

Chromosomes of Two Species of Atherinoid Fishes

By

Ryoichi ARAI

Department of Zoology, National Science Museum, Tokyo

and

Akiyoshi FUJIKI

College of Agriculture and Veterinary Medicine, Nihon University, Tokyo

Recently, we observed chromosomes of *Atherion elymus* JORDAN et STARKS and *Nematocentris* sp. The former belongs to the family Atherinidae, and the latter to the family Melanotaeniidae. However, their higher systematic position has not been fixed, *e. g.*, MATSUBARA (1955) and GOSLINE (1971) classified them into the order Perciformes, but GREENWOOD *et al.* (1966) and NELSON (1976) into the order Atheriniformes.

On the other hand, karyological approach to fish systematics has become more important. However, there have been few reports on chromosomes of Atherinidae and Melanotaeniidae (SCHEEL, 1972; HINEGARDNER and ROSEN, 1972). Therefore, karyotypes of two species of atherinoid fishes are described 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.

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

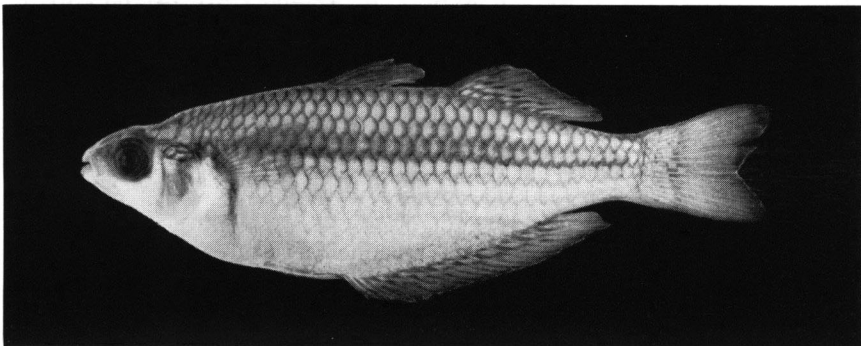


Fig. 1. *Nematocentris* cf. *rubrostriatus*, No. E-74-1, 91.2 mm T. L. Gills are removed.

Nematocentris cf. *rubrostriatus* RAMSAY et OGILBY

(Figs. 1 and 2 A, C)

A male specimen (No. E·74·1), 91.2 mm in total length, was purchased from a tropical fish dealer (Table 1). According to MUNRO (1967), this specimen is classified into the genus *Nematocentris* and very similar to *N. rubrostriatus* RAMSAY et OGILBY. Two anal spines of the specimen may be abnormal.

As shown in Table 2, the diploid chromosome number is 48. The karyotype comprises 24 pairs of acrocentric chromosomes. In size, one-arm chromosomes show a gradation from largest to smallest, hence cannot be easily divided into size groups. The arm number is 48.

Table 1. Characters of two species of material fishes.

Species	Sex	No. of fish	S. L. (mm)	D ₁	D ₂	A	P	V	VN
<i>Nematocentris</i>									
cf. <i>rubrostriatus</i>	♂	1	75.3	VI	I, 10	II, 19	14	I, 5	20+13
<i>Atherion elymus</i>	?	8	57.2-61.4	IV-VI	I, 9-10	I, 15-16	11-12	I, 5	18-19+25-26*

* 18+25 (5 specimens), 18+26 (1), and 19+25 (2).

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

Species	2n														Total
	39	40	41	42	43	44	45	46	47	48	49	50	51		
<i>Nematocentris</i> cf. <i>rubrostriatus</i>	2		1	2		1	2	5	12	24	4			53	
<i>Atherion elymus</i>						2	2	4	22	45	6		1	82	

Atherion elymus JORDAN et STARKS "Mugi-iwashi"

(Figs. 2 B, D)

Eight specimens (Nos. E·81·1-E·81·6, E·81·12 and E·81·14), 66.1 to 70.1 mm in total length, were collected at Amatsu-kominato, Awa, Chiba Prefecture. Characters of material fish are shown in Table 1.

