

Atlas of the Dragonfly Larvae

(Class Insecta: Order Odonata: Suborder Anisoptera)

Recorded at the

Old Woman Creek

**National Estuarine Research Reserve
and State Nature Preserve, Ohio**

by

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Acknowledgments

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“The Old Woman Creek National Estuarine Research Reserve in Ohio is part of the National Estuarine Research Reserve System (NERRS), established by Section 315 of the Coastal Zone Management Act, as amended. Additional information about the system can be obtained from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, 1305 East West Highway – N/ORM5, Silver Spring, MD 20910. Financial support for this publication was provided by a grant under the Federal Coastal Zone Management Act, administered by the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration, Silver Spring, MD.”

Copies of this publication are available from the
Ohio Department of Natural Resources-Division of Wildlife
2514 Cleveland Road East
Huron, Ohio 44839

We thank Dr. Carmen Trisler for information on the habitats of several genera.

Introduction

Both the formal biologist and the amateur naturalist often encounter lists of animals and plants when they read published scientific reports and visit nature centers. Rarely do they have ready access to photographs for each member of the list. The purpose of this chapter of the atlas is to provide a detailed pictorial record of larvae of the dragonflies (Class Insecta: Order Odonata: Suborder Anisoptera) within the Old Woman Creek coastal wetland system (OWC) along Lake Erie in Ohio.

Invertebrates occur in great abundance in freshwater ecosystems, including Great Lakes wetlands such as the marshes, swamps, and open water that make up OWC. A few invertebrates, such as freshwater mussels, grass shrimps, and giant water bugs, are readily visible once collected because of their large size. However, many others are so small that special attention must be given to seeing them. Most groups of invertebrates go unnoticed by casual visitors to aquatic habitats, and this is true of the aquatic larvae, or nymphs, of many kinds of dragonflies. The youngest larvae may be only a couple millimeters (1/16 inch) long, whereas mature nymphs of some species attain a length of more than 3.5 centimeters (about 1-1/2 inch).

Often, careful observation through a dissecting microscope is necessary to distinguish one kind of dragonfly larva from another. This chapter presents detailed photographs of critical diagnostic features that permit correct identification to the taxonomic level of genus (plural, genera) of the dragonfly larvae found to date at OWC.



Erythemis sp. larva, dorsal view

The dragonflies are a very diverse group comprised of nearly 5,500 species worldwide, with approximately 650 species in North America. Adult dragonflies possess two pairs of wings. They spend most of their time in the air while hunting, capturing prey, and searching for mates. Many dragonflies lay their eggs while in flight.

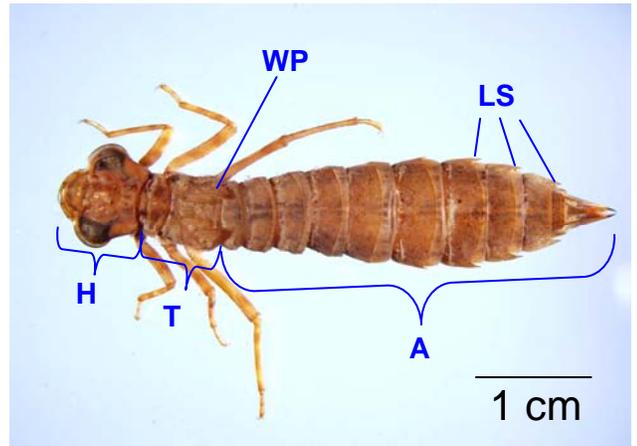
Dragonfly larvae differ greatly from the adults. They do not share the bright coloring of their adult counterparts; instead, their drab colors camouflage them from predators. The larvae of most species are exclusively aquatic. The larvae of some species actively stalk their prey, whereas others lay in wait for the arrival of their next meal.

Dragonflies are considered beneficial predators; a large part of the diet of both adults and larvae consists of mosquitoes and other nuisance insects. Dragonflies are integral to aquatic food webs, for they feed on invertebrates and small fish while themselves serving as prey for larger predators.

