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دراسات تصنيفية لكروموسومات أسماك النيل

Clarias lazera

١- سمكة القرموط

مختار الدواهرى ، توفيق وهبنة

يمثل هذا البحث الخطوة الأولى فى خطة بحثية وضعت لدراسة تصنيف كروموسومات أسماك النيل وذلك بهدف دراسة أفضل للوضع التقسيى الحالى لهذه الأسماك فى العائلات المختلفة وكذلك محاولة معرفة العلاقات التطورية لهذه الأنواع المختلفة بناء على تركيبها الكروموسومى .

وفى هذا البحث تم دراسة تصنيف كروموسومات سمكة القرموط Clarias lazera ووجد أن العدد الثنائى الكروموسومى بها هو ٥٦ ، كما أوضحت دراسة وتحليل الكاربيوتايب أن هذه الكروموسومات موزعة الى ١٠ أزواج وسطية السنترومير و ١١ زوج تحت وسطية السنترومير و ٧ أزواج طرفية السنترومير .

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KARYOTYPIC STUDIES ON THE NILE FISHES:  
I- CLARIAS LAZERA CUVIER AND VALENCIENNES  
(With 3 Tables and 4 Figures)

By

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SUMMARY

The study of chromosome number and karyology of fishes has become more valuable to ichthyologists interested in taxonomy and evolution. Chromosomes or karyotypes of River Nile fishes have not been reported in the world. The present paper is intended as the first of a series of karyological studies of River Nile fishes. In this study the karyotypes of one species of family Clariidae: Clarias lazera. The diploid chromosome number was found to be 56. It consists of 42 two-arm chromosomes and 14 one-arm chromosomes. The arm number is 98. No polymorphism in the diploid number nor any sexual dimorphism was noted. The karyotype comprises 10 pairs of metacentric, 11 pairs of submetacentric and 7 pairs of sub-telocentric and acrocentric chromosomes.

INTRODUCTION

The study of chromosome number and karyology of fishes has become more valuable to ichthyologists interested in taxonomy and evolution. Karyotype work in fishes has long been impeded by lack of adequate techniques to permit examination of the large number and the small size of their chromosomes. As a result, many earlier counts are incorrect. Highly effective methods for determining these counts were developed as a result of the intensive activity in mammalian cytogenetics brought about by cancer studies (NOWELL *et al.*, 1958). Leucocyte culture, hypotonic treatment of cells to produce better chromosome spreads, softening and preserving agents for tissues, and distinctive stains were developed. These techniques provide the means for studying chromosomes in species that had been avoided because of extreme difficulty in analysing materials.

Recently, interest in the karyotypes of fishes has greatly increased, and during the past few years reports on fish chromosomes have become numerous (CHEN and EBELING, 1971; SCHEEL, 1972; ARAI, 1973; ARIA and SCHICTSUKI, 1974; PARK, 1974; OJIMA *et al.*, 1976; ARIA and NAGAIWA, 1976, 1977). Most of these reports seem to center around Salmonidae, Characidae, Cyprinidae, Centrarchidae and Cichlidae (NIKOL'SKI and VASIL'VE, 1973). There are small numbers of reports also on the shorefishes (ARAI and KATSUYAMA, 1973; ARAI and SHIOTSUKI, 1973).

Karyological approach in systematics of Catfishes is very poor (ARAI and KATSUYAMA, 1974). As regard family Clariidae, karyotypes of only two species have been reported: Clarias batrachus (SRIVASTAVA and DAS, 1986) and Clarias fucus (ARIA and HIRANO, 1974).

As far as we know, chromosomes or karyotypes of River Nile fishes have not been reported in the world. As we had the chance to study this group of fishes, this paper is intended as the first of a series of karyological studies of River Nile fishes. In this paper karyotypes of one species of family Clariidae: Clarias lazera Cuvier and Valenciennes, are described, and the relationship of the diploid chromosome number (2n) and the arm number are discussed for analysis of comparative karyology of catfishes.

