IDENTIFICATION KEYS TO

NORTHEASTERN ANISOPTERA LARVAE

Compiled by

Ken Soltesz
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25 Moore Avenue
Mt. Kisco, New York 10549

Workshops on Invertebrate Biodiversity:

Dragonflies and Damselflies

June 7 & 8, 1996
University of Connecticut

CENTER FOR CONSERVATION AND BIODIVERSITY
(University of Connecticut)
and the
CAMBRIDGE ENTOMOLOGICAL CLUB

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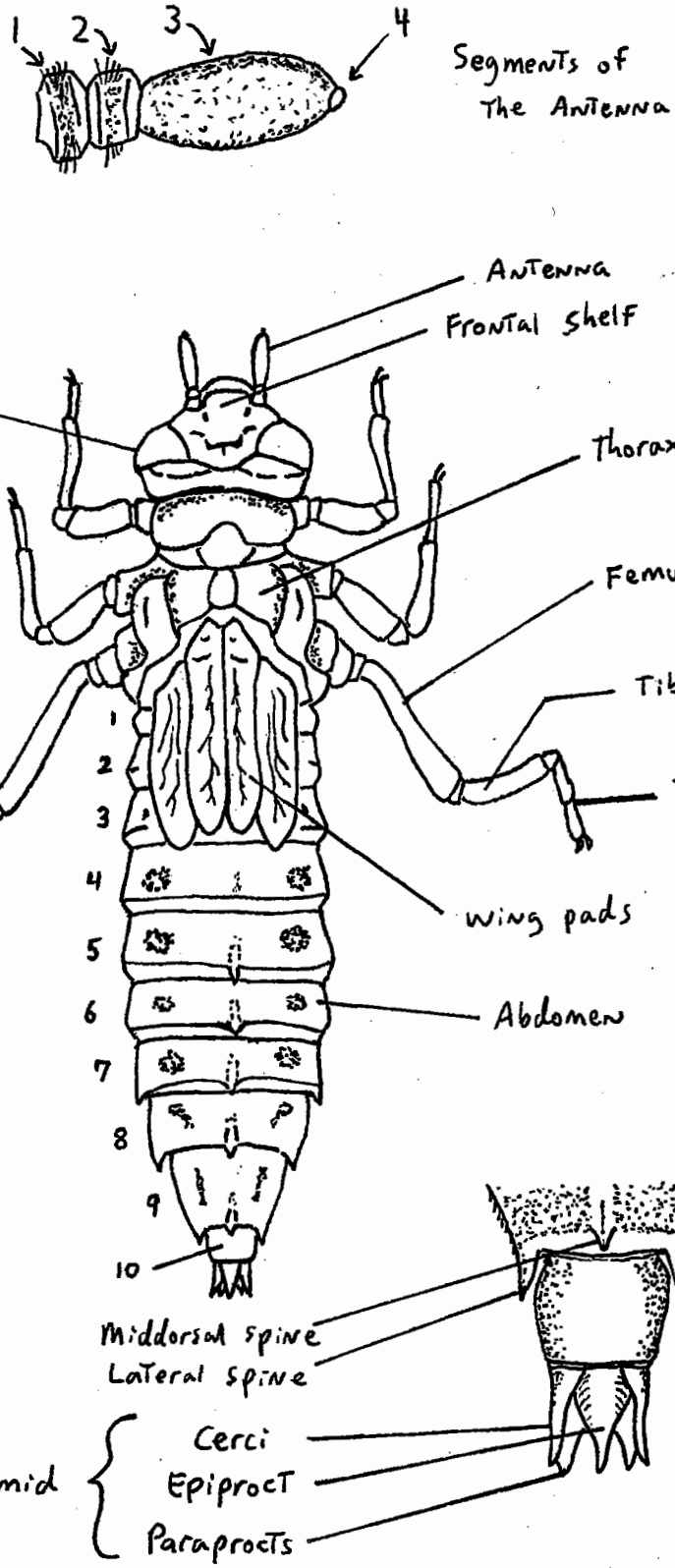
NEW ENGLAND ASSOCIATION OF ENVIRONMENTAL BIOLOGISTS
ANNUAL MEETING
MARCH 10 – 12, 1998 ASCUTNEY MOUNTAIN RESORT; BROWNSVILLE, VT
ODONATE LARVAE WORKSHOP

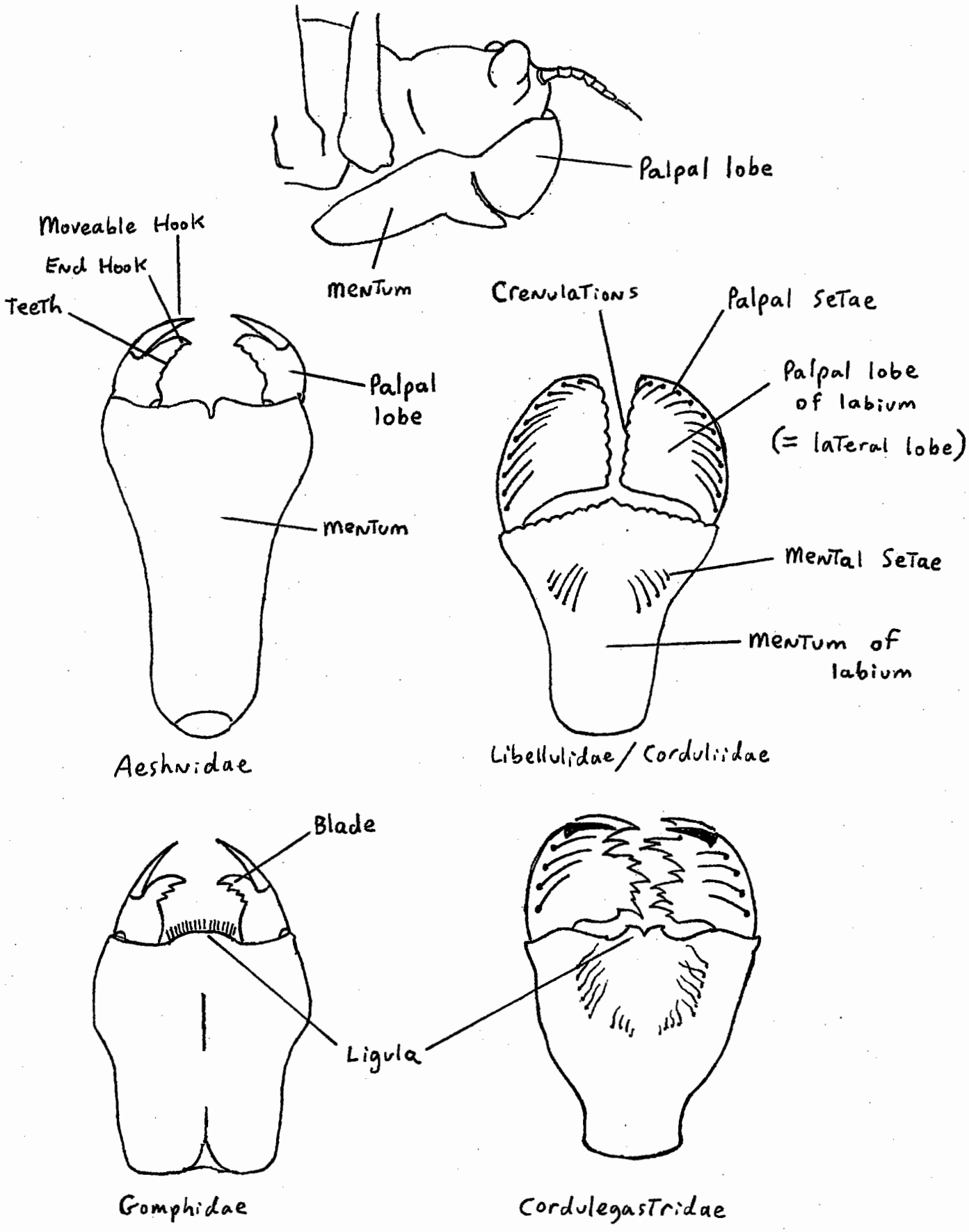
Karen Frolich
New York State Biodiversity Research Institute
New York State Museum
CEC 3140
Albany, NY 12230

General Anatomy of Nymph:



Cercus (pl. cerci) = Lateral caudal (or anal) appendage
Epiproct = Superior caudal (or anal) appendage
Paraproct = Inferior caudal (or anal) appendage

Labial Anatomy:



IDENTIFICATION KEYS TO NORTHEASTERN ANISOPTERA LARVAE

Key to the Families of Anisoptera

Needham and Westfall (1954)

1	Mentum of labium flat or nearly so (fig. 1)	2
	Mentum of labium spoon-shaped or mask-shaped, covering face up to the eyes (fig. 2)	4
2	Antennae 4-segmented; first two pairs of legs with 2-jointed tarsi (fig. 3)	Gomphidae
	Antennae 6- or 7-segmented; all legs with 3-jointed tarsi (fig. 4)	3
3	Antennal segments short, thick, and hairy (fig. 5)	Petaluridae (One species, *Tachopteryx thoreyi*)
	Antennal segments slender, bristle-like (fig. 6)	Aeshnidae
4	Lateral lobes of labium so deeply and irregularly cut on opposed margins as to form large jagged teeth (fig. 7)	Cordulegastridae
	Lateral lobes of labium less deeply cut, having smaller, more regular teeth (fig 8)	5
5	Prominent frontal horn on head (fig. 9); abdomen strongly depressed, almost circular when viewed from above; teeth on opposed margins of lateral lobes of labium large with deep incisions between them (fig. 10)	Macromiidae
	No frontal horn on head; legs shorter; abdomen less depressed; teeth on lateral lobes smaller, more numerous, with incisions shallower or lacking (fig. 11)	6

