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KARYOLOGY OF *MUGIL LIZA* AND *M. CUREMA* FROM VENEZUELA

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ABSTRACT

Karyotypes of *Mugil liza* and *M. curema* from Venezuela were studied. *M. liza* karyotype is 2n=48 acrocentric chromosomes, but *M. curema* is 2n=24, containing one submetacentric and 11 metacentric pairs. The chromosomic complement described for *M. liza* constitutes the first report for the species and coincides with the modal karyotype (2n=48) in the Mugilidae family. Venezuelan *M. curema* karyotype differs in number and shape from *M. curema* from Louisiana (USA), which has been reported to have a complement 2n=28 (10 metacentric pairs, two subtelocentric pairs and two acrocentric pairs).
KEY WORDS: Karyotype. Chromosomes. Mugil liza. Mugil curema.

RESUMEN

Cariología de *Mugil liza* y *M. curema* de Venezuela. Se estudió el cariotipo de dos especies de mugílidos presentes en Venezuela: *M. liza*, que posee un cariotipo 2n=48 con cromosomas acrocéntricos, y *M. curema* con un complemento 2n=24, constituido por once pares metacéntricos y un par submetacéntrico. El complemento descrito para *M. liza* constituye el primer registro para la especie y coincide con el cariotipo modal (2n=48) en la familia Mugilidae. El cariotipo descrito para *M. curema* difiere del presentado en un registro previo en el que se describe para la misma especie de las costas de Louisiana, USA, un complemento 2n=28 (10 pares metacéntricos, 2 pares subtelocéntricos y 2 pares acrocéntricos).
PALABRAS CLAVE: Cariotipo. Cromosomas. Mugil liza. Mugil curema.

INTRODUCTION

Descriptions of karyotypes in teleostean fishes have been published and lists of their chromosome morphology and number are readily available (see Gyldenholm and Scheel, 1971; Gold et al., 1980; Sola et al., 1981; Hartley, 1987). Although some intraindividual and intraspecific variation is commonly found among living teleost fishes, a karyotype with 48 uniarmed chromosomes appears to be predominant and has been proposed as ancestral to modern fishes (Gold et al., 1980; Sola et al., 1981; Doucette and Fitzsimons, 1988).

In the case of Mugilidae, reported karyotypes cover the following species: *Mugil cephalus*, *M. corsula*, *M. parsia*, *M. curema*, *Chelon labrosus*, *Liza ramada*, *Liza saliens*, *Liza aurata* and *Oedalechilus labeo*. In Table 1 it can be observed that the modal karyotype is 2n=48 except for *M. curema* from

Louisiana, USA, with a complement 2n=28 (Le Grande and Fitzsimons, 1976). This paper investigates the karyotypes of Venezuelan *M. curema* and *M. liza*. It will be shown that the same extensive variation found above is also present in Venezuelan *M. curema* to even a greater degree and that the *M. liza* karyotype of Venezuela corresponds to the modal karyotype of the family.

Table 1. Chromosome numbers of eleven species of Mugilids

Species	2n	Karyotype	Number of arms	Reference
Chelon labrosus	48	2st+46a	48	Cataudella and Cappanna., 1974
Liza aurata	48	2st+46a	48	Cataudella and Cappanna., 1974
L. ramada	48	2st+46a	48	Cataudella and Cappanna., 1974
L. saliens	48	2st+46a	48	Cataudella and Cappanna., 1974
M. cephalus	48	48a	48	Cataudella and Cappanna., 1974
M. cephalus	48	48a	48	Le Grande and Fitzsimons, 1976
M. corsula	48	48a	48	Khuda-Buksh and Manna., 1974
M. curema	28	20m+4st+4a	48	Le Grande and Fitzsimons, 1976
M. curema	24	22m+2sm	48	this paper
M. liza	48	48a	48	this paper
M. parsia	48	48a	48	Chatterjee and Majhi., 1973
M. parsia	48	48a	48	Khuda-Buksh and Manna., 1974
Oedalechilus labeo	48	2st+46a	48	Cataudella and Cappanna., 1974

a= acrocentric chromosome, st=subtelocentric chromosome, sm= submetacentric chromosome, m=metacentric chromosome.

