Neotropical Ichthyology, 10(2): 461-464, 2012

Cytogenetic description of *Bunocephalus doriae* Boulenger, 1902 (Siluriformes: Aspredinidae) from the Paraná River (Misiones, Argentina)

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In this work, Bunocephalus doriae was cytogenetically analyzed. A karyotype with a diploid number of 2n= 50 comprising 6m, 10sm, 6st, and 28a (FN= 72) chromosomes was observed. The occurrence of an asymmetric karyotype with a large number of acrocentric chromosomes distinguishes this species from others the Order Siluriformes. An exclusive character observed is the first pair of subtelocentric as the largest chromosome pair of the complement. NORs detected using AgNO3 were located in the terminal regions, on the short arm of a subtelocentric chromosome pair (pair 11), in a secondary constriction. C-banding revealed heterochromatic centromeric regions on several chromosomes of the complement after C-banding. This is the first cytogenetic description of this species and the first cytogenetic report on a member of the family Aspredinidae.

No presente trabalho, Bunocephalus doriae. foi analisado citogeneticamente. O número diploide encontrado foi 2n= 50 compreendendo 6m, 10sm, 6st, and 28a (NF= 72) cromossomos. A ocorrência de um cariótipo assimétrico com um grande número de cromossomos acrocêntricos distingue esta espécie das demais pertencentes à Ordem Siluriformes e foi observada como característica exclusiva a presença do primeiro par subtelocêntrico, sendo o maior do complemento. As NORs detectadas pelo AgNO3 foram observadas na região terminal do braço curto de um par cromossômico subtelocêntrico (par 11), em uma constrição secundária. A heterocromatina, após o bandamento C, foi visualizada em regiões centroméricas de vários cromossomos do complemento. Esta é a primeira descrição citogenética desta espécie e a primeira descrição de um membro da família Aspredinidae.

Key words: AgNORs, C-banding, Chromosomes.

Introduction

Fishes of the family Aspredinidae are commonly known as "banjo catfishes" due to their overall body shape, depressed head and slender caudal peduncle, which somewhat resembles the musical instrument (Myers, 1960). Their skin is completely keratinized and covered with tubercles and periodically the entire outer layer of skin is shed just like that of amphibians and reptiles (Friel, 1989). This family comprises 13 genera and 39 species (Eschmeyer & Fong, 2011). *Bunocephalus* species are found in the Magdalena, Orinoco, Amazon, Paraguay-Paraná, and São Francisco Rivers. Within the family, this genus is the most widely distributed. It is also the only aspredinid genus found west of the Andes range, in the Atrato, San Juan, and Patia rivers (Ferraris, 2007). The species *Bunocephalus doriae* (Boulenger, 1902) is endemic to Paraguay-Paraná and Uruguay basins (Ferraris, 2007). This paper aims to cytogenetically characterize *Bunocephalus doriae* for the first time using Giemsa, AgNOR, and C-banding.

Material and Methods

Four specimens (three females and one male) of *Bunocephalus doriae* from Paraná River (Posadas-Argentina) were studied cytogenetically. The specimens were deposited in the collection of the Laboratory of Fish Cytogenetics and Environmental Monitoring of the Universidad Nacional de Misiones-UNaM, voucher numbers: 115, 116, 117 and 118. Mitotic chromosome preparations were obtained according to Bertollo *et al.* (1978). NOR silver staining was performed using the method of Howell & Black (1980). C-banding

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analyses were performed using the method described by Sumner (1972). Chromosome morphology was determined on the basis of arm ratio (AR) as proposed by Guerra (1986) and chromosomes were classified as metacentric (m), submetacentric (sm), subtelocentric (st) and acrocentric (a). NF (chromosome arm number) was determined considering each m/sm/st chromosome as having two arms and each acrocentric chromosome as consisting of one single arm.

Results

Bunocephalus doriae is the first species of the Aspredinidae family cytogenetically described. The modal diploid number determined for the individuals of *Bunocephalus doriae* examined was 50 chromosomes (Fig. 1a), with no chromosomal differences detected between males and females. Within the order Siluriformes, the only species