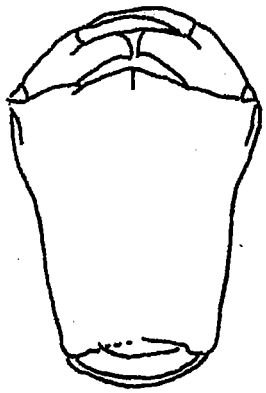


Fig. 1

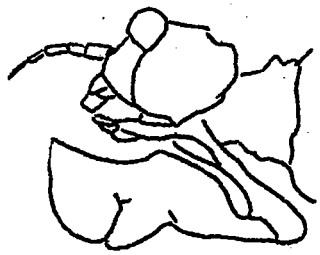


Fig. 2

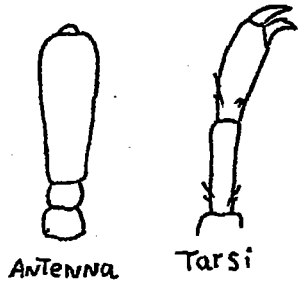


Fig. 3

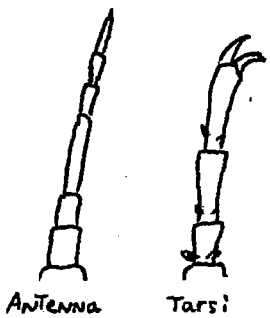


Fig. 4

Fig. 5

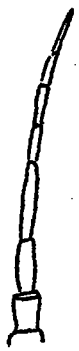


Fig. 6

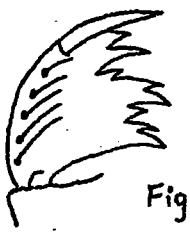


Fig. 7

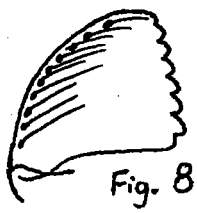


Fig. 8

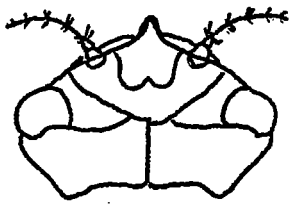


Fig. 9

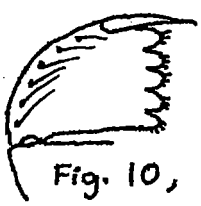


Fig. 10,

11

Fig. 12

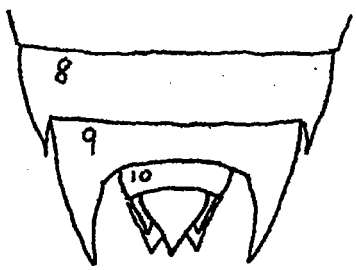


Fig. 13

6 Lateral caudal appendages (cerci) generally more than half as long as inferior appendages (paraprocts) [fig. 12]; lateral spines of segment 9 longer than its mid-dorsal length (fig. 13); mid-dorsal hooks on abdomen often cultriform (fig. 14) Corduliidae

Lateral caudal appendages generally half as long, or less, than inferior appendages (fig. 15); if lateral spines of segment 9 are longer than its mid-dorsal length, then mid-dorsal hooks on abdomen are not cultriform but more spine-like, stubby, or absent (fig. 16) Libellulidae

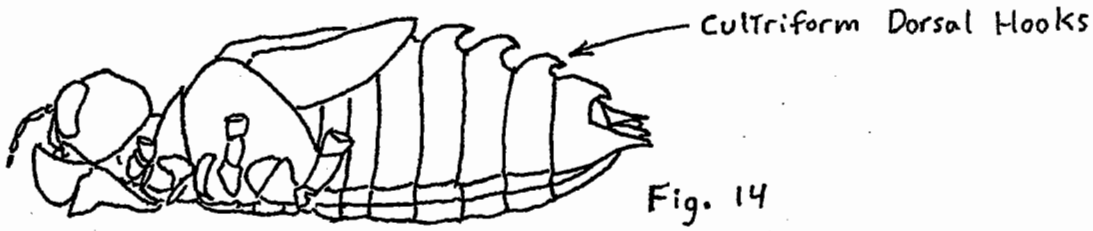


Fig. 14

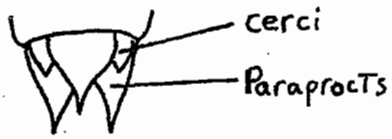


Fig. 15

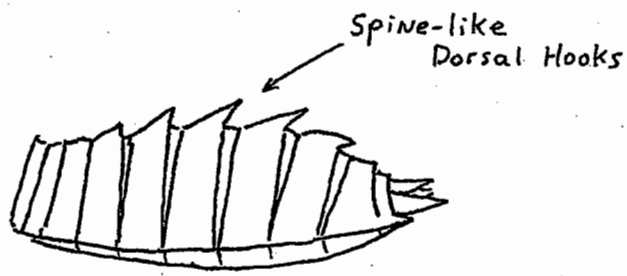
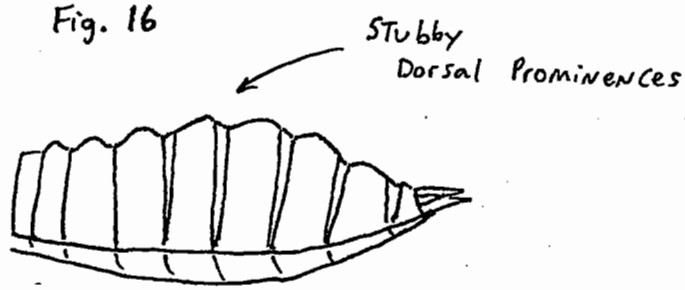


Fig. 16



KEY TO THE FAMILY CORDULEGASTRIDAE (Genus *Cordulegaster*):

Adapted from Needham and Westfall (1954)

---

1 Lateral setae 4, mental setae generally 5+5;
Hairs on margin of frontal shelf short, very much flattened and often wider at apex than at base;
Few large obsolescent brown dots (hair bases?) on frontal-shelf disc;
Hairs on epaulet less than twice as long as epaulet is wide. *erronea*

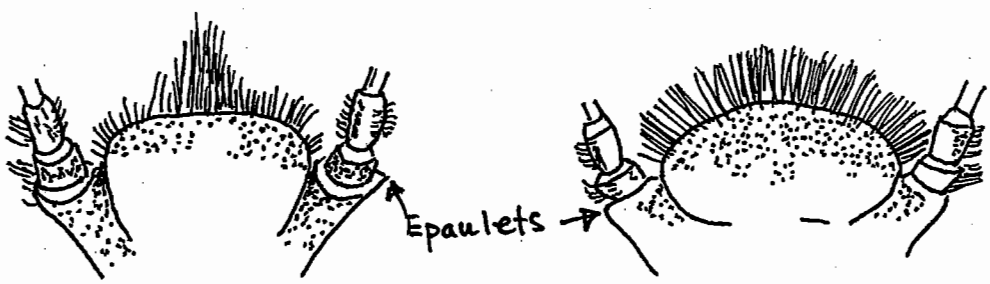
Lateral setae 5-7, mental setae not 5+5;
Brown dots on frontal-shelf disc smaller. 2

2 Lateral setae 7 (distal setae often small and occasionally missing), mental setae 8-9 + 4-5;
Lateral spines of abdominal segments 8 and 9 minute. *obliqua*

Lateral setae 5, mental setae 5-6 + 3-4;
Lateral spines of abdominal segments 8 and 9 larger. 3

3 Margin of frontal shelf usually with tuft of very long thin hair in center;
Long, usually black, hairs anterior to ocelli;
Obsolescent brown dots (hair bases?) on frontal-shelf disc generally few and irregular in outline;
Epaulets truncate on outer side. *diastatops*

Margin of frontal shelf usually without tuft of hair in center;
Brown dots on frontal-shelf disc generally numerous, small, and round;
Epaulets widely rounded at outer anterior edge. *maculata*



C. diastatops frontal shelf

C. maculata frontal shelf

KEY TO THE GENERA OF THE FAMILY GOMPHIDAE

Adapted from Needham and Westfall (1954), Westfall and Trogdon (1962), and Walker (1958)

---

1 Antennal segment 4 naked and generally about one fourth as long as large, hairy, segment 3;
Middle legs closer together at base than fore legs. *Progomphus*
(One species, *Progomphus obscurus*)

Antennal segment 4 vestigial or nearly so;
Middle legs not closer together at base than fore legs. 2

2 Wing pads strongly divergent. *Ophiogomphus*

Wing pads laid parallel along back. 3

3 Very large, flat body;
Abdomen nearly circular;
Paired tubercles on top of head. *Hagenius*
(One species, *Hagenius brevistylus*)

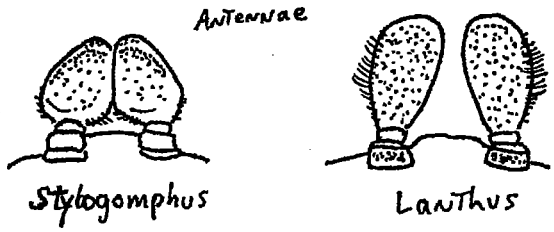
Body more elongate and cylindric;
No tubercles on head. 4

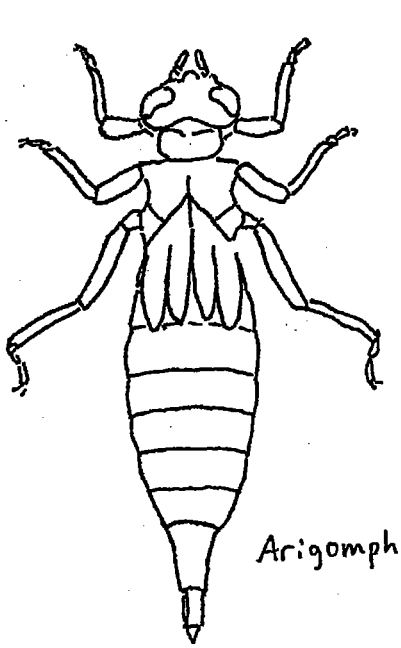
4 Antennal segment 3 flat, and nearly as wide as long. 5

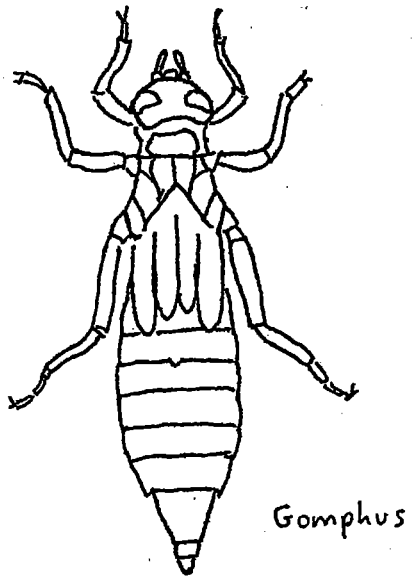
Antennal segment 3 elongate, and more or less cylindric. 6

