

Mayflies—Order Ephemeroptera

Delicate and strong

Mayflies have caught the fancy of humans for many reasons. The winged adults are graceful aerialists with famously short lifespans (they rarely survive more than a week or so). Adults and larvae are important food for fish, so in some parts of the world they're popular models for artificial flies: the many permutations of "drakes," "duns," and "spinners" in a flyfisher's box are patterned after mayfly larvae and adults. Mayflies live in a variety of aquatic habitats and, like caddisflies, encompass many species that are sensitive to pollution, so they're helpful for monitoring water quality.

Adult mayflies are handsome, delicate-looking insects with two or four triangular wings held vertically when they are at rest. They sometimes rest with their abdomens curled upward, displaying slender, fragile tails that may be longer than their bodies. They range in color from drab brown or reddish, to rich green to bright yellow.

Mayfly larvae vary quite a bit in shape, but they always

have six legs. Their abdomens are tapered, and they have two or three long tails. Some mayfly larvae have more rounded bodies, while others are dramatically flattened. Many types have prominent leaf-like gills down the sides of their abdomens. When they swim, mayflies flip their abdomens up and down like a dolphin.

Mayflies don't undergo complete metamorphosis, so they don't go through a pupal stage. But they do have an unusual extra life stage. Once its aquatic stage is complete, a mayfly emerges from its larval skin underwater or at the water surface, or it crawls ashore to emerge. The emerged insect is called a subimago, a stage that looks much like the adult but with cloudy, slightly-fringed wings. For the next day or two, the subimago will stay close to the stream, until it molts its exoskeleton for the last time, becoming a reproductive adult. At least 50 species of mayflies have been documented in Alaska.



Subimago (above) and adult mayflies are easily identified by their long tails and large triangular wings.



This is the exoskeleton of a mayfly larva that has crawled out of the water and emerged as the subimago below.



The above photo shows a recently emerged mayfly subimago. At right is an adult mayfly emerging from the subimago stage.





Most mayfly larvae eat algae and detritus or biofilm. Many types have elaborate color patterns that help camouflage them as they feed among the stones and detritus.

Cleftfooted Minnow Mayflies

Metretopodidae

The Cleftfooted Minnow Mayflies are primarily a northern family of mayflies. The larvae are fast and vigorous swimmers. Their long legs have a wide range of motion, like the oars of a rowing skiff. Short, stiff tails densely covered with swimming hairs provide additional propulsion with each undulation of the wide abdomen. They prefer to live in slow areas of streams and the margins of lakes.

Larval identification notes

- ▶ Only mayfly family with forked claws (a) on front pair of legs
- ▶ Most abdominal segments with plate-like gills
- ▶ 3 tails

Interesting facts

- ▶ Functional Feeding Groups: predators, collectors-gatherers

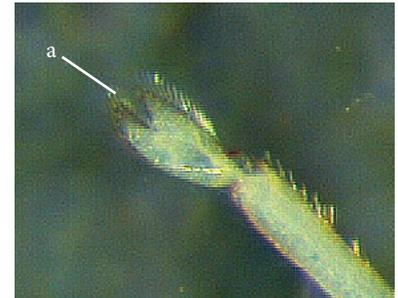


Photo by Dan Bogan



Cleftfooted Minnow Mayfly larva
(photo by Dan Bogan)

Combmouthed Minnow Mayflies

Ameletidae

Combmouthed Minnow Mayflies are elongate and streamlined mayflies that were once placed in the Primitive Minnow Mayfly family. The larvae live in streams and are typically found in pools and in the shallow slack-water margins of riffles and glides. These fast-swimming mayflies propel themselves through the water using their three short, stout tails—which are densely fringed with stiff hairs—like fins. Combmouthed Minnow Mayflies get their food by scraping diatoms from hard surfaces or collecting fine particles of detritus. The mouth combs are rows of stiff spines on the tip of their scraping mouthparts.

