This key has been reproduced from Brigham, Brigham and Gnilka (eds.) 1982. Aquatic Insects and Oligochaetes of North and South Carolina.

**Key to the Families of Mature Mayfly Nymphs of Eastern North America**
(after Edmunds, Allen and Peters 1963 and McCafferty 1975)

1. Thoracic notum enlarged to form a shield or carapace-like projection extending to the 6th abdominal segment and concealing the abdominal gills ..... Baetiscidae

   Thoracic notum not enlarged as above; at least some abdominal gills exposed.....2

2. Gills on abdominal segments 2-7 forked, with margins fringed; gills on 1st segment variable or absent; mandibular tusks usually present and projecting in front of head; if tusks absent, the anterolateral angles of head an pronotum with a dense crown of spines.....3

   Gills on abdominal segments variable, not as above; mandibular tusks absent .....7

3. Gills ventral; anterolateral angles of head and pronotum with a dense crown of spines; mandibular tusks absent ..... Behningiidae

   Gills lateral or dorsal; head without crown of spines; mandibular tusks present and projecting in front of head.....5

4. Gills lateral; forelegs not adapted for digging, tibiae cylindrical ..... Potamanthidae

   Gills dorsal; forelegs adapted for digging; tibiae flattened.....5

5. Femora of 1st pair of legs produced posteroproximally ventral to trochanters; tusks broadened laterally with armature consisting of a row of spurs along the lateral margins; terminal segment of labial palpi club-shaped, broadly rounded apically..... Palingeniidae

   Femora of 1st pair of legs not produced proximally as above; tusks either slender or without single row of spurs along the lateral margins; labial palpi not club-shaped, being either slightly rounded, pointed, truncate, or falcate apically .....6

6. Tusks divergent and usually upturned apically, with spines absent on distal 2/3; when present, spines located on basal part of tusk; labial palpi lateral to body of the labium; ventral edge of tibiae of the hind legs extending into a distinct acute point .....Ephemeridae

   Tusks convergent apically, with spines present to various degrees on the distal 2/3; labial palpi at right angle to the body of the labium; apex of tibiae of hind legs variable, not as above ..... .....Polymitarcyidae

7. Gills on abdominal segment 2 operculate, semi-quadrate, or quadrate, meeting or nearly meeting dorsally on midline; gills on segment 1 vestigial; gills on segments 3-7 with fringed margins .....8

   Gills variable, if those on segment 2 operculate, they are not quadrate, do not meet on the midline.....9

8. Operculate gills fused dorsally along midline; hind wing pads present; nymphs medium to large in size; a medial carina (ridge) may be present on abdominal segments 6 to 8.....Neoephemeridae

   Operculate gills not fused on midline; hind wing pads absent; nymphs small to medium in size (3mm to 7mm); medial carina absent on abdominal segments 6 to 8.....Caenidae

9. Gills absent or vestigial and tread-like on 1st abdominal segment; gills may be absent from segment 2, or 2 and 3.....10

   Gills present on abdominal segments 1-5, 1-6, or 1-7.....11

10. Lamellate gills present on abdominal segments 3-7 or 4-7; absent on segment 2 and sometimes segment 3; gills on segment 4 may be semi-operculate; gills on segment 1 absent or vestigial..... .....Ephemerellidae

    Lamellate gills present on abdominal segments 2-5 or 2-6; those on segment 2 operculate and triangular, or elongate-oval .....Tricorythidae

11. Abdominal gills on middle segments either forked, in clusters or filaments, or with double lamellae terminating in projections or points.....Leptophlebiiae

    Abdominal gills on middle segments variable, not as above.....12

12. Tuft of gills present on each maxillary palpus; forelegs without row or rows of long setae on inner margin .....Oligoneuriidae

    Tuft of gills absent on each maxillary palpus; forelegs without row or rows of long setae on inner margin .....12

13. Head and body flattened; gills with a lamella and fibrilliform portion (the fibrilliform portion is rarely reduced or absent) .....Heptageniidae