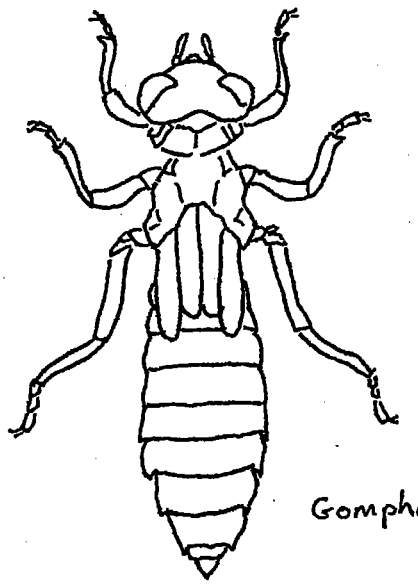
5 Antennal segment 3 inequilateral (widest proximally), inner margins straight and nearly parallel;
Frontal shelf truncate apically;
Anterior margin of prementum nearly straight and generally with 3 teeth. *Stylogomphus*
(One species, *Stylogomphus albistylus*)

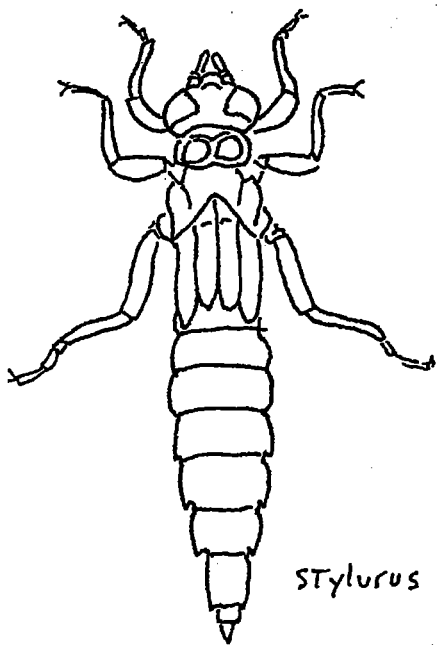
Antennal segment 3 nearly oval and evenly convex;
Frontal shelf bifurcate;
Anterior margin of prementum convex and generally with 4 teeth. *Lanthus*











Typical Gomphid Body Shapes

6 Dorsal hook on abdominal segment 9 is spinelike termination of middorsal ridge. *Dromogomphus*
(One species, *Dromogomphus spinosus*)

Dorsal hook on abdominal segment 9, if present, rises above level of its rounded dorsum. 7

7 Abdomen ends to rearward in a long tapering point (bottleneck);
A low wide median ridge but no median groove on middle segments. *Arigomphus*

Abdomen ends to rearward more abruptly;
There may be low dorsal hooks or a median groove on middle segments. 8

8 Tibial burrowing hooks vestigial or lacking;
1-4 palpal teeth;
Abdomen slender, no wider than head. *Stylurus*

Tibial burrowing hooks well-developed;
5 or more palpal teeth;
Abdomen wider than head. 9

9 Abdomen lanceolate (moderately pointed to rearward);
Small dorsal hooks on middle segments;
No median groove. *Gomphus*

Abdomen ending more bluntly, flattened, narrowed abruptly on segment 9;
Lateral spines of segment 9 spinulose-serrate on outer edge. 10

10 Small species: length less than 27 mm. *Hylogomphus*

Larger species: length 28-40 mm. 11

11 Lateral spines of abdominal segment 9 equal to the middorsal length of segment 10. *Stenogomphurus*
(One species, *Stenogomphurus rogersi*)

Lateral spines of abdominal segment 9 one-and-one-half to two times the middorsal length of segment 10. *Gomphurus*

Key to the species of the genus *Ophiogomphus* (Gomphidae):

from Needham and Westfall (1954), omits *howei*

1	Antennal segment 3 broadly oval; Antennal segment 4 nearly as wide at base as 3, cut off obliquely.	*anomalus*
	Antennal segment 3 long and narrow *; Antennal segment 4 a conical rudiment.	2
2	Antennal segment 3 narrowly oblong *, densely scaly, twice as long as wide.	*mainensis*
	Antennal segment 3 two and one half to three times as long as wide.	3
3	Lateral appendages (cerci) twice the middorsal length of segment 10.	4
	Lateral appendages (cerci) two and a half times as long as 10.	5
4	Antennal segment 3 about three times as long as wide.	*rupinsulensis*
	Antennal segment 3 about two and a half times as long as wide.	*carolus*
5	Dorsal hooks on abdominal segments 8 and 9, viewed from above, with acute tips.	*colubrinus*
	Dorsal hooks on abdominal segments 8 and 9 with obtuse tips.	*aspersus*

* – Neither "long and narrow" nor "narrowly oblong" accurately describe the third antennal segment on *Ophiogomphus mainensis*. "Broad and obliquely oval" (Walker 1958), is a more accurate description.

Alternate key to the species of the genus *Ophiogomphus* (Gomphidae):

Adapted from Carle (1992)

1	Dorsal abdominal processes vestigial or absent, in lateral view those of segments 2, 3, and 4 longer than high; Base of antennal segment 3 wider than antennal segment 2.	2
	Dorsal abdominal processes well developed, in lateral view those of 2, 3, or 4 higher than long; Base of antennal segment 3 narrower than antennal segment 2.	3
2	Lateral abdominal spines absent; Antennal segment 4 minute, less than one-fourth the width of antennal segment 3.	*howei*
	Lateral abdominal spines well developed on segments 7, 8, and 9; Antennal segment 4 capping apex of segment 3 (about 8/10 width of segment 3).	*anomalus*
3	Dorsal abdominal processes appressed-subfalcate, in dorsal view those of abdominal segments 2, 3, and 4 with obtuse apices extended to near granulate posterior border.	*colubrinus*
	Dorsal abdominal processes raised-falcate, in dorsal view those of abdominal segments 2, 3, and 4 with acute apices extended well beyond granulate posterior border of segments.	4
4	Third antennal segment 1.7 to 2.0 times as long as wide.	*mainensis*
	Third antennal segment 2.3 to 3.0 times as long as wide.	5
5	Third antennal segment 2.7 to 3.0 times as long as wide.	6
	Third antennal segment 2.3 to 2.6 times as long as wide.	*carolus*

6 Lateral margins of prementum slightly divergent in distal half;
Lateral abdominal spines about 1/8 the length of their segment's lateral margin;
Dorsal cercal length 2.5 times basal cercal width;
Dorsal abdominal processes 3, 4, 5, and 6 erect and subequal. *aspersus*

Lateral margins of prementum parallel to slightly divergent in distal half;
Lateral abdominal spines about 1/5 the length of their segment's lateral margin;
Dorsal cercal length 2.0 times basal cercal width;
Dorsal abdominal processes 3, 4, 5, and 6 appressed and subequal. *rupinsulensis*

Note: Couplets 4 and 5 in this key are highly unreliable in practise. Specific differences in the morphology of the third antennal segment of *mainensis*, *carolus*, and *rupinsulensis* should also be considered when making determinations:

O. mainensis — Third segment broad, flattened, and obliquely oval.

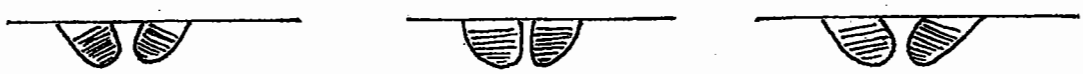
O. carolus — Third segment spatulate, more or less acute at its distal end, and widest at about the middle. Upper surface of segment flat or evenly convex.

O. rupinsulensis — Third segment somewhat truncate at its distal end, and widest beyond the middle, at about the distal third. Upper surface somewhat sculptured so as to form a median longitudinal ridge.

The greatest potential for confusion exists between *carolus* and *rupinsulensis*, some specimens of which are so intermediate in characters as to defy determination. In many of these cases, the vulvar laminae of the females can be a useful character. To examine the vulvar lamina on exuviae, moisten the abdomen with water and carefully pull the terminal segments so as to fully expose the ventral intersegmental membrane between the 8th and 9th segments.

O. carolus — Vulvar laminae are well-separated at the base and are either directed straight to rearward or are slightly divergent.

O. rupinsulensis — Vulvar laminae are close-together at the base and are usually directed inwardly toward each other. Although the mesal borders of the laminae may sometimes be parallel, the outer sides are nearly always convergent.

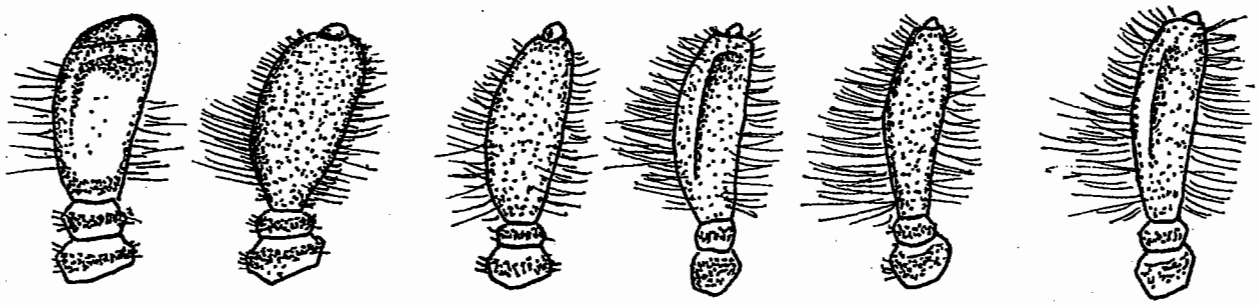


T. W. Donnelly (pers. comm.) has had similar problems with the *Ophiogomphus*, especially with the species *carolus*, *rupinsulensis*, and *aspersus*, and has prepared the following chart to assist with the keys. The asterisks indicate characters which appear to grade together in many specimens and to be less reliable for identification.

