



Attendees of the 2014 Northeast Regional DSA Meeting. Photo by Bryan Pfeiffer.

Odonata of Black Moshannon State Park, Centre County, Pennsylvania

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Abstract

Black Moshannon State Park includes a variety of freshwater wetlands that support a diversity of Odonata. It is situated 1900 feet (580 m) above sea level in central Pennsylvania. Since 1943, 96 species of Odonata have been observed within the park. We document the fauna that includes a number of species of state and regional conservation concern.

Introduction

The 2015 annual Dragonfly Society of the Americas (DSA) meeting will be held in central Pennsylvania, where the local dragonfly fauna has been sampled frequently for more than 70 years. The first indications of its rich and diverse fauna emerged from a publication by George H. Beatty (Beatty, 1946) in which he reported collections at Bear Meadows and a few other locations near State College. In 1955, he moved to the State College area and lived there with his wife, Alice Ferguson Beatty, also an Odonata specialist. They and coauthors published 14 papers on Pennsylvania Odonata between 1968 and 1971, of which several relate to central Pennsylvania (Beatty, Beatty, and White, 1969a; Beatty, Beatty, and Shiffer, 1969b; Beatty and Beatty, 1971). While maintaining an interest in Odonata, the Beattys never published another paper on Odonata and devoted much of their time to botanical pursuits and photography. Alice passed away in 1987 and George died in 2004. The Beatty's large Odonata collection is now housed at Pennsylvania State University's Stuart W. Frost Entomological

Museum (Deans, 2013). Two of the authors (CNS and HBW) attribute their deep interest in Odonata to the Beattys who cultivated that interest early on with frequent field trips and sharing of their extensive knowledge.

The 2015 DSA meeting will be a great opportunity to showcase and explore several rich Odonata habitats such as Bear Meadows (White, Beatty, and Beatty, 1968), Ten Acre Pond (White, 1963; Shiffer and White, 1995; 2014), and others where almost 100 species have been reported over the years. One of the lesser-known habitats is Black Moshannon State Park, the focus of this article, which will hopefully entice many to attend the 2015 DSA meeting.

Black Moshannon State Park

Black Moshannon State Park (40.91°N, -78.06°W) in Rush Township, Centre County, Pennsylvania, is nine miles (15 km) east of Philipsburg and about 20 miles (32 km) northwest of State College. It contains a diverse complex of wetlands and supports a similarly diverse Odonata fauna. Black Moshannon Lake (250 A, 101 ha, elev. 1870 ft, 570 m), a long-standing impoundment about two miles (3 km) in greatest length is the park's centerpiece. It is cradled in a broad valley atop the Allegheny Plateau and is almost surrounded by an extensive bog and heath complex. Numerous small streams, some with beaver ponds, feed the wetlands and lake that below the dam form Black Moshannon Creek, a medium-sized rocky stream flowing north in a narrow forested valley. Close by, the Allegheny Front drops 1300 feet (395 m) into Bald Eagle Valley in the Ridge and

Valley physiographic province. Ecologically, the area is more typical of boreal habitats in glaciated regions hundreds of miles to the north than to the habitats fairly close to the south and east. A map of the state park is available on line at <http://www.mobilemaplets.com/thumbnails/2377_thumbnail-1024.jpg>.

The park is within the larger Moshannon State Forest. The entire area was clearcut by and burned over by fires in the 1800s. To support the lumbering operations, a saw mill and dam were constructed on Black Moshannon Creek where it exits the shallow valley. This flooded many of the series of beaver dams to form the lake. During the 1930s, the dam was replaced by the Civilian Conservation Corps and again reconstructed the 1950s.

Survey Methods

Due to the diverse, extensive, and often difficult-to-access wetlands in Black Moshannon State Park, Odonata surveys were frequently limited to certain areas and thus rarely sampled the full diversity of species present during a visit. For example, exploration of Black Moshannon Creek downstream from the lake would provide a reasonable sampling of stream species, but species present at the lake, bogs, beaver ponds, or small streams might not be seen. While recent surveys by CNS recorded all species seen, early records made by others only recorded specimens actually collected and preserved. Nevertheless, Odonata records on nearly 200 dates since 1943 reveal a tremendous diversity even if common resident species such as *Ladona julia* (Chalk-fronted Corporal), *Calopteryx maculata* (Ebony Jewelwing), or *Ischnura verticalis* (Eastern Forktail) at unsampled habitats might have been overlooked in many years. Although the earliest and latest dates for Odonata range from early May to mid-October, most surveys (82%) occurred in June, July, and August, thus early and late dates for seasonal distributions presented in Table 2 may be truncated in some cases. All records used to construct this table come from a Pennsylvania Odonata logbook maintained by CNS that was scanned and is available on-line through the Frost Museum Website (Shiffer, White, and Deans, 2014). Voucher specimens exist for virtually every species reported and are currently part of the Florida State Collection of Arthropods in Gainesville, Florida, where CNS's collection now resides.