    Head and body variable in shape, not flattened as above; gills variable .....14

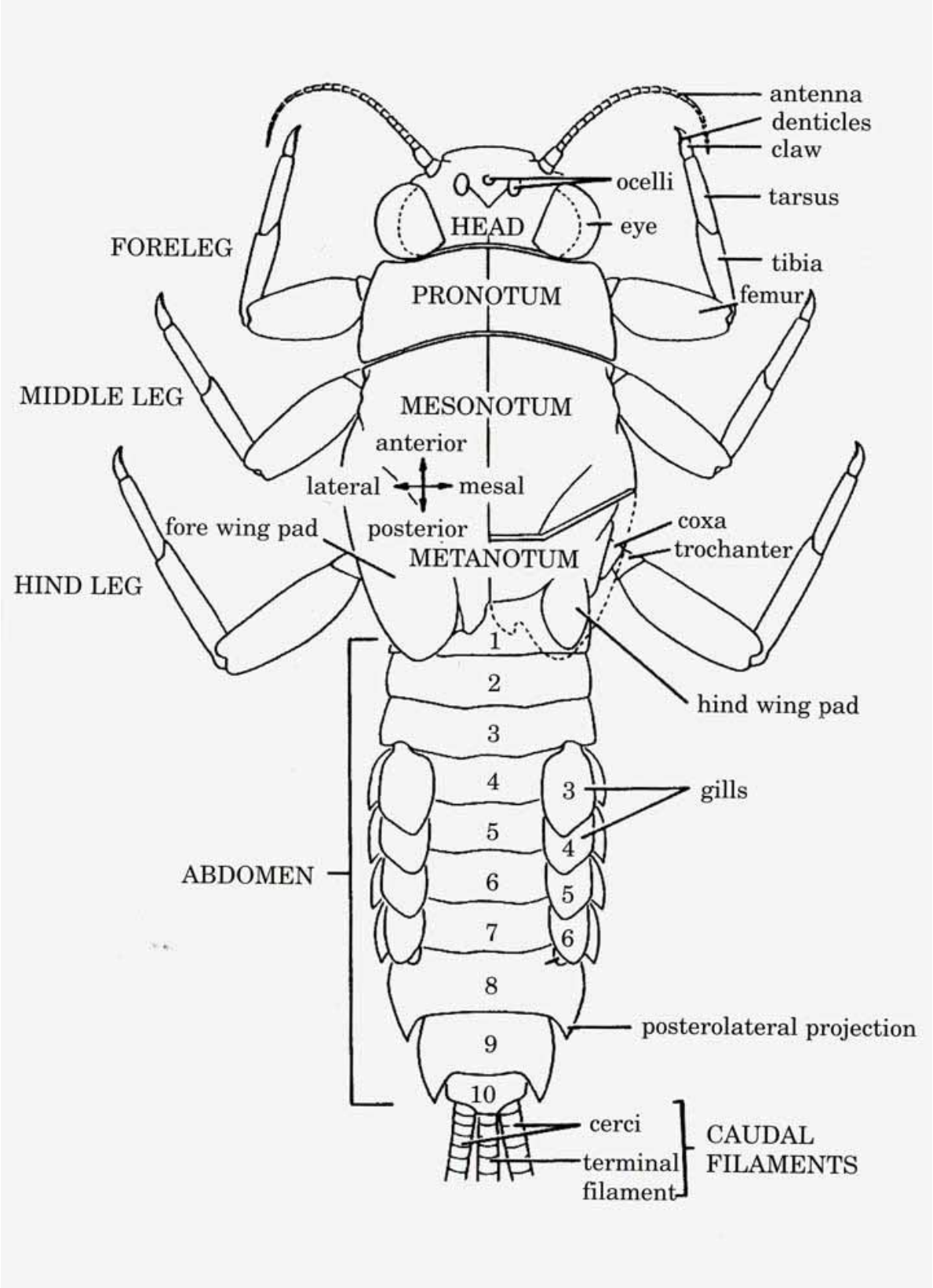
14. Claws of forelegs bifid; those of middle and hind legs single.....Metretopodidae

    Claws of forelegs similar in structure to those on the middle and hind legs although they a\may be shorter.....15

15. Antennae short, length less than twice the width of head; glossae and paraglossae of labium short and broad; posterolateral angles of abdominal segments 8 and 9, and sometimes preceding segments, produced into distinct, flattened spines; spines absent or weakly to moderately developed in *Ameletus*... ..... Siphlonuridae

