

**Urban Fort Collins Streams:  
Aquatic insects and others**



Photo: David Rees



Photo: Dave Leatherman



**THE BIG PICTURE**



## THE PAST

(Reviews by Eschner et al. (1993), Fausch and Bestgen (1997), Wohl (2001))

**Plains streams-** Unique ecosystems, snow melt **PEAK** driven:  
Most flow during early summer

Little permanent streamside vegetation (?), willows, few groves of cottonwoods; apparently few events of overbank flooding ; **flood plain wetlands ? –refugia?**

Physicochemical variables (water chemistry) fluctuated among seasons





## Aquatic Insects and others

**Spring Creek, Fossil Creek, Boxelder Creek, Poudre River**  
(mouth to Greeley), what were they like ?

Before irrigated agriculture (1860's)? **AND:**  
flow regulation, dams, timber harvest, urbanization, gravel  
mining, channelization, etc.

**NOW COMPONENTS OF IRRIGATION DITCH NETWORKS**

**LITTLE OR NO PRESETTLEMENT INFORMATION**

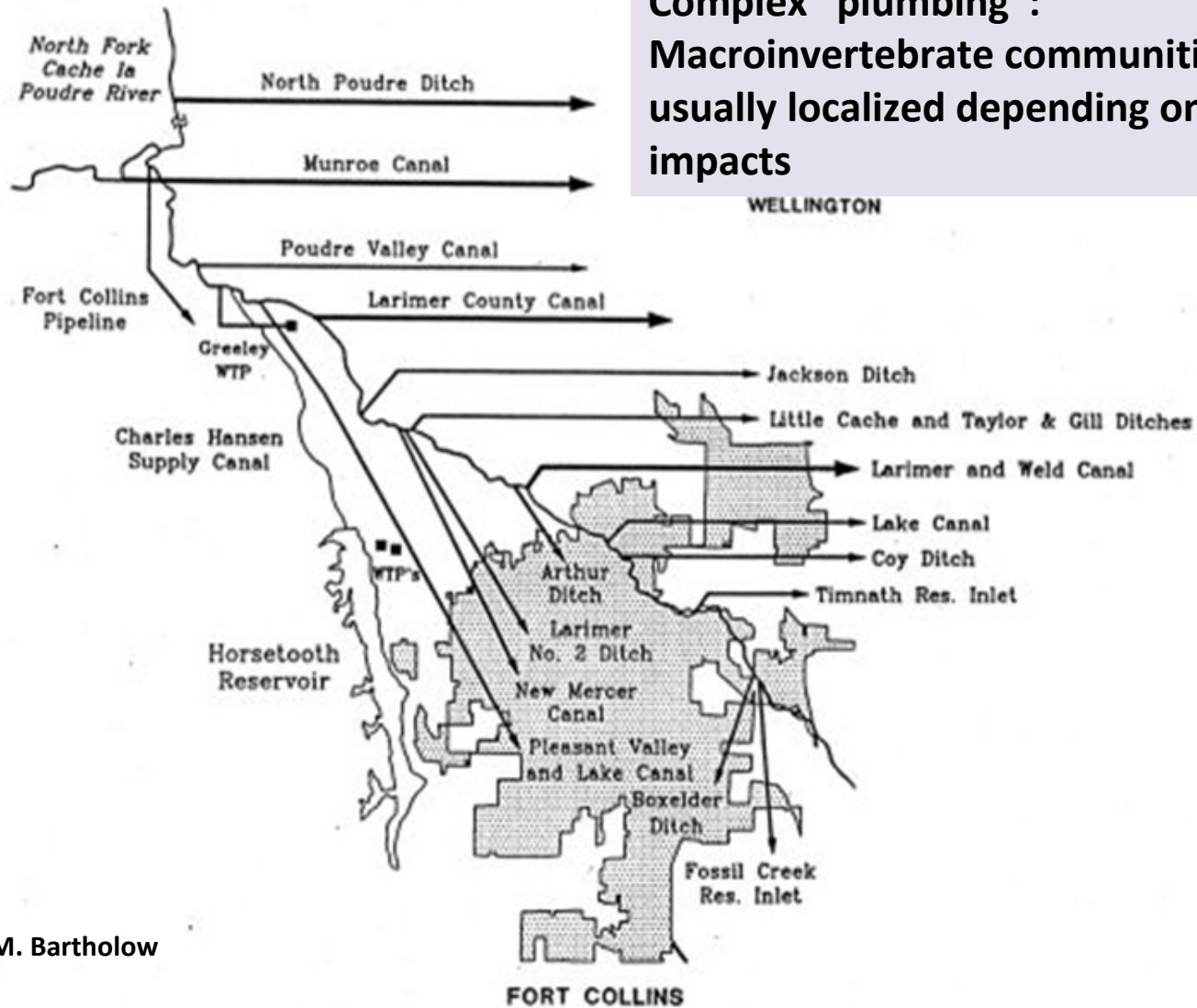


Photo: Brian Bledsoe



# POUDRE RIVER DIVERSIONS

Complex “plumbing”:  
Macroinvertebrate communities  
usually localized depending on  
impacts



Map courtesy of J. M. Bartholow

## AQUATIC MACROINVERTEBRATES

### Summary

No baseline surveys of the aquatic macroinvertebrates available before streams such as Spring Creek, Fossil Creek, the Poudre River were almost completely impacted by irrigated agriculture.

No “reference” streams left along the Front Range/plains or anywhere else to “predict community structure and function. No refugia.