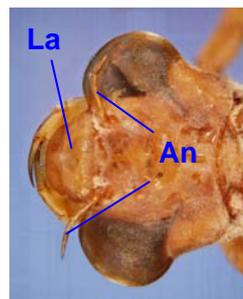
Characteristics of Anisoptera Larvae

As members of the insect Order Odonata, dragonflies have three life stages: egg, larva (or nymph), and adult. Eggs are deposited by the female into moist substrate, plant tissue, or onto the water surface. The larva ranges in size from 13 to 68 mm when mature and molts (sheds its skin) 10 to 15 times before becoming an adult. The mature larva climbs onto a solid surface and sheds its skin to emerge as an adult.

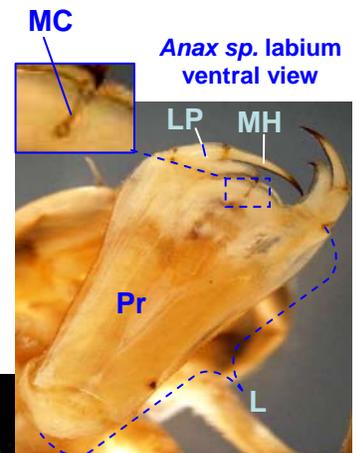
General features of a dragonfly larva are shown in the photographs on this page. The body is divided into three regions: **head (H)**, **thorax (T)** and **abdomen (A)**. **Wing pads (WP)** are present on the thorax of more-mature specimens, and the abdomen features **lateral spines (LS)**. Head structures include paired **antennae (An)** and a dorsal **labrum (La)**. A ventral mouthpart unique to dragonfly and damselfly larvae is the extendable **labium (L)**, which is usually folded beneath the head. It includes the **prementum (Pr)**, an anterior extension of the prementum called the **ligula (Li)**, and a pair of extendable **labial palps (LP)**, each with a **movable hook (MH)** and, in some species, **palpal setae (PS)**. The prementum of some species features dorsal **premental setae (PrS)**, and the ligula may have an anterior **median cleft (MC)**. Each leg is divided into five parts: the **coxa** (attached to the thorax, not shown), **trochanter** (not shown), **femur (F)**, **tibia (Ti)**, and **tarsus (Ta)**. A pair of **claws** (not shown) is attached to each tarsus. The posterior end of the abdomen consists of five appendages: a pair of **cerci (C)**, a pair of **paraprocts (P)**, and the **epiproct (E)**.



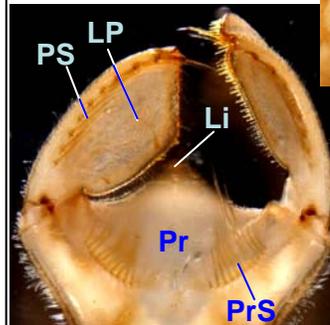
dorsal views of *Aeshna sp.*



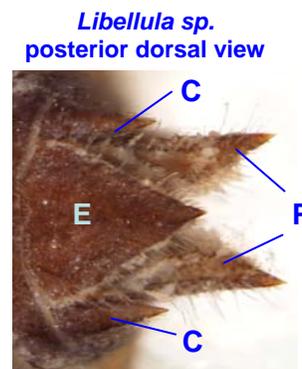
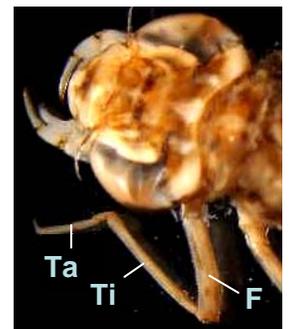
Epitheca sp. labium dorsal view



Anax sp. labium ventral view



Anax sp. anterior dorsal view



Libellula sp. posterior dorsal view

Layout of this Atlas

The following pages are organized alphabetically by family. Collectors have identified six genera of dragonfly larvae in three families (Aeshnidae, Corduliidae, and Libellulidae) within the OWC wetland system, which excludes the free-flowing upland reaches of Old Woman Creek.

