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Karyotype Analysis in Orthrias angorae (Steindachner, 1897)

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Summary

Karyotype analysis was performed in *Orthrias angorae* (Steindachner, 1897) (Fam: *Balitoridae*) by investigating the number and structures of their chromosomes. The fish used in this study were caught with fishing nets from the Kura-Aras river basin and taken to the laboratory. Fishes were injected intraperitoneally (i.p.) with doses of 0.01 ml/g body weight of 0.6% solution of colchicine and left for 190 minutes before sacrification. It was determined that *O. angorae* had 2n=50 chromosomes by metaphase investigation. Their karyotypes were determined as being composed of 7 metacentric, 7 submetacentric and 11 acrocentric chromosome pairs with NF:78. We were unable to identify any sex-related chromosomes in this species.

Keywords: *Balitoridae, Orthrias angorae*, Karyotype, Kura-Aras river basin.

Çöpçü Balığı (Orthrias angorae, Staindachner 1897)'nda Karyotip Analizi

Özet

Orthrias angorae (Steindachner, 1897) (Fam: *Balitoridae*)'nin kromozomlarının sayı ve yapıları incelenerek, karyotip analizi yapılmıştır. Bu çalışmada kullanılan balıklar Kura-Aras havzasından ağlarla yakalanarak laboratuvara getirilmiştir. Her bir gram vücut ağırlığı için 0.01 ml, %0.6'lık kolsişin solusyonu balıkların karın boşluğuna enjekte edilmiş ve balık kesilmeden önce 190 dakika beklenilmiştir.

Metafaz incelemeleri ile *O. angorae*'nın 2n=50 kromozoma sahip olduğu belirlenmiştir. Karyotiplerinin; 7 metasentrik, 7 submetasentrik ve 11 akrosentrik kromozom çiftinden (NF=78) oluştuğu tespit edilmiştir. Bu türde cinsiyete bağlı herhangi bir kromozom tespit edilememiştir.

Anahtar sözcükler: *Balitoridae*, Çöpçü Balığı, Karyotip, Kura-Aras havzası.

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INTRODUCTION

Balitoridae is represented by 36 geni and 500 species worldwide. Distribution area is Eurasia. Mouth inferior, with at least 3 pairs of barbels. Pelvic fins separate or fused under belly. In subfamily *Balitorinae*, only paired fins serve as adhesive organs about 35 cm maximum length[1].

Chromosomal analysis is important for fish breeding from the viewpoint of genetic control, the rapid production of inbred lines, taxonomy and evolutionary studies. Genetic divergence of populations and their local adaptation are a potential resource for breeding programs in aquaculture and for fishery management[2].

Standart karyotypes (chromosome and chromosome arm number) have been reported approximately 10% of the more than 20.000 species of fishes. The application of chromosome banding methodologies to fish chromosomes has been minimal. The main difficulty in working with fish chromosomes is to obtain high quality metaphase spreads. A few studies have used fish standart karyotypes to examine taxonomic or systematic problems[3,9].

The aim of this study was to investigate the chromosomes and karyotype of *O. angorae* from the Kura-Aras river basin in Turkey.

MATERIALS and METHODS

Ten females and ten males of *O. angorae* were caught in the Kura-Aras river basin [(lat 42° 15'E, long 41° 10'N), (lat 42° 30'E, long 40° 40'N), (lat 43° 10'E, long 41° 15'N), (lat 43° 15'E, long 41° 10'N)] in Eastern Turkey. The fishes were transported live to the laboratory, and kept in a well-aerated aquarium at 20-25°C before analysis.

Fishes were injected intraperitoneally with doses of 0.01 ml/g body weight of 0.6% solution of colchicine and left for 190 minutes before sacrification. The gill filament tissues were removed and placed in hypotonic fetal calf serum (fetal calf serum diluted with distilled water, 1:7), for 45 min 4-12. They were then fixed in fresh and cold Carnoy solution (3:1) for 40 min. Staining was performed with 10% Giemsa in Sorenson buffer solution for 10 min.

Observations and microphotograps were made with a Nikon light microscope. Chromosomes were classified on the basis of the arm- lenght ratio[8].

RESULTS

Relatively small and high number chromosomes were observed in *O. angorae*. In 78 metaphases from the gill epithelial cells of fifteen *O. angorae* specimens, the diploid number was found to be 2n=50 (Figs. 1,2). Different chromosome numbers in a total of 12 metaphase cells were recorded ranging from 48 to 52 (Table 1).

