

The Dragonflies and Damselflies (Insecta:Odonata) of the Aquatic Gardens, Kenilworth Marsh, Kingman Lake/Marsh, National Arboretum and the Anacostia River from New York Avenue south to Benning Bridge (Washington, D.C.)

(With notes on butterflies and other natural history observations)

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Abstract: Forty-three (43) species of odonata were recorded from the survey area. Forty-one (41) species of odonata were found during the year 2000 survey of the Anacostia River and the surrounding wetlands from New York Avenue south to Benning Bridge in the District of Columbia. This included the National Arboretum, Aquatic Gardens, and Kingman Lake/Marsh. During the course of the survey the Unicorn Clubtail, Mocha Emerald, Skimming Bluet and the Great Spreadwing were added to the known fauna list for the District. Two previously recorded species, the Slender Bluet from the Aquatic Gardens, and the Roseate Skimmer from the National Arboretum, were not found during the survey. The majority of the wetlands were mainly dominated by species of dragonflies and damselflies that inhabit still or slow-moving water and tolerate a wide range of organic and inorganic pollutants coupled with low aquatic oxygen levels. To a much lesser extent remnant odonate species still exist in the semi-healthy short sections of protected streams running into the Anacostia River, pockets of protected woodland pools next to the Anacostia River, and at least one upland rain-filled island pool within Kenilworth Marsh. Those odonate species normally associated with healthy or semi-healthy Maryland and Virginia tidal marshes and their associated fresh water ponds were noticeably absent or represented by few individuals in the survey area. It is the water quality that is the limiting ecological factor in the odonate species composition of the tidal marsh habitat within the survey area, not the landscape structure of the marsh (this is reversed when water quality is moderate to good). This survey provides a baseline study by which future improvements in aquatic habitat may be measured or monitored. The paper provides insights as to what odonate changes can be expected within the wetland habitats of the survey area if water quality is returned to a more healthy condition.

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I. Introduction

Contract: The Nature Conservancy (# 031000-MD/DCFO)

Permits: National Park Service (#NACE-00-002) and National Arboretum (#FY-00-NA-011)

I was asked by The Nature Conservancy to conduct a survey of Kenilworth Marsh and Kingman Lake/Marsh for dragonflies, damselflies, butterflies, and tiger beetles during the 2000 field season. During preliminary scouting trips in late 1999, it was apparent that much of the biology of these two sites was connected to adjacent aquatic habitats. In order to understand what was happening at Kenilworth Marsh and Kingman Lake/Marsh, a more encompassing approach was needed. Therefore, the 2000 survey was expanded to cover all of the Anacostia River and the surrounding wetlands from New York Avenue south to Benning Bridge in the District of Columbia. This included, but was not limited to, the National Arboretum, Aquatic Gardens (including Kenilworth Marsh), and Kingman Lake/Marsh.

The majority of the field data in this report came from personal visits to the survey area on 1-June-1996, 21-July-1998, 17-Dec-1999, 9-March-2000, 24-March-2000, 1-April-2000, 5-May-2000, 7-June-2000, 30-June-2000, 13-July-2000, 27-July-2000, 11-August-2000, 1-Sept-2000, 6-Sept-2000, 8-Sept-2000, and 4-Nov-2000.

Forty-one species of damselflies and dragonflies were recorded from the 2000 survey. Two additional species from historical records were added to reach a total of forty-three species known from the survey area. In addition, forty-six species of butterflies and one species of Tiger Beetle were recorded. Two species of dragonflies (Unicorn Clubtail and Mocha Emerald) and two species of damselflies (Skimming Bluet and the Great Spreadwing), were found during the survey that had not previously been recorded from Washington, D.C. However, the overall diversity of odonates was much lower than expected considering the variety of wetland habitats found within the survey area. The degraded water quality of the Anacostia River appeared to be the limiting factor in the diversity of the dragonflies and damselflies of Kenilworth Marsh and Kingman Lake/Marsh.

I would like to thank the personnel from the National Park Service, National Arboretum, Patuxent Wildlife Refuge, and The Nature Conservancy for allowing me access, obtaining collecting permits, supplying on-site information, and for providing scientific and historical expertise; without which the survey would never have been possible. Thanks also goes to the personnel from the Agricultural Research Service, Animal and Plant Health Inspection Service, National Park Service, and the National Invasive Species Council that were instrumental in the quick identification, policy and planning, and eradication of the Giant Salvinia from the Aquatic Gardens. Special thanks goes to Brent Steury (NPS), Doug Samson (TNC), Richard Hammerschlag (USGS) and Pat Durkin (Washington Area Butterfly Club) for their continuous support throughout the survey.

II. List of dragonflies and damselflies of the survey area

Key:

(#) = voucher specimen (with number) taken during 2000 survey

(AG) = observed adults at the Aquatic Gardens during 2000 survey

(KM) = observed adults at Kingman Lake/Marsh during 2000 survey

(NA) = observed adults at the National Arboretum during 2000 survey

(AN) = observed adults over Anacostia River during 2000 survey

(B-AG) = recorded during the June 1, 1996, Bioblitz at the Aquatic Gardens (if collected, followed by voucher number)

(H-AG) = historical records from Aquatic Gardens as recorded in Donnelly, T.W. 1961. THE ODONATA OF WASHINGTON, D.C. AND VICINITY. Entomological Society of Washington, Vol 63, March 1961.

No. 1 pages 1-13.

DAMSELFLIES

Calopterygidae (Broad-winged Damsels)

1. *Calopteryx maculata* -- Ebony Jewelwing -- Adults seen: (AG) 7-June-00, 11-August-00, (NA) 30-June-00 -- This conspicuous species is uncommon on the small tributaries that enter the Anacostia. It was recorded from Heckey Run, Nash Run, and Watts Creek. It was noticeably absent from the Anacostia river proper. Its larval habitat is forested streams and rivers.

Lestidae (Spreadwings)

2. *Archilestes grandis* -- Great Spreadwing -- Adult seen: (NA) 1-Sept-00 -- The only known record of this species from Washington D.C. was the male collected next to Hickey Run near Heart Pond. It is the largest damselfly in North American. A late season species. Its larval habitat is wooded streams.

3. *Lestes rectangularis* -- Slender Spreadwing -- Adults seen: (B-AG) USNM ENT 00123316, (AG) 7-June-00, 30-June-00 (NA) 30-June-00. A common and widespread species. Its larval habitat is ponds, swamps, and lakes with emergent vegetation.

Coenagrionidae (Pond Damsels)

4. *Argia apicalis* -- Blue-fronted Dancer -- Adults seen: (AG) 30-June-00 #2028, (NA) 21-July-98, (AN) 30-June-00, 13-July-00 -- A widespread uncommon species of damselfly which can tolerate polluted water. It was one of the two odonate species that emerged from the Anacostia River as evidenced by cast skins. It was reasonably common in the tributaries. It likely also emerges out of Kingman and Kenilworth marshes, but I was never able to confirm it. Its larval habitat is streams, rivers, and ponds.

