

Appendix G
Odonata Survey 2008 (Damselflies and Dragonflies)

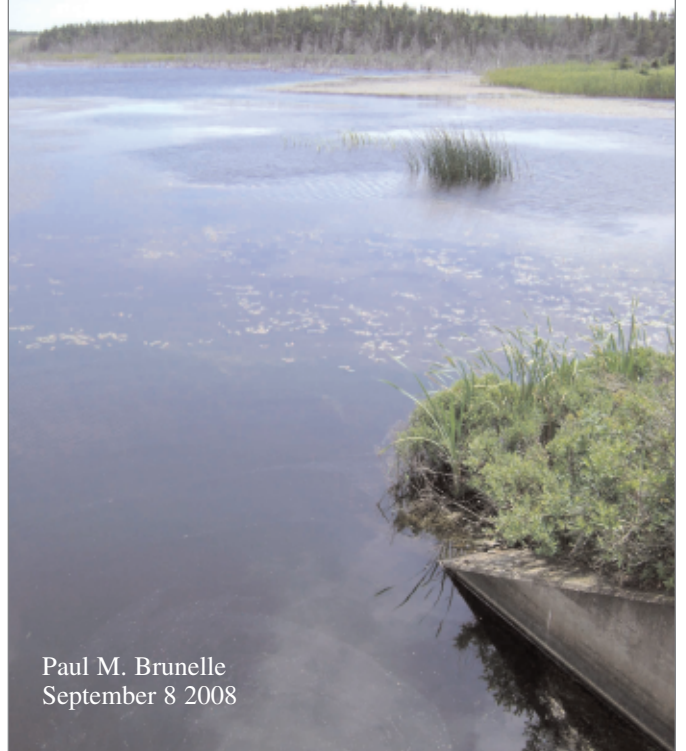


Odonata Survey 2008 (Damselflies and Dragonflies)

Donkin Exploration Project
Environmental Assessment



Prepared for:
CBCL Limited Consulting Engineers



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September 8 2008

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On the cover (top down):

Serpentine Settling Pond, NS1079.

Devco Settling Pond, NS1083.

*Left side:**Lestes forcipatus* Rambur 1842, Sweetflag Spreadwing; ovipositing pair, male above.*Aeshna i. interrupta* Walker 1908, Variable Darner; a female of the Gulf Variant, in which the normally interrupted lateral thoracic stripes are narrowly bridged.Note: neither of these images were taken on the Donkin Peninsula, though the *A. i. interrupta* was taken nearby.**Section A: Introduction**

Eight field survey days were spent in July and August surveying for odonates on the Donkin Peninsula and along the proposed transportation corridor, a railway grade running to the west, in Cape Breton County, Cape Breton Island. All types of aquatic habitat present were sampled.

This report is presented separately from that on the proposed transportation corridor in order to serve the needs of the Donkin Exploration Project, in which a substantial amount of coal will be mined for testing purposes as a precursor to commercial production. Consequently, this report deals only with the results of survey on the peninsula, confined to the area associated with the current mine operations and aquatic features draining it.

Five aquatic habitats were sampled on the peninsula – all but one (Schooner Pond) are anthropogenic. It seems unlikely, given the topography of the peninsula, that substantial aquatic features were destroyed in the construction associated with the original Devco mine development, although primary streams were likely present.

The existing aquatic habitats are of three types; large ponds, small running waters draining those ponds, and one moderate-sized natural lake. The latter has likely been influenced by the road construction on its seaward side. In addition, survey was done on the facility access road.

Twenty-three species of odonates were encountered on the peninsula. This is a reasonable percentage (24%) of the Cape Breton Island odonate list of 98, considering the narrow range of habitat types present.

The Donkin Peninsula is 1.6km wide by 2.25km long. It is of comparatively low relief, sloping from the coastal bluffs at the north, east, and south, down to the base, which is largely occupied by Schooner Pond.

Most of the peninsula is densely forested in somewhat stunted conifers, indicative of harsh weather conditions during much of the year. Due to the proximity of all habitats to the sea, the weather is likely inclement from the perspective of odonata over much of the flight season, and the wind tends to be strong much of the time.

The water on the peninsula is derived from precipitation and that pumped from the mine, which is apparently freshwater.

The peninsula bedrock is comprised of coal (at depth), sandstone, shale, and conglomerate – rocks which will readily yield nutrients to surface water.

The center of the peninsula was apparently leveled during the initial construction of the Donkin Mine by Devco, and extensive tailings were deposited down-slope.

Survey was done only down-stream of the mine workings footprint, essentially west of the large quonset hut and Serpentine Settling Pond. The slight elevations above these areas appear to have few aquatic habitats, possibly only primary streams and small bogs, and are not thought to be vulnerable to mining activities. No expansion of the mine works upslope from the existing facilities is anticipated.

Five aquatic habitats were sampled on the peninsula – all but one (Schooner Pond) are anthropogenic, or possibly highly impacted natural stream courses, and all are in series, again excepting Schooner Pond, which is not connected with the other waters.

The existing aquatic habitats are of three types; comparatively large ponds, small running waters draining those ponds, and one moderate-sized natural lake (Schooner Pond).

In addition, survey was done on the facility access road.

See pages indicated for all results for each habitat.

Ponds

Ponds are defined here as standing water which is sufficiently shallow over the bulk of its area to support rooted plants. Ponds house the greatest diversity of odonate species.

The two anthropogenic ponds on the peninsula are significantly different, in part due to their age, but possibly also to water quality issues.

The **Serpentine Settling Pond** (NS1079, see detailed results page A1.01) was recently constructed by the project proponent in order to treat water pumped out the mine shaft. This initial pumping has been completed in the last year, and only maintenance pumping is currently being done – the principal pre-production impact has hence passed.



The pond is intended to allow the fine silt in the otherwise clear mine water time to settle out before release into the drainage stream.

The pond has not had sufficient time to develop extensive emergent or rooted aquatic plant beds, which likely had an impact on the odonate list and specific abundance encountered in 2008 (particularly on endophytic ovipositors, those who lay their eggs within plant tissues), but plant growth has begun and will likely develop with time.

The margins of the pond are still rough from its construction, but will become somewhat more overgrown with brush as it matures. This will further encourage odonates at the feature.

