

Karyological Analysis and Body Proportion of Catfish (Clariidae, *Clarias lazera*, Valenciennes, 1840) in the Göksu Delta, Turkey

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Abstract: Chromosome analysis of *Clarias lazera* living in wet lands located in Göksu River (Göksu Delta) was accomplished by modified air-drying. *Clarias lazera* was found to have 18 metacentric, 26 submetacentric and 12 acrocentric chromosomes. Twenty-five systematically important meristic and morphometric characters of *Clarias lazera* in the Göksu Delta were examined for 49 specimens. In order to clarify the taxonomic status of *Clarias lazera*, which is not originally from this region, karyological analyses were carried out, and certain some morphometric characteristics were investigated.

Key Words: *Clarias lazera*, chromosomes, karyotype, morphological characteristics, Göksu Delta.

Göksu Deltasında Bulunan Kedi Balığının (Clariidae, *Clarias lazera*, Valenciennes, 1840)

Vücut Oranları ve Karyolojik İncelemesi

Özet: Göksu Nehri, Göksu Deltası sulak alanlarında yaşayan *Clarias lazera*'nın kromozom analizi havada kurutma tekniği modifiye edilerek yapılmıştır. Bu çalışma sonucunda *Clarias lazera*'nın 18 metasentrik, 26 submetasentrik ve 12 akrosentrik kromozoma sahip olduğu belirlenmiştir. Göksu Deltasında bulunan *Clarias lazera*'nın 49 örneğinde sistematik açıdan önemli yirmibeş meristik ve morfometrik özelliği incelenmiştir. Bu çalışmada Göksu bölgesinde sonradan yerleşmiş olan *C. lazera*'nın taksonomik durumunun ortaya konulması amacıyla karyolojik ve morfometrik özellikleri belirlenmiştir.

Anahtar Sözcükler: *Clarias lazera*, kromozom, karyotip, morfolojik özellikler, Göksu Delta.

Introduction

Clarias lazera is of high economic significance and is consumed especially in the southern part of Turkey, where it is bred. The aim of this study is to increase the productivity of this economically important species of fish, to investigate if the species has differentiated from its origin, and to contribute to the determination of genetic strains of species living in the Göksu Delta. Discovery of karyological characteristics may contribute to the breeding of more productive individuals. Twenty-five meristic and morphometric characters of 49 specimens of *Clarias lazera* were examined in the Göksu River, Lake Akgöl and drainage channels. Studies of karyotypical analysis on *C. lazera* are rather limited. Ozouf-Costaz et al. (1) have performed karyological analysis on three different progenies and declared that *C.*

lazera is synonymous to *C. gariepinus*. Teugels (2) has done taxonomic evaluation on types belonging to *Clarias* species. Most chromosome analysis in Turkey has been done on Rodentia (Mammalia) (3-5). In Turkey, of karyotypical studies on fishes are rather limited (6-8), and studies on *C. lazera* are limited to systematics (9-11). As yet, no systematical, karyotypical, metric or meristic studies have been realized in Turkey.

Materials and Method

Live *C. lazera* specimens taken from Akgöl-Paradeniz Lagoons in the Göksu Delta were brought to the laboratory in air-tight containers and put into aquariums where they were kept for several days. They were fed twice a day, and 0.06 % colchicine was injected

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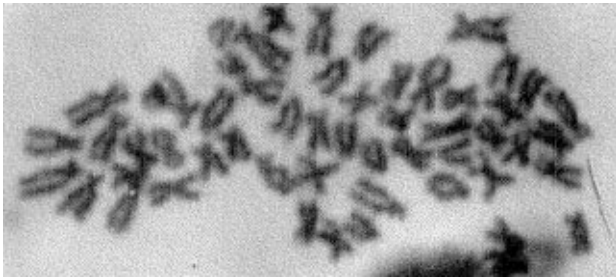


Figure 1. Diploid metaphase from kidney of *C. lazera*, giemsa staining, X 1500.

