

**Baseline Inventory of Odonata at the Detroit River International Wildlife Refuge,
Humbug Marsh Unit
Final Report, Challenge Cost Share MOA #2007CCS-98**

Julie A. Craves
Rouge River Bird Observatory
Environmental Interpretive Center
University of Michigan-Dearborn
Dearborn, MI 48128

This report summarizes a baseline inventory of Odonata (damselflies, suborder Zygoptera, and dragonflies, suborder Anisoptera) at the Detroit River International Wildlife Refuge, Humbug Marsh Unit, Trenton and Gibraltar, Wayne County, MI (hereafter referred to as “Humbug”).

Methods

In their paper recommending biodiversity inventories for invertebrates, Rohr et al. (2007) advise that baseline data emphasize relative abundances. Accordingly, this inventory was designed to summarize the Odonata taxa present at Humbug, including relative abundance, status (e.g., breeding resident), and habitats (Kremen et al. 1993, Hawking and New 2002).

The site was visited 14 times in 2007: 3 times each in June, July, and August; twice in September for adults and once for larval sampling; and once in October for adults and once for larval sampling. Adult surveys were only done on days with appropriate weather (mostly sunny, warm, without high winds) (Schmidt 1985, Chovanec and Waringer 2001, Hornung and Rice 2003) and at peak flight times (10:00 to 16:00) (Bried et al. 2007).

Adult surveys took place along three transects and in two areas searches. One east-west transect was as parallel as possible to a man-made ditch known as Monguagon Creek¹, beginning where it empties from an underground pipe, and extending approximately 525 m to the Detroit River (Trenton Channel). A second transect ran north-south parallel to the Detroit River shoreline for approximately 185 m. A third transect was 200 m through open upland habitat. These transects were walked slowly by one or two people, with only one person serving as a counter (Bried et al. 2007).

Area searches were conducted at the viewing platform on the Detroit River, and at the pumphouse on Handler Drain. These surveys consisted of one or two people counting all adult odonates found in an approximately 20 x 20 m open area adjacent to the water, as well as adults

¹To avoid confusion with another identically-named creek approximately 8 km north of Humbug, it will be referred to here as “Monguagon Ditch.” As plans are in place to unearth and perhaps slightly re-route this waterway, it will also be clearer to call the current stream a “ditch” and the restored stream a “creek.”

visible near shore over the water at each location. Following Hornung and Rice (2003), enough time was spent on all surveys to adequately sample Odonata present, so the durations of the surveys depended on the abundance of the odonates present (i.e., days with high numbers took longer to survey). In the case of the area searches, which covered small areas, the duration was a minimum of 20 min, and searching was stopped when no new species were recorded for at least 10 min.

A tally was kept of all adult odonates observed. The exception was for damselfly species once the count exceeded 50 individuals on survey dates after which large numbers (>100) had already been recorded, as these species would have already qualified for the highest abundance class (see below). This allowed for more concentration on less-common species. In addition to presence and abundance, the sex of individuals was noted if the species was dimorphic, as were the number of teneral individuals (newly emerged, shiny wings, and/or lacking adult coloration), and any breeding activity (pairs in tandem, ovipositing). Individuals were netted for identification if necessary. Most were released, but voucher specimens were taken for species new to the site, if they represented extreme dates, or if they had unusual morphology (see Appendix A).

At the end of the season, each species received an abundance score based on the survey date with the largest number of individuals recorded (Chovanec and Waringer 2001). The scores are based on Bried et al. (2007), with their last two abundance categories combined:

- 1 = 1 to 2 individuals observed
- 2 = 3 to 10
- 3 = 11 to 25
- 4 = 26 to 50
- 5 = 50 or more, or the single clearly numerically dominant species.

For ease of use, these were then given a corresponding relative abundance class similar to that used by Chovanec and Waringer (2001), where

- 1 = Rare
- 2 = Uncommon
- 3 = Frequent
- 4 = Abundant
- 5 = Extremely abundant.

