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RESEARCH ARTICLE

MEIOTIC CHROMOSOMES AND KARYOTYPE OF PUNTIUS TICTO (CYPRINIDAE) FROM KATHUA REGION (J &K), INDIA

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ABSTRACT

Somatic karyotype of *Puntius ticto* (Cprinidae) consists of 2n=50. The karyotype comprises of seven metacentric (m) pair, nine submetacentric (sm) pairs, seven subtelocentric (st), pairs and two pairs of telocentric (t) chromosome and the karyotype formula was derived as 14m + 18sm + 14st + 4t with fundamental arm number (FN) =84. Meiotic stages metaphase I have shown the haploid number exactly half of the diploid chromosome number i.e. n=25. Meiotic stages observed are leptotene, Zygotene, Pacytene and Metaphase I.

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INTRODUCTION

Puntius has long been recognized as a catch all genus for a variety of small tropical Asian cyprinids whose interrelationships are poorely understood (**Kortmulder, 1972; Schut *et al,* 1984; Kottelat and Pithyagoda, 1989; Kullander and Fang, 2005; Kullander, 2008**). Despite revision of this genus by Jayaram 1991, the taxonomy of the genus continues to be ambiguoius. There is general consensus that when fully revised many species will be placed into new or different genera. The genus *Puntius* comprise some 120 valid species of small to medium sized barbs mostly inhabits and breed in common water-bodies; therefore chances of interbreeding and hybridization are higher. Many species of this are considered as weed fishes while some of them are of ornamental value.

The study on the fish chromosome has received considerable attention because of their importance in classification, evolution and heredity **(Gold *et al,* 1990).** The cytogenetic techniques are considered as authentic tools for species and have extensively been used to resolve taxonomic ambiguities in closely related species, identification of strains/ cytotypes, genetic polymorphisims, sex determination, polyploidy etc. **(Manna and Khuda Bukhsh 1978; Nagpure *et al,* 2004)**. Thus the present study aims to find chromosomal and meiotic analysis of *Puntius ticto.*

MATERIAL AND METHODS

Live specimens of *Puntius ticto* were obtained from Ravi river, Kathua, Jammu and Kashmir and were transported to cytogenetic lab, University of Jammu. Specimens were identified upto species level following taxonomic keys described by Jayaram (2002), Talwar and Jhingran (1991). Specimens were injected with 0.5% colchicines intraperitoneally at the rate of 1ml/100mg to depress mitotic division at metaphase and left for 3hrs before sacrificing. Hypotonic air drying Giemsa staining technique was employed for chromosomal preparations. Well spread metaphase compliments were photographed under Ch20i BIMF microscope attached with SSc-DC378P camera. Also the gonadal tissue was used to study the meiotic chromosomes by the same method. For karyotyping, the chromosomes were classified as per the method described by Levan *et al*, (1964).

RESULTS

The metaphase compliments and karyotype of *P. ticto* is shown in Fig. 1. In *P. ticto*, the diploid chromosome number was found to be 50. The specimens of *P. ticto* possessed seven metacentric pair (m), nine submetacentric (sm) pairs, seven subtelocentric (st), pairs and two pairs of telocentric (t) pairs of chromosome and the karyotype formula was derived as 14m +

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18sm + 14st + 4t with fundamental arm number (FN) =84. Morphometric data is given in the Table 1. Ideogram (Fig. 2) and Histogram (Fig. 3) were prepared using morphometric data. The total length of the chromosomes (TL) in *P. ticto* varied from1.88 to 2.41µm, whereas RL% ranged from 53.94 to 100. No heteromorphic sex chromosomes were observed which could be considered. Meiotic stages were studied from the gonadal tissue as:

