

Lestes disjunctus and *L. forcipatus* (Odonata: Lestidae): An evaluation of status and distribution in British Columbia

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ABSTRACT

Of the five species of the damselfly genus *Lestes* that live in British Columbia, *Lestes forcipatus* Rambur and *L. disjunctus* Selys are the most difficult to separate morphologically. Females can be readily distinguished by the size of the ovipositor, but males are difficult to separate. In British Columbia, *L. disjunctus* is more common, widespread and familiar. Before 1998, when it was first reported in BC, specimens of *L. forcipatus* were misidentified as *L. disjunctus* because the former is known mainly from eastern North America and most *Lestes* species are usually most readily identified using male characters. The identities of museum specimens of the two species were checked and corrected by us as necessary. Ecological and behavioural observations and up-dated distribution maps of the species are presented. Throughout its range in BC, *L. forcipatus* is mostly sympatric with *L. disjunctus* but lives in a narrower range of habitats and localities – mostly cool sedge marshes and fens. The two species show some temporal and behavioural separation.

Key Words: Odonata, *Lestes disjunctus*, *Lestes forcipatus*, British Columbia, distribution, habitat preference, plant associations, temporal separation, oviposition

INTRODUCTION

Five species of *Lestes* occur in British Columbia (BC): *L. congener* Hagen (spotted spreadwing), *L. disjunctus* Selys (northern spreadwing), *L. dryas* Kirby (emerald spreadwing), *L. forcipatus* Rambur (sweetflag spreadwing), and *L. unguiculatus* Hagen (lyre-tipped spreadwing). *Lestes disjunctus* is the most common, widespread and familiar of these in the province, and one of the most abundant odonates in Canada where it ranges as far north as the Arctic treeline (Cannings 2002). It inhabits many types of standing water habitats with abundant aquatic vegetation and, in southern BC, adults have been recorded from mid-June to mid-October (Cannings 2002).

Lestes forcipatus, although as abundant as *L. disjunctus* in some cold fen habitats, is generally much less common; both species often occur at the same site. *Lestes forcipatus* does not range as far north as *L. disjunctus* but, although not known from much

of BC's north, it has been collected in south-eastern Yukon (S.G. Cannings, pers. comm.). In the western Canadian Cordillera, it is most common in sedge fens (Cannings 2002). Walker (1953) described *L. forcipatus* habitat in Ontario as "ponds, both temporary and permanent, marshy lakes, and slow, weedy streams". In BC, adults of *L. forcipatus* have been reported from mid-May to mid-September (Cannings 2002).

Lestes forcipatus was first recorded in BC in 1998, when it was collected in the Rocky Mountain Trench north of Golden and subsequently found in many other localities in the south-eastern part of the province (Cannings *et al.* 2005). However, undoubtedly it has long been a resident of the province but was overlooked because of its close resemblance to *L. disjunctus*. Before 1998, *L. forcipatus* was unknown west of Saskatchewan in Canada (Walker 1953, Westfall and May 1996), although in 1997

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it was found in Washington State, the first record west of Montana in the United States (Cannings *et al.* 2005). The species is now known from seven counties in Washington and one in Idaho (Paulson 2005). Subsequently, collectors found *L. forcipatus* at several other BC locations farther south and west in 1999; by 2000 it had been collected on Vancouver Island. Inventories in northern BC (2000-2003) have extended its range to about 55°N latitude (Cannings *et al.* 2005), although records in south-eastern Yukon in 2004 and 2005 (S.G. Cannings, pers. comm.) indicate it probably ranges through much of north-eastern BC, at least. In addition, Catling *et al.* (2004) reported the species from southern Northwest Territories near Fort Smith. A map of the distribution of *L. forcipatus* in North America was published by Donnelly (2004).

Catling (2002), Donnelly (2003) and Simaika and Cannings (2004) provided practical information on characters for the identification of the two species. Simaika

and Cannings (2004) particularly emphasized the usefulness of pruinosity patterns in western North American populations. A recent check of some specimens in the Royal BC Museum (RBCM) (Victoria) and the Spencer Entomological Museum, University of BC (SEM) (Vancouver) by one of us (JPS) revealed that a significant number identified as *L. disjunctus* (even among those collected after 1998) are misidentified *L. forcipatus* (Cannings *et al.* 2005). The discovery of misidentified specimens indicates that other museum collections across western Canada probably contain such specimens. Herein we report the results of an identification check of all *L. disjunctus* specimens in the RBCM and the SEM, the two collections holding the majority of Odonata specimens from BC.

