

24. EPHEMEROPTERA

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Mayflies date from Carboniferous and Permian times and represent the oldest and in many ways the most primitive of the existing winged insects. They have no close living relatives. Mayflies are the only living pterygotes with two winged instars; these are the subimago and the true adult.

In North America north of Mexico there are 16 families, 60 genera, and about 622 species. Twenty families are recognized worldwide. Canada has a rich mayfly fauna: 15 families, 47 genera, and about 300 species.

The short-lived terrestrial adults are relatively uniform in habits and appearance. They do not feed and live from a few hours to a few days. The subimago, a stage of sexual maturation, lasts from a few minutes to a week. Females typically enter swarms of males for mating; oviposition usually occurs immediately. Both eggs and swarming behaviour vary, depending on the group (Koss 1968; Brodskiy 1973).

Nymphs inhabit a wide variety of aquatic habitats, and are very varied, but variations do not follow taxonomic lines. This is emphasized by data on nymphal habits shown in Table 24. Convergent and parallel evolution appear to be common. For example, ventral sucker disks and operculate gills covering respiratory gills apparently evolved independently in several lineages. A streamlined, swimming body form associated with a grazing, herbivorous diet is found in several families. Lateral legs and a sprawling posture are characteristic of most Caenoidea and

Table 24. Census of Canadian Ephemeroptera

	No. Canadian genera	No. spp. known for Canada	Est. no. Can. spp. undescr. or unrecorded	Distribution in Canada	Habits of nymphs ¹	
					Form	Food
Superfamily Heptagenioidea						
1. Siphonuridae	5	41	5			
Siphonurinae	3	35		Trans.	S	G
Acanthametropodinae	1	1		W, interior	S	P
Isonychiinae	1	5		Trans.	S	H
2. Metretopodidae	2	3	0	Trans.	S	G
3. Bactidae	7	71	50	Trans.	S	G
4. Oligoneuriidae	1	1	0	W, interior	C	H
5. Heptageniidae	11	75	20			
Pseudironinae	1	1		W, interior	R	P
Heptageniinae	8	72		Trans.	F	G
Arthropleinae	1	1		E	F	H
Anepeorinae	1	1		W, interior	F	P
6. Ametropodidae	1	2	0	W, Cordillera, interior	B	H
Superfamily Leptophlebioidea						
7. Leptophlebiidae	6	24	8	Trans.	R,S	G
Superfamily Ephemerelloidea						
8. Ephemerellidae	1	44	15	Trans.	R	G
9. Tricorythidae	1	4	5	Trans.	R	G
Superfamily Caenoidea						
10. Neophemeridae	1	1	0	E	C	G
11. Caenidae	2	10	3	Trans.	R,B	G
Superfamily Prosopistomatoidea						
12. Baetiscidae	1	7	1	E,W, interior	R	G
Superfamily Ephemeroidea						
13. Potamanthidae	1	3	1	E	B	G
14. Ephemeridae	5	12	2			
Ephemerinae	4	11		Trans.	B	G
Pentageniinae	1	1		E	B	G
15. Polymitarcidae	2	3	0			
Polymitarcinae	1	2		Trans.	B	G
Campsurinae	1	1		W, interior	B	G
TOTAL	47	301	110			

¹Habits of nymphs: C, clinging; S, swimming; B, burrowing; F, flattened; R, surface sprawlers (recumbent); P, predators; G, herbivorous, grazers; H, herbivorous, filter feeders.

ABBREVIATIONS: Trans., transcontinental; undescr., undescribed.

Ephemerellidae. Carnivory is rare in mayflies but is found in three subfamilies. Filter feeding from the passing current by means of hair fringes on the femora and tibiae is found in two families. Unique filter feeding techniques are found in Ametropodidae, Arthropleinae, and Caenidae (*Brachycercus*).

The nymphal stage lasts a few months, a full year, or several years, depending on the species. Diapause is common in the egg stage, but very few species have been studied in detail. Edmunds *et al.* (1976) list the life cycles of many genera as unknown.

Nymphs have varying degrees of tolerance to pollution even within a single genus (Lewis 1974) and individual species or communities show great promise as pollution indicators. Nymphs may be very abundant, up to 1000 or more per square metre, and often form the base of food chains leading to valuable fish, as clearly documented for *Hexagenia* and the Great Lakes fishery. Dead adult bodies may, however, be a nuisance during mass emergences when they form drifts a metre or so in depth on bridges or around lights.

The diversity of mayflies is greatest in clean, flowing water. While a few genera are characteristically eastern (*Neophemera*, *Potamanthus*, *Pentagenia*) or western (*Cinygma*, most *Cinygmula*), many are transcontinental. A few *Baetis* spp. are found in true arctic tundra and numerous genera occur as far north as the tree line. *Caenis* and *Callibaetis* are characteristic of prairie potholes. A unique feature of the Canadian fauna is the community of the Saskatchewan River as it courses through the prairie provinces. Thirteen families and about 30 genera, including many representing monotypic subfamilies, are found here (Lehmkuhl 1976a). Many of these originated from the southwestern United States after the last glaciation and are not found elsewhere in Canada.

It is not uncommon to find undescribed species and genera in Canada; many border regions are poorly collected. While the species of the east are better known than those of the west, work remains to be done throughout Canada, especially in revisions of genera, descriptions of nymphs, and studies of life histories. Northern range limits are also uncertain.

There is no comprehensive treatment of the Canadian fauna. While James McDunnough of Ottawa described many of the Canadian species (papers ranging from about 1921–1943, mostly in the *Canadian Entomologist*), many taxa have not been reviewed since the original descriptions. Identification remains largely the realm of the specialist with access to reference collections and reprint files. Although a number of nymphs have been described, very few descriptions are adequate for taxonomic purposes. Therefore the state of knowledge of nymphs is not tabulated here.

Edmunds *et al.* (1976) provide excellent keys to families and genera of North and Central America, and list species with their known distributions. Needham *et al.* (1935) remains the most useful single volume for species level studies. Other useful papers are listed in the bibliography.

Several problems contribute to the primitive state of mayfly taxonomy. Adult males are not encountered frequently, while subimagos (duns) and females are at present of no value for taxonomy. Adult males are very delicate, do not pin well, and are easily damaged even when preserved in alcohol. Nymphs are easily collected but so few have been described adequately that most specimens are of little value at the species level.

Nonetheless, great strides are currently being made in the study of the mayflies of North America.

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