This publication should not be used as the sole source to identify the families and genera of larval dragonflies of OWC because it is likely that additional families and genera will be found in new collections. The references cited on this page should be used to obtain definitive identifications. The species within each genus are not included here, and the species of some genera cannot be identified in their larval stage. In fact, some specimens in the families Corduliidae and Libellulidae are difficult to assign reliably to the correct family because of the overlap of characteristics.

Each genus of dragonfly larva is illustrated and described on a single page of this atlas. Because the identifying features of the Suborder Anisoptera and the particular family are repeated on each page, the page for each genus can be used independently. Photographs are labeled with identifying letters and lines that indicate diagnostic structures. Some photographs show specimens collected within OWC; specimens from other ecosystems were used if they were of superior quality. The exact specimens photographed are recorded at the bottom of the page.

Beneath the descriptive features, each page lists where within OWC the genus has been found. It is likely that future

collections will reveal some of the genera in additional habitats. The general ecology of the genus is briefly summarized, including its habit (such as sprawler or climber) and its functional feeding group (all are predators).

All information on each page was derived from four references, which are abbreviated as shown below followed by the page number(s):

H = Hilsenhoff, W.L. 1982. *Aquatic Insects of Wisconsin*. Publication of the Natural History Council, University of Wisconsin-Madison, No. 2. Geological & Natural History Survey, Madison, Wisconsin.

NWM = Needham, J.G., M.J. Westfall, Jr., and M.L. May. 2000. *Dragonflies of North America*. Scientific Publishers, Gainesville, Florida.

V = Voshell, Jr., R.J. 2002. *A Guide to Common Freshwater Invertebrates of North America*. The McDonald and Woodward Publishing Co., Blacksburg, Virginia.

WT = Westfall, Jr., M. J., and K. J. Tennessen. 1996. Chapter 12. Odonata, pp. 164-211. *In: Merritt, R.W., and K.W. Cummins (Eds.). An Introduction to the Aquatic Insects of North America*. 3rd Ed. Kendall/Hunt Publishing Co., Dubuque, Iowa.

Checklist of Genera of Dragonfly (Anisoptera) Larvae Reported in the OWC Wetland System

Three genera that have been reported but for which no specimens were available for presentation in this atlas are indicated with an asterisk (*).

Family Aeshnidae

Aeshna

Anax

Family Corduliidae

*Epitheca**

Family Libellulidae

Erythemis

Libellula

Pachydiplax

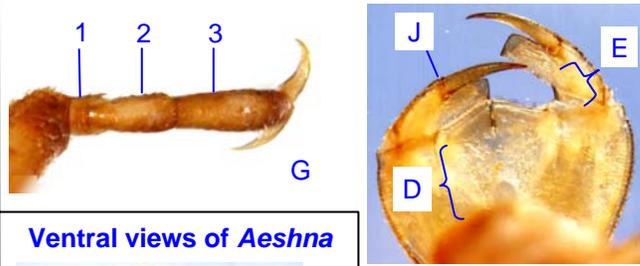
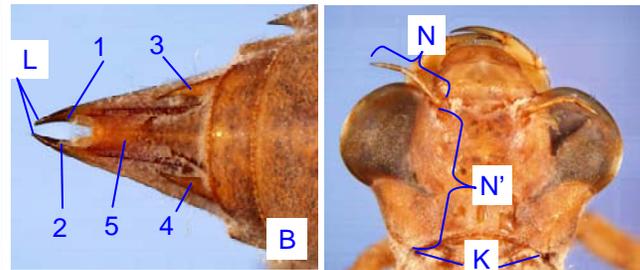
*Pantala**

