

The karyotype of *Barbus grypus* Heckle.

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ABSTRACT

The chromosome complement of *Barbus grypus* is found to be 98, consisting of 22 metacentric, 64 submetacentric and 12 subtelocentric chromosomes. It is probably a tetraploid species and more advanced than other species having the same chromosome number and belonging to the genus *Barbus*.

INTRODUCTION

The study of fish chromosomes is important for genetics, taxonomy and phylogenetic relationships and for work on toxicology and environmental protection. Fish has been successfully used to detect the presence of chromosome damaging agents in the aquatic environment (Hofman, 1981; Al-Sabti, 1985; Ibrahim *et al.* 2000). Chromosomal differences were recorded in some fish populations from different geographical regions (Formation and Uwa, 1985; Al-Sabti, 1986a). Studies have been done throughout the world concerning the chromosomes of different species of the genus *Barbus* (Al-Sabti, 1991). In Iraq, two species were studied: *B. sharpeyi* (Balasem *et al.* 1994) and *B. xanthopterus* (Balasem *et al.* 2004). *B. grypus* is a fresh water fish distributed almost

throughout Iraq; this study was carried out to investigate the chromosome complement of this species.

MATERIALS AND MEHODS

Fish were collected from Al-Suwaira farm near Baghdad. Metaphase chromosomes were prepared from kidney tissues of five fish (weight: 10 - 48 gm.), following the method that was used by Balasem *et al.* (1994). Fish were injected intramuscularly with colchicine in a dose of 60 mg /g body weight (conc. 6mg/ml of phosphate buffer saline), and kept in well-aerated aquaria in the laboratory for five hours before sacrifice. The kidneys were removed, soaked and macerated in 0.075 M KCl for 20 minutes for hypotonizing. The cell suspension was centrifuged at 200xg for 10 minutes, the su-

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pernatant was removed and replaced with 3:1 methanol/ acetic acid for fixation, centrifugation and replacement of the fixative was repeated four times. Cell suspension was dropped on slides, air dried and stained with Giemsa solution for 30 minutes. For estimation the chromosome number, 50 metaphases were scored from each fish. Photographs were taken and the karyotype was ordered, the chromosomes were arranged according to their size and centromeric position in rows using the criteria of Levan *et al.* (1964).

RESULTS AND DISCUSSION

The present study reveals that the chromosome number of *Barbus grypus* is 98 and the karyotype consists of 22 metacentric (M), 64 submetacentric (SM) and 12 subtelo-centric (ST) chromosomes (figure 1-a, b). The chromosome number is the same as that of *B.sharpi* ($98 = 4M, SM+54 T,ST$) (Balasem *et al.*,1994)and *B.xanthopterus*($98 = 16 M,SM + 82 T,ST$) (Balasem *et al.* 2004). Meanwhile, no telocentric chromosome was observed and the number of subtelo-centric chromosomes is much far less than those recorded in these species. It was concluded that the monoarmed chromosomes were the basic type and the biarmed chromosome have occurred through the pericentric inversions and robertsonian fusions (Ohno *et al.* 1967;Formacion and Uwa, 1985;Thode *et al.*1985;Oliveira *et al.* 1990),the increase of biarmed chromosomes indicates such degree of karyotype evolution. Consequently, *B.grypus* seems to be more advanced than the other two species. The wide range of 2n values were recorded in the genus *Barbus* (48 – 150) (Al -Sabti, 1991) indicates such evolutionary chromosome relationships among the species of this genus. It was suggested that Cyprinid species can be separated into

two groups, those with 2n of about 50 and other with 2n of about 100. (Al-Sabti, 1986 b).Diploid and tetraploid species were recorded in the Salmonid fish and it was concluded that the common ancestor of Clupeoid and Salmonid fish had diploid complement of 48 acrocentric (Ohno *et al.*, 1967). The 48 acrocentric chromosomes was also considered as the basic model complement of Cyprinodontoid fish (Ebeling and Chin, 1970) and of Gobiidae group as well (Thode *et al.*, 1985). Spontaneous triploidy and tetraploidy were recorded in the common carp (Al-Sabti *et al.*,1983).If we propose that chromosome doubling probably followed or precede by chromosomal rearrangement had occurred in the genus *Barbus*, and the basic diploid chromosome number is $2n = 2X = 48$, then the tetraploid has to be $2n=4X=96$. Consequently, *B. sharpyi*, *B.xanthopterus* and *B.grypus* can be suggested as tetraploids.deviation from the expected number probably caused by Robertsonian fusion ,dissociation of large metacentric and submetacentric chromosomes, to smaller acrocentrics and to loss of some not essential chromosomes. However this hypothesis has to be tested by further comparative cytogenetic and molecular analyses.

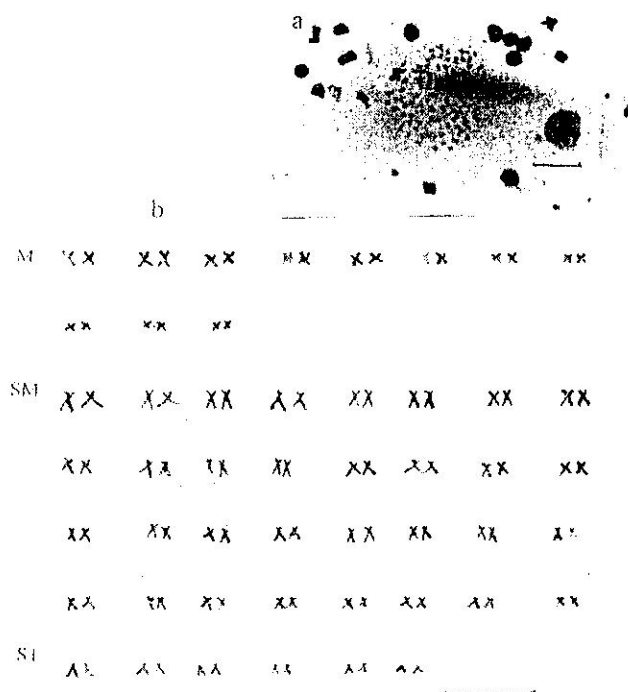


Figure 1. The chromosomes of *Barbus grypus*. (a) Mitotic metaphase chromosomes. (b) The karyotype. Bar represents 5µ.

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الطراز الكروموسومي لسمكة الشبوط *Barbus grypus* Heckle.

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الملخص

وجد ان سمكة الشبوط نوع *Barbus grypus* 98 كروموسوما ، تتكون من : 22 كروموسوم وسطي السنتروميير و 64 كروموسوم ذو سنتروميير قريب من الوسط و 12 كروموسوم ذو سنتروميير قريب من الطرف ، من المحتمل ان يكون هذا النوع رباعي المجموعة الكروموسومية واكثر تطورا من الانواع الاخرى المدروسة التي تعود الى الجنس *Barbus* وتمتلك نفس العدد الكروموسومي .