Comparative Cytology of *Tilapia rendalli* and *Geophagus brasiliensis* (Cichlidae, Pisces)

João Luiz Michele¹ and Catarina Satie Takahashi²

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Two species of fishes of the family Cichlidae, *Tilapia rendalli* and *Geophagus brasiliensis*, co-exist in the lake of Ribeirão Preto campus of São Paulo University.

Species of tilapia were introduced in Brazil in 1953. Cytogenetic studies have been made in some species of this genus. Jakowska (1950) found $2n=32$ in *T. macrocephala*; Natarajan and Subrahmanyam (1968) made a preliminary study of chromosomes of *T. mossambica*, and Chervinski (1964) of those of hybrids of *T. nilotica* and *T. galilaea*.

G. brasiliensis is a native species, commonly found in rivers and lakes of the south of Brazil.

Cytological study of *T. rendalli* and *G. brasiliensis* has become of interest because they are morphologically similar and live at the same ecological niche.

Materials and methods

Twelve males of *T. rendalli* and five males of *G. brasiliensis* were studied. Each animal received 1 ml of 1% colchicine solution subcutaneously for every 50 g of animal weight six hours before the animal were killed. Intestine, spleen, liver, gonads and gills were removed and put on separate Petri dishes containing 0,56% potassium chloride solution, where they were minced in order to obtain a fine cellular suspension. The suspension was left for 10 min at room temperature and then centrifuged at 800 rpm for 20 min. The supernatant was then removed and the cells resuspended in the fixative (methanol and glacial acetic acid); this operation was repeated three times centrifuging at 800 rpm for 15 min. The final preparation of the slides followed the usual routine. All preparations were stained with 1% acetic orcein or with Giemsa's solution.

Results

The results are presented in Figs. 1 and 2. The best preparations were obtained from cells of gill epithelium. Few or no dividing cells were found in other tissues of the animal.

T. rendalli showed a majority of cells with $2n=44$ chromosomes (Fig. 1). The chromosomes of this species are of about the same size, except the first pair which is

¹ Departamento de Genética da Faculdade de Medicina de Ribeirão Preto da Universidade de São Paulo.

² Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto da Universidade de São Paulo (Ribeirão Preto-S.P.) Brazil.

larger than the others by about three times. Chromosomes are acrocentric except pairs 3, 10, 11 and 18 which are submetacentric.

Figs. 1-2. 1, chromosomes from gill epithelium of male of *Tilapia rendalli*. $2n=44$. 2, chromosomes from gill epithelium of male of *Geophagus brasiliensis*. $2n=48$.

G. brasiliensis has $2n=48$ chromosomes (Fig. 2). They are acrocentric, except the three largest which are submetacentric. The size of chromosomes becomes gradually smaller so that it is impossible to distinguish the pairs. The largest submetacentric and the smallest acrocentric seem to have no homologous chromosome.

Discussion

It is known that in most cases fishes have 48 chromosomes (Roberts 1970). Our findings fit the same outline, showing that *T. rendalli* has a diploid complement of 44 chromosomes and *G. brasiliensis* has 48.

We found 16 submetacentrics in the former species and only 3 in the latter. This result gives a "nombre fondamental" (NF) as 52 and 51, respectively. Hence we can explain the difference in chromosome number as being due to chromosome rearrangement, e. g., pericentric inversions. Very probably both species are of the same ancestral origin.

The occurrence of a large submetacentric and a small acrocentric without forming a homologous pair in *G. brasiliensis* suggests sexual difference of chromo-

somes. Ebeling and Chen (1970) have reported 12 species of deep water and 5 species of shallow water in which the males carried one pair of heteromorphic chromosomes.

Summary

Two species of the family Cichlidae, *Tilapia rendalli* and *Geophagus brasiliensis*, live at the same ecological niche and are morphologically similar. Cytogenetic study showed a diploid complement of 44 chromosomes in the former and 48 in the latter, with the N.F. of 52 and 51, respectively. The findings suggest that they have the same origin and the difference in chromosome number may be due to chromosome rearrangements.

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