**NO  
RECOLONIZATION  
SOURCES**



## **Functional Feeding Groups and Feeding Modes of Aquatic Insects.**

### **Functional Group**

### **Feeding Mode**

**Scrapers**

**Shear off food material and associated organisms.**

**Collector-gatherers**

**Vacuum organic deposits from the stream bottom.**

**Collector-filterers**

**Filter suspended organic material from the water column.**

**Shredders**

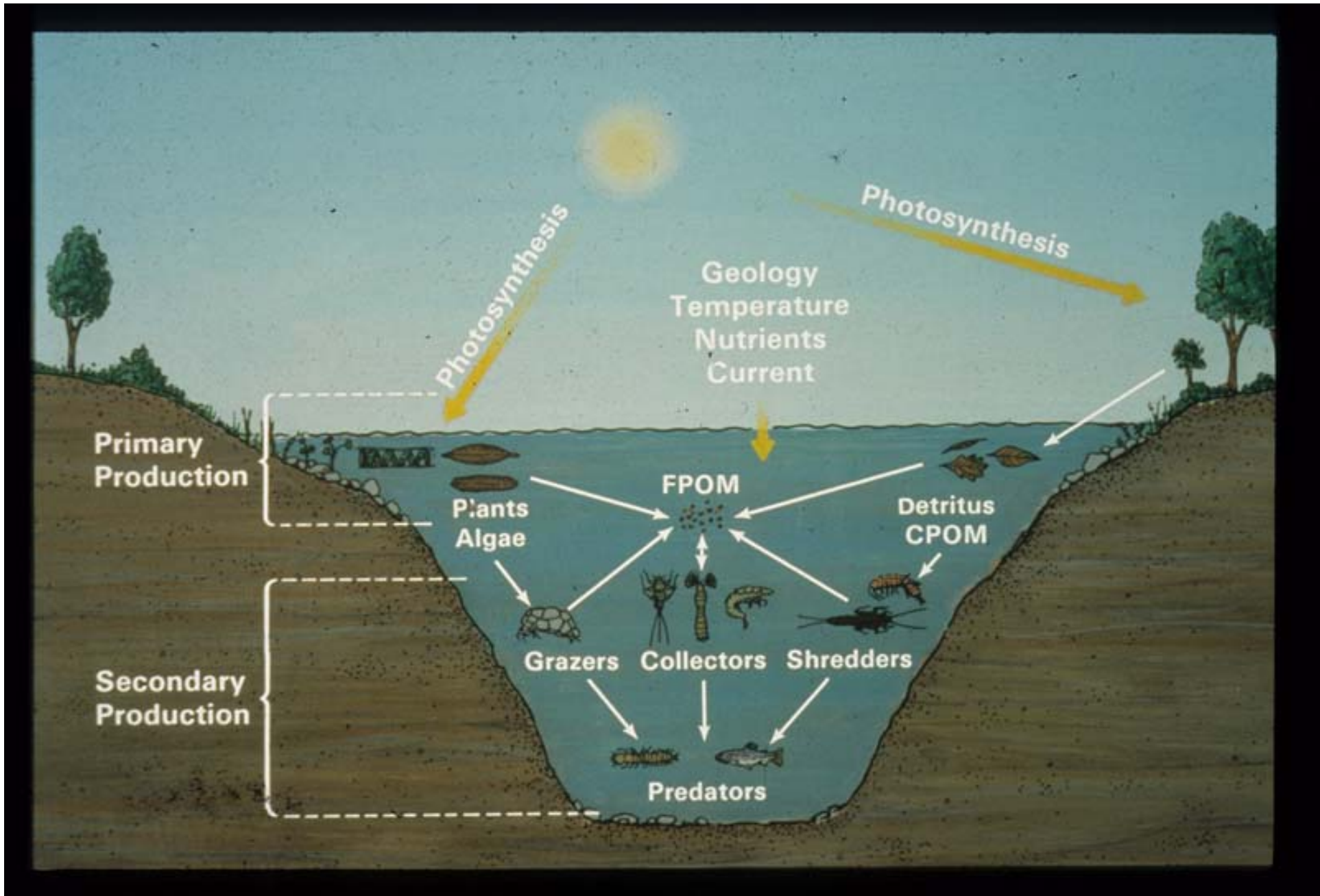
**Skeletonize whole leaves and fragments.**

