

GEOGRAPHICAL AND BATHYMETRICAL DISTRIBUTION OF RED SHRIMPS IN SARDINIAN WATERS RELATED TO ENVIRONMENTAL CONDITIONS

Andrea Sabatini ^{1*}, Gloria Matta ¹, Francesco Palmas ¹ and Antonio angelo Pendugiu ¹
¹ Department of Animal Biology and Ecology, University Of Cagliari - asabati@unica.it

Abstract

Red shrimps *Aristaeomorpha foliacea* and *Aristeus antennatus* are one of the most important and exploited resource in the western Mediterranean. The aim of this work is to evaluate the geographical and bathymetrical distribution of the two species in Sardinian seas and to identify a possible relationship with environmental conditions. We calculated the ratio between the two species and we compared ratio values with hydrological data (temperature and salinity) to establish how water masses properties influence species distribution. Our results indicate that *A. antennatus* prefers colder and less salty waters while *A. foliacea* prefers both higher temperature and salinity.

Keywords: Crustacea, Intermediate Waters, Western Mediterranean

Introduction

Red shrimps are mainly captured at depths between 400 and 800 m while unexploited below 900 m. In Sardinian waters we can find both species: in the southern and eastern parts *A. foliacea* is more abundant, while *A. antennatus* is more present along the northern and western coasts [1]. The spatial and temporal variability of these two species seems to be closely connected to hydrological and oceanographic factors and the distribution of red shrimps may be correlated to water mass properties such as salinity and temperature.

Materials and Methods

The biological data were collected in Sardinian waters between 1994 and 2006 during two annual trawl survey as part of the research projects Medits and Grund. Taking into account the number of individuals of *A. foliacea* (Af) and *A. antennatus* (Aa), logistic models were calculated fitting the ratio between the two species in function of depth:

$$\text{Ratio} = Aa / (Aa + Af)$$

Using logistic regressions, depth values for Ratio 0.5 (D_{50}), 0.25 (D_{25}) and 0.75 (D_{75}) respectively were calculated. D_{50} represents the depth in which the two species have the same abundance, D_{25} and D_{75} the depth in which the 25% and the 75% of individuals, respectively, are *A. antennatus*. Hydrographic data were extracted from the MEDATLAS database [2] and a mean value of temperature and salinity was considered. The data were correlated with the correspondent ratio values for different Sardinian coasts between 400 and 800 m.

Results and Discussion

The logistic models obtained for Sardinian waters showed that in the northern and western Sardinia there is an equal occurrence of the two species at about 453 m and 478 m (D_{50}) respectively indicating a greater presence of *A. antennatus* in the whole depth range analyzed. The southern Sardinia is characterized by an extended presence of *A. foliacea* ($D_{50}=612$ m) while in the south-eastern Sardinia *A. foliacea* predominates over the whole depth range even below 650 m ($D_{25}=647$ m) (Fig. 1).

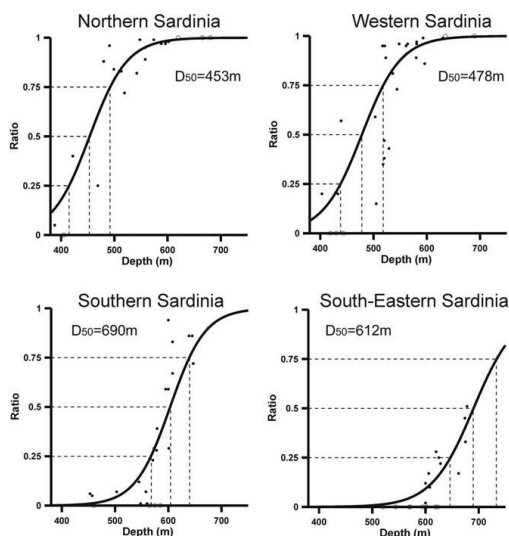


Fig. 1. Logistic models (Ratio values in function of depth)

These results showed that the ratio between the two species is very different among Sardinian coasts. The Regression Analysis, carried out fitting ratio values against hydrographic data, indicated that the ratio between the two species is correlated with environmental conditions (Fig. 2).

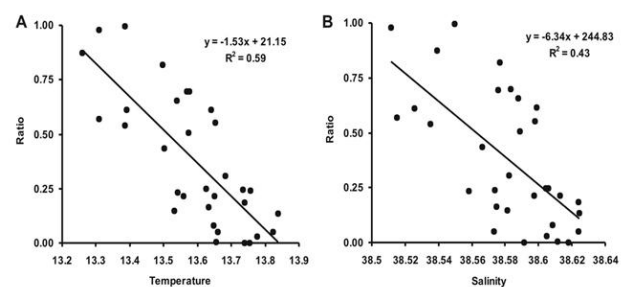


Fig. 2. Regression between Ratio values and (A) temperature and (B) salinity

Our results showed an already known bathymetrical distribution of the two species. The fluctuations in ratio and species distribution seem to be connected to environmental conditions and in particular to the circulation of intermediate water masses along Mediterranean coasts [3]. The comparison between hydrographic and biological data evidenced that both species seem to be connected to the peculiar features and fate of the LIW (Levantine Intermediate Water). In fact, in the eastern and southern part, LIW properties predominate and *A. foliacea* is the main species while in the western and northern sides of Sardinia LIW properties lose intensity in favor of *A. antennatus* which prefers colder temperatures and less salty waters.

References

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