

**Chromosomes of *Scatophagus argus*
and *Selenotoca multifasciata*
(Scatophagidae)**

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The Indo-Pacific family Scatophagidae consists of two genera and about four species (Nelson, 1984). Khuda-Bukhsh and Manna (1974) reported that the male of *Scatophagus argus* had a metacentric and 47 acrocentric chromosomes and the female 48 acrocentrics. They identified the single metacentric in the male as Y chromosome. However, Chaudhury et al. (1979) observed two metacentrics and 46 acrocentrics in the female of the same species, and questioned the nomenclature by Khuda-Bukhsh and Manna (1974) of the single bi-arm in the male as Y chromosome.

In the present study, we examined the chromosomes of two species, *Scatophagus argus* and *Selenotoca multifasciata*, employing both the conventional Giemsa-staining method and Ag-staining technique to give answer to the above-mentioned question.

Materials and methods

Live specimens of *Scatophagus argus* (4 males, 52.7–62.0 mm SL and 3 females, 56.0–74.2 mm SL) and *Selenotoca multifasciata* (1 male, 77.5 mm SL) were obtained from an aquarium dealer in Tokyo. Sex of the specimens was determined on the basis of gonad histology.

Each specimen was injected with calf serum at a dosage of 0.2 ml/10 g body weight five days and one day before the removal of the kidney according to the method described by Ojima (1982).

Chromosome preparations were made following the routine flame-drying method as described in Suzuki and Taki (1981). Ag-staining for the detection of nucleolus organizer regions (NORs) was made employing the method by Kodama et al. (1980). Chromosome classification followed Levan et al. (1964).

