G.Ü. Gazi Eğitim Fakültesi Dergisi Cilt 21, Sayı 3 (2001) 33-37

Kızılırmak (Kayseri – Türkiye)'ta Yaşayan *Carassius auratus* (L., 1758)'un Karyotipi

Karyotype of the *Carassius auratus* (L., 1758) Live in Kızılırmak (Kayseri – Turkey)

Didem ÖLMEZ AYDIN[*]

[*] *Department of Biology, Faculty of Science, University of Ankara, Ankara, Turkey.*

Mustafa KURU[**]

[**] *Department of Hidrobiology, Biology Division Faculty of Education, Gazi* University, Ankara, Turkey

ÖZET

Bu araştırmada Cyprinidae familyasından Carassius auratus (L., 1758)'un kromozom sayısı ve morfolojisi incelenmiştir. Araştırmada kullanılan balıklar Kızılırmak'ın Kayseri ili sınırları içerisindeki Yemliha ve Boğazköprü civarından serpme ve germe ağlarla yakalanmıştır. Preparatlar solungaç epitel hücrelerinden hazırlanmıştır. Kromozom sayısı 2n 104 bulunmuştur. Bunun 12 çifti metasentrik (m), 17 çifti submetasentrik (sm), 23 çifti ise akrosentriktir (a). Kromozom kol sayısı NF 162 bulunmuştur.

Anahtar kelimeler: *Carassius auratus*, Kromozom, Karyotip, Kızılırmak

ABSTRACT

The number and structure of chromosomes of Carassius auratus (L., 1758) (Cyprinidae family) were investigated and karyotype was determined. The specimens used were caught with fishing nets and fish line from Kızılırmak River near Boğazköprü and Yemliha, Kayseri. Gill tissues were used for slide preparation. The total chromosome number (2n) was to be 104. Of these, 12 pairs were identified in metacentric (m) position, 17 in submetasentric (sm) and 23 in acrocentric (a). The arm number of chromosome (NF) was 162.

Key words: *Carassius auratus*, Chromosome, Karyotype, Kızılırmak

1. INTRODUCTION

Turkey is very rich in inland waters, and about 192 fish species and subspecies belonging to 26 families are naturally found in Turkey (1). The family Cyprinidae is widely distributed throughout the world and also in Turkey. 90 species and subspecies of this family have been reported in Turkish fresh water (2). Because of its economic importance particulary due to rapid growth and artifical fertilization the family has been exported to various countries from its natural habitats. Besides fish culture and reformation of the family are being conducted (3), the genetic structure may be helpful in increasing fish production, reformation and pisciculture. The karyotype of fish is beneficial at great extent in evolution, cytotaxonomy, gene maping, mutation and mutafenics (4). There are several methods to know the variation within species and speciation in result of geographic isolation based on such characters finrays, vertebrae, body ratio (metric, meristic pecularities), body colours, bone structure and other morphological characters, however, they are found insufficient. Therefore, studies regarding the number and morphology of chromosomes are very important. A very few such studies have previously been carried out in Turkey (5, 6, 7, 8).

The aim of present study is to examine karyological aspects of *Carrassius auratus* and to contribute to its cytotaxonomy.

2. MATERIAL AND METHOD

Six live specimens of *Carassius auratus* (L., 1758) were collected from Kızılırmak near Yemliha and Bogazköprü by using fishing net and fish line. Specimens were then shifted to laboratuary and kept in 35×50×70 cm aquarium already aerated for sufficient oxygen. Fish were then injected with 0.1 % colchicine (1 ml/100 g body weight) without identifying sex and were left again in aquarium for 3.5-4 hours. Individuals were then killed by blowing on head to avoid any handling stress gills were removed and epithelium tissue were used for slide preparation tissues were cut into small pieces with blade and finally homogenized with homogenizor. Material was then put into 0.075 m KCl for 35 – 40 minutes at room temperature for proper swelling of cells. After that material was centrifuged at 2000 rpm. for 10 minutes and supernant was removed. Material was then put into freshly prepared fixative (Methanol and Glacial Acetic Acid 3 : 1) and centrifuged at 2000 rpm. for 10 minutes for two times and supernant was

removed with pasteure pipette after each centrifugation. Some drops were then thrown on the steriled slides. The slides were allowed to dry for 1 day and were stained with 0.5 % Giemsa, pH 6.8 for 6 minutes. Ten slides per individual were prepared and examined on microscope (Nikon × 35, 50 ASA) using Canada balsame. Black and white photographs were taken with 24 × 36 mm film. For morphological study of chromosomes, Levan et al. (9) method was followed.

