Photo George Doerkson, Royal BC Museum

The Dragonflies of the Colu

Field Surveys, Collections Development

Aeshna canadensis (Canada Darner) is an inhabitant of sedgy fens and beaver ponds in the Columbia/Kootenay region. Dragonflies are visual predators and the large compund eyes fill much of the head. Prey is captured in the spiny legs during flight.

Robert Cannings

In 1998/99 the Royal British Columbia Museum (RBCM) and British Columbia Conservation Data Centre (CDC) (part of the Ministry of Environment, Lands and Parks) joined forces to study the dragonflies *(Insecta: Odonata)* of the Columbia Basin in south-eastern BC. This study was part of the Museum's Living Landscapes project, designed to take its resources to the diverse regions of the province, stimulating local residents and organizations to conceive their own research projects and participate in the Museum's research, collections and public programming activities.

Our main objective was to determine the status, precise locations and habitat requirements of the dragonflies of selected areas of the Columbia Basin. The RBCM has dragonfly specimens and a species list for the region that represented our knowledge up to 1997, mostly based on Cannings and Stuart (1977), Walker (1953, 1958) and Walker and Corbet (1975). However, no comprehensive survey for dragonflies had ever been made; some of the recorded populations were known only from collections made in the early 1900s. We were keen to collect new data that would help in wetland management and conservation planning. But we also wanted to create simple educational materials that would promote understanding of dragonflies and their relationship to diverse and healthy wetland habitats. In addition to a report on the internet (http://livinglandscapes.bc.ca/www_dragon/toc.html), complete with photographs and distribution maps of every species, we are producing slide shows and videos for distribution to parks, naturalist groups and schools. Another long-term goal is to involve a few residents of local communities in the detailed study of dragonflies and the long-term monitoring of selected species and localities. Several naturalists have expressed interest in these activities. Dean Nicholson of Cranbrook discovered several species new to the East Kootenays during this study, and presented several dragonfly slide shows in provincial parks.

In mountains, the most extensive wetlands are usually in the broadest and flattest valleys, where water pools. Such corridors, relatively easily travelled, develop concentrations of transportation and stopover facilities. In the southern Canadian Rockies, Kicking Horse and Bow valleys are the largest and best examples of such wetland habitats. Parks Canada was a partner in this project from the beginning. John Woods (Faunal Specialist, Revelstoke and Glacier National Parks) was excited to have baseline data on these aquatic insects from sensitive habitats along major transportation corridors. The broad scope of the project precluded any comprehensive work within parks. Nevertheless, we targeted a fen in the Beaver River Valley between the CPR mainline and Highway 1, fens and marshes along Highway 1 at Leanchoil in Glacier and wetlands at the confluence of the Ottertail and Kicking Horse rivers in Yoho.

Dragonflies and their damselfly relatives seldom receive attention from government biologists and resource managers. However, they are of ecological importance for many reasons. They are upper-level predators in aquatic and semi-aquatic habitats, often the dominant group of the large invertebrates, especially in fish-free systems. For the most part, adults inhabit the edges of

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Photo: George Doerkson, Royal BC Museum

⬆ *Argia vivida (Vivid Dancer) lives around streamlets associated with warm springs; most of the Canadian population lives in the mountains of the Columbia/Kootenays. It's habitat is vulnerable to development and the damselfly is on the BC threatened and endangered list*

Photo: Robert Cannings, Royal BC Museum.

⬅ *Dragonfly larvae are among the most abundant of the large invertebrate predators in aquatic ecosytems. In turn, they are food for many invertebrate and vertebrate animals. The majority of the life of most dragonfly species is spent in the larval stage. This is Aeshna interrupta (Variable Darner).*

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"25% Fen" *Photo: Leah Ramsay*

water bodies, living in the riparian interface between land and water *(Figure 1).* The aquatic larvae (*Figure 2)* of many species are habitat-specific. Some are sensitive to temperature fluctuations and siltation caused by habitat change, and their presence can be used to characterize healthy wetlands of all sorts. Furthermore, unlike most invertebrates, dragonflies are identifiable in the field by experts, and surveys can proceed with speed and efficiency. These surveys are ideal for long-term monitoring programs. Finally, because the adults are large, colourful, diurnal creatures with interesting behaviours, dragonflies are excellent subjects for nature interpretation programs and public education about aquatic ecosystems in general.