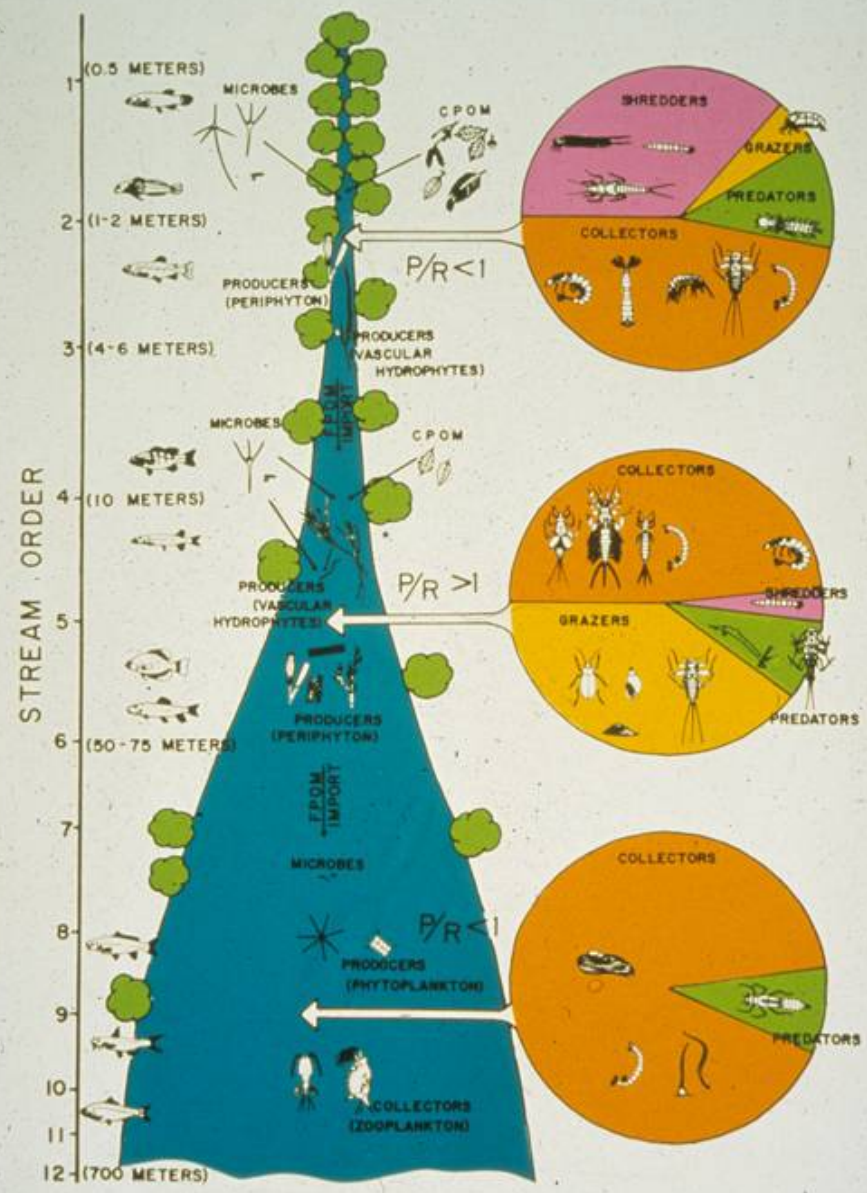
**Predators**

**Capture and ingest animals.**

**Piercer-herbivore**

**Pierce plant material.**







Caddisfly larvae grazing  
*Dicosmoecus* sp. (Trichoptera: Limnephilidae)  
South Fork Eel River, California, USA



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video by Jeremy Morton  
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# **Aquatic Insect Orders**

**Ephemeroptera (Mayflies)**

**Odonata (Dragonflies and Damselflies)**

**Plecoptera (Stoneflies)**

**Hemiptera (True Bugs)**

**Megaloptera (Dobsonflies, Fishflies and Alderflies)**

**Trichoptera (Caddisflies)**

**Coleoptera (Beetles)**

**Diptera (True Flies)**

**Lepidoptera (Moths and Butterflies)**



TRANSITION ZONE [eastern & western edge of mixing faunal elements]  
The interface of Rocky Mountain montane and high plains  
macroinvertebrate faunas-a ? complex mix of species: **Ebb and flow! of species**

**TODAY**

The “**working streams**” of Bartholow, Bledsoe and others; not a “**Aquatic Invertebrate Stat**” **depending on available habitat WATER-quantity, quality**



Photo: R. Zuellig



Photo: Brian Bledsoe

## Total “aquatic invertebrates”

At least 150 possible species in the Fort Collins streams throughout the year

85 species at a typical Fort Collins site –Shields Street  
~50% loss?

45 species East of I-25, additional ~50% loss

**Total loss of about 65% potential species in Fort Collins streams, Spring Creek, Fossil Creek, Poudre River?**

Smaller and faster growing species with multiple generations (e.g. chironomid midges) that are **widespread, pollution tolerant** and are **slow water forms** dominate Fort Collins sites. The “**resilient species**”





## Possible EPT taxa in FORT COLLINS STREAMS

### Mayflies

**27** taxa [total in South Platte River Basin: **68**] **40%**

### Stoneflies

**14** taxa [total in South Platte River Basin: **65**] **21%**

### Caddisflies

**23** taxa [total in South Platte River Basin: **156**] **15%**



# TAXA EXTIRPATED

Historic collections in 1870's by C. P. Gillette-  
BEFORE?

## Mayfly

*Macdunnoa persimplex*

## Stoneflies

*Capnia decepta*

*Capnura wanica*

*Taenionema pacifica*

*Isogenoides elongatus*

## Caddisflies

*Smicridea signata*

*Oecetis ochracea*





# Ephemeroptera (Mayflies)

**Nymphs have chewing mouth parts used for feeding on decayed plant material or algae. Two or three tails. One claw at the end of each leg. One set of obvious wing pads, usually two sets present. Plate-like, feather-like or tassel-like gills on 1 or more of 1-7 abdominal segments.**





