

A Karyotype Study on Two Species of Freshwater Fishes Transplanted into Japan

By

Ryoichi ARAI

Department of Zoology, National Science Museum, Tokyo

and

Akemi KOIKE

College of Agriculture and Veterinary Medicine, Nihon University, Tokyo

From the view point of comparative karyology, we have examined chromosomes of various groups of teleostean fishes from Japan.

Recently we observed chromosomes of two species of freshwater fishes transplanted into Japan, i.e., *Sarotherodon niloticus* (Cichlidae) from Africa and *Basilichthys bonariensis* (Atherinidae) from South America. As far as we know, the diploid chromosome number of *S. niloticus* was preliminarily reported by JALABERT *et al.* (1971), but the karyotype of *B. bonariensis* has not been studied. We describe their karyotypes in this paper.

Method of chromosome preparation is the same as that of ARAI (1973). Classification of chromosomes is adopted from LEVAN *et al.* (1964). Metacentrics and submetacentrics are described as two-arm chromosomes, and subtelocentrics and acrocentrics as one-arm chromosomes. The definition of the new arm number (NAN) is referred to ARAI and NAGAIWA (1976).

All the specimens used for the experiments are deposited in the fish collection of the Department of Zoology, National Science Museum, Tokyo.

Sarotherodon niloticus (LINNAEUS) "Nile Mouth-brooder"

(Figs. 1 A, C)

Five specimens (Nos. E·96·1, E·96·2 and E·96·4–E·96·6), 56.2 to 63.2 mm in total length, had been kept at the Tokyo University of Fisheries. Characters of material fish are shown in Table 1.

As shown in Table 2, the diploid chromosome number of this species is 44. The karyotype comprises a pair of metacentric, 8 pairs of submetacentric, a pair of larger acrocentric, and 12 pairs of smaller subtelocentric-acrocentric chromosomes. The larger one-arm chromosomes may be formed by centric fusion. The new arm number may be 46. The arm number is 62.

Table 1. Characters of two species of material fishes.

Species	No. of fish	S.L. (mm)	Dorsal	Anal	VN
<i>Sarotherodon niloticus</i>	5	43.8-50.2	XVII-XVIII, 11-13	III, 9	17+14-15
<i>Basilichthys bonariensis</i>	4	82.4-88.5	V-VI, I, 9-11	I, 16-17	26-27+22-23

Table 2. Frequency distributions of diploid chromosome counts in two species of material fishes.

Species	2n													Total
	38	39	40	41	42	43	44	45	46	47	48	49		
<i>Sarotherodon niloticus</i>	1	2	3	7	4	7	42						66	
<i>Basilichthys bonariensis</i>									1	2	14		17	

This result supports the preliminary report by JALABERT *et al.* (1971), in which there are no figures of chromosomes and only the diploid chromosome number is described. Two large one-arm chromosomes are found in the karyotype of any species of *Tilapia* and *Sarotherodon* that has been studied in the world. The arm number of *S. niloticus* is the most numerous among those of species of *Tilapia* and *Sarotherodon* (FUKUOKA & MURAMOTO, 1975; PRASAD & MANNA, 1976; THOMPSON, 1976; MICHELE & TAKAHASHI, 1977; KORNFIELD *et al.*, 1979).

THOMPSON (1979) reported karyotypes of 41 species of Neotropical cichlid fishes. Their diploid chromosome numbers range from 38 to 60. However, they have no large one-arm chromosomes such as found in karyotypes of species of *Tilapia* and *Sarotherodon*. As regards karyotypes of the family Cichlidae, these large one-arm chromosomes may be the unique character to the species of *Tilapia* and *Sarotherodon*.

The genus *Sarotherodon* is separated from the genus *Tilapia* by mouth-brooders and some morphological characters (TREWAVAS, 1973). As shown in Table 3, however, karyotypes seem to show no differences between *Sarotherodon* and *Tilapia*, although diploid chromosome numbers of *Tilapia mariae* and *T. sparrmanii* are smaller than those of 5 species of *Sarotherodon*.

Table 3. Karyotypes of *Tilapia* and *Sarotherodon*.

Species	2n	NF	NAN	Literature
<i>Tilapia mariae</i>	40	44	46?	THOMPSON, 1976
<i>T. rendalli</i>	44	52	46	MICHELE & TAKAHASHI, 1977
<i>T. sparrmanii</i>	42	46	46	THOMPSON, 1976
<i>T. zillii</i>	44	54	46	KORNFIELD <i>et al.</i> , 1979
<i>Sarotherodon aureus</i>	44	54	46	KORNFIELD <i>et al.</i> , 1979
<i>S. galilaeus</i>	44	54	46	KORNFIELD <i>et al.</i> , 1979
<i>S. macrochir</i>	44			JALABERT <i>et al.</i> , 1971
<i>S. mossambicus</i>	44	44	46	FUKUOKA & MURAMOTO, 1975; PRASAD & MANNA, 1976
<i>S. niloticus</i>	44	62	46	This paper