Presumably mine water will carry more silt and possibly sulphur during coal extraction – whether the pond can support odonate larvae to emergence under those circumstances is unknown. However, there was emergence from the pond in 2008 (*Ischnura verticalis* (Say 1839), Eastern Forktail, record 311390), and two species of *Pantala* were observed ovipositing in the pond.

The **Devco Settling Pond** (NS1083, details page A1.02) was constructed about 25 years ago by the original mine developer. It receives mine water from the preceding site and drainage from the tailings. The water is dark with tannins, indicating considerable filtering through marshes upstream. It has dense aquatic and emergent plant growth and substantial marginal marshes of *Typha latifolia* (Cattail). The margins and dam are well-grown with marsh, brush, and forest.



Although there is currently evidence of only one species emerging from this pond (*Enallagma hageni* (Walsh 1863), Hagen's Bluet, record 311027), several other species were observed ovipositing, and the abundance of most species encountered suggested that they are probably resident. It appears to be a healthy rich pond.

Streams

Streams are defined here as running waters into which brooks (or primary streams) run.

The two streams on the peninsula are anthropogenic, and significantly different, again in part due to their age, but possibly also water quality issues.



The stream from the Serpentine Settling Pond (NS1080, details page A1.02) was recently constructed by the project proponent in order to carry mine water treated in the pond downhill to the Devco Settling Pond.

As with the Serpentine Settling Pond, the principal impact of mine water has passed with the completion of the initial emptying of the mine shaft. The stream near the pond is now shallow, with a moderate grade, light scour, and with moderate *Typha latifolia* (Cattail) growth in places. The water is largely clear, but retains a small amount of the milky silt from the mine water, and possibly also from the rich soils it flows through.

The growth of Cattail will likely increase if not physically prevented, which will further increase its filtering capacity. Downstream between the tailing piles the stream has become in essence a linear pond with extensive Cattail growth.

A primary brook (probably intermittent) enters the stream at a point downstream, but adjacent to the Serpentine Settling Pond; water below will be a mixture of mine and surface running water in similar proportions.

The stream in 2008 had attracted the attention of beavers to the point where it was necessary to trap them out – this will likely be an on-going problem.

The stream was found to house only one lotic species of odonate (*Cordulegaster diastatops* (Sélys 1854), Delta-spotted Spiketail, record 311036). This is a species specializing in very small and often turbid waters, which may colonize ditches with virtually no current.

There is a possibility for other lotic species on the stream, particularly near the mouth of the primary brook tributary, but none seems likely.

The stream from the Devco Settling Pond

(NS1083, details page A1.03) is thought to have been constructed about 25 years ago by the original mine developer in order to carry water from the pond to the sea. As it has no brook tributaries, it might be considered a brook itself. As with the preceding sites, the principal impact of mine water has passed.



This stream had no current when visited, although during intensive mine pumping and/or precipitation this may not be the case. The water is heavily stained with natural tannins and thick with aquatic and emergent plants.

The species encountered at this small water appeared largely to be resident, and the only exuvia taken on the peninsula was there (*Libellula quadrimaculata* Linnaeus 1758, Four-spotted Skimmer, record 311023).

Lake

Schooner Pond (NS1081, details page A1.03) is a natural lake, or 'barrachois pond', isolated from the sea by a barrier beach. It is not in the mine drainage, and only a catastrophic failure of the Devco Settling Pond dam would allow mine water to enter it. This seems unlikely.



Impacts on the lake are confined to the road on the barrier beach and a water level control structure.

The lake has few aquatic plants, although there are extensive emergents over much of its circumference.

The water is heavily stained as a result of the floating bog which makes up the bulk of its margin.

Potential impacts from the mining operation would be confined to alteration of the water level. No deliberate reason for this seems likely, but blow-out of the barrier beach due to road activities during high water is a possibility which should be considered.

It appears to be a healthy rich lake.

Land

The Donkin Mine Facility Road (NS1102, details page A1.04) has no residence implications for odonata, but foraging flights over it are daily, and the species observed can be abundant.

The posted speed limit on the road is 25km/hour (within the mine area 15km/hour) – at these speeds it is unlikely that significant numbers of foraging odonates will be harmed.

Nova Scotia Species List and General Results

The full list of odonates for the province is provided in the following table. Species encountered during 2008 survey, or at the sites during prior survey, are highlighted in yellow.

Species have been characterized as occupying the following basic habitat types;

- lotic obligate* (running waters, blue) – 13 species, possibilities for running waters in the system,
- peatlands obligate* (brown) – 23 species, possibilities for bogs marginal to reservoirs in the system,
- saltmarsh obligate* (green) – 1 species (*E. berenice*),

The balance are *lentic* (slow waters) inhabitants.

Note that there are issues of range within the province (latitude and elevation related), micro-habitat preferences, and flexibility of habitat use which have not been addressed in this basic assignment.

The various status ranks are given and are current (see Appendix 1 for definitions); those of conservation interest are set in bold.

Sites surveyed are shown in the columns.

The best residence status (see Appendix 1) of each species encountered at each site is given in the site columns.