Larval identification notes

- ▶ Mature larvae have conspicuous pigmentation pattern
- ▶ Mouthparts with a pair of conspicuous comb-like structures
- ▶ Tails (3) short, stout, and densely fringed with long hairs and usually with a dark band
- ▶ Plate-like, oval gills have a dark-colored hardened edge on the outside margin

Interesting facts

- ▶ Larvae crawl out of the water before emerging.
- ▶ Functional Feeding Groups: collectors-gatherers, scrapers



Combmouthed Minnow Mayfly larva



Combmouthed Minnow Mayfly larva

Flatheaded Mayflies

Heptageniidae

Members of this family have flattened heads and bodies—an adaptation to life in flowing water. Those species occurring in the fastest-flowing habitats are especially flat and possess long legs and long curved claws, both of which help the larvae cling to algae-slick rocks as water rushes over them. Several species have overlapping gills that form a virtual suction cup that provides a firm grip on smooth rocks. In streams these ubiquitous larvae can be found in pools, riffles, glides, and rapids grazing upon diatoms and other biofilms. It's difficult to pick up a plate-sized stone and not find several of these mayflies scurrying around the underside.

Larval identification notes

- ▶ 2 or 3 tails
- ▶ Broad and flat heads
- ▶ Plate-like gills on abdominal segments 1-7
- ▶ In most species, body is compressed and legs extend outward from the body like crab legs

Interesting facts

- ▶ In 2005, R. P. Randolph and Patrick McCafferty described a new species of Flatheaded Mayfly collected near Circle, Alaska. They named it *Rhithrogena ingalik* in honor of the Ingalik people who once inhabited the interior of Alaska.
- ▶ Functional Feeding Groups: scrapers, collector-gatherers



Flatheaded Mayfly larva



Flatheaded Mayfly larva

Primitive Minnow Mayflies

Siphonuridae

Like the other minnow mayflies, Primitive Minnow Mayfly larvae are excellent swimmers and may be mistaken for small fish. Unlike larvae of most other mayfly families, the larvae of this family can be quite common in standing waters. In ponds and lakes they cling to aquatic vegetation or rest on the bottom between short bursts of swimming. Some may be found in slow-flowing, sand-bottomed rivers.

Interesting facts

- ▶ Some species do not appear to produce males.
- ▶ Functional Feeding Groups: collectors-gatherers, predators, scrapers

Larval identification notes

- ▶ Similar to Small Minnow Mayflies
- ▶ 3 tails
- ▶ Short antennae, less than twice width of head
- ▶ Platelike gills on abdominal segments 1-7 that cover sharp spines on the sides of each segment



Primitive Minnow Mayfly larva

Pronggill Mayflies

Leptophlebiidae

Most Pronggill Mayfly larvae inhabit shallow, slow-flowing or standing water at the margins of streams, rivers, marshes, and ponds, including temporary bodies of standing water. In Southeast Alaska we have found them in steep streams fed by snowmelt. They are generally poor swimmers, and those that venture into flowing water tend to seek refuge from the current under rocks, in moss, and on logs and other debris. Their diet consists of detritus and algae, although they will sometimes shred leaves.

Larval identification notes

- ▶ Gills long, narrow, and deeply forked (prong-like) and present on most abdominal segments

Interesting facts

- ▶ The larvae of some species make spring migrations sometimes by crawling along the shoreline from large rivers to small tributaries, and eventually into seasonally isolated ponds and marshes. After emerging from their new home they return to the main river to breed and lay eggs.
- ▶ Functional Feeding Groups: collectors-gatherers, sometimes scrapers



Pronggill Mayfly larva

Sand Minnow Mayflies

Ametropodidae

Sand Minnow Mayfly larvae are fast swimmers with special adaptations for living on the shifting sands of large swift-flowing rivers. Their streamlined bodies and short, stiff, hair-covered tails help them propel themselves against strong currents. Long, pointed claws on the middle and hind legs anchor their position in the unstable sediments, and pads of short, stiff spines at the base of each front leg provide friction to hold them in place.

Their cleverest adaptation, however, is behavioral. A larva uses its front legs to excavate a shallow pit in front of its head. Then it waves its legs to initiate and maintain a vortex (i.e. spiraling water) within the pit. Diatoms and other small food particles suspended in the water are swept into, and concentrated by, the vortex. The larva then collects the food with its spiny front legs and other filtering devices.