*Perithemis**

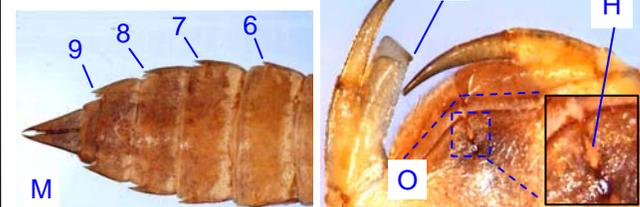
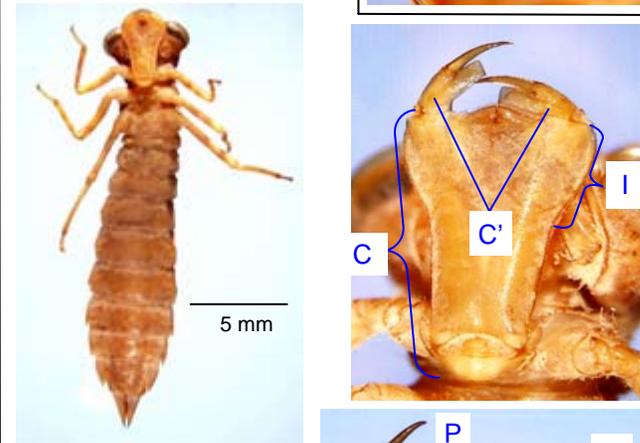
Plathemis

Insecta: Odonata: Anisoptera: Aeshnidae: *Aeshna* sp. Darners Dragonflies

Dorsal views of *Aeshna*



Ventral views of *Aeshna*



Features of Order Odonata

- Three pairs of segmented legs on thorax
- Wings absent or may have wing pads
- Terminal appendages absent or with fewer than ten segments
- Labium a hinged grasping organ

Features of Suborder Anisoptera

- Stout larvae with head nearly always narrower than thorax and/or abdomen (A)
- Abdomen with five stiff, short pointed appendages at apex (B, 1-5)

Features of Family Aeshnidae

- Prementum (C) and labial palps (C') flat
- Dorsal premental setae absent (D)
- Palpal setae usually absent (E)
- Antennae slender and bristlelike, with 6 or 7 segments (F, 1-6)
- Fore and middle tarsi with 3 segments (G, 1-3)
- Median cleft present in ligula (H)
- Prementum widest in distal half (I)
- Movable hook lacks spur at base (J)

Features of Genus *Aeshna*

- Posterolateral edges of head rounded or bluntly angular (K)
- Tips of paraprocts usually straight or slightly curved inward (L)
- Lateral spines usually on abdominal segments 6 through 9, although sometimes segments 7 through 9 (M)
- Antennae generally half as long (N) as distance from their base to posterior of head (N')
- Distal margin of ligula forming an obtuse angle; cleft is closed (O)
- End hook of labial palp not prominent (P)

Where Recorded at Old Woman Creek

On underwater stems of water plants

General Ecology

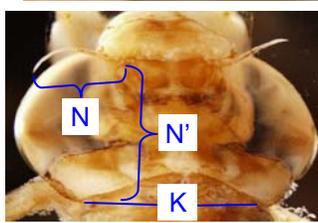
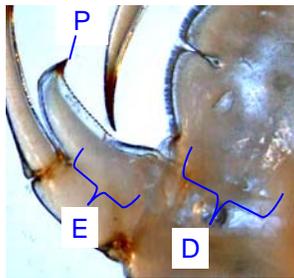
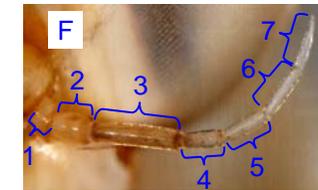
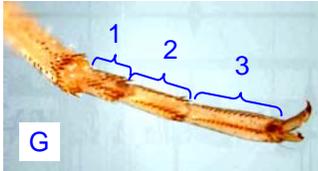
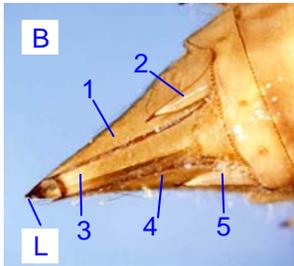
Habit: Climbers
Functional feeding group: Predators