Table 1. Frequency distribution of chromosome number of *Clarias lazera* (M: Metacentric, SM: Submetacentric, A: Acrocentric)

Examined specimens	Evaluated metaphase number	Chromosome number	Chromosome			Occurrence %
			M	SM	A	
	6	49	18	19	12	4.9
	7	51	8	29	14	5.7
	8	52	13	29	10	6.6
	7	53	29	14	10	5.8
	9	54	16	26	12	7.4
	8	55	17	26	12	6.6
	7	55	18	25	12	5.7
	56	56	18	26	12	47.1
	13	58	20	26	12	10.6
18	121					100

intramuscularly and intraperitoneally for per 10 gr body weight of *C. lazera* 4 or 4.5 hours later, fish were decapitated and gill epithelium tissue and kidney tissue were crushed and placed in 0.75 % KCl for 30-35 minutes at room temperature, and centrifuged for 10 minutes. Cells were fixed in 10 ml. G:A:A. (glacial acetic acid) and methanol (1:3), which were centrifuged three times for 10 minutes (7, 8, 12-16). Cells in fixative were placed on clean and cold slides and stained in 10% Giemsa solution in 6.8 phosphate buffer for 30 minutes (17). After the dying process, slides were covered, microscopic studies were performed, and well-separated metaphase chromosomes photographed. Five preparatus and approximately 20 metaphase plates were examined for each fish. A karyogram was prepared by high-contrast chromosome photographs (Fig, 2), and the individual chromosomes were cut out of the photographs. Classification of chromosomes was performed according to Levan (18). The final karyogram was scanned and



Figure 2. Karyotype from kidney of *C. lazera*, giemsa staining, X 1500.

printed (7-8). After karyological processes, metric and morphometric measurements were evaluated for the fish. Average and standard deviations of these character measurements were found (Table 2).

Results

Different variations are required, especially in examining fish chromosomes, which lead to various difficulties in karyotypical analysis. From the karyotypes examined, the diploid chromosome number for *C. lazera* was determined to be $2n = 56$ and autosomes basic arm number determined as $NF = 100$. It was found that *C. lazera* has 18 metacentric, 26 submetasentric and 12 acrocentric chromosomes (Table 1, Figure 1). Well dispersed metaphase plates of *C. lazera* can be seen in Figure 1, and the karyogram in Fig. 2.

In this study, aside from karyological characteristics, 25 metric and 3 meristic characteristics of *C. lazera* were determined (Table 2). Measurements and counts were carried out on 49 specimens of *C. lazera* with ages ranging between 1 and 4. The proportions of measurements and metric and meristic characteristics of *C. lazera* found in Göksu Delta are given in Table 2. As a result of this, variations in head length/SL, interorbital distance/ HL and eye diameter proportions were determined, and variations were found in dorsal and anal fin ray numbers (Table 2).

Discussion

Karyotypes of *C. lazera* living in the Göksu Delta were $2n = 56$, and in terms of centromere position, there were

Table 2. Body proportions for *Clarias lazera* living in Göksu Delta

Measurement of body characteristics (mm)	C.lazera		Standard deviation
	Mean	Min-Max	
1. Total length	-	135 - 324	--
2. Standard length (SL)	-	110 - 283	--
3. Predorsal distance / SL	35.92	32.28 - 47.54	2.43
4. Preanal distance / SL	56.64	51.4 - 70.67	2.97
5. Prepelvic distance / SL	45.75	21.41 - 54.16	4.86
6. Prepectoral distance / SL	21.46	15.3 - 31.54	2.23
7. Dorsal fin length / SL	62.2	40.74 - 67.8	3.89
8. Anal fin length / SL	42.37	37.14 - 45.61	1.84
9. Pelvic fin length /SL	10.42	6.53 - 19.46	1.62
10. Pectoral fin length /SL	12.41	10.08 - 14.68	1.24
11. Distance between dorsal and caudal fin /SL	3.24	1.4 - 5.5	0.97
12. Distance between occipital process and dorsal fin / SL	6.48	4.53 - 9.29	1.09
13. Caudal peduncle depth/SL	8.16	6.93 - 9.63	0.66
14. Body depth at anus / SL	14.58	10.91 - 18	1.58
Counted characters			
1. Dorsal fin rays	64.66	50-83	8.55
2. Pectoral fin rays	1-9	1-7 - 1-9	--
3. Anal fin rays	43.41	30-53	7.07
Measurement of head characteristics (mm)			
1. Head length (HL) / SL	28.9	20.8 - 32.5	2.04
2. Head width / SL	19.2	16.5 - 21.7	0.96
3. Snout length /HL	23.9	18.5 - 30.2	2.65
4. Interorbital distance / HL	43.5	38.9 - 59.2	3.14
5. Eye diameter / HL	8.87	6.69 - 13.4	1.45
6. Length occipital fontanelle	--	4.6 - 14.6	--
7. Width occipital fontanelle	--	1.2 - 9.7	--
8. Length nasal barbel	--	23.1 - 45.6	--
9. Length maxillary barbel	--	33.4-80.8	--
10. Length inner mandibular barbel	--	22 - 46	--
11. Length out mandibular barbel	--	29.3 - 63.8	--