This paper establishes accurate distributions for both species in BC by publishing up-dated distribution maps. We also provide revised information on habitat preferences and life histories.

MATERIALS AND METHODS

Specimens. We examined 1853 specimens previously identified as *L. disjunctus* in the RBCM and SEM collections and separated the two species using characters documented in Simaika and Cannings (2004). Females were identified by the relative lengths of the ovipositor. The most useful character for separating males is the amount of pruinescence on the thorax and, in *L. forcipatus*, the presence of a bare, non-pruinose patch on the posterior third of the dorsum of the second abdominal segment.

Habitat and life-history data. Information on habitat preferences, emergence times, flight period and breeding behaviour was extracted from the RBCM and SEM databases. The wetland site association

classification used is that of MacKenzie and Moran (2004); site associations noted are listed and defined in Table 1.

Distribution maps. Maps (Figs. 1 and 2) were produced electronically from the databases of the RBCM and SEM by Clover Point Cartographics Ltd. (Victoria, BC) using Microsoft Visual Basic version 6 and Environmental Systems Research Institute (ESRI) Arc Info Workstation version 9.0 (ESRI 2005). The base line features are from Terrain Resource Information Mapping (TRIM) 1: 2,000,000 and the surface model is based on Clover Point and TRIM Digital Elevation Model data. TRIM data are used under license from the BC Ministry of Environment.

RESULTS AND DISCUSSION

Changes in specimen identification. In the RBCM collection, 38 specimens (23♂, 15♀) from British Columbia collected before 2004 and previously identified as *L. disjunctus* were re-identified as *L. forci-*

patus; five (3♂, 2♀) identifications were changed in the SEM collection. These changes represent 2.3% of the sample. This material came from ten localities over the southern two-thirds of the province in the

Table 1.

Main wetland habitat types used by *Lestes disjunctus* (*L. dis.*) and *L. forcipatus* (*L. for.*) in British Columbia. Wetland site associations and codes are taken from MacKenzie and Moran (2004). Site association names indicate dominant plant species used to define the habitat type; codes are used in the discussion of *Lestes* habitat in the text. A, absent; C, common; R, rare; U, uncommon.

Ecosystem Type	Association Code	Site Association Name	<i>L. dis.</i> status	<i>L. for.</i> status
Saline associations at grassland ponds	Gs01	<i>Distichlis spicata</i> var. <i>stricta</i> (Alkali saltgrass)	C	A
	Gs02	<i>Puccinellia nuttalliana</i> – <i>Hordeum jubatum</i> (Nuttall's alkali-grass - Foxtail barley)	C	A
	Gs03	<i>Carex praegracilis</i> (Field sedge)	C	A
Bogs	Wb12	<i>Scheuchzeria palustris</i> – <i>Sphagnum</i> (Scheuchzeria – Peat-moss)	U	U
	Wb13	<i>Carex limosa</i> – <i>Menyanthes trifoliata</i> – <i>Sphagnum</i> spp. (Shore sedge - Buckbean - Peat-moss)	U	A
	Wb50	<i>Ledum groenlandicum</i> – <i>Kalmia microphylla</i> – <i>Sphagnum</i> spp. (Labrador Tea – Bog-laurel - Peat-moss)	C	A
	Wb51	<i>Pinus contorta</i> – <i>Empetrum nigrum</i> – <i>Sphagnum austinii</i> (Shore pine–Black crowberry–Tough peat-moss)	C	A
	Wb52	<i>Juniperus communis</i> – <i>Trichophorum cespitosum</i> – <i>Rhacomitrium lanuginosum</i> (Common juniper – Tufted clubrush – Hoary rock-moss)	C	A
Fens	Wf01	<i>Carex aquatilis</i> – <i>Carex utriculata</i> (Water sedge – Beaked Sedge)	C	U
	Wf02	<i>Betula nana</i> – <i>Carex aquatilis</i> (Scrub birch – Water sedge)	C	U
	Wf03	<i>Carex aquatilis</i> – <i>Sphagnum</i> (Water Sedge – Peat-moss)	R	R
	Wf04	<i>Salix barclayi</i> – <i>Carex aquatilis</i> – <i>Aulacomnium palustre</i> (Barclay's willow – Water sedge – Glow moss)	U	R
	Wf05	<i>Carex lasiocarpa</i> – <i>Drepanocladus aduncus</i> (Slender sedge – Common hook-moss)	C	U
	Wf06	<i>Carex lasiocarpa</i> – <i>Menyanthes trifoliata</i> (Slender sedge – Buckbean)	C	C
	Wf07	<i>Betula nana</i> – <i>Menyanthes trifoliata</i> – <i>Carex limosa</i> fens (Scrub birch – Buckbean – Shore sedge)	C	C
	Wf08	<i>Carex limosa</i> – <i>Menyanthes trifoliata</i> – <i>Drepanocladus</i> spp. (Shore sedge – Buckbean – Hook moss)	C	C
	Wf09	<i>Eleocharis quinqueflora</i> – <i>Drepanocladus</i> (Few-flowered spike-rush – Hook moss)	U	A
	Wf10	<i>Trichophorum alpinum</i> – <i>Scorpidium revolvens</i> (Hudson Bay clubrush – Red hook-moss)	C	C
	Wf12	<i>Eriophorum angustifolium</i> – <i>Caltha leptosepala</i> (Narrow-leaved cotton-grass – Marsh-marigold)	C	A
	Marshes	Wm01	<i>Carex utriculata</i> – <i>Carex aquatilis</i> (Beaked sedge – Water sedge)	C
Wm02		<i>Equisetum fluviatile</i> - <i>Carex utriculata</i> (Swamp horsetail – Beaked sedge)	C	U
Wm04		<i>Eleocharis palustris</i> (Common spike-rush)	C	R
Wm05		<i>Typha latifolia</i> (Cattail)	C	R
Wm06		<i>Schoenoplectus acutus</i> (Great bulrush)	C	R
Wm07		<i>Juncus balticus</i> (Baltic rush)	C	A

