

# INFLUENCES OF GUARDING TERRITORY ON REPRODUCTIVE ACTIVITY IN THE MALE DWARF GOURAMI, COLISA LALIA

## Hayakawa, Y., Kobayashi, M.

Department of Biology, International Christian University, 3-10-2 Osawa, Mitaka, Tokyo 181-8585, Japan Fax: +81-422-33-1449, e-mail: hyouichi@nt.icu.ac.jp

### **Introduction:**

Among teleost fishes, alternative mating tactics are commonly observed. Particularly in pair-spawning species with external fertilization, social status is generally divided into two types: the territorial dominant male, which establishes its territory and courts females to perform pairspawning, and the sneaker, which have no territory of its own but tries to release semen during pair-spawning of other dominant males. In such species, it has been predicted that the sneakers possess relatively larger testes compared to the dominant males in order to overcome sperm competition by increasing number of sperm. Data from many species have proved the prediction [1]. The dwarf gourami, Colisa lalia, is known to be included among the pair-spawning species [2, 3]. Males establish their territories (bubble nest) under a floating plant to obtain females and to care eggs. However, no research has reported an occurrence of sneaking. During spawning, male C. lalia exhibits a clasping behavior where the male bends its body around a female under the nest. Since the testes are situated in the vicinity of the fulcrum which is formed when a male bends its body, male may emit semen by squeezing out semen from the testes by bending its body. In other words, the clasping behavior is necessary for emitting semen, and subordinate males cannot emit semen probably because of lacking situation to perform clasping behavior [3]. From this speculation and the fact that spawning is taken place under the bubble nest, we assumed that the reproductive condition concerning sperm production is influenced by whether males establish territories or not. In this study, we examined the influence of guarding territory (nest) on reproductive activity of males.

#### **Methods:**

In order to examine the influence of social status on the reproductive ability in males, three males were forced to fight for territories in an aquarium. After three weeks, their testes were removed to calculate gonadosomatic indices (GSI), and were stained with hematoxylin and eosin for microscopy after fixed in paraffin to make serial sections  $(7\mu m)$ .

## **Results:**

Reproductive status was divided into three classes: the dominant male which established and kept the territory under the floating nest, the second male which located near the nest and occasionally attacked the dominant male, and the third male which was unwarlike and kept a distance with the other two males. A significant difference was detected in GSI between the initial control (males not involved in any experiments:

0.85±0.10, n=5) and the dominant (1.19±0.07, n=5), between the second (0.81±0.15, n=5) and dominant and between the third (0.62±0.08, n=5) and dominant (Student-Newman-Keuls's test, *P*=0.007), indicating that the testes of the dominant males enlarged while guarding their territories, and those of males which failed to obtain territory became smaller or did not change. In the testes of all males examined, cysts at various stages of spermatogenesis were observed and the lobule lumen was filled with sperm. However, in the testes of the dominant male, broken vacuous cysts, which represent frequent occurrence of spermiaiton, were conspicuously observed and each lumen was enlarged, compared to other status males including the control group.

### **Discussion:**

After forcing a three-week fight, testes of the dominant males enlarged by guarding territory, whereas testes of males which failed to obtain territory did not, and in particular males situated on the third became smaller. Histological observation revealed that sperm production of the dominant males was more active compared to males of other status, although spermatogenesis was confirmed in all males. that examined This means dominancy physiologically influences on sperm production. Socialstatus dependent development of testes may reflect the absence of sperm competition due to the lack of sneaking by subordinate males.

Fourcelius (1957) reported that taking-over the dominance between the dominant and the subordinate males frequently occur under natural conditions [2]. Since dominancy affect not only on sperm emission but also on reproductive ability, the way to increase reproductive success in males of *C. lalia* is not by alternative tactics (e.g. sneaking) but by obtaining and keeping territory.

#### **References:**

- [1]MONTGOMERIE, R., FITZPATRICK, J. L. 2009. Testes, sperm, and sperm competition. In: Reproductive Biology and Phylogeny of Fishes (Agnathans and Bony Fishes) Vol. 8A. (ed. Jamieson, B. G. M), pp 1-53, Science Publishers, Enfield, NH.
- [2]FOURCELIUS, S. 1957. Studies of anabantid fishes. I. A quantitative description of the reproductive
  - behavior in territorial species investigated under laboratory conditions with special regard to *Colisa lalia*. Zool. Bidr. Uppsala, 32: 93-597.
- [3]HAYAKAWA, Y., KOBAYASHI, M. 2010.Clasping behavior and the asymmetrically latitudinal structure of the testes in the male dwarf gourami *Colisa lalia*. Ichthyol. Res., 57: 40-48.