Species	Known on CBI				Global (NatureServe)	NGS Canada	NSDNR Colour Ranks	NGS Nova Scotia	NS1079 Serpentine Settling Pd.	NS1080 stream fr. 'Serpentine Pd.	NS1083 Devco Settling Pond	NS1082 stream from Devco Pd.	NS1081 Schooner Pond	NS1102 Donkin Mine Access Rd.
	* possible Donkin Penin.													
	<i>lotic obligate</i>													
	<i>peatland obligate</i>													
Number of Species/Site									10	8	12	9	12	2
Zygotera - Damselflies														
Family Calopterygidae														
Genus Calopteryx														
<i>C. aequabilis</i>	g5	4	Gr	4										
<i>C. amata</i>	g4	4	Gr	4										
<i>C. maculata</i>	g5	4	Gr	4										
Family Lestidae														
Genus Lestes														
<i>L. congener</i> *	g5	4	Gr	4										
<i>L. disjunctus</i>	g5T	4	Gr	4						8	8	8		
<i>L. dryas</i> *	g5	4	Gr	4										
<i>L. eurinus</i> *	g4	4	In	5										
<i>L. forcipatus</i>	g5	4	In	5					7					
<i>L. rectangularis</i> *	g5	4	Gr	4										
<i>L. unguiculatus</i> *	g5	4	Gr	4										
<i>L. vigilax</i> *	g5	3	In	5										
Family Coenagrionidae														
Genus Amphiagrion														
<i>A. saucium</i> *	g5	4	Gr	4										
Genus Argia														
<i>A. fumipennis violacea</i>	g5T	4	Gr	4										
<i>A. moesta</i>	g5	4	Gr	4										
Genus Chromagrion														
<i>C. conditum</i>	g5	4	Gr	4							8			
Genus Coenagrion														
<i>C. interrogatum</i> *	g5	4	In	5										
<i>C. resolutum</i>	g5	4	Re	2										
Genus Enallagma														
<i>E. annexum</i> *	g5	4	In	5										
<i>E. aspersum</i> *	g5	4	Gr	4										
<i>E. boreale</i>	g5	4	Gr	4									3	
<i>E. carunculatum</i> *	g5	4	In	5										
<i>E. civile</i>	g5	4	Gr	4					8	3	5			
<i>E. ebrium</i> *	g5	4	Gr	4										
<i>E. exsulans</i>	g5	4	Gr	4										
<i>E. hageni</i>	g5	4	Gr	4						8	8			
<i>E. minusculum</i> *	g3/4	3	Ye	3										
<i>E. signatum</i>	g5	4	In	5										
<i>E. vernale</i> *	g4T	4	In	5										
<i>E. vesperum</i>	g5	4	In	5										
Genus Ischnura														
<i>I. posita</i>	g5	4	Gr	4								6		
<i>I. verticalis</i>	g5	4	Gr	4					1	3	3	1	1	
Genus Nehalennia														
<i>N. gracilis</i> *	g5	4	In	5										
<i>N. irene</i> *	g5	4	Gr	4										

B.06

Section B: Environmental Baseline

Known on CBI
* possible Donkin Penin.
lotic obligate
peatland obligate

Species	Global (NatureServe)	NGS Canada	NSDNR Colour Ranks	NGS Nova Scotia	NS1079 Serpentine Settling Pd.	NS1080 stream fr. 'Serpentine Pd.	NS1063 Devco Settling Pond	NS1082 stream from Devco Pd.	NS1081 Schooner Pond	NS1102 Donkin Mine Access Rd.
Anisoptera - Dragonflies										
Family Aeshnidae										
Genus Aeshna										
<i>A. canadensis</i>	G5	4	G4	4	8	8		8		
<i>A. clepsydra</i>	G4	4	Gr	4						
<i>A. constricta</i>	G5	4	In	5						
<i>A. eremita</i> *	G5	4	Gr	4						
<i>A. i. interrupta</i>	G5T	4	Gr	4			6			10
<i>A. septentrionalis</i>	G5	4	BI	5						
<i>A. sitchensis</i>	G5	4	Gr	4						
<i>A. subarctica</i>	G5	4	Gr	4						
<i>A. tuberculifera</i> *	G4	4	Gr	4						
<i>A. u. umbrosa</i>	G5T	4	Gr	4	8	8	8		3	
<i>A. verticalis</i>	G5	4	Gr	4						
Genus Anax										
<i>A. junius</i>	G5	4	Gr	4	8	8	8	8		
Genus Basiaeschna										
<i>B. janata</i> *	G5	4	Gr	4						
Genus Boyeria										
<i>B. grafiana</i>	G5	4	In	5						
<i>B. vinosa</i>	G5	4	Gr	4						
Genus Gomphaeschna										
<i>G. fucillata</i>	G5	2	Ye	2						
Genus Rhionaeschna										
<i>R. mutata</i>	G3/4	2	In	6						
Family Gomphidae										
Genus Dromogomphus										
<i>D. spinosus</i>	G5	4	Gr	4						
Genus Gomphus										
<i>G. adelphus</i>	G4	4	Gr	4						
<i>G. borealis</i> *	G4	4	Gr	4						
<i>G. descriptus</i>	G4	4	Ye	3						
<i>G. exilis</i> *	G5	4	Gr	4						
<i>G. spicatus</i> *	G5	4	Gr	4						
<i>G. ventricosus</i>	G3	2	In	2						
Genus Hagenius										
<i>H. brevistylus</i>	G5	4	Gr	4						
Genus Lanthus										
<i>L. parvulus</i> *	G4	4	Ye	3						
Genus Ophiogomphus										
<i>O. aspersus</i>	G3/4	4	Re	2						
<i>O. carolus</i>	G5	4	Gr	4						
<i>O. m. mainensis</i>	G4	4	Re	2						
<i>O. rupinsulensis</i>	G5	4	Re	2						

Species	Global (NatureServe)	NGS Canada	NSDNR Colour Ranks	NGS Nova Scotia	NS1079 Serpentine Settling Pd.	NS1080 stream fr. 'Serpentine Pd.	NS1083 Devco Settling Pond	NS1082 stream from Devco Pd.	NS1081 Schooner Pond	NS1102 Donkin Mine Access Rd.
Family Gomphidae cont.										
Genus Stylogomphus										
<i>S. albistylus</i>	G5	4	Gr	4						
Genus Stylurus										
<i>S. scudderi</i>	G4	4	In	5						
Family Cordulegastridae										
Genus Cordulegaster										
<i>C. diastatops</i>	G5	4	Gr	4		8				
<i>C. maculata</i>	G5	4	Gr	4						
Family Macromiidae										
Genus Didymops										
<i>D. transversa</i> *	G5	4	Gr	4						
Genus Macromia										
<i>M. i. illinoensis</i>	G5	4	Gr	4						
Family Corduliidae										
Genus Cordulia										
<i>C. shurtleffii</i> *	G5	4	Gr	4						
Genus Dorocordulia										
<i>D. lepida</i> *	G5	4	Gr	4						
<i>D. libera</i> *	G5	4	Gr	4						
Genus Epitheca										
<i>E. canis</i> *	G5	4	Gr	4						
<i>E. cynosura</i> *	G5	4	In	5						
<i>E. princeps</i>	G5	4	Ye	3						
<i>E. semiaquea</i> *	G4	5	In	5						
<i>E. spinigera</i>	G5	4	Gr	4					8	
Genus Helocordulia										
<i>H. uhleri</i> *	G5	4	Gr	4						
Genus Somatochlora										
<i>S. albicincta</i>	G5	4	Re	2						
<i>S. brevicincta</i> *	G3	3	In	5						
<i>S. cingulata</i>	G5	4	Gr	4						
<i>S. elongata</i> *	G5	4	Gr	4						
<i>S. forcipata</i> *	G5	4	In	5						
<i>S. franklini</i> *	G5	4	In	5						
<i>S. incurvata</i>	G4	4	Gr	4						
<i>S. kennedyi</i> *	G5	4	In	5						
<i>S. minor</i> *	G5	4	Gr	4						
<i>S. septentrionalis</i>	G5	4	Ye	3						
<i>S. tenebrosa</i>	G5	3	Ye	3						
<i>S. walshii</i> *	G5	4	Gr	4						
<i>S. williamsoni</i> *	G5	4	Re	2						
Genus Williamsonia										
<i>W. fletcheri</i>	G3/4	3	Re	2						