MATERIALS AND METHODS

Sexually immature *Mugil curema* and *M. liza* specimens (180-200 mm TL) were collected in coastal waters near La Restinga Lagoon, Margarita Island, Venezuela. Twenty specimens of each species were injected intraperitoneally with 0.1% colchicine and kept in a well aerated aquarium. After 6 h, specimens were sacrificed and the anterior portion of the kidney was removed, placed in 0.4% KCl solution and cut into small pieces. The chromosome preparations were carried out a technique described by Reddy and George (1987), except that preparations were stained for 20 minutes with FLP orcein (1.5% orcein in 20% formic acid, 80% lactic acid, propionic acid and distilled water; 1:1:1:1). Twenty cells from each specimen were analyzed for chromosome count and chromosome morphology. The size range between the smallest and the biggest chromosomes was measured in the best quality spread. Well spread metaphase plates were photographed and chromosomes arranged according to Levan et al. (1964).

RESULTS AND DISCUSSION

Representative karyotypes from each species are presented in Figure 1. Table 2 shows a summary of karyotypic data for species studied. *Mugil liza* diploid number ranged from 45-49, while for *M. curema* ranged from 19-26. The *M. liza* modal diploid number count was 48 with small acrocentric chromosomes. *M. curema* had a 2n=24 unimodal complement, with one submetacentric pair and eleven metacentric pairs which were arranged in two groups of different size. The number of arms was the same for both species (NF=48). Counts below the modal numbers are attributed to a loss of chromosomes during slide preparation or to naturally occurring incomplete complements. The few hypermodal counts probably represent additional chromosomes from another spread, a premature separation of chromatids, or additional chromosomes in atypical nuclei.

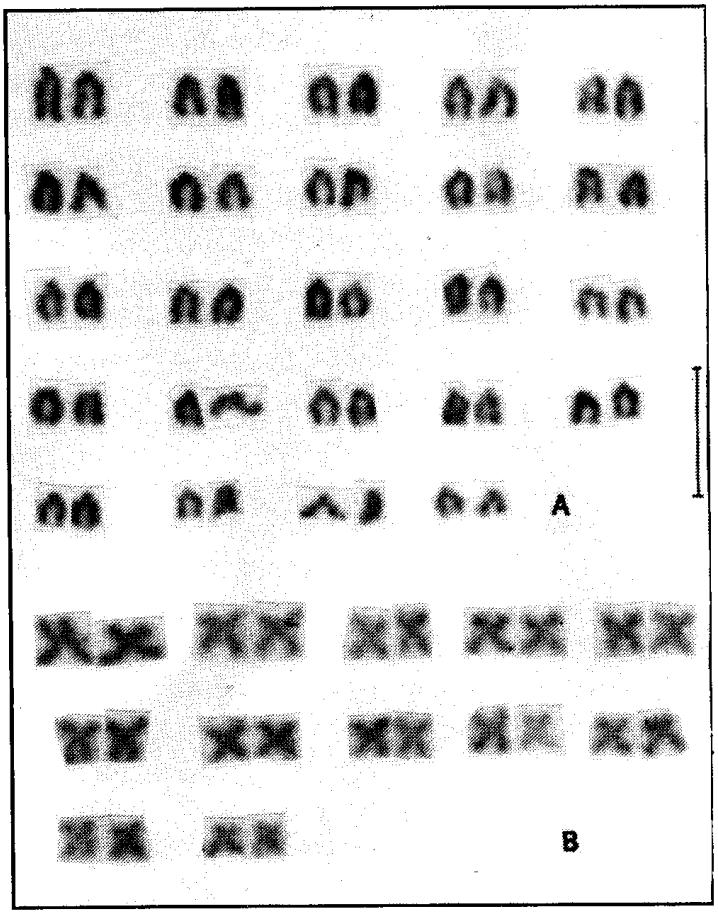

Fig. 1. Karyotypes of *Mugil liza* (A) and *M. curema* (B). Scale represents 5 micrometers.