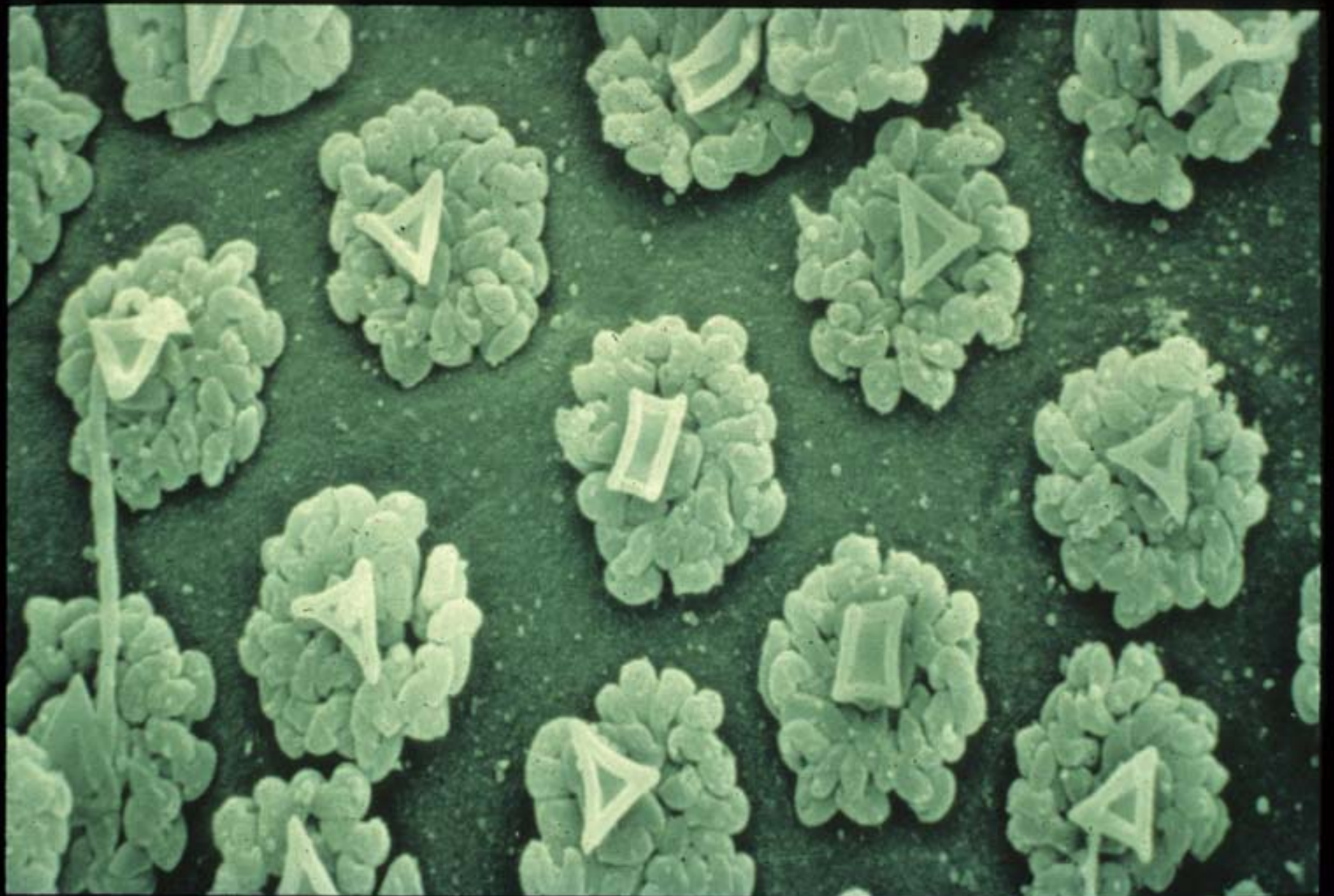














## Baetidae (Minnow-like mayflies)

Nymph: plate-like abdominal gills 1-7; posterolateral angles of abdominal segments without flat spines

*Baetis tricaudatus*



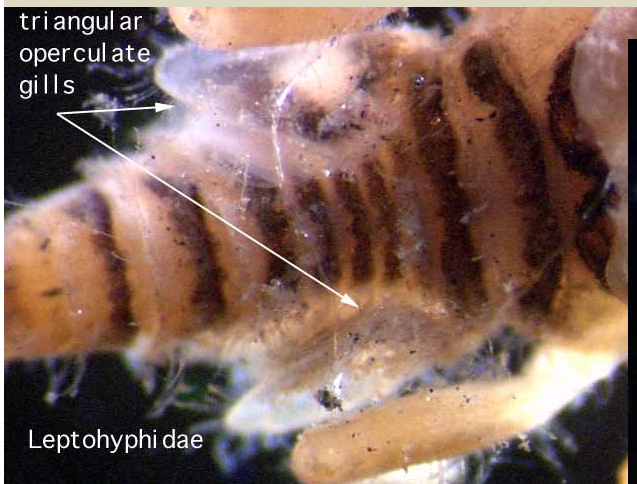
Photo: David Rees

## Leptohyphidae (Little Stout Crawlers)

Nymph: gill on segment two operculate,  
Not meeting at midline

*Tricorythodes explicatus*

Ecology





Mayfly nymph grazing  
Amelotus sp. (Ephemeroptera: Ameletidae)  
Horonai Stream, Hokkaido, Japan

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video by Jeremy Monte  
Archive: FI-201  
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NYMPH



WET FLY



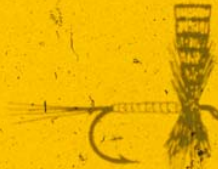
EMERGING  
SUBIMAGO



WET FLY



SUBIMAGO



DRY FLY  
(DUN)



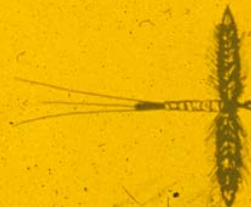
IMAGO



DRY FLY  
(SPINNER)



SPENT IMAGO



DRY FLY



## Odonata (Dragonflies and Damselflies)

**Adults have membranous wings with many veins. Wings outstretched flat in dragonflies and held vertically in damselflies. Chewing mouth parts. Short antennae usually 3-7 segments. Both pairs of wings similar in shape.**



