Journal of Applied Biological Sciences 4 (2): 5-7, 2010
ISSN: 1307-1130, E-ISSN: 2146--0108, www.nobel.gen.tr

B- Chromosomes in Gymnocorymbus Ternetzi (Boulenger)

B. UMA*

*Department of Zoology, Bharathi Women's College, Chennai-600 108,Tamil Nadu, INDIA

*Corresponding Author
e-mail: uma.balasubramanian@rediffmail.com

Received : April 20, 2010
Accepted : June 12, 2010

Abstract

Karyological analyses of fish are important in terms of systematics and aquaculture . On this basis , the present study is aimed at analysing the metaphases of an ornamental fish , Gymnocorymbus ternetzi , for the presence of B chromosomes, an evolutionarily significant genetic element . Interestingly , the present study revealed the presence of B chromosomes in the metaphases, in the range of 0-2. The frequency of B chromosomes was found to be higher in females (1.06) than males (0.81). This is the first report on the existence of B chromosomes in G.ternetzi . Importance of B chromosomes are discussed.

Key words: *B chromosomes - G.ternetzi*

INTRODUCTION

Many plants and animals, besides having autosomes and gonosomes possess a special category of chromosomes called microchromosomes or supernumerary or B-chromosomes [1]. The occurrence of B- chromosomes in a teleost fish had been first reported in Cyprinus carpio [2] . Since then several cases of supernumerary or B-chromosomes had been reported in various fish species and had been compiled [3]. B-chromosomes vary in number, size, as well as in their chromatization in different species. While the role of B-chromosomes in evolution had been dealt early [4], its role on the very existence (survival) of the fish had been discussed[5 , 6] and their role in sex ratio distortion had also been analysed[7 ,8]. Further the best feature that points to the kinship of some fish groups is the common occurrence of microchromosomes and the example here can be of some species of Cyclostomes, Chondricthys, Choanicthys and Acipenseriformes as well as some primitive amphibians which possess microchromosomes [9] .The present study is aimed at identifying such microchromosomes through karyology in the characid, Gymnocorymbus ternetzi , an ornamental fish.

MATERIAL AND METHODS

Metaphases were prepared using suitable karyological method [10] . Adult males and females were used as specimens. From each fish , gills were used for obtaining chromosomes and specimens were placed in 0.3% aerated colchicine for 12 hours. Each tissue was then minced and placed in a hypotonic solution (0.5% KCl) for 30-40 minutes to allow the cells to swell. Later, the tissue was fixed in methanol-acetic acid (3:1) mixture and centrifuged at 600 rpm for 5 minutes. The supernatant was discarded, cells were resuspended in the fixative, recentrifuged for 5 minutes and refrigerated the whole night. Next day, for slide preparation, a small bit of tissue was taken and aspirated with a few drops of 45% acetic acid and this suspension was dropped onto a preheated slide kept on a slide warmer at 50^0C. Slide was air dried; stained for 10-15 minutes in 5% Giemsa prepared with phosphate buffer (pH 6.9) and viewed under a phase contrast microscope (Nikon, Japan). Well spread metaphases were photographed and analysed

RESULTS AND DISCUSSION

Supernumerary or B-chromosomes were found in both the female (Figures 1 a, b) and male (Figure 1 c) metaphases. They were in the form of microchromosomes and their number varied from 0-2 (Table 1). However, the frequency of microchromosome was found to be higher in females (1.06) than males (0.81).

Present karyological study reveals the presence of supernumerary or B-chromosomes in G.ternetzi . This is the first ever report on the presence of such B chromosomes in G.ternetzi . The B-chromosomes in this species are in the form of microchromosomes and their frequency had been found to be higher in females than males. This is in consensus with the earlier report [7] in a characin, Astyanax scabripinnis and in a catfish, Clarias batrachus [11]

Table1. Frequency of B- microchromosomes in G. ternetzi

Sex	No.of B-microchromosomes	No.of fish	Mean No.of B-microchromosomes	Sex ratio
Female	0	4	1.06	0.58
	1	6		
	2	5		
Male	0	8	0.81	
	1	9		
	2	4		

Figure 1. Metaphases of female (1a,b) and male (1c) G.ternetzi

Figure 1 a - (↑) indicates 1 microchromosome (100x)