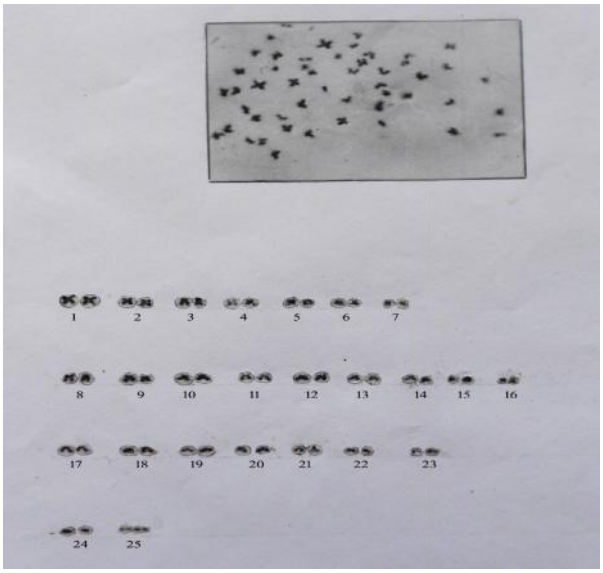

Figure 1 Somatic karyotype of *Puntius ticto*

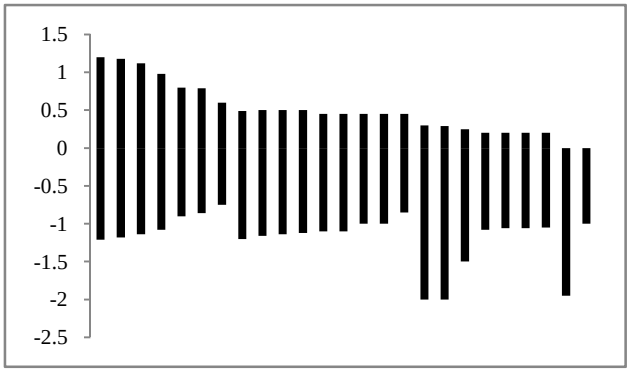

Figure 2 Idiogram of *Puntius ticto*

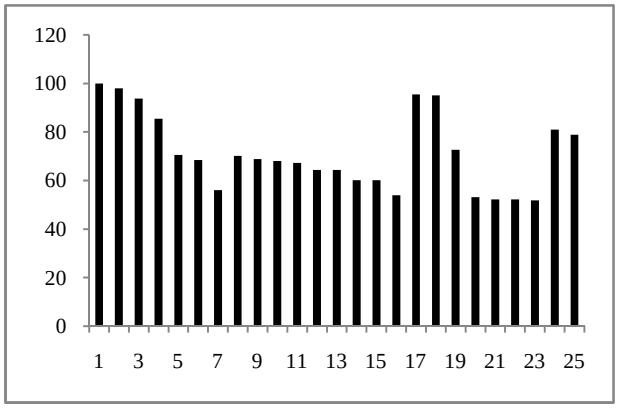

Figure 3 Histogram of chromosomes constructed on the basis of relative length percentage.

Where X-axis represents chromosome number
Y-axis represents relative length percentage

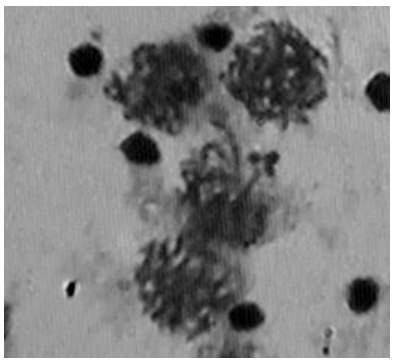

Figure 4 leptotene

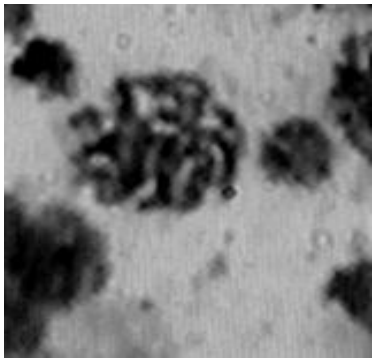

Figure 5 Zygotene

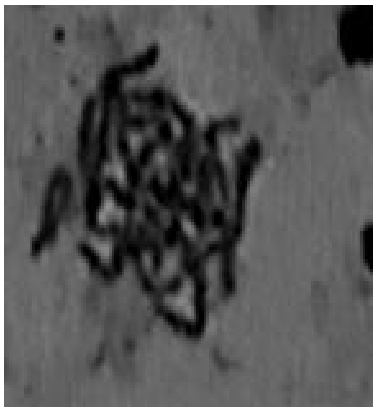

Figure 6 Pachytene

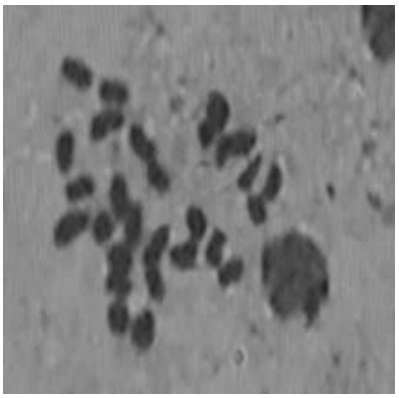

Figure 7 Metaphase I

1. ***Leptotene:*** This stage was characterized by presence of a thread ball of chromatin having beaded appearance. Chromosomes were more or less uniformely distributed

along the length of chromatin thread. No condensation was observed in chromatin material. (Fig. 4)