Larval sampling took place along the entire length of Monguagon Ditch, along the Detroit River shoreline at the viewing platform and the shore opposite the north end of Humbug Island, and in Handler Drain. A few rainwater puddles that had been present for > 4 weeks were also sampled. Aquatic D-nets were used to sample mud and vegetation, and rocks and other debris were overturned by hand and examined for larvae (Bright 1999). Net contents were sorted on-site in sorting pans. Non-odonate organisms and Odonata nymphs too undeveloped to identify beyond suborder were returned to the sampling site. Nymphs taken for later identification were chosen in approximate proportion to the phenotypes observed in the entire sample. These were immediately

preserved in individual vials of alcohol. Representative taxa were taken as voucher specimens (see Appendix B). All specimens have been deposited into the University of Michigan Museum of Zoology, Insect Division, and have been catalogued by the Michigan Odonata Survey.

Results

Surveys for adult Odonata tallied 4358 individuals (3341 damselflies and 1017 dragonflies) of 34 species (12 damselfly species in 2 families and 22 dragonfly species in 5 families). In addition, 3 dragonfly species were recorded outside of the designated survey routes or times. Table 1 summarizes all adult species recorded.

Larval sampling did not yield large numbers or variety of Odonata nymphs (or other benthic macroinvertebrates). Greater than 75% were damselfly larvae. Approximately half of the Odonata nymphs were returned to the sampling sites because they were too undeveloped to identify beyond suborder. Seventy-three individual nymphs of entire sample of between 160 and 200 individuals were taken for later identification under a microscope. Fifty-four were damselflies (46 Coenagriidae, all of which were *Enallagma* species, 8 too young to identify; and 19 were dragonflies (5 Aeshnidae, 11 Libellulidae, 3 too young to identify). There were no nymphs identified to species that had not been recorded as adults. Table 2 summarizes the larvae sampled.

There was evidence of breeding for 18 species (8 damselflies and 10 dragonflies) (see Table 1). While ovipositing or presence of nymphs does not necessarily indicate successful breeding (e.g., production of adults), it is highly likely that most of these species have self-sustaining populations at Humbug.



Figure 1. Male *Stylurus plagiatus*, 28 July 2007, Detroit River International Wildlife Refuge, Humbug Marsh Unit. Photo by Julie A. Craves.

Table 1. Adult Odonata recorded at the Detroit River International Wildlife Refuge, Humbug Marsh Unit, 2007.

Species	Abundance class¹	Breeding evidence²	Notes
SUBORDER ZYGOPTERA			
FAMILY LESTIDAE			
<i>Lestes dryas</i> , Emerald Spreadwing	Rare		More common in previous (wetter) years.
<i>Lestes rectangularis</i> , Slender Spreadwing	Uncommon		More common in previous (wetter) years.
FAMILY COENAGRIIDAE			
<i>Argia apicalis</i> , Blue-fronted Dancer	Uncommon	Pairs	Found only in areas adjacent to Detroit River.
<i>Enallagma carunculatum</i> , Tule Bluet	Extremely abundant	Ovipositing	
<i>Enallagma civile</i> , Familiar Bluet	Extremely abundant	Larvae	
<i>Enallagma exsulans</i> , Stream Bluet	Extremely abundant	Ovipositing	
<i>Enallagma geminatum</i> , Skimming Bluet	Extremely abundant	Ovipositing	Only found on Handler Drain.
<i>Enallagma signatum</i> , Orange Bluet	Abundant	Ovipositing	
<i>Enallagma vesperum</i> , Vesper Bluet	Rare		See Notable Species.
<i>Ischnura posita</i> , Fragile Forktail	Frequent	Pairs	
<i>Ischnura verticalis</i> , Eastern Forktail	Extremely abundant	Ovipositing	
<i>Nehalennia irene</i> , Sedge Sprite	Rare		See Notable Species.

Table 1, continued.

SUBORDER ANISOPTERA

FAMILY AESHNIDAE

<i>Aeshna constricta</i> , Lance-tipped Darner	Rare	Ovipositing	Only observed ovipositing in Monguagon Ditch.
<i>Aeshna umbrosa</i> , Shadow Darner	Uncommon	Larvae	Only observed ovipositing in Monguagon Ditch, where larvae were also found.
<i>Anax junius</i> , Common Green Darner	Abundant	Larvae	
<i>Anax longipes</i> , Comet Darner	Rare		See Notable Species.

