

Notes

Sex Ratio and Insemination Rate of *Parapenaeus fissuroides* and *P. lanceolatus* (Penaeidae: Decapoda) Collected in January from Southern Korean Waters

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We examined the sex ratio, and insemination rate of *Parapenaeus fissuroides* and *Parapenaeus lanceolatus* using samples collected near Cheju Island, Korea, in January 2005. Females were more numerous than males in both species, and based on the gonad color pattern, sex ratio, and insemination rate, the spawning period of these shrimps was determined to be during winter.

Key words: *Parapenaeus fissuroides*, *Parapenaeus lanceolatus*, Sex ratio, Insemination rate, Korean shrimp

Introduction

Parapenaeus fissuroides and *Parapenaeus lanceolatus* are commercial penaeid shrimp that dwell on muddy bottoms. These shrimp inhabit a wide range in the western Pacific, from tropical to temperate regions, and occur in deep waters from India eastward to the East China Sea (Liu and Zhong, 1986). In Korea, penaeid shrimp are found from the south-western to the southeastern coasts (Cha et al., 2001), but are rare during winter. Sexual maturity and growth are closely related to local environmental conditions (Dall et al., 1990). In the temperate western Pacific, penaeid shrimp can be divided into two reproductive groups according to their main spawning seasons: the spring and summer spawning groups (Choi, 2001; Cha et al., 2002, 2004a,b). During the main spawning season, the sex ratio (relative abundance of females to males) increases (Choi, 2001). *Parapenaeus longirostris* is a common penaeid shrimp in the Indian Ocean, where its spawning season varies according to its habitat. Individuals inhabiting shallow coastal areas spawn year-around, whereas those in deeper areas stop spawning during summer, when water temperatures rise (Tom et al., 1988). Studies on the sexual maturity and spawning of *Parapenaeus* species have suggested that *P. fissuroides* and *P.*

lanceolatus inhabiting shallow Korean coastal waters spawn once a year, during the spring.

We examined the sex ratio and insemination rate of female shrimp using samples collected in January.

Methods and Materials

During a winter survey of shrimp fauna, we collected 47 *P. fissuroides* and 46 *P. lanceolatus* in a commercial trawl near Cheju Island, Korea, in January 2005. Females and males were distinguishable by the presence of a thelycum (females) or petasma (males). Gonad development was grouped into three stages using gonadal color patterns: yellow, green, and dark green (Gab-Alla et al., 1990). Insemination was determined by the presence of a thelycum on the females.

Results and Discussion

We examined 47 *P. fissuroides* and 46 *P. lanceolatus*. In *P. fissuroides*, the sex ratio was 22:1, with more females than males, while in *P. lanceolatus*, the sex ratio was 5.7:1. The high sex ratio is due to the high mortality of males after copulation, and also reflects a high insemination rate (Cha et al., 2004a,b).

The dominant size groups differed between the two species. Shrimp with a carapace length of 29 mm

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were dominant in *P. fissuroides* (22.5% of the total), while those with a carapace length of 27 mm were dominant in *P. lanceolatus* (20%; Figs. 1 and 2). In both species, the ovaries were green or dark green

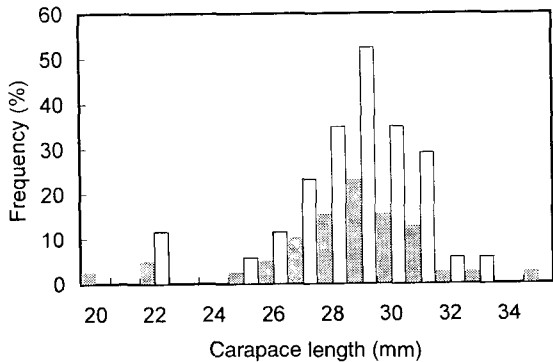


Fig. 1. Size-frequency distribution of female for *Parapenaeus fissuroides* (shaded bar) and *Parapenaeus lanceolatus* (blank bar) sampled in January, 2005.

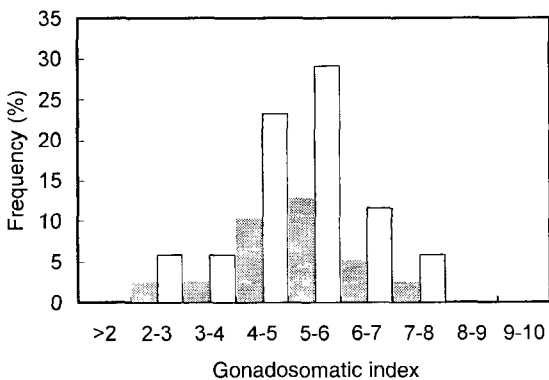


Fig. 2. Gonadosomatic index frequency distribution of *Parapenaeus fissuroides* (shaded bar) and *Parapenaeus lanceolatus* (blank bar) female sampled in January, 2005.

with a gonadosomatic index (GSI) greater than 3, representing eggs at the mature stage. Over one-third (36%) of the *P. fissuroides* females and more than one-half (61%) of the *P. lanceolatus* females had mature eggs.

Data on the ovary color of *P. fissuroides* and *P. lanceolatus* indicated that their eggs were sufficiently mature by the time of catch. In both species, roughly half of the females had a thelycum. The insemination rate was 48 and 52.2% in *P. fissuroides* and *P. lanceolatus*, respectively (Table 1). Cha et al. (2004a) reported that *Trachysalambria curvirostris* caught during winter in the Yellow Sea had an insemination rate of over 50%. The high insemination rates of *P. fissuroides* and *P. lanceolatus* led us to postulate that

Table 1. Sex ratio and insemination rate of female for *Parapenaeus fissuroides* and *Parapenaeus lanceolatus* sampled in January, 2005

Items	<i>P. fissuroides</i>	<i>P. lanceolatus</i>
Sex ratio (Female : Male)	22 : 1	5.7 : 1
Insemination rate (%)	48.7	52.2

these two species are inseminated during the winter, which is supported by our previous observations of these shrimp species collected in summer over the past two years. We were unable to find any females with either mature eggs or a thelycum during summer, suggesting that they are neither mature nor inseminated during summer. Combined, these findings suggest that *P. fissuroides* and *P. lanceolatus* spawn during the winter in the southern waters of Korea.

Acknowledgements

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