Character:		
Mentum of labium, viewed ventrally:	CAR	* Appears to taper, expanding distally; lateral margin least sigmoid; narrows almost exactly at mid-point between base and distal margin.
	RUP	* Appears not to taper; lateral margins nearly parallel both on basal and distal portions; sigmoid bend very slightly in basal half.
	ASP	Appears to converge slightly in distal third; sigmoid bend most developed of the 3 species.
Mentum of labium, tiny denticles (pustules) on flattened lateral rim:	CAR	* Mainly dark; often pale.
	RUP	Invariably dark.
	ASP	Invariably pale.
Third antennal segment, dorsal view:	CAR	* Evenly curved on lateral margin; greatest width at mid-point.
	RUP	* Curved less in basal half, more in distal half; greatest width in distal half.
	ASP	* Narrower than either of the other two species, but not much.
Fourth antennal segment, dorsal view:	CAR	* Triangular, appears to continue the line of the lateral margin of the third segment,
	RUP	* Subcylindrical to triangular; does not continue line of lateral margin, so that there is a shoulder at the distal end of the third segment.
	ASP	* Similar to *rupinsulensis*.
Dorsal prominence of 9th segment, at apical margin of tergum, dorsal view:	CAR	Extends most apically of the three species; subtends approximately a right angle.
	RUP	* More obtuse than *carolus* and extends less apically, somewhat rounded, but appears to subtend an angle of 100 - 110 degrees.
	ASP	A rounded prominence extending almost not at all beyond apical margin of 9.

Female vulvar laminae:	CAR	Scales widely separated, not prominent.
	RUP	Scales prominent, joining at median line.
	ASP	Intermediate between *carolus* and *rupinsulensis*.
Male epiproct:	CAR	Broad; swellings at midpoint large and widely separated.
	RUP	Narrower, swellings smaller and set very closely together so as not to extend laterally.
	ASP	Similar to *rupinsulensis*.

Note: Refer to Walker (1933) for an exhaustive, though somewhat outdated, analysis of the larval stages of this difficult genus.



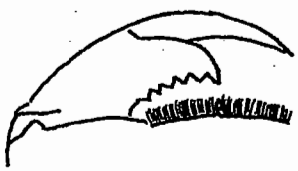
Ophiogomphus antennae:

Traced from Walker (1933)

Key to the species of the genus *Gomphurus*:

Adapted from Walker (1958) and Louton (1983)

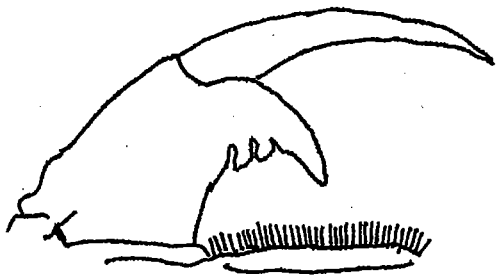
1	Strongly hooked palpal lobes with few teeth (3 - 5).	*Gomphurus* group I	2
	End hook of palpal lobe barely extends beyond adjacent teeth; Many teeth on palpal lobe (7 - 9).	*Gomphurus* group II	3
2	Length 27 - 30 mm.		*vastus*
	Length 32 - 35 mm.		undescribed species (Delaware River)
3	Anterior margin of prementum slightly convex, with median tooth.		*fraternus*
	Anterior margin of prementum straight, with no median tooth.		*ventricosus*



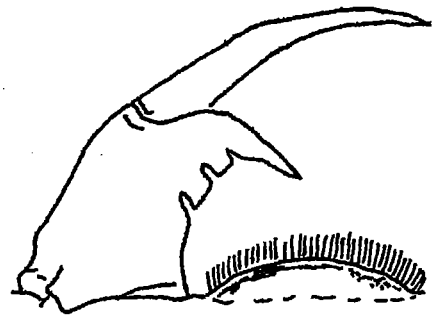
GROUP II
(fraternus)

GROUP I
(vastus)

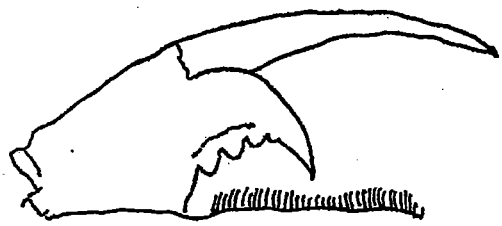
Gomphurus labial Palps:



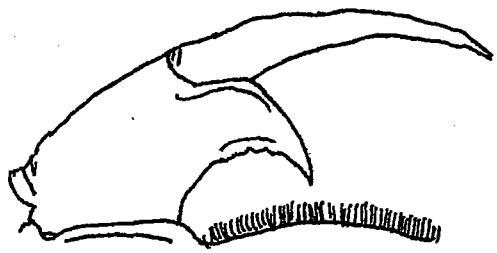
SPINICEPS



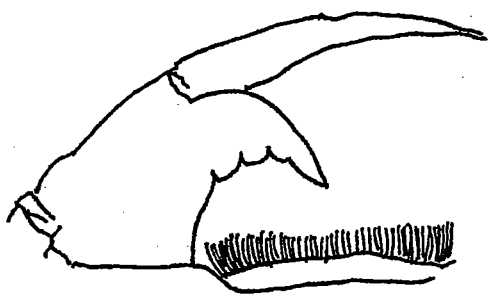
AMNICOLA



NOTATUS



PLAGIATUS



SCUDDERI

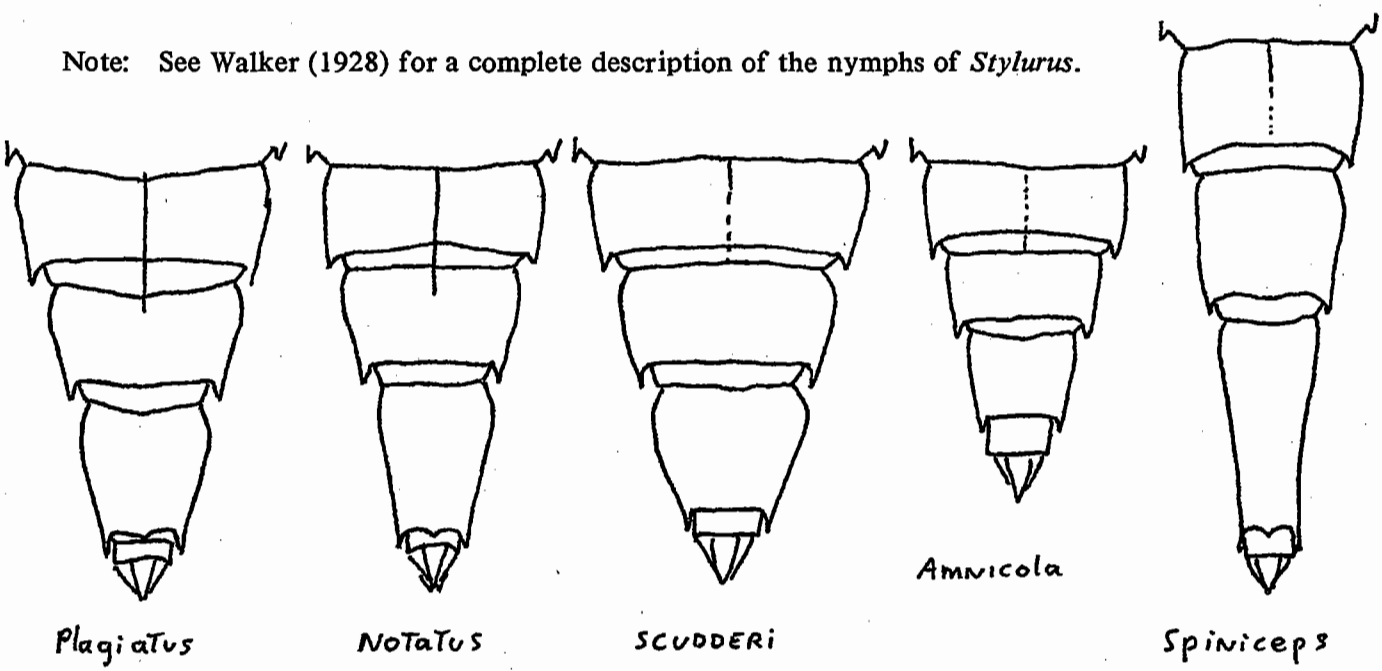
Right labial palpus and ligula of Stylurus nymphs
Traced from Walker (1928)

Key to the species of the genus *Stylurus*:

Adapted from Needham and Westfall (1954)

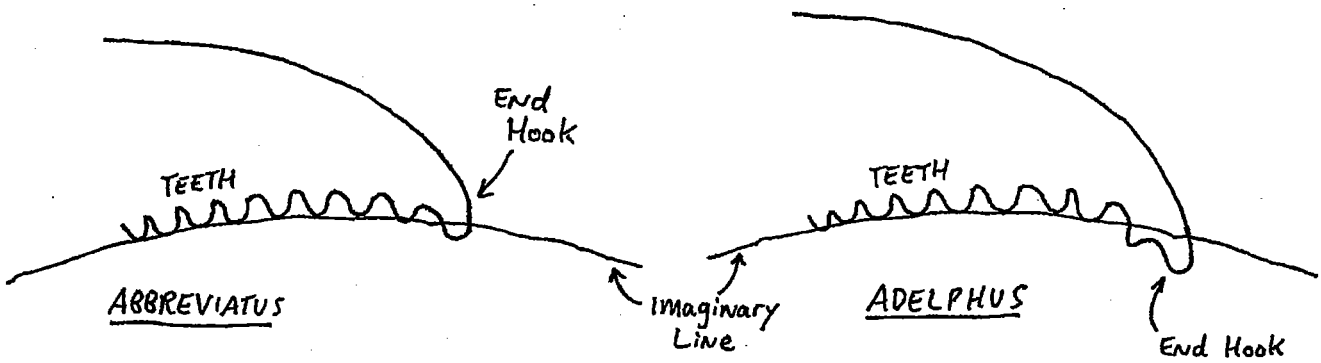
1	Abdominal segment 9 twice as long as wide at base.	*spiniceps*
	Abdominal segment 9 less than twice as long as wide at base.	2
2	Vestigial dorsal hook, represented on segment 9 by small flattened triangular rearward projection on middorsal line, not hooklike in form.	3
	Nothing representing a hook on 9.	4
3	Front border of median lobe straight; Teeth on inner margin of lateral lobe large; Lateral spines of 9 shorter than segment 10.	*notatus*
	Front border of median lobe slightly convex; Teeth on inner margin of lateral lobe small; Lateral spines of 9 may be as long as segment 10.	*plagiatus*
4	Total length less than 34 mm.; Median lobe of labium very convex.	*amnicola*
	Total length more than 34 mm.; Median lobe of labium only slightly convex.	*scudderi*

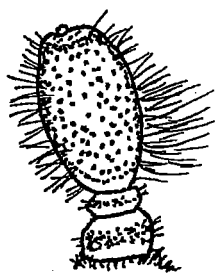
Note: See Walker (1928) for a complete description of the nymphs of *Stylurus*.