FAMILY GOMPHIDAE

<i>Arigomphus villosipes</i> , Unicorn Clubtail	Rare		Only observed at Handler Drain.
<i>Stylurus notatus</i> , Elusive Clubtail	Uncommon		See Notable Species.
<i>Stylurus plagiatus</i> , Russet-tipped Clubtail	Abundant	Pairs	See Notable Species.

FAMILY MACROMIIDAE

<i>Macromia taeniolata</i> , Royal River Cruiser	Rare		See Notable Species.
--	------	--	----------------------

FAMILY CORDULIIDAE

<i>Epitheca cynosura</i> , Common Baskettail	Rare		Abundance not representative due to lack of early-season surveys.
<i>Epitheca princeps</i> , Prince Baskettail	Uncommon		

FAMILY LIBELLULIIDAE

<i>Celithemis eponina</i> , Halloween Pennant	Rare		
<i>Erythrodiplax umbrata</i> , Band-winged Dragonlet	Rare		See Notable Species.

<i>Erythemis simplicicollis</i> , Common Pondhawk	Frequent	Larvae	Males nearly always at water, females more common in upland areas.
<i>Libellula luctuosa</i> , Widow Skimmer	Rare		
<i>Libellula lydia</i> , Common Whitetail	Uncommon	Larvae	Abundance may not be representative due to lack of early-season surveys.
<i>Libellula pulchella</i> , Twelve-spotted Skimmer	Uncommon		Abundance may not be representative due to lack of early-season surveys.
<i>Libellula vibrans</i> , Great Blue Skimmer	Rare		See Notable Species.
<i>Pachydiplax longipennis</i> , Blue Dasher	Abundant	Ovipositing	
<i>Pantala flavescens</i> , Wandering Glider	Abundant	Larvae	
<i>Pantala hymenaea</i> , Spot-winged Glider	Uncommon		
<i>Perithemis tenera</i> , Eastern Amberwing	Uncommon	Ovipositing	
<i>Sympetrum rubicundulum</i> , Ruby Meadowhawk	Rare		More common in previous (wetter) years.
<i>Sympetrum vicinum</i> , Autumn Meadowhawk	Uncommon		Found to be more common in previous (wetter) years.
<i>Tramea carolina</i> , Carolina Saddlebags	Rare		
<i>Tramea lacerata</i> , Black Saddlebags	Abundant	Ovipositing	

¹Based on the survey date with the largest number of individuals recorded.

²Strongest breeding evidence recorded, where rank order of strongest to weakest is: larvae found, ovipositing, pairs in tandem, and teneral individuals. The latter two categories could include individuals that did not actually breed on the site. Egg deposition or presence of larvae does not necessarily indicate successful breeding (e.g., production of adults).

Table 2. Larval Odonata recorded at the Detroit River International Wildlife Refuge, Humbug Marsh Unit, 2007.

Location	Genus/species	N	
Detroit River	<i>Enallagma</i> sp.	26	3 likely <i>E. signatum</i>
	Unknown Zygoptera	8	too undeveloped to identify
	<i>Libellula</i> sp.	2	Possibly <i>Erythemis simplicicollis</i>
	Unknown Anisoptera	3	too undeveloped to identify
Monguagon Ditch	<i>Enallagma civile</i>	3	
	<i>Enallagma</i> sp.	13	Likely include several <i>E. basidens</i>
	<i>Aeshna umbrosa</i>	2	
	<i>Anax junius</i>	3	
	<i>Libellula lydia</i>	4	
	<i>Libellula lydia</i> or <i>pulchella</i>	1	
Handler Drain	<i>Enallagma civile</i>	1	
	<i>Enallagma</i> sp.	1	
	<i>Erythemis simplicicollis</i>	1	
Former Chrysler property	<i>Enallagma civile</i>	2	
	<i>Pantala flavescens</i>	3	

Notable Species

Enallagma vesperum, Vesper Bluet – One found in shrubs adjacent to the mouth of Monguagon Ditch, 22 September. First for this site, and also only the second location for this species in Wayne County.

Nehalennia irene, Sedge Sprite – Female on 17 June in tall grass along Monguagon transect was the first for this location.