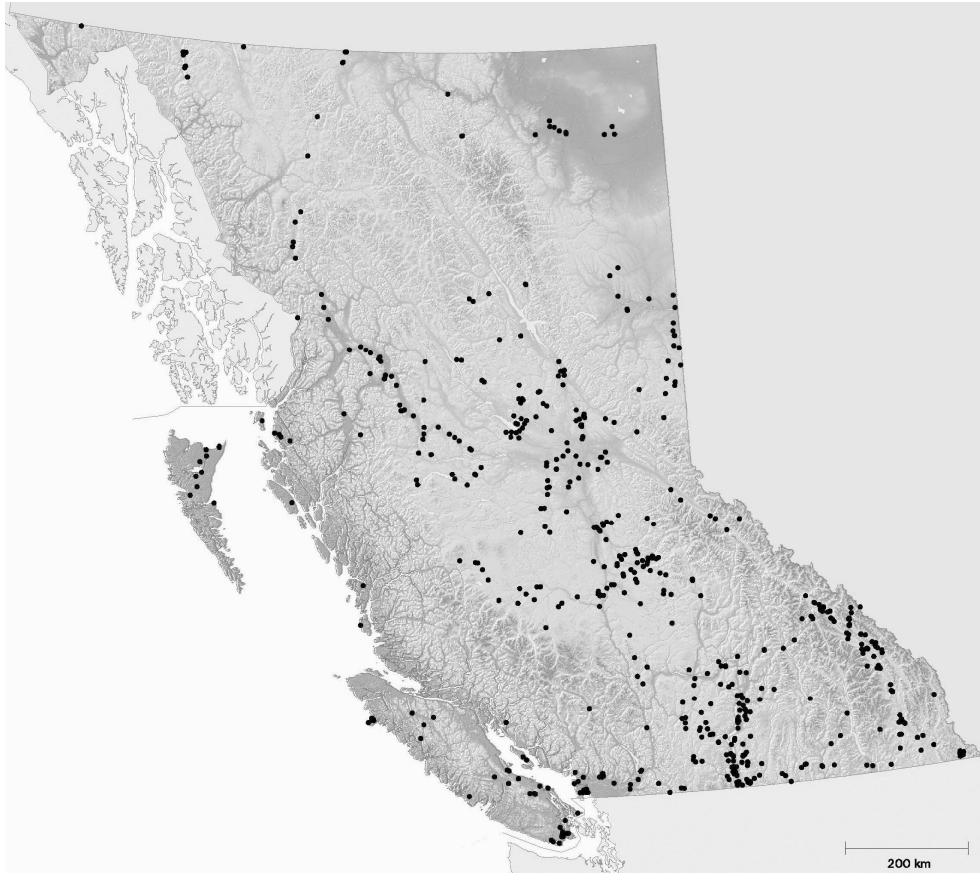


Figure 1. Distribution of records of *Lestes disjunctus* in British Columbia to 2004. Data represent specimen records only from the Royal BC Museum, Victoria, and the Spencer Entomo-

vicinities of Bowser, Cawston, Duncan, Fort St. James, Germansen Landing, Horsefly, Mackenzie, Qualicum Beach, Rogers Pass, and Wells Gray Provincial Park.