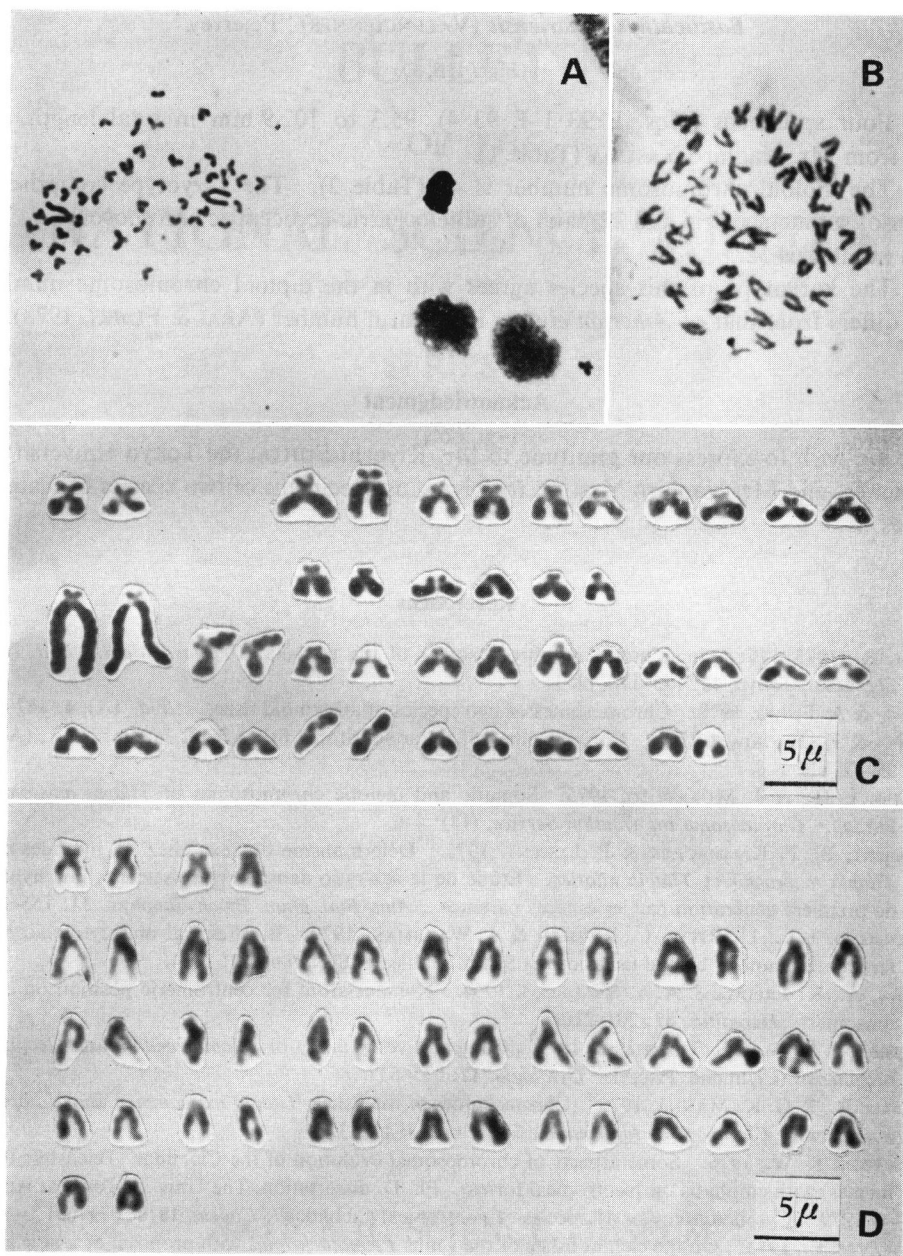


Fig. 1. Photomicrographs of mitotic metaphase chromosomes and karyotypes from gill epithelial cells of a cichlid and an atherinid. — A, *Sarotherodon niloticus* (No. E·96·6), $2n=44$, $\times 650$; B, *Basilichthys bonariensis* (No. E·93·3), $2n=48$, $\times 1,250$; C, *Sarotherodon niloticus*, from Fig. A, NF=62, $\times 1,930$; D, *Basilichthys bonariensis*, from Fig. B, NF=52, $\times 2,240$.

Basilichthys bonariensis (VALENCIENNES) "Pejerrey"

(Figs. 1 B, D)

Four specimens (Nos. E·93·1–E·93·4), 95.3 to 102.9 mm in total length, are gift from Mr. Naohiro YASUDA (Table 1).

The diploid chromosome number is 48 (Table 2). The karyotype comprises 2 pairs of submetacentric and 22 pairs of subtelocentric-acrocentric chromosomes. The arm number is 52.

The karyotype of this species agrees with in the diploid chromosome number, but differs from that of *Atherion elymus* in the arm number (ARAI & FUJIKI, 1978).

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