Anax longipes, Comet Darner – A female taken on 17 June along the Detroit River transect is the first adult voucher specimen for the county, and first female adult specimen for the state. Males were recorded on 18 and 26 August. In 2005, there were two sightings at Humbug near Handler Drain.

Stylurus notatus, Elusive Clubtail (Figure 2) – Three adults (two males, one female) were found along the Detroit River transect on 29 September. These tend to perch high in trees (Dunkle 2000), and another observation on 6 October in a tree may have been this species. The first adult voucher specimen for the state was taken in virtually the same location on 9 September 2006.

This is a species of special concern in Michigan, and is also listed as a species of greatest conservation need in Michigan’s Wildlife Action Plan (Eagle et al. 2005). In Ontario, it is listed as uncommon in Essex County (Pratt 2007) and the only records for Lambton and Kent counties occurred prior to 1984 (OOA 2005). It is considered uncommon and limited in Ohio where most records are from the southern tier of counties (Glotzhober and McShaffrey 2002).



Figure 2. Male *Stylurus notatus*, 29 September 2007, Detroit River International Wildlife Refuge, Humbug Marsh Unit. Photo by Julie A. Craves.

Stylurus plagiatus, Russet-tipped Clubtail (Figure 1) – A total of 121 individuals were recorded. Nearly all were on the Monguagon transect (with most on the portion adjacent to the *east-west* section of the shoreline of the Detroit River, opposite the north end of Humbug Island) and the Detroit River transect. The majority were found perched in the shrubs closest to the open fields of the former Chrysler property.

The daily maximum was 68 on 18 August, which included 15 seen off the designated transects

(flushed from the fields on the former Chrysler property). Since they allowed close approach before flushing, counts were likely quite a small fraction of the total number of individuals present. Further, the obstructed view of the Detroit River prevented any observation of patrolling males, which often spend much of the day over water (Dunkle 2000).

Several deformed individuals were observed, all females: one with a bent abdomen on 8 August, and two with deformed wing tips, on 8 and 28 August.

This is a species of special concern in Michigan, and is also listed as a species of greatest conservation need in Michigan's Wildlife Action Plan (Eagle et al. 2005). The only record for Canada was a male taken on Pelee Island, Essex Co., on 19 July 1924 (P. Pratt, pers. comm., OOA 2005). It is considered uncommon and restricted in Ohio with few recent records (Glotzhober and McShaffrey 2002).

Macromia taeniolata, Royal River Cruiser – A male on 26 August along the Detroit River (in the far north corner, not during a transect count) was the first for this site.

Erythrodiplax umbrata, Band-winged Dragonlet (Figure 3) – Two males on 6 October in a temporary puddle on the former Chrysler property, close to Jefferson Avenue, were the first for this genus in Michigan. This southern species, most common in Texas and Florida (see Figure 4), had also been observed in Ohio in late summer 2007. The Humbug location is the furthest north this species has ever been recorded (~40 km further north than the northernmost Ohio observation), and over 200 km farther north than the previous northernmost specimen, taken in southern Ohio in 1934 (Borror 1935, Craves, in prep.).



Figure 3. Male *Erythrodiplax umbrata*, 6 October 2007, Detroit River International Wildlife Refuge, Humbug Marsh Unit. Photo by Julie A. Craves.

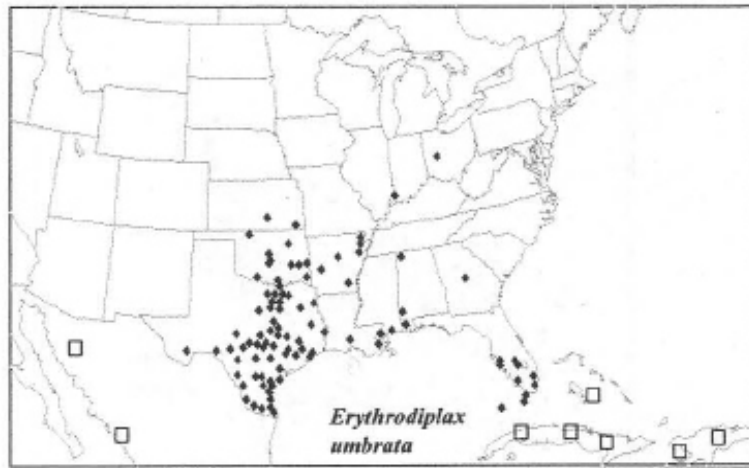


Figure 4. Distribution of pre-2006 records of *Erythrodiplax umbrata*, from Donnelly (2004).

