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The Remaining Endopterygote Orders

1. Introduction

The six remaining endopterygote orders dealt with in this chapter are quite distinct from those that form the panorpoid complex. Of the six, the order Hymenoptera appears most isolated phylogenetically and is sometimes considered in a distinct superorder, the Hymenopteroidea, perhaps the sister group to the panorpoid complex. Except for the Strepsiptera, whose affinities remain unclear, the remaining orders are then tentatively united in a neuroptero-coleopteroid group (see Chapter 2, Section 3.2). Some authors include the Mecoptera and Raphidioptera as suborders within the order Neuroptera.

2. Megaloptera

SYNONYMS: Corydalida, Sialoidea (in order
Neuroptera *sensu lato*)

COMMON NAMES: alderflies and
dobsonflies

Large, soft-bodied insects; head with chewing mouthparts, elongate antennae, and large compound eyes, three ocelli present (Sialidae) or absent (Corydalidae); two pairs of identical wings with primitive venation and large number of crossveins, abdomen 10-segmented without cerci.

Larvae aquatic with chewing mouthparts and paired abdominal gills. Pupae dectitious and exarate.

Representatives of this small (300 species) order are found especially in temperate regions, though their distribution is discontinuous. Some 43 species have been described from North America, about 25 from Australia, and 3 from Britain.

Structure

Adult. Adult Megaloptera are generally large insects, with members of some species having a wingspan of about 17 cm. Their prognathous head carries well-developed compound eyes, long multisegmented antennae, and chewing mouthparts [including enormously elongate mandibles in some male Corydalidae (Figure 10.1C)]. Three ocelli are present in Sialidae but absent in Corydalidae. The thoracic segments are well developed and freely movable; the pronotum is broad. All legs are similar. Four membranous wings occur, with all of the major veins and a large number of crossveins present. The wings lack

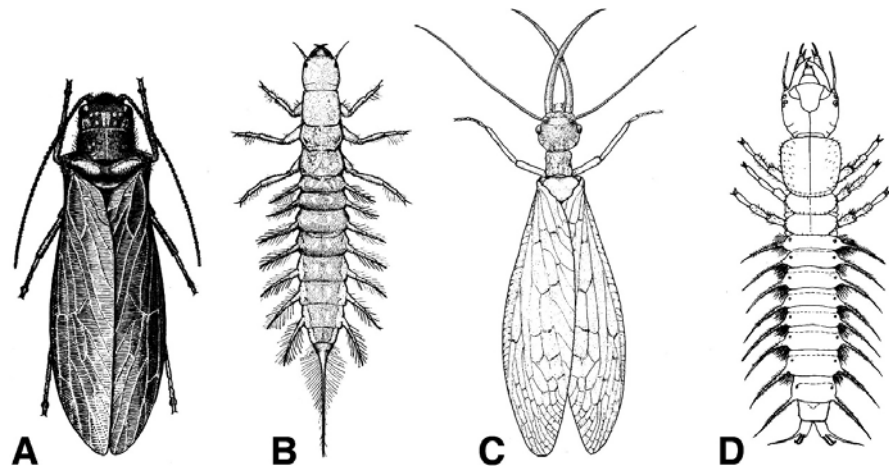


FIGURE 10.1. Megaloptera. (A) An alderfly, *Sialis mohri* (Sialidae); (B) *Sialis* sp. larva; (C) a male dobsonfly, *Corydalus cornutus* (Corydalidae); and (D) *Corydalus* sp. larva. [A, B, from H. H. Ross, 1937, Studies of Nearctic aquatic insects. I. Nearctic alderflies of the genus *Sialis* (Megaloptera, Sialidae), *Bull. Ill. Nat. Hist. Surv.* **21**(3). By permission of the Illinois Natural History Survey. D, from A. Peterson, 1951, *Larvae of Insects*, By permission of Mrs. Helen Peterson.]

a pterostigma. The wing-coupling apparatus is of the jugofrenate type. The abdomen is 10-segmented and lacks cerci.

The structure of the internal organs is poorly known. The alimentary canal has a mediodorsal food reservoir; six or eight Malpighian tubules are present; the nervous system is primitive with three thoracic and generally seven abdominal ganglia; females have a varied number of panoistic (Corydalidae) or telotrophic (Sialidae) ovarioles.

Larva and Pupa. Larvae are elongate and in some species may reach a length of 8 cm. The prognathous head is well developed and carries chewing mouthparts. The thorax bears three pairs of strong legs, the abdomen seven (Sialidae), or eight (Corydalidae) pairs of gills. Pupae are decticious, exarate, and not enclosed in a cocoon.

Life History and Habits

Adult Megaloptera are generally found in the vicinity of streams or in other cool, moist habitats where, during the day, they rest on vegetation. They probably feed very little and are generally short-lived. Reproduction appears to be entirely sexual and eggs are attached, in batches of several hundred to several thousand, to stones, vegetation, etc., usually near water.

Larvae are aquatic and predaceous. Development in most species is completed in a season, but in some large forms it may take up to 5 years. Larvae pass through 10–12 instars and when mature leave the water and burrow into soil or moss or under stones where pupation occurs. Before emergence pharate adults wriggle to the surface of the pupation medium.

Phylogeny and Classification

Fossil Megaloptera are known from as early as the Upper Permian and probably had a common ancestry with the Raphidioptera and/or Neuroptera in the Upper Carboniferous. The cladistic analysis of Aspöck *et al.* (2001) indicates that the Megaloptera and Neuroptera