O. angorae has the largest metacentric chromosome pair (Fig. 2).

Cells lacking normal values (2n=48-52) were probably caused by losses during preparation or additions from nearby cells. The karyotype consisted of 7 pairs of metacentric and 7 pairs of submetacentric and 11 pairs of acrocentric chromosomes (Fig. 3). The number of chromosome arms were therefore determined to be NF=78.

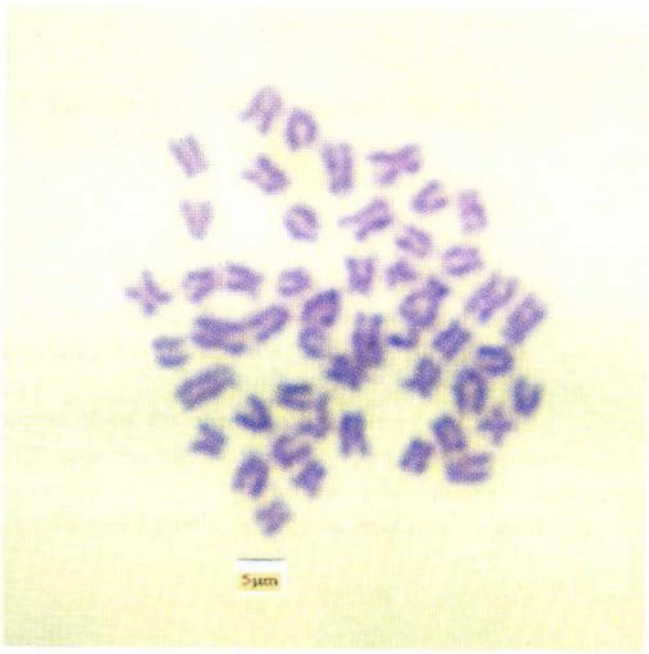

Figure 1. Metaphase spreads (2n=50) from gill epithelial tissue of *O. angorae* from the Kura-Aras river basin (Turkey). X 1.600. Bar, 5μm.
Şekil 1. Kura-Aras havzasından *O. angorae*'nin solungaç epitel dokusundan elde edilen metafaz örneği (2n=50). X 1.600. Bar, 5μm.

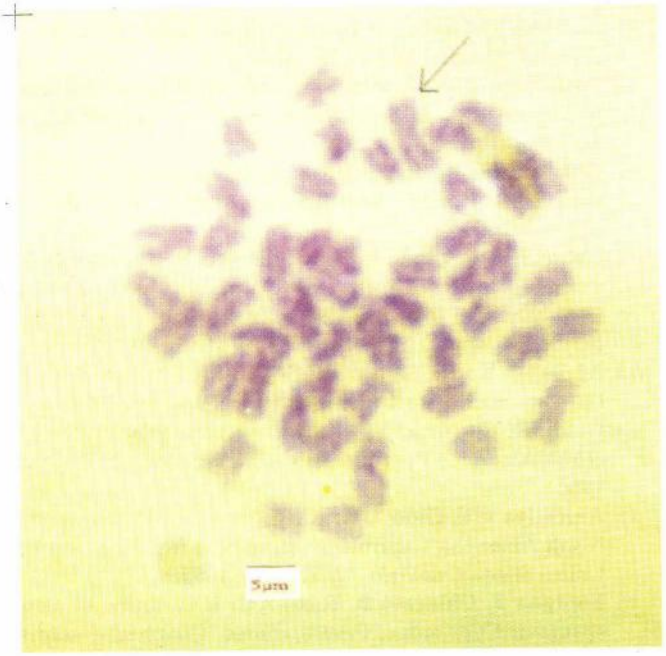

Figure 2. Metaphase spreads (2n=50) from gill epithelial tissue of *O. angorae* from the Kura-Aras river basin (Turkey). Largest metacentric chromosome pair, indicated by arrow. X 1.600. Bar, 5μm.
Şekil 2. Kura-Aras havzasından *O. angorae*'nin solungaç epitel dokusundan elde edilen metafaz örneği. Büyük metasentrik kromozom ok ile gösterilmiştir. X 1.600. Bar, 5μm.

Table 1. Chromosome complement of *O. angorae*.
Tablo 1. *O. angorae*'nin kromozomlarının sayısal dağılımı.