The diploid chromosome number is 48 (Table 2). The karyotype of this species comprises a pair of submetacentric, 5 pairs of subtelocentric, and 18 pairs of acrocentric chromosomes. The arm number is 50.

Chromosomes of Atherinoid Fishes

As far as we know, chromosomes of seven species of atherinoid fishes have been reported (Table 3). As regards atherinoid families, GREENWOOD *et al.* (1966) and NELSON (1976) synonymized both Bedotiidae and Telmatherinidae with Atherinidae,

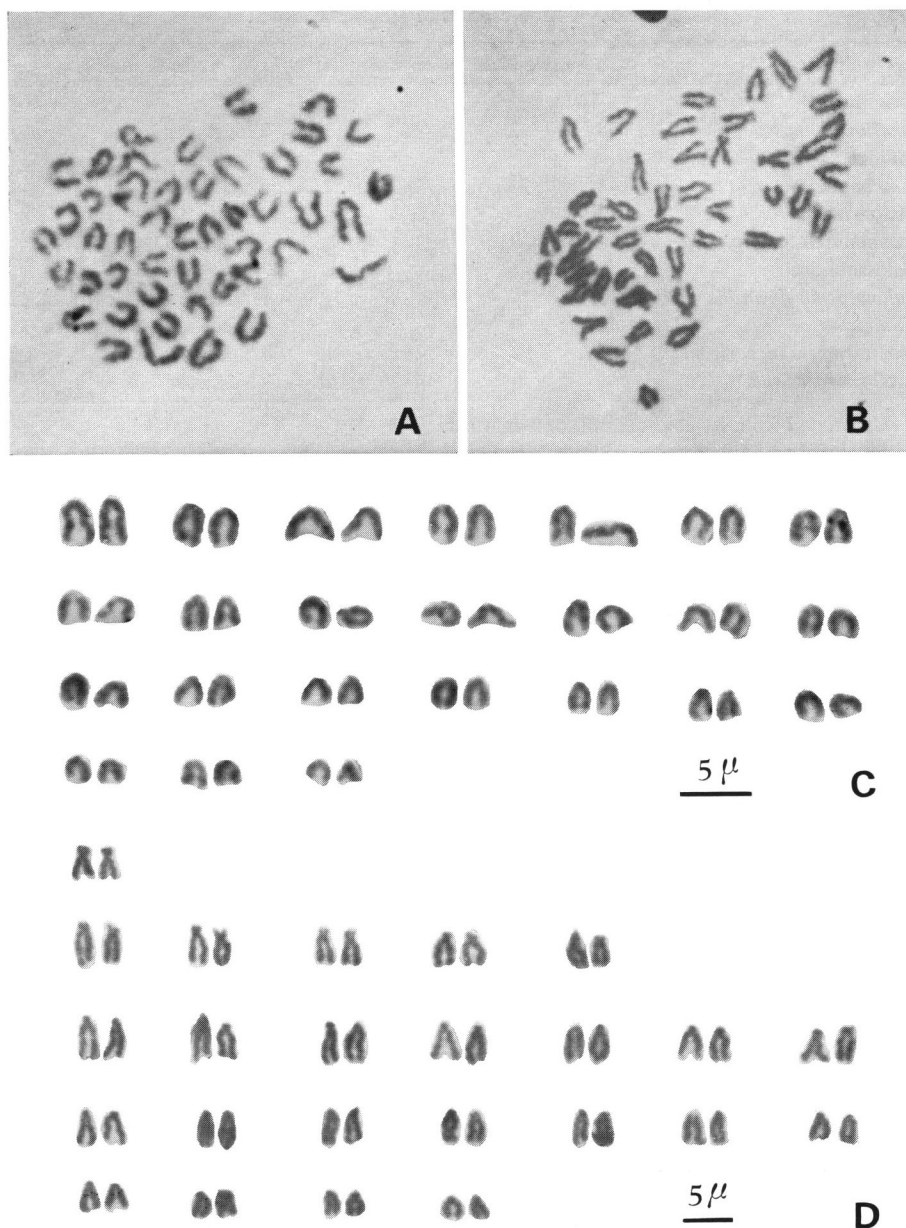


Fig. 2. Photomicrographs of mitotic metaphase chromosomes and karyotypes from gill epithelial cells of atherinoid fishes. — A, *Nematocentris cf. rubrostriatus*, $2n=48$, $\times 1,970$; B, *Atherion elymus*, $2n=48$, $\times 1,380$; C, *Nematocentris cf. rubrostriatus*, from Fig. A, $NF=48$, $\times 1,970$; D, *Atherion elymus*, from Fig. B, $NF=50$, $\times 1,380$.

Table 3. Chromosomes of atherinoid fishes.

Species	2n	two-arm	one-arm	NF	Literature
Atherinidae					
<i>Atherion elymus</i>	48	2	46	50	This paper
Bedotiidae					
<i>Bedotia geayi</i>	48	24	24	72	SCHEEL, 1972
Telmatherinidae					
<i>Telmatherina ladigesii</i>	48	38	10	86	SCHEEL, 1972
Melanotaeniidae					
<i>Melanotaenia fluviatilis</i>	48*				HINEGARDNER & ROSEN, 1972
<i>M. nigrans</i>	48*				HINEGARDNER & ROSEN, 1972
<i>Nematocentris macculochi</i> **	46	0	46	46	SCHEEL, 1972
<i>N. cf. rubrostriatus</i>	48	0	48	48	This paper

* Calculated from haploid chromosome number.

** Reported as *Melanotaenia macculochi* in SCHEEL (1972).

but MUNRO (1967) recognized Bedotiidae and Telmatherinidae as well as Atherinidae.

