

Occurrence of karyotypical mosaicism in *Trichomycterus paolence* (Teleostei, Trichomycteridae)

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Abstract - A chromosomal mosaic has at least two cell lineages with different karyotypes derived from a single zygote and the karyotype alteration can be numeric or structural as well. In the present paper were detected a numeric chromosomal alterations in a single specimen of *Trichomycterus paolence* from the Quinta stream (Itatinga, state of São Paulo, Brazil). In a total of 61 analysed metaphases, besides the normal chromosome number of this species ($2n=54$), other four chromosomal sets characterized by $2n=55$ (54 plus a microchromosome), $2n=55$ (54 plus a small subtelocentric chromosome), $2n=56$ (54 plus a subtelocentric and a microchromosome) and $2n=57$ (54 plus a subtelocentric pair and a microchromosome) have been detected. The mechanisms that have originated those abnormal karyotypical constitutions is discussed.

Key Words: fish mosaicism, neotropical fishes, *Trichomycterus*.

INTRODUCTION

Karyotypical variations can be characterized as the result of the occurrence of different cells in a specimen, as the presence of different cells within species or still as the occurrence of distinct cells within a population (KIRPICHNIKOV 1981).

Mosaicism is a term related to the presence of different cell lineages in the same individual concerned to the genotype or even to the chromosome complement. However, each cell lineage is considered as a clone and characterized by cells with the same missing or additional chromosomes or still involving structural rearrangements, originally from a single zygote (MITELMAN 1991).

The occurrence of karyotypical aberrations is an event rarely observed among the neotrop-

ical fish group. MAISTRO *et al.* (1994) reported the occurrence of a natural triploidy with the presence of B chromosomes in samples of *Astyanax scabripinnis* from two streams in the Cuesta of Botucatu (state of São Paulo, Brazil). The analyzed samples were characterized by the presence of $2n=75 + 1B$ chromosomes (Araquá river) and $2n=75 + 2B$ chromosomes (Córrego das Pedras). Another registration of these events among neotropical fishes is the results presented by BORIN and MARTINS-SANTOS (2000). These authors verified the occurrence of three cell populations in a specimen of *Trichomycterus davisi* from Iguaçu river basin characterized by the presence of cells with 53, 55 and 56 chromosomes besides the cells that presented the characteristic chromosomal set of this species, 54 chromosomes.

The purpose of this paper is to reveal the occurrence of a karyotypical mosaicism in *Trichomycterus paolence*.

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MATERIAL AND METHODS

A cytogenetic study performed in 12 specimens (4 males and 8 females) of *Trichomycterus paolence* from the Quinta stream (Itatinga, state of São Paulo, Brazil) revealed the occurrence of a karyotypical mosaicism in a single specimen. The obtention of the mitotic metaphase chromosomes was carried out by kidney cells suspension as proposed by FORESTI *et al.* (1993). The karyotype was established according to LEVAN *et al.* (1964) and compared to the karyotypical description of *Trichomycterus paolence* as proposed by TORRES *et al.* (1998).

RESULTS

The cytogenetic study carried out in specimens of *Trichomycterus paolence* from Quinta stream showed that the modal diploid number is $2n=54$ ordered in a chromosomal formula of 46M (metacentrics)+6SM (submetacentrics)+2ST (subtelocentrics) (TORRES *et al.* 1998).

The analysis of 61 metaphases belonging to one specimen evidenced the occurrence four cell lineages: 11 cells (18,03%) with $2n=55$ (54 plus a microchromosome, Fig. 1), 9 cells (14,75%) with $2n=55$ (54 plus a small subtelocentric chromosome, Fig. 2), 8 cells (13,11%) with $2n=56$ (54 plus a subtelocentric and a microchromo-

some, Fig. 3) and 4 cells (6,56%) with $2n=57$ (54 plus a subtelocentric pair and a microchromosome, Fig. 4) besides the normal karyotype (29 cells – 47,54%).

DISCUSSION

The occurrence of chromosomal aberrations in the neotropical fish fauna is an event that is rarely observed. According to CENTOFANTE *et al.* (2001) the documentation of specimens possessing abnormal karyotypes will become more frequent, considering the increasing number of individuals analysed by a cytogenetic point of view.