Species	Global (NatureServe)	NGS Canada	NSDNR Colour Rank	NGS Nova Scotia	NS1079 Serpentine Settling Pd.	NS1080 stream fr. Serpentine Pd.	NS1063 Devco Settling Pond	NS1082 stream from Devco Pd.	NS1061 Schooner Pond	NS1102 Donkin Mine Access Rd.
known on CBI. * possible Donkin Penin.										
lotic obligate										
peatland obligate										
saltmarsh obligate										
Family Libellulidae										
Genus Celithemis										
<i>C. elisa</i>	G5	4	Gr	4						
<i>C. martha</i>	G4	5	Gr	5						
Genus Erythrodiplax										
<i>E. berenice</i>	G5	2	Ye	2						
Genus Ladona										
<i>L. exusta</i> *	G4	4	Gr	4						
<i>L. julia</i>	G5	4	Gr	4				8		
Genus Leucorrhinia										
<i>L. frigida</i> *	G5	4	Gr	4						
<i>L. glacialis</i> *	G5	4	Gr	4						
<i>L. hudsonica</i>	G5	4	Gr	4		8	8			
<i>L. intacta</i>	G5	4	Gr	4			6			
<i>L. patricia</i>	G4	4	In	5						
<i>L. proxima</i> *	G5	4	Gr	4						
Genus Libellula										
<i>L. incesta</i>	G5	4	Gr	4						
<i>L. luctuosa</i>	G5	4	Bl	5						
<i>L. pulchella</i>	G5	4	Gr	4						
<i>L. quadrimaculata</i>	G5	4	Gr	4		8	8	1	8	
Genus Nannothemis										
<i>N. bella</i>	G4	4	Gr	4						
Genus Pantala										
<i>P. flavescens</i>	G5	4	Gr	4	3				8	10
<i>P. hymenaea</i>	G5	4	Gr	4	3					
Genus Plathemis										
<i>P. lydia</i>	G5	4	Gr	4	8					
Genus Sympetrum										
<i>S. corruptum</i>	G5	4	In	5						
<i>S. costiferum</i> *	G5	4	Gr	4						
<i>S. danae</i> *	G5	4	Gr	4						
<i>S. internum</i>	G5	4	Gr	4	8	8	8	8	8	
<i>S. obtrusum</i> *	G5	4	Gr	4						
<i>S. rubicundulum</i> *	G5	4	In	5						
<i>S. semicinctum</i> *	G5	4	Gr	4						
<i>S. vicinum</i>	G5	4	Gr	4			1	1	1	
Genus Tramea										
<i>T. carolina</i>	G5	5	In	5						
<i>T. lacerata</i>	G5	4	In	6						

Although the aquatic habitat types on the Donkin Peninsula are few, they appear to be healthy and to support an extensive list of odonates.

Even the recently-constructed habitats, the Serpentine Settling Pond and drainage stream, appear to house a reasonable list, although that can be expected to grow as they age.

Importance of Odonata

A healthy dragonfly diversity and population is an indicator of viable water habitats. As odonates are high on the aquatic foodchain, they will reflect any up-take of toxins throughout the flora and fauna of the habitat. They act to reduce populations of pest invertebrates such as the biting flies.

Dragonflies and damselflies are currently a high-profile group with conservation authorities and the public.

The Nova Scotia Species List (page B.05) indicates which odonates were encountered on the peninsula, in the context of the provincial list. Appendix A3.01 gives an overview of the order.

Species of Conservation Concern

One species of conservation interest in Nova Scotia was encountered, ranked as Indeterminate by NSDNR – *Lestes forcipatus* Rambur 1842, Sweetflag Spreadwing, an inhabitant of diverse still and slow waters. This species was ranked as Indeterminate due to past confusion with the common *L. disjunctus* – it appears to be not uncommon in the province. Record 311389 was of a single female taken at the Serpentine Settling Pond; it may have been wandering from the more developed Devco Settling Pond.

Potential Impacts on Odonata

There are three general types of human impacts on odonates; direct, habitat alteration, and broadcast.

Broadcast impacts include widely-dispersed pesticides and other chemicals, which enter the freshwaters and can affect odonates directly, or their prey. In south-west Nova Scotia, acid rain is a broadcast effect. No broadcast effects are associated with the mine operations as described to me.

Direct impacts are where individual odonata, generally flying adults, are harmed by human activities. There are only two such impacts, collection for scientific purposes and road-kill. Manual collection is not efficient enough to threaten odonates, except in the case of the most isolated and small populations. This does not apply to any peninsular species or habitat.

Road kill can be a significant factor for some species at certain times of the year, but the posted speed limits on the peninsula, if enforced, are far too low for this to be a significant threat there.

Habitat alteration is by far the most serious threat to odonates. As virtually all aquatic habitats on the peninsula below the mine facilities are man-made, this is a moot point in this case. It could be argued that the construction of the four principal aquatic habitats relevant to the development are entirely beneficial to odonates and other aquatic fauna.

If future operations entail the pumping of mine water which contains toxic chemicals, that would constitute an impact on the existing habitats, which are in series. These impacts on the Serpentine Settling Pond could be considered acceptable, as mitigating them is the express purpose for which the pond was constructed. If the impacts persist down to the Devco Settling Pond, that should be considered problematic.

As Schooner Pond is not in the mine-related drainage, it is not likely to be impacted by operations.

