

# Chapter IV —Order Odonata



## (Dragonflies and Damselflies)

- (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

The Odonata, comprising **damsel-** and **dragonflies**, are the second order of palaeopteran insects and share with them the archaic wing articulation. Fossil Odonata are known from the late Paleozoic. Most nymphs are strictly aquatic, but some live in damp terrestrial environments. Three ecological types of nymph are recognized: burrowers, sprawlers, and climbers. All are predators and use visual or tactile input to locate prey.

More is known about the chemical ecology of odonates than of mayflies. Solutes in the environment of the nymphal odonate can influence distribution; for example, there are calcicole and calcifuge species. Salinity and other chemical factors also influence their distribution. Temporal and spatial differences in trophic niches appear to account for the common occurrence of high species diversity in some habitats.

This order belongs to the primitive infraclass Paleoptera. They are among the most ancient flying insects; their ancestors appeared during the Carboniferous period 280-350 million years ago. Dragonflies of the Carboniferous period reportedly had wingspans of 75 cm, four times that of the largest extant species. Odonates comprise two suborders, the Anisoptera (dragonflies) and Zygoptera (damselflies). The taxonomy of this order is relatively well known among the aquatic insects, since nymphs (or naiads) are typically very conspicuous and well studied. 194 species are reported to occur in the whole of Canada.

### Life History and Habitat

Odonates are hemimetabolous, with relatively long-lived adults (several weeks to several months). After fertilization, the eggs are deposited into the water, onto substrata in or near the water, or into submersed parts of macrovegetation. Egg development, as in most invertebrates, is temperature-dependent; nymphs hatch after about two to five weeks of egg development. Growth in the nymphal stages is quite variable, especially in relation to temperature and food supply. Within a range of about five weeks to five years, 10 to about 20 instar moltings occur. The mature nymphs often leave the water on some emergent substratum as aerial adults. In cool-temperate and higher altitude warm-temperate regions, the majority of species are univoltine or semivoltine (one generation in 2 years).

The odonate nymphs are almost entirely littoral in habitat, living among macrovegetation and littoral sediments, and burrowing into surficial sediments. The nymphs have fairly high respiratory demands and oxygen requirements.

Characteristics of dragonfly and damselfly larvae include:

- Large eyes.
- 3 pairs of long segmented legs on upper middle section (thorax) of body.
- Large scoop-like lower lip that covers bottom of mouth.
- No gills on sides or underneath of abdomen.

Table IV-1: Differences between the Anisoptera and the Zygoptera (Williams & Feltmate, 1992) and (Kellogg, 1994)

Anisoptera (dragonflies)	Zygoptera (damselflies)
	
Hindwings broader at base, held horizontally or slightly depressed at rest. Strong fliers.	Wings of equal size, narrow at base, held vertically at rest. Weaker fliers.
Larvae- Wide oval to round abdomen that may end in three wedge-shaped extensions	Larvae- Narrow body with 3 oar-shaped tails (gills) extending in a tripod formation. Long spindly legs and a thin narrow body
Eyes not projecting from sides of head.	Eyes bulbous and prominent.
Most families with reduced or vestigial ovipositors.	Females with well developed ovipositors.
Supra-anal plate present in males.	Supra-anal plate vestigial.
Nymphs robust, with rectal gills.	Nymphs slender, with paddle-like caudal gills.
Eggs usually laid at water surface or on surfaces of aquatic plants.	Eggs inserted into stems of aquatic plants.

## Feeding

Odonate nymphs are strictly predaceous, using their modified extensible labium or “mask” to capture insect, crustacean, molluscan, or oligochaete prey. They have even been reported to consume small vertebrates. Some species burrow in the substrate and ambush prey that they detect by tactile or vibrational cues. Other species more actively stalk their prey. Odonates are one of the few orders of aquatic insects whose immature stages have eyes well developed for hunting. Adult odonates have large compound eyes to detect insect prey, which they grasp with their legs while flying.

## References

- Hutchinson, G. Evelyn 1993. A Treatise on Limnology. Vol. IV, The Zoobenthos. Ed. Y.H. Edmondson. John Wiley & Sons, Inc. Xx, 944pp.
- Kellogg, Loren Larkin 1994. Save Our Streams. Monitor’s Guide to Aquatic Macroinvertebrates. Second Ed. [Izaak Walton League of America](#). 60pp.
- Narf, R. 1997. Midges, bugs, whirligigs and others: The distribution of insects in Lake “U-Name-It”. Lakeline. N. Am. Lake Manage. Soc. 16-17,57-62.
- Peckarsky, Barbara L., Pierre R. Fraissinet, Marjory A. Penton, and Don J. Conklin, Jr. 1990. Freshwater Macroinvertebrates of Northeastern North America. Cornell Univ. Press. xii, 442pp.

- Wetzel, Robert G. 1983. Limnology. Second Edition. Saunders College Publishing. Xii, 767pp., R81, I10.
- Williams, D. Dudley, and Blair W. Feltmate. 1992. Aquatic Insects. CAB International. xiii, 358pp.

**(This page intentionally left blank)**