**“lower lip-labium the mask”**



Photo David Leatherman



© Jay Cossey



© Doug Collicutt





**Variegated Meadowhawk, *Sympetrum corruptum*, photo Dave Leatherman**





Eight-spotted Skimmer, *Libellula forensis*

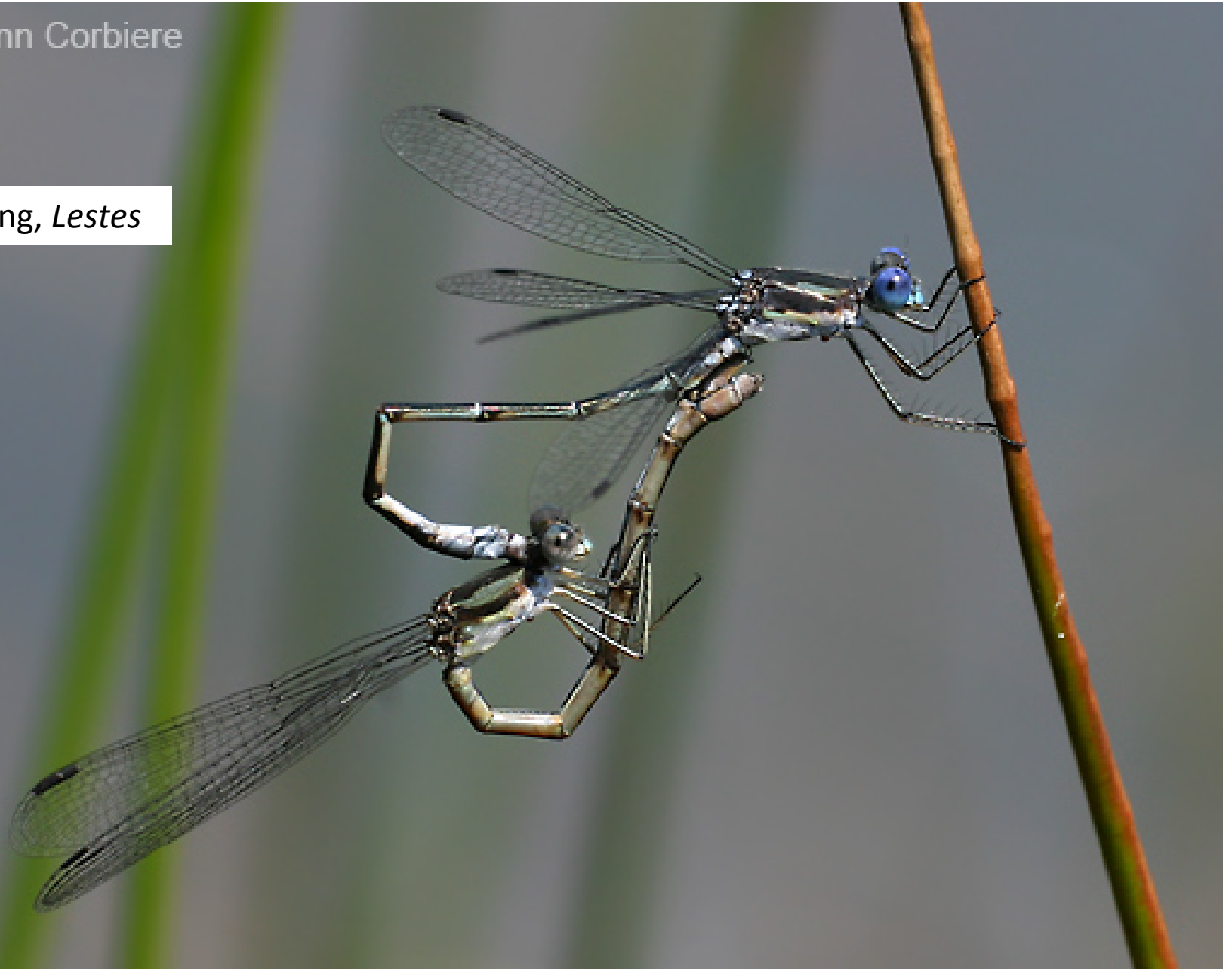


***Ophiogomphus severus*, Pale Snaketail, photo by Jerry Hatfield**



© 2004 Glenn Corbiere

Spreadwing, *Lestes*





Bluet, *Enallagma* sp.



# Plecoptera (Stoneflies)

**Adults have two sets of membranous wings that are held flat along the back. Hind wings have a large folded area. Adults also possess long antennae and may have two large tails at the end of the abdomen.**



**Nymphs have chewing mouth parts. Two claws at the end of each leg. Two tails and two obvious sets of wing pads.**



# Plecoptera (Stoneflies)

**Life cycle: Incomplete. egg, nymph and adult.**

**Life history: 1 generation / year or several years / generation. Some groups live beneath the stream bed during nymphal development. Nymphs migrate to edges where they emerge from the water and crawl out of their shuck. Adults can be found along stream side vegetation. Most stoneflies are restricted to cold water streams. Some nymphs feed on other insects while most feed on plant material.**





***Claassenia sabulosa***

© Robert Newell | Photo



***Capnura wanica*** (Frison)(photo by D. Rees)





Salmonfly  
(*Pteronarcys californica*)

4-6

June

Golden stone  
(*Claassenia sabulosa*)  
*Hesperoperla pacifica*

8-10

June-Sept



# Hemiptera (True Bugs)

**Life cycle: Incomplete. egg, nymph and adult.**

**Life history: Many over winter as adults and produce either 1 generation / year, multiple generations / year or several years / generation. All are predators except some water boatman which feed on plant material. Aquatic Hemiptera are adapted to a wide range of habitats. Some forms exist in hot springs, large rivers, saline marshes and even the ocean.**





# Hemiptera (True Bugs)

**Nymphs closely resemble adults. Adults have wings that are half membranous and half leathery. Mouth parts are jointed and specialized for piercing and sucking. Some use digestive juices to liquefy the internal parts of prey.**



