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Karyotypes of Two Cichlid Fishes from Mexico, *Cichlasoma ellioti* and *C. trimaculatum*

Manuel Uribe-Alcocer[1], Blanca L. Náder-García[2] and N. Valdés-Morales[1]

[1] Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México

[2] Facultad de Biología, Universidad Veracruzana, México

The family Cichlidae is abundantly distributed in the Neotropical region of the world. Of about 84 recognized genera in this family (Nelson, 1984), about 24 genera including some 135 species are found in the Americas. This family is one of the most important in the ichthyofauna of Mexico, where it is represented by the genera *Cichlasoma* and *Petenia* (Alvarez, 1950; Miller, 1966; Alvarez del Villar, 1970).

Several papers dealing with intrageneric relationships of *Cichlasoma* have been published (Regan, 1905; Alvarez, 1950; Miller and Nelson, 1961; Miller, 1966; Alvarez del Villar, 1970; Toral-Almazán and Reséndez Medina, 1974). Cytogenetic studies of neotropical cichlids have been carried out by several authors (Post, 1965; Ohno and Atkin, 1966; Nishikawa et al., 1973; Michele and Takahashi, 1977; Thompson, 1979).

Cichlasoma ellioti is found in the upper affluents of the Papaloapan river, which drains into the Gulf of Mexico. *C. ellioti* is considered to have originated in Middle America. For this reason and its morphological traits, it has been placed in the *Thorichthys* species group of the genus *Cichlasoma* (Miller and Nelson, 1961; Miller, 1966).

Cichlasoma trimaculatum inhabits streams on the Pacific slopes, from the Mexican state of Guerrero to the Gulf of Tehuantepec and Guatemala. Because of its morphology it has been placed in the *Parapetenia* species group of *Cichlasoma* (Miller, 1966). Thompson (1979) reported the karyotype of *C. trimaculatum* but the geographical origin of the fishes studied were unknown, as they were purchased from a dealer.

The aim of this paper is to report the karyotypes of *Cichlasoma ellioti* and *C. trimaculatum.*

Material and methods

Fifteen specimens, six females and nine males, of *Cichlasoma ellioti* were collected at three locations along the Actopan River, Veracruz, Mexico: Mata Verde (19°27′8″N, 96°26′21″W), Paso del Bobo (19°25′30″N, 96°23′45″W), and Ursulo Galvan (19°24′30″N, 96°21′45″W). The specimens were collected by seine in water depths of 1.3 m. Twenty specimens, 13 female and 7 male, of *C. trimaculatum* were collected with a seine net from the Tres Palos Lagoon, which lies northwest of Acapulco, between 16°43′ and 16°49′N latitude and 99°39′ and 99°46′ W longitude. Material fishes were deposited in the fish collection of the Instituto de Ciencias del Mar y Limnología of the National University of Mexico under "CCML-PF 0.000.737/.743 (Gro)."

Methods followed Maldonado-Monroy et al. (1985). Cells of the gill epithelium were observed.

For the study of karyotypes, chromosomes in 10 cells of *C. ellioti* and 17 cells of *C. trimaculatum* were examined. Classification of chromosomes followed Levan et al. (1964). Subtelocentric and telocentric chromosomes were included in a single stt group.

Results

The chromosome number of *Cichlasoma ellioti* was counted in 115 mitotic metaphase cells, and the modal number was 48 chromosomes. The karyotype formula is 6 sm + 42 stt, and the fundamental number is 54.

The diploid number of *Cichlasoma trimaculatum* is 48, the mode (128) in 154 cells counted. The chromosome formula is 8 sm + 40 stt.

No secondary constrictions or satellites were detected in the complements, and no heteromorphic chromosome elements indicative of sexual chromosomes were found in females or males, of either species.

Discussion

The diploid chromosome number of *Cichlasoma ellioti* and *C. trimaculatum* is 48, which is the modal number found for most neotropical cichlids (Post, 1965; Nishikawa et al., 1973; Thompson, 1979). This number 2N = 48 is also found in most other fish groups (Roberts, 1964; Ohno et al., 1968; Ohno, 1974; Alvarez et al., 1986).

C. meeki, in the *Thorichthys* group, has a chromosome complement with only 3 pairs of msm's and 21 pairs of stt's (Thompson, 1979), closely resembling the karyotype of *C. ellioti.*