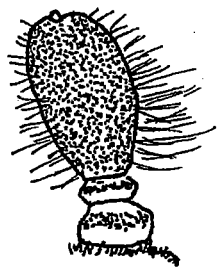
Traced from Walker (1928)

Palpal Blades of Hylogomphus:





Parvulus



Vernalis

Antennae of Lanthus

Key to the species of the genus *Lanthus*:

From Carle (1980)

1	Third antennal segment with dorsal papilliform setae dense, forming smooth surface; Teeth of labial palp in curved row; Median abdominal groove extended to base of tergum 9.	*vernalis*
	Third antennal segment with dorsal papilliform setae sparse, not forming smooth surface; Teeth of labial palp in a straight row; Median abdominal groove not extended to base of tergum 9.	*parvulus*

Key to the species of the genus *Arigomphus*:

From Walker (1958) [Note: Needham and Westfall's (1954) key seldom works for these two species]

1	Length of abdominal segment 9 greater than its basal width.	*furcifer*
	Length of abdominal segment 9 about equal to its basal width.	*villosipes*

Key to the species of the genus *Hylogomphus*:

From Needham and Westfall (1954)

1	Small vestiges of middorsal hooks on abdominal segments 8 and 9.	2
	No vestiges of dorsal hooks on any abdominal segments. (Length of grown nymph 27 mm.)	*viridifrons*
2	Length of grown nymph 24 mm.; End hook on lateral lobe of labium hardly projecting beyond tip of tooth before it on inner margin.	*abbreviatus*
	Length of grown nymph 26 mm.; End hook better developed, its tip distinctly projecting beyond tip of tooth before it.	*adelphus*

Note: Couplet 2 seldom works in practice. Grown nymphs of both species measure about 24 mm when alive, and stretch out to about 26 mm as exuviae. The end tooth of the labial blade is only slightly more reliable as a character. If you visualize a line from the base of the blade following in a curve along the tips of the teeth and continuing along the same curve beyond the penultimate tooth, the end tooth of *abbreviatus* will project only slightly beyond the line, whereas the end tooth of *adelphus* will project farther. Still, its a judgement call with a high potential for error.

Key to the species of the genus *Gomphus*:

Adapted from Needham and Westfall (1954)

1	Lateral spines on abdominal segments 7 to 9 (very minute if present on 6).	2
	Lateral spines of abdominal segments 6 to 9 well developed.	3
2	Lateral spines of 9 about one tenth as long as segment 10.	*borealis*
	Lateral spines of 9 about half as long as segment 10.	*spicatus*
3	Superior caudal appendage (epiproct) shorter than inferiors (paraprocts); Teeth on lateral lobes of labium obsolete or poorly developed.	*quadricolor*
	Superior caudal appendage (epiproct) as long as inferiors (paraprocts); Teeth on lateral lobes of labium well developed.	4
4	Medium lobe of labium straight-edged.	*lividus*
	Medium lobe of labium convex-edged.	5
5	Total length less than 27 mm.; End hook on lateral lobe of labium projecting well beyond level of tips of teeth.	*exilis*
	Total length more than 28 mm.; End hook more or less even with other teeth, hardly projecting beyond tip.	*descriptus*

Note: The weakest aspect of this key is couplet 4, as it applies to *Gomphus descriptus*, the difference in the "convexity" of the median lobe between *lividus* and *descriptus* being very slight and difficult to discern in practise. Donnelly (pers. comm.) has found that, at least with New York specimens, the posterior narrowing of the median lobe of the labium is more abrupt in *lividus*, and relatively gradual in *descriptus*. Also, the labial teeth are better developed in *lividus* than in *descriptus*. These characters are so relative that any unknown suspected of being either of these species should be compared to reference specimens.

KEY TO THE GENERA OF THE FAMILY AESHNIDAE

Adapted from Needham and Westfall (1954)

1	Hind angles of head angulate.	2
	Hind angles of head rounded (sometimes slightly angulate in *Aeshna eremita*). lateral spines on segments 5-9 →	5
2	Blade of lateral lobe of labium wide and squarely truncated on outer end.	*Boyeria*
	Blade of lateral lobe of labium narrowed toward tip and with stronger end hook.	3
3	Dorsum of abdomen broadly rounded.	*Basiaeschna* (One species, *Basiaeschna janata*)
	Dorsum of abdomen with low median ridge.	4
4	Blunt dorsal hooks on median ridge.	*Nasiaeschna* (One species, *Nasiaeschna pentacantha*)
	No dorsal hooks on median ridge.	*Epiaeschna* (One species, *Epiaeschna heros*)
5	Lateral spines on abdominal segments 7 to 9 only.	6
	Lateral spines on abdominal segments 5 or 6 to 9.	*Aeshna*
6	Antenna longer than distance from its base to rear of head.	*Gomphaeschna*
	Antenna about half as long as this distance.	*Anax*

Key to the species of the genus *Boyeria*:

Needham and Westfall (1954)

---

1 Length when grown 37 - 39 mm.;
Lateral spines on abdominal segments 4 to 9 (minute on 4);
Mentum of labium more than twice as long as its median width;
Inferior caudal appendages (paraprocts) stouter, scarcely incurved at tips;
Apex of superior anal appendage (epiproct) uncleft and sharply pointed;
Epiproct as long as paraprocts. *grafiana*

Length when grown 34 - 37 mm.;
Lateral spines on abdominal segments 5 to 9;
Mentum of labium less than twice as long as its median width;
Inferior appendages more slender, distinctly incurved at tips;
Apex of superior appendage (epiproct) deeply emarginate (cleft);
Epiproct distinctly shorter than paraprocts. *vinosa*

Key to the species of the genus *Gomphaeschna*:

From Daigle (1992)

---

1 Antennal segments 6. *furcillata*

Antennal segments 7. *antilope*

Key to the species of the genus *Anax*:

From Needham and Westfall (1954)

---

1 Lateral lobes of labium tapering to a hooked point;
Total length about 40 mm. *junius*

Lateral lobes of labium squarely truncate;
Total length about 55 mm. *longipes*

Key to the species of the genus *Aeschna*:

Adapted from Walker (1958)

1	Palpal lobes tapering to slender, slightly curved points.	*constricta*
	Palpal lobes truncate or abruptly hooked.	2
2	Antennae 6-segmented; Lateral spines on abdominal segments 7 to 9 (if present on 6, minute); Small northern species.	3
	Antennae 7-segmented; Lateral spines on abdominal segments 5 or 6 to 9.	4
3	Width of folded labium 70 percent of length; Lateral spines on 7 to 9 only.	*sitchensis*
	Width of folded labium 58 percent of length; Lateral spines on 6 to 9, on 6 minute and not always present.	*septentrionalis*
4	Lateral spines on 5 to 9 (minute on 5); Posterolateral margins of head somewhat obtusangulate.	*eremita*
	Lateral spines on 6 to 9 only; Posterolateral margins of head rounded.	5
5	Eyes widest at, or a little behind, the middle (using posterolateral margin of eye as posterior limit of measurement); Postocular lateral margins of head convexly curved.	6
	Eyes widest in front of middle; Postocular lateral margins of head nearly straight.	*umbrosa*
6	Width of folded labium 78 to 80 percent of its length, width at base scarcely more than half the width at the palpal articulation.	*mutata*
	Width of folded labium rarely over 70 percent of length and not over 75 percent, width at base variable.	7

7 Folded labium slightly longer than hind femora, reaching level of hind coxae, its distal width 55 percent of its length. *tuberculifera*

Folded labium slightly shorter than hind femora, not reaching beyond middle coxae, its distal width 60 - 75 percent of its length. 8

8 Femora dark with three pale annuli;
Abdomen marked with irregular pale blotches on a darker ground color. *interrupta*

Femora uniform;
Abdomen more or less distinctly striped lengthwise, with a dark median stripe bordered by pale stripes. 9

9 Lateral spines on 6 vestigial;
Longitudinal stripes of abdomen somewhat broken into segmental spots, not always distinct, the dark median stripe no darker than the lateral dark areas. *juncea*

Lateral spines on 6 not vestigial, though small;
Longitudinal stripes of abdomen clear-cut, the median stripe usually darker than the lateral dark areas. 10

10 Palpal lobes squarely truncate with the outer distal angle very little rounded, the opposing distal margins of the paired lobes parallel. *verticalis*

Palpal lobes not squarely truncate, the outer distal angles distinctly rounded, the opposing distal margins of the paired lobes not parallel. 11

11 Palpal lobes each terminating in a very abruptly curved, and almost truncate, hook;
Dark median stripe deepened about the dorsal puncta. *canadensis*

Palpal lobes each terminating in a broadly curved hook;
Dark median stripe not deepened about the dorsal puncta. *clepsydra*

Alternate key to the species of the genus *Aeshna*:

Adapted from Needham and Westfall (1954)

Types of lateral labial lobes used in this key:

A B C D E

1	Lateral spines on abdominal segments 5 to 9 (on 5 minute); Hind angles of head obtusely angulate.	*eremita*
	Lateral spines well developed on 6 to 9; Hind angles of head rounded.	2
	Lateral spines on 7 to 9 (if present on 6, minute).	9
2	Blade of lateral lobe of labium type A.	*constricta*
	Blade wider than A.	3
3	Blade shaped about like B.	4
	Blade wider than B.	5
4	Width to length ratio of labial mentum approx. 10:13; Lateral spines of abdominal segment 8 about as long as those of 9.	*canadensis*
	Width to length ratio of labial mentum approx. 10:14; Lateral spines of 8 longer than those of 9.	*clepsydra*
5	Blade shaped about like C.	6
	Blade wider than C.	7

