

Reproduction and population dynamics of a temperate freshwater shrimp *Neocaridina denticulata denticulata* (De Haan, 1844) in a stream of Korea

CHUL-WOONG OH · CHAE-WOO MA* · RICHARD G. HARTNOLL**
and HAE-LIP SUH***

Mokpo National University · *Soonchunhyang University · **The University of Liverpool · ***Chonnam National University

Introduction

Atyid shrimps are an important component in the lentic and lotic waters of temperate and tropical areas (Hart, 1981; De Silva & De Silva, 1989). They play an important role in the food webs of freshwater ecosystem by clearing debris and epiphytic microalgae on the deciduous leaves and roots of submerged macrophytes and in turn, by serving as the diet for fishes. Recent investigations have suggested that the activity of macroconsumers (fish, shrimp, crayfish) in lotic environments can help break down leaf litter, influencing numerous aspects of stream environment (Webster & Benfield, 1986; Boulton & Boon, 1991; Parkyn, Rabeni & Collier, 1997; Schofield *et al.*, 2001).

This study aims at investigating the reproductive biology of a temperate freshwater shrimp *N. denticulata denticulata* in Korea, based on observation of gonadosomatic index, occurrence of ovigerous females, and ovarian development. Along with the examination of the sex ratio, size at sexual maturity, fecundity, brood mortality and relationship between reproductive variables and certain body dimensions, investigation has been made to determine whether there is a consecutive breeding within a single breeding period. In addition, we estimate growth, mortality and recruitment patterns on the basis of monthly length-frequency data analysis (LFDA) collected July 1999 June 2001.

Materials and Methods

Monthly samples were obtained over a period of two years between July 1999 and June 2001. An open-ended rectangular metal box with 0.4 m² area and 0.3 m depth was put into the littoral vegetation and adhered to the substrate. A scoop net of a fine mesh size (0.5 x 0.5 mm) was repeatedly swept around the confined area of the box.

Shrimps were sorted from debris by eyes and preserved in 4% formaldehyde for a day and then transferred to 70% ethanol for storage. Sex was determined by the size and shape of the endopodite of the second pleopod and the presence or absence of the appendix masculina. Carapace length (CL), the shortest distance between the posterior margin of the orbit and the mid-dorsal posterior edge of the carapace, was measured

using dissecting microscope (Zeiss Stemi SV-6) and Image-Pro Plus Version 4.1. Each subsample was dried for 48 h at 80°C and then weighed using an electronic digital balance with a precision of 0.01 mg (Satorius BP 201S).

Results and Summary

1. Seasonal changes in population structure, density, biomass, reproductive aspects and growth of *Neocaridina denticulata denticulata* were examined at a stream of Young-am Lake, Korea between July 1999 and June 2001. Average population density, ranged from a maximum of 180 to a minimum of 34 indiv. m⁻² (14.4–3.6 g dry wt). During rainy season, the population size declined with increased stream level, as a result of the diffusion of population into freshly inundated areas.

2. The main breeding season from June/July, was reflected by higher gonadosomatic indices (GSI). The ovarian dry weight of females with late egg stage was significantly higher than for those with early egg stage and the ovarian dry weight also was different between each egg stage. This indicates that ovarian maturation occurs during embryonic period, suggesting that females were potentially consecutive breeder, capable of multiple breeding within a single reproductive season.

3. Average reproductive output (0.44), as the proportion of female weight to egg, was much higher than that of other freshwater and marine shrimps studied, suggesting investment more energy towards egg production.

4. The size at which 50% of females are mature (*CL50*) is estimated as 6.36 mm for proportions of females with mature ovaries and 7.82 mm for proportions of ovigerous females. For the pooled data (since no significant difference in the *CL50* of two categories was not found), the *CL50* was 7.24 mm.

References

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