5. *Argia fumipennis violacea* -- Variable Dancer -- Adults seen: (B-AG) USNM ENT 00123320,

(AG) 7-June-00, 30-June-00, 11-August-00, (NA) 21-July-98, 30-June-00 -- This species seemed to be restricted to the small streams in the survey area. A common species on Heckey Run, Nash Run, and Watts Creek Run. Outside of the immediate survey area, the larval habitat is generally much broader, including almost any still or slow-moving water.

6. *Argia tibialis* -- Blue-tipped Dancer -- Adults seen: (AG) 7-June-00 #2029, 11-August-00 -- An uncommon species found at Watts Creek. It most likely occurs in the other streams as well (but not the Anacostia). Its larval habitat is streams and rivers.

7. *Enallagma civile* -- Familiar Bluet -- Adults seen: (KM) 30-June-00, 1-Sept-00, (AG) 7-June-00, 30-June-00, 27-July-00, 1-Sept-00, 6-Sept-00, (AN) 27-July-00, (NA) 21-July-98, 30-June-00, 1-Sept-00 -- An abundant species of damselfly throughout the survey area and the most general in its aquatic larval requirements. This species was abundant at ponds and common in both marshes. Adults were also seen flying over the Anacostia River but they most likely did not complete their life-cycle there.

8. *Enallagma divagans* -- Turquoise Bluet -- Adults seen: (AG) 7-June-00 #2027 -- An uncommon species along Watts Creek. It most likely occurs in other streams (but not the Anacostia) in the area. Larval habitat is streams.

9. *Enallagma durum* -- Big Bluet -- Adults seen: (KM) 1-Sept-00, (AG) 11-August-00, 6-Sept-00 #2031, 8-Sept-00, (NA) 1-Sept-00, (AN) 11-August-00, 6-Sept-00 -- An uncommon species of the marshes and Anacostia River. A few adults were seen at ponds but these are most likely strays from the nearby marsh. The larval habitat in Maryland is large rivers on the coastal plain. This species and *Argia apicalis* appear to be the only odonate species that exist as larvae in the Anacostia River.

10. *Enallagma exsulans* -- Stream Bluet -- Adults seen: (B-AG) USNM ENT 00123321, (AG) 7-June-00, 11-August-00 -- An uncommon species of Heckey Run, Nash Run, and Watts Creek. Its larval habitat is streams and rivers.

11. *Enallagma geminatum* -- Skimming Bluet -- Adults seen: (AG) 5-May-00, 6-Sept-00, (NA) 1-Sept-00 -- An uncommon species in the survey area usually found resting on floating plants. This species is widespread and common in areas surrounding Washington, D.C. and therefore it was a surprise that this year's record appears to be the first for this species in the District. Its larval habitat is ponds with floating plants.

12. *Enallagma signatum* -- Orange Bluet -- Adults seen: (AG) 7-June-00, 1-Sept-00, 6-Sept-00, (NA) 1-Sept-00, (KM) 1-Sept-00 -- A common species in ponds; uncommon at pond-like microhabitats surrounding both marshes. Its larval habitat includes marshes, ponds, and lakes.

13. *Enallagma traviatum* -- Slender Bluet -- (H-AG) -- This species was not found at the Aquatic Gardens in 2000 despite great effort to find it. Its larval habitat is ponds. Based on only one year's attempt to find it, I am reluctant to call the species absent from the survey area.

14. *Ischnura kellicotti* -- Lilypad Forktail -- Adults seen: (B-AG) (AG) 5-May-00, 7-June-00, 13-July-00, 27-July-00, 11-August-00, 1-Sept-00, 6-Sept-00, 8-Sept-00, (NA) 1-Sept-00 -- The most abundant species of odonate at ponds with floating vegetation in the survey area. Both the red and grey female forms present. Because of the current large numbers of individuals of this species, it is hard to believe that it was not recorded prior to the 1990s in Washington D.C. Its larval habitat is the suspended roots of pond-loving floating plants.

15. *Ischnura posita* -- Fragile Forktail -- Adults seen: (KM) 5-May-00, 30-June-00, 1-Sept-00 (B-AG) USNM ENT 00123317, (AG) 1-Apr-00, 5-May-00, 30-June-00, 27-July-00, 11-August-00, 1-Sept-00, 6-Sept-00, 8-Sept-00, 4-Nov-00, (NA) 21-July-98, 5-May-00, 30-June-00, 1-Sept-00 -- A common pond species found throughout the survey area. Uncommon in both marshes where they are most likely completing a full life-cycle. Its larval habitat is non-flowing fresh water.

16. *Ischnura verticalis* -- Eastern Forktail -- Adults seen: (B-AG) USNM ENT 00123318, (AG) 7-June-00, 13-July-00, 27-July-00, 6-Sept-00, (NA) 30-June-00 -- An uncommon pond species in the survey area. Its larval habitat is non-flowing fresh water with emergent vegetation.

DRAGONFLIES

Aeshnidae (Darners)

17. *Aeshna umbrosa* -- Shadow Darner -- Adults seen: (B-AG) larva from Nash Creek - USNM ENT 00123319, (AG) 1-Sept-00, (NA) 1-Sept-00 -- An uncommon late season dragonfly. Its larval habitat is small streams.

18. *Anax junius* -- Common Green Darner -- Adults seen: (KM) 30-June-00, 1-Sept-00, (B-AG) (AG) 1-June-96, 1-April - 00, 5-May-00, 7-June-00, 30-June-00, 27-July-00, 1-Sept-00, 6-Sept-00, 8-Sept-00, (NA) 21-July-98, 5-May-00, 30-June-00, 1-Sept-00 -- This is the most abundant large species of dragonfly in the area. Both a migratory population and a resident population co-exist in the survey area. Larvae were generally restricted to ponds in the survey area, but migratory juvenile adults often formed huge feeding swarms (sometimes reaching nearly a hundred individuals) well away from the larval habitat in open areas, and over the marshes and river during the late summer and fall.

19. *Boyeria vinosa* -- Fawn Darner -- Adult seen: (AG) 11-August-00 -- One individual was seen at Watts Creek. Its larval habitat is streams and rivers.

20. *Epiaeschna heros* -- Swamp Darner -- Adults seen: (B-AG) (AG) 7-June-00, (NA) 30-June-00 -- The largest dragonfly in our area. Its larval habitat is swamps. In the survey area, the larval habitat was mostly confined to rain and groundwater-fed freshwater swamps within the riparian zone of the Anacostia river. The females were often seen ovipositing in rotten wood in the swamps.

Gomphidae (Clubtails)

21. *Arigomphus villosipes* -- Unicorn Clubtail -- Adults seen: (AG) 30-June-00 #2024 -- This and *Somatochlora linearis* were the best dragonfly finds of the survey. Two adults were seen around a pond with muddy edges and little emergent vegetation at the Aquatic Gardens. A small population most likely exists at this pond site. It is unlikely that this population is viable in the long run, since ponds are not managed to have extensive muddy banks and little vegetation. My guess is that this small population is leftover from a time when this species utilized the muddy sections of the marshes and edges of a once much cleaner Anacostia. This species has not been recorded before from Washington, D.C. Larval habitat is ponds and still water at the edges of rivers.