Libellula vibrans, Great Blue Skimmer – A male seen perched along the wood-chipped path near the gate to Jefferson Avenue on 26 August was the first for this site. This species was first vouchered for the state in 2005 (Craves 2006), but was found at many new locations in the county in 2007.

Discussion and recommendations

As noted in Table 1, some species were certainly (*Epitheca cynosura*, Common Baskettail) or probably (*Libellula lydia*, Common Whitetail; *Libellula pulchella*, Twelve-spotted Skimmer) undercounted because surveys did not begin until mid-June. There are several other unrecorded species that also peak early in the season, such as *Epitheca costalis* (Slender [Stripe-winged] Baskettail), *Leucorrhinia intacta* (Dot-tailed Whiteface), the pond clubtails *Gomphus lividus* (Ashy Clubtail), *Gomphus fraternus* (Midland Clubtail), and *Gomphus graslinellus* (Pronghorn Clubtail), and the darner *Basiaeschna janata* (Springtime Darner) that could potentially be found at Humbug.

Several species of damselflies as well as the meadowhawks (*Sympetrum* sp.) were recorded in lower numbers than might be expected during a summer with more normal rainfall. Not only do these species tend to breed in shallow or temporary ponds, but so does much of their prey. With rainfall below normal from April through August (Deedler 2007a and 2007b), dry conditions may account for lower than expected numbers of some species at Humbug in 2007. Also unusual were the unseasonably warm temperatures in late March (with several days $>26^{\circ}\text{C}$) followed by a prolonged period of below-normal temperatures (Deedler 2007a). The impact on Odonata is unknown, but the heat could have accelerated emergence of some species, which would have then perished in the subsequent cold weather.

It is, therefore, recommended that at least one more year of surveys be completed that span the period from May through early October to help offset the unusual weather conditions of 2007,

and provide a more complete picture of the taxa present over the entire flight season.

Having complete baseline data is particularly important considering the habitat restoration planned for this site. Baseline data will help guide restoration efforts. Follow-up inventories will aid in assessing the success of restoration projects, and be especially valuable because of the usefulness of Odonata as indicators of ecosystem health – not only aquatic environments, but also aquatic/terrestrial transition zones and upland communities (Chovanec and Waringer 2001, Hornung and Rice 2003).

The presence of such a substantial population of the state special concern *Stylurus plagiatus* is very noteworthy. This is the largest documented population of this species in the region. Michigan's Wildlife Action Plan (Eagle et al. 2005), in which *S. plagiatus* is listed as a species of greatest conservation need, states that the distribution, population status, and threats to this species need to be determined. *S. plagiatus* inhabits primarily rivers, typically with silty sand bottoms (Dunkle 2000, Glotzhofer and McShaffrey 2002).

Very little has been written about the habits of this species. At the only other location where a population has been found in southern Michigan, along the Huron River in the Willow and Lower Huron Metroparks (Craves 2002, unpublished data), the habitat characteristics are remarkably similar to that observed at Humbug. Both sites feature slow, fairly shallow sections of silty or sandy-bottomed large rivers, at least one shoreline that is lined with a 20 to 30 m wide strip of vegetation comprised of tall trees immediately adjacent to the river, bordered by dense shrubs which face an open, weedy field. These features apparently provide the necessary breeding habitat, and preferred habitat for mate-finding, roosting, and foraging for this species. If this unique combination of characteristics proves to be strictly required by *S. plagiatus*, then this habitat is probably quite limited in the region, making Humbug a critically important site for this species.

More study on the habitat association of *S. plagiatus* at Humbug and on other properties on the Lower Detroit River within the Refuge boundaries is highly merited. It is further recommended that the current configuration of the shoreline vegetation in areas where *S. plagiatus* were concentrated be preserved. This should include portions of the former Chrysler property, up to a minimum of 0.5 km from the shoreline (NatureServe 2007).