6	Blade with minute triangular tooth on innermost angle.	*verticalis*
	Blade merely sharply angulate there.	*(mutata ?)*
7	Blade shaped about like D.	8
	Blade shaped about like E.	*umbrosa*
8	Lateral spines of 8 longer than those of 9; Width to length ratio of labial mentum approx. 10:17.	*tuberculifera*
	Lateral spines of 8 shorter than those of 9; Mentum much shorter.	*interrupta*
9	Length of grown nymph more than 36 mm.; Lateral spines of 8 shorter than those of 9; Caudal appendages in ratio of 6:8:10 (cerci:epiproct:paraprocts).	*juncea*
	Length of grown nymph less than 35 mm.; Lateral spines of 8 as long as or longer than those of 9; Caudal appendages in ratio of 5:7:10.	10
10	Blade type E; Lateral spines of 8 as long as those of 9; Ovipositor of female about as long as 9th sternite.	*septentrionalis*
	Blade type D; Lateral spines of 8 longer than those of 9; Ovipositor about 1.2 times as long as 9th sternite.	*sitchensis*

KEY TO THE GENERA OF THE FAMILY MACROMIIDAE

Adapted from Needham and Westfall (1954)

---

1 Lateral spines of abdominal segment 9 reach to rearward to level of tips of inferior appendages;
Bulging sides of head hardly narrowed behind eyes;
Lateral setae of labium = 3;
No dorsal hook on segment 10. *Didymops*
(One species, *Didymops transversa*)

Lateral spines of abdominal segment 9 do not reach to rearward to level of tips of inferior appendages;
Sides of head somewhat convergent behind eyes to pair of low tubercles on hind angles;
Lateral setae of labium = 6;
Small dorsal hook on segment 10. *Macromia*

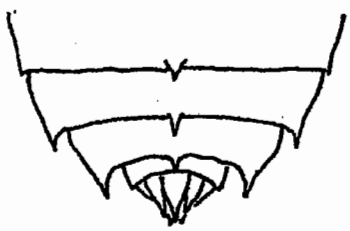
Key to the species of *Macromia*:

Adapted from Needham and Westfall (1954)

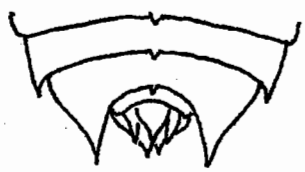
Note: One species, *Macromia illinoiensis*, is widespread throughout the northeastern states. A second species, *Macromia alleghaniensis*, occurs in the New Jersey pine barrens.

1 Lateral spines of abdominal segments 8 and 9 directed straight to rearward. *illinoiensis*

Lateral spines of abdominal segments 8 and 9 incurved, especially 8. *alleghaniensis*



Macromia



Didymops

KEY TO THE GENERA OF THE FAMILY CORDULIIDAE

from Needham and Westfall (1954), omits *Williamsonia*

---

1 Pair of small tubercles on top of head;
Lateral lobe of labium with 4 or 5 setae (except sometimes 6 or 7 in *Neurocordulia*). 2

No tubercles on top of head;
Lateral lobe of labium with 6 or 7 setae. 3

2 Strong lateral spines of abdominal segment 8 very divergent and as strong as parallel spines of 9. *Neurocordulia*

Lateral spines of abdominal segment 8, if divergent at all, much weaker than those of 9;
Small setae on middle lobe of mentum numerous. *Epicordulia*
(One species, *Epicordulia princeps*)

3 Dorsal hooks large, laterally flattened, generally cultriform 4

Dorsal hooks rudimentary or lacking: not flattened laterally or cultriform, but small obtuse or pointed prominences. 6

4 Lateral spines of segment 9 more than half its middorsal length;
Dorsal hooks on segments 2 to 9 (highest on segments 6 or 7), often cultriform and sharp. *Tetragoneuria*

Lateral spines of segment 9 less than half its middorsal length;
Dorsal hooks less developed. 5

5 Dorsal hooks on segments 2 to 9 laterally flattened, but obtuse at apices. *Somatochlora*

Dorsal hooks on segments 6 to 9 (longest on 8), cultriform. *Helocordulia*
(One species, *Helocordulia uhleri*)

6 Hind angles of head rounded;
Lateral spines of segment 9 one-fifth as long as its middorsal length. 7

Hind angles of head angulate superiorly;
Lateral spines of segment 9 about one-third as long as its middorsal length. *Dorocordulia*

7 Teeth on lateral lobes of labium deeply cut and separated by rather wide notches. *Somatochlora*

Teeth low, separated only by shallow crenulations. *Cordulia*
(One species, *Cordulia shurtleffi*)
Broad stripes across "shoulder" thorax

ALTERNATE KEY TO THE GENERA OF THE FAMILY CORDULIIDAE

from Walker and Corbet (1975), includes *Williamsonia*

---

1 Dorsal hooks present and well developed on some of the abdominal segments. 2

Dorsal hooks absent or reduced to low knobs. 6

2 Lateral spines on segment 8. 3

No lateral spines on segment 8. *Williamsonia*

3 Crenations on distal margin of labial palpi nearly semicircular or even more deeply cut;
Lateral spines on segment 8 divergent. *Neurocordulia*

Crenations of labial palpi much shallower than a semicircle;
Lateral spines on segments 8 and 9 about equal in length, those on segment 8 not or scarcely divergent 4

4 Lateral spines on segment 9 more than three times as long as those on segment 8, being at least as long as the middorsal length of segment 9 and usually much longer. *Epitheca*
(includes subgenera *Epicordulia* and *Tetragoneuria*)

Lateral spines on segments 8 and 9 short and about equal in length, or absent, those of segment 9 never as much as twice as long as those of segment 8. 5

5 Dorsal hooks on segments 6 to 9 only, minute on segment 6, those on 7 to 9 as long as the segment or longer. *Helocordulia*
(One species, *Helocordulia uhleri*)

Dorsal hooks on segments 3 or 4 to 9, spine-like and usually curved. *Somatochlora*

6 Sides of thorax with a broad dark longitudinal stripe. 7

Sides of thorax uniformly colored. *Somatochlora*

7 Total length 23 mm.;
Dorsal hooks absent or vestigial. *Cordulia*
(One species, *Cordulia shurtleffi*)

Total length 19 mm.;
Dorsal hooks stubby but distinct. *Dorocordulia*

Key to the species of the genus *Neurocordulia*:

From Byers (1937)

---

1 Lateral spines of 9 as long as the corresponding segment, extending beyond the tips of the caudal appendages;
Dorsal hooks forming prominent tubercles on segments 7 to 9;
Length 20 - 21 mm. *obsoleta*

Lateral spines of 9 about 30 to 50 percent the length of segment 9, not extending beyond the tips of the caudal appendages;
Dorsal hooks of segments 7 to 9 reduced to scarcely more than a short ridge;
Length 22 - 24.5 mm. *yamaskanensis*

lateral spines of segment 9 even with tips of caudal appenages *michaelis* (Brunelle)

Key to the species of the genus *Dorocordulia*:

From Walker and Corbet (1975)

---

1 Low dorsal hook on segment 9. *lepida*

Neither a dorsal hook nor a ridge on segment 9. *libera*

Key to the species of the genus *Williamsonia*:

From Charlton and Cannings (1993)

---

1 Lateral spine on segment 9 approx. 0.38 mm. (0.37 - 0.40);
Total length of segment 9 (measured laterally) approx. 1.72 mm. (1.70 - 1.75);
Tips of the lateral spines of segment 9 extend rearward to about the tips of the cerci;
Dorsal abdominal hooks of segments 8 and 9 about 0.35 mm. (0.30 - 0.40) long. *fletcheri*

Lateral spine on segment 9 approx. 0.55 mm. (0.47 - 0.60);
Total length of segment 9 (measured laterally) approx. 2.08 mm. (2.00 - 2.22);
Tips of the lateral spines of segment 9 almost always reach beyond the cerci, and in some specimens, beyond the tips of the paraprocts;
Dorsal abdominal hooks of segments 8 and 9 about 0.22 mm. (0.18 - 0.27) long. *lintneri*

Key to the species of the genus (subgenus) *Tetragoneuria*:

Constructed from Walker and Corbet (1975), Needham and Westfall (1954), Tennessen (1977), and Tennessen (1994).

1	Lateral spines of segment 9 pointing directly backward, their axes parallel. (premental setae not less than 11)	2
	Lateral spines of segment 9 distinctly divergent.	*spinigera* (northern lake species)
2	Lateral spines of segment 9 short, ~~barely~~ attaining the tips of the ~~caudal appendages.~~ cerci	3
	Lateral spines of segment 9 long, ~~extending well beyond the~~ tips of the ~~caudal appendages, usually by twice its length or more.~~ cerci	4
3	Lateral spines of segment 9 extend rearward to about the tips of the paraprocts; Paraprocts in lateral view nearly straight; Ratio of cerci length to segment 9 lateral spine length 0.72 (0.64 - 0.84).	*spinosa*
	Lateral spines of segment 9 do not reach level of tips of paraprocts; Paraprocts in lateral view slightly to moderately decurved; Ratio of cerci length to segment 9 lateral spine length 1.18 (1.05 - 1.34).	*canis*
4	Length of grown nymph about 22 mm.	5
	Length of grown nymph about 19 mm.	*semiaquea* (coastal plain)
5	Lateral spine of segment 9 about as long as middorsal length of 9. premental setae not more than 10	*cynosura*
	Lateral spine of segment 9 about 2.5 to 3.5 times the middorsal length of 9.	*costalis*

Note: Parts of this key (especially *costalis*, *spinosa*, and *semiaquea*) are based on small samples from restricted parts of their ranges. Much more study needs to be done before a more adequate key can be constructed.

Caudal appendages = cerci

Key to the species of the genus (subgenus) *Tetragoneuria*:

Constructed from Walker and Corbet (1975), Needham and Westfall (1954), Tennessen (1977), and Tennessen (1994).