Decadal and Seasonal Distribution of Odonata at Black Moshannon State Park

Table 1 shows the number of years various species were observed at Black Moshannon by decade since the 1940s. Table 2 shows the seasonal distribution for each species and the number of survey dates by decade and monthly quarter. While collecting dates since 1943 provide a longitudinal

perspective, the most thorough surveys have occurred in recent years. Thus, recent data provides a more robust indication of the Odonata fauna. Since 2000, 75 species have been recorded by CNS. Several of these are undoubtedly resident species that eluded detection in previous decades due to their low population numbers, localization to infrequently sampled habitats, or early or late seasonal occurrence. The incompleteness of the earlier surveys is evident by the common species that were not reported in many years. Nevertheless, these data do provide an indication of which species are resident and common and those that may be resident, but are uncommon. In the 69 years covered in Table 1, only 17 years do not have any records. It should be noted that the 2015 DSA meeting is scheduled for fourth week of June when the largest number of species have been observed (67).

Species of Conservation Interest in Pennsylvania

Nine species of special conservation concern with a rank of S1 or S2 for Pennsylvania have been reported from Black Moshannon State Park (Pennsylvania Natural Heritage Program, 2013). S1 indicates: "Critically imperiled in the state because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically 5 or fewer occurrences or very few remaining individuals or acres". S2 indicates: "Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state. Typically 6–20 occurrences or few remaining individuals or acres". State assessment ratings of S3, S4, and S5 indicate successively less vulnerability.

Note that state ranks are part of an iterative process to assess the health and status of species in the state. Records reported by odonate enthusiasts are a critical component of the assessment and ranking process. The ranks provided here were last updated in 2010. The Pennsylvania Natural Heritage Program is currently reviewing state ranks as part of a State Wildlife Action Plan update. Odonates are being assessed using NatureServe's rank calculator v3.1 in which the number of known populations carries less weight in determining rank. Range extent and threats are now the primary drivers of rank. Many species will see an increase of a half to one step (e.g., from S2 to S2S3 or S3) as a result of this new ranking approach. We anticipate that the new rankings will be posted on the Pennsylvania Natural Heritage Program website by early 2015 before the DSA meeting in June.

Rhionaeschna mutata (Spatterdock Darner) (S2). This species has been reported in eight different years and in almost every year recently when more intensive surveying was done. Usually only one or two were present. Thus, it is

likely a resident species with a small population. It flies over spatterdock patches at the lake in June and early July.

Gomphus rogersi (Sable Clubtail) (S2). Although this species has been reported only twice, its normal habitat of small sandy-bottomed woodland streams with gentle flow is often bypassed in surveys. It is likely a rare but resident species in the park.

Libellula flavida (Yellow-sided Skimmer) (S1). Two males of this southern species were seen in late June 2005. They were likely strays and not part of an established breeding population.

Somatochlora incurvata (Incurvate Emerald) (S1). For many years, this species was unknown in Pennsylvania. However, once its preferred bog heath habitat and later-season flight period were recognized, it was looked for and discovered in Clinton County (Shiffer, 1969) and subsequently in several other counties in north-central and northeastern Pennsylvania. It has been seen in three different years at Black Moshannon since its discovery there in 2002. It is undoubtedly a resident that flies in places that are hard to access.

Gomphus descriptus (Harpoon Clubtail) (S1S2). This stream species was recorded in five years before 1970, often commonly on Black Moshannon Creek in late May and June, but has not been reported since. Whether it is still a resident species is uncertain.

Calopteryx aequabilis (River Jewelwing) (S2). A single male was collected in 1954 by Stuart W. Frost. The species has not been seen since. While there may be populations further downstream on Black Moshannon Creek, finding it again would be a significant discovery.

Gomphaeschna furcillata (Harlequin Darner) (S2). This typical bog species is well known from Tamarack Bog to the north and Bear Meadows (White, Beatty, and Beatty, 1968) to the south, yet it has been reported only twice from Black Moshannon State Park where one might expect it to be a frequently-seen resident.

Somatochlora forcipata (Forcinate Emerald) (S2). Once this species was discovered as a resident in 2003, it was found in low numbers when looked for in late June and early July flying in sunny glades near the Moss-Hanne Trail.

