

Karyology of *Puntius sophore* (Pisces, Cypriniformes) from the Brahmaputra River, Assam, India

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Abstract

In this investigation karyotypes of *Puntius sophore* from the Brahmaputra River (Assam, India) are presented. Chromosome preparations were made using anterior parts of the kidney cells. The karyotype of the population under study consisted of 48 diploid chromosomes with fundamental arm number 54. The chromosomal divergences in *P. sophore* with different ecology and geographical distribution are discussed.

Keywords: Karyotypes; *Puntius sophore*; Brahmaputra river; Assam

Introduction

The pool barb *Puntius sophore* (Hamilton, 1822) is a freshwater to brackish water cyprinid widely distributed in inland water of Asia, including Bangladesh, Pakistan, India, Nepal, Myanmar, Bhutan, Afganistan and China. This fish is benthopelagic (demersal) and inhabits rivers, streams and ponds of plains and submontane regions [1]. Due to the complicated geological history of the Brahmaputra basin (associated with significant geomorphological changes as a result of tectonic activity), and the extensive geographical distribution of *P. sophore*, we have accomplished a karyological study of the species from an unstudied locality. The main goal of this study was to analyze karyotypes of *P. sophore* from the river Brahmaputra in Assam, India.

Twenty five (18 males, 7 females) mature healthy fish specimens weighing 4-12 g were collected from Guwahati (26°11'10.2"N 91°45'03.6"E) with the help of local fishermen. Specimens were identified upto species level following taxonomic keys [2-4]. For karyotype analysis, cells were used from the front part of the kidney. Chromosome preparations made using standard flame drying techniques and were stained with 5% Giemsa solution (concentrate, Merck) and a total of 200 metaphase plates were studied. Chromosomes were classified according to the system of Levan [5] with calculation of the centromeric index using Leica Application Suite V3.3.0. Chromosome spreads were studied using a Leica DM 3000 microscope. Photos of mitotic chromosomes were taken with camera fitted with microscope.

Karyological studies of *P. sophore* revealed a chromosomal complement containing $2n=48$, $NF=54$ (Figure 1A) without any sex differentiation. The karyotype consists of 2 pairs of meta and 1 pair of subtelo and 21 telocentric chromosomes (Figure 1B). The largest chromosomes in the *P. sophore* karyotype is presented by pairs of submetacentric chromosome.

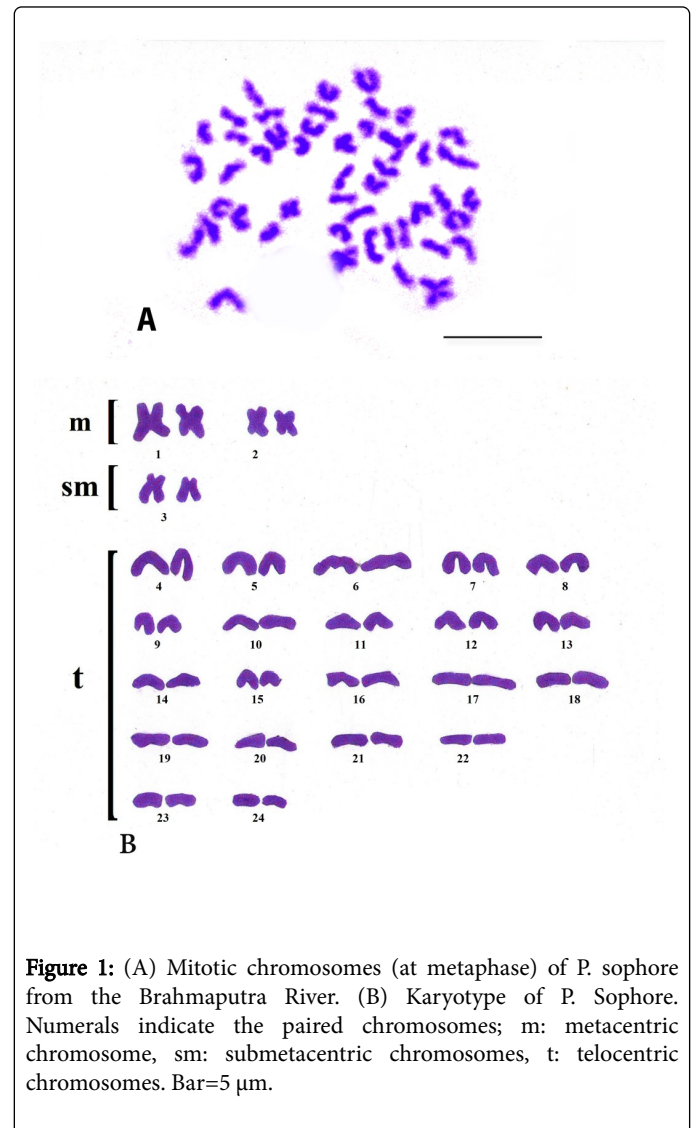


Figure 1: (A) Mitotic chromosomes (at metaphase) of *P. sophore* from the Brahmaputra River. (B) Karyotype of *P. Sophore*. Numerals indicate the paired chromosomes; m: metacentric chromosome, sm: submetacentric chromosomes, t: telocentric chromosomes. Bar=5 μ m.

The smaller size and usually abundant and more contracted structures of chromosome, studying and measuring fish chromosomes is somewhat more difficult than those of mammals [6]. Besides, identification of fish chromosomes is difficult due to the lack of any standard karyotype of fishes, polymorphism exists not only among various fish species but also within species [7]. The most commonly occurring diploid number in family cyprinidae is 50, considered to be the modal number in case of this family [8,9]. According to the studies performed by various researchers on *Puntius* species across India [10-12], it seems that $2n=50$ in the genus *Puntius*, as in many other cyprinids [13].

The main objective of karyotyping is to throw some light in classification, evolution and heredity of the concern species. The

cytogenetic techniques are considered as authentic tools for species and have extensively been used to resolve taxonomic ambiguities in closely related species. The ancestral karyotype for *P. sophore* probably contained $2n=50$ chromosomes [10]. But after that, it was changing and remains constant. Previously, the karyotype of *P. sophore* was studied in only three localities across India (Table 1). In only one population different diploid number of chromosomes was reported (Table 1) though karyotype formula was found to be different in all the studied populations. However, similar structure of the karyotype observed between some populations, could be due to intrapopulation differentiation. Chromosomal variability may be associated with rearrangements, leading to a change of the position of the centromere.

Locality	2n	Haploid karyotype	Information source
Delhi (Western Jamuna Canal), India	50	12m+20sm+10st+8t	Nayyar [10]
Orissa, India	48	2m+46t	Biswai et al., 2010
Central India	48	4m+2st+42t	Saroniya et al., 2013
Assam, India	48	4m+2st+42t	This report

2n: number of chromosomes in a diploid set (m, sm, st, and t: meta, submetata, subtelo, and telocentric chromosomes respectively).

Table 1: Karyotype characteristics in *P. sophore* from different localities of India.

Thus, the karyotypes of all studied *P. sophore* populations from the Brahmaputra River have almost stable numbers of chromosomes. Further karyological study of *P. sophore* populations will probably allow us to reveal chromosomal variability associated with the rearrangements that change the structure of separate chromosomes without changing their number.

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