Corduliidae (Emeralds)

22. *Epicordulia princeps* -- Prince Baskettail -- Adults seen: (KM) 30-June-00, (NA) 21-July-98, 30-June-00, (AN) 30-June-00, (AG) 30-June-00 -- A common widespread species seen throughout the District. This species is a powerful flier which shows up everywhere. It breeds in huge numbers from the Potomac River system (ponds, C&O canal, and the river proper). I was unable to find any evidence of it completing its life cycle in the survey area but think it is likely that its larvae occur in the larger ponds or the pond-like habitat at the edges of Kenilworth Marsh.

23. *Somatochlora linearis* -- Mocha Emerald -- Adult seen: (AG) 6-Sept-00 -- Another unexpected find. An adult female was collected in an open area near Kenilworth Marsh (#2025). Her abdomen was stained by mud from ovipositing in a nearby stream. This is the first time this species has been recorded from Washington, D.C. Its larval habitat is forested streams.

24. *Somatochlora tenebrosa* -- Clamp-tipped Emerald -- Adults seen: (NA) 21-July-98, 30-June-00 -- This species was first noticed during a visit in 1998 to the National Arboretum. This species is completing its life cycle in Hickey Run, where it is uncommon. It was found nowhere else in the survey area. Larval habitat is streams.

25. *Tetragoneuria cynosura* -- Common Baskettail -- Adults seen: (AG) 5-May-00 #2026, (NA) 5-May-00 -- An uncommon early spring species. Males were found, on territory, along the shady sections of ponds. Its larval habitat is still or slow-moving water.

Libellulidae (Skimmers)

26. *Celithemis eponina* -- Halloween Pennant -- Adult seen: (AG) 11-August-00 -- A rare dragonfly in the survey area. A single adult male was seen during the survey. It probably was not a stray, and so a small resident population likely exists. This species should increase its numbers in the area when water quality improves and is a good indicator species of healthy marsh habitat; its near absence from the survey area along with other local *Celithemis* species, was shocking. Its larval habitat is marshes and ponds with marshy edges.

27. *Erythemis simplicicollis* -- Eastern Pondhawk -- Adults seen: (KM) 30-June-00, 1-Sept-00,

(H-AG) (B-AG) (AG) 5-May-00, 7-June-00 o-g, 30-June-00, 13-July-00, 27-July-00, 11-August-00, 1-Sept-00, 6-Sept-00, 8-Sept-00, (NA) 21-July-98, 30-June-00 o-g w, 1-Sept-00 -- An abundant dragonfly found throughout the survey area. Its larval habitat is nearly any still or slow flowing fresh or polluted water.

28. *Libellula cyanea* -- Spangled Skimmer -- Adults seen: (AG) 1-June-96 USNM ENT 00123312, 7-June-00, 30-June-00, (NA) 30-June-00 -- An uncommon species. Its larval habitat is ponds and lakes.

29. *Libellula incesta* -- Slaty Skimmer -- Adults seen: (KM) 30-June-00, 1-Sept-00, (B-AG) USNM ENT 00123313, (AG) 7-June-00, 30-June-00, 27-July-00, 11-August-00, 1-Sept-00, 6-Sept-00, (NA) 21-July-98, 30-June-00, 1-Sept-00 -- A large conspicuous common species. Its larval habitat is sunlit ponds.

30. *Libellula luctuosa* -- Widow Skimmer -- Adults seen: (AG) 30-June-00, 11-August-00, (NA) 21-July-98, 30-June-00 -- This species has my vote for the most attractive dragonfly in the survey area. It is uncommon. Its larval habitat is ponds.

31. *Libellula needhami* -- Needham's Skimmer -- Adults seen: (KM) 30-June-00, (NA) 21-July-98, (AG) 30-June-00 -- A rare dragonfly during the 2000 survey. This species should be one of the major components of the marsh and ponds but is conspicuously absent. This species should increase in numbers following an improvement in water quality. Its larval habitat is semi-freshwater tidal and coastal marshes. This species is nearly identical to the much rarer *Libellula auripennis*, which has also been found in the Washington, D.C. area, and has been the cause of a number of misidentifications. Past records of *L. auripennis* from the survey area were most likely *L. needhami*. The presence of *L. auripennis* in the survey area will have to wait on a collected specimen.

32. *Libellula pulchella* -- Twelve-spotted Skimmer -- Adults seen: (H-AG) (AG) 7-June-00, 11-August-00, (KM) 30-June-00, (NA) 30-June-00 -- The only dragonfly that utilizes the tidal mud flat of Kenilworth Marsh. It was uncommon at Kenilworth Marsh. Males are very striking in appearance. A few stray individuals were also seen at ponds. Larval habitat is normally fresh to degraded temporary or semi-temporary shallow, exposed ponds.

33. *Libellula vibrans* -- Great Blue Skimmer -- Adults seen: (AG) 7-June-00, 30-June-00, 11-August-00, 1-Sept-00, (NA) 30-June-00 -- A large impressive dragonfly. Confined to rain and groundwater-fed freshwater swamps next to the Anacostia River and at least one pool on an upland island within Kenilworth Marsh. Rare in the survey area. Its larval habitat is shaded still or slow-moving water.

34. *Orthemis ferruginea* -- Roseate Skimmer -- (NA) -- Only a single record exists for Washington, D.C. A mature male was seen by Ottavio Janni at the National Arboretum's Beech Spring Pond on July 18, 1998. This species was also been found in Maryland in 1999. This southern species has probably not yet established in the Washington, D.C. area.

35. *Pachydiplax longipennis* -- Blue Dasher -- Adults seen: (KM) 30-June-00, 1-Sept-00, (B-

AG) USNM ENT 00123315, (AG) 7-June-00, 30-June-00, 13-July-00, 27-July-00, 11-August-00, 1-Sept-00, 6-Sept-00, 8-Sept-00, (NA) 21-July-98, 30-June-00, 1-Sept-00 -- The most abundant summer dragonfly in the Washington, D.C. area. Found throughout the survey area in high numbers. Its larval habitat is almost any still or slow-moving fresh or degraded water.

36. *Pantala flavescens* -- Wandering Glider -- Adults seen: (KM) 30-June-00, 1-Sept-00, (NA) 30-June-00, (AG) 30-June-00 -- An uncommon aerial dragonfly in the survey area. This species is a migratory species most often seen hawking for insects over open areas. Its larval habitat is shallow or temporary ponds. Does not overwinter in the Washington, D.C. area.

37. *Pantala hymenaea* -- Spot-winged Glider -- Adults seen: (KM) 5-May-00, 30-June-00, (AG) 7-June-00, 30-June-00, 27-July-00, 11-August-00, 1-Sept-00, 6-Sept-00, 8-Sept-00, (NA) 21-July-98, 30-June-00 -- A common aerial dragonfly in the survey area. This species is also a migratory species most often seen hawking for insects over open areas. Its larval habitat is shallow or temporary ponds. Does not overwinter in the Washington, D.C. area.