Somatochlora walshii (Brush-tipped Emerald) (S2). This species is sufficiently common to be found when it is looked for in its preferred habitat of grassy wet meadows, often near beaver ponds

Species that have not been found but could be present

There are several species that are not common in Pennsylvania but, based on their distribution in Pennsylvania and habitat preference, might be found in Black Moshannon State Park. Perhaps participants at the 2015 DSA meeting can document several and thereby top the 100 species mark for the park. Ten to look for include:

Aeshna clepsydra (Mottled Darner) (S2S3). This species is known from several counties in Pocono Mountains of northeastern Pennsylvania. CNS once observed a dragonfly following the shore of Black Moshannon Lake that appeared to be this species, but its identity was not confirmed.

Lanthus parvulus (Northern Pygmy Clubtail) (S3). This species is found on small cold-water streams in the Pennsylvania mountains, but it often goes unseen. Black Moshannon State Park is within its range and has the requisite habitats.

Epithecina spinigera (Spiny Baskettail) (S1). A few records of this species exist in five northeastern counties of Pennsylvania. Black Moshannon State Park is near the southern range limit of this species.

Somatochlora elongata (Ski-tipped Emerald) (S2). It is hard to imagine that this species has not been found yet at Black Moshannon because there is plenty of suitable habitat and the species is known from other places in Centre County and adjacent counties.

Leucorrhinia glacialis (Crimson-ringed Whiteface) (S3S4). As with the previous species, this species would be expected to be present in Black Moshannon State Park due to its habitat preferences and known geographic range.

Leucorrhinia proxima (Red-waisted Whiteface) (S2). There are relatively few Pennsylvania records for this species, but it has shown up at Ten Acre Pond (Shiffer and White, 2014) and Beaver Dam (CNS, unpublished record), and is known from several northern counties. The fact that it looks a lot like the more common *L. frigida* (Frosted Whiteface) might enable it to escape detection.

Pantala flavescens (Wandering Glider) (S5). This widespread migratory species can be expected to appear sometime at any habitat in Pennsylvania. It is surprising that it has not been reported at least once over a parking lot or field in Black Moshannon State Park.

Tramea carolina (Carolina Saddlebags) (S4S5). As with the previous species, *T. carolina* migrates and could appear

in the park. There are breeding populations within Centre County.


Archilestes grandis (Great Spreadwing) (S4). Twice there have been unconfirmed reports of this late-season damselfly along tributaries near the Mid-State Regional Airport on the west side of the park.

Coenagrion resolutum (Tiaga Bluet) (S1). This species is only known from five sites in Pennsylvania, but one is Ten Acre Pond in Centre County where it established a breeding colony for several years in the 1980s; it showed up there again briefly in 2001, which suggests there are source populations in the area. There are suitable habitats in Black Moshannon State Park where this species might show up.

Future Study

As the above lists and Table 1 indicate, there are a number of rare and interesting species in Black Moshannon State Park and others that might well be found there. Other than the adjacent Mid-County Regional Airport which may affect runoff and could degrade the habitat and water quality, the location of the park within the Moshannon State Forest, provides some expectation for long-term habitat protection. We hope that this publication will make dragonfly enthusiasts aware of this important island of Odonate diversity and encourage continued study and monitoring. It will be among habitats available for exploration during the 2014 DSA Meeting in State College, Pennsylvania.

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Your membership fees help support the society and its web site, its annual meetings, and the critically important and useful web site and database OdonataCentral. You can also become a Sustaining Member, just by adding \$5 to your regular dues. For more information about DSA membership and to download a membership form, visit <http://www.odonatacentral.org/index.php/PageAction.get/name/DSA_Membership>.

Table 1. Decadal distribution of Odonata at Black Moshannon State Park, Centre County, Pennsylvania