Mitigation of Impacts

Aside from the existing monitoring of mine water, and avoiding altering the water depth of existing habitats, no mitigation of operations on the peninsula seems necessary.

There appear to be no other activities in the area which might act cumulatively with mine operations to increase the negative impacts on odonates.

The potential impacts of shipment by the proposed transportation corridor will be considered in the report on that area.

The ADIP site code is given first, then the page and grid for the new Nova Scotia mapbook, followed by those for the preceding mapbook in brackets, and then the NTIS 1/50:000 map reference.

Latitude and longitude are given in the degree, minute, and decimal second format, followed by the format in which look-ups can be readily done in the Google Earth website.

The number of species recorded from the site is next.

Visits

For visits, the date, time on site, surveyors, sky cover (the average percentage was estimated, but usually varied during the visit), wind condition, and time on site are given for single/two surveyors (not including travel to or from).

Survey was by Paul M. Brunelle. M.E. Brunelle indicates that my son Michael accompanied me.

Species Recorded

Species encountered at the site are listed in taxonomic order to family, in alphabetical order by genus and species. The current status of each is given – see Appendix 4 for definitions.

For each record the ADIP record number identifies the voucher specimens (suffix ‘v’), in hand determination and release ‘h’, or observation on the wing ‘o’); the latter two records are claimed only for unambiguous species.

The date of encounter is given, followed by the lifestage (see Appendix 3), and the Residence Status (RSTAT) which the record substantiates (see Appendix 4). A brief definition of these residence statuses are given as well.

Serpentine Settling Pond

ADIP **NS1079** – 15w02 (43e03), 11J04.
 46°10’38.80”, -59°49’23.70” [46.1774N, 59.8233W].

All Species Recorded – **10**.

Visits

July 7 2008, P.M. Brunelle, sunny 80%, wind light, 09:10 to 09:30 [20 m].

July 8 2008, P.M. Brunelle, sunny 100%, wind light, 15:40 to 16:05 [25 m].

Aug. 15 2008, P.M. Brunelle, M.E. Brunelle, sunny 90%, wind light to moderate, 12:00 to 12:55 [55/110 m].

Aug. 26 2008, P.M. Brunelle, M.E. Brunelle, light overcast variable, wind none to light, 16:35 to 17:20 [45/90 m].

Species Recorded

Lestes forcipatus Rambur 1842 – Sweetflag Spreadwing (Family Lestidae).
 NATSRV G5, NGS CDA 4, NSDNR Indeterminate, NGS NS 5.
 Record 311389v, Aug. 26 2008, Adult, RSTAT 7 (females at appr. hab.).

Enallagma civile (Hagen 1861) – Familiar Bluet (Family Coenagrionidae).
 NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311033v, July 8 2008, Adult, RSTAT 8 (males at appr. habitat).
 Record 311253v, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).

Ischnura verticalis (Say 1839) – Eastern Forktail (Family Coenagrionidae).
 NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311035o, July 8 2008, Adult, RSTAT 3 (ovipositing observed).
 Record 311252h, Aug. 15 2008, Adult, RSTAT 3 (ovipositing observed).
 Record 311390v, Aug. 26 2008, Adult, Teneral, RSTAT 1 (emerg. proven).

Aeshna canadensis Walker 1908 – Canada Darner (Family Aeshnidae).
 NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311391h, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).

Aeshna u. umbrosa Walker 1908 – Shadow Darner (Family Aeshnidae).
 NATSRV G5T5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311406v, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).

Anax junius (Drury 1770) – Common Green Darner (Family Aeshnidae).
 NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311034o, July 8 2008, Adult, RSTAT 8 (males at appr. habitat).
 Record 311386o, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).

Pantala flavescens (Fabricius 1798) – Wandering Glider (F. Libellulidae).
 NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311032v, July 8 2008, Adult, RSTAT 3 (ovipositing observed).
 Record 311250o, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).

Record 311387o, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).

Pantala hymenaea (Say 1839) – Spot-winged Glider (Family Libellulidae).
 NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311007v, July 7 2008, Adult, RSTAT 3 (ovipositing observed).
 Record 311031o, July 8 2008, Adult, RSTAT 8 (males at appr. habitat).

Record 311251o, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).

Plathemis lydia (Drury 1770) – Common Whitetail (Family Libellulidae).
 NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311257o, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).
 Record 311393o, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).

Sympetrum internum Montgomery 1943 – Cherry-faced Meadowhawk (Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311256v, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).

Stream from Serpentine Settling Pond

ADIP **NS1080** – 15w02 (43e03), 11J04.
 46°10’38.80”, -59°49’23.70” [46.1774N, 59.8233W].

All Species Recorded – **8**.

Visits

July 7 2008, P.M. Brunelle, sunny 80%, wind light, 09:30 to 10:00 [30 m].

July 8 2008, P.M. Brunelle, sunny 100%, wind light, 15:50 to 15:55 [5 m].

Aug. 15 2008, P.M. Brunelle, M.E. Brunelle, sunny 90%, wind light to moderate, 12:25 to 12:40 [15/30 m].

Aug. 26 2008, P.M. Brunelle, M.E. Brunelle, light overcast variable, wind none to light, 17:05 to 17:15 [10/20 m].

Species Recorded

Ischnura verticalis (Say 1839) – Eastern Forktail (Family Coenagrionidae).
 NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311010v, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
 Record 311255o, Aug. 15 2008, Adult, RSTAT 3 (ovipositing observed).

Aeshna canadensis Walker 1908 – Canada Darner (Family Aeshnidae).
 NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.

Record 311394h, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).

A1.02
Appendix 1
Detailed Results by Site

- Aeshna u. umbrosa* Walker 1908 – Shadow Darner (Family Aeshnidae).
NATSRV G5T5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311392v, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).
Record 311392v, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).
- Anax junius* (Drury 1770) – Common Green Darner (Family Aeshnidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311009o, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
- Cordulegaster diastatops* (Sélys 1854) – Delta-spotted Spiketail
(F. Cordulegastridae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311036v, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
- Leucorrhinia hudsonica* (Sélys 1850) – Hudsonian Whiteface
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311012v, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
- Libellula quadrimaculata* Linnaeus 1758 – Four-spotted Skimmer
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311008v, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
Record 311254h, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).
- Sympetrum internum* Montgomery 1943 – Cherry-faced Meadowhawk
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311407v, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).