# Trichoptera (Caddisflies)





# Trichoptera (Caddisflies)



**Free Living**



**Case Making**



**Shelter Making**



**Net Spinning**





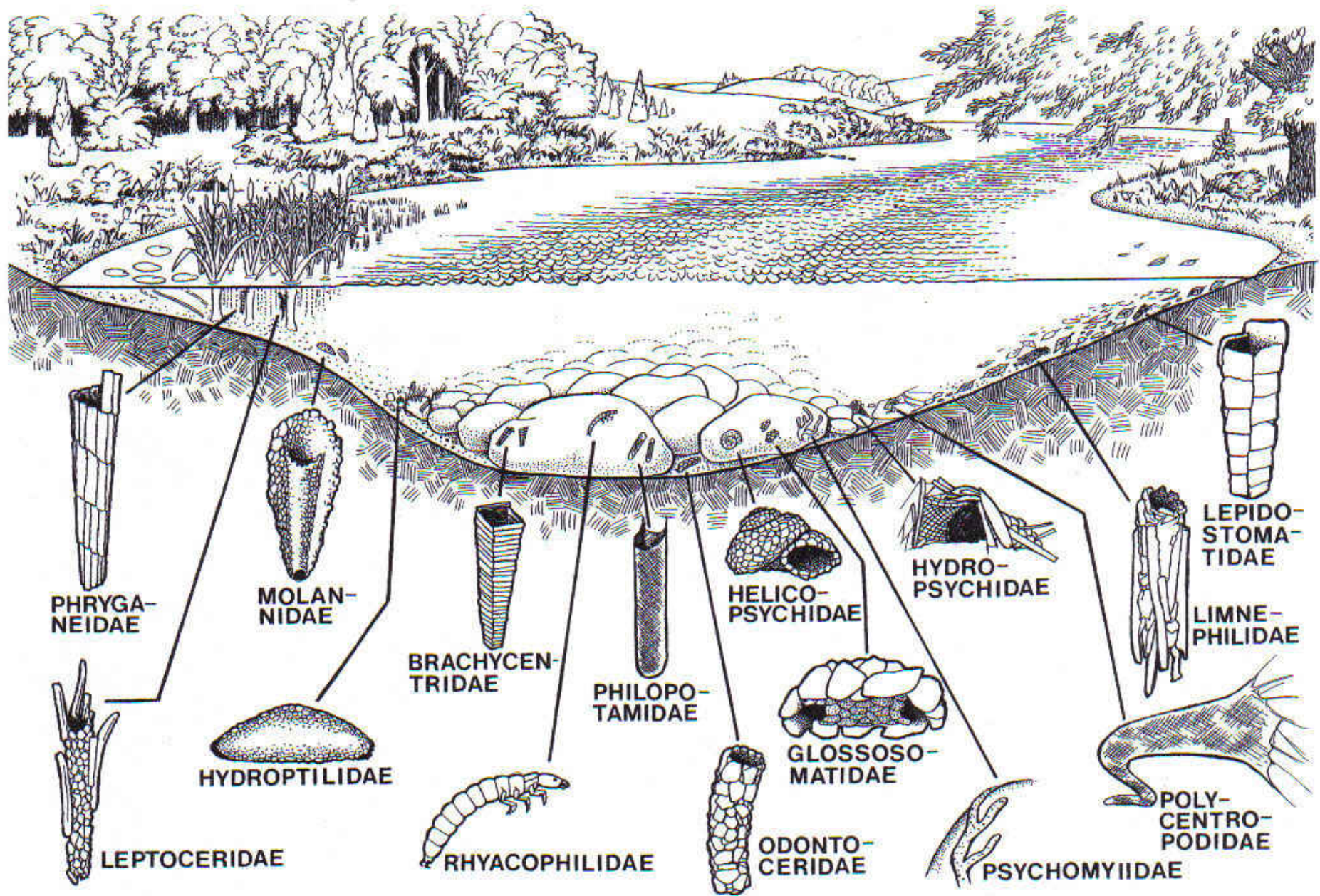
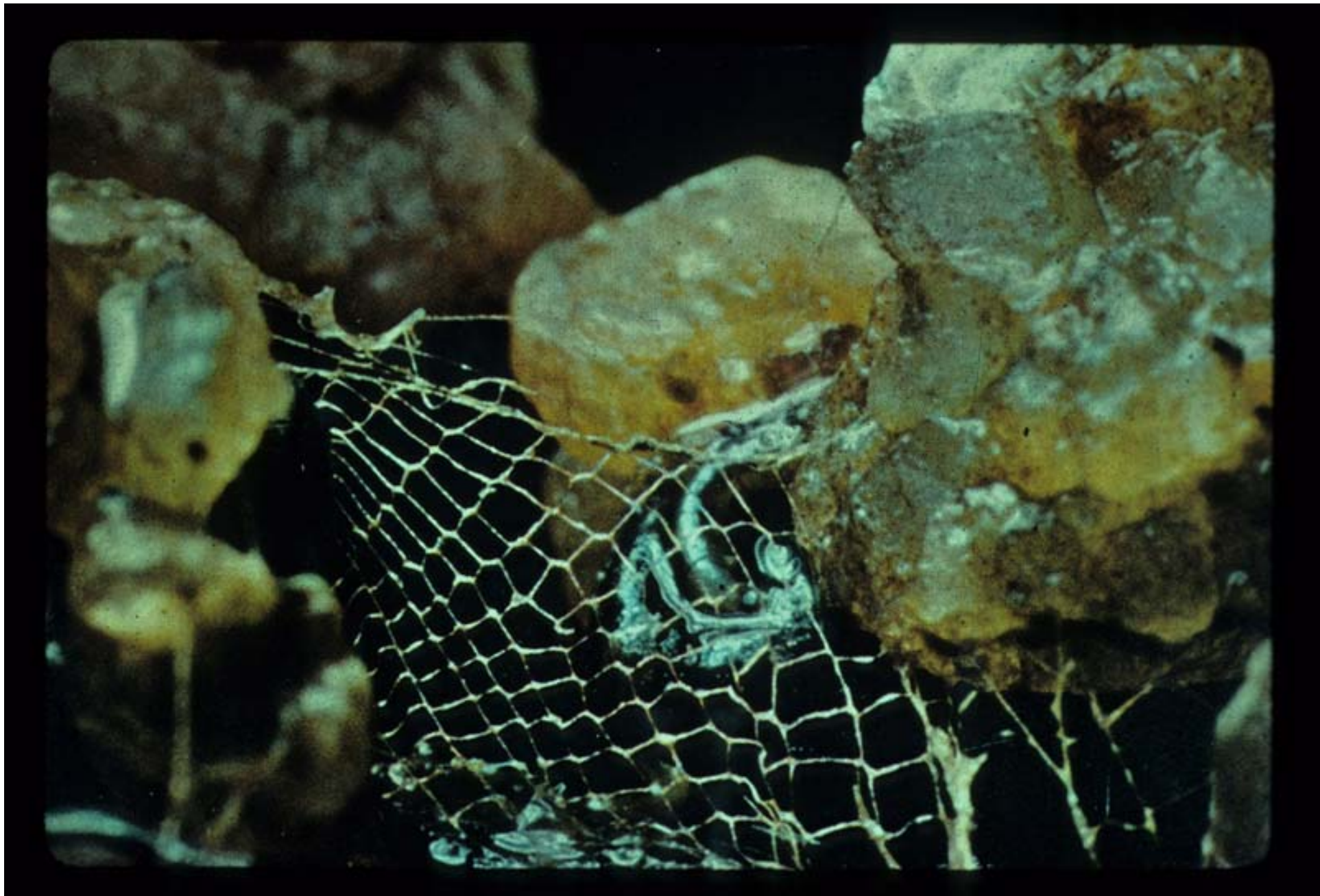


Figure 45. Diagrammatic section of a running-water habitat showing diversification in microhabitats among families of caddisflies.