	Observation Interval							
	1943	1950	1960	1970	1980	1990	2000	Tot
Species Scientific Name	1949	1959	1969	1979	1989	1999	2010	Yrs
<i>Calopteryx aequabilis</i>	0	1	0	0	0	0	0	1
<i>Calopteryx amata</i>	0	0	3	2	2	0	1	8
<i>Calopteryx maculata</i>	0	0	2	2	3	3	9	19
<i>Lestes congener</i>	0	0	1	0	0	0	0	1
<i>Lestes dryas</i>	0	0	1	0	0	1	0	2
<i>Lestes eurinus</i>	0	0	0	0	0	1	0	1
<i>Lestes forcipatus</i>	0	0	1	0	0	0	1	2
<i>Lestes inaequalis</i>	1	1	1	0	1	1	2	7
<i>Lestes rectangularis</i>	1	1	2	1	1	1	6	13
<i>Lestes unguiculatus</i>	0	0	1	0	0	0	0	1
<i>Lestes vigilax</i>	0	0	1	1	0	2	4	8
<i>Amphiagrion saucium</i>	0	0	0	1	0	0	6	7
<i>Argia apicalis</i>	0	0	1	2	0	1	0	4
<i>Argia fumipennis violacea</i>	0	0	1	1	1	0	1	4
<i>Argia moesta</i>	0	0	1	0	0	0	2	3
<i>Chromagrion conditum</i>	0	2	5	2	2	1	7	19
<i>Enallagma antennatum</i>	0	0	1	1	0	0	1	3
<i>Enallagma aspersum</i>	0	0	1	2	2	1	0	6
<i>Enallagma basidens</i>	0	0	0	0	0	0	1	1
<i>Enallagma civile</i>	0	0	1	1	0	0	0	2
<i>Enallagma annexum</i>	0	0	1	1	0	0	0	2
<i>Enallagma divagans</i>	0	0	1	0	0	0	0	1
<i>Enallagma ebrium</i>	0	0	1	0	0	0	1	2
<i>Enallagma exsulans</i>	0	0	0	1	1	0	0	2
<i>Enallagma geminatum</i>	0	0	0	0	0	1	2	3
<i>Enallagma hageni</i>	0	2	4	2	2	2	10	22
<i>Enallagma signatum</i>	0	0	3	1	0	1	1	6
<i>Enallagma traviatum</i>	0	0	0	1	1	0	0	2
<i>Enallagma vesperum</i>	0	0	1	2	0	1	0	4
<i>Ischnura hastata</i>	0	0	0	0	0	0	2	2
<i>Ischnura posita</i>	0	0	1	0	0	0	2	3
<i>Ischnura verticalis</i>	3	3	3	3	3	3	8	26
<i>Nehalennia gracilis</i>	0	1	0	0	1	0	3	5
<i>Nehalennia irene</i>	0	1	3	0	3	1	6	14
<i>Aeshna canadensis</i>	2	1	1	3	2	1	4	14
<i>Aeshna tuberculifera</i>	0	0	0	1	1	0	4	6
<i>Aeshna umbrosa</i>	0	0	1	2	1	2	5	11
<i>Aeshna verticalis</i>	0	0	0	1	0	0	4	5
<i>Anax junius</i>	0	0	5	3	1	4	9	22
<i>Basiaeschna janata</i>	0	1	4	0	0	2	3	10
<i>Boyeria grafiana</i>	0	0	0	0	2	2	0	4
<i>Boyeria vinosa</i>	0	0	0	0	2	1	1	4
<i>Epiaeschna heros</i>	0	0	1	0	1	0	3	5
<i>Gomphaeschna furcillata</i>	0	0	0	1	0	0	1	2
<i>Rhionaeschna mutata</i>	0	0	0	1	0	1	6	8
<i>Arigomphus villosipes</i>	0	1	4	2	0	0	6	13
<i>Gomphus borealis</i>	0	1	4	2	1	2	7	17
<i>Gomphus descriptus</i>	0	2	3	0	0	0	0	5
<i>Gomphus exilis</i>	0	1	3	2	1	1	4	12
<i>Gomphus lividus</i>	0	0	4	1	0	2	2	9
<i>Gomphus rogersi</i>	0	0	1	0	0	0	1	2
<i>Gomphus spicatus</i>	0	2	3	4	1	1	5	16
<i>Hagenius brevistylus</i>	0	1	1	2	0	0	0	4
<i>Lanthus vernalis</i>	0	0	1	0	0	0	0	1

Table 1, continued. Decadal distribution of Odonata at Black Moshannon State Park, Centre County, Pennsylvania