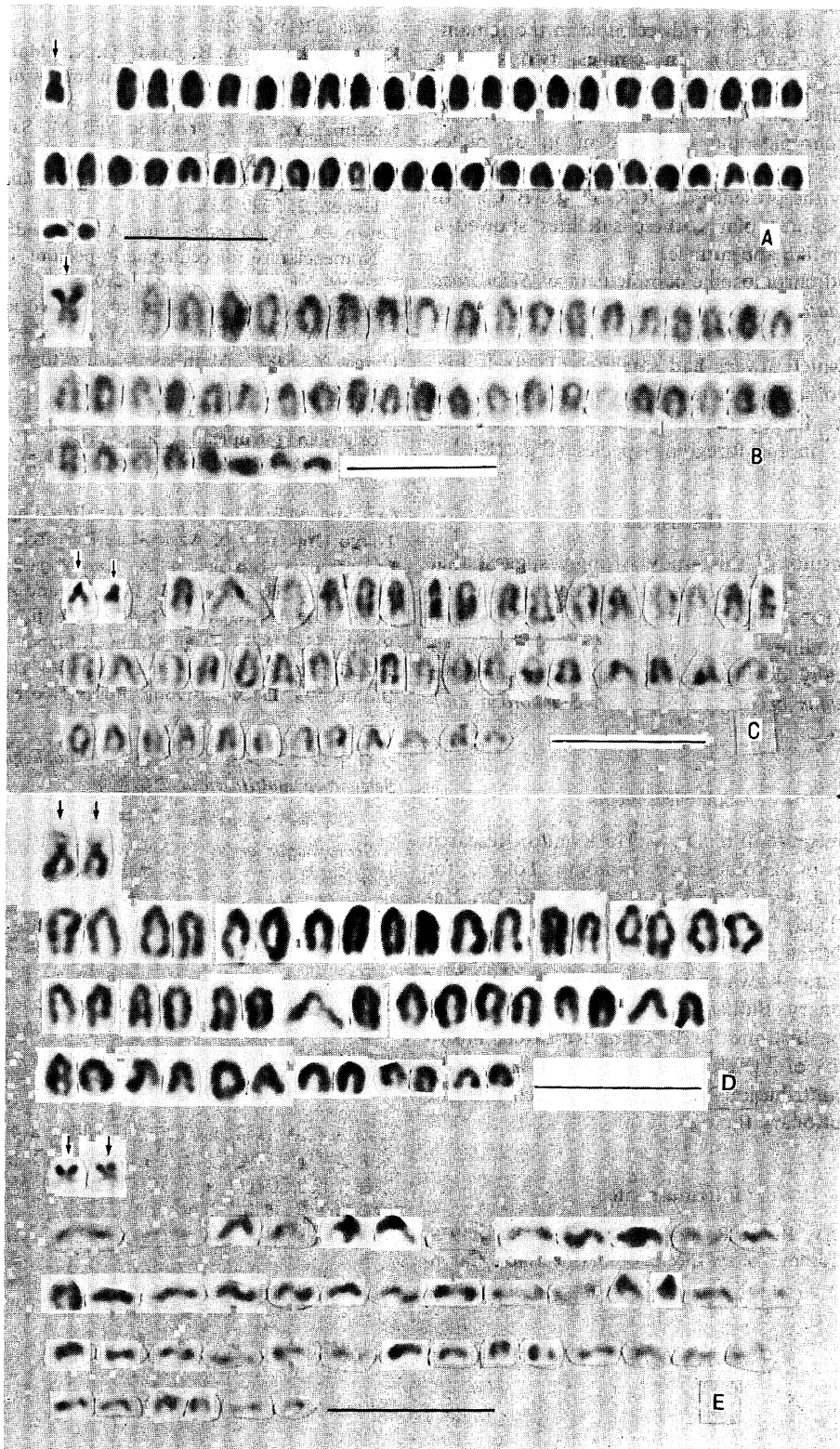
Results

Diploid chromosome complement of *Scatophagus argus*, based on counts of 221 metaphase plates, consisted solely of 48 acrocentric chromosomes. Sexual dimorphism was not observed. Of the 121 male metaphase plates examined, satellites were clearly observed on two chromosomes in 24 plates and on one chromosome in 40 plates

Table 1. Karyotypes of two species of Scatophagidae. A, acrocentric; SAT, satellite.

Species	Karyotype			No. of cells observed
	2A+SAT and 46A	1A+SAT and 47A	48A	
<i>Scatophagus argus</i>				
male	19	2		21
male	2	31	40	73
male	3	4	6	13
male		3	11	14
female	1		5	6
female	2	50	27	79
female	7	5	3	15
<i>Selenotoca multifasciata</i>				
male	200			200

Fig. 1. Chromosomes of two species of Scatophagidae. A: Conventional Giemsa-stained chromosomes of *Scatophagus argus*. $2n=48$ (male). Arrow indicates a satellite chromosome. B: Ag-stained chromosomes of *Scatophagus argus*. Arrow indicates an acrocentric chromosome bearing NOR. C: Ag-stained chromosomes of *Scatophagus argus*. Arrows indicate NOR chromosomes (male). D: Giemsa-staining karyotypes of *Selenotoca multifasciata*. $2n=48$ (male). Arrows indicate satellite chromosomes. E: Ag-stained chromosomes of *Selenotoca multifasciata* (male). Arrows indicate NOR-bearing chromosomes. Scale bars indicate 10 μ m.



(Fig. 1A), and were not discernible in the remaining plates (Table 1). In females, two satellite chromosomes were seen in 10 metaphase plates, one satellite chromosome in 55 plates, and no satellite chromosome was evident in 35 plates (Table 1). The occurrence of satellites was confirmed by the presence of NORs (Fig. 1B, C). In Giemsa stained plates, these satellites showed a short-arm-like appearance.

Diploid chromosome complement of *Selenotoca multifasciata*, based on 200 metaphase plates, was composed solely of 48 acrocentric chromosomes, two of which always had satellites (Table 1, Fig. 1D). No sex-associated heteromorphic pair was detected. In Ag-stained plates, NORs were observed as in the foregoing species (Fig. 1E).

Discussion

The results of this study strongly suggest that the short arm identified by Khuda-Bukhsh and Manna (1974) and Chaudhury et al. (1979) was in reality satellites. It follows that there is no morphologically distinguishable sex chromosomes in *Scatophagus argus* as well as in *Selenotoca multifasciata*.

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Literature cited

Chaudhury, R. C., R. Prasad and C. C. Das. 1979. Chromosomes of six species of marine fishes. Caryo-

logia, 32(1): 15-21.

Khuda-Bukhsh, A. R. and G. K. Manna. 1974. Somatic chromosomes in seven species of teleostean fishes. Chromosome Inf. Serv., (16): 24.

Kodama, Y., M. C. Yoshida and M. Sasaki. 1980. An improved silver staining technique for nucleolus organizer regions by nylon cloth. Japan. J. Human Genet., 25: 229-233.

Levan, A., K. Fredga and A. A. Sandberg. 1964. Nomenclature for centromeric position on chromosomes. Hereditas, 52: 201-220.

Nelson, J. S. 1984. Fishes of the world. 2nd ed. John Wiley & Sons, New York, xv+523 pp.

Ojima, Y. 1982. Methods in fish cytogenetics. The nucleus, 25(1, 2): 1-7.

Suzuki, A. and Y. Taki. 1981. Karyotype of tetraploid origin in a tropical Asian cyprinid, *Acrossocheilus sumatranus*. Japan. J. Ichthyol., 28(2): 173-176.

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クロホシマンジュウダイ科の *Scatophagus argus* と *Selenotoca multifasciata* の染色体

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Scatophagus argus と *Selenotoca multifasciata* の染色体を通常のギムザ染色と銀染色 (Ag-NOR 染色) 法により調査を行ったところ、2種ともに $2n=48$ で、核型は、48本のアクロセントリック染色体で構成され、1ないし2本の染色体には附随体がみられ、時には2腕染色体のように観察された。これまでに *Scatophagus argus* では、雄に異形対、1本のメタセントリック (Y染色体) と47本のアクロセントリック染色体が報告されているが、銀染色法により染色体の短腕は、仁形成部位を含む附随体部であることが判明した。

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