3. RESULT

In this study, mitotic metaphase chromosome number (2n) varied between 89 – 105 and numerical distribution (2n) 104 (Figure 1). Among these, 12 pairs of metacentric, 17 of submetacentric and 23 of acrocentric were identified. NF 162. For chromosome number and morphology sex either male or female was not studied separately.

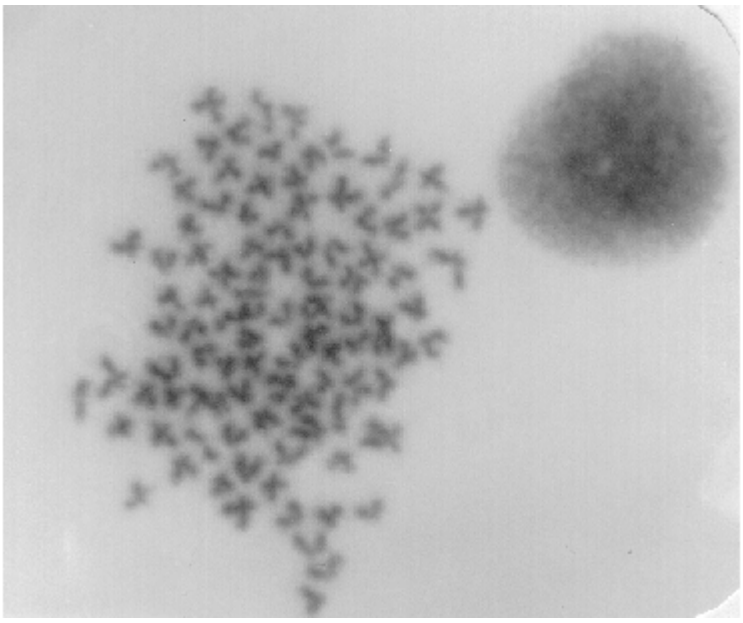

Figure 1. Karyotype of *Carassius auratus* at metaphase (1000×40)

4. DISCUSSION

The chromosomal studies already carried on *Carassius auratus* are given in Table 1 (10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21).

Table 1. The chromosomal studies on *Carassius auratus* species

Origins	2n	Karyotype m, sm, st	a	NF	Authors
?	94	–	–	?	Makino 1934, 1939, 1941
?	104	46	58	150	Post 1965
?	96-104	62-64	37-42	165-166	Ohno et al. 1966, 1967, 1986
Yodo-Osaka River	100	48	52	148	Ojima et al. 1966, 1967
?	104	–	–	?	Chiarelli et al. 1969
?	100	60	40	160	Kobayasi 1965
Biwa Lake	100	60	40	160	Muramoto 1975
Ochiota Channel	98	48	50	146	Raicu et al. 1981
Kızılırmak River	104	58	46	162	Present research

Boron (1994) has reported 2n 100 for *Carassius auratus* gibelio (Bloch) 1783 in Japan. Three species of *Carassius auratus* have been categorized in 3 types on the basis of chromosome number. Bisexuel diploid 2n 100, unisexuel triploid 3n 150 and unisexual tetraploid 2n 200 (22) Alvarez et al. (1991) have found 2n 100 for *Carassius auratus* (23). In present study, the chromosome number of *Carassius auratus* has been found (2n) 104 our result resemble with that of Post et al. (1965), Ohno et al. (1966) and Chiarelli et al. (1966). Post reported m and sm chromosomome number 46, a chromosome number 48 and NF 150 (10). Ohno et al., (1966) found m and sm chromosome ranged between 62 – 64, a chromosome number 37 – 42 and NF number 165 – 166 (10).