Literature Cited

- Borror, D. J. 1935. New records of Ohio dragonflies (Odonata). *Ohio Jrl. Science*. 35:457-456.
- Bried, J. T., B. D. Herman, and G. N. Ervin. 2007. Umbrella potential of plants and dragonflies for wetland conservation: a quantitative case study using the umbrella index. *Jrl. Applied Ecology* 44:833-842.
- Bright, E. 1999. Sampling protocol for Odonata larvae. Michigan Odonata Survey Tech. Note No. 2. June 1999. 5 pp.
- Chovanec, A. and J. Waringer. 2001. Ecological integrity of river-floodplain systems – assessment by dragonfly surveys (Insecta: Odonata). *Regulated Rivers: Research and Mgmt.* 17: 593-507.
- Craves, J. A. 2002. A preliminary list of the Odonata of Wayne Co. *Michigan Birds and Natural History* 9:7-16.
- Craves, J. A. 2006. First Michigan specimens of Libellula vibrans Fabricius (Odonata: Libellulidae). *Great Lakes Entomologist* 39: 91-93.
- Craves, J. A. In prep. Erythrodiplax umbrata (Linnaeus) (Odonata: Libellulidae): New for Michigan.
- Donnelly, T. W. 2004. Distribution of North American Odonata Part II: Macromiidae, Corduliidae, and Libellulidae. *Bulletin of American Odonatology* 8:1-32.
- Dunkle, S. W. 2000. Dragonflies Through Binoculars. Oxford Univ. Press, New York, NY.
- Deedler, B. 2007a. Spring frequently teased us and displeased us in 2007. Climate archives, National Weather Service Weather Forecast Office, Detroit/Pontiac, MI. National Oceanic and Atmospheric Administration. <http://www.crh.noaa.gov/crnews/display_story.php?wfo=dtx&storyid=8693>. Accessed 29 Nov 2007.
- Deedler, B. 2007b. Summer of 2007 review. Climate archives, National Weather Service Weather Forecast Office, Detroit/Pontiac, MI. National Oceanic and Atmospheric Administration. <<http://www.crh.noaa.gov/images/dtx/climate/sum07review.pdf>>. Accessed 29 Nov 2007.
- Eagle, A. C., E. M. Hay-Chmielewski, K. T. Cleveland, A. L. Derosier, M. E. Herbert, and R. A. Rustem, eds. 2005. Michigan's Wildlife Action Plan. Michigan Dept. Natural Resources. Lansing, MI. <<http://www.michigan.gov/dnrwildlifeactionplan>>. Accessed 28 Nov 2007.

Glotzhober, R.C. and D. McShaffrey, eds. 2002. *The Dragonflies and Damselflies of Ohio*. Ohio Biological Survey Bulletin New Series Vol. 14, No. 2.

Hawking, J. H. and T. R. New. 2002. Interpreting dragonfly diversity to aid in conservation assessment: lessons from the Odonata assemblage at Middle Creek, north-eastern Victoria, Australia. *Jrl. Insect Conservation* 6:171-178.

Hornung, J. P. and C. L. Rice. 2003. Odonata and wetland quality in southern Alberta, Canada: a preliminary study. *Odonatologica* 32:119-129.

Kremen, C., R. K. Colwell, T. L. Erwin, D. D. Murphy, R. F. Noss, and M. A. Sanjayan. 1993. Terrestrial arthropod assemblages: their use in conservation planning. *Conservation Biology* 7:796-808.

NatureServe. 2007. *Stylurus plagiatus* species account. NatureServe Explorer: An online encyclopedia of life. NatureServe, Arlington, VA. <<http://www.natureserve.org/explorer>> Ver. 6.3. Accessed 29 Nov 2007.

[OOA] Ontario Odonata Atlas. 2005. Natural Heritage Information Centre, Ontario Ministry of Natural Resources. <<http://www.mnr.gov.on.ca/MNR/nhic/odonates/ohs.html>> Ver. 15-02-2005. Accessed 29 Nov 2007.

Pratt, P. D. 2007. Odonata of Essex County, Ontario. Ojibway Nature Centre Home Page. Dept. of Parks and Recreation, Windsor, Ontario. <<http://www.ojibway.ca/swodonat.htm>>. Ver. JUNE2007. Accessed 29 Nov 2007.