1	Lateral spines of segment 9 short, barely attaining the tips of the caudal appendages.	2
	Lateral spines of segment 9 long, extending well beyond the tips of the caudal appendages, usually by twice its length or more.	3 for non-coastal plain spp. → 4
2	Lateral spines of segment 9 extend rearward to about the tips of the paraprocts; Paraprocts in lateral view nearly straight; Ratio of cerci length to segment 9 lateral spine length 0.72 (0.64 - 0.84).	*spinosa*
	Lateral spines of segment 9 do not reach level of tips of paraprocts; Paraprocts in lateral view slightly to moderately decurved; Ratio of cerci length to segment 9 lateral spine length 1.18 (1.05 - 1.34).	*canis*
3	Length of grown nymph about 22 mm.	4
	Length of grown nymph about 19 mm.	*semiaquea*
4	Lateral spine of segment 9 about as long as middorsal length of 9.	*cynosura*
	Lateral spine of segment 9 about 2.5 to 3.5 times the middorsal length of 9.	*costalis*

Note: Parts of this key (especially *costalis*, *spinosa*, and *semiaquea*) are based on small samples from restricted parts of their ranges. Much more study needs to be done before a more adequate key can be constructed.

Key to the species of the genus *Somatochlora*:

Adapted from Daigle (1991) [omits *incurvata*; nymph unknown]

1	Dorsal hooks present.	2
	Dorsal hooks absent.	10
2	Dorsal hooks falciform, acute, the last one projecting beyond the middle of segment 10.	3
	Dorsal hooks low knobs, not falciform, the last one not projecting to the middle of segment 10.	*williamsoni*
3	Epiproct of male nearly flat above, ante-apical tubercles of male not at all elevated.	4
	Epiproct of male longitudinally concave, ante-apical tubercle slightly elevated. Mental setae 11-12 20mm when full grown	*tenebrosa*
4	Lateral abdominal spines at least half as wide as long; Epiproct not acuminate.	5
	Lateral abdominal spines less than half as wide as long; Epiproct acuminate with a very slender tip.	6
5	Cerci 0.8 or less the length of the epiproct; Transverse series of long prominent setae on posterior margin of abdominal segments.	*filosa*
	Cerci equal in length to epiproct; No series of long prominent setae on posterior margins of abdominal segments.	*linearis*
6	Hind tibiae greater than 8.4 mm.; Hind femora greater than 7.4 mm.	*elongata*
	Hind tibiae less than 8.4 mm.; Hind femora less than 7.4 mm.	7

Ante-apical tubercle: apex of developing inferior appendage as adult.

7	Dorsal hooks present on segments 3 to 9; Dorsal hook of segment 4 in lateral view about 0.75 times the length of hook on segment 5.	*minor*
	Dorsal hooks present on segments 4 or 5 to 9; Dorsal hook of segment 4, if present, less than 0.5 times the length of hook on segment 5.	8
8	Epiproct longer than the cerci; Dorsal hooks on abdominal segments 7 to 9 nearly straight in lateral view.	*provocans*
	Epiproct distinctly shorter (male) or nearly the same length (female) as cerci; Dorsal hooks on segments 7 to 9 slightly decurved in lateral view.	9
9	Dorsal hooks on segments 5 to 9; Premental setae 12.	*georgiana*
	Dorsal hooks on segments 4 to 9; Premental setae 9 or 10.	*walshii*
10	Labium extending laterally over inner edge of eyes; Male cerci with outer margins not regularly arcuate, more or less sinuate; Lateral spines on both segments 8 and 9.	11
	Labium not extending laterally over inner edge of eyes; Male cerci with outer margins regularly arcuate; Lateral spines, when present, confined to segment 9.	12
11	Metafemur long, usually greater than 7.3 mm.; Abdomen with median series of slightly elevated dorsal prominences; Epiproct of male with a distinct knob on each side.	*cingulata*
	Metafemur less than 7.3 mm.; Abdomen without dorsal prominences; Epiproct of male without lateral knobs.	*albicincta*

12	Fringe of hair on hind margins of abdominal segments 6 to 9 forming two rows of dorsolateral tufts; Lateral spines absent from 9 or represented by very minute denticles; Palpal setae 9 or 10.	*forcipata*
	Fringe of hair on hind margins of abdominal segments 6 to 9 not forming two rows of dorsolateral tufts; Lateral spines normally present on 9; Palpal setae 7 or 8.	13
13	Fringe of hair on middle of hind margins of segments 7 and 8 forming a thick dorsal tuft.	*kennedyi*
	Fringe of hair on hind margins of 7 and 8 not forming median tuft; Fringe of hair on hind margins of 8 and 9 equal, or almost equal, to median length of corresponding segment.	*franklini*

KEY TO THE GENERA OF THE FAMILY LIBELLULIDAE

Adapted from Needham and Westfall (1954)

1	Eyes capping the fronto-lateral part of the head; Abdomen long and tapering.	2
	Eyes lower, more broadly rounded and more lateral in position; Abdomen usually ending more bluntly.	4
2	Margin of median lobe of labium ~~smooth.~~ not evenly crenulated	*Libellula*
	Margin of median lobe of labium crenulate.	3
3	Dorsal hook present on segment 8.	*Ladona*
	No dorsal hook on 8.	*Plathemis* (One species, *Plathemis lydia*)
	(Note: *Ladona* and *Plathemis* are included in *Libellula* by some authorities)	
4	Inferior abdominal appendages (paraprocts) strongly decurved at tip.	*Erythemis* (One species, *Erythemis simplicicollis*)
	These appendages straight or nearly so.	5
5	Dorsal hooks on some abdominal segments.	6
	No dorsal hooks on any abdominal segments.	10
6	Dorsal hook on 9	*Perithemis* (One species, *Perithemis tenera*)
	No dorsal hook on 9	7
7	Dorsal hook on 8	8
	No dorsal hook on 8	9

8	Superior abdominal appendage (epiproct) as long as, or nearly as long as, inferiors (paraprocts).	*Leucorrhinia*
	Superior abdominal appendage (epiproct) much shorter than inferiors (paraprocts).	*Sympetrum*
9	Lateral spines of segment 9 much longer than its middorsal length.	*Celithemis*
	Lateral spines of segment 9 not longer than its middorsal length.	*Erythrodiplax* (One species, *Erythrodiplax berenice*)
10	Lateral spines of segment 9 much longer than its middorsal length.	11
	Lateral spines of segment 9 not longer than its middorsal length.	13
11	Lateral spines on segment 8 about half as long as on 9.	*Pachydiplax* (One species, *Pachydiplax longipennis*)
	Lateral spines on 8 nearly as long as on 9.	12
12	Superior abdominal appendage (epiproct) as long as, or longer than, inferiors.	*Pantala*
	Superior abdominal appendage (epiproct) shorter than inferiors.	*Tramea*
13	Small species: length 10 mm.; Lateral setae = 6; End of abdomen truncated and very hairy.	*Nannothemis* (One species, *Nannothemis bella*)
	Larger species: length 12 to 20 mm.; Lateral setae more than 6.	14
14	Lateral spines of segment 8 very minute or lacking.	*Tarnetrum* (one species, *T. corruptum*, now = *Sympetrum corruptum*)
	Lateral spines of segment 8 at least half as long as those on 9.	*Leucorrhinia*

Key to the species of the genus *Celithemis*:

Adapted from Daigle (1992) [omits *martha*; nymph unknown?]

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1 Eyes tapered posterolaterally to an acutely conical, pointed tip;
Lateral spines on segment 9 more than twice the middorsal length of 9. 2

Eyes rounded laterally;
Lateral spines on segment 9 not more than twice the middorsal length of 9. 4

2 Abdomen and legs with sharply contrasting color pattern;
Palpal setae 9, rarely 10;
Dorsal hook on segment 4 vestigial;
Dorsal hook on segment 5 much smaller than on 7. *fasciata* (= monomelaena)

Abdomen without definite color pattern;
Palpal setae 8;
Dorsal hook on 4 high;
Dorsal hook on 5 as large as hook on 7. 3

3 Premental setae 11;
Length when fully grown 15 - 16 mm. *verna*

Premental setae 12 - 13;
Length when fully grown 17 - 18 mm. *ornata*

4 Length when grown (last instar) 19 mm. or more;
Lateral spines on segment 9 more than twice the middorsal length of 9. *eponina*

Last instar less than 17 mm.;
Lateral spines on segment 9 not more than twice the middorsal length of 9. *elisa*

Key to the species of the genus *Ladona* (subgenus of *Libellula*)

Couplet 1 from Bennefield (1965)
Couplet 2 based on a small series of exuviae from Cumberland County, New Jersey and Orange County, New York. Nymph of *exusta* remains undescribed.

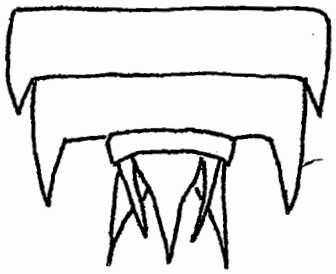
1	Mental setae 3.	*julia*
	Mental setae absent.	2
2	Anal pyramid more than twice as long as its basal width; Palpal setae 6; Lateral spines of segment 9 longer than those of 8.	*deplanata*
	Anal pyramid less than twice as long as its basal width; Palpal setae 5; Lateral spines of segment 9 shorter than those of 8.	*exusta*

Key to the species of the genus *Pantala*

Combined from Needham and Westfall (1954), Walker and Corbet (1975), and Daigle (1992)

1	Body pattern of brown conspicuous; Epiproct as long as paraprocts; Palpal setae 15 - 18; Width of base of lateral spine on segment 9 more than one-third the length of that spine; Epiproct with rounded dorsal surface when viewed laterally; Tiny dorsal hooks on segments 3 and 4.	*hymenaea*
	Body pattern pale; Epiproct longer than paraprocts; Palpal setae 12 - 14; Width of base of lateral spine on segment 9 one-third or less than the length of that spine; Epiproct without rounded dorsal surface when viewed laterally; Dorsal hooks absent.	*flavescens*

PANTALA Abdominal Termini :



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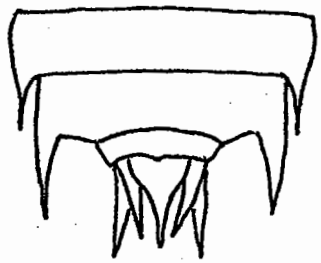

