5 | Morphology and Adaptations

There is no comprehensive, comparative account of Plecoptera nymph morphology. Morphological studies that have included orthopteroid orders, such as these of Walker (1922) and Snodgrass (1909, 1932a,b, 1933, 1951), have dealt largely with adults. Classic entomology textbooks such as Fox & Fox (1964) Imms et al. (1964), Ross (1965), and Borrer et al. (1981), give generalized descriptions of nymphs as flattened, elongated stages with long cerci and antennae that closely resemble adults in body form. Hoke (1924) included nymphs of two species, *Perla immarginata* and *Pteronarcys regalis*, in her study of the anatomy of the head and mouthparts of Plecoptera.

Descriptions and illustrations of some nymphs were presented in the classic works of Frison (1929, 1935), Claassen (1931), Ricker (1952, 1959b) and Jewett (1968), and by Harper & Stewart (1984), to accompany their keys and taxonomic presentations. However, these and the many other isolated nymphal descriptions and illustrations of North American genera and species are largely noncomparative (except mesosternal ridge patterns and gills [Ricker 1952, 1959b]) and are therefore of limited phylogenetic value. The most detailed accounts of plecopteran nymphal morphology were by Hynes (1941) and Zwick (1973). The latter gave an excellent comparative account of internal anatomy and characters that are actually or potentially valuable for phylogenetic analysis. The gills are the only specific external nymphal structures that have been comparatively studied for all North American genera (Shepard & Stewart 1983).

GENERAL BODY FORM

Nymphs of the nine North American families vary considerably in body conformation. Those of the Capniidae, Leuctridae (except *Megaleuctra*), and Taeniopterygidae are generally elongate, cylindrical or subcylindrical, gilless (except *Taeniopteryx*), and with parallel or divergent wingpads and relatively short legs (Fig. 7.1, 8.1, 10.3); this form is adaptive for their cryptic habit in mineral or plant debris interstices. The appressed hind legs of most mature capniid and leuctrid nymphs fall far short of reaching the tips of their abdomens; those of taeniopterygid nymphs reach approximately the abdominal tip.

Nemouridae nymphs are small, mostly shorter than 8 mm, stout-bodied, subcylindrical, and have markedly divergent wing pads (Fig. 9.1). Gills are absent, or are present only in the ventral neck region. In most genera, the legs are relatively long, and their appressed hind legs exceed or approximately reach the abdominal tip. Mature Pteronarcyidae nymphs are large, longer than 14 mm, robust, dark, and heavily sclerotized, and they have profusely branched ventral gills on the thorax and first two or three abdominal segments (Fig. 15.1, 15.2). The nymphs of Peltoperlidae are distinctive, having been aptly described by many authors as "roach-like." They are robust, broad, subflat-