Natural triploidies are the main chromosomal aberration detected in the neotropical fishes, as the cases in *Curimata modesta* (VÈNERE *et al.* 1985), *Astyanax scabripinnis* (FAUAZ *et al.* 1994; MAISTRO *et al.* 1994) and *Characidium gomesi* (CENTOFANTE *et al.* 2001) among others.

Concerning to the occurrence of karyotypical mosaicisms, the neotropical ichthyofauna is a group in which almost no cases are reported.

The results presented here revealed a wide and drastic reorganization of the karyotype at the kidney cells. The presence of four cellular lineages besides the normal karyotypical constitu-

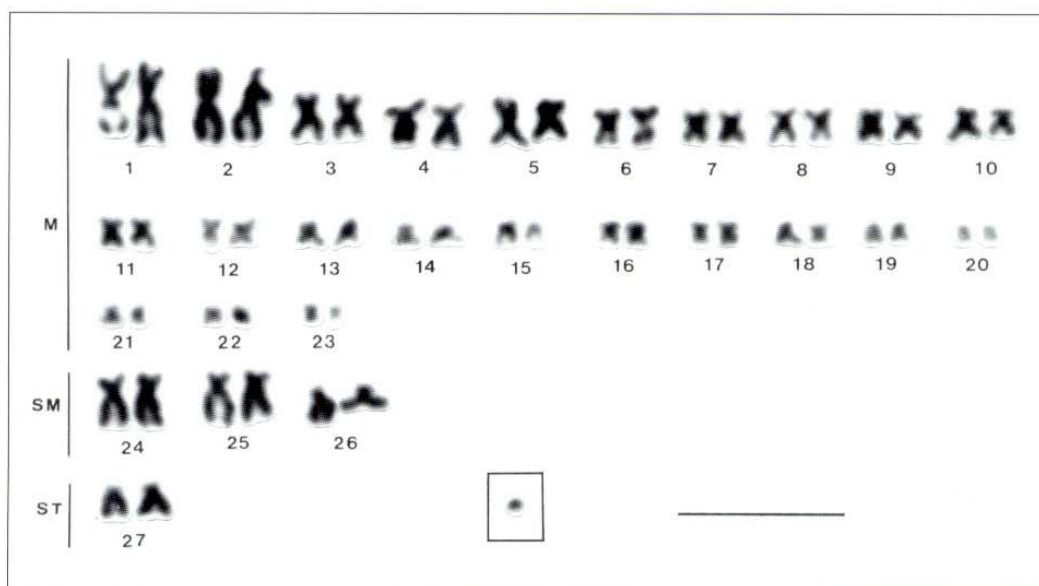


Fig. 1 – First abnormal karyotypical constitution detected in *Trichomycterus paolence* from Quinta stream. Note the occurrence of $2n=54 + 1$ microchromosome. Bar 10 μ m.