References: H 2, 15; NWM 116-118; V 125; WT 169, 171, 174, 185, 207

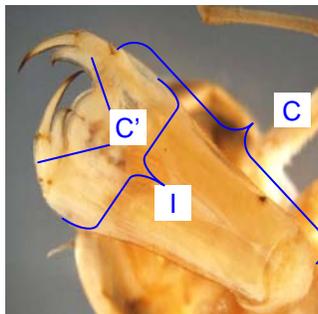
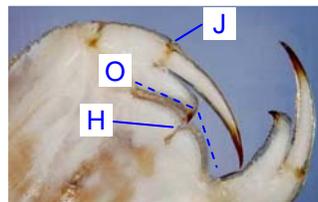
Photographs: KK REF CC4 May 2, 1980, UHC2

Insecta: Odonata: Anisoptera: Aeshnidae: *Anax* sp. Darnier Dragonflies

Dorsal views of *Anax*



Ventral views of *Anax*



Features of Order Odonata

- Three pairs of segmented legs on thorax
- Wings absent or may have wing pads
- Terminal appendages absent or with fewer than ten segments
- Labium a hinged grasping organ

Features of Suborder Anisoptera

- Stout larvae with head nearly always narrower than thorax and/or abdomen (A)
- Abdomen with five stiff, short pointed appendages at apex (B, 1-5)

Features of Family Aeshnidae

- Prementum (C) and labial palps (C') flat
- Dorsal premental setae absent (D)
- Palpal setae usually absent (E)
- Antennae slender and bristlelike, with six or seven segments (F, 1-7)
- Fore and middle tarsi with three segments (G, 1-3)
- Median cleft present in ligula (H)
- Prementum widest in distal half (I)
- Movable hook lacks spur at base (J)

Features of Genus *Anax*

- Posterolateral edges of head rounded (K)
- Tips of paraprocts usually straight (L, 1, 4)
- Lateral spines on abdominal segments 7 through 9 (M)
- Antennae generally half as long (N) as distance from their base to posterior of head (N')
- Anterior margin of ligula forming an obtuse angle (O); cleft is closed (H)
- Prominent end hook on labial palp (P)

Where Recorded at Old Woman Creek

In sediment and on lotus, filamentous algae and cattails

General Ecology

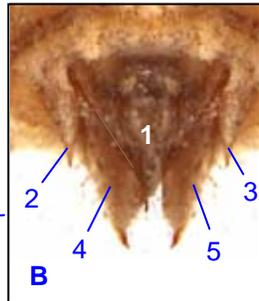
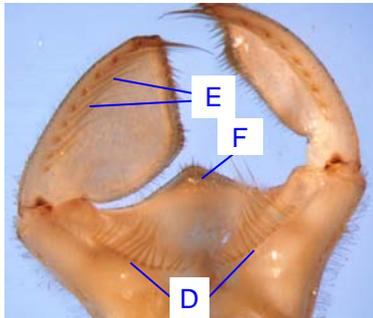
Habit: Climbers
Functional feeding group: Predators

References: H 2, 15; NWM 116-118; V 125; WT 169, 171, 174, 185, 207

Photographs: KK REF O1, August 6, 2002 OWCI

Insecta: Odonata: Anisoptera: Libellulidae: *Erythemis* sp. Skimmer Dragonflies

Dorsal views of *Erythemis*



Features of Order Odonata

- Three pairs of segmented legs on thorax
- Wings absent or may have wing pads
- Terminal appendages absent or with fewer than ten segments
- Labium a hinged grasping organ

Features of Suborder Anisoptera

- Stout larvae with head nearly always narrower than thorax and abdomen (A)
- Abdomen with five stiff, short pointed appendages at apex (B, 1-5)