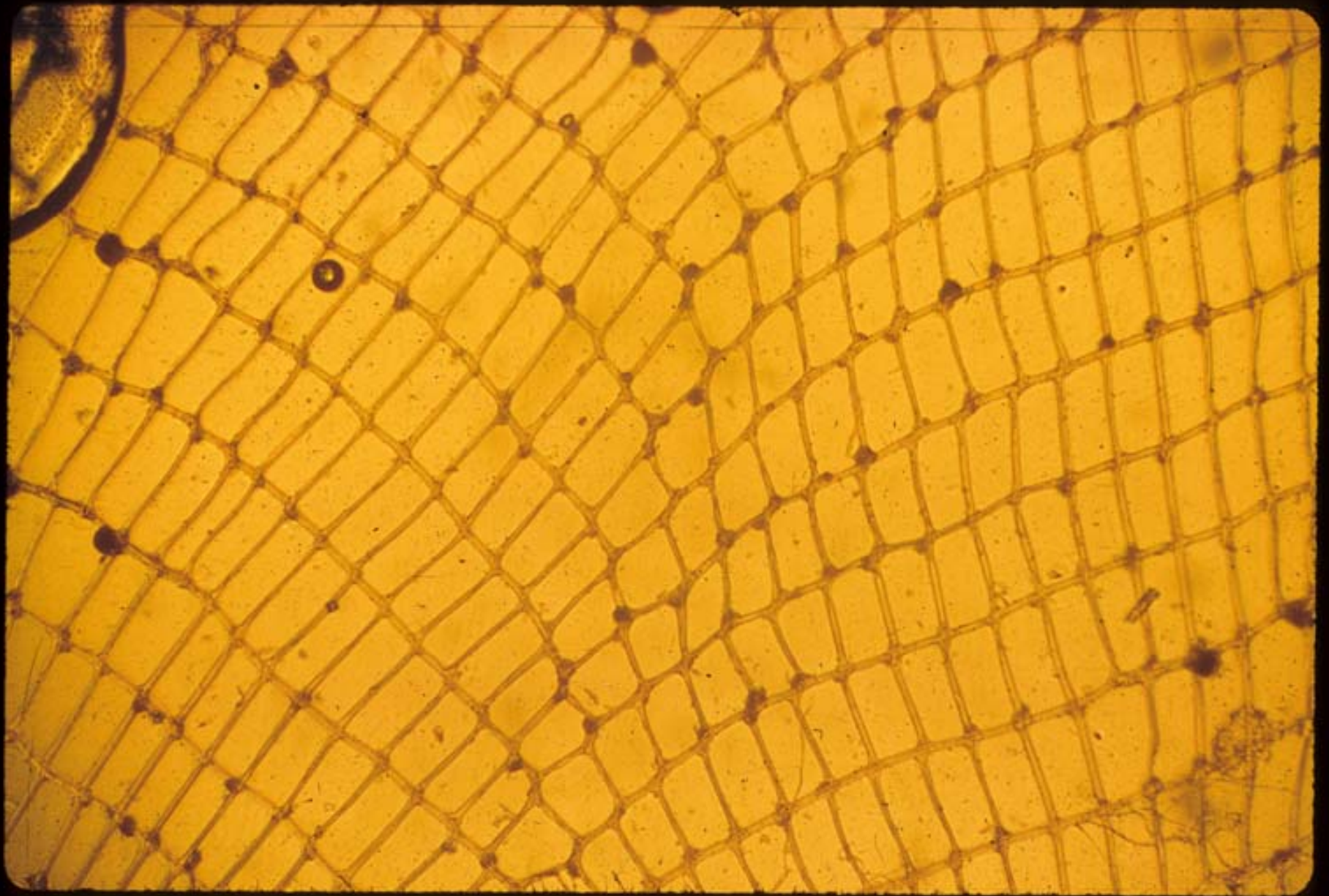












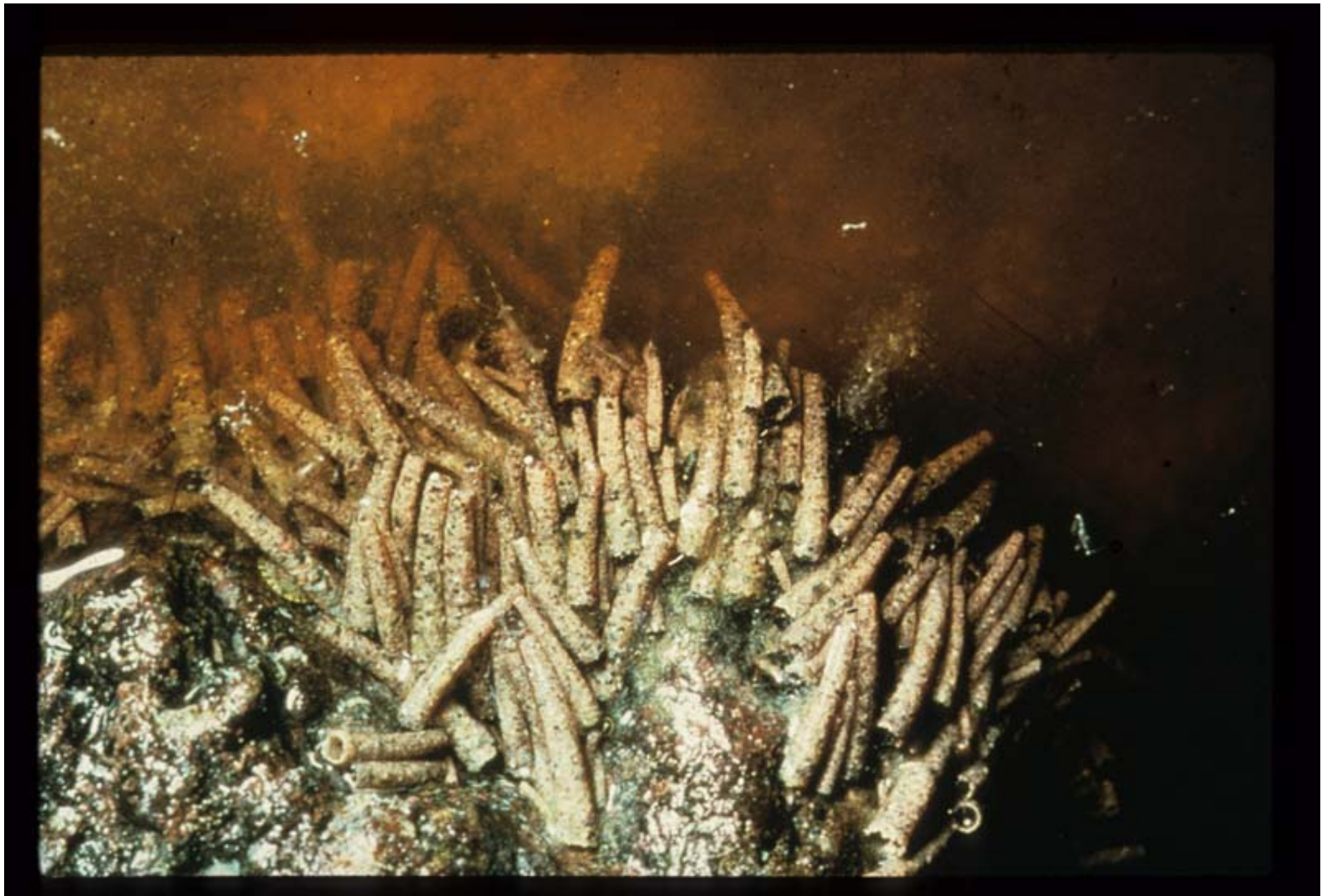


Caddisfly larvae filter-feeding  
Brachycentrus sp. (Trichoptera: Brachycentridae)  
Makami River, Hokkaido, Japan

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video by Jeremy Montoo  
Archive: FI-205  
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## **COLEOPTERA (Beetles)**

**Dytiscidae (Predaceous Diving Beetles)**

**Hydrophilidae (Water Scavenger Beetles)**

**Elmidae (Riffle Beetles)**

# Coleoptera (Beetles)

**Larvae have three pairs of jointed legs on the thorax. End of abdomen usually without anal prolegs or anal filaments.