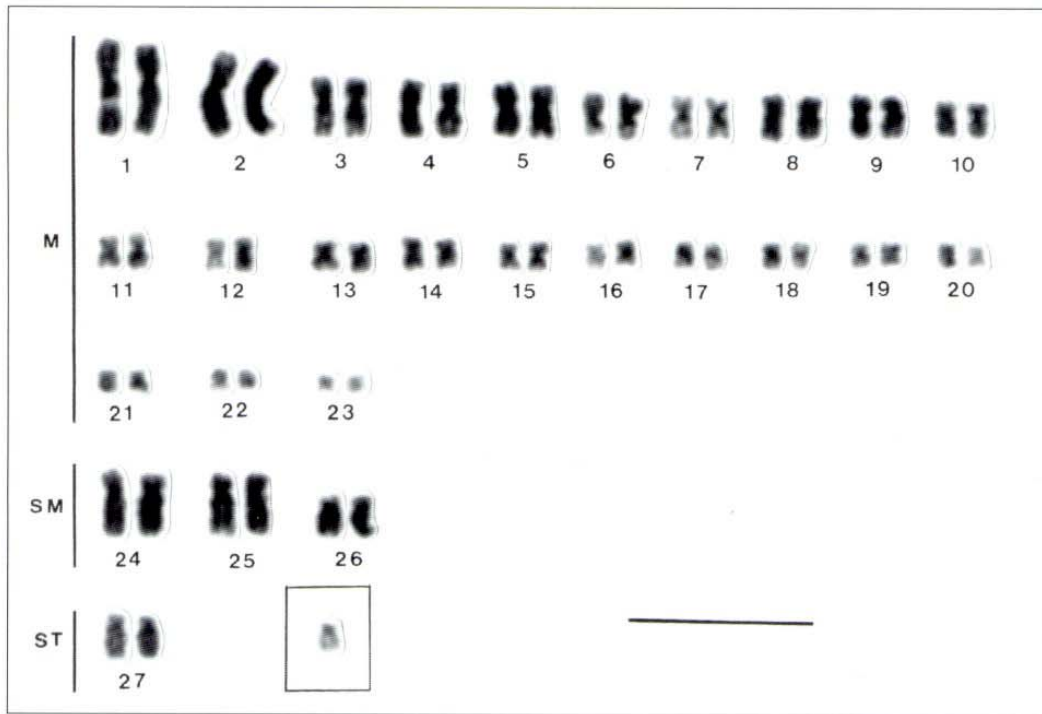


Fig. 2 – Second abnormal karyotypical constitution detected in *Trichomycterus paolence* from Quinta stream. Note the occurrence of $2n=54 + 1ST$. Bar $10\mu m$.

tion could be considered as the result of somatic non-disjunction, characterizing post zygotic aneuploidies. It is known that individuals with at least two different cell lineages with also different

karyotypes had their origins from events of non-disjunction occurred in the cell after the fertilization. However, a single cell could receive an extra chromosome while another one would be defi-

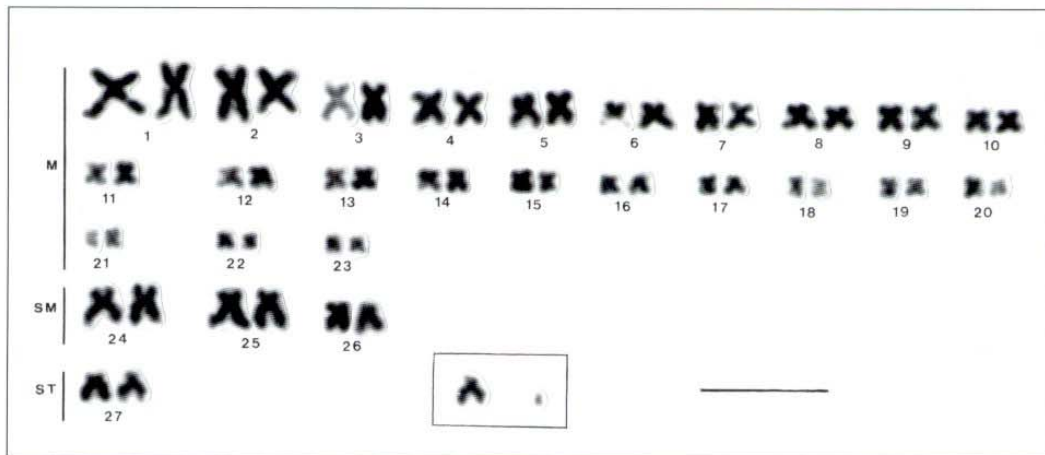


Fig. 3-- Third abnormal karyotypical constitution detected in *Trichomycterus paolence* from Quinta stream. Note the occurrence of $2n=54 + 1ST + 1$ microchromosome. Bar $10\mu m$.

cient in a chromosome, although this last argument has not been the case detected here.

Figs. 1, 3 and 4 show the presence of microchromosomes in the karyotypes. A possible explanation for this occurrence could be answered by a refined analysis of those karyotypes. It is possible to recognize the existence of a size heteromorphism involving the homologous of the 1st chromosomal pair presented in the Fig. 1 and better characterized in the Fig. 4. Furthermore, it is also relatively clear the presence of gaps in the long arms of the chromosomes that compose the 6th pair (Figs. 1, 3 and 4). These occurrences suggested that all of microchromosomes detected here have been originated by chromosomal breaks on those aforementioned chromosomes.

The non-presence of those microchromosomes in all cell lineages, such as shown the Fig. 2, could suggest that probably they are acentric chromatin fragments lost during the cell cycle.

