

## DISCORDANCE IN CHROMOSOME NUMBER AMONG SOMATIC AND GONADAL TISSUE CELLS OF *Gymnogeophagus balzanii* (PISCES: CICHLIDAE)

Eliana Feldberg<sup>1</sup> and Luiz Antonio Carlos Bertollo<sup>2</sup>

### ABSTRACT

*Gymnogeophagus balzanii* (Pisces: Cichlidae) is characterized by the fact that its somatic cells (kidneys and gills) exhibit  $2n = 48$  chromosomes. Analysis of testis cells not only revealed the occurrence of the expected haploid number equal to 24, but also showed the presence of a few extra chromosomes. As a viable hypothesis, we propose that these are supernumerary chromosomes which are absent in the somatic cells analyzed.

### INTRODUCTION

Family Cichlidae has been relatively well studied in terms of karyotype, but only in few species were the haploid and diploid numbers determined simultaneously, with only the diploid number established in most cases.

In our cytogenetic studies of some species of neotropical cichlids, we had the opportunity to note an interesting case of discordance between the chromosomes numbers of different tissues in the same species. Thus, the

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<sup>1</sup> Departamento de Biologia Aquática e Limnologia, Instituto Nacional de Pesquisa da Amazônia (INPA), Caixa Postal 478, 69000 Manaus, AM, Brasil. Address for reprint requests.

<sup>2</sup> Departamento de Ciências Biológicas, Universidade Federal de São Carlos, Caixa Postal 676, 13560 São Carlos, SP, Brasil.

objective of the present study was to record one such case of discrepancy in chromosome number in *Gymnogeophagus balzanii*, a species native to the basin of the Prata river and to other small basins in Uruguay and southern Brazil.

## MATERIAL AND METHODS

Four specimens, 3 males and 1 female, were collected from marginal lagoons of the Miranda river, MS, Brazil. The animals were injected with 1 ml/100 g body weight of a 0.16% aqueous solution of colchicine, and killed approximately 1.30 hours later. Mitotic metaphases were obtained from kidney and gill cells by the conventional air-drying technique of Egozcue (1971), modified by Bertollo (1978). Meiotic chromosomes were obtained from testis cells by the technique of Kligerman and Bloom (1977), slightly modified.

## RESULTS

Figure 1 shows the frequency of diploid numbers in somatic metaphases from kidney and gill tissue of male and female *G. balzanii* specimens, with the modal number being equal to 48 chromosomes for both sexes.

Figure 2 shows the frequency of chromosome numbers in testis metaphases (spermatogonial preparations, metaphase I and metaphase II), as well as the corresponding metaphase figures. It can be seen that the chromosome number of these cells can be higher than expected in terms of the diploid number observed in the kidney and gill cells of the species.

## DISCUSSION

The somatic karyotype of *G. balzanii* is characterized by the presence of 48 chromosomes both in males and females, with no differentiation in chromosome morphology between sexes. There is one meta-submetacentric pair, the largest in the complement, accompanied by 23 subtelo-acrocentric pairs, with a fundamental number (FN) equal to 50<sub>2</sub> (Feldberg and Bertollo, manuscript in preparation). The analysis of the testis cells of the three males specimens studied, however, did not reveal only an  $n=24$  number, as expected. Even though we found only a few spermatogonial cells, we detected a numerical variability of 48 to 52 chromosomes. This variability was better