Features of Family Libellulidae

- Paraprocts (B, 4-5) usually at least twice length of cerci (B, 2-3)
- Labium (C) and labial palps (C') spoon-shaped
- Dorsal premental setae usually present (D)
- Labial palps always with dorsal setae (E)
- No cleft in ligula (F)

Features of Genus *Erythemis*

- Eyes broadly rounded and positioned laterally, rather than on top of head (H)
- Abdomen ending bluntly (I)
- Paraprocts and cerci curved downward at tips (J)

Where Recorded at Old Woman Creek

In plant litter and silt on the bottom

General Ecology

Habit: Sprawlers
Functional feeding group: Predators

References: H 2; NWM 605-606; V 126; WT 171, 173-174, 198, 208

Photographs: KK REF O3, October 9, 2002 OWCI

Ventral view of *Erythemis*

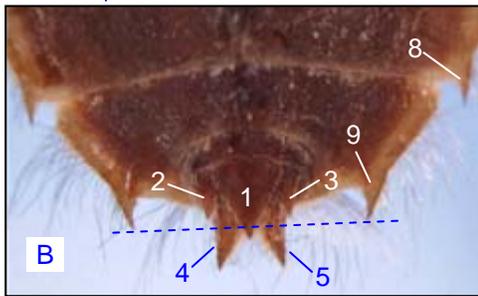
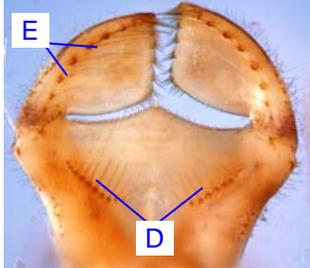


Lateral views of *Erythemis*

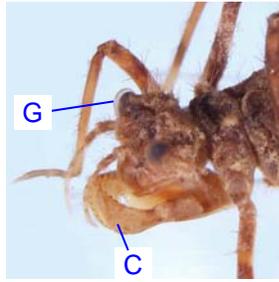


Insecta: Odonata: Anisoptera: Libellulidae: *Libellula* sp. Skimmer Dragonflies

Dorsal views of *Libellula*



Oblique view of *Libellula*



A

E

D

G

C

Features of Order Odonata

- Three pairs of segmented legs on thorax
- Wings absent or may have wing pads
- Terminal appendages absent or with fewer than ten segments
- Labium a hinged grasping organ

Features of Suborder Anisoptera

- Stout larvae with head nearly always narrower than thorax and abdomen (A)
- Abdomen with five stiff, short pointed appendages at apex (B, 1-5)

Features of Family Libellulidae

- Paraprocts (B, 4-5) usually at least twice length of cerci (B, 2-3)
- Labium and labial palps spoon-shaped (C)
- Dorsal premental setae usually present (D)
- Labial palps always with dorsal setae (E)
- No cleft in ligula (F)

Features of Genus *Libellula*

- Cerci and paraprocts straight (B, 2-3 and 4-5)
- Lateral spines of abdominal segments 8 and 9 nearly equal in length (B, 8, 9); spines of segment 9 do not extend beyond tip of epiproct (B, 9, 1)
- Eyes small, at front corners of head, and raised above head capsule (G)
- Anterior margin of ligula forming an oblique angle with straight sides (H)
- Anterior margin of ligula finely scalloped and lined with spinulose setae (I)

Where Recorded at Old Woman Creek

Beach sediment, sediment near water lotus

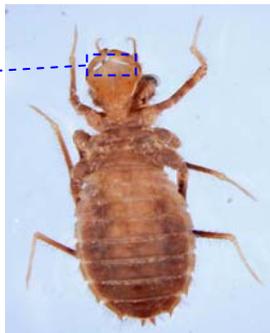
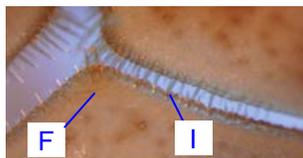
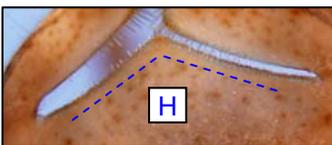
General Ecology