38. *Perithemis tenera* -- Eastern Amberwing -- Adults seen: (KM) 30-June-00, 1-Sept-00, (AG) 7-June-00, 30-June-00, 27-July-00, 11-August-00, 1-Sept-00, 6-Sept-00, (NA) 21-July-98, 30-June-00, 1-Sept-00 -- An abundant species at ponds in the survey area. This is the smallest dragonfly found in the District. This species normally lays its eggs on floating algae, vegetation, or other floating objects in open marshes, ponds, and lakes. However, within the survey area, its oviposition sites were restricted to ponds or pond-like environments at the edges of marshes.

39. *Plathemis lydia* -- Common Whitetail -- Adults seen: (KM) 5-May-00, 30-June-00, 1-Sept-00, (B-AG) USNM ENT 00123314, (AG) 7-June-00 w, 30-June-00, 13-July-00, 27-July-00, 11-August-00, 1-Sept-00, 6-Sept-00, 8-Sept-00, (NA) 21-July-98, 5-May-00, 30-June-00, 1-Sept-00 -- An abundant conspicuous species in the survey area, where it utilizes nearly any still water habitat, especially those that other dragonflies avoid. This species was the most common species of dragonfly around the edges of the marshes. Its larval habitat is ponds, ditches, and other (often degraded) still water habitats.

40. *Sympetrum rubicundulum* -- Ruby Meadowhawk -- Adult seen: (AG) 1-Sept-00 -- One male was recorded during the 2000 survey at the stream-pool where Nash Run enters the marsh. This species is very rare at the survey site, since its larval habitat is small unpolluted ponds.

41. *Sympetrum vicinum* -- Yellow-legged Meadowhawk -- Adults seen: (AG) 11-August-00 #2030, 6-Sept-00, 4-Nov-00, (NA) 1-Sept-00 - This is the most abundant fall-flying dragonfly of the survey area, where it emerged from the managed ponds. Its larval habitat is ponds and edges of lakes.

42. *Tramea carolina* -- Carolina Saddlebags -- Adult seen: (AG) 7-June-00 -- A migratory species which appears to be rare in the survey area. This species requires cleaner water for larval development than its close relative *Tramea lacerata*, but seeing it only once during 2000 was unexpected, since it is a widespread common aerial species in our region. This species does not overwinter in the Washington, D.C. area.

43. *Tramea lacerata* -- Black Saddlebags -- Adults seen: (KM) 30-June-00, (B-AG) (AG) 7-June-00, 30-June-00, 11-August-00, 8-Sept-00, (NA) 21-July-98, 30-June-00 -- A common aerial migratory species in the survey area, where it utilizes the ponds for larval development. Adults were often seen hawking for insects over open areas, sometimes forming swarms with *Anax junius*. This species does not overwinter in the Washington, D.C. area.

III. Discussion of Odonata species by habitat type

Managed ponds at the Aquatic Gardens and National Arboretum:

More than 95% of the total biomass and 90% of all individual dragonflies and damselflies found within the survey area were pond species which tolerate moderate to extreme organic and inorganic pollution and low-oxygen water levels. These species as a general rule are strongly r-selected, producing large numbers of larvae and producing strong-flying adults which disperse over great distances. These are the same species which have utilized urban, suburban, and rural ditches, ponds, and other permanent non-moving degraded waters throughout the Mid-Atlantic Coastal region. Examples include *Enallagma civile*, *Enallagma signatum*, *Pachydiplax longipennis*, *Plathemis lydia*, *Perithemis tenera*, and *Erythemis simplicicollis*.

The deliberate planting of high numbers of aquatic plants, especially floating plants, at the Aquatic Gardens increased the number of individual odonates whose larvae utilize the roots, stems, or leaves of pond plants, in comparison to ponds which did not have these plants. This was evidenced by the high numbers of individuals within species like *Ischnura kellicotti* and *Ischnura posita* found at the Aquatic Gardens.

Those regional odonate species, which normally utilize clean water ponds were conspicuously absent or in low numbers. These species will quickly establish when water quality improves, since Washington, D.C. regularly receives dispersing adults of these species from nearby Maryland and Virginia. An improvement in pond water quality would be expected to result in population increases for currently established species particularly *Celithemis eponina*, *Sympetrum rubicundulum*, *Tetragoneuria cynosura*, *Arigomphus villosipes* and/or future healthy establishments of *Celithemis elisa*, *Ladona deplanata*, and *Tramea carolina*.

On the other side of the coin, the disappearance or reduction of one or more of the current populations of *Libellula incesta*, *Libellula cyanea*, *Celithemis eponina*, *Sympetrum rubicundulum*, *Tetragoneuria cynosura* and/or *Libellula luctuosa* may indicate a further reduction in the water quality of the managed ponds.

Natural swamp pools/ponds:

A few groundwater and rain-fed shallow swamp pools were found within the riparian zone of the Anacostia River. A swamp pool was also located on a raised island within Kenilworth Marsh. In addition, a single pool between a wooded hill and the river on the west side fit this category. These swamp/pools were of much higher water quality than the managed ponds and contained dragonfly species which had either disappeared (*Libellula vibrans* and *Epiaeshna heros*) or were uncommon elsewhere (e.g. *Lestes rectangularis*) within the survey area.

There is a good possibility that these swamp habitats contain odonate species that I missed, because some of the ponds were found after most of the survey season had passed.

Kenilworth Marsh:

Kenilworth Marsh is currently the only established tidal freshwater marsh within Washington, D.C.. The marsh has been the site for numerous natural history studies and restoration projects which are well documented and need not be repeated here.

To view Kenilworth Marsh as a single aquatic habitat would be incorrect. The marsh has a number of components including, daily exposed mud flats with little or no vegetation, raised vegetated islands, reconstructed wetlands with extensive diverse wetland plant species, and areas of much less diversity consisting almost exclusively of cut grass, short-leafed cattails, and *Phragmites*. Careful monitoring of the expansion of *Phragmites* within the marsh is probably warranted.

If the Anacostia River (which provides the majority of the daily influx of water into the marsh) was of good quality, each of the various habitats within the marsh would have its own representative odonate composition. Although the edges of these different species (habitat) complexes would blend and blur with each other, the differences would be nearly as noticeable as the plant assemblages themselves. Because of the degraded water quality of the Anacostia, this is not what is happening.

Currently, the odonate species found within the marsh are nearly identical to those found at the managed ponds. As a general rule, and to over-simplify, the water quality is so poor that the odonate species expected from healthy marsh habitats and fresh-water tidal zones cannot currently exist within the marsh, and those odonate species which specialize in degraded pond or other still-water habitats are utilizing the marsh to the extent that their biological ability allows. These pond species are not facing competition from normal marsh-loving species, which allows them to push farther into the tidal marsh area than would normally be expected. Therefore, the dominant species of the marsh are *Enallagma civile*, *Enallagma signatum*, *Pachydiplax longipennis*, *Plathemis lydia*, *Perithemis tenera*, and *Erythemis simplicicollis*. These are the same species that dominate the managed ponds; however, it is important to note that they are far less abundant in the marsh than at the managed ponds to which they are better adapted.