Table 2. Sumary of Karyotypic data for *Mugil Liza* and *Mugil curema*

Species	*Mugil liza*	*Mugil curema*
Number of specimens	20	20
Number of cells examined	400	400
Diploid number	48	24
Range	45-49	19-26
% Modal	59,25%	50,75%
% Hypomodal	38,58%	36,00%
% Hypermodal	2,25%	13,25%
Arm number (modal)	48	48
Size range (μm)	1.21-2.34	1.38-3.12

A common type of chromosomal rearrangement in fishes is a change in chromosome number due to fusion of two one-armed chromosomes into one two-armed chromosome or to fission (the reverse) (Manna and Prasad, 1971; Denton, 1973; Le Grande, 1975; Gold, 1979; Ferguson and Allendorf, 1991), but according to Le Grande and Cavender (1980), centric fission constitutes a more complex event and, as a consequence, it is less probable than centric fusion.

It has been suggested that the deviations from the 2n=48 presumptive fish ancestral karyotype are towards a reduction in the chromosome number (Gold, 1979). Karyotype studies in twenty species of Elopiformes and Clupeiformes, indicated that the association of large metacentric or submetacentric chromosomes with a reduction in chromosome number is consistent with fusion events in the karyotype evolution from a hypothetical ancestral complement (Doucette and Fitzsimons, 1988) .

Since biarmed chromosomes in *M. curema* are larger than in *M. liza* (Table 2), it seems reasonable to suggest that the karyotype of the former evolved from an ancestral group like the latter with a chromosome complement of 48 uniarmed elements, by fusion of pairs of acrocentric chromosomes accounted for the formation of biarmed element. This suggestion is consistent with a previous report by Le Grande and Fitzsimons (1976) who observed that the *M. curema* metacentric chromosomes are about twice the size of *M. cephalus* uniarmed elements and proposed that the 20 metacentric chromosomes of *M. curema* from Louisiana evolved from an ancestral group with the *M. cephalus* chromosome complement probably by centric fusion of 20 uniarmed chromosomes pairs from one with 48 uniarmed chromosomes.

The *M. liza* karyotype showed in Fig. 1 agrees with the published information, indicating that, with the exception of *M. curema* which possesses a

karyotype strikingly different, mugilids are a fairly homogeneous karyotypic group with 48 chromosomes (Table 1). Nevertheless, our study revealed that the basic chromosome number of *M. curema* (2n=24) from Venezuela is not in agreement with those reported by Le Grande and Fitzsimons (1976), for *M. curema* from Louisiana (2n=28).

Although chromosomal polymorphisms among population of fishes are not widespread, there are some documented cases (see Le Grande and Cavender, 1980; Vitturi and Lafargue; 1992; Gyldenholm and Scheel, 1971; Gold et al., 1980; Sola et al., 1981; Ihssen et al., 1981; Hartley, 1987 and references therein). The fact that the modal chromosome number in *M. curema* from Louisiana (Le Grande and Fitzsimons, 1976), and from Venezuela (present study) were different and are considered to represent the correct diploid chromosome complement for each population, supports the possibility of chromosomal variation within the species which could be used as diagnostic character for fish stock recognition, as it has been described by Ihssen et al (1981).

Althouhg discrepancies between the karyotype reported here and the one reported by Le Grande and Fitzsimons (1976) for *M. curema* suggest the possibility of chromosomal polymorphisms in the species with fixed karyomorphs in local population, the convenience of a taxonomic revision for the species should not be neglected, since the karyotype differences pointed out could constitute evidence that *M. curema* denomination could be employed to identify two different species. In this sense, it has been admitted that mugilids belong to one of the most complicated taxonomic group, above all in juvenile stages, and at the present time the classification to specific level is still not completely clear (Cervigón, 1993).

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