In present study, m chromosome number has been found 24, sm chromosome number 34, a chromosome number 46 and NF number 162. Species belonging to family Cyprinidae are devided in to two grous on the basis of chromosome number. First group has chromosome number near 2n 50 (*Abramis brama* 2n 50, *Tinca tinca* 2n 48, *Chalcalburnus mossulensis* 2n 48, *Leuciscus cephalus* 2n 50) and second group has about 2n 100 (*Carassius auratus* 2n 94 – 104, *Cyprinus carpio* 2n 100 – 104). Species having chromosome number between 48 – 58 are said diploid and above this number are polyploid. *Carassius* and *Barbus* species of family Cyprinidae are reported as polyploid (24).

The studies on morphology and the difference in chromosome number of *Carassius* species and other such work on different populations may be helpful in knowing the taxonomic and phylogenetic differences in all populations of *Carassius auratus*. The present study on *Carassius auratus* in first step in this contest in Turkey.

REFERENCES

1. Kuru, M., (1994), Türkiye Tatlısu Balıkları Kataloğu, Büro Zelal Matbaası, Ankara, s.73.

2. Kuru, M., (1994), Omurgalı Hayvanlar. Gazi Üniversitesi Yayın No: 1865, Gazi Eğitim Fakültesi Yayın No: 22, Gazi Üniversitesi İletişim Matbaası, Ankara, s.841.

3. Geldiay, R. ve Balık, S., (1988), Türkiye Tatlısu Balıkları. Ege Üniversitesi Fen Fakültesi Kitapları Serisi, No: 97, Ege Üniversitesi Basımevi, s.519

4. Demir, N., (1994), İhtiyoloji, İstanbul Üniversitesi Fen Fakültesi Basımevi, İstanbul, s.391

5. Çolak, A., Sezgin, İ. ve Süngü, Y.S., (1985), Doğa Bilim Dergisi, A2, 9-2.

6. Gül, A., Çolak, A. ve Sezgin, İ., (1988), IX Ulusal Biyoloji Kongresi, Cilt 1, 21-23 Eylül.

7. Ergene, S., Kuru, M. ve Çavaş, T., (1998), Uluslararası Kızılırmak Fen Bilimleri Kongresi, Kırıkkale, 20-22 Mayıs.

8. Demirok, Kılıç, N., Ünlü, E., (1998), XIV. Ulusal Biyoloji Kongresi, Cilt III, 493-499, 7-10 Eylül.

9. Levan, A., Fredga, Karl, Sandberg, Avera., (1964), Hereditas, 52,201.

10. Raicu, P., Taisescu, E. and Banarezcu, P., (1981), Cytologia, 46, 233-240.

11. Makino, S., (1934), Jap. J. Genet., 9:100-103.

12. Makino, S., (1939), Cytologia, 9:430-440.

13. Makino, S., (1941), Cytologia, 12:96-111.

14. Post, A., (1965), Z. für Zool. Syst. and Evol. Forsch, 3,4793.

15. Ohno, S. and Atkin, N.B., (1966), Chromosoma, 18, 455-466.

16. Ojima, L., Hitotsumachi, S. and Makino, S., (1966), Proc. Japan. Acad., 42, 62-66.

17. Ojima, Y. and Hitotsumachi, S., (1967), Jap. J. Genet., 42, 163-167.

18. Chiarelli, B., Ferrantelli, O. and Cucchi, C., (1969), Experientia, 25, 426-427.

19. Kobayasi, H., (1965), A chromosome study in funa loach hybrids. Zool. Mag., Tokyo, 74.201-267.

20. Muramoto, J., (1969), Proc. Japan. Acad., 51, 101-103.

21. Muramoto, J. and Christian, L., (1967), Diploid-tetraploid relationship among old-world membres of the fish family Cyprinidae-Chromosoma. 23:1-9.

22. Boron, A., (1994), Cytobios, 80, 117-124.

23. Alverez, M.C., Otis, J., Amores, A., and Guise, K., (1991), Journal of Fish Biology, 39, 817-824.

24. Golubtsov, A.S., and Krysanov, E., Yu., (1993), Journal of Fish Biology, 42, 445-455.