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Effects of Red-Tide and Toxic Dinoflagellates on the Survival and Growth of Larvae of the Mussel, *Mytilus galloprovincialis*

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Introduction

There were many studies on the effects of red tide dinoflagellates on shellfish populations (Nielsen and Strømgren, 1991; Lesser and Shumway, 1993; Luckenbach *et al.*, 1993; Matsuyama *et al.*, 1997; Li *et al.*, 2001). However, these studies mainly focused on the toxic effects of dinoflagellates on adults or juveniles. Interactions between dinoflagellates and bivalve larvae have not been understood comprehensively yet. Thus, the purpose of this study was established to know the effects of red tide dinoflagellates (*Amphidinium carterae, Prorocentrum triestinum, Gymnodinium impudicum,* and *Akashiwo sanguinea* on the survival and growth of the larvae of the mussel, *Mytilus galloprovincialis.*

Materials and Methods

Experiments were designed to measure the survival and growth of *M. galloprovincialis* larvae incubated with one of unialgal cultures of red tide and toxic dinoflagellates. Six sets of treatments, namely a control (no food), a standard (*Isochrysis galbana*) and 4 dinoflagellate species (*A. carterae, P. triestinum, G. impudicum,* and *A. sanguinea*) were established. For the survival experiment, 20 individuals of 5 days old *M. galloprovincialis* larvae were incubated at 15℃ under 5 μE/m^2/sec for 10 days. Numbers of survivors were counted everyday. For the growth experiment, 5 days old larvae were injected to the final density of 10 larvae/ml to 270 ml bottles filled with each algal culture. Ten-ml aliquots of subsamples were taken from each treatment at 2 days interval. Shell length of 10 larvae was measured with a micrometer to the nearest 1 μm.

Results and Discussion

The survivals of *M. galloprovincialis* larvae in no food and *I. galbana* treatments after 10 days were 100%. But, some of larvae died in treatments with red tide and toxic

dinoflagellates. The survival of larvae was higher than 90% when the food was either *A. carterae* ($p=0.153$) or *A. sanguinea* ($p=0.630$). The lowest survival (20%) was found when the food was *P. triestinum* ($p<0.001$). In the *P. triestinum* treatment, there was no significant change in survival from day 0 to day 4. But, after day 4, the survival rapidly decreased from 87% down to ca. 50% at day 6, and 20% at day 10. The shell length of *M. galloprovincialis* larvae in no food treatment decreased ($p=0.010$), while that in *I. galbana* treatment increased ($p<0.001$). The daily increment of shell growth of larvae in the *I. galbana* treatment was 3.79 μm. When the food was *A. carterae*, *G. impudicum*, or *A. sanguinea*, the shell length of larvae increased. But, the shell length decreased when the food was *P. triestinum*. After 10 days, the shell length of larvae was significantly affected by 6 different treatments ($p<0.001$), and was higher in the order of treatments: *I. galbana* > *A. carterae* > *A. sanguinea* > *G. impudicum* > *P. triestinum* > no food. In considering the harmful effects of red tides on the aquatic ecosystem, not only the effects on adult populations of fish and shellfish, but also the effects on larval populations should be included.

References

Lesser, M.P. and S.E. Shumway. 1993. Effects of toxic dinoflagellates on clearance rates and survival in juvenile bivalve molluscs. *J. Shellfish Res.*, 12: 377-381.

Li, S.C., W.X. Wang and D.P.H. Hsieh. 2001. Feeding and absorption of the toxic dinoflagellate *Alexandrium tamarense* by two marine bivalves from the South China Sea. *Mar. Biol.*, 139: 617-624.

Luckenbach, M.W., K.G. Sellner, S.E. Shumway and K. Greene. 1993. Effects of two bloom-forming dinoflagellates, *Prorocentrum minimum* and *Gyrodinium uncatenum*, on the growth and survival of the eastern oyster, *Crassostrea virginica* (Gmelin 1791). *J. Shellfish Res.*, 12: 411-415.

Matsuyama, Y., T. Uchida and T. Honjo. 1997. Toxic effects of the dinoflagellate *Heterocapsa circularisquama* on clearance rate of the blue mussel *Mytilus galloprovincialis*. *Mar. Ecol. Prog. Ser.*, 146: 73-80.

Nielsen, M.V. and T. Strømgren. 1991. Shell growth response of mussels (*Mytilus edulis*) exposed to toxic microalgae. *Mar. Biol.*, 108: 263-267.