	Observation Interval							
	1943	1950	1960	1970	1980	1990	2000	Tot
Species Scientific Name	1949	1959	1969	1979	1989	1999	2010	Yrs
<i>Ophiogomphus mainensis</i>	0	0	0	0	2	1	1	4
<i>Stylogomphus albistylus</i>	0	0	2	1	0	0	1	4
<i>Cordulegaster diastatops</i>	0	0	1	2	2	4	9	18
<i>Cordulegaster maculata</i>	0	0	1	0	1	0	4	6
<i>Cordulegaster obliqua</i>	0	0	0	0	1	2	7	10
<i>Didymops transversa</i>	1	1	1	0	0	0	0	3
<i>Macromia illinoensis</i>	0	0	0	1	0	0	0	1
<i>Cordulia shurtleffi</i>	0	0	3	0	0	0	5	8
<i>Dorocordulia libera</i>	3	3	6	2	2	3	9	28
<i>Epitheca canis</i>	0	1	2	3	0	2	4	12
<i>Epitheca cynosura</i>	1	4	4	2	2	3	9	25
<i>Epitheca princeps</i>	0	0	0	0	0	1	2	3
<i>Helocordulia uhleri</i>	0	0	4	2	0	0	1	7
<i>Somatochlora forcipata</i>	0	0	0	0	0	0	4	4
<i>Somatochlora incurvata</i>	0	0	0	0	0	0	3	3
<i>Somatochlora tenebrosa</i>	0	0	3	3	2	2	9	19
<i>Somatochlora walshii</i>	0	0	0	3	0	1	7	11
<i>Celithemis elisa</i>	0	0	0	0	0	0	2	2
<i>Celithemis eponina</i>	0	0	0	0	0	0	1	1
<i>Erythemis simplicicollis</i>	0	0	0	0	0	0	4	4
<i>Ladona julia</i>	0	4	5	5	1	4	9	28
<i>Leucorrhinia frigida</i>	0	2	4	1	2	2	8	19
<i>Leucorrhinia hudsonica</i>	0	0	2	0	0	0	3	5
<i>Leucorrhinia intacta</i>	0	3	1	2	1	3	8	18
<i>Libellula axilena</i>	0	0	0	0	0	0	1	1
<i>Libellula cyanea</i>	0	0	0	0	0	0	4	4
<i>Libellula flavida</i>	0	0	0	0	0	0	1	1
<i>Libellula luctuosa</i>	0	0	0	0	0	2	3	5
<i>Libellula pulchella</i>	0	0	1	2	0	1	8	12
<i>Libellula quadrimaculata</i>	0	0	3	2	1	2	9	17
<i>Libellula semifasciata</i>	1	0	2	1	0	1	2	7
<i>Libellula vibrans</i>	0	0	0	0	0	0	6	6
<i>Plathemis lydia</i>	1	0	1	1	0	2	6	11
<i>Pachydiplax longipennis</i>	0	0	0	0	0	0	1	1
<i>Pantala flavescens</i>	0	0	0	0	0	0	1	1
<i>Pantala hymenaea</i>	2	0	1	1	0	3	0	7
<i>Perithemis tenera</i>	0	1	3	3	1	2	9	19
<i>Sympetrum janeae</i>	0	0	0	0	0	1	8	9
<i>Sympetrum obtrusum</i>	1	1	0	0	1	0	0	3
<i>Sympetrum semicinctum</i>	0	0	0	2	1	1	6	10
<i>Sympetrum vicinum</i>	2	4	0	0	0	2	5	13
<i>Tramea lacerata</i>	0	0	0	0	0	0	4	4
Total Species	12	26	59	50	37	48	75	96
Number of visits during interval	6	9	23	23	10	28	94	193

Table 2. Seasonal distribution of Odonata at Black Moshannon State Park, Centre County, Pennsylvania.