**



**Adults front wings without veins and very hard, covering hind wings. Chewing mouth parts.**













## **DIPTERA (True Flies)**

**Tipulidae (Crane Flies)**

**Blephariceridae (Netwinged Midges)**

**Chironomidae (Midges)**

**Simuliidae (Black Flies)**



# Diptera (True Flies)

**Larvae are often legless and maggot like. Adults possess one pair of membranous wings. Hind wings are reduced to small knobbed structures. Mouth parts are often used for sucking.**

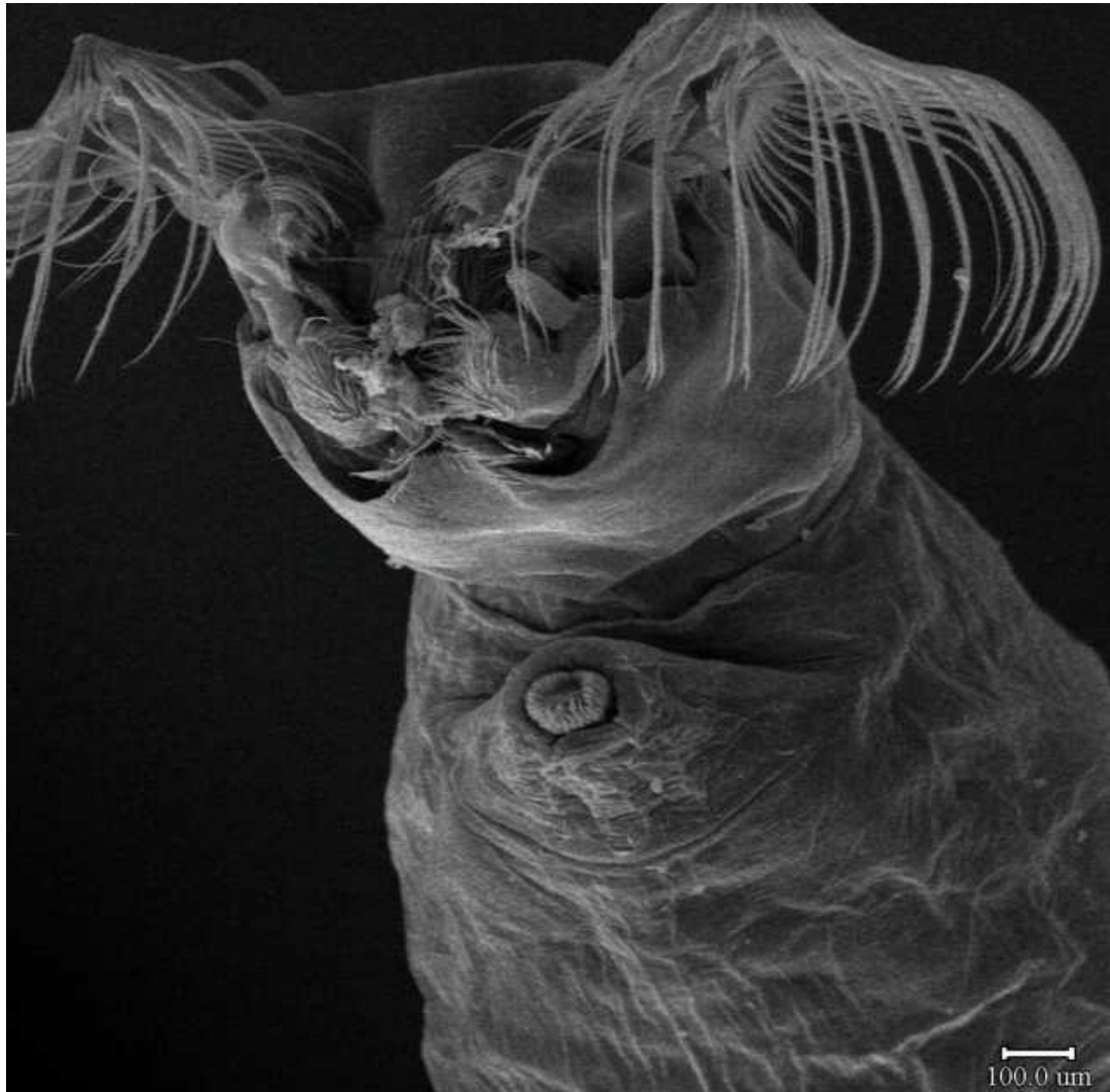




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