There are a few interesting exceptions. The first is the swamp pool habitat on one of the raised islands mentioned in the previous habitat section. The second are areas where groundwater and or/streams flow into the marsh, creating areas of higher water quality. It is here that both *Sympetrum rubicundulum* and *Celithemis eponina* were found. Unfortunately, only one individual of each was found during 2000; but still, these are probably species that are hanging on from better water quality days.

The third exception is *Libellula pulchella*. The larvae of this species normally utilize temporary shallow degraded pools or ponds for development. *Libellula pulchella* occurs in low numbers at Kenilworth Marsh but not at the managed ponds (except for an occasional stray adult). It is likely that the Twelve-spotted Skimmer is completing its larval cycle in the non-vegetated areas of the mud flats which are exposed on a daily basis by the tidal flux. This use of the tidal mud flats by this dragonfly was unexpected and not recorded in the literature. *Plathemis lydia* may also do this, but if so, only at the very edges of the mud flats near stands of emergent vegetation and not throughout the mud flats like *L. pulchella*.

The final exception is the damselfly *Enallagma durum*. This species emerges from Kenilworth Marsh and along the edges of the Anacostia River. Adults could be found at some of the managed ponds adjacent to the marsh, but these are probably dispersals from the marsh. The Big Bluet is a species which occurs in tidal marshes and large rivers on the coastal plain throughout the mid-Atlantic. It was a pleasant surprise to me that it was still present in reasonable numbers at the marsh.

If water quality within the marsh is improved, I would expect that the current pond species, especially *Erythemis simplicicollis*, *Pachydiplax longipennis*, *Libellula pulchella*, *Plathemis lydia*, *Perithemis tenera*, *Enallagma civile*, *Enallagma signatum*, *Enallagma durum*, *Ischnura verticalis*, and *Ischnura posita* would remain at current or higher numbers, but would be more restricted in their larval habitats within the marsh. Currently repressed populations of *Celithemis eponina* and *Libellula needhami* would increase substantially, possibly becoming the most conspicuous species. The diversity of the marsh would also increase through the introductions of and subsequent healthy established populations of *Ischnura ramburii*, *Ischnura hastata*, *Brachymesia gravida*, *Libellula semifasciata*, *Celithemis elisa* and possibly others. *Arigomphus villosipes* would also expand to utilize the edges of the marsh.

Further degradation of water quality within the marsh will likely result in little change from the present odonate composition. The complete disappearance of *Celithemis eponina* and *Libellula needhami* would occur, but these are already in such low numbers that they may well be destined for loss anyway.

Kingman Lake/Marsh:

Little information on the odonate composition could be derived from the 2000 survey on Kingman Lake/Marsh. The marsh was in flux due to being turned from a tidal mud flat into a marsh. During the 2000 survey season, massive amounts of mud from the Anacostia was dredged and pumped into Kingman Lake/Marsh, which was then planted with marsh loving plants. The goal is to turn the old Kingman Lake (essentially a side section of the Anacostia River) into a tidal marsh like Kenilworth Marsh.

Before reconstruction started, Kingman Lake was nearly identical to the open daily-exposed mud flats of Kenilworth Marsh, where *Libellula pulchella*, *Plathemis lydia*, and *Enallagma durum* could, at least in small numbers, complete their life cycles. In addition, side pockets along the edge provided permanent to semi-permanent pond habitat for a number of local pond species. These were dominated by *Enallagma civile*, *Enallagma signatum*, *Pachydiplax longipennis*, *Plathemis lydia*, *Perithemis tenera*, and *Erythemis simplicicollis*.

Emergence of hundreds of thousands of nematoceran flies, especially chironomids, from Kingman Lake/Marsh provided food for a number of dragonfly species which did not complete their life cycle at Kingman, but still were found (especially in autumn and late-summer evenings) swarming over Kingman Lake/Marsh. Most noticeable were *Anax junius*, *Epicordulia princeps*, *Pantala hymenaea*, and *Tramea lacerata*.

During reconstruction of the marsh, the influx of huge amounts of mud to build up the ground level and the introduction of large numbers of plants completely changed the environment of the old Kingman Lake system. This will eventually result in changes to the odonate species structure as well.

In the next few years, the overall biological structure of Kingman Lake/Marsh will be dominated by those species which arrive at the newly-formed marsh and those locations at the Kingman site where the initial establishment of these species takes place. I would expect that by 2004 or so, the situation for the odonates will have stabilized to the degree that looking at them will be informative. This is much faster than what one would expect for plants and most other animal taxon; this is because of the strong r-selection strategy (high dispersal, high reproductive rate, fast life cycles) that typifies still-water inhabiting odonate species.

Water quality is the limiting ecological factor in the odonate species composition of the tidal marsh habitat within the survey area, not the landscape structure of the marsh (in moderate to good water quality this is reversed). Since it is unlikely that water quality will improve significantly by 2004, the same species that are currently listed for Kingman Lake will most likely be the same species found at Kingman Marsh in 2004. The major change will be more individuals of the same species due to the increase in still-water habitats. Kingman Marsh in 2004 will likely not differ in odonate species and distribution from what we see today at Kenilworth Marsh. The proximity of Kingman Lake/Marsh to Langston golf course may further compromise the ability to improve water quality.

Anacostia River:

The two damselfly species *Enallagma durum* and *Argia apicalis* were the only species of odonates I could find that were completing their life cycles in the Anacostia River proper. The populations of these two species are very small and may possibly exist only in those sections of the river where tributaries dilute the main river water. The condition of this river is inexcusable and is by far the most degraded river that I have ever surveyed in the Maryland/ Washington, D.C. region. Regional coastal rivers of this size with even moderately degraded water quality should be producing in excess of 20 odonate species. For all practical odonatological purposes, the surveyed section of the Anacostia is dead.

Recruitment from the Potomac and Maryland coastal streams, along with expansion of relic populations holding out in Anacostia's tributaries, would quickly re-establish in the Anacostia if water quality improved.

Small streams entering the Anacostia:

Two streams, Watts Creek and Hickey Run, were surveyed on a regular basis, while Nash Run was visited intermittently. These lotic habitats were in much better condition than the Anacostia River. To a small degree, one can get a feel for the odonate diversity of the old Anacostia River from the relic populations of stream/river species still found in the creeks entering the Anacostia. This includes *Calopteryx maculata*, *Argia fumipennis violacea*, *Argia tibialis*, *Enallagma divagans*, *Enallagma exsulans* and *Boyeria vinosa*. All of these currently existing species would

move into the Anacostia if they could.

Other species found in streams in the survey area, such as *Somatochlora tenebrosa*, *Somatochlora linearis*, and *Archilestes grandis*, indicate that these streams, although degraded, are still maintaining a diversity of lotic odonate species that is uncommon in the District. The best opportunity for protection of the existing odonate diversity within the study area is to protect the integrity of these streams.

