GROWTH OF MUSSELS (*MYTILUS GALLOPROVINCIALIS*) ON CULTIVATION RAFTS IN THERMAIKOS GULF (GREECE)

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Abstract

The aim of this study was to investigate mussel growth of several cultured populations (Kalohori, Halastra and Makrygialos) in Thermaikos gulf. The results revealed that shell length and mussel weight were affected neither by the position where spat attached to the initial ropes nor by the different water culture depths. Reciprocal mussel transplantations between the culture areas of Halastra and Makrygialos revealed that all the populations, native and transplanted, showed a higher shell and weight growth and seemed to grow faster in the area of Halastra than in Makrygialos. The slope values of the length-wet weight and length-dry weight regressions were significantly higher for all populations cultured in the area of Halastra. The analysis of water physicochemical parameters revealed no significant differences between the two culture areas while a relatively small difference of the nutrients' content was observed.

Keywords : Bivalves, Growth, Aegean Sea.

Introduction

The blue mussel *Mytilus galloprovincialis* predominates in Thermaikos gulf in the Northern Aegean Sea where mussel cultivation has recently become increasingly important. It is a highly variable species and populations frequently differ in growth rate and size as well as in the morphology of shell and soft parts. A large part of this variation may be a result of environmental factors. Reciprocal transplantations are one way to examine the extent to which population differences in growth may be environmentally induced or inherited. The present study is part of a wider one, which aimed at describing the growth characteristics and genetic variation of three mussel populations from three different sites at Thermaikos gulf in the Northern Aegean Sea. In this paper we compare growth characteristics of mussels attached or cultured at different water depths and of mussels reciprocally transplanted among three sites within Thermaikos Gulf.

Materials and Methods

The study of mussel growth in suspended culture farms started in May 1995 and was completed by July 1996. Special ropes used for collection of spat, were placed at three stations in Kalohori, Halastra and Makrygialos areas, at 8 m water depth in February 1995. At each station, 30 bands were created and suspended in long-line mussel culture farms at 8 m water depth. In June 1995 reciprocal transplantation of mussels were carried out among the study areas. The mussel density of each unit was controlled and the mussels were spaced out at two months intervals.

Several physicochemical parameters, as well as nutrient content of the water were measured at two months intervals at 1 and 3 m water depths [1]. Comparison of their mean values between the two areas and between the different water depths of mussel culture was performed using Mann-Whitney test. For growth study 22.245 mussels were used, 12.879 from the Halastra and 9.366 from Makrygialos area. Growth was reconstructed by measuring shell length (mm) and the data obtained were formalized using the Von Bertalanffy [2] growth equation (VBGF). Shell lengths were related to weight according to the allometric equation: $W=aL^b$. Linear regression analyses on logarithmically transformed values of weight and length were carried out for each sample, followed by covariance analysis to compare estimates of b. For the weight study, 3.760 mussels were used, 2.146 from the Halastra and 1.614 from Makrygialos area.

Results and Discussion

Many authors have attempted to compare growth rates within a single species monitored at different water depths and concluded that growth rates differed according to cultivation raft position but not according to culture depth [3]. Our results revealed that shell length and weight of mussels were affected neither by the position where spat attached to the collector ropes nor by the different culture water depth (from 1 to 4 m below surface). Probably, such differences would be detected between moderate depths and depths greater than 6 m.

The most important finding is the fact that in Halastra culture site mussels seem to grow faster than in Makrygialos. Values of Von Bertallanfy K were significantly higher (t-test $p<0.001$) for all subpopulations cultured in Halastra compared to the same subpopulations cultured in Makrygialos (mean K for Halastra: 2.15± 0.04, for Makrygialos: 1.62± 0.08). The same trend was seen for the values of φ, which represent the rate of shell growth (mean φ for Halastra: 2.09±0.005, for Makrygialos 2.00±0.007). This difference in growth rate of mussels between the two culture areas may be a result of more favorable environmental factors [4]. However, during our study, no significant differences were found in any physicochemical parameter measured between the two culture areas that could justify our results. Also, the effect of contamination by various metals on mussel growth has been recorded as high levels of metals have inhibitory effect on mussel filtration. Halastra and Makrygialos areas receive high quantities of agriculture outfall from Axios and Aliakmonas rivers respectively [5]. The difference in mussel growth observed between the two areas could be caused by a possible different metal concentration in the water outfall of the two rivers. However the available data on metal concentration in the two rivers during the experimental period do not show any significant differences (Kravva, unpublished data).

Mussel growth is largely influenced by the water nutrient content as it regulates the phytoplancton concentration, which in turn is the primary food source for mussels [6]. The nutrient concentration in both culture sites is influenced by the waters of the Axios and Aliakmonas rivers. The differences in nutrient concentration observed during our study, especially those in PO_4-P content (mean value for Halastra: 47.6 μg/l, for Makrygialos: 32.6 μg/l) could justify the faster weight gain of mussels in the area of Halastra as this area receives water from Axios River. Water from this river has the highest nutrient concentration, mainly in phosphates, caused by anthropogenic processes.

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