MATERIALS AND METHODS

The material is one species of family Clariidae: Clarias lazera Cuvier and Valenciennes. Twelve specimens, 3 males and 9 females, were caught in the River Nile at Assiut region, Egypt. They ranged between 50 and 200 gms. Each fish was injected with colchicine solution 7 ug/gm body weight and then kept for 4 hours at room temperature. Fish was killed, gills and kidneys were removed and minced in Parker medium 199. Free cell suspension was prepared either by in vitro-colchicine direct method or by in-vitro-trypsinization-colchicine direct method (EL-ZAWAHRI, 1974). Free cells were treated with 0.95% sodium citrate solution for 20 minutes at room temperature.

Chromosome Preparations:

Cells were fixed with methyl alcohol and acetic acid (3:1 v/v). Slides were prepared by both air-dried and flamedried methods and stained with either Giemsa or Unna polychrome blue.



Chromosome Analysis And Karyotyping:

Metaphases with good spread chromosomes were analysed and photographed. Karyotypes were done from good metaphases of both sexes. The classification of chromosomes in karyotype was done according to the method of LEVAN *et al.* (1964). Metacentric and submetacentric chromosomes are described as two-arm chromosomes. Sub-telocentric and acrocentric chromosomes are described as one-arm chromosomes.

## RESULTS

As shown in Table 1, the diploid chromosome number of the species *Clarias lazera* is 56. It consists of 42 two-arm chromosomes and 14 one-arm chromosomes. The arm number is 98. No polymorphism in diploid number was found in this species, nor any sexual dimorphism was noted (Fig. 1 & 2). The karyotype was found to be species-specific with constant chromosome count. It comprises 10 pairs of metacentric, 11 pairs of submetacentric; and 7 pairs of sub-telocentric and acrocentric chromosomes (Fig. 3 & 4). Again there is neither polymorphism in the karyotypic features nor any differences between male and female karyotypes (Fig. 3 & 4). In size, the chromosomes showed a graduation from largest to smallest, and can be divided into size grouping. Morphological details of the karyotypes are given in Table 2.

## DISCUSSION

The karyological data may yield information on the polygenetic position and evolutionary relationship of species within family Clariidae. As seen in Table 3, diploid chromosome number in 3 species only within this family have been studied. It is interesting that these species of fishes have large diploid chromosome number that range from 52 to 56. The diploid number of species *Clarias fucus* was found to be 56 chromosomes (ARAI and HIRANO, 1974). Karyotype of species *Clarias batrachus* was studied by SRIVASTAVA and DAS (1968) and was found to have 52 chromosomes. The present study revealed a diploid chromosome number of 56 in the species *Clarias lazera*. This number is similar to that of *Clarias fucus*. We cannot determine whether *Clarias lazera* and *Clarias fucus*, with its higher diploid number than *Clarias batrachus*, are primitive judging from the karyotype data without looking at more species in this family. The representatives of this family in the Nile were identified by BOULENGER (1907) as shown in Table 3.

Although it is unknown whether or not diagnostic characters within family Clariidae are directly related with different karyotypes, from the karyological point of view, we shall try to find out the relationship between the comparative anatomy and karyotypes. Karyological data until now are not many in this family. We hope in future when we complete the karyological data of all species of this family, shown in Table 3, to be able to reinterpret their phylogenetic position and evolutionary relationship.

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TABLE (1)

Frequency distribution of diploid chromosome in *Clarias Lazera* Cuvier and Valenciennes

Specimen No.	Sex	2n	Frequency of chromosome counts				Total
			53	54	55	56	
1	Female	56	0	1	3	26	30
2	Male	56	0	0	1	19	20
3	Female	56	1	1	4	22	28
4	Male	56	0	1	1	23	25
5	Female	56	0	0	1	14	15
6	Female	56	0	2	3	15	20
7	Female	56	0	0	0	33	33
8	Female	56	1	0	1	23	25
9	Female	56	0	1	2	37	40
10	Female	56	0	2	3	25	30
11	Male	56	0	0	2	28	30
12	Female	56	0	2	4	44	50
Total			2	10	25	309	346