Devco Settling Pond

ADIP NS1083 – 15w02 (43e03), 11J04.
46°10'40.80", -59°50'20.20" [46.178N, 59.8389W].

All Species Recorded – 12.

Visits

- July 7 2008, P.M. Brunelle, sunny 90%, wind light to moderate,
11:45 to 12:15 [30 m].
Aug. 15 2008, P.M. Brunelle, M.E. Brunelle, sunny 90%, wind none to
light, 14:25 to 15:25 [60/120 m].
Aug. 26 2008, P.M. Brunelle, M.E. Brunelle, cloudy 60%, wind none to
light, 17:35 to 18:05 [30/60 m].

Species Recorded

- Lestes disjunctus* Sélys 1862 – Common Spreadwing (Family Lestidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311275o, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).
Record 311401v, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).
- Enallagma civile* (Hagen 1861) – Familiar Bluet (Family Coenagrionidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311024v, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
Record 311273o, Aug. 15 2008, Adult, RSTAT 3 (ovipositing observed).
Record 311397o, Aug. 26 2008, Adult, RSTAT 5 (reproductive behav.).
- Enallagma hageni* (Walsh 1863) – Hagen's Bluet (F. Coenagrionidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311027v, July 7 2008, Adult, Teneral, RSTAT 8 (m. at appr.
hab.).
- Ischnura verticalis* (Say 1839) – Eastern Forktail (Family Coenagrionidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311025o, July 7 2008, Adult, RSTAT 6 (both sexes at appr.
hab.).
Record 311274o, Aug. 15 2008, Adult, RSTAT 3 (ovipositing observed).
Record 311400o, Aug. 26 2008, Adult, RSTAT 7 (females at appr. hab.).
- Aeshna i. interrupta* Walker 1908 – Variable Darner (Family Aeshnidae).
NATSRV G5T5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311278v, Aug. 15 2008, Adult, RSTAT 6 (both sexes at appr. hab.).
- Aeshna u. umbrosa* Walker 1908 – Shadow Darner (Family Aeshnidae).
NATSRV G5T5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311279v, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).

- Anax junius* (Drury 1770) – Common Green Darner (Family Aeshnidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311030o, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
Record 311272o, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).
Record 311396o, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).
- Leucorrhinia hudsonica* (Sélys 1850) – Hudsonian Whiteface
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311029o, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
- Leucorrhinia intacta* (Hagen 1861) – Dot-tailed Whiteface
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311026o, July 7 2008, Adult, RSTAT 6 (both sexes at appr.
hab.).
- Libellula quadrimaculata* Linnaeus 1758 – Four-spotted Skimmer
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311028o, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
Record 311276o, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).
- Sympetrum internum* Montgomery 1943 – Cherry-faced Meadowhawk
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311277o, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).
Record 311398v, Aug. 26 2008, Adult, RSTAT 8 (males at appr. habitat).
- Sympetrum vicinum* (Hagen 1861) – Autumn Meadowhawk
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311280o, Aug. 15 2008, Teneral, RSTAT 1 (emergence proven).
Record 311399o, 8 26 2008, Adult, RSTAT 8 (males at appr. habitat).

Stream from Devco Settling Pond

ADIP NS1082 – 15w02 (43e03), 11J04.
46°10'40.80", -59°50'23.70" [46.178N, 59.8399W].

All Species Recorded – 9.

Visits

- July 7 2008, P.M. Brunelle, sunny 80%, wind light, 11:30 to 11:45 [15 m].
Aug. 15 2008, P.M. Brunelle, M.E. Brunelle, cloudy 90%, wind light,
14:05 to 14:25 [10/20 m].

Species Recorded

- Lestes disjunctus* Sélys 1862 – Common Spreadwing (Family Lestidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311266o, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).
- Chromagrion conditum* (Hagen in Sélys 1876) – Aurora Damsel
(Family Coenagrionidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311021v, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
- Ischnura posita* (Hagen 1861) – Fragile Forktail (Family Coenagrionidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311022v, July 7 2008, Adult, RSTAT 6 (both sexes at appr. habitat).
Record 311269o, Aug. 15 2008, Adult, RSTAT 6 (both sexes at appr. hab.).
- Ischnura verticalis* (Say 1839) – Eastern Forktail (Family Coenagrionidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311020v, July 7 2008, Adult, Teneral, RSTAT 1 (emergence proven).
Record 311265o, Aug. 15 2008, Adult, RSTAT 6 (both sexes at appr. hab.).
- Aeshna canadensis* Walker 1908 – Canada Darner (Family Aeshnidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311405v, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).
- Anax junius* (Drury 1770) – Common Green Darner (Family Aeshnidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311271o, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).
- Libellula quadrimaculata* Linnaeus 1758 – Four-spotted Skimmer
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311023v, July 7 2008, Adult, Exuvia, RSTAT 1 (emergence proven).
- Sympetrum internum* Montgomery 1943 – Cherry-faced Meadowhawk
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311267o, Aug. 15 2008, Adult, RSTAT 4 (mating observed).
- Sympetrum vicinum* (Hagen 1861) – Autumn Meadowhawk
(Family Libellulidae). NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311268o, Aug. 15 2008, Adult, RSTAT 1 (emergence proven).

Schooner Pond

ADIP NS1081 – 15w02 (43e03), 11J04.
46°10'39.79", -59°50'31.19" [46.1777N, 59.842W].

All Species Recorded – 12.

Visits

July 7 2008, P.M. Brunelle, sunny 80%, wind light, 10:15 to 11:15 [60 m].
July 8 2008, P.M. Brunelle, sunny 100%, wind light, 15:10 to 15:35 [25 m].
Aug. 15 2008, P.M. Brunelle, M.E. Brunelle, sunny 80%, wind light to moderate, 13:00 to 14:00 [60/120 m].
Aug. 26 2008, P.M. Brunelle, M.E. Brunelle, medium overcast, wind none to light, 18:10 to 18:45 [35/70 m].

Species Recorded

Lestes disjunctus Sélys 1862 – Common Spreadwing (Family Lestidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311262v, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).