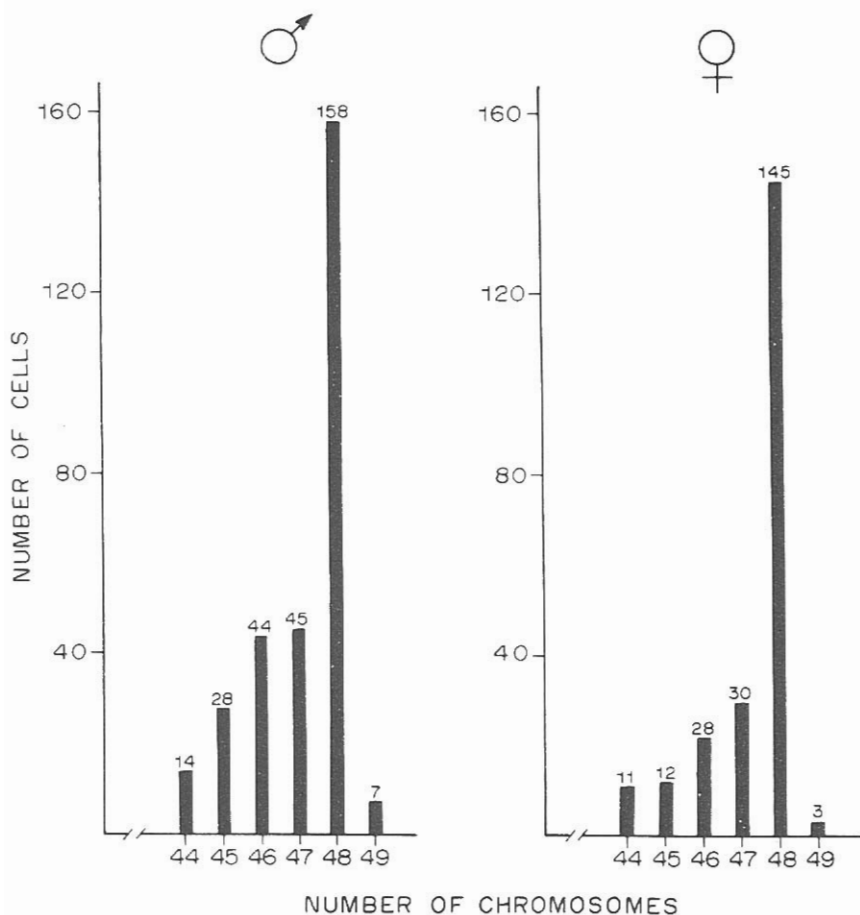


Figure 1 - Chromosome number frequency in kidney and gill cells of *Gymnogeophagus balzanii*.

characterized among metaphases I, where, in a larger sampling, we observed 17 cells with 24, 70 with 25 and 71 with 26 chromosome figures which were visualized as bivalents, and, in certain cases, as probable trivalents and univalents. Metaphase II cells, although fewer in number, also showed this variability, with cells showing 24, 25 and 26 chromosomes (Figure 2).

