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A Study on Direct Determination of the Size at First Sexual Maturity of a Starfish, *Asterias amurensis*

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Introduction

In many studies, the size at first sexual maturity (SFSM) of marine invertebrate was determined by histological procedure (Chung and Kim, 2000; Chung and Ryou, 2000; Morriconi et al., 2002). However, the histological approach (which is indirect method) does not give information on whether the animal actually participate in reproduction in nature. Ideally, it is necessary to observe directly the reproductive behavior of the animal for accurate understanding of the reproductive biology. In asteroid, fertile gametes can be easily obtained from mature individuals by a simple chemical treatment (Chia and Walker, 1991). Therefore, it is possible to determine directly the SFSM of asteroids by observing whether sperm and eggs succeed in fertilization. However, previous study on reproductive cycle of an asteroid, SFSM was determined by only the presence or absence of gonad (Byrne et al., 1997). Here, the purpose of this study was established to try to determine SFSM of the northern Pacific asteroid, *Asterias amurensis* through non-histological indices. We observed whether the gametes from excised gonad were actually fertile or not, estimated and compared the SFSM with the results from Byrne et al. (1997).

Materials and Methods

A total of 146 individuals of *A. amurensis* with arm radius (R) ranging from 30 to 100 mm were collected at a rocky coast of Jangmok, Geoje island, in February 2004. They were classified into 7 size groups with a 10 mm interval. Gonadosomatic index (GSI) were calculated as GSI = (gonad WW/total WW) x 100. Excised gonad from each individual was treated with 1 μM of 1-methyladenine for 30 min, then released gametes were tested for fertilization success by cross-inseminating sperms or eggs from mature individuals which were prepared

separately. We considered (1) the presence or absence of gonad, (2) gonadosomatic index, (3) proportion of individual succeeded in fertilization for each size class as the indices for sexual maturity.

Results and Discussion

There was no *A. amurensis* with gonad in the arm radius (R) ranging between 30 and 39 mm. When R was 40-49 mm, some individuals had gonad and sex could be determined, but sex could not determined for all individuals. When R > 60 mm, all individuals had gonad and sex could be determined under the compound microscope (x 40). The R of smallest individual succeeded in fertilization was different with sex: 43 mm for male and 60 mm for female. For male, the proportion succeeded in fertilization was ca. 50% with R between 40 and 49 mm. For female, the proportion succeeded in fertilization was ca. 30% with R between 60 and 69 mm. The group maturity was more than 50% when R was 40-49 mm for male and 80-85 mm for female. From these results, the SFSM was calculated as 44.5 mm for male and 85.5 mm for female. These results are somewhat different from 50-54 mm of Byrne et al. (1997). Byrne et al. (1997) observed only the presence of gonad and did not considered male and female separately. This study clearly showed that the sexual maturation in male is earlier than in female. Therefore, it is necessary to consider each sex separately in estimating SFSM and group maturity.

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