PRELIMINARY COMMUNICATION

Preliminary results on the growth and mortality of warty venus *Venus verrucosa* (Linnaeus, 1758) in the suspension

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Abstract

At the end of 2007, experiment in the field on growth rate and mortality of warty venus *Venus verrucosa* was started on the Luka location in the middle part of Mali Ston bay (south Adriatic) aiming to investigate the possibility of commercially culturing this shellfish species. Experimental wire mesh cylindrical cage with 73 collected specimens was placed on the depth of 3 m. Low growth rate and high mortality within the experimental population was recorded during summer period, and the experiment was stopped in the beginning of 2009 because of loss of the cage with remaining specimens.

Key words: Warty venus, *Venus verrucosa*, growth rate, mortality rate, suspension

Preliminarni rezultati praćenja stope rasta i smrtnosti brbavice *Venus verrucosa* (Linnaeus, 1758) u kavezu iznad morskog dna

Sažetak

Na lokaciji Luka u središnjem dijelu Malostonskog zaljeva krajem 2007. godine postavljen je pokus praćenja stope rasta i smrtnosti brbavice *Venus verrucosa*, u cilju ispitivanja mogućnosti pronalaženja adekvatne tehnologije komercijalnog uzgoja ovog za marikulturu vrlo interesantnog školjkaša. U ljetnom razdoblju je zabilježena niska stopa rasta te vrlo visoka smrtnost pokusnih jedinki. Pokus je prekinut početkom 2009. godine zbog nestanka kaveza s preostalim manjim brojem školjkaša.

Ključne riječi: brbavica, *Venus verrucosa*, rast, smrtnost

Introduction

Warty venus *Venus verrucosa* (Linnaeus, 1758) is shellfish species common to the Mediterranean Sea, and can be found on the sandy bottoms and in the *Possidonia oceanica* meadows down to depth of about 30 m (Poppe and Goto, 1993). On the eastern coast of the Adriatic Sea it is usually collected by diving (Benović, 1997), in amounts of 500 tonnes yearly (Hervat et al., 2006). Along the Italian southern Adriatic coast catches are also around 500 tonnes per year (Arneri et al., 1998).

The biology of *V. verrucosa* has been previously investigated by several authors. Reproduction cycle in the wild has been investigated by Marano et al. (1982), Valli et al. (1988) and Tirado et al. (2003) while growth rate has been investigated by Arneri et al. (1998) and by Hervat et al. (2006). Potential for artificial reproduction has been investigated by Rossi et al. (1994) and there has been successful spawning of this species on the eastern Adriatic coast during 2008 (Jug-Dujaković et al., 2009; Gavrilović et al., 2009).

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Considering its commercial importance, warty venus seems to be very interesting shellfish for the introduction into the mariculture. In that respect this paper presents preliminary results of the growth and mortality rates in experimental suspended cage.

Materials and methods

By the end of December of 2007, 73 collected shellfish were placed in the experimental cage, and growth recording was commenced. Shellfish specimens were placed in the plastic insulated wire mesh cylindrical cage 150 mm high and 250 mm diameter, wrapped in the net with opening of 10 mm. Since all commercial breeding of shellfish in the Mali Ston bay has been occurred at the depth of 4 to 4.5 m, cage with specimens was placed on the depth of 3 m, approximately at the middle of farming column.

The individuals were measured once a month throughout experiment. Each *V. verrucosa* specimen was measured with a vernier caliper along two axes: length (anterior to posterior margin), and height (dorso-ventral axis from the umbo to the ventral margin) (Seed, 1980). All measurements were taken to the 0.1 mm. Dead specimens were recorded during the measurements. Last measurement was taken in the December of 2008, and the experiment was terminated in the February of 2009 due to the loss of cage line. Sea temperature was monitored daily and salinity was monitored monthly.

Results and discussion

Warty venus, being cultured during one-year period showed slow growth rate along with above 50% mortality (fig.1a). Initial average shell length of specimens placed in cages was 28.77±2.82 mm; average shell height was 25.75±2.61 mm. After a year in the experiment average shell length was 30.35±1.90 mm, and average shell height was 27.47±2.10 mm. Mean monthly growth increment in length in the course of investigated period was 0.16 mm month^{-1}, with maximum of 0.35 mm month^{-1} in January. In April there was no recorded growth in relation to the March. For shell height mean was 0,17 mm month^{-1}, monthly maximum was recorded in January, 0.42 mm month^{-1} and minimum in July, 0,01 mm month^{-1}. The average temperature for experimental period was 16.01˚C and the average salinity was 36.3 ppt. Regression analysis was performed on the linearized (LOG-transformed) data of shell length, which showed significant, although small standardized linear regression coefficient: ß=0.157712±0.039852 (R^2= 0.024873, t= 3.9575, p= 0.000085). Regression plot is shown on figure 1b.

Low shell growth rate of *V. verrucosa* was recorded also in previous studies. Thus Hervat et al. (2006) conclude that this species reaches its minimal commercial shell length of 25 mm in second year of life, while the majority of the growth takes place until six years old. Estimated age of specimens in fore mentioned experiment 37.1-52.0 mm long was 4.5-11.5 years, which was in concurrence with some previous measurements taken from the Italian and Greek populations (Arneri et al., 1998).