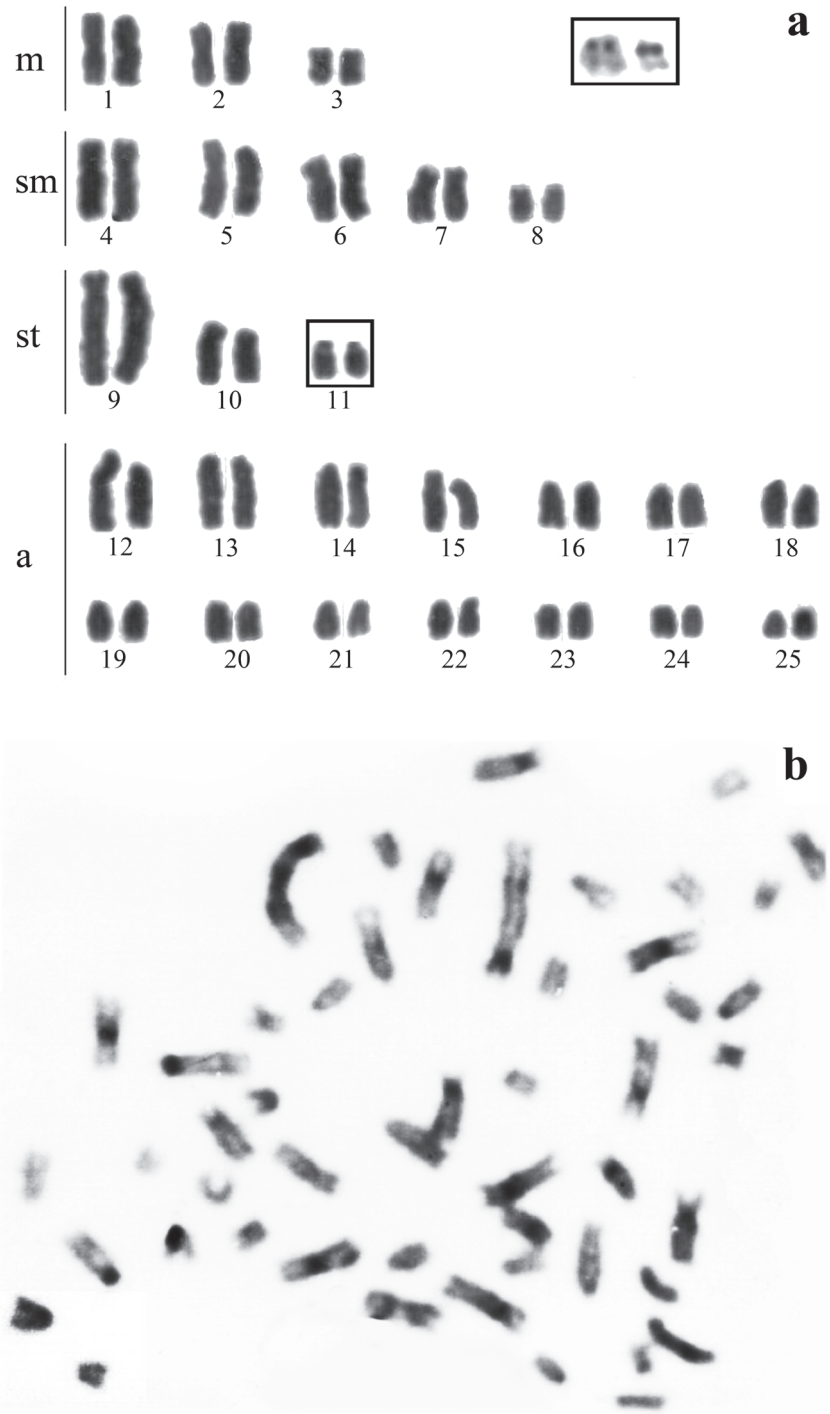

Fig. 1. Karyotypes with conventional Giemsa staining (**a**) and C-banding (**b**). Boxes display chromosomes bearing AgNORs.

with 2n=50 chromosomes studied so far belong to the Pimelodidae family (*i.e. Pinirampus pirinampu, Calophysus macropterus, Luciopimelodus pati*) (Swarça *et al.,* 1999; Vasconcelos & Martins-Santos, 2000; Sanchez, 2006). Oliveira & Gosztonyi (2000) reported that karyotypes of 2n= 56 have been reported in thirteen genera of Siluriformes, suggesting that this could be the basal chromosome number for the order. However, considering the few cytogenetic data available for some groups, generalizations should be carefully revised (Swarça *et al.,* 2007).

The chromosome formulae established consisted of 6m, 10sm, 6st, and 28a and the fundamental number (FN) was 72 (Fig. 1a). A very interesting and exclusive characteristic observed was the presence of the first pair of subtelocentrics as the largest chromosome pair of the complement. The presence of an asymmetric karyotype with a large number of acrocentric chromosomes in *Bunocephalus doriae* sets this species apart from all other species belonging to the Order Siluriformes, characterized by a large number of biarmed chromosomes and therefore, high values of FN as one of its main chromosomal features (Swarça *et al.*, 2007).

Silver staining allowed the detection of NORs on terminal regions of the short arm of a subtelocentric chromosome pair (pair 11) in a secondary constriction (Fig. 1a). These results (*e.g*. NORs on terminal regions of the short arm) were also observed in species of the sister groups Auchenipteridae (Fenocchio & Bertollo, 1992; Ravedutti & Júlio Jr, 2001; Lui *et al*., 2009) and Doradidae (Fenocchio *et al.*, 1993, Eler *et al*., 2007, Milhomem *et al.*, 2008). Likewise, other species such as *Pinirampus pirinampu, Calophysus macropterus, and Luciopimelodus pati* (Swarça *et al.,* 1999; Vasconcelos & Martins-Santos, 2000, Sanchez, 2006), which share the same diploid chromosome number with *Bunocephalus doriae*, also exhibited NORs on the short arms of a subtelocentric chromosome pair.

Heterochromatin was visualized in centromeric regions of several chromosomes of the complement (Fig. 1b) after C-banding. The C–banding pattern was similar to the ones reported for Doradidae (Milhomem *et al*., 2008) and Auchenipteridae (Lui *et al*., 2009).

Discussion

The anatomical distinctiveness of aspredinids creates a wide gap between it and other Neotropical catfish families. Also, the relationships among families have always been obscure, and there have been few explicit proposals about its possible closest relatives (Pinna, 1996), however, Diogo *et al.* (2001) pointed out five derived characters that are exclusively present in the aspredinid catfishes, and constitute Aspredinidae autapomorphies. Some of these characters when compared with other aspredinid and other catfishes constitute a support for hypothesis about autoapormophies and phylogenetic relationships among species of this family. The C–banding pattern was similar to the ones reported for Doradidae (Milhomem *et al*., 2008) and Auchenipteridae (Lui *et al*., 2009).

The latter hypothesis was confirmed by a recent molecular phylogenetic analysis substantiating that aspredinids are the sister group to a clade containing the Neotropical Auchenipteridae and Doradidae (Sullivan *et al*., 2006). Currently, there are no cytogenetic data available to corroborate this hypothesis until more studies are carried out on these groups.

Acknowledgements

The authors are grateful to Larissa Bettin Pires and Marceléia Rubert for assistance in preparation of the photos.

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Submitted September 10, 2010
Accepted July 11, 2011
Published June 29, 2012