2. ***Zygotene:*** In this stage, small condensed chromatin structures were seen with some free ends. (Fig. 5)
3. ***Pacytene:*** Chromosomes were present in paired form as tetrads much thicker than leptotene. Some of these were undergoing crossing over. However, there number was not counted. (Fig. 6)
4. ***Metaphase I:*** Twenty five bivalents were observed. Highly condensed dumb-bell shaped and some rod shaped bivalents were observed. Majority with a single terminal or non terminal chaisma each. In two of the larger bivalents two chaismata had been observed. (Fig.7)

Table 1 Morphometric data of karyotype of *Punitus ticto* showing 2n=50 (chromosomal formula)

Chromosome pair no.	Mean length of the short arm (p) in µm	Mean length of the long arm (q) in µm	Absolute length (p+q) of the chromosome in µm	Arm ratio (q/p)	Realtive length percentage	Total compliment length percentage	Centromeric index	Nomenclature
1	1.20	1.21	2.41	1.00	100	5.60	49.70	M
2	1.18	1.18	2.36	1.00	97.92	5.48	50.00	M
3	1.12	1.14	2.26	1.02	93.77	5.25	49.50	M
4	0.98	1.08	2.06	1.10	85.47	4.78	48.90	M
5	0.80	0.90	1.70	1.12	70.54	3.95	47.00	M
6	0.79	0.86	1.65	1.08	68.46	3.83	47.87	M
7	0.60	0.75	1.35	1.25	56.01	3.13	44.44	M
8	0.49	1.20	1.69	2.44	70.12	3.93	28.99	SM
9	0.50	1.16	1.66	2.32	68.87	3.85	30.12	SM
10	0.50	1.14	1.64	2.28	68.04	3.81	30.48	SM
11	0.50	1.12	1.62	2.24	67.22	3.76	30.86	SM
12	0.45	1.10	1.55	2.44	64.32	3.60	29.03	SM
13	0.45	1.10	1.55	2.44	64.32	3.60	29.03	SM
14	0.45	1.00	1.45	2.22	60.16	3.37	31.03	SM
15	0.45	0.85	1.45	1.88	60.16	3.37	31.03	SM
16	0.40	1.00	1.30	2.50	53.94	3.02	34.61	SM
17	0.30	2.00	2.30	6.60	95.44	5.34	13.04	ST
18	0.29	2.00	2.29	6.89	95.02	5.32	12.66	ST
19	0.25	1.50	1.75	6.00	72.61	4.06	14.28	ST
20	0.20	1.08	1.28	5.40	53.11	2.97	15.62	ST
21	0.20	1.06	1.26	5.30	52.28	2.92	15.87	ST
22	0.20	1.06	1.26	5.30	52.28	2.92	15.87	ST
23	0.20	1.05	1.25	5.25	51.86	2.90	16.00	ST
24	0	1.95	1.95	∞	80.91	4.46	0	T
25	0	1.90	1.90	∞	78.83	4.41	0	T

Mean Total haploid length=43.01µm

Total compliment length=Mean total haploid length×2

=43.01×2

=82.48µm

Chromosomal formula=14m+18sm+14st+4t

DISCUSSION

The most commonly occurring 2n in fish family Cyprinidae is 50 with the range from 34 to 446 **(Sola *et al,* 1992, Fontana *et al,* 1998).** In India, the 2n=50 seemed to be the modal number of genus *Puntius* **(Nayyar, 1964; Taki *et al,* 1977; Tripathi and Sharma 1987; Ganai and Yousaf 2011).** The present study also revealed the same diploid number 2n=50 but karyomorpholgy of *P. ticto* showed variation with chromosomal formula as n=7m+9sm+7st+2t; FN=86.

Earlier workers in *P. ticto* reported 2n=50 with chromosomal formula as n=10m+6sm+5t+4t; NF=92 (Sharma *et al*, 1990); n=7m+12sm+4st+2t; FN=88 **(Saroniya *et al,* 2013)**. The difference in karyomorpholgy in present study from earlier workers is due to presence of different populations, races and/or subspecies arising from mutation, race improvement and hybridization with other indigenous species and their distribution in different aquatic ecosystems. Intra-specific variation in karyomorphology have also been ascribed to ambiguities in classification due border-line centromere positions caused by cell to cell variation in the extent of chromosome contraction, which is general problem in the description of the relatively small chromosome of cyprinids. Differences in FN among closely related species corroborated the importance of pericentric inversions as the main mechanism of karyotypic evolution in several modern fish orders.

