance before the apices . . . . . *verticalis*
11. Styli long (1.2-1.5 mm), with 0.4-0.7 mm hair on ends, genital valves with a pencil of hair on apices . . . . . *tuberculifera*
11′. Styli shorter (0.7-1.0 mm), without a pencil of hairs on apices of genital valves, apices slightly divergent . . . . . *umbrosa*

IDENTIFICATION PROBLEMS

Although the freshly caught specimens may show clear color marks, these have often faded into the dark brown background by the time they are identified. These markings, particularly thoracic stripes, are very useful in separating female specimens.

As regards the females of *A. canadensis* and *A. verticalis*, the degree of upper angulation of the upper margin of the thoracic stripe may be so obscured by postmortem

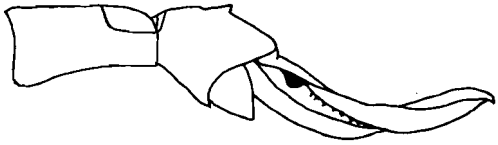

Fig. 5 Aeshna tuberculifera

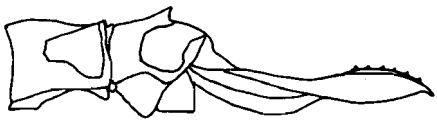

Fig. 6 Aeshna canadensis

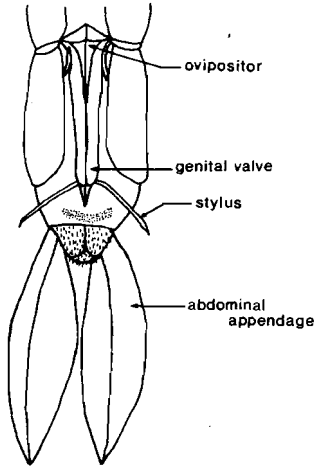

Fig. 7 Aeshna constricta

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changes as to be of no value in determining the species. However, we failed to devise any other means to separate them. Inasmuch as *canadensis* is an abundant Minnesota species and *verticalis* has never been described as more than locally abundant throughout its entire range, nearly all female specimens fitting couplet 10 of the foregoing key may be regarded as *canadensis*. In fact it is even very difficult to obtain female specimens of *verticalis* on loan. A single specimen was made available to us by the Royal Ontario Musuem. This specimen, determined by Walker, did not provide us with a reliable means of distinguishing it from female *canadensis* specimens. Possibly the characters provided by Walker's (1958) key to *Aeshna* species may be quite functional, although we have not seen specimens that fit his description of *verticalis* females. Prompt identification of newly captured questionable females could alleviate this and other problems of female identification.

Identification of male specimens is only slightly impeded by the inevitable fading of the thoracic stripes. Stable characters, i.e., anal triangle, superior appendages, and spines of anterior lamina, have contributed to the construction of several useful keys to the identification of males. Perhaps the most widely used in North America are the works of Walker (1912, 1958) as well as Needham and Westfall (1955). The characters used here are not new, but are simply edited to simplify the identification of the local species.

SPECIES NOTES

Aeshna eremita Scudder. This species, the largest of Minnesota *Aeshna* species, appears to be restricted to the forested regions of northern Minnesota. It can usually be seen during sunlight hours flying around small lakes, ponds and marshy areas. We have collected them feeding with *interrupta* and *tuberculifera* along wooded roads at dusk. Our collection records extend from June into the first week of September. *A. eremita* is not one of our most abundant species.

Aeshna interrupta Walker. The dark fronto-clypeal suture and greatly reduced dorsal thoracic stripes readily identify this abundant Minnesota species. It may be found frequenting any body of water or waterway with abundant emergent vegetation. It finds suitable habitat throughout the state. Our collection dates for this species range from mid-June through September.

Several subspecies and geographical races of *interrupta* have been described. Walker (1958) recognizes four such subgroups in Canada and Alaska. All of these subgroups show variations of the thoracic stripe patterns. Although the thoracic stripe characters are not entirely constant in the Minnesota specimens used in this study, these differences appeared to be gradations of the typical *interrupta* thoracic markings.

Aeshna tuberculifera Walker. A rather large species with straight lateral thoracic stripes and segment 10 entirely black. The adult of *A. tuberculifera* is the last of our Minnesota species to emerge. Our collection dates range from mid-July to September. This species seems to prefer bog lakes which may well account for its restriction to northern Minnesota. It is only locally abundant. Our greatest collecting success occurred near Lake Itasca.

Aeshna canadensis Walker. One of the most abundant *Aeshna* species in the mixed forest and prairie regions of Minnesota. The adults may be seen flying as early as mid-June and continue through September. The nymphs seem able to adapt to both bog lakes and the marshy edges of lakes, sloughs, or sluggish flowages with marginal emergent vegetation.

In evenings when the air is relatively still, foraging adults may develop swarms over open fields or along roadways. Breeding adults are most active on sunny days flying among the emergent grasses and cat-tails.

Aeshna verticalis Hagen. *A. verticalis* has been so obscure that reliable biological information is not available. It seems to be restricted to northern Minnesota. Walker (1958) describes *verticalis* as a late summer species that is never generally abundant. Canadian collection records mark *verticalis* as an eastern species.

Aeshna constricta Say. An abundant species throughout the state, especially around prairie lakes and marshes. *A. constricta* is usually seen flying in open areas where it flies in the sunshine hours and at dusk like most Minnesota *Aeshna* species. Mating often

occurs at some distance from the water. Our records indicate the flight period to be from mid-June through the first week of October. *A. constricta* is primarily a native of eastern North America.

Aeshna umbrosa Walker. A very widespread species in North America and found generally throughout Minnesota. With *constricta*, it is our most common late summer *Aeshna* species. The period of emergence is longer and more irregular than in our other *Aeshna* species. Our collection records cite a few mid-June captures with most collections in August and September. We have taken *umbrosa* in November.

Walker (1958) cites the marked preference of *umbrosa* for shaded habitats. Ditches, streams, small lakes and ponds with wooded borders are likely places to seek them.

Little is known regarding the reproductive behavior of these species in Minnesota. Walker (1958) has described several differences among these species in mating behavior and oviposition in Canada. Quite possibly the imaginal reproductive activities are similar in Minnesota. Nevertheless it would seem in order to continue observation of breeding populations in Minnesota habitats to determine if the Canadian reproductive behavior patterns are also the standard for Minnesota populations.

In his remarkable *Aeshna* studies, Dr. Walker indicated that other species of *Aeshna* exist in Minnesota, and reported a specimen of *sitchensis* from Duluth (1912). We have determined nymphs to be *sitchensis* and *septentrionalis*. However, these specimens failed to transform. Inasmuch as we have experienced frequent failures in recognizing the species of living nymphs, only adult records have been utilized in this study.

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