Distribution and status. The newly plotted range maps for *L. disjunctus* (Fig. 1) and *L. forcipatus* (Fig. 2) update our knowledge of the BC distributions of the species to the 2004 collecting season. The distribution of *L. disjunctus* in the province remains unchanged; it is so common and widespread that the subtraction of specimens from ten localities made little difference to the updated range map (Fig. 1). Indeed, in all but a very few localities, *L. disjunctus* has been collected wherever *L. forcipatus* is found. *Lestes disjunctus* is second only to *Enallagma boreale* Selys as the most frequently collected odonate in BC; it occurs

over the entire province where dragonflies are able to live; the only major gaps in its known distribution are those areas difficult to access by road.

Although our reidentifications show that *L. forcipatus* has lived in the region since long before 1998, all but five of the 43 known localities were recorded from 1998 to 2004. Thus, in terms of its known status in BC, the species has gone from anonymity to being a widespread and fairly common taxon in only seven years. Although it was collected at two localities in the year of its discovery and 12 the year after, it was retained on the provincial Blue List of species of concern until 2004 (Ramsay and Cannings 2005). Despite this rapid change in its status, *L. forcipatus* is clearly less common and widespread than *L. disjunctus*

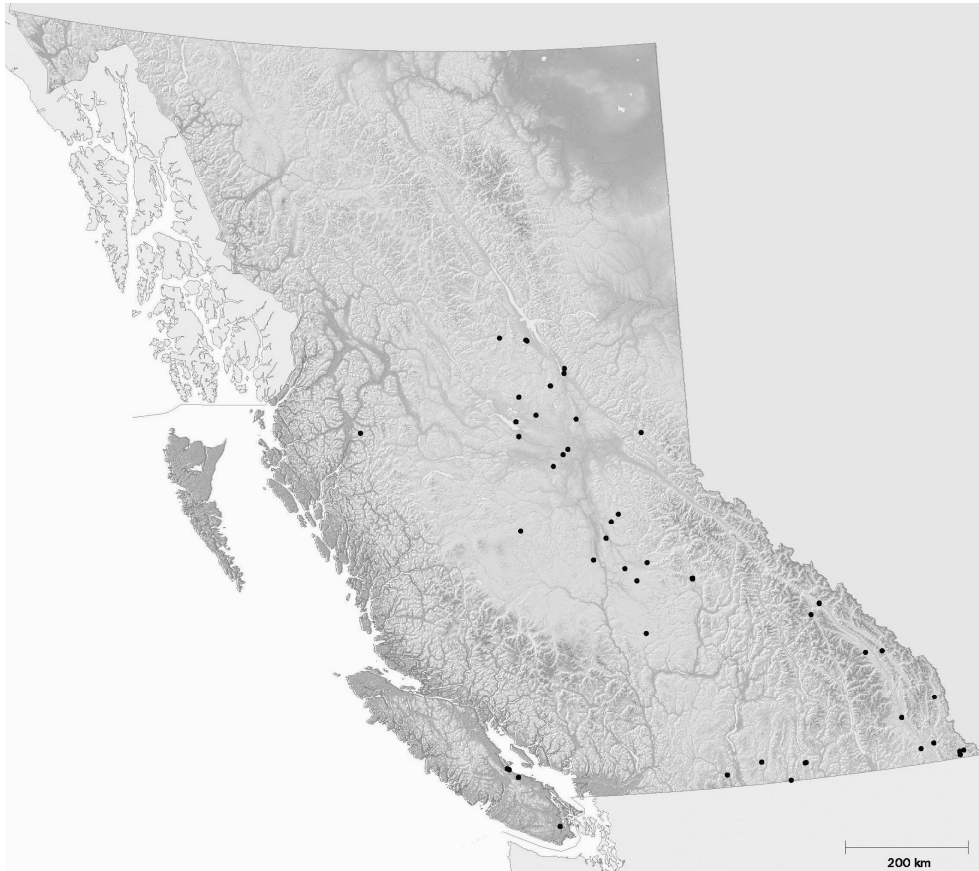


Figure 2. Distribution of records of *Lestes forcipatus* in British Columbia to 2004. Data represent specimen records only from the Royal BC Museum, Victoria, and the Spencer Entomological Museum, University of BC, Vancouver.

