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Effects of Food Quantity and Temperature on the Filtering Activity of *Saxidomus purpuratus*

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Introduction

Saxidomus purpuratus is naturally distributed along the coasts of China, Japan, and Korea. The commercial yields from the traditional exploitation of fisheries have been declining due to over-harvesting. So, much attention has been concentrated to the aquaculture of this species. Although there are several studies to reveal the basic ecological and biological aspects (Kim, 1971; Chung *et al.*, 1999; Kim *et al.*, 2001) of *S. purpuratus*, there was no published report on the aquacultural aspects of this species. To find the optimal conditions for juvenile *S. purpuratus*, effects of prey concentration and temperature on the filtering activity was assessed. We measured the clearance rate (IR) and the ingestion rate (IR) of *S. purpuratus* among different prey concentrations and temperatures.

Materials and Methods

The juvenile *S. purpuratus* were obtained from the Taean Marine Hatchery, NFRDI. They were acclimated to experimental temperatures for 1 week. Prey (*Isochrysis galbana*) was grown at 20℃ in enriched f/2 seawater medium without silicate, with continuous illumination of 100 $\mu E/m^2/sec$ provided by cool-white fluorescent lights. Clearance rate and ingestion rate were measured by an indirect method originally described by Coughlan (1969). Clams were incubated with combinations of 6 prey concentrations and 6 temperatures. The algal concentrations before and after the feeding experiments were measured by counting more than 400 cells in triplicate 1-ml Sedgewick-Rafter counting chambers. The functional responses were determined by fitting clearance rate and ingestion rate data to an exponential and a Michaelis-Menten equation, respectively.

Results and Discussion

Prey concentration and temperature strongly affected the clearance rate (CR) and ingestion rate (IR). CR changed greatly from 0.04 to 19.3 liter/hr/g. It was maximal at low prey concentration, then decreased as prey concentration increased further. IR changed greatly from 1.9×10^7 to 5.2×10^9 cells/hr/g. It increased at lower prey concentrations, then was saturated as prey concentration increased further. When the prey concentrations were above 5.8×10^5 cells/ml, IR showed no statistical differences. To ensure higher growth of *S. purpuratus*, prey should be supplied with at least 5.8×10^5 cells/ml.

There were great effects of temperature on CR and IR. The maximum CR (CR_{max}) at 5℃ was as low as 0.3 liter/hr/g. It increased as temperature increased, was highest at 25℃, then rapidly decreased at 30℃. CR_{max} was most stable within 15~25 ℃. The trend for maximum IR (IR_{max}) was similar to CR_{max}. Within the temperature range of 15~25℃, both CR_{max} and IR_{max} were highest and least variable (3.5−fold change for CR_{max} and 1.6−fold for IR_{max}). The optimal range of temperature is 15~25 ℃.

From the relationship between the IR_{max} and temperature, it is possible to predict the annual variation in IR from the annual variation in seawater temperature measured in the field. Higher IR, and hence fast growth can be expected during May to November (active period). From December to April, the IR was low because the water temperature was low. To ensure higher growth of *S. purpuratus* during this inactive period, temperature should be elevated to at least 15℃.

References

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