A few reports of the presence of supernumerary chromosomes in

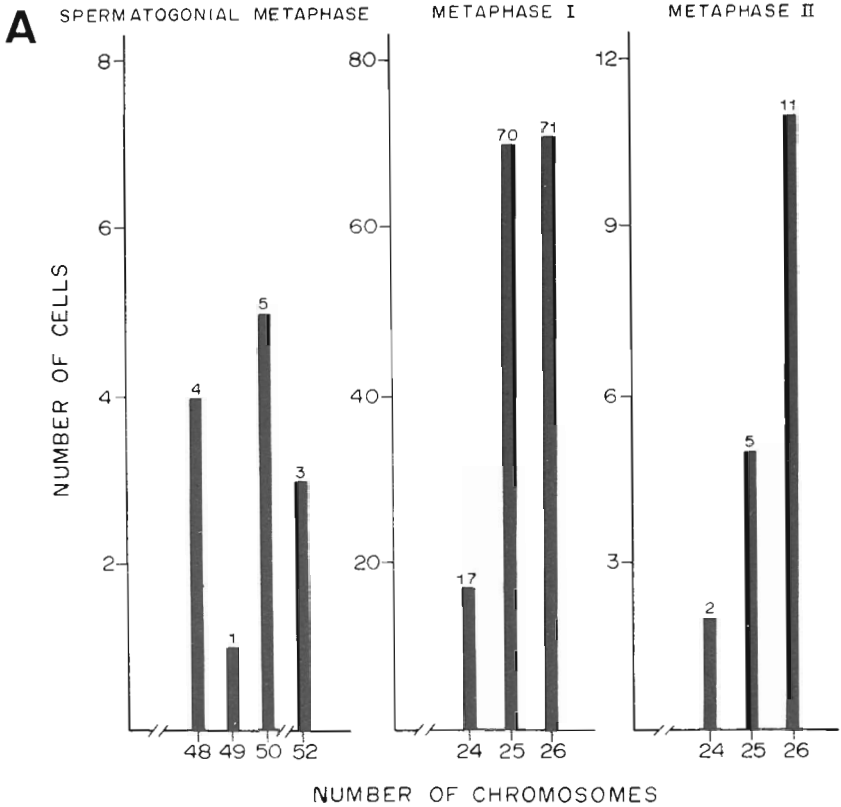


Figure 2 - A, Chromosome number frequency in testis cells of *Gymnogeophagus balzanii*.

The "chromosome numbers" (24, 25 and 26) of metaphases I actually refer to the chromosomal figures observed that may involve the presence of bivalents and of probable trivalents and univalents. B, Testicular metaphase figures; 1B, 2B and 3B, metaphases I showing 23 "bivalents" + 1 possible "trivalent" (arrow), 24 "bivalents" + 1 possible "univalent" (arrow) and 26 "bivalents", respectively; 4B, metaphase II showing 26 chromosomes.

fish have been published. Pauls and Bertollo (1983), in a study on *Prochilodus scrofa* (Prochilodontidae), detected small accessory chromosomes both in somatic and gonadal cells, whose numbers varied intra- and interindividually. Falcão *et al.* (1984) also reported karyotype variability in *Paroligosarcus pintoii* (Characidae) and *Apareiodon piracicabae* (Parodontidae). An additional large metacentric chromosome was found in *P. pintoii* specimens in relation to the standard complement for the species, both in somatic and gonadal cells. A similar phenomenon was found to occur in *A. piracicabae* somatic cells. The hypothesis advanced as the most probable one was that the additional chromosome is a supernumerary one.

Cases of supernumerary chromosomes that are more specifically localized in determined tissues or organs have also been reported. Thus, for example, gonadal cells and cells of corneal epithelium of certain specimens of the marsupial *Echymipera kalabu* exhibit accessory chromosomes which vary in numbers both intra- and interindividually and which are not detected in other cells, such as those of bone marrow and spleen (Hayman *et al.*, 1969). In the termite *Incisitermes snyderi*, Luykx and Syren (1979) frequently observed an extra bivalent which stained more weakly in relation to the remaining chromosomes among meiotic male cells. In only one of the mitotic cells analyzed were two additional chromosomes detected.

Among plants, an example of accessory chromosomes in meiotic cells was recorded for the gramineous plant *Poa alpina* (Müntzing and Nygren, 1955). In a variety of this species, 14 chromosomes were observed in root cells and 16 during meiosis, with the extra pair representing supernumerary chromosomes that are eliminated from somatic cells but retained in germ cells.

Thus, in view of the cases cited above, it is possible that the results obtained for *G. balzanii* may also represent the occurrence of supernumerary chromosomes, which were present in the gonadal cells of the males studied. The data obtained here showed the presence of distinct gonadal cell lines exhibiting up to 4 extra chromosomes in relation to the cells of the somatic tissues investigated.

Unfortunately we were unable to obtain a larger sampling that would permit us to detect the occurrence and investigate the behavior of these chromosomes in other *G. balzanii* individuals, as well as in the gonadal cells of females, or to carry out a more positive investigation of the probable chromosome associations (trivalents, univalents) observed in metaphase I preparations. Also, there was no opportunity to carry out C-banding tests to

determine whether these extra chromosomes are heterochromatic in nature, as is usually the case for supernumerary chromosomes. In view of these considerations, further detailed studies are needed to reach more definite conclusions on the present case.

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### RESUMO

*Gymnogeophagus balzanii* (Pisces: Cichlidae) caracteriza-se por apresentar  $2n = 48$  cromossomos em suas células somáticas (rim e brânquia). A análise de células testiculares não revelou apenas a ocorrência de um número haplóide igual a 24, como o esperado, mas também evidenciou a presença de alguns cromossomos extras. Admite-se, como hipótese viável, que esses cromossomos sejam supranumerários, ausentes nas células somáticas analisadas.

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