Habit: Sprawlers
Functional feeding group: Predators

References: H 2; NWM 605; V 126; WT 171, 173-174, 198, 200, 208

Photographs: KAK teaching lab specimen

Ventral views of *Libellula*



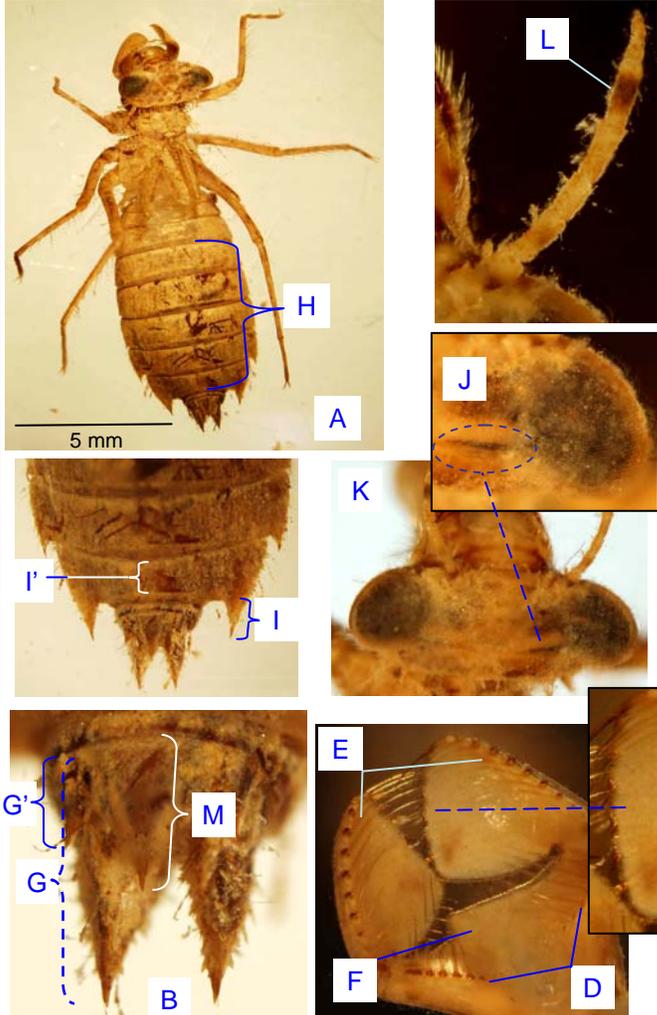
H

F

I

Insecta: Odonata: Anisoptera: Libellulidae: *Pachydiplax* sp. Skimmer Dragonflies

Dorsal views of *Pachydiplax*



Features of Order Odonata

Three pairs of segmented legs on thorax
Wings absent or may have wing pads
Terminal appendages absent or with fewer than ten segments
Labium a hinged grasping organ

Features of Suborder Anisoptera

Stout larvae with head nearly always narrower than thorax and abdomen (**A**)
Abdomen with five stiff, short pointed appendages at apex (**B**)

Features of Family Libellulidae

Labium and labial palps spoon-shaped (**C**)
Dorsal premental setae usually present (**D**)
Labial palps always with dorsal setae (**E**)
No cleft in ligula (**F**)
Paraprocts (**G**) usually at least twice length of cerci (**G'**)

Features of Genus *Pachydiplax*

Abdominal segments 5-9 lacking middorsal spines or knobs (**H**)
Lateral spines of abdominal segment nine (**I**) longer than middorsal length of segment (**I'**)
Dark line running mesad from mesoposterior of eye (**J**)
Eyes lateral rather than forward (**K**)
Antennae light with dark band on segment six (**L**)
Epiproct (**M**) less than two thirds length of paraprocts (**G**)
Paraprocts and cerci straight or nearly straight (**B**)

