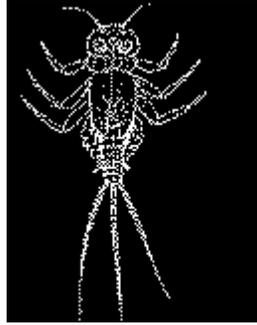


Chapter III —Order Ephemeroptera



Mayflies

- (Williams & Feltmate, 1992)
 - Superphylum Arthropoda
 - (jointed-legged metazoan animals [Gr, *arthron* = joint; *pous* = foot])
 - Phylum Entoma
 - Subphylum Uniramia
 - (L, *unus* = one; *ramus* = branch, referring to the unbranched nature of the appendages)
 - Superclass Hexapoda
 - (Gr, *hex* = six, *pous* = foot)
 - Class Insecta
 - (L, *insectum* meaning cut into sections)
 - Subclass Ptilota
 - Infraclass Palaeopterygota

These have a fossil record that is relevant to the issue of the evolutionary origin of wings in the Insecta. Carboniferous mayflies include gigantic species with wing spans of at least 45 cm. Modern Ephemeroptera number about 2000 species in 19 families, most of them associated with running water. The adults are less diverse in form than the nymphs.

The mayflies belong to the infraclass Paleoptera; their primitive wings cannot be folded over their backs. They are among the most primitive aquatic insects and probably arose in the Carboniferous period, 280-350 million years ago. The taxonomy of the immature stages is poorly known because the nymphs of many species have not yet been associated with adult forms.

Life History

Mayflies are hemimetabolous insects well known for their short-lived (ephemeral) adult phase, which usually lasts from two hours to three days. Mayflies are unique insects in that they have two adult stages. Both are winged, short-lived (1-2 hours to a maximum of 14 days) and do not feed. The subimago (dun) is a stage of sexual maturation in which the wings are semi-opaque and covered in minute hairs (microtrichia) with longer setae on the margins. Beneath the subimaginal cuticle the adult eyes, legs and genitalia are clearly visible. The mature adult (imago) that emerges when the subimago moults has much longer legs and cerci, and wings that are clear and bare.

In contrast to the imagos, mayfly nymphs exhibit considerable diversity in appearance although many stream species are dorso-ventrally flattened. Mayfly nymphs go through a large number of

moults as they grow, with most species having 15-25 instars. Estimates for some species reach as high as 50 and variations occur within single species.

Distribution and Habitat

The order Ephemeroptera has a cosmopolitan distribution but is absent from the Arctic and antartic. They are absent from oceanic islands, but New Zealand has a good fauna. Chemical tolerance is less well known for mayflies than for some other groups. Life forms of **mayfly larvae** are diverse, but they fall into four broad categories: burrowing, flattened, swimming, and creeping.

They reach peak abundance in cool, clean headwater streams, where they are an important source of food for fish. Some species can regulate respiratory movements of gills in response to changing oxygen concentrations. Mayfly nymphs are characteristic of shallow streams and littoral areas of lakes, and are distributed widely. However, many species are restricted to specific substrata of macrophytes, sediments of waveswept or moving stream areas, or sediments of specific sized particles.

Table III-1: Typical nymphal habitats of the families of Ephemeroptera (Williams & Feltmate, 1992)

Family	Primary distribution	Habitat
Suborder Schistonota		
Superfamily Baetoidea/Heptagenioidea		
Siphonuridae	largely Holarctic	chiefly running water
Colorburiscidae	S. Hemisphere	stony upland streams
Oniscigastridae	S. Hemisphere	lotic & lentic
Ameletopsidae	S. Hemisphere	stony upland streams
Ametropodidae	Holarctic	large rivers
Baetidae	widespread	chiefly running water
Metretopodidae	Holarctic	fast-flowing water
Oligoneuriidae	esp. Afrotr./Neotrop/ some Holarc. & Orient.	running water
Heptageniidae	largely Holarctic	lotic & lentic-erosional
Superfamily Leptophlebioidea		
Leptophlebiidae	esp. S. Hemisphere/ some Holarc. & Orient	esp. fast-flowing waters
Superfamily Ephemeroidea		
Behningiidae	Holarctic	burrowers in river sand
Potamanthidae	largely Asian/some N.A.	lotic-depositional
Euthyplociidae	esp. Neotrop./Afrotr.	sand burrowers
Polymitarciidae	esp. Neotrop./Afrotr./ some in Holarctic	burrowers in stream & river beds
Ephemeridae	Oriental/Afrotr./Holarc.	lotic & lentic burrowers
Palingeniidae	Afrotr./Orient/Palaearc.	burrowers in river beds
Suborder Pannota		
Superfamily Ephemerelloidea		
Ephemerellidae	widespread	chiefly running water
Tricorythidae	esp. Afrotr./Neotrop.	lotic-deposit/lentic littoral
Leptohyphidae	esp. Neotrop./some N.A.	lotic
Superfamily Caenoidea		
NeoepheMERidae	Holarctic & Oriental	lotic-depositional
Caenidae	widespread	lotic-deposit/lentic-litt.
Superfamily Prosopistomatoidea		
Baetiscidae	esp. eastern N. Amer.	lotic-depositional
Prosopistomatidae	Afrotr./some Oriental	lotic-depositional

Ecological preference

In general, mayfly nymphs tend to live mostly in unpolluted lakes, ponds, streams and rivers where, with densities of up to 10,000/sq.metre, they contribute substantially to secondary production. However, very small amounts of organic pollution can sometimes, initially, increase the numbers and production of certain species while others are exterminated. Species of **Baetis** (Family Baetidae) seem the most tolerant to pollution and these are often used as indicators of water quality. Burrowing nymphs such as *Hexagenia bilineata* (Family Ephemeridae) do particularly well in silted impoundments and the problems associated with their mass emergence from the Mississippi River are notorious- e.g. accumulation of adult bodies on road bridges create slippery surfaces for motorists.

Feeding

They are primarily grazers and collector-gatherers. Some species are predaceous, and others have interesting adaptations for filter feeding (Oligoneuriidae). The diet of most mayflies is composed of algae and detritus.

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