Currently, Hickey Run, within the National Arboretum, is the only known site of the species *Somatochlora tenebrosa* and *Archilestes grandis* within the District of Columbia. Current plans are to redirect the stream in the near future so that it connects with Beech Spring Pond and Heart Pond. The stated purpose is to increase the water quality of the two ponds, decrease erosion from Hickey Run, and add aesthetic landscape appeal to visitors. However, it should be noted that the resulting pond/stream hybrid combination, by its very nature of reducing flow rates, will likely result in the loss of these two species from Hickey Run.

IV. BUTTERFLIES OF THE SURVEY AREA

Butterflies are a common and delightful sight at the National Arboretum and Aquatic Gardens. The survey area boasts a wide diversity of native and introduced plants which can be utilized by butterfly larvae. Managed planting of native and exotic flowers also provides for extensive nectar sources for adult butterflies. This has long been recognized by local butterfly enthusiasts which often visit and record the butterflies at the National Arboretum and Aquatic Gardens. I am thankful to the Washington Area Butterfly Club, specifically Pat Durkin and Dick Smith, for sharing their hard-earned butterfly data and expertise for the National Arboretum and Aquatic Gardens. A complete list of all known species of butterflies recorded from Washington, D.C. can be found at < <http://www.vais.net/butterfly/wabclist.txt> >.

I netted a skipper which I tentatively identified as a male Whirlabout (*Polites vibex*) at the National Arboretum. It was visiting flowers on the raised bank separating Beech Spring Pond and Hickey Run on September 1, 2000. At the time I did not recognize that this species had not been recorded in the District of Columbia and therefore released it without taking detailed notes. After discovering my error, I was not able to relocate the specimen for collection. Without detailed field notes or specimen this find should, at best, remain as a possible record. It is not included in the list below.

The list below represents those adult butterfly species that have been recorded in the survey area. It is important to note that this list represents both those species which complete their larval development within the survey area and those that emigrate in as adults whose larval sites are outside of the survey area.

Key:

(NA) Recorded in the National Arboretum

(AG) Recorded in the Aquatic Gardens

(KM) Recorded in Kingman Lake/Marsh

(1) July 23, 2000 annual DC Butterfly Count (Pat Durkin data)

(2) May 31-June 1, 1996 BioBlitz (Aquatic Gardens)

(3) July 21, 23, 25, 1999 records (Pat Durkin data)

(4) July 28 and August 10, 1999 records (Pat Durkin data)

(dates) = observed species during the 2000 survey (Richard Orr data)

1) Eastern Tiger Swallowtail

Papilio glaucus

(NA)(1)(3)(30-June)(1-Sept)

(AG)(1)(2)(4) (7-June)(30-June)(27-July)
(11-August)(6-Sept);

(KM)(1-Sept)

2) Pipevine Swallowtail

Battus philenor

(NA)(1)

3) Black Swallowtail

(NA)(1)(5-May)

- Papilio polyxenes*
- 4) Spicebush Swallowtail
Papilio troilus (NA)(1)(3)(1-Sept)
(AG)(1)(2)(4)(7-June)(27-July)(11-August)
(6-Sept)(8-Sept)
(KM)(1-Sept)
- 5) Zebra Swallowtail
Eurytides marcellus (AG)(30-June)(27-July)
- 6) Cabbage White
Pieris rapae (NA)(1)(3)(24-March)(5-May)(30-June)(1-Sept)
(AG)(1)(2)(4)(9-March)(1-April)(5-May)
(7-June)(30-June)(13-July)
(27-July)(11-August)(6-Sept)(4-Nov)
(KM)(5-May)(30-June)(1-Sept)
- 7) Clouded Sulphur
Colias philodice (NA)(1)(3)(24-March)(1-April)(5-May)
(AG)(5-May)(30-June)(4-Nov)
- 8) Orange Sulphur
Colias eurytheme (NA)(1)(3)(4)
(AG)(1-April)(7-June)(11-August)
- 9) Cloudless Sulphur
Phoebis sennae (AG)(6-Sept)
- 10) Little Wood Satyr
Megisto cymela (NA)(30-June)
(AG)(4)
- 11) Appalachian Brown
Satyrodes appalachia (NA)(1-Sept)
(AG)(1)(7-June)(27-July)(11-August)(6-Sept)
- 12) Monarch
Danaus plexippus (NA)(1)(3)
(AG)(1)(2)(4)(30-June)(27-July) 11-August)
- 13) Viceroy
Limenitis archippus (AG)(2)(4)(27-July)(11-August)(6-Sept)
- 14) Mourning Cloak
Nymphalis antiopa (AG)(7-June)
- 15) Question Mark
Polygonia interrogationis (NA)(July 18, 2000 Pat Durkin record)(30-June);
(AG)(4)(1-April)(7-June)(30-June)
- 16) Eastern Comma
Polygonia comma (AG)(30-June)(27-July)(11-August)(4-Nov)

17 Red-spotted Purple <i>Limenitis arthemis astyanax</i>	(NA)(1)(30-June)(1-Sept) (AG)(1)(2)(30-June)(11-August)(6-Sept)(8-Sept) (KM)(1-Sept)
18) Variegated Fritillary <i>Euptoieta claudia</i>	(NA)(1)(3)(24-March -- may indicate overwintering larva)
19) Great-spangled Fritillary <i>Speyeria cybele</i>	(AG)(4)
20) Red Admiral <i>Vanessa atalanta</i>	(NA)(1)(30-June) (AG)(1)(7-June)(30-June)(27-July)(11-August)
21) Painted Lady <i>Vanessa cardui</i>	(NA)(3)
22) American Lady <i>Vanessa virginiensis</i>	(NA)(1)
23) Pearl Crescent <i>Phyciodes tharos</i>	(NA)(1)(3)(5-May)(30-June)(1-Sept) (AG)(4)(5-May)(30-June)(13-July)(27-July) (11-August)(6-Sept)(4-Nov) (KM)(30-June)(1-Sept)
24) Red-banded Hairstreak <i>Calycopis cecrops</i>	(NA)(1) (AG)(2)
25) Gray Hairstreak <i>Strymon melinus</i>	(NA)(3)
26) White M Hairstreak <i>Parrhasius m-album</i>	(NA)(3)
27) Eastern-tailed Blue <i>Everes comyntas</i>	(NA)(1)(3)(5-May)(30-June) (AG)(2)(5-May)(7-June)(13-July)(27-July)(6-Sept)
28) Spring/Summer Azure Complex <i>Celastrina</i> spp.	(NA)(3)(5-May)(30-June)(1-Sept) (AG)(2)(5-May)(30-June)(27-July) (KM)(30-June)(1-Sept)
29) American Snout <i>Libytheana carinenta</i>	(NA) (20-Sept-2000 Pat Durkin record)
30) Silver-spotted Skipper	(NA)(1)(3)(5-May)