    Antennae long, length more than 3 times the width of head; glossae and paraglossae long and narrow; posterolateral angles usually absent or weakly to moderately developed on abdominal segments 8 and 9.....Baetidae

# Basic Mayfly Morphology



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**Key to the Families of Mature Stonefly Nymphs of Eastern North America**
(after Ricker 1959; Gaufin, et al. 1972)

1. Paraglossa and glossa of labium of about equal length .....2

   Paraglossa of labium long than glossa.....7

2. Abdomen with ventral branched gills on segments 1 and 2 .....Pteronarcyidae

   Abdomen without ventral branched gills.....3

3. Form cockroach-like; thoracis sterna produced posteriorly into thin plates overlapping segment behind; ocelli 2.....Peltoperlidae

   Form typical, not cockroach-like; thoracic sterna not produced posteriorly; ocelli 3 .....4

4. 2nd tarsal segment, as seen in dorsal aspect, about as long as 1st segment.....Taeniopterygidae

   2nd tarsal segment much shorter than 1st.....5

5. Body stout, hind wing pads strongly diverging from axis of body; hind legs, when extended, reaching past end of abdomen.....Nemouridae

   Body cylindrical, elongate, hind wing pads nearly parallel to axis of body; hind legs not reaching past end of abdomen .....6

6. Dorsal sclerotized portion (tergite) and ventral sclerotized portion (sternite) of 1st 9 abdominal segments divided ventro-laterally by a membranous fold.....Capniidae

   Dorsal and ventral sclerotized portions of 1st 6 abdominal segments, or fewer, divided ventro-laterallyLeuctridae

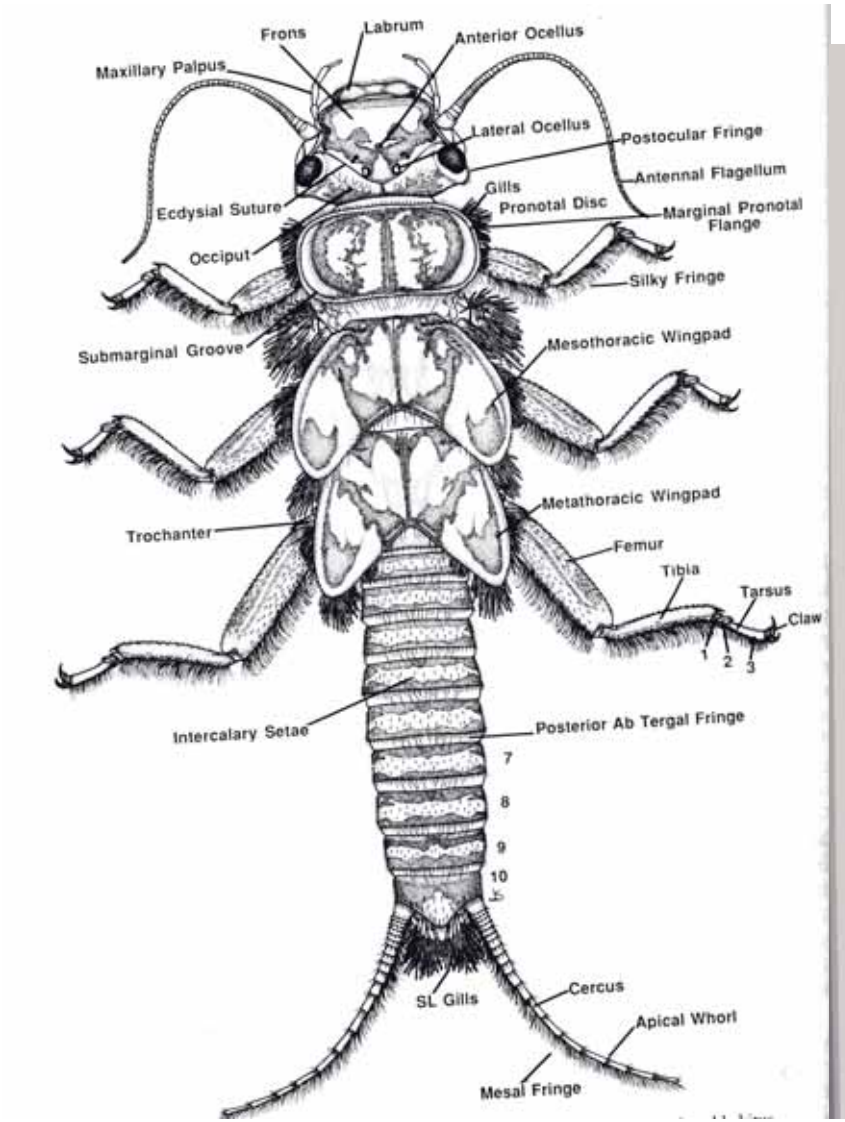
7. Profusely branched gills present at corners of thoracic sterna and above front coxae, usually also present above middle and hind coxae; paraglassa broadly rounded; galea with transverse suture near middle.....Perlidae