TABLE (2)

Chromosome number, Chromosome morphology and arm number of *Clarias Lazera* Cuvier and Valenciennes

Sex	Total No. of specimens	No. of cells scored	2n No.	Metacentric chromosomes	Submetace- ntric chro- mosomes	acrocent- ric chro- mosomes	Arm No.
Male	3	75	56	20	22	14	98
Female	9	271	56	20	22	14	98

TABLE (3)

Chromosome number of family Clariidae

Species	Locality	in	2n	Literature
<i>Clarias batrachus</i>	India	--	52	Srivastava and Das, 1968
" "	"	27	--	Miregarndner and Rosen, 1972
<i>C. fucus</i>	Japan	--	56	Arai and Hirano, 1974
<i>C. lazera</i>	Nile	--	56	This paper
<i>C. anguillaris</i>	Nile	--	--	Not studied
<i>C. moorii</i>	Nile	--	--	Not studied
<i>C. robecchii</i>	Nile	--	--	Not studied
<i>C. tsanensis</i>	Nile	--	--	Not studied
<i>C. carsonii</i>	Nile	--	--	Not studied
<i>C. alluaudi</i>	Nile	--	--	Not studied
<i>C. wernerii</i>	Nile	--	--	Not studied

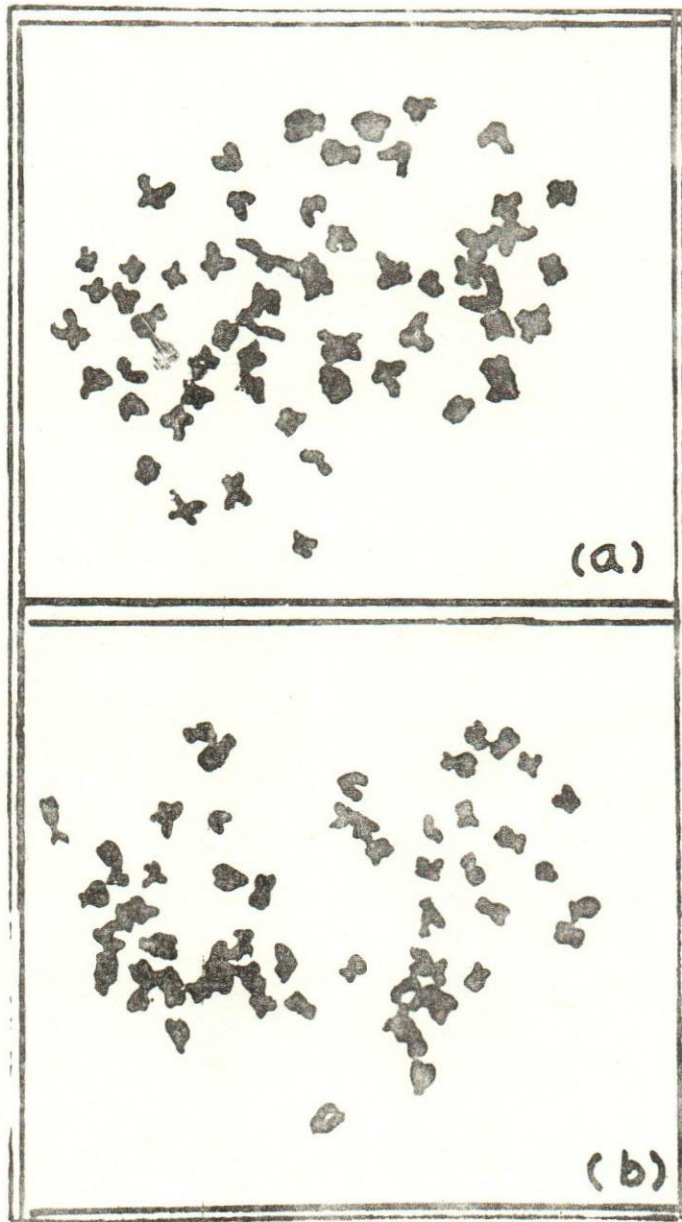