We visited the widest possible array of habitats — mountain fens and bogs, trickling springs, warm lake beaches, grassland alkali ponds and rich cattail marshes - to identify and document dragonflies, emphasizing habitats likely to support rare species. We usually netted adults for close examination and kept voucher specimens, critical for identification reference and for confirming species occurrence. Larvae, or the cast skins of larvae (exuviae), can also be used as indicators of a species' use of a particular site. Specimens were prepared, labelled, identified and accessioned into the RBCM collections. Synoptic collections will be deposited with both Parks Canada and BC Parks. Details of dragonfly numbers, behaviour and ecology, as well as precise UTM grid co-ordinates of collection sites were recorded in an RBCM database. Distribution maps of each species were produced using ArcView GIS. The distribution of larvae and breeding adults will be analysed to determine critical habitats.

By the end of the 1999 season, we had visited 291 sites (RBCM collections made before the survey came from 75 localities) and the original regional species list increased from 57 to 66. These species represent 76% of the 87 species recorded from BC, and 33 % of the 201 species recorded in Canada. The 4 National Parks host 40 species. One site, the peatland squeezed between Highway 1 and the CPR in Glacier National Park's Beaver River Valley, was fondly dubbed "The 25 Per Cent Fen" because it contained no less than 22 species, one quarter of the provincial fauna.

The 9 species added to the Columbia/Kootenay list were River Jewelwing *(Calopteryx aequabilis),* Sweetflag Spreadwing *(Lestes forcipatus)*, Subarctic Bluet *(Coenagrion interrogatum)*, Olive Clubtail *(Stylurus olivaceus)*, Lake Emerald *(Somatochlora cingulata)*, Forcipate Emerald *(S. forcipata)*, Ocellated Emerald *(S. minor)*, Brush-tipped Emerald *(S. walshii)* and Crimson-ringed Whiteface *(Leucorrhinia glacialis).*

The inventory also improved our understanding of the status of other species rarely recorded in the Columbia Basin. Twelve are considered rare and of management concern in BC based on collections in museums; 3 of these occur in the 4 mountain national parks and 2 more are known from Banff. However, with increased study, species such as the Black-tipped Darner *(Aeshna tuberculifera)* and Lake Emerald *(Somatochlora cingulata)* proved to be more widespread than initial records suggested. The Vivid Dancer *(Argia vivida)* is a Kootenay specialty because its Canadian range is centred in the region and it is restricted there to the outlets of hot springs in the area's mountain ridges. Although we found a few new populations of this damselfly, it is still considered vulnerable because it has been eliminated from some springs and most of the others are threatened by development. Several species, including the Alkali Bluet *(Enallagma clausum)*, Hagen's Bluet *(E. hageni)*, Azure Darner *(Aeshna septentrionalis)* and Hudsonian Emerald *(Somatochlora hudsonica)*, were not found in the region, but probably occur there.

The River Jewelwing *(Calopteryx aequabilis)*, Sweetflag Spreadwing *(Lestes forcipatus)* and Forcipate Emerald *(Somatochlora forcipatus)* are species new to BC. The Jewelwing represents the family Calopterygidae. This spectacular damselfly, with its metallic green body and brown-banded wings, had been recorded as close to BC as Stevens County, Washington and for several decades we suspected that it lived in the streams of the Boundary district. However, we did not find it there until July 1999, when it appeared along Christina Creek, the outlet of Christina Lake.

In 1998, in a wetland near Donald in the Rocky Mountain Trench, we located the Sweetflag Spreadwing, previously not confirmed elsewhere in Canada west of Manitoba. This uncommon species had been overlooked because it was not expected and because it closely resembles the widespread and abundant Common Spreadwing (*Lestes disjunctus)* Subsequently, it was found in many more localities, and some museum

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Somatochlora forcipata (Forcipate Emerald) had not been found in the Rocky Mountains since the 1920s. It was rediscovered in 1998 at three locations in Yoho and Kootenay National Parks, flying over trickling spring seeps in subalpine forest.

Photo: Blair Nikula.