Greatest absolute mortality of warty venus was recorded during august 2008 (25 individuals, 36.76%). Greatest relative monthly mortality was recorded during October the same year, and was 37.14%. Afterwards the mortality rate was steadily decreasing toward the end of experiment. Since mortality was low until the august of 2008, large mortality could be explained by high summer sea temperature. In the wild *V. verrucosa* lives buried in the soft substrate a few centimetres where the variations of temperature are limited. Furthermore, *V. verrucosa* cannot be found on the surface of bottom during summer months, but only in the colder part of year (Franušić, personal communication). Total survival rate of warty venus after one-year experiment was only 26.03% (fig. 2).

Considering that previously growth of warty venus was monitored only in wild populations, further study will reveal its real potential as a culture species.

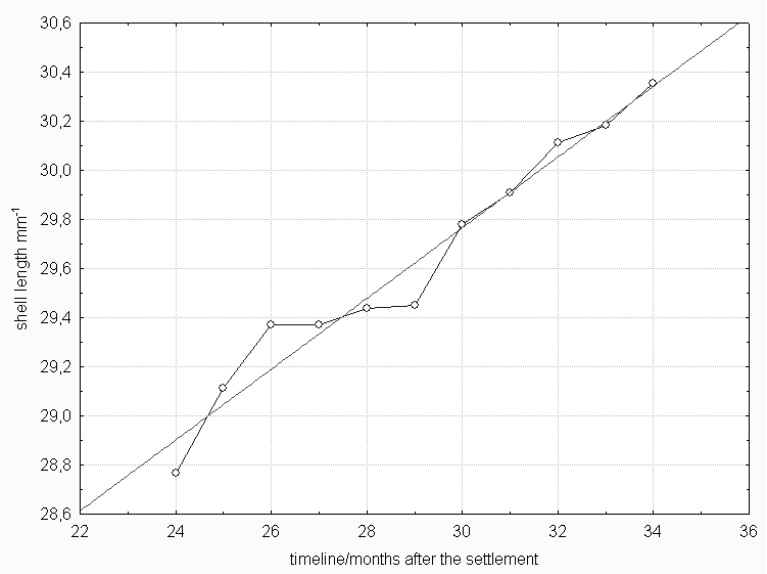

Figure 1a. Shell length of warty venus *Venus verrucosa*, in suspension cage during one-year cycle.

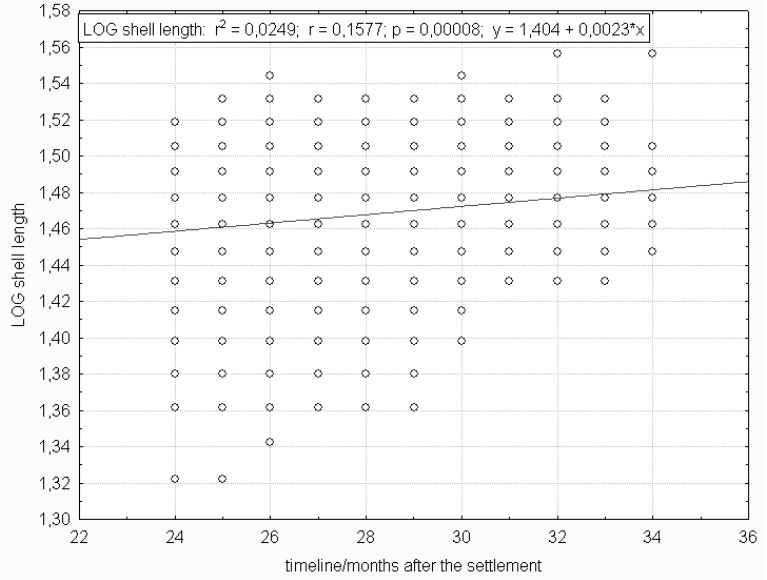

Figure 1b. Regression plot on LOG-transformed shell length data.

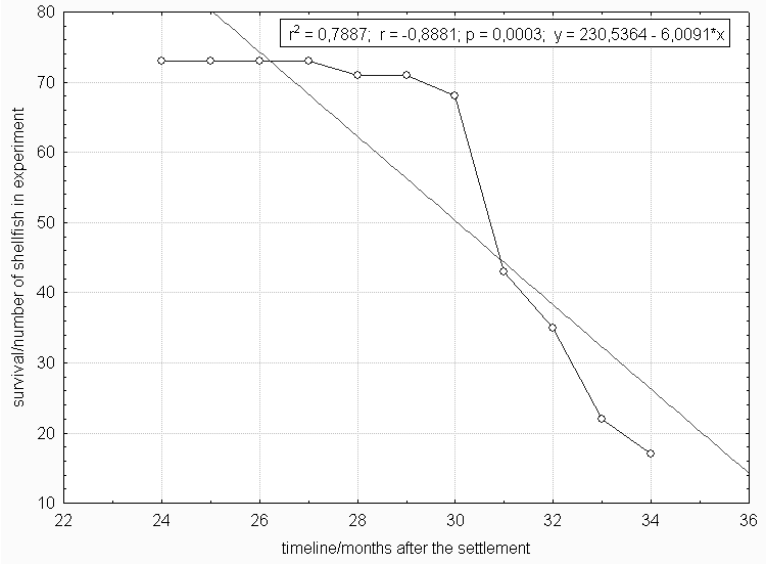

Figure 2. Survival of warty venus during culturing period.

Conclusion

Low growth rate and increasing mortality of warty venus during one-year trials was probably caused by high culture density and shallow water placement of cage. Relatively high temperature values of surface water during summer-autumn period contributed significantly to low rate of survival (little over 20%). Taking into account the fact that warty venus lives solitary, in contrast to more gregarious shellfish species, and digs into the substrate during warmer periods, we can conclude that, in order to evaluate its culture potential, all these behaviour characteristics must be addressed in future experimental design.

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