Rohr, J. R., C. G. Mahan, and K. C. Kim. 2007. Developing a monitoring program for invertebrates: guidelines and a case study. *Conservation Biology* 21:422-433.

Schmidt, E. 1985. Habitat inventarization, characterization, and bioindication by a “representative spectrum of odonata species (RSO).” *Odonatologica* 14: 127-133.

~

Please cite this document as:

Craves, J. A. 2007. Baseline inventory of Odonata at the Detroit River International Wildlife Refuge, Humbug Marsh Unit. Final Report. CCS MOA #2007CCS-98. USFWS Region 3, Fort Snelling, MN.

Appendix A. Adult voucher specimens taken at the Detroit River International Wildlife Refuge, Humbug Marsh Unit, 2007. Specimens have been deposited into the University of Michigan Museum of Zoology, Insect Division, and have been catalogued by the Michigan Odonata Survey.

Species	Date	Reason
<i>Lestes dryas</i> , Emerald Spreadwing	17 Jun 2007	female with bent abdomen
<i>Enallagma carunculatum</i> , Tule Bluet	6 Oct 2007	new late specimen date for southeast MI
<i>Enallagma signatum</i> , Orange Bluet	29 Sep 2007	new late specimen date for southeast MI
<i>Enallagma vesperum</i> , Vesper Bluet	29 Sep 2007	first sighting and voucher for site, new late specimen date for MI
<i>Ischnura verticalis</i> , Eastern Forktail	28 Jul 2007	rare andromorphic female
<i>Nehalennia irene</i> , Sedge Sprite	17 Jun 2007	first sighting and voucher for site
<i>Aeshna constricta</i> , Lance-tipped Darner	15 Jul 2007	first voucher for site
<i>Aeshna umbrosa</i> , Shadow Darner	15 Jul 2007	new early specimen date for county
<i>Anax longipes</i> , Comet Darner	17 Jun 2007	first county record, first voucher for site
<i>Stylurus notatus</i> , Elusive Clubtail	29 Sep 2007	new late specimen date for MI
<i>Stylurus plagiatus</i> , Russet-tipped Clubtail	15 Jul 2007	new early specimen date for MI
	8 Sep 2007	new late specimen date for MI
<i>Macromia taeniolata</i> , Royal River Cruiser	26 Aug 2007	first sighting and voucher for site
<i>Epitheca princeps</i> , Prince Baskettail	24 Jun 2007	first voucher for site
<i>Celithemis eponina</i> , Halloween Pennant	18 Aug 2007	first sighting and voucher for site
<i>Erythrodiplax umbrata</i> , Band-winged Meadowhawk	6 Oct 2007	new state record
<i>Erythemis simplicicollis</i> , Common Pondhawk	29 Sep 2007	new late specimen date for southeast MI
<i>Pantala flavescens</i> , Wandering Glider	13 Oct 2007	new late specimen date for county
<i>Pantala hymenaea</i> , Spot-winged Glider	29 Sep 2007	new late specimen date for MI
<i>Sympetrum rubicundulum</i> , Ruby Meadowhawk	29 Sep 2007	new late specimen date for southeast MI

Appendix B. Larval voucher specimens taken at the Detroit River International Wildlife Refuge, Humbug Marsh Unit, 2007. Specimens have been deposited into the University of Michigan Museum of Zoology, Insect Division, and have been catalogued by the Michigan Odonata Survey.

Species	Date
<i>Enallagma</i> sp.	22 Sep 2007
<i>Enallagma civile</i> , Familiar Bluet	13 Oct 2007
<i>Aeshna umbrosa</i> , Shadow Darner	22 Sep 2007
<i>Anax junius</i> , Common Green Darner	22 Sep 2007
<i>Erythemis simplicicollis</i> , Common Pondhawk	22 Sep 2007
<i>Libellula lydia</i> or <i>pulchella</i> , Common Whitetail or Twelve-spotted Skimmer	22 Sep 2007
<i>Libellula lydia</i> , Common Whitetail	22 Sep 2007
<i>Pantala flavescens</i> , Wandering Glider	13 Oct 2007