As far as authors are aware, there is no information available regarding meiotic stages of *P.ticto*

References

Fontana, F., Tagaliavini, J., Congiu, L., Lanfredi, M., Cica, M., Laurenti C. and Rossi, R. 1998. Karytotypic characterization of great sturgeon *Huso huso* by mutilple staining techniques and fluorescent in situ hybridization. Mar. Bio., 132: 495-501.

Ganai, F.A. and Yousaf, A.R. 2011. A karyological analysis of *Puntius conchonius* (Hamilton, 1822) (Pisces, Cyprinidae), a new cytotype from Dal Lake Srinagar Kashmir, J and K, India. Int. J. Fish Aquacult., 3(11): 213-217.

Gold, J.R., Li, Y.C., Shipley, N.S. and Powers, P.K. 1990. Improved methods for working with fish chromosomes with a review of metaphase chromosome banding. Journal of Fish Biology, 37: 563-575.

Jayaram, K. C. 1991. Revision of the genus *Puntius* Hamilton from the Indian Region. Records of the Zoological Survey of India, Occasional Paper, 135: 1-178.

Jayaram, K.C. 2002. Fundamentals of fish taxonomy. Narendra Publishing House, Delhi.

Kortmulder, K. 1972. A comparative study in colour patterns and behaviour in seven Asiatic *Barbus* species (Cyprinidae, Ostariophysi, Osteichthyes): a progress report. Behaviour, Supplement, 19: i-xiii, 1-331.

Kottelat, M. and Pethiyagoda, R. 1989. Eine neue Barbenart von Sri Lanka: *Puntius asoka* spec. nov. Die Aquarium und Terrarium Zeitschrift, 42: 472-476.

Kullander, S. O. 2008. Five new species of *Puntius* from Myanmar (Teleostei: Cyprinidae). Ichthyological Exploration of Freshwaters, 19: 59-84.

Kullander, S. O. and Fang, F. 2005. Two new species of *Puntius* from northern Myanmar (Teleostei: Cyprinidae). Copeia, 2005: 290-302.

Levan, A., Fredga, K. and Sandberg, A.A. 1964. Nomenclature of centromeric positions on chromosomes. Heriditas, 52: 201-220.

Manna, G.K. and Khuda-Bukhsh, A.R. 1978. Karyomorphological studies in three species of teleostean fishes. Cytologia, 43: 69-73.

Nagpure, N.S., Kumar, R., Srivastava, Satish, K., Gopalakrishnan, A., Verma, M.S. and Basheer V.S. 2004. Cytogenetic studies of fish species *Horabagrus nigricollaris*, *Puntius denisonii* and *Puntius sarana subnasutus* endemic to the Western Ghats. The Nucleus, 47(3): 143-148.

Nayyar, R.P. 1964. Karyotypic studies in seven species of Cyprinidae. Geneics, 35: 95-104.

Saroniya, R.K., Nagpure, N.S., Saksena, D.N., Kushwaha, B. and Kumar, R. 2013. Cyotaxonomic studies in four species of genus *Puntius* (Hamilton, 1822) from central India. Nat. Acad. Sci. Let., 36(4): 411-418.

Schut, J., De Silva, S. S., Kortmulder, K. 1984. Habitat associations and competition of eight *Barbus* (=*Puntius*) species (Pisces, Cyprinidae) indigenous to SriLanka. Nether. J. of Zoo., 34: 159-181.

Sharma, O.P., Tripathi, N.K., Agarwal, A. and Tripathi, S. 1990. Karyotypic diversity in genus *Puntius* (Cyprinidae: Pisces). The Nucleus, 33(1,2): 81-83.

Sola, L., Ross, A.R., Laselli, V., Rasch, E.M. and Monaco P.J. 1992. Cytogenetics of bisexual/unisexual species of Poecilia II. Analysis of heterchromatin and nucleoalar organizer regions in *Poecilia mexiccana* by C- banding and DAPI, Quinacrine, chromomycin A3. and silver staining. Cytogenet. cell Genet., 60: 229-234.

Takii, Y. Urushido, T., Suzuki, A. and Serizaw, A. 1977. A comparative chromosome study of *Puntius* (Cyprinidae: Pisces) I South east Asian species. Proc. Jap. Acad., 53: 231-235.

Talwar P.K. and Jhingran A.G. (1991). Inland fishes of India and adjacent countries, vol 1. IBH, Publishing Co. Pvt. Ltd. New Delhi.

Tripathi, N.K. and Sharma, O.P. 1987. Cytological studies on six cyprinid fishes. Genetica, 73(3): 243-246.

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