   Thoracic gills usually absent, but when present single or double; paraglossae pointed; galea not divided near middle9

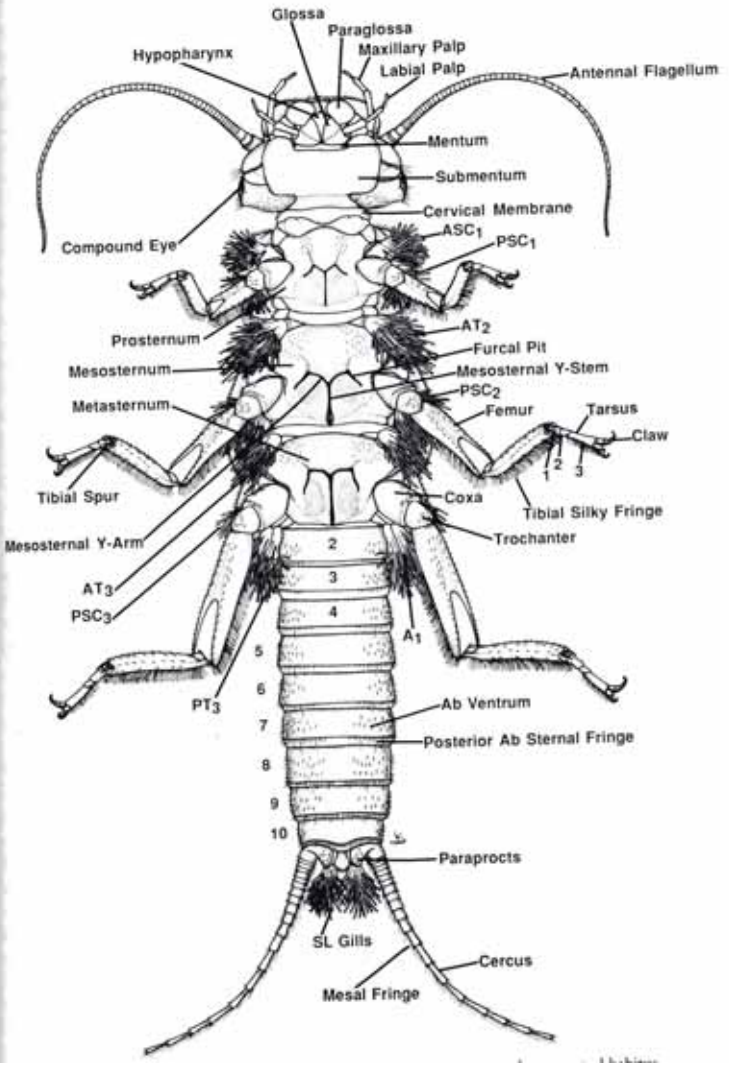
8. Medium to large size (10mm to 25 mm); body usually pigmented in a distinct pattern; hind wing pads set at an angle to axis of body, thus diverging; circus usually at least as long as or longer than abdomen; gills absent, or simple gills present on submentum, thorax, or abdomen .....Perlodidae

   Usually small in size (6mm to 13 mm), if moderately large, abdomen very narrow and elongate; body uniformly brown; hind wing pads nearly parallel to axis of body; circus not more than ¾ length of abdomen; external gills absent .....Chloroperlidae

# Basic Stonefly Morphology




Dorsal view




Ventral view

This key has been reproduced from Brigham, Brigham and Gnilka (eds.) 1982. Aquatic Insects and Oligochaetes of North and South Carolina.