in BC. In the Okanagan-Similkameen basin, probably the most thoroughly collected area of the province, it has been found at only one locality (near Cawston). It has yet to be collected in the Shuswap region or in the Lower Mainland of south-eastern BC and still must be considered rare on the coast in general. It was not found in intensive surveys in the Peace River and Fort Nelson regions in 1997, nor along Highway 37 or in the Atlin area in 2003, although in 2004 and 2005 it was collected in south-eastern Yukon (S.G. Cannings, pers. comm.). Further study will likely fill some of these gaps; nevertheless, the narrower range of its preferred habitats will continue to make it harder to find than *L. disjunctus* in most places in BC.

Habitat Requirements. See Table 1. A

major basis for the greater abundance and wider distribution of *L. disjunctus* compared with *L. forcipatus* is the ability of the former to use a wider range of habitats. This is especially true of warmer habitats in the southern parts of the province such as eutrophic marshes (Wm04-07) and saline ponds (Gs01-03), where *L. disjunctus* is common and *L. forcipatus* is rare or absent. *Lestes forcipatus* has yet to be found in the widespread bogs of the outer coast, from the Queen Charlotte Islands and Prince Rupert regions to Vancouver Island and the Fraser River delta (Wb13, Wb50-52). Both species are found in *Carex* and *Equisetum* marshes (e.g. Wm01-02), but *L. disjunctus* is more common in these places. *Lestes forcipatus* appears to be most frequent in fens or bogs dominated by *Carex*,

Trichophorum, *Menyanthes*, *Comarum* and mosses such as *Sphagnum*, *Drepanocladus* and *Scorpidium* (Wb12, Wf01-10, 12). However, *L. disjunctus* is usually more abundant in these habitats and, apparently, *L. forcipatus* is absent from many localities with such habitat types, especially in the North, that superficially appear ideal for its development. Walker (1953) notes that, in eastern Canada, *L. forcipatus* is also more locally distributed than *L. disjunctus*. In summary, *L. forcipatus* is most common in cold sedge and moss fens and uncommon, rare or absent in warmer habitats such as eutrophic marshes.

Life histories. *Lestes disjunctus* adult records range from 15 May to 9 October. The bulk of them fall between late June and early August with a peak in the last half of July. For example, on 22 July 1996 hundreds of teneral adults were observed at Burns Bog in the Fraser River delta. Records of mating pairs range from 12 July to 5 October and oviposition dates range from 12 July to 17 September. Adult records of *L. forcipatus* range from 18 May to 4 September; about 85% of these are from late June through late July, with the peak in the last half of July. Mating has been observed from 28 June to 14 August and oviposition from 12 July to 14 August. Although there is strong overlap of the flight periods of the two species in BC, there is some evidence that adult *L. forcipatus* emerge earlier than *L. disjunctus* where they co-occur. At Nahleelah wetlands near Kitimat on 10 July 2005, fully mature adult *L. forcipatus* were

common but the population of *L. disjunctus* was just beginning to emerge. At Hamilton Marsh near Qualicum Beach, adult *L. forcipatus* were flying on 18 May 2004; adult *L. disjunctus* appeared on 23 June and sexually mature specimens were not observed until 3 July. This suggests a difference of about two to four weeks in emergence times of the two species and is similar to the amount of time between the first emergence of the two species in eastern Canada noted by Walker (1953).

In addition to a possible temporal shift in the flight period and, consequently, the mating times of the two species, there may be some interspecific differences in oviposition behaviour. Simaika (2005) and Simaika and Cannings (2006) reported that at Hamilton Marsh, near Qualicum Beach, ovipositing females of *L. disjunctus* inserted eggs into only two species, *Carex lanuginosa* Michaux and *Juncus arcticus* Willdenow. Females on *C. lanuginosa* oviposited into fresh stems, just above the water surface; on *J. arcticus* they laid eggs in dead stem tissue, about 10 cm from the tip of the stem. *Lestes forcipatus* will also oviposit on *C. lanuginosa* and *J. arcticus* but, unlike *L. disjunctus*, it appears to prefer the living stems of *J. arcticus* and will also utilize *Menyanthes trifoliata* L.

These observations suggest that there may be some niche separation of *L. disjunctus* and *L. forcipatus* in BC. More research is required to elucidate the ecological and behavioural differences between these two closely related, sympatric damselflies.

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