Enallagma boreale (Sélys 1875) – Boreal Bluet (Family Coenagrionidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311019v, July 7 2008, Adult, RSTAT 3 (ovipositing observed).

Enallagma civile (Hagen 1861) – Familiar Bluet (Family Coenagrionidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311016v, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
Record 311260v, Aug. 15 2008, Adult, RSTAT 5 (reproductive behaviour).
Record 311402h, Aug. 26 2008, Adult, RSTAT 5 (reproductive behaviour).
Record 311404h, Aug. 26 2008, Adult, RSTAT 5 (reproductive behaviour).

Enallagma hageni (Walsh 1863) – Hagen's Bluet (Family Coenagrionidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311263v, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).

Ischnura verticalis (Say 1839) – Eastern Forktail (Family Coenagrionidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311014o, July 7 2008, Adult, Teneral, RSTAT 1 (emergence proven).
Record 311038o, July 8 2008, Adult, Teneral, RSTAT 1 (emergence proven).
Record 311258o, Aug. 15 2008, Adult, RSTAT 3 (ovipositing observed).

Aeshna u. umbrosa Walker 1908 – Shadow Darner (Family Aeshnidae).
NATSRV G5T5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311264o, Aug. 15 2008, Adult, RSTAT 4 (mating observed).
Record 311403h, Aug. 26 2008, Adult, RSTAT 3 (ovipositing observed).

Epitheca spinigera (Sélys 1871) – Spiny Baskettail (Family Corduliidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311013v, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).

Ladona julia (Uhler 1857) – Chalk-fronted Corporal (Family Libellulidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311018o, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).

Libellula quadrimaculata Linnaeus 1758 – Four-spotted Skimmer (Family Libellulidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311015o, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).
Record 311037o, July 8 2008, Adult, RSTAT 8 (males at appr. habitat).

Pantala flavescens (Fabricius 1798) – Wandering Glider (Family Libellulidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311017o, July 7 2008, Adult, RSTAT 8 (males at appr. habitat).

Sympetrum internum Montgomery 1943 – Cherry-faced Meadowhawk (Family Libellulidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311261v, Aug. 15 2008, Adult, RSTAT 8 (males at appr. habitat).

Sympetrum vicinum (Hagen 1861) – Autumn Meadowhawk (Family Libellulidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311259h, Aug. 15 2008, Adult, RSTAT 1 (emergence proven).

Donkin Mine Access Road

ADIP NS1102 – 15w02 (43e03), 11J04.
46°10'46.93", -59°50'4.37" [46.1797N, 59.8345W].

All Species Recorded – 2.

Visits

Aug. 17 2008, P.M. Brunelle, M.E. Brunelle, sunny 50%, wind none to light, 17:30 to 17:45 [15/30 m].

Species Recorded

Aeshna i. interrupta Walker 1908 – Variable Darner (Family Aeshnidae).
NATSRV G5T5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311301v, Aug. 17 2008, Adult, RSTAT 10 (not at water).

Pantala flavescens (Fabricius 1798) – Wandering Glider (Family Libellulidae).
NATSRV G5, NGS CDA 4, NSDNR Green, NGS NS 4.
Record 311302v, Aug. 17 2008, Adult, RSTAT 10 (not at water).

Methodology for survey, curation and documentation followed the ADIP (Atlantic Dragonfly Inventory Program) protocols, which have evolved over the last twenty years, and which reflect current practice in the study of odonates.

Habitat Location

After discussions with CBCL Limited Consulting Engineers staff, airphotos of the peninsula were reviewed and a target aquatic habitat list prepared.

This list was confirmed during the first field trip.

Each site was given an ADIP identification code beginning with 'NS'.

Field Survey

Personnel

All survey was done by Paul M. Brunelle, accompanied by Colin MacDonald during the first trip, although not on the Donkin Peninsula (CBCL staff), and by Michael E. Brunelle latterly.

Lifestage

Principal survey was for adults and teneral (the latter are recently-emerged adults), however exuviae (the abandoned skins of the emerged insects) were also collected when found (in the event only one was found). Exuviae collection may present the most effective means of inventory for these habitats, and firmly establishes residence status (see Appendix 1), but field survey must be scheduled carefully to collect this material, and tends to be protracted.

Larval survey can yield excellent information on the residence status of species, however it is protracted in the field and in the lab. With respect to the Serpentine Settling Pond, larval collection would stir up sediments which may undermine the function of the pond, in which water characteristics are monitored – this should be carefully considered before proceeding.

Adults were captured by net, and retained in field envelopes until preserved.

Frequency of Survey

As one visit to a water body per year is insufficient to acquire a reasonably complete species list, due to the diverse flight periods of species, three trips were made to sample the habitats.

Diel

Survey was done principally during the peak periods of odonate activity, roughly 10:00 to 17:00, depending on weather.

Weather

Field days were chosen in which the weather was suitable for encountering adults – sunny and hot, with no more than moderate winds. However, the wind rose to strong during a few site visits, with consequent reduction in diversity, and overcast occasionally reduced results, particularly early in the day. The third field trip was cut short based on a poor weather forecast, and will be completed in mid-September.

Voucher Specimens

Specimens were taken *pro forma* in many cases, and in all cases where field determination of particular species was considered untrustworthy.

The specimens were force-dried in acetone (adults and teneral) and air-dried (exuviae) and are stored in clear mylar envelopes with a label giving all identification and accession information.

Each specimen was given a 6-digit ADIP accession number, unique among specimens of odonates taken in Atlantic Canada and northern New England and catalogued in the ADIP databases.

The specimens will be deposited at the Nova Scotia Museum of Natural History, Halifax.

Documentation

Photography

General habitat photos were taken during each visit, converted to jpg format, catalogued, and will be tendered to CBCL for project use.

Data

Field notes, species observations and specimen details were entered into a Filemaker Pro 8.5v1 relational database structure, which will be translated into Excel 11.3.5 database form for deposit with CBCL.

Adults of the insect order Odonata are of one of the most ancient and widely-recognized groups of insects – with very few exceptions they are identifiable to suborder even by children.

Taxonomy

The suborder Zygoptera comprises the damselflies; very slim, with eyes widely separated on a short head, and wings of similar shape generally held together over the back when perched.

The suborder Anisoptera comprises the dragonflies; which tend to be larger and more robust, and which hold their differently-shaped fore and hindwings more or less flat out to the side when perched.