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Photo: George Doerksen, Royal BC Museum.

Enallagma boreale (Boreal Bluet) is perhaps the most common and abundant damselfly in northern and mountain wetlands. Unique in insects, dragonfliesmate in a wheel-like position; sperm is transferred from specialized secondary genitalia at the base of the male's abdomen.

specimens of the Common Spreadwing have been re-identified as the Sweetflag Spreadwing. Inventories do not simply gather new records; they force curators to re-evaluate old collections!

The Forcipate Emerald eluded us for years. In the 1920s Edmund Walker of the Royal Ontario Museum had collected this elusive dragonfly about 3 km from the BC/Alberta boundary in Banff (Walker and Corbet 1975). After much searching, we finally came across the Forcipate Emerald in Kicking Horse Pass and mapped the species at 3 peatland sites in Yoho and Kootenay national parks. This emerald is clearly a sparsely distributed member of the Rocky Mountain dragonfly community, and an inhabitant of an apparently rare habitat.

As a result of this project and additional inventory in central BC in 2000, the list of species at risk in BC as a whole has been revised. The ranks of 6 listed species in the province, 3 of which are recorded in the Columbia Basin, have been downgraded. Two of the latter species, the Black-tipped Darner and the Lake Emerald, are still considered vulnerable (Blue List) but the Sweetflag Spreadwing has been struck completely from the list only 3 years after it was discovered in the province.

Of the 9 species on the provincial Red List (extirpated, endangered or threatened), 2 are known from the mountain parks. These are the Vivid Dancer and the Forcipate Emerald. In the parks, the Vivid Dancer is known only from Banff; the larvae live in hot springs, and the damselfly has probably been extirpated from some springs, including those at Radium in Kootenay, because of pool development. The species still lives in the outlet stream of the springs in Albert Canyon, a developed spring immediately east of Mt. Revelstoke and occurs in several other springs farther south. Any warm or hot spring in the mountain national parks probably supports this rare species, and protection of these habitats should be a management priority.

Spring-fed habitats of other sorts are also of management concern. The springs along the Emerald Lake Road in Yoho comprise1 of 3 known localities (all 3 in national parks) for the Forcipate Emerald in western Canada.

The 25 Per Cent Fen, the most diverse park habitat examined, is at least partly spring-fed. This is an old, mature fen that has much variety in its component microhabitats. A rather rich marsh occupies one end of the site, and supports species such as the Pacific Forktail *(Ischnura cervula)* that are more at home in warm southern valleys. Northern species are prominent, including those such as the Subarctic Darner that require moss-filled water. The blue-listed Black-tipped Darner occurs here and, with more study, other listed species such as the Azure Darner might also be discovered. Any expansion of Highway 1 along the margin of this site could radically affect the drainage patterns that have produced these habitats. Spring-fed sites are notoriously sensitive to change.

Rare and poorly known northern dragonflies are associated with peatlands in the high mountains of national parks in southeastern BC and southwestern Alberta, especially in the Bow, Kicking Horse , Ottertail and Beaver river valleys. Because major transportation corridors follow these large valleys through the mountains, much of this habitat is vulnerable to significant physical and chemical perturbation. The accessibility of these areas makes them appealing for nature interpretation and scientific study. Thus, their study and preservation should be a high priority in the management of parks. Preliminary information from this study may be relevant to park management decisions for modifying transportation corridors.

ACKNOWLEDGEMENTS

Other Parks Canada staff involved included Alan Dibb and Pat Dunn of Yoho and Kootenay national parks and Larry Halverson, Park Naturalist, Kootenay National Park.

Funding was a truly cooperative effort. Parks Canada provided lodging and logistical support within parks and some cash for fieldwork and data analysis. Most travel, equipment and salary costs came from RBCM and CDC budgets as well as a grant from the Living Landscapes project, which in this case, was extensively funded by the Columbia Basin Trust. Another grant from the Habitat Conservation Trust Fund paid some travel expenses.

Robert A. Cannings is Curator of Entomology at the Royal British Columbia Museum, 675 Belleville Street, Victoria, BC V8W 9W2.
e-mail: rcannings@royalbcmuseum.bc.ca
phone (250) 356-8242; fax (250) 356-8197

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