Where Recorded at Old Woman Creek

Sediment near water lily bed

General Ecology

Habit: Sprawlers
Functional feeding group: Predators

References: H 2, 15, 17; NWM 606, 610; V 126; WT 171, 173-174, 198, 200, 208

Photographs: KK REF CC13, October 12, 1990
OWC

Ventral view of *Pachydiplax*

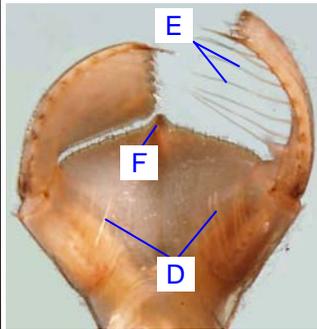
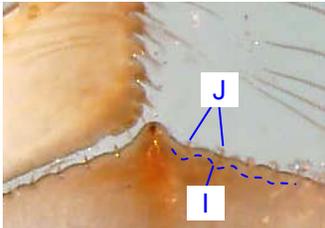


Lateral view of *Pachydiplax* labium

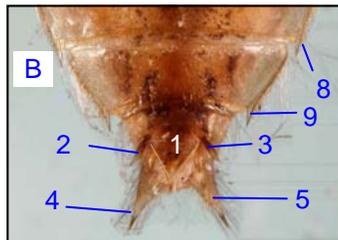
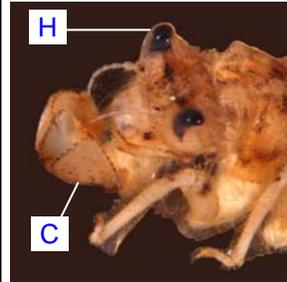


Insecta: Odonata: Anisoptera: Libellulidae: *Plathemis* sp. Skimmer Dragonflies

Dorsal views of *Plathemis*



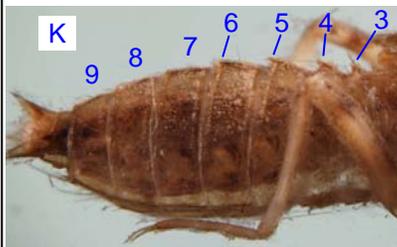
Oblique anterior view of *Plathemis*



Ventral view of *Plathemis*



Lateral posterior view of *Plathemis*



Features of Order Odonata

- Three pairs of segmented legs on thorax
- Wings absent or may have wing pads
- Terminal appendages absent or with fewer than ten segments
- Labium a hinged grasping organ

Features of Suborder Anisoptera

- Stout larvae with head nearly always narrower than thorax and abdomen (A)
- Abdomen with five stiff, short pointed appendages at apex (B, 1-5)

Features of Family Libellulidae

- Paraprocts (B, 4-5) usually at least twice length of cerci (B, 2-3)
- Labium and labial palps spoon-shaped (C)
- Dorsal premental setae usually present (D)
- Labial palps always with dorsal setae (E)
- No cleft in ligula (F)

Features of Genus *Plathemis*

- Head widest behind the eyes (G)
- Cerci and paraprocts straight (B, 2-3 and 4-5)
- Lateral spines of abdominal segments 8 and 9 nearly equal in length (B, 8, 9); spines of segment 9 do not extend beyond tip of epiproct (B, 9, 1)
- Eyes small, at front corners of head, and raised above head capsule (H)
- Anterior margin of ligula noticeably scalloped (I) with a seta in each notch between scallops (J)
- Dorsal hooks present on segments 3 through 6, but not on segments 7 through 9 (K)

Where Recorded at Old Woman Creek

In submerged shoreline grass

General Ecology

Habit: Sprawlers
Functional feeding group: Predators

References: H 2; NWM 605-606; V 126; WT 171, 173-174, 198, 200, 208

Photographs: KK REF O2, KK Qual, August 6, 2002
OWCI