									Seasonal Distribution by Monthly Quarters																				
	May				June				July				August				September				Oct		Tot	Early - Late Dates					
Species Scientific Name	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	Qtrs						
<i>Calopteryx aequabilis</i>							X																1	June 22					
<i>Calopteryx amata</i>					X	X	X	X	X	X		X											7	June 8 - July 29					
<i>Calopteryx maculata</i>					X	X	X	X	X	X	X	X	X	X									10	June 8 - August 12					
<i>Lestes congener</i>																			X				1	September 13					
<i>Lestes dryas</i>										X		X											2	July 15 - July 31					
<i>Lestes eurinus</i>								X															1	June 25					
<i>Lestes forcipatus</i>												X				X							2	July 31 - August 17					
<i>Lestes inaequalis</i>						X	X	X				X	X	X									6	June 11 - August 4					
<i>Lestes rectangularis</i>						X		X		X	X	X	X	X	X	X		X					10	June 15 - September 10					
<i>Lestes unguiculatus</i>													X										1	July 31					
<i>Lestes vigilax</i>						X		X		X	X	X	X					X					7	June 11 - September 8					
<i>Amphiagrion saucium</i>				X		X	X	X	X	X					X								7	May 30 - August 15					
<i>Argia apicalis</i>										X	X			X									3	July 11 - August 8					
<i>Argia fumipennis violacea</i>								X	X		X			X									4	June 25 - August 1					
<i>Argia moesta</i>						X		X															2	June 11 - June 30					
<i>Chromagrion conditum</i>		X			X	X	X	X	X	X	X												8	May 15 - July 22					
<i>Enallagma antennatum</i>								X															1	June 25 - June 30					
<i>Enallagma aspersum</i>								X			X	X	X										4	June 24 - August 1					
<i>Enallagma basidens</i>						X																	1	June 11					
<i>Enallagma civile</i>												X						X					2	July 24 - September 8					
<i>Enallagma annexum</i>								X															1	June 24 - June 29					
<i>Enallagma divagans</i>								X															1	June 25					
<i>Enallagma ebrium</i>							X	X															2	June 19 - June 27					
<i>Enallagma exsulans</i>								X		X				X									3	June 29 - August 1					
<i>Enallagma geminatum</i>								X	X		X								X				4	June 27 - August 25					
<i>Enallagma hageni</i>						X	X	X	X	X	X	X	X	X		X	X						10	June 8 - August 25					
<i>Enallagma signatum</i>						X		X				X						X	X				5	June 11 - September 13					
<i>Enallagma traviatum</i>								X				X											2	June 24 - July 18					
<i>Enallagma vesperum</i>								X	X		X	X				X		X					6	June 24 - September 8					
<i>Ischnura hastata</i>						X				X							X	X	X				5	June 12 - September 11					
<i>Ischnura posita</i>						X		X				X											3	June 11 - July 30					
<i>Ischnura verticalis</i>		X		X		X	X	X	X	X	X	X	X	X	X	X	X	X					14	May 15 - September 13					
<i>Nehalennia gracilis</i>							X	X		X	X		X	X									6	June 20 - August 15					
<i>Nehalennia irene</i>						X	X	X	X	X	X	X	X										8	June 8 - July 30					
<i>Aeshna canadensis</i>													X	X	X	X	X	X	X	X			9	July 29 - September 30					
<i>Aeshna tuberculifera</i>														X		X	X	X	X	X			7	August 1 - September 30					
<i>Aeshna umbrosa</i>								X						X		X	X	X	X	X	X		9	June 20 - October 12					
<i>Aeshna verticalis</i>										X				X	X	X	X	X	X	X		X	8	July 10 - October 1					
<i>Anax junius</i>		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	17	May 6 - October 1					
<i>Basiaeschna janata</i>					X	X	X	X		X													5	May 28 - July 11					
<i>Boyeria grafiana</i>														X	X								2	August 1 - August 12					
<i>Boyeria vinosa</i>												X	X	X			X						4	July 29 - September 4					
<i>Epiaeschna heros</i>						X		X						X		X							4	June 9 - August 20					
<i>Gomphaeschna furcillata</i>								X	X														2	June 20 - June 24					
<i>Rhionaeschna mutata</i>						X	X	X	X		X												5	June 11 - July 26					
<i>Arigomphus villosipes</i>						X	X	X	X	X	X	X				X							8	June 11 - August 20					
<i>Gomphus borealis</i>					X	X	X	X	X	X		X											7	May 30 - July 25					
<i>Gomphus desertus</i>					X		X	X	X														4	May 28 - June 24					
<i>Gomphus exilis</i>						X	X	X	X		X												5	June 9 - July 13					
<i>Gomphus lividus</i>				X	X	X	X	X	X														6	May 20 - June 25					
<i>Gomphus rogersi</i>								X	X														2	June 23 - June 30					
<i>Gomphus spicatus</i>				X		X	X	X	X	X	X												7	May 20 - July 17					
<i>Hagenius brevistylus</i>								X	X		X	X											3	June 24 - July 27					
<i>Lanthus vernalis</i>						X	X	X		X													4	June 15 - July 14					

Table 2. Seasonal distribution of Odonata at Black Moshannon State Park, Centre County, Pennsylvania.