The karyotype of *C. trimaculatum* agrees with that

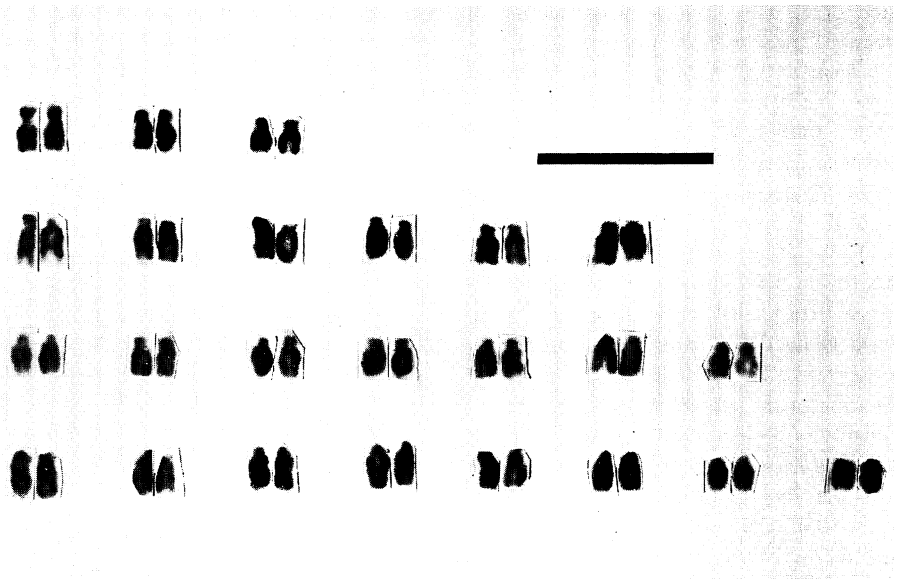

Fig. 1. Karyotype of *C. ellioti.* Sm chromosomes are shown in the top row, st chromosomes in the second and third rows, and t chromosomes in the fourth row. Bar represents 10 μm.

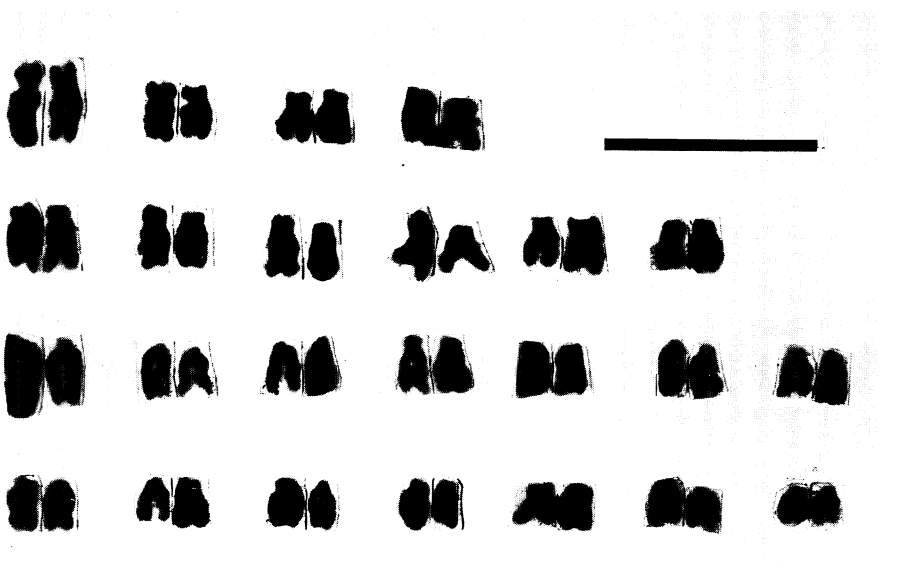

Fig. 2. Karyotype of *C. trimaculatum.* Sm chromosomes are shown in the top row, st chromosomes in the second row, and t chromosomes in the third and fourth rows. Bar represents 10 μm.

reported by Thompson (1979) in the diploid chromosome number, but differs in the arm number, having 8 biarmed msm chromosomes instead of the 6 reported by Thompson (1979).

The chromosome number (48) and karyotypic structure of *C. trimaculatum* (8 msm + 40 stt) corre-

spond to that of *C. dowi*, and is close to those of other members of the *Parapetenia* species group, *C. beani*, *C. labridens* and *C. managuense* (6 msm + 42 stt) (Thompson, 1979).

Karyotypical studies on species groups of the genus *Cichlasoma*, except the *Parapetenia* and *Archocentrus* species groups, are few. Nevertheless, the resemblance of the karyotypes of the species reported in this paper to the other species of the same species group points to the persistance of a common karyotypic line in several related species. In this respect, the new world genus *Cichlasoma* seems to have retained a conservative karyotypical structure during the diversification of the group during speciation.

The uniformity of diploid numbers and variability in arm number in *Cichlasoma* might mean that the mechanisms of karyotype evolution are not Robertsonian translocations, but rather, pericentric inversions or local increment or loss of genetic material, such as tandem duplication or unequal crossing over.

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メキシコ産カワスズメ科魚類 *Cichlasoma ellioti* と *C. trimaculatum* の核型

Manuel Uribe-Alcocer・Blanca L. Náder-García・N. Valdés-Morales

メキシコ産カワスズメ科 *Cichlasoma* 属の *Thorichthys* 種群に属する *C. ellioti* と *Parapetenia* 種群に属する *C. trimaculatum* の核型を比較検討した．前者の核型は本報告で初めて明らかになったもので，6個の次中部着糸型染色体 (sm) と42個の次端部・端部着糸型染色体 (stt) で構成され，2n＝48, FN＝54であった．後者の核型は2n＝48, 8sm＋49stt, FN＝56であった．両種の核型は従来報告されているそれぞれの種群の核型と類似しており，2n の均一性から，本属の核型進化にはロバートソン型転座は関与していないことが示唆された．