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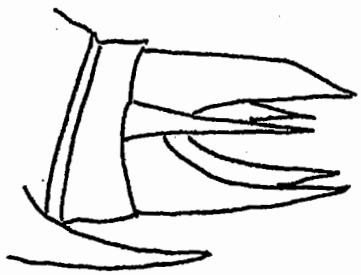
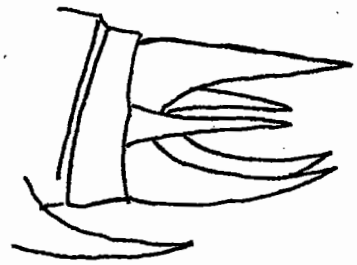
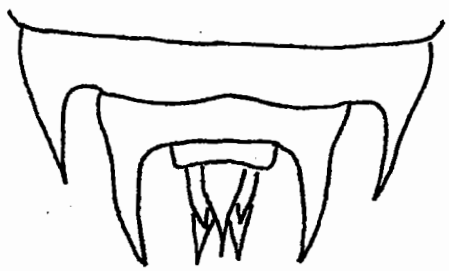
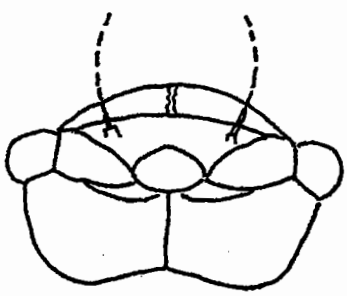


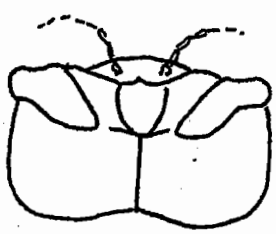




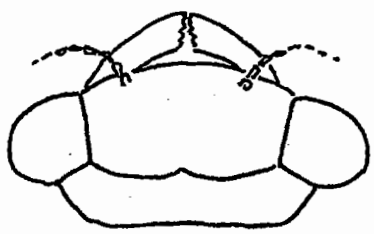
TRAMEA



Libellula quadrimaculata



Plathemis lydia



Pachydiplax longipennis

HEAD SHAPES OF LIBELLULIDS

Key to the species of the genus *Tramea*

Combined from Needham and Westfall (1954) and Walker and Corbet (1975)

1	Lateral spines of segment 8 directed straight to rearward; Paraprocts longer than epiproct; Two rows of spinules on upper surface of epiproct.	*carolina*
	Lateral spines of segment 8 incurved; Paraprocts shorter than epiproct; A few scattered spinules on upper surface of epiproct.	*lacerata*

Key to the species of the genus *Sympetrum*

Adapted from Walker and Corbet (1975)

1	Dorsal hooks absent.	*corruptum* (western migrant; probably non-breeding in our area)
	Dorsal hooks present (at least on segments 5 to 7).	2
2	Dorsal hook on segment 8.	3
	No dorsal hook on segment 8.	4
3	Dorsal hook on abdominal appendage 4.	5
	No dorsal hook on segment 4.	*rubicundulum*
4	Lateral spines on segment 9 about one-fourth the lateral length of 9 (including the spine).	*danae*
	Lateral spines on segment 9 about one-fifth the length of the segment.	*internum*
5	Lateral spines on segment 9 extending posteriorly beyond tips of cerci by at least one-third of length of cercus.	6
	Lateral spines on segment 9 not extending posteriorly beyond tips of cerci or, if doing so, by less than one-third of length of cercus.	7

6 Lateral spines on segment 8 scarcely twice, and those of segment 9 two and one-half times, as long as their widths at base;
Outer margins of lateral spines on segment 9 distinctly incurvate;
Cerci one-half as long as the paraprocts;
Paraprocts not acuminate. *semicinctum*

Lateral spines on segment 8 more than twice, and those of segment 9 three times, as long as their widths at base;
Outer margins of lateral spines on segment 9 nearly straight;
Cerci less than one-half as long as paraprocts;
Paraprocts usually acuminate. *vicinum*

7 Lateral spines on segment 9 more than one-third the lateral length of segment 9, including the spine. 8

Lateral spines on segment 9 less than one-third the length of 9, *obtrusum*

8 Dorsal hook on segment 8 extending posteriorly over about one-half the middorsal length of tergite of segment 9. *ambiguum*

Dorsal hook on segment 8 extending posteriorly only barely beyond the anterior margin of tergite of segment 9. *costiferum*

Note: In practise, this key is very difficult, and has been further confused by the recent description of a new species, *Sympetrum janeae* Carle (1993), which was erected to solve complex taxonomic problems in the *rubicundulum/internum* group of this genus. Carle did not include a nymphal key in his description, but stated:

> **The larva of S. janeae sp. n. is distinguished from that of related species by having a vestigial dorsal hook on abdominal segment 4, by having a well-developed dorsal hook on segment 8, and by having the lateral spine of segment 9 ca. 1/4 the length of segment 9 including the spine.**

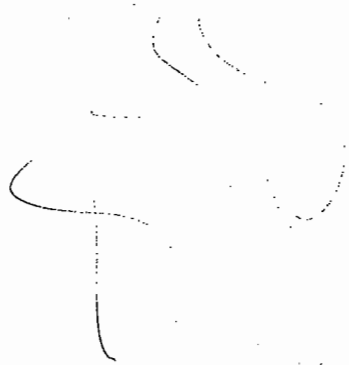
It is difficult to fit these characters into Walker and Corbet's key especially since Carle's sketch of *rubicundulum* shows a well-developed middorsal hook on segment 4.

Key to the species of the genus *Libellula*

Adapted from Needham and Westfall (1954) [omits *flavida*; nymph unknown?]

1	Dorsal hooks lacking on one or two antepenultimate abdominal segments.	*pulchella*
	Dorsal hooks regularly present on segments 4 to 8.	2
2	Palpal setae 7 or more.	3
	Palpal setae 5 (sometimes 6 in *cyanea*).	5
3	Lateral spine of segment 8 not more than one-tenth as long as the lateral margin of 8 (including spine); Cerci about seven-tenths as long as paraprocts.	*quadrimaculata*
	Lateral spine of segment 8 three-tenths or four-tenths as long as the lateral margin of 8 (including spine); Cerci about half as long as paraprocts.	4
4	Largest dorsal hook on segment 8; Dorsal hook on segment 3 present; Mental setae of labium about 16.	*semifasciata*
	Largest dorsal hook on segment 6; No dorsal hook on segment 3; Mental setae of labium about 10.	*luctuosa*
5	Epiproct distinctly decurved at tip.	6
	Epiproct straight or only slightly decurved at extreme tip.	7
6	Length of last instar about 22 mm.; Cerci half as long as paraprocts.	*cyanea*
	Length of last instar about 26 mm.; Cerci less than half as long as paraprocts.	*incesta*

7	Epiproct, viewed dorsally, only slightly longer than basal width.	8
	Epiproct longer, more slender, subacuminate, at least one and one-half times as long as basal width.	9
8	Cerci slightly less than half as long as paraprocts.	*vibrans*
	Cerci slightly more than half as long as paraprocts.	*axilena*
9	Cerci about half as long as paraprocts.	*needhami*
	Cerci less than half as long as paraprocts; All appendages a little more slender, and dorsal hooks a little less hairy toward their bases.	*auripennis*



Key to the species of the genus *Leucorrhinia*

Adapted from Walker and Corbet (1975)

1	Dorsal hooks on segments 3 to 8; Venter of abdomen without continuous longitudinal dark bands, although transverse dark bands may be present.	2
	Dorsal hooks variable but usually absent on at least segments 7 and 8; Venter of abdomen with three conspicuous (rarely inconspicuous) continuous longitudinal dark bands.	4
2	Eyes very prominent; Lateral spines on segment 9 extending back nearly as far as tips of paraprocts.	*frigida*
	Eyes less prominent; Lateral spines on segment 9 not extending back as far as tips of paraprocts.	3
3	Dorsal hook on segment 7 as long as middorsal length of 7; Dorsal hook of segment 8 projecting well over the base of 9; Lateral spines on segment 8 more parallel and directed caudad, their outer margins not continuing the regular curve of the abdominal margin when viewed dorsally; Lateral spines of segment 9 extend beyond tips of cerci.	*intacta*
	Dorsal hook on segment 7 shorter than the middorsal length of 7; Dorsal hook of segment 8 projecting barely over the base of 9; Lateral spines on segment 8 slightly convergent, their outer margins continuing the general curve of the abdominal margin when viewed dorsally; Lateral spines on segment 9 not reaching beyond tips of cerci.	*proxima*
4	Length of last instar less than 18.5 mm.; Lateral spines on segments 8 and 9 with outer margins slightly divergent; Dorsal hooks absent, or vestigial on some segments.	*hudsonica*
	Length of last instar more than 18.5 mm.; Lateral spines on segments 8 and 9 with outer margins not divergent, but following the curved outline of the abdomen; Dorsal hooks absent.	*glacialis*

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Key to the species of the genus *Leucorrhinia*

Adapted from Walker and Corbet (1975)

---

1 Dorsal hooks on segments 3 to 8;
Venter of abdomen without continuous longitudinal dark bands, although transverse dark bands may be present. 2

Dorsal hooks variable but usually absent on at least segments 7 and 8;
Venter of abdomen with three conspicuous (rarely inconspicuous) continuous longitudinal dark bands. 4

2 Eyes very prominent;
Lateral spines on segment 9 extending back nearly as far as tips of paraprocts. *frigida*

Eyes less prominent;
Lateral spines on segment 9 not extending back as far as tips of paraprocts. 3

3 Dorsal hook on segment 7 as long as middorsal length of 7;
Dorsal hook of segment 8 projecting well over the base of 9;
Lateral spines on segment 8 more parallel and directed caudad, their outer margins not continuing the regular curve of the abdominal margin when viewed dorsally;
Lateral spines of segment 9 extend beyond tips of cerci. *intacta*

Dorsal hook on segment 7 shorter than the middorsal length of 7;
Dorsal hook of segment 8 projecting barely over the base of 9;
Lateral spines on segment 8 slightly convergent, their outer margins continuing the general curve of the abdominal margin when viewed dorsally;
Lateral spines on segment 9 not reaching beyond tips of cerci. *proxima*

4 Length of last instar less than 18.5 mm.;
Lateral spines on segments 8 and 9 with outer margins slightly divergent;
Dorsal hooks absent, or vestigial on some segments. *hudsonica*
usually

Length of last instar more than 18.5 mm.;
Lateral spines on segments 8 and 9 with outer margins not divergent, but following the curved outline of the abdomen;
Dorsal hooks absent. *glacialis*
usually.

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