Development of Egg and Larvae of the Bitterling, *Rhodeus suigensis* (Cyprinidae) from Korea, with a Note on Minute Tubercles on the Skin Surface

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남줄챙이의 卵發生, 仔魚의 發育 및 仔魚의 表皮上突起

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概 要

安城川과 發安川産 南줄챙이의 卵發生과 仔魚의 發育에 對한 經時的 觀察을 實施했으며 아울러 이들 仔魚의 表皮上에 存在하는 突起의 形態を 觀察했다. 22℃의 飼育條件下에서는 受精後 約 43時間부터 孵化를 시작하여 浮上期에 이 르는데는 約 20일을 要했다.

本種의 個體發生은 産 水系 사이에서는 메우 類似했으나 仔魚期에 봉 수 있는 卵黃最前端部에서 아랫쪽으로의 影像突起의 發達程度에는 差異가 있었다. 又 한 日本産 남줄챙이의 個體發生하고도 메우 類似했으나 韓國産체이 조급 일찍 浮上期에 이르렀다.

그러나 日本産 달남줄계를 包含해서 日本産 및 韓國産 남줄챙이에서는 個體 發生과 仔魚의 表皮上突起의 形態에는 基本의 인 差異을 볼 수 없었다. 又한 Uchida (1939)의 捕南줄계의 詳細한 個體發生圖로부터 判斷해 본다면 南줄챙이, 달남줄계의 2種하고 基本의 인 差異을 볼 수 없다. 위의 事實로부터 달남줄계, 南南줄계, 捕南줄계의 3種族은 特히 近似種이어서 亞種의 型別의 分化段階에 있는 것이라고 생각된다.

INTRODUCTION

*Rhodeus suigensis* (Mori) is common freshwater fish in Korea. This species is widely
distributed over Korea and Japan. Though Suzuki and Hibiya (1984a) described the details on embryonic and larval stages of *R. suigensis* from Japan, those of this species from Korea is still unknown. On the other hand, Suzuki and Hibiya (1984b) reported the morphology and distribution of minute tubercles on the skin surface of larvae in all species of *Rhodeus* from Japan. However, there is no report for those of larvae in *R. suigensis* from Korea.

This paper deals with the comparative development of eggs and larvae, and the minute tubercles of *R. suigensis* both from Korea and from Japan.

**MATERIALS AND METHODS**

Parental fish of *R. suigensis* were collected from the two localities, Kyonggi-do, Anson-gun, Taedok-myon, Nae-ri, Ansong-river, on November 7, 1987 and Kyonggi-do, Hwasong-gun, Palan-up, Cheam-ri, Palan-river, on October 4, 1987. Artificial insemination was carried out several times from March to July using a single pair in each locality. Methods of artificial insemination and rearing of eggs and larvae followed those of Suzuki and Hibiya (1984a).

The development of eggs and larvae were observed under a dissecting microscope. Total length of live larvae was measured with an ocular micrometer. Specimens used for morphological observations of minute tubercles on the skin surface of larvae were same as those for observations of the larval development. For scanning electron microscope observations of the tubercles, three specimens were fixed in each stage of larval development for 24 hours at 2°C in cacodylate-buffered 2.5% glutaraldehyde, dehydrated by a graded series of ethanol, dried to a critical point with liquid CO₂. The dried materials were coated with a gold by a ion sputtering and then examined with a Hitach S-450 scanning electron microscope.

**OBSERVATIONS**

**Embryonic stage.** During the spawning season, the ovipositor of maternal fish showed repeatedly growth and reduction. The ovipositor growth of each locality reached the maximal length (mean±SD=13.45±2.65 mm, ranged from 10.00 to 16.85 mm) at intervals of 4 to 7 days. The ripe unfertilized eggs are nearly pear shaped, opaque yellow in color, measuring 3.58±0.13 mm (mean±SD, ranged from 3.25 to 3.94 mm, N=50) in length, 1.17±0.07 mm (mean±SD, ranged from 1.34 to 1.57 mm, N=50) in breadth at Ansong-river and 3.56±0.04 mm (mean±SD, ranged from 1.28 to 1.48 mm, N=30) in length, 1.39±0.07 mm (mean±SD, ranged from 1.28 to 1.48 mm, N=30) in breadth at Palan-river (Fig. 1A and Fig. 2A). The number of eggs obtained an artificial exploitation ranged from 5 to 17 (mean±SD=8.43±4.07) in both localities. The sequence of embryonic development in