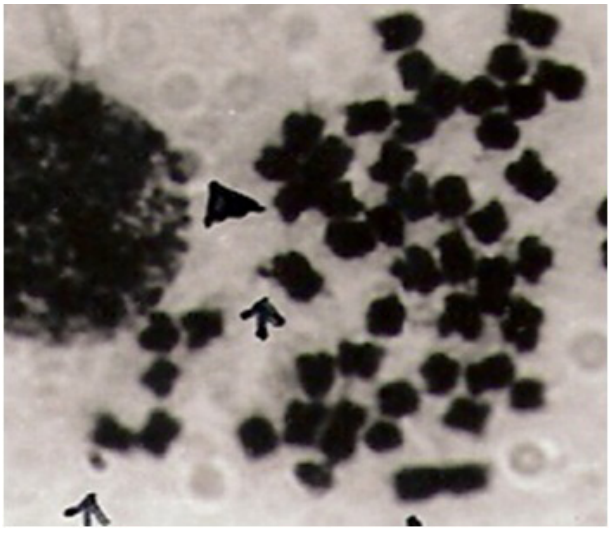

Figure 1 b - (↑) indicates 2 microchromosomes (100x)

The presence of B-chromosomes had been associated with the sex ratio distortion [7]. A similar distorted / skewed sex ratio in favor of males (0.58 : 0.42) was observed in the present study , with G.ternetzi too. A correlation between B-chromosome frequency and sex ratio had been previously reported in the lady bird Exochomus quadripustulatus[12] but in this case only males had been analysed cytologically and the conclusion was that the factors influencing the sex ratio are also responsible for affecting the frequency of B-chromosomes in different populations. As suggested for A.scabripinnis[7], ascertaining the phenomena underlying the association between the sex ratio and B-chromosome frequency is a major challenge for future research which might provide answers to some interesting questions on sex-ratio evolution and on the evolution of selfish genetic elements in genetics and B-chromosomes in particular.

Further, in chondrichthys, fusion of microchromosomes into macrochromosomes had played a major role in the course of evolution [13] . In the present study , it is interesting to note that such microchromosomes are present and as in chondrichthians, will they fuse to form a macrochromosome is a question, though there is every

Figure 1c - (↑) indicates2 microchromosomes (100x)
▲ indicates marker chromosomes in all figures

likelihood of such an action in future, for evolutionary progression.

REFERENCES

[1] Verma, P.S. and Agarwal, V.K. 1982. Genetics. S.Chand & Co. Ltd., New Delhi.

[2] Ohno, S., Muramoto, J., Christan, L. and Atkin, N.B. 1967. Diploid - Tetraploid relationships among old world members of the fish family Cyprinidae. Chromosoma, 23 : 1-9.

[3] Uma, B. 1999. Ploidy and sex manipulation in black tetra, Gymnocorymbus ternetzi (Boulenger) , Ph.D., Thesis, Bharathidasan University, Tiruchirappalli, T.N., India.

[4] Birstein V.J., Hanner, R. and Desalle, R. 1997. Phylogeny of the Acipenseriformes: Cytogenetic and molecular approaches. In: Environmental Biology of Fishes, 48: 127-155.

[5] Salvador, L.B. and Moreira-Filho, O. 1992. B-chromosomes in Astyanax scabrpinnis (Pisces: Characidae). Rev. Brasil Genet., 16 : 601-615.

[6] Aldhous, P.1995. The secret of sex life of the Amazon molly. New scientist, January.

[7] Vicente, V.E., Moreira-Filho, O. and Camocho, J.P.M. 1996. Sex-ratio distortion associated with the presence of a B-chromosome in Astyanax scabripinnis (Teleostei : Characidae). Cytogenet. Cell Genet., 74: 70-75.

[8] Rab, P. 1991. Fish cytogenetics and its application in fish reproductive biology. Bull.Inst. Zool. Academia Sinica, Monograph,16:357-373.

[9] Rishi, K.K. 1989. Current status on fish cytogenetics In : Fish Genetics in India, Das Jhingran (Eds.), Today & Tomorrow's Printers and Publishers, New Delhi, pp 1-20.

[10] Kligerman, A.D. and Bloom, S.E. 1977. Rapid chromosome preparations from solid tissues of fishes. J. Fish. Res. Bd. Can. 34 (2) : 266-269.

[11] Pandey, N. and Lakra, W.S. 1997. Evidence of female heterogamety, B- chromosome and natural tetraploidy in the Asian catfish, Clarias batrachus used in aquaculture. Aquaculture, 149: 31-38.

[12] Henderson, S. 1988. A correlation between B-chromosome frequency and sex ratio in Exochomus quadripustulatus. Chromosoma, 96: 376-381.

[13] Birstein V.J., Hanner, R. and Desalle, R. 1997. Phylogeny of the Acipenseriformes: Cytogenetic and molecular approaches. In: Environmental Biology of Fishes, 48: 127-155.