FUNCTIONAL MORPHOMETRY OF ARISTEUS ANTENNATUS 
(RISSO, 1816) (DECAPODA, ARISTEIDAE)

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ABSTRACT

Growth as reflected by measurements of different body parts of the pink shrimp, Aristeus antennatus (abdomen, scaphocerite, uropods, and segments on the third and fourth pereiopods) was related to carapace length by type-I regression analysis. There were differences in the relative growth of swimming appendages and pereiopods. For the former (abdomen, uropods, and scaphocerite) growth was negatively allometric at a statistically significant level, whereas for the latter (pereiopod segments) growth either was isometric or exhibited a slightly positive allometry. Comparison of the measurements between the sexes revealed differences in growth only for the uropods, with the slopes of the regression lines indicating higher negative allometry in females than in males. There was no evidence of growth discontinuity for any body part over the life cycle of individuals of this species. The results have been compared to the findings reported by other investigators working with other species of shrimps, prawns, lobsters, and crabs, and the relative growth of the different body parts has been related to the different life strategies of each group.

RESUMEN

Se estudia el crecimiento relativo de varias medidas longitudinales del cuerpo de la gamba rosada, Aristeus antennatus (abdomen, escafocerito, uropodos y artejos del tercer y cuarto pereiopodos), respecto a la longitud del caparazón, mediante un análisis de la regresión de tipo-I. Se observan diferencias en el crecimiento relativo de los apéndices natatorios y pereiopodos. En los primeros (abdomen, uropodos y escafocerito), el crecimiento fue significativo para una alometría negativa, mientras que para los segundos (artejos de los pereiopodos), fue isométrico o con alometría positiva débil. Comparativamente entre sexos, se observan diferencias significativas solo en el crecimiento de los uropodos, presentando las hembras una alometría negativa más fuerte que los machos. No se observó evidencia de discontinuidad, en ningún apéndice, a lo largo del crecimiento de esta especie. Los resultados obtenidos se han comparado con los registrados por otros autores en otras especies de gambas, langostas y cangrejos, de manera que la discusión se plantea relacionando el crecimiento relativo de estas especies con las diferentes estrategias vitales de cada grupo.

INTRODUCTION

Relative growth has been widely studied in crustaceans, and both conceptual and empirical aspects have been discussed by various investigators, e.g., Hartnoll (1974, 1978), Finney & Abele (1981), Huber (1985), and Blackstone (1986). The relative growth rates (chiefly linear measurements) of different body parts and function of body parts, sexual dimorphism, sexual maturity, changes in individual behaviour with puberty, fecundity, and changes in the weight-length relationship are just a few of the processes that may be studied through
morphometric analysis and analyses of growth in general, and there is an extensive literature dealing with such aspects (Hartnoll, 1985).

The allometry of certain body parts can be of singular importance, especially among brachyurans, and may be a diagnostic character for some species. A number of investigators have studied this group and have established that sexual maturity is represented by the points of intersection between the segments of the regression line for specific variables (Du Preez & McLachlan, 1984; Gaertner & Laloë, 1986; Davidson & Marsden, 1987; Clayton, 1990; Abelló et al., 1990, being some of the more recent publications). Growth processes have also been studied in certain species of clawed and spiny lobsters, primarily in respect of abdominal width or morphological differentiation of chelae at puberty, a frequent indicator of sexual dimorphism; for general reviews see Aiken & Waddy (1980) for Homarus americanus H. Milne Edwards, 1837 and Sardà (in press) for Nephrops norvegicus (L., 1758).

In contrast, studies on growth of this type are less common in the case of shrimps and prawns, possibly because proportions of body parts of such species, unlike those of the large chelae of other decapods, do not undergo appreciable variations during growth. Additionally, many of these species are fast-growing, and the females in some species do not carry the eggs during incubation, thus lessening morphometric differences between body measurements during an individual’s lifetime. This has been borne out for the morphometry of Heterocarpus reedi Bahamonde, 1955 (cf. Arana, 1970) and for the weight-length relationships of Aristaeus antennatus (Risso, 1816) (cf. Bas, 1966; Balestra et al., 1975; Demestre, 1990) and for Penaeus kerathurus (Forskål, 1775) (cf. San Feliu, 1966; Rodríguez, 1987), as well as for other penaeids (Costello & Allen, 1965; Rao, 1967; García-Pinto, 1970; Le Reste et al., 1974; D’Incào & De Calasans, 1978, Menz & Bowers, 1980; Kirkwood & Somers, 1984; Huber, 1985). Nevertheless, the literature contains few comprehensive morphometric studies on natantian crustacean species, probably because such species are mainly of interest for aquaculture, in which the weight-length relationship takes on primary importance.

The object of the present study was Aristaeus antennatus (Risso, 1816), a species found in the Mediterranean, neighbouring regions of the Atlantic Ocean, and south-eastern African coasts, and of great interest in terms of both ecology and fisheries. A number of workers have investigated the basic biology and fisheries of this species in the region (Massuti, 1961; Bas, 1966; Arrobas & Ribeiro-Cascalho, 1987; Relini & Orsi Relini, 1987; Sardà & Demestre, 1987, 1989; Tobar & Sardà, 1987, 1992; Demestre, 1990; Demestre & Lleonart, 1993). The present study undertook to analyze thirteen different linear measurements with a view to establishing relative growth, examining both pre- and post-pubertal differences between the sexes, and ascertaining the variability in certain measurements.