determined to be 18 metacentric, 26 submetacentric and 12 acrocentric chromosomes. Ozouf Costaz et al. (1), after the karyological analysis of *C. gariepinus* generation strains, reported that the chromosome number was $2n = 56$, and that 8 of these chromosomes were of metacentric, 24 of submetacentric and 24 of acrocentric morphology.

Ozouf-Costaz et al. (1) determined that three generations taken from three different regions (Africa Bongui, Bauake and Israel) had the same chromosome number and shapes. In addition, they stated that, these three generations, *C. gariepinus*, *C. lazera* and *C. mosambicus*, are synonymous with *C. gariepinus*. In this study, karyotype analysis of *C. lazera* in Göksu Delta showed variations in large proportions. These 18 metacentric chromosomes were determined to be 8 metacentric in 3 generations by Ozouf-Costaz et al. (1),

in which 24 males and 23 females were found to have acrocentric chromosomes. Vujosevic et al. (19) determined that the diploid number for Wells or European Catfish (*Silurus glanis*) is 60 and the chromosome morphology is 16 metacentric, 18 submetacentric, 14 subtelocentric and 12 acrocentric.

It is a well known phenomenon that acrocentric chromosomes have a tendency to stick to each other by their centromeres, and in this way they form metacentric chromosomes (4). If we consider the same condition for *C. lazera*, the metacentric number would increase but the acrocentric number would decrease; but since the acrocentric number would decrease and this would result in a decrease in chromosome number, this is considered to be a weak probability. It is not known when *C. lazera* came to Turkey or its origin, but the people living in these regions say that it has been living in Göksu Delta for 100 years. Balık (9) stated that it was determined by previous researchers that *C. lazera* was found only in Asi River and Amik Lake, but he determined it to be in Silifke and the Antalya region. Balık (9) claimed that this species originated in Africa could not have come to Antalya and Silifke by natural means because of ecological needs.

The variation seen in the karyotype of *C. lazera* in the Göksu Delta can be viewed as a small part of the main population. Furthermore, variations in chromosome number and chromosome morphology were determined in *C. lazera* living in the Göksu Delta (Table 1). Variations such as these show that various karyotypic forms exist in this species, since the highest value in the count is accepted as the number of chromosomes.

Ozouf-Costaz (1) et al., supporting Teugel's (2) study, stated that *C. lazera* and *C. mosambicus* are synonymous with *C. gariepinus*. In this study, it is seen that *C. lazera* shows karyotypical polymorphism. Karyotypical and morphological studies on *C. lazera* living in other parts of Turkey are necessary for more detailed knowledge about karyotypical forms.

In order for *C. lazera* as synonymous to *C. gariepinus*, it must be determined whether they can breed and produce fertile individuals. In Ozouf-Costas (1) and Teugel (2), it is claimed that *C. lazera* and *C. mosambicus* are synonyms of *C. gariepinus*. However, taking only karyological and morphological characteristics into account in defining species has its drawbacks. In addition to karyological and morphological examinations, biochemical, serological characteristics and DNA analysis should be carried out for determination of various species or of intraspecific variation.

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