									Seasonal Distribution by Monthly Quarters																			
	May				June				July				August				September				Oct		Tot	Early - Late Dates				
Species Scientific Name	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	Qtrs					
<i>Ophiogomphus mainensis</i>						X								X									2	June 10 - August 4				
<i>Stylogomphus albistylus</i>						X		X															2	June 11 - June 30				
<i>Cordulegaster diastatops</i>			X	X	X	X	X	X	X	X	X	X		X									11	May 20 - August 15				
<i>Cordulegaster maculata</i>				X		X		X	X														4	May 28 - July 6				
<i>Cordulegaster obliqua</i>					X	X	X	X	X	X													6	June 8 - July 14				
<i>Didymops transversa</i>						X		X	X														3	June 9 - July 4				
<i>Macromia illinoensis</i>									X														1	June 29				
<i>Cordulia shurtleffi</i>					X	X	X	X		X	X												6	June 8 - July 22				
<i>Dorocordulia libera</i>				X	X	X	X	X	X	X	X	X	X	X									10	May 30 - August 7				
<i>Epithea canis</i>	X	X	X	X	X	X	X	X															6	May 7 - July 3				
<i>Epithea cynosura</i>			X		X	X	X	X	X	X	X	X											9	May 20 - July 30				
<i>Epithea princeps</i>								X								X							2	June 27 - Aug 19				
<i>Helocordulia uhleri</i>				X		X		X															3	May 28 - June 30				
<i>Somatochlora forcipata</i>							X	X	X	X													4	June 19 - July 10				
<i>Somatochlora incurvata</i>											X				X	X	X	X	X	X	X		7	July 17- September17				
<i>Somatochlora tenebrosa</i>						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			14	June 15 - September 17				
<i>Somatochlora walshii</i>						X	X	X	X	X	X	X		X	X	X	X						11	June 15 - September 8				
<i>Celithemis elisa</i>						X											X						2	June 15 - September 4				
<i>Celithemis eponina</i>														X	X								2	August 3 - August 15				
<i>Erythemis simplicicollis</i>									X		X	X				X							4	June 23 - August 27				
<i>Ladona julia</i>				X	X	X	X	X	X	X	X	X	X										10	May 28 - August 4				
<i>Leucorrhinia frigida</i>						X	X	X	X	X	X		X	X	X	X							10	June 11 - August 25				
<i>Leucorrhinia hudsonica</i>						X	X	X	X			X											5	June 11 - July 13				
<i>Leucorrhinia intacta</i>					X	X	X	X	X	X	X		X	X									9	June 8 - August 9				
<i>Libellula axilena</i>						X					X												2	June 15 - July 21				
<i>Libellula cyanea</i>						X		X		X					X								4	June 15 - August 15				
<i>Libellula flavida</i>								X															1	June 25				
<i>Libellula luctuosa</i>						X	X	X	X		X		X										6	June 15 - August 4				
<i>Libellula pulchella</i>				X		X	X	X	X	X	X		X	X	X	X	X						12	May 30 - September 11				
<i>Libellula quadrimaculata</i>			X	X		X	X	X	X	X	X		X										9	May 20 - August 4				
<i>Libellula semifasciata</i>						X	X	X	X	X	X	X		X	X								10	June 5 - August 23				
<i>Libellula vibrans</i>						X																	1	June 15				
<i>Plathemis lydia</i>				X	X	X	X	X	X	X	X		X	X	X	X		X					13	May 25 - September 17				
<i>Pachydiplax longipennis</i>						X	X	X	X	X	X	X	X	X	X	X	X						12	June 11 - September 4				
<i>Pantala flavescens</i>																	X						1	September 5				
<i>Pantala hymenaea</i>										X													1	July 13				
<i>Perithemis tenera</i>								X	X	X		X	X		X								6	June 30 - August 22				
<i>Sympetrum janeae</i>						X		X	X		X	X	X	X	X	X	X	X					11	June 15 - September17				
<i>Sympetrum obtrusum</i>									X			X	X					X					4	July 6 - September10				
<i>Sympetrum semicinctum</i>											X	X	X	X	X	X	X	X	X				8	July 29 - September 17				
<i>Sympetrum vicinum</i>											X		X		X	X	X	X	X	X			8	July 21- September 17				
<i>Tramea lacerata</i>								X	X								X	X	X		X		7	June 30 - October 1				
Total Species	2	3	5	18	19	54	42	67	40	41	42	33	35	24	25	22	23	18	10	4	3	1	96	May 7 - October 12				
Number of visits during interval	2	1	3	3	6	18	21	24	14	12	11	16	13	7	9	8	10	6	4	3	1	1	193					

Common Names of Species

Calopteryx aquabilis
C. amata
C. maculata
Lestes congener
L. dryas
L. eurinus
L. forcipatus
L. inaequalis
L. rectangularis
L. unguiculatus
L. vigilax
Amphiagrion saucium
Argia apicalis
A. fumipennis violacea
A. moesta
Chromagrion conditum

River Jewelwing
Superb Jewelwing
Ebony Jewelwing
Spotted Spreadwing
Emerald Spreadwing
Amber-winged Spreadwing
Sweetflag Spreadwing
Elegant Spreadwing
Slender Spreadwing
Lyre-tipped Spreadwing
Swamp Spreadwing
Eastern Red damsel
Blue-fronted Dancer
Variable Dancer
Powdered Dancer
Aurora Damsel

Enallagma antennatum
E. aspersum
E. basidens
E. civile
E. annexum
E. divagans
E. ebrium
E. exsulans
E. geminatum
E. hageni
E. signatum
E. triviatum
E. vesperum
Ischnura hastata
I. posita
I. verticalis
Nehalennia gracilis
N. irene

Rainbow Bluet
Azure Bluet
Double-striped Bluet
Familiar Bluet
Northern Bluet
Turquoise Bluet
Marsh Bluet
Stream Bluet
Skimming Bluet
Hagen's Bluet
Orange Bluet
Slender Bluet
Vesper Bluet
Citrine Forktail
Fragile Forktail
Eastern Forktail
Sphagnum Sprite
Sedge Sprite