Number of fish	chromosome number				total metaphases	chromosome number			
	48	49	50	52		m	sm	a	NF
1	1		5		6	14	14	2	78
2			6	2	8				
3		1	7		8				
4			3		3				
5			7		7				
6		1	5		6				
7			6		6				
8			4		4				
9			4		4				
10	1		3		4				
11			5	1	6				
12			3		3				
13			5		5				
14			3		3				
15			5		5				
Totals	2	2	71	3	78				

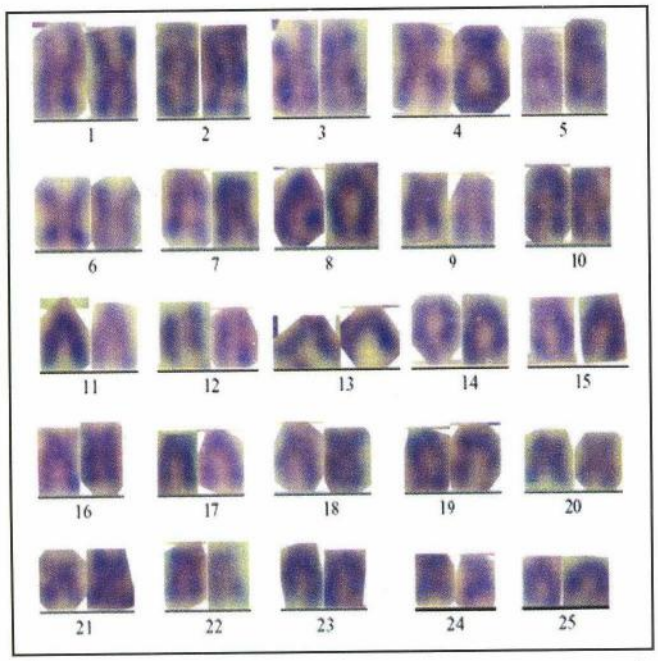

Figure 3. Karyotypes of a metaphase from *O. angorae*.
Şekil 3. *O. angorae*'nin karyotipi.

DISCUSSION

Karyotypes are prepared from metaphases with well spread chromosomes . The major difficulty encountered is the morphological variation existing even between homologous chromosomes in the same nucleus[7,13]. Sometimes it could happen that some chromosomes are more contracted than others, so chromosome measurements are very difficult, and especially in fish, which have very small chromosomes compared to those of mammals[9]. Another problem is that fish karyotypes are not identical as in human or in other animal species. Therefore, for fish, we cannot have a standart karyotype because differences not only exist between species, but polymorphism often occurs within one fish species[13]. Several incomplete metaphases were encountered in the preparation that may probably have been resulted from hypotonic overtreatment[6].

The majority of authors classify uni-armed and bi-armed chromosomes according to the guidelines of Levan and et al[8]. In which differences in the number of chromosome arms have been reported for the same species. This is

usually result of a difference in the scoring of subtelocentric chromosomes by different authors[3].

The majority of cyprinid species have 2n=50 chromosomes[13]. Gross karyotypic change in North American cyprinids appears to have been minimal: Over 90% of all species assayed (including all *Notropis* species examined) possess diploid chromosome numbers of 50 (range=48-52) and estimated diploid chromosome arm numbers between 92 and 100 (range=80-100)[14,15]. Karyotypes have been described for specimens of *R. aula, S. Erythrophthalmus* and *R. rubilio* all possessing 2n=50 chromosome[12,16] while *Cyprinus carpio* has 2n=98-100[9] and the polyploid *Barbus species* from Southern Africa have 2n=148 or 150 chromosomes[10]. A number of 48 chromosomes were found in a few species, such as *Chalcalburnus mossulensis*[11] and *Ctenopharyngodon idella*[17]. Heteromorphic sex chromosomes have been identified in *Coregonus sardinella, Oncorhynchus mykiss, Oncorhynchus nerka* and *Salvelinus namaycush*[2]. There was an XY/XX system in *S. namaycush* and *O. mykiss*, and an XYY system in *C. sardinella*[2]. The formation of heteromorphic sex chromosomes often involves heterochromatin addition, as in other animals, and this appears to be the case in *S. namaycush* and *O. mykiss*[2,25].

There was no evidence of sexual dimorphism of the chromosomes in *O. angorae*. Similar results were also observed in most fish species[3,7,9,11-13,18-26].

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