Karyologically, the karyotypes of *Bedotia geayi* and *Telmatherina ladigesii* seem more specialized than those of *Atherion elymus* and two species of *Nematocentris* (Table 3). If the karyotypes of *Bedotia geayi* and *Telmatherina ladigesii* represent those of Bedotiidae and Telmatherinidae respectively, these families do not seem sufficiently independent from the karyological point of view.

At any rate, whether or not the three families described above are independent from one another is difficult to determine at the present moment. The subject should be discussed when more karyological data are accumulated.

References

- ARAI, R., 1973. Preliminary notes on chromosomes of the medaka, *Oryzias latipes*. *Bull. Natn. Sci. Mus., Tokyo*, **18**: 173–176, pl. 1.
- GOSLINE, W. A., 1971. *Functional Morphology and Classification of Teleostean Fishes*. 208 pp. Honolulu, Univ. Press of Hawaii.
- GREENWOOD, P. H., D. E. ROSEN, S. H. WEITZMAN & G. S. MYERS, 1966. Phyletic studies of teleostean fishes, with a provisional classification of living forms. *Bull. Amer. Mus. nat. Hist.*, **131**: 339–455, pls. 21–23.
- HINEGARDNER, R., & D. E. ROSEN, 1972. Cellular DNA content and the evolution of teleostean fishes. *Amer. Naturalist*, **106**: 621–644.
- LEVAN, A., K. FREDGA & A. A. SANDBERG, 1964. Nomenclature for centromeric position on chromosomes. *Hereditas*, **52**: 201–220.
- MATSUBARA, K., 1955. *Fish Morphology and Hierarchy I*. xi+789 pp. Tokyo, Ishizaki Shoten. (In Japanese.)
- MUNRO, I. S. R., 1967. *The Fishes of New Guinea*. xxxvii+651 pp., 78 pls. Port Moresby, Dept. of Agriculture, Stock and Fisheries, Port Moresby, New Guinea.
- NELSON, J. S., 1976. *Fishes of the World*. ix+426 pp. New York, John Wiley & Sons.
- SCHEEL, J. J., 1972. Rivuline karyotypes and their evolution (Rivulinae, Cyprinodontidae, Pisces). *Z. zool. Syst. Evol. Forsch.*, **10**: 180–209, 5 pls.