Interesting facts

- ▶ When at rest the larvae burrow into the sediment with only their eyes and gills exposed.
- ▶ Sand Minnow Mayflies were first discovered in Alaska in the Yukon River.
- ▶ Functional Feeding Groups: collectors-filterers, collectors-gatherers

Larval identification notes

- ▶ Claws on middle and hind legs long and slender; claws on front legs short and stout with 4 or 5 long spines
- ▶ 3 tails
- ▶ Plate-like gills on most abdominal segments



Sand Minnow Mayfly larva (photo by California Dept. Fish & Game, Aquatic Bioassessment Laboratory)

Small Minnow Mayflies

Baetidae

Small Minnow Mayflies are probably the most widely distributed and abundant mayfly family in Alaska. The small, fish-like larvae are excellent swimmers. Many have a streamlined body form that helps them move about and maintain their position in torrents of water. They can be found living in a wide variety of habitats: lakes and ponds, steep mountain streams, and even the cold, muddy rivers flowing out of glaciers. Their diet consists of diatoms and detritus.

Interesting facts

- ▶ Small Minnow Mayflies can represent a large fraction of the invertebrate drift in a stream. In streams with drift-feeding fish, most larvae drift between dusk and dawn to avoid detection.
- ▶ Adults wag their abdomen when at rest.
- ▶ Small Minnow Mayflies are often the first mayflies to colonize new streams exposed by retreating glaciers.
- ▶ Functional Feeding Groups: collectors-gatherers, scrapers

Larval identification notes

- ▶ Similar to Primitive Minnow Mayflies
- ▶ Antennae long, usually longer than twice the width of the head
- ▶ Upper lip notched
- ▶ All claws similar in size and shape
- ▶ Gills plate-like
- ▶ 2 or 3 tails



Small Minnow Mayfly larva



Small Minnow Mayfly larva

Small Square-gill Mayflies

Caenidae

At less than 8 mm in length (excluding the tails), Small Square-gill Mayflies are among the smallest of mayflies. The larvae are fond of places where sand and silt tend to accumulate, such as calm waters along the edges of streams, ponds, and small lakes. They can also be found crawling about on dense vegetation. Tiny and slow-moving, Small Square-gill Mayfly larvae are often coated with fine particles of silt and detritus, making them difficult to observe. They are unique among mayfly larvae in possessing a pair of large 4-sided gills on the second abdominal segment. As they crawl over and through fine sediments, these special gills act as protective covers to prevent abrasion and clogging of the delicate breathing gills underneath. Their diet consists of fine particles of organic matter and diatoms.

Larval identification notes

- ▶ A pair of large 4-sided gills on abdominal segment 2 that cover smaller plate-like fringed gills on segments 3-6
- ▶ 3 tails
- ▶ Hind wing pads absent

Interesting facts

- ▶ Larvae raise their abdomen upward when they walk.
- ▶ The adult phase lasts fewer than four hours.
- ▶ Functional Feeding Groups: collectors-gatherers, scrapers



Small Square-gill Mayfly larva (photo by Dan Bogan)

Spiny Crawler Mayflies

Ephemerellidae

Most Spiny Crawler Mayflies live in streams and rivers, yet most are poor swimmers. Those that live in fast-flowing water have flattened bodies, short and stout legs, and a friction pad of dense hairs under the abdomen, all adaptations that prevent them from being swept away by swift currents. On slippery, algae-covered rocks the friction pad provides enhanced traction, much like the felt soles found on some wading boots. Larvae adapted for slow-water habitats are cylindrical in cross section and have long spindly legs for crawling around and clinging to root tangles and moss mats.

Interesting facts

- ▶ Spiny Crawler Mayflies in the genus *Drunella* are omnivores. While their primary foods are algae and detritus, they will occasionally prey on other insects.
- ▶ When taken from the water or disturbed, the larvae will often raise their tails upward like scorpions poised to strike.
- ▶ Functional Feeding Groups: predators, collectors-gatherers, scrapers

Larval identification notes

- ▶ The only family of mayflies that lack gills on abdominal segment 2
- ▶ In some species, top of head, thorax, and abdomen have rounded or sharp spines
- ▶ Abdominal segments usually have lateral spines
- ▶ 3 tails



Spiny Crawler Mayfly larva



Spiny Crawler Mayfly larva



Spiny Crawler Mayfly larva