History of Study

There has been an extraordinary surge in interest in odonates in the last twenty years – fueled in part by the availability of photographs of these brilliantly-coloured insects and the publication of field guides, but also by increased interest in rare and endangered species among conservation and government authorities.

In the northeast of North America, this interest was first manifested in the formation of volunteer surveys – ADIP (Atlantic Dragonfly Inventory Program) in Atlantic Canada, and MDDS (Maine Damselfly and Dragonfly Survey). Based on these largely volunteer efforts, government and conservation authorities have begun supporting studies, and odonates are now often included in environmental assessments.

Much remains to be done before we have a firm body of knowledge upon which to base assumptions in the region – however the 55,000 records in hand for Acadia (Maritime Provinces and Maine) are a substantial baseline for further work.

Listing

See Appendix 4 for status definitions.

Until recently the NatureServe listing for the Maritime Provinces was not complete on the subnational (provincial) level – recent efforts by the Atlantic Canada Conservation Data Centre have addressed that.

Nova Scotia uses a system of colour statuses which largely reflects the NatureServe definitions.

Recently, the odonates of Canada were assigned statuses in the National General Status structure, as were species in all provinces and territories.

Significance to Humans

The order is an important component in all freshwater aquatic habitats – as predators high on the aquatic foodchain they consume many organisms we consider injurious, and are prey for many others we value.

They are, in particular, an important brake on the abundance of the aquatic biting insects.

Impacts on Odonata

Human impacts on odonates are principally those from aquatic habitat alteration, and tend to favour the common species over those rarer in the natural environments. On the positive side, we have constructed ponds, reservoirs, bogs and ditches which generally house good lists of lentic (slow-water) species. The formation of bogs has been particularly beneficial to northern species. On the negative side, we have greatly altered and in some cases eliminated all sizes of lotic (running water) habitats, and as a result have negatively impact many of those species which are obligate to those habitats.

Direct impacts are confined to collection for scientific purposes and road-kill. The latter can be a powerful impact on species depending upon their flying characteristics, however the former is rarely intense enough to endanger even the most restricted species population.

Lifestages

Odonata are largely aquatic insects, spending their infancy in the water. Unlike many aquatic insects, their larvae breathe the water (rather than taking their breath from the surface) and are hence vulnerable to a degree to changes in water chemistry.

After a maturation period, variable by species, they emerge into the teneral lifestage, leaving the empty shell of the larva behind (called an exuvia). The teneral is soft-bodied and does not generally have the brilliant colours of the adult.

After a period away from the water spent foraging and firming up, they return to their breeding arenas (usually at the water's edge).

Mature adults may be significantly different in colour and pattern from their tenerals, and in some groups there is considerable sexual dichromatism.

Behaviour

Major behaviours observed informed the establishment of residence status (see Appendix 4), and are: *emergence* (a teneral leaving its larval form), *mating* and *towing* (indicative of laying), *laying*, *males fighting* (indicative of territoriality at a larval habitat), *nuptial* (reproductive behaviour), *wandering* (an adult thought to be foraging away from its normal larval habitat).

Conservation Statuses

Italic comments are by Brunelle.

NatureServe Global Ranks

- G1** Extremely rare throughout its range (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
- G2** Rare throughout its range (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
- G3** Uncommon throughout its range, or found only in a restricted range, even if abundant in at some locations. (21 to 100 occurrences).
- G4** Usually widespread, fairly common throughout its range, and apparently secure with many occurrences, but the Element is of long term concern (e.g. watch list, 100+ occurrences).
- G5** Demonstrably widespread, abundant, and secure throughout its range, and essentially ineradicable under present conditions.
- T** This suffix indicates that there is some taxonomic confusion with the species.
- /** This indicates that the rank is intermediate between two ranks.

National General Status Ranks

– Canada and Nova Scotia

- 1 At risk:** species for which a formal assessment has been completed and determined to be at risk of extirpation or extinction (i.e., endangered or threatened).
- 2 May be at risk:** species that may be at risk of extirpation or extinction, and are therefore candidates for a detailed risk assessment.
- 3 Sensitive:** species which are not believed to be at risk of extirpation or extinction, but may require special attention or protection to prevent them from becoming at risk.
- 4 Secure:** species which are not believed to be ‘at risk’ or ‘sensitive’.
- 5 Undetermined:** species for which insufficient data, information, or knowledge is available to reliably evaluate their status. *Generally rare where known.*
- 6 Not assessed:** species known or believed to be present but which have not yet been assessed. *This status is usually is applied to recent discoveries.*
- 7 Exotic:** species that have been introduced as a result of human activity.

- 8 Extirpated/extinct:** species no longer thought to be present in the jurisdiction or that are believed to be extinct.
- 9 Accidental/vagrant:** species occurring infrequently and unpredictably, outside their usual range.

Nova Scotia DNR Colour Ranks

- Red** May be at risk (‘Re’ in table, page B.05).
- Yellow** Sensitive (‘Ye’).
- Green** Secure (‘Gr’)
- Blue** Thought to be extirpated (‘Bl’).
- Indeterminate** Rank not determined (‘In’).

Generally rare and of conservation concern, or the subject of taxonomic confusion historically. This rank is also given to recent additions to the provincial list, pending further consideration.

Residence Status

Developed by ADIP, residence status is a metric of the nature of a species’ presence in a water body or wetland, based on the degree to which it has been proven or indicated that the larvae of the species develop successfully to emergence.

- 1 Emergence vouchered or observed;**
 - directly observed,
 - collection of exuvia, or,
 - teneral on its maiden flight near the site.
- 2 Larvae collected,** unambiguous determination.
- 3 Laying vouchered or observed.**
- 4 Mating vouchered or observed.**
- 5 Reproductive behavior vouchered or observed;**
 - male display for female,
 - male priming (transferring semen to secondary genitalia), or,
 - male towing female (an indicator of laying).
- 6 Males and females vouchered or observed,** at the aquatic habitat appropriate for the species.
- 7 Females only vouchered or observed,** at appropriate aquatic habitat.
- 8 Males only vouchered or observed,** at appropriate aquatic habitat.
- 9 Not encountered at an appropriate aquatic habitat,** for the species.
- 10 Not encountered at any aquatic habitat.**