GROWTH RESPONSE OF A SMALL PLANKTIVOROUS FISH (*PSEUDORASBORA PARVA* : CYPRINIDAE) UNDER CURRENT VELOCITY STRESS AND PREDATION RISK

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Worldwide, freshwater fish are the most diverse of all vertebrate groups, but are also the most highly threatened (Duncan and Lockwood, 2001). Several studies have revealed that engineered structural changes have led to a serious damage of their necessary habitats. Changes in rivers and streams caused by engineered structural have increased the habitat alteration of aquatic community. Lost of covers such as vegetated areas, causes small fish become more exposed to high fluxtuation of water discharge associated with flow regulation, and more vulnerable to predation. This study aimed to investigate the responses of small fish inhabiting the stream waters faced with multiple dangers that frequently impose conflicting demands on such fish. A small planktivorous fish, *Pseudorasbora parva*, was exposed to two stressors: high current velocity and risk of predation in an experimental flume. The experimental arena was devided into two areas: (1) shallow part to facilitate high current velocity, and (2) deep part to facilitate low current velocity. Largemouth bass, *Micropterus salmoides*, was used to produce the risk of predation. The results showed that the small fish had a lowered growth as a result of being exposed to both the two stressors. Swimming energy expenditure and lost of feeding opportunities might be the main cause of lowered gorwth rate. During the high risk of predation, fish shifted to the shallow part to avoid predation. The shallow part provided safer environment, nevertheless the cost was high in terms of low feeding opportunities and high swimming cost. The multiple costs of maintaining a position in a fast current may reduced the energy budget allocated to body mass. During the low risk of predation, fish might migrate to deep part to compensate the feeding. The nocturnal migration of some fish to the pool was suggested that fish avoid the suboptimal habitat with the hostile feature during the low risk of predation. This behavior may also benefit the fish to compensate the restricted daytime feeding. The fish might resolve the conflicting necessities by compromising costs and benefits associate with the growth. After all, the results suggested that the failure of small planktivores to increase optimal body mass in such situation may occur as a cost of antipredatory behavior, which may be expected as a result of balancing conflicting demands. As an implication, population in nature of such fish may have lower fitness following habitat invasion by predators and high current exposure.

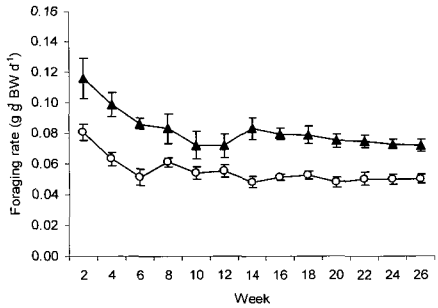

Fig. 1 Daily foraging rate (mean ± S.D.) of *P. parva* in two types of environment, in the absence (▲) and presence (○) of a predator during the experimental period.

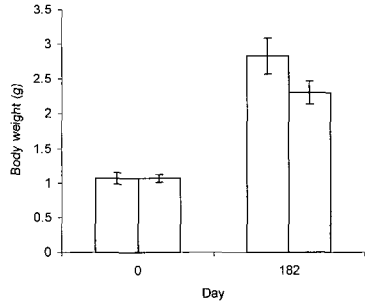

Fig. 2 Body weight (mean ± S.D.) increment of *P. parva* in the absence (□) and presence (■) of a predator during the experimental period.

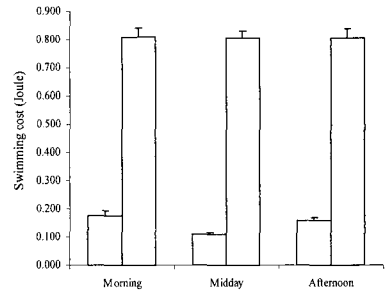

Fig. 3. The swimming energy expenditure (mean ± S.D.) of an individual *P. parva* in a 10-minute period during the daytime, in the absence (□) and presence (■) of a predator.

REFERENCES

Duncan J. R. & Lockwood J. L. (2001) Extinction in a field of bullets: a search for the causes in the decline of the world 's freshwater fishes. Biological Conservation 102: 97-105.