**Key to the Families of Mature Caddisfly Larvae of Eastern North America**
(after Wiggins 1977 and Ross 1959)

1. Case helical in shape, resembling a snail shell and made of sand grains; anal claw with ventral comb of teeth, apex not hooked- shaped ..... Helicopsychidae

   Portable case not resembling snail shell, or larva not building a case; anal claw usually without ventral comb, apex stout and hook-shaped.....2

2. Dorsum of each thoracic segment mostly covered with conspicuous sclerotized plates.....3

   Metanotum, and sometimes mesonotum, entirely membranous or largely so, with several pairs of smaller sclerites or hairs.....4

3. Abdomen with ventral rows of branched gills and with prominent fan-shaped brush of long hairs at base of anal claw; larva building fixed retreat.....Hydropsychidae

   Abdomen without ventral rows of gills and with only 2 or 3 hairs at base of anal claw; larva very small, usually less than 6 mm long, often building purse case.....Hydroptilidae

4. Antenna very long and conspicuous, 6 to 8 times as long as wide arising near base of mandible; if antenna short, mesonotum with pair of curved, sclerotized bars.....Leptoceridae

   Antenna short, not more than 4 times as long as wide, or inconspicuous and arising at various points; mesonotum without pair of curved bars.....5

5. Dorsum of mesothorax mostly covered with conspicuous sclerotized plates.....11

   dorsum of mesothorax membranous, or, if sclerotized plates present, they are small and scattered.....6

6. Dorsum of 9$^{th}$ abdominal segment entirely membranous.....7

   Dorsum of 9$^{th}$ abdominal segment bearing sclerotized plate.....9

7. Labrum membranous and T- shaped.....Philopotamidae

   Labrum sclerotized and widest near base, not T-shaped.....8

8. Trochantin of 1$^{st}$ leg broad and hatchet-shaped, set off from base by suture ..... Psychomyiidae

   Trochantin of 1$^{st}$ leg pointed, without basal suture.....Polycentropodidae

9. Prosternal horn present; larva building tubular case mostly of plant materials..... Phryganeidae

   Prosternal horn absent; larva either building saddle case or no case (free living).....10

10. Anal claw large, nearly as long as basal sclerite; trochantin of front leg projecting forward and conspicuous; larva free living ..... Rhyacophilidae

    Anal claw small, much shorter than basal sclerite; trochantin of front leg small and inconspicuous; larva building saddle case of small stones ..... Glossosomatidae

11. 1st abdominal segment without dorsal hump or pair of lateral humps; *sa* 1 of metanotum absent, or at most represented by a single seta ..... Brachycentridae

    1st abdominal segment with pair of lateral humps, usually dorsal hump; *sa* 1 of metanotum present, usually as small sclerotized plate with several setae ..... 12

12. Tarsal claw of hind leg much smaller than those of middle and front legs ..... Molannidae

    Tarsal claw of hind leg as long as that of middle leg ..... 13

13. Labrum with row of approximately 16 to 20 long setae across middle ..... Calamoceratidae

    Labrum with only 6 to 8 setae across middle ..... 14

14. Base of anal claw with brush of 25 to 30 fine setae on inner margin; larva builds curved, tapered case of sand grains ..... Beraeidae

15. Antenna located very close to eye; 1st abdominal segment without dorsal hump ..... Lepidostomatidae

    Antenna located either midway between eye and anterior margin of head, or closer to anterior margin than to eye; dorsal hump usually present on 1st abdominal segment ..... 16

16. Antenna located approximately midway between eye and anterior margin of head; prosternal horn present, but sometimes short ..... Limnephilidae

    Antenna located close to anterior margin of head; prosternal horn absent ..... 17

17. Trochantin of front leg conspicuous, with apex hook-shaped; dorsum of anal proleg with group of approximately 30 setae ..... Sericostomatidae

    Trochantin of front leg inconspicuous, apex not hook-shaped; dorsum of anal proleg with approximately 5 setae, occasionally with short spines ..... Odontoceridae

# TRICHOPTERA