- 31) *Epargyreus clarus* (AG)(1)(2)(4)(7-June)(13-July)(11-August)
 Hayhust's Scalpwing (NA)(1); (AG)(2)
Staphylus hayhurstii
- 32) Juvenile's Duskywing (NA)(24-March)(5-May)
Erynnis juvenalis (AG)(1-April)
- 33) Wild Indigo Duskywing (NA)(1)(3)(1-Sept)
Erynnis baptisiae (KM)(1-Sept)
- 34) Horace's Duskywing (AG)(11-August)
Erynnis horatius (NA)(1)(3)
- 35) Common Sootywing (AG)(7-June)
Pholisora catullus
- 36) Swarthy Skipper (NA)(1)
Nastra lherminier
- 37) Peck's Skipper (NA)(1)
Polites peckius
- 38) Crossline Skipper (AG)(11-August)
Polites origenes
- 39) Dun Skipper (AG)(4)(11-August)
Euphyes vestris
- 40) Little Glassywing (AG)(13-July)(11-August)
Pompeius verna (KM)(30-June)
- 41) Zabulon Skipper (AG)(4)(6-Sept)(8-Sept)
Poanes zabulon
- 42) Broad-winged Skipper (AG)(11-August)
Poanes viator
- 43) Ocola Skipper (AG)(11-August)
Panoquina ocola
- 44) Fiery Skipper (NA)(July 18, 2000 Pat Durkin record)
Hylephila phyleus (AG)(11-August)
- 45) Sachem (NA)(1)(3)(5-May)(1-Sept)

<i>Atalopedes campestris</i>	(AG)(4)(7-June)(13-July)(6-Sept)(8-Sept) (KM)(1-Sept)
46) Least Skipper	(NA)(1)(30-June)(1-Sept)
<i>Ancyloxypha numitor</i>	((AG)(1)(2)(4) 7-June)(30-June)(13-July) (27-July)(11-August)(6-Sept) (8-Sept) (KM)(30-June)(1-Sept)

V. Other Natural History Observations

- Only one species of Tiger Beetle was found during the 2000 survey. A few *Cicindela sexguttata* were found along the forest paths in the National Arboretum and the River Trail at the Aquatic Gardens. They were seen on 7-June-2000.
- One of the most impressive insects seen was the robber fly which mimics a large carpenter bee. This was seen along the River Trail at the Aquatic Gardens on 7-June-2000. Other insects that found their way into my field notes during the survey were: the Salt Marsh Mosquito (*Aedes sollicitans*), *Hemaris gracilis* (a large day-flying sphinx moth), a note on the large numbers of flying male Gypsy Moths within the Anacostia Riparian zone, the huge number of flea beetles *Altica litigata* that were seen feeding on the *Ludwigia* but were also found on purple loosestrife, the delphacid plant hopper *Megamelus davisii* which covered the *Nuphar* lily pads at the Aquatic Gardens (often 500+/leaf), and the small stinging ants (*Crematogaster* sp.) that were common on the new Kenilworth boardwalk when it first opened. Dates, locations, or notes on any of these insects will be provided upon request.
- I found Giant Salvinia growing in a pond at the Aquatic Gardens on 1-September-2000. It was identified as belonging to the *Salvinia auriculata* complex and probably was *Salvinia molesta*. This species and others in the *S. auriculata* complex are listed under the Federal Noxious Weed Act because of their potential to become major weed species within the United States. The National Park Service took quick action. A team, led by Brent Steury, removed by hand all visible plants from the pond on 8-September-2000. In addition, other Aquatic Garden ponds were examined by both the National Park Service and USDA's Plant Protection and Quarantine scientists for additional populations. None were found. Because Giant Salvinia can grow from very small pieces, it was recognized that some may have been missed during the September 8th removal. A return visit to the pond on 4-November-2000 turned up 73 new bunches of *Salvinia* which were promptly removed and destroyed. The total mass of removal on 4-November was approximately 1/100 of what was removed on 8-September. The northern limit of survival for Giant Salvinia is speculative, and it is hoped that this winter's temperatures will eradicate any plants that are left after the two removals. The pond will be monitored carefully next spring and summer for surviving plants by both the NPS and USDA. If the plants did survive the winter and are found in 2001 more drastic measures will have to be used to ensure eradication of this weed. I was very impressed with the high degree of cooperation and fast action exhibited by the National Park Service, USDA Plant Protection and Quarantine, and the National Invasive Species Council in resolving this problem.
- At low tide, the exposed mud flats of the old Kingman Lake were heavily utilized by migrating wading birds. Little time was spent identifying birds, but Semipalmated

Plovers, Semipalmated Sandpipers, Solitary Sandpipers, Least Sandpipers, Greater Yellowlegs, Lesser Yellowlegs, and a single Pectoral Sandpiper were noticed. Dates and notes on any of these birds will be provided upon request.

- Spotted turtles were observed in the freshwater swamps within the riparian zone of the Anacostia river at the Aquatic Gardens. This species is rare in Washington, D.C. and may warrant monitoring. Other herps seen during the survey in the study area were: Bull frogs, Green Frogs, Spring Peepers, Leopard Frogs, American toad, Red-eared Sliders, Eastern Painted Turtles, Snapping turtle, Eastern Mud turtle, Northern Water snake, Northern Brown Snake, and Black Rat Snake. Date, location, and notes on any of these herps will be provided upon request.
- The black morph of the Eastern Gray Squirrel was common within the survey area. Other mammals seen were Muskrat, Beaver, Eastern Cottontail, and an unidentified mole. Date, location, and notes on any of these mammals will be provided upon request.
- The exotic mile-a-minute weed is becoming common along the Anacostia riparian zone and may become a serious problem along the riparian zone at the Aquatic Gardens in the next few years.
- On 4-November-2000 in Kenilworth Marsh I noticed that, when the tide was coming in, the banded killfish would gather near the shore around patches of exposed mud in noticeable numbers, often with some of the fish flashing their light sides (or bellies) up towards the surface of the water -- a strange behavior whose purpose is unknown to me.
- Two species of crayfish were collected from Watts Creek and were sent to Brent Steury for identification.

IV. APPENDIX

A. PRELIMINARY LIST OF THE DRAGONFLIES AND DAMSELFLIES OF WASHINGTON D.C.

This list was submitted in December, 2000, to the Dragonfly Society of the Americas for publication in ARGIA.

Key:

- (1) My personal records from Washington D.C. from 1990 through 2000
- (2) USNM collection data base (Thanks Nancy Adams)
- (3) Damselflies of North America -- Westfall & May -- 1996
- (4) Dragonflies of North America -- Needham, Westfall, & May -- 2000 -- I assumed that when the species account stated "all contiguous states" that included Washington D.C. as well.