Common Names of Species, continued

<i>Aeshna canadensis</i>	Canada Darner	<i>E. cynosura</i>	Common Baskettail
<i>A. tuberculifera</i>	Black-tipped Darner	<i>E. princeps</i>	Prince Baskettail
<i>A. umbrosa</i>	Shadow Darner	<i>Helocordulia uhleri</i>	Uhler's Sanddragon
<i>A. verticalis</i>	Green-striped Darner	<i>Somatochlora forcipata</i>	Forcipate Emerald
<i>Anax junius</i>	Common Green Darner	<i>S. incurvata</i>	Incurvate Emerald
<i>Basiaeschna janata</i>	Springtime Darner	<i>S. tenebrosa</i>	Clamp-tipped Emerald
<i>Boyeria grafiana</i>	Ocellated Darner	<i>S. walshii</i>	Brush-tipped Emerald
<i>B. vinosa</i>	Fawn Darner	<i>Celithemis elisa</i>	Calico Pennant
<i>Epiaeschna heros</i>	Swamp Darner	<i>C. eponina</i>	Halloween Pennant
<i>Gomphaeschna furcillata</i>	Harlequin Darner	<i>Erythemis simplicicollis</i>	Eastern Pondhawk
<i>Rhionaeschna mutata</i>	Spatterdock Darner	<i>Ladona julia</i>	Chalk-fronted Corporal
<i>Arigomphus villosipes</i>	Unicorn Clubtail	<i>Leucorrhinia frigida</i>	Frosted Whiteface
<i>Gomphus borealis</i>	Beaverpond Clubtail	<i>L. hudsonica</i>	Hudsonian Whiteface
<i>G. desertus</i>	Harpoon Clubtail	<i>L. intacta</i>	Dot-tailed Whiteface
<i>G. exilis</i>	Lancet Clubtail	<i>Libellula axilena</i>	Bar-winged Skimmer
<i>G. lividus</i>	Ashy Clubtail	<i>L. cyanea</i>	Spangled Skimmer
<i>G. rogersi</i>	Sable Clubtail	<i>L. flavida</i>	Yellow-sided Skimmer
<i>G. spicatus</i>	Dusky Clubtail	<i>L. luctuosa</i>	Widow Skimmer
<i>Hagenius brevistylus</i>	Dragonhunter	<i>L. pulchella</i>	Twelve-spotted Skimmer
<i>Lanthus vernalis</i>	Southern Pygmy Clubtail	<i>L. quadrimaculata</i>	Four-spotted Skimmer
<i>Ophiogomphus mainensis</i>	Maine Snaketail	<i>L. semifasciata</i>	Painted Skimmer
<i>Stylogomphus albistylus</i>	Eastern Least Clubtail	<i>L. vibrans</i>	Great Blue Skimmer
<i>Cordulegaster diastatops</i>	Delta-spotted Spiketail	<i>Platthemis lydia</i>	Common Whitetail
<i>C. maculata</i>	Twin-spotted Spiketail	<i>Pachydiplax longipennis</i>	Blue Dasher
<i>C. obliqua</i>	Arrowhead Spiketail	<i>Pantala flavescens</i>	Wandering Glider
<i>Didymops transversa</i>	Stream Cruiser	<i>Pantala hymenaea</i>	Spot-winged Glider
<i>Macromia illinoiensis</i>	Swift River Cruiser	<i>Perithemis tenera</i>	Eastern Amberwing
<i>Cordulia shurtleffii</i>	American Emerald	<i>Sympetrum janeae (internum)</i>	Cherry-faced Meadowhawk
<i>Dorocordulia libera</i>	Racket-tailed Emerald	<i>Sympetrum obtrusum</i>	White-faced Meadowhawk
<i>Epithecica canis</i>	Beaverpond Baskettail	<i>S. semicinctum</i>	Band-winged Meadowhawk
		<i>S. vicinum</i>	Autumn Meadowhawk
		<i>Tramea lacerata</i>	Black Saddlebags

Register Now for the 2015 DSA Central American Regional Meeting!

DSA will host its first-ever Central American Regional Meeting in Costa Rica from 31 May–9 June 2015. This is an eight day/nine night meeting in the land of Pseudostigmatidae, resplendent quetzels, and poison dart frogs. The meeting will involve field excursions through the Organization of Tropical Studies (OTS) at two of their field stations in different ecoregions: La Selva, in the Caribbean Lowlands of northern Costa Rica in an area of tropical and premontane wet forest; and Palo Verde, an area in northwestern Costa Rica with deciduous dry forest, and freshwater marshes and wetlands bordering the Tempisque River. Dennis Paulson will be our keynote speaker and main guide, and Ken Tennessen will also present and lead guided field excursions. Bill Haber will also be joining us for the LaSelva portion of the trip. Don't miss a rare opportunity to learn from an A-team of odonatologists in a gorgeous tropical setting in one of the most biodiverse counties on Earth!

Seats are limited, so don't delay. Full details regarding the daily itinerary, costs, registration, and more can be found on the meeting web site at <<https://sites.google.com/site/2015dsacostarica/>>. You can also contact Marla Garrison at <mgarrison@mchenry.edu> with additional questions.

Registration must be completed by 1 February 2015, and deposits must be received by mid-February. Spaces are filling up fast, so be sure to check out the details soon!