

Reproductive potential and condition of red shrimp (*Aristeus antennatus*, Risso 1816) in the Balearic Islands (North-western Mediterranean Sea), 1991-2004

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This study explores the relationship between the **reproductive potential and condition** (energy reserves) of the red shrimp population inhabiting the waters off Mallorca Island (North-western Mediterranean) from 1991 to 2004. Red shrimp is one of the most valuable resources exploited in the Mediterranean by the demersal fishery. To assess the condition we evaluated two indices based on weight-length data computed for each single individual: the relative condition index (Kn), which included the gonad weight, and the relative condition without the gonad weight (Kne). None of these indices were related to the body length. We also analyze the use of the relative condition indices as potential predictors of recruitment. Furthermore, important aspects of the reproductive biology of red shrimp such as the interannual and seasonal variability in the sex-ratio, the maturity, the Gonadosomatic index (GSI), and the spermatophore presence in females have been considered using a 13 years continuous fishery and biological monitoring programme.

A significant negative relationship was found between GSI and Kn and Kne, indicating that energy reserves are transferred from the body to the gonad during the reproduction cycle. Results also showed that Kn of both males and females attained minimum values between June and August. The relationship between Kn and Kne by sex was also significant (linear regression), indicating that there is an effective loss of somatic condition during the reproductive season and that Kn may be used as an indicator of the population well-being during reproduction. Seasonal fluctuations of the Kn can be observed for both females and males showing a significant decrease during the reproduction season (June-August). The monthly values of Kn for males showed a decreasing trend throughout the whole period analyzed.

The relationship between the condition index of red shrimp adults during the months prior to the reproduction and the estimated number of recruits from VPA showed a significant positive relationship. This relationship had a higher correlation when only males' condition index was considered, indicating that males have an important role on the reproductive potential of the species.

Overall, our results suggest that condition plays an important role in the efficiency of the reproduction process and recruitment success of red shrimp in the western Mediterranean. The difficulties inherent to the males' structure and the mating system together with the effect of exploitation may produce a loss of reproductive efficiency.

Keywords- Red shrimp, sex-ratio, size at maturity, mating system, reproductive potential, condition index, stock-recruitment relationship, environmental impact, stock assessment.