

LENGTH COMPOSITION, GROWTH AND REPRODUCTION OF A MEDITERRANEAN RED SHRIMP (*ARISTEUS ANTENNATUS* (RISSO, 1816), DECAPODA, DENDROBRANCHIATA) POPULATION IN THE ALICANTE GULF (S.E. SPAIN)

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Abstract

The pink shrimp (*Aristeus antennatus*) is a demersal species that is the target of a very specific trawl fishery in the Alicante Gulf (SE Spain). This paper describes, for first time in this area, certain biometric relationships, as well as growth parameters and reproductive patterns of the species. The results showed a sexual size dimorphism, with a negative allometry of growth that was higher in females. In addition, females dominated in the catch composition. The spawning period occurred between the months of June to September and the maturation stage, both for males and females, took place within the first year of life.

Keywords: Decapoda, Biology, Western Mediterranean

Introduction

The pink shrimp (*Aristeus antennatus*) is a demersal species that is found on the muddy bottoms in the Mediterranean Sea and Atlantic Ocean south of the Iberian peninsula, at depths from 200 m to deeper than 2000 m. It is the target of a very specific trawl fishery, which is considered to be monospecific. Despite the fact that it has been studied in neighbouring areas (1), we describe the biological parameters of the species for the first time in an area defined between Cape Palos and Cape San Antonio.

Materials and Methods

Monthly random stratified samplings were carried out on pink shrimp commercial catches from the Alicante Gulf landed in the port of Santa Pola, from January 1995 to December 1998. Individuals from a total of 15,683 specimens were sexed and measured by their cephalothoracic length (CL). In addition, monthly biological sampling from 5,062 additional individuals was carried out during 1997. The parameters of the size-weight relationship were determined by regression. The estimates of the Von Bertalanffy growth parameters were obtained by the FISAT statistical package (2) from monthly length frequency distributions by sex for the 1995-1998 period. Maturity was determined by macroscopic observation. For females, a scale of five maturity stages modified from (3) was adopted, whereas for males maturity was a function of the shortening of the rostrum and the presence or not of petasma fusion (4). Moulting of the individuals was determined by the hardness of the carapace considering two stages: postmoulting (soft carapace) and premoulting (hard carapace). Sexual ratios were calculated by size class, expressed as the ratio of females to the total number of individuals. Finally, the percentages of maturity by size for each sex were calculated, in order to determine the size at 50% first maturity.

Results

The sizes of the females in the catches varied from a minimum of 10.0 mm to a maximum of 66.2 mm CL, with a mean size in the sampling period of 29.3 mm CL. The males varied from a minimum of 14.6 mm to a maximum of 35.6 mm CL, with an average of 22.8 mm CL. Males represented 30% of the landings in number, whereas the remaining 70% corresponded to females. The contribution by size class of the individuals by sex to the yearly total landings showed a size dimorphism for the species (Fig. 1). The results obtained for the different size-weight relationships by sexes (Table I) showed a negative allometry between the considered parameters. Absolute growth parameters (Table II) gave high growth rate values (K , f'), which were higher in females. The mean contribution of post-moulted individuals was very low for the period studied (7.7% for males and 3.0% for females) and appeared as a clear bimonthly pattern.

The sexual ratio (sr) by size class showed that, after an initial stage (18-22 mm) when males predominated significantly, females started to dominate significantly throughout the whole range of sizes above 26 mm. The mean sexual ratio for the whole period of the study was dominated by the females ($P_s = 0.70$). The percentages of mature males showed a high ratio throughout the year, with the immature ratios increasing from November to March. In females, the ratios of mated females started to increase in spring, reached the maximum during the summer (June-September) and then decreased in the autumn. The spawning period occurred during the same period, and it was especially intense in July and August. The percentages of maturity by size class showed a 50% size at first maturity of 16.7 mm for males and 23.5 mm for females according to the logistic model (Fig. 2). However, the maturation stage, both for males and females, would have to take place within the first year of life, but with a life expectancy of four and five years respectively.

Table I. Parameters of relative growth (size (mm)-weight (g) relationship: $Weight = a \cdot Size^b$) calculated for males and females of *Aristeus antennatus*. Level of significance ***= $p < 0.001$, **= $p < 0.01$, *= $p < 0.05$ and NS= $p < 0.1$ in the Student t -test.

Group	a	b	err.b	signif.	r ²	n
males	0.00206058	2.53225	0.02016	***	0.92	1332
females	0.00187869	2.56269	0.00654	***	0.98	3730

Table II. Results of the growth parameters (size-age relationship) for the VBGF model obtained using the FISAT (ELEFAN) programme, for males and females of *Aristeus antennatus*, with t_0 being adjusted for a CL_{50} (first modal class obtained by Battacharya) of 21.46 mm in males and 25.65 mm in females.

Years	Group	L_{∞} (mm)	K (year ⁻¹)	t_0	Rn	ϕ'
95-98	males	51.0	0.360	-0.520	0.382	2.97
	females	77.0	0.380	-0.065	0.128	3.35

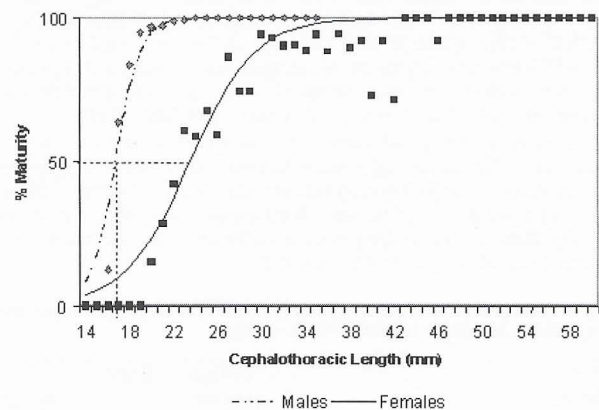


Figure 1. Size contribution by sex to the annual landings of *Aristeus antennatus* in Santa Pola port.

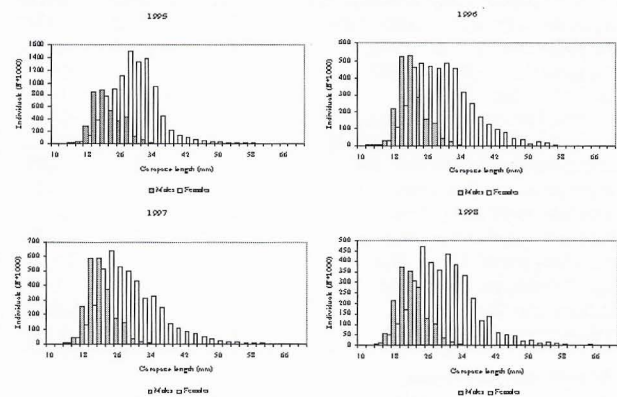


Figure 2. Logistic curves of sexual maturity in *Aristeus antennatus*.

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