



Differential growth of crayfish *Procambarus alleni* in relation to hydrological conditions in marl prairie wetlands of Everglades National Park, USA

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Accepted 23 November 2000

Key words: crayfish, *Procambarus alleni*, growth, Florida Everglades, hydroperiod

Abstract

Environmental conditions influence crustacean growth by affecting molt intervals and incremental increases in length and weight. In the seasonally-flooded marl prairie wetlands of eastern Everglades National Park, U.S.A., hydroperiod exerts considerable influence on aquatic primary productivity, and so may influence the availability of food resources for higher trophic levels. The seasonal hydroperiod has been drastically altered by anthropogenic factors, but the impacts on the aquatic community are not well known. We studied whether differences in growth of crayfish *Procambarus alleni* could be detected in habitats with different hydroperiods. We first described growth patterns based on incremental increases in length and weight of crayfish on a high protein diet in the laboratory. Regression analyses indicated that growth patterns in males and females were similar. Although the intermolt period increased with age, the proportional increases in length and weight were similar through successive molts. The relationship between length and weight of crayfish was best described by a power equation for allometric growth. We then compared growth curves for crayfish subpopulations from different areas of the marl prairie. In habitats with the longest hydroperiods, crayfish weight-at-size was not significantly different from that in laboratory crayfish on the high protein diet. However, weight gain per unit increase in length in short hydroperiod sites was significantly less than in long hydroperiod sites or in the laboratory. These results indicate that crayfish productivity may be associated with hydroperiod in these stressed wetlands, and this may contribute to observed source-sink population regulation.

Introduction

Growth in crustaceans is a highly complex and asynchronous process that is often impacted by environmental conditions. Protein synthesis and cellular growth occur primarily during intervals between molts, but size increases directly follow ecdysis (Aiken & Waddy, 1987). Furthermore, molt frequency and increases in size-at-age may be highly variable within a species and between species due to a number of abiotic factors (Hartnoll, 1982; Huner, 1984; France, 1985; Griffith et al., 1996). Environmental factors may impact crayfish growth by affecting feeding behavior, foraging efficiency, and the availability

and quality of food resources (Momot & Gowing, 1977; France, 1985). The relationship between pre-molt and post-molt length has been used to describe growth and the effects of environmental conditions on growth patterns, but the functional relationships vary among species (Hiatt, 1948; Kurata, 1962; Mauchline, 1976). Additionally, simple length-weight patterns may have the potential for indicating differential growth (Austin, 1995) that may be associated with the severity of environmental stress across the range of a species.

The crayfish *Procambarus alleni* Faxon is one of the most ubiquitous inhabitants of the seasonally-flooded marl prairie wetlands of eastern Everglades