CHAPTER 1. INTRODUCTION TO DISSERTATION

The amphipod *Gammarus minus* Say is a dominant life form in hardwater springs, streams, and caves of the montane eastern United States. It ranges from southern Pennsylvania to western Kentucky and southern Indiana (Holsinger 1972). (Fig. 1 in Chapter 2 is a map of the range.) Because *G. minus* is found at many locations in the range and because some cave populations of the species exhibit troglomorphy[1], *G. minus* has attracted the interest of a number of researchers in the last three decades. Culver and others (e.g., Culver et al. 1995, Fong 1989) have used the study of troglomorphy in *G. minus* to answer questions of evolution in cave animals. Glazier is determining the preferred physical/chemical habitats of the species (Glazier 1991, Glazier et al. 1992), and Gooch studies genetic relationships of *G. minus* populations (Gooch and Wiseman 1980, Gooch and Glazier 1986). Griffith et al. (1994) included *G. minus* in a study of the relationship of alkalinity to secondary production in shredders in headwater streams.

However, gaps in the knowledge of the ecology of the species still remain. There is a lack of detailed information regarding the role of *G. minus* in the bioenergetics of surface streams. Also needed are more comparisons of the relationship of habitat (particularly biotic features such as available plant material) to bioenergetics of different populations and to functional morphology of surface populations. For example, in the functional feeding groups scheme proposed by Cummins (1973), gammarids are assumed to be shredders (organisms that break down larger pieces of detritus) or collector-gatherers (organisms that collect finer pieces of detritus from the bottom zones). However, published data supporting assumptions of what or how freshwater amphipods eat are sparse (exceptions include Minckley and Cole 1963, Wagner and Blinn 1987, and Willoughby 1983).

Gammarus minus populations are discontinuously distributed and differ markedly in morphological characteristics such as eye structure and antennal length (Hubricht 1943, Holsinger 1969, Cole 1970, Holsinger and Culver 1970). Only limited studies of other morphological differences between populations have been conducted (Minckley and Cole 1963).

Phototaxic behavior in *G. minus* has also been examined in relation to reduction of eyes in some cave populations (Vawter et al. 1987). Feeding behaviors, however, had not been examined prior to the current study. Mouthpart functional morphology is of interest to amphipodologists because of its importance in elucidating the evolution of amphipods (Watling 1993). Although information on the functional morphology of feeding in marine amphipods is available, little is known of the feeding habits of freshwater species. And, despite the tendency

[1] Troglomorphic is a term that refers to behavioral and morphological characters that are convergent in subterranean populations. (Culver et. al. 1995)

of young *G. minus* to occupy different microhabitats from adults (Miller and Buikema 1977), there are few data concerning differences in the functional morphology of feeding structures between immature and mature amphipods.

The objectives of the two studies reported in the following chapters are to relate habitat features, particularly potential food sources, in two populations of *G. minus* to 1) annual production (CHAPTER 2), 2) features of population structure and life history (CHAPTER 2), and 3) mouthpart and foregut functional morphology (CHAPTER 3).

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