These considerations could lead to the idea that those chromosomal regions at the abnormal karyotypes involved with the occurrence of

gaps, could represent the existence, in the 1st and 6th pairs, of some hotspots of chromatin fragility resulting in chromosomal instabilities. However, these chromatin regions could be more susceptible to breaks, by the mechanic efforts of cell division or still by environmental influences.

Considering the induction of these events by the environmental forces, it is important to take into account eventual water contaminations by agricultural defensives. The Quinta stream is a very small rivulet located in the base of a geographical accident called Cuesta of Botucatu and this water course crosses some small rural properties that maintain diverse agricultural cultivations that could be related to the occurrence of this abnormal karyological event.

Although these mosaicism cases have been considered here as rare, a similar event was detected in *Trichomycterus davisi* from Iguazu river basin by BORIN and MARTINS-SANTOS (2000). These authors revealed an intra-individual polymorphism related to the diploid number characterized by the presence of three different

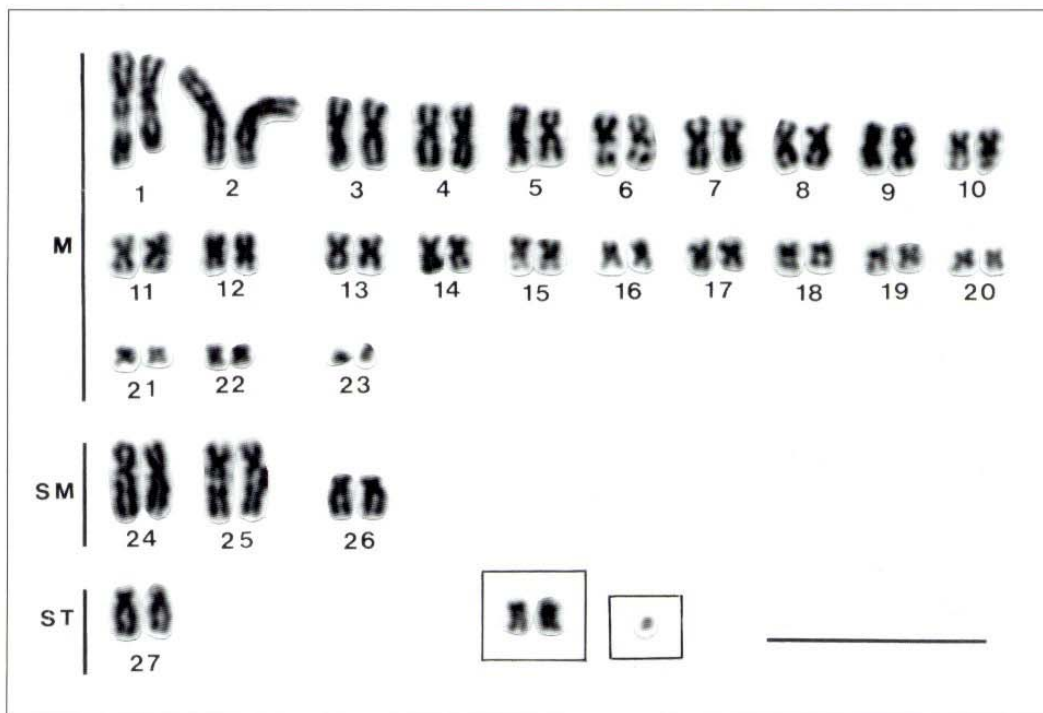


Fig. 4 - Fourth abnormal karyotypical constitution detected in *Trichomycterus paolence* from Quinta stream. Note the occurrence of $2n=54 + 2ST + 1$ microchromosome. Bar $10\mu\text{m}$.

cell populations, $2n=54$ (40M+12SM+2ST), $2n=55$ (40M+12SM+2ST+1M) and $2n=56$ (40M+12SM+2ST+2A). Such variation was attributed to a probable post-zygotic non-disjunction of a metacentric chromosome of small middle size, followed by centric fission. Furthermore, it was considered a probable and narrow relationship between that uncommon chromosomal variation and the intentional aggression suffered by Iguaçú river during the last hundred years by the uncontrolled emission of urban and industrial effluents in the river.

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