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# A PRELIMINARY NOTE ON CHROMOSOMES OF F1 HYBRID BETWEEN MIDDLE AND SMALL RACES OF THE STRIATED SPINED LOACH (COBITIS TAENIA STRIATA)

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#### INTRODUCTION

In the previous paper (Saitoh et al., 1984) I reported the karyotype composition and C-band pattern of middle (medium sized) and small (dwarf) races of the striated spined loach, so called "Cobitis taenia striata Ikeda". Despite that they were both diploid populations having very similar karyotypes, there were still slight differences between them: arm ratio of a submetacentric pair was usually larger and centromeric heterochromatin of it was smaller in middle race; Robertsonian polymorphism which was assumed as an incipient state of the differentiation of multiple sex chromosome system was found in small race. This assumption is, however, based upon only the fact that metacentric chromosome formed by fusion was found in some individuals of males but not detected in females.

Observing karyotypes of  $F_1$  hybrid is very useful for examining chromosomal differentiation. Since chromosomes of both parental forms are compared in the same physiological condition of hybrid cell, differnces could be more clearly demonstrated. Besides, it is more interesting to see if the metacentric appears only in male hybrids of the crossing made for the present study.

In this short report I will show chromosomes of male and female  $F_1$  hybrids of crossing between female middle race and male small race to test the assumption of the previous study.

#### MATERIALS AND METHODS

Artificial  $F_i$  hybrids used in this study were produced from a cross fertilization between female middle race and male small race both obtained from Asahi River, Okayama Prefecture. Ovulation was induced by intraperitoneal injection of frog pituitaries (after Kawamura, 1944). Fertilized eggs were reared in an out-door aquarium at "Biwako Bunkakan" until they

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grew to enough size for chromosome preparation. Pellet food prepared for aquarium fishes was supplied to young fish.

Chromosome preparations were made on three males and three females of hybrids according to Ojima and Kurishita (1980). BSG technique (after Sumner, 1972) of C-band staining employed here was little modified as noted below: saturated Ba $(OH)_2$  treatment for 100 sec at 55°C of initial temperature; soaking into 0.1N HCl was not adopted before barium treatment but brief rinse with it was done after the denaturation to remove exessive barium.

## RESULTS AND REMARKS

Chromosome number of all the male hybrids is 49 with a large metacentric chromosome (Fig. 1A, asterisk) just as 49 chromosome type of male small race. On the other hand, all the females have 50 chromosomes (Fig. 1B). Differnces in arm ratio and size of constitutive heterochromatin of a submetacentric pair are also demonstrated (Fig. 1A,B, arrows). Heterochromatic block on the chromosome presumably from middle race is a small region surrounding centromere, while the segment presumably from small race is larger and extending toward short arm.

Though karyotype analyses were failed in the parental fishes, the paternal small race and the maternal middle race would possibly be 49 and 50 chromosome type respectively, because former type was found only among males of small race as far as I have examined.

The fact that the large metacentric chromosome appeared in all males but did not in females strongly suggests existance of a male determinating genetic element on it. Thus small race is undergoing differentiation of sex chromosome morphologically toward  $X_1X_2Y/X_1X_1X_2X_2$  system. In addition, the fact also implies that the male determinant is dominant and that there is not such a gene in the genome from middle race — eggs do not carry it. Parental races may therefore have homologous sex determining factor, in spite that their chromosomal system are not the same.

From these results and considerations, it is clear that middle and small races of striated spined loach have been invoked chromosomal differentiation, and that small race has a rather rare sex chromosome system.

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Fig. 1. Chromosome spreads of male (A) and female (B) F1 hybrids. Large metacentric chromosome (asterisk) and differences in arm ratio and heterochromatic size of a submetacentric pair (arrows) are demonstrated. Arrowhead indicates the position of centromere.

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## REFERENCES

- Kawamura, T., 1944. A fundamental investigation on loach breeding in the paddy field. 19 pp. Hiroshima (in Japanese, private edition).
- Ojima, Y. and A. Kurishita, 1980. A new method to increase the number of mitotic cells in the kidney tissue for fish chromosome studies. Proc. Jpn. Acad., 56B (10):610-615.
- Saitoh, K., A. Takai, and Y. Ojima, 1984. Chromosomal study on the three local races of the striated spined loach (Cobitis taenia striata). Proc. Jpn. Acad.,60B(6):187-190.
- Summer, A. T.,1972. A simple technique for demonstrating centromeric heterochromatin. Exp. Cell Res.,75(1):304-306.

スジシマドジョウ (Cobitis tainia striata) 中型種族と小型種族の雑種 の核型に関する予察的研究\*

# 斉 藤 憲 治

前報(Saitoh *et al*, 1984)で報告したスジシマドジョウの中型および小型種族の核型の相違が,両者の雑種第1代(中型雌×小型雄)の核型分折によって支持されるかどうか調べた。その結果,両種族間の核型の相違は雑種の核型中にも現れていた。また,小型種族の雄に固有な大型の中部着糸型染色体は F<sub>1</sub>雄にだけみられ,雌には認められなかった。これらの結果はいずれも前報を支持する。

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