Petaluridae

- 1) *Tachopteryx thoreyi* (H - 1898 specimen from Rock Creek Park -- Maryland/D.C. Heritage)

Gomphidae

- 2) *Arigomphus villosipes* (1) (Aquatic Gardens 30-June-2000)
- 3) *Dromogomphus spinosus* (1) (Chain Bridge Flats 31-May-1997)
- 4) *Erpetogomphus designatus* (2)(4)(5)
- 5) *Gomphus exilis* (1) (Little Falls Zone 31-May-1997)
- 6) *Gomphus vastus* (2)(4)(5)
- 7) *Hagenius brevistylus* (2)(4)(5)
- 8) *Stylogomphus albistylus* (1) (Chain Bridge Flats 31-May-1997)
- 9) *Stylurus plagiatus* (2)(4)(5)

Aeshnidae

- 10) *Aeshna umbrosa* (1)(4)(5)
- 11) *Anax junius* (1)(2)(4)(5)
- 12) *Anax longipes* (2)(4)(5)
- 13) *Boyeria vinosa* (1)(2)(4)(5)
- 14) *Epiaeschna heros* (1)(2)(4)(5)
- 15) *Gomphaeschna antilope* (H - 1920)(2)(4)(5)

Cordulegasteridae

- 16) *Cordulegaster bilineata/diastatopes* (recorded as *C. diastatopes*)(2)
- 17) *Cordulegaster erronea* (H - 6-June-1922)(4)(5)
- 18) *Cordulegaster maculata* (2)(4)(5)
- 19) *Cordulegaster obliqua* (H - pre1921)(4)(5)

Macromiidae

- 20) *Didymops transversa* (4)
- 21) *Macromia taeniolata* (H - 10-July-1907)(2)(4)(5)

Corduliidae

- 22) *Epicordulia princeps* (1)(2)(4)(5)
- 23) *Neurocordulia obsoleta* (2)(4)(5)
- 24) *Somatochlora filosa* (H - 1921)(2)(4)
- 25) *Somatochlora linearis* (1) (Aquatic Gardens 6-Sept-2000)
- 26) *Somatochlora tenebrosa* (1) (National Arboretum 1-July-98 and 30-June 2000)
- 27) *Tetragoneuria cynosura* (1) (Aquatic Gardens and National Arboretum 5-May-200)

Libellulidae

- 28) *Celithemis eponina* (1)(2)(4)(5)
- 29) *Erythemis simplicicollis* (1)(2)(4)(5)
- 30) *Erythrodiplax berenice* (H - 8-July-1899)(2)(4)(5)
- 31) *Libellula auripennis* (2)
- 32) *Libellula cyanea* (1)(2)(4)(5)
- 33) *Libellula flavida* (H - 16-July-1899)(4)(5)
- 34) *Libellula incesta* (1)(Aquatic Gardens and National Arboretum June-September 2000)
- 35) *Libellula luctuosa* (1)(2)(4)(5)
- 36) *Libellula needhami* (1)(2)(4)(5)
- 37) *Libellula pulchella* (1)(2)(4)(5)
- 38) *Libellula semifasciata* (1)(2)(4)(5)
- 39) *Libellula vibrans* (1)(2)
- 40) *Orthemis ferruginea* (4)
- 41) *Pachydiplax longipennis* (1)(2)(4)(5)
- 42) *Pantala flavescens* (1)(2)(4)(5)
- 43) *Pantala hymenaea* (1)(2)
- 44) *Perithemis tenera* (1)(2)(4)(5)
- 45) *Plathemis lydia* (1)(2)(4)(5)
- 46) *Sympetrum internum* (2)
- 47) *Sympetrum rubicundulum* (1)(2)(4)(5)
- 48) *Sympetrum semicinctum* (2)(4)(5)
- 49) *Sympetrum vicinum* (1)(2)(4)(5)
- 50) *Tramea carolina* (1)(2)
- 51) *Tramea lacerata* (1)(Chain Bridge Flats 31-May-1997; Aquatic Gardens and National Arboretum June-September 2000)

Calopterygidae

- 52) *Calopteryx dimidiata* (H -- date ?)(3)
- 53) *Calopteryx maculata* (1)(2)(3)(5)
- 54) *Hetaerina americana* (2)(3)(5)
- 55) *Hetaerina titia* (H - pre 1990)(2)(3)(5)

Lestidae

- 56) *Achilestes grandis* (1)(National Arboretum 1-September-2000)
- 57) *Lestes dryas* (H -- date ?)(3)
- 58) *Lestes forcipatus* (2)(3)(5)
- 59) *Lestes inaequalis* (1)(Chain Bridge Flats 32-May-1997)
- 60) *Lestes rectangularis* (1)(2)(3)(5)
- 61) *Lestes unguiculatus* (H - 31-July-1899)(2)(3)(5)

Coenagrionidae

- 62) *Amphiagrion saucium* (2)(5)
- 63) *Argia apicalis* (1)(2)(3)(5)
- 64) *Argia bipunctulata* (H - two records from 1899)(2)(3)(5)
- 65) *Argia fumipennis violacea* (1)(2)(3)(5)
- 66) *Argia moesta* (1)(2)(3)(5)
- 67) *Argia sedula* (2)(3)
- 68) *Argia tibialis* (1)(2)(3)
- 69) *Argia translata* (2)(3)(5)
- 70) *Chromagrion conditum* (3)
- 71) *Enallagma civile* (1)(2)(3)(5)
- 72) *Enallagma divagans* (1)(Chain Bridge Flats 31-May-1997)
- 73) *Enallagma durum* (1)(2)(3)(5)
- 74) *Enallagma exsulans* (1)(2)(3)(5)
- 75) *Enallagma geminatum* (1)(Aquatic Gardens 5-May-2000; National Arboretum 1-September 2000)
- 76) *Enallagma signatum* (1)(2)(3)(5)
- 77) *Enallagma traviatum* (3)(5)
- 78) *Ischnura hastata* (1)(2)(5)
- 79) *Ischnura kellicotti* (1)(Aquatic Gardens from May-September 2000 -- the most numerous odonate species at the Gardens)
- 80) *Ischnura posita* (1)(2)(3)(5)
- 81) *Ischnura ramburii* (2)(3)(5)
- 82) *Ischnura verticalis* (1)(2)(3)(5)
- 83) *Nehalennia gracilis* (H -- date ?)(2)

B. COLLECTED SPECIMENS FROM THE AQUATIC GARDENS WITH DATA AND NATIONAL PARK SERVICE CATALOG NUMBERS

- #2024 *Arigomphus villosipes* 1 male collected (two present) at pond with muddy sides and little emergent vegetation, 30-June-2000, R.Orr
- #2025 *Somatochlora linearis* 1 female w/dirty abdomen (evidence of recent ovipositing), collected while feeding in open area along the River Path, 6-September, 2000, R. Orr
- #2026 *Tetragoneuria cynosura* 1 male collected (others seen) while on territory over shaded edge of pond, 5-May-2000, R.Orr
- #2027 *Enallagma divagans* Male/female tandem pair collected at Watts Creek, 7-June-2000, R. Orr
- #2028 *Argia apicalis* Two females, one male collected on River Path next to Anacostia River, 30-June-2000, R.Orr
- #2029 *Argia tibialis* One male collected (others seen) at Watts Creek, 11-August-2000, R. Orr
- #2030 *Sympetrum vicinum* One male collected (others seen) at Pond, 11-August-2000, R. Orr
- #2031 *Enallagma durum* 1 male collected (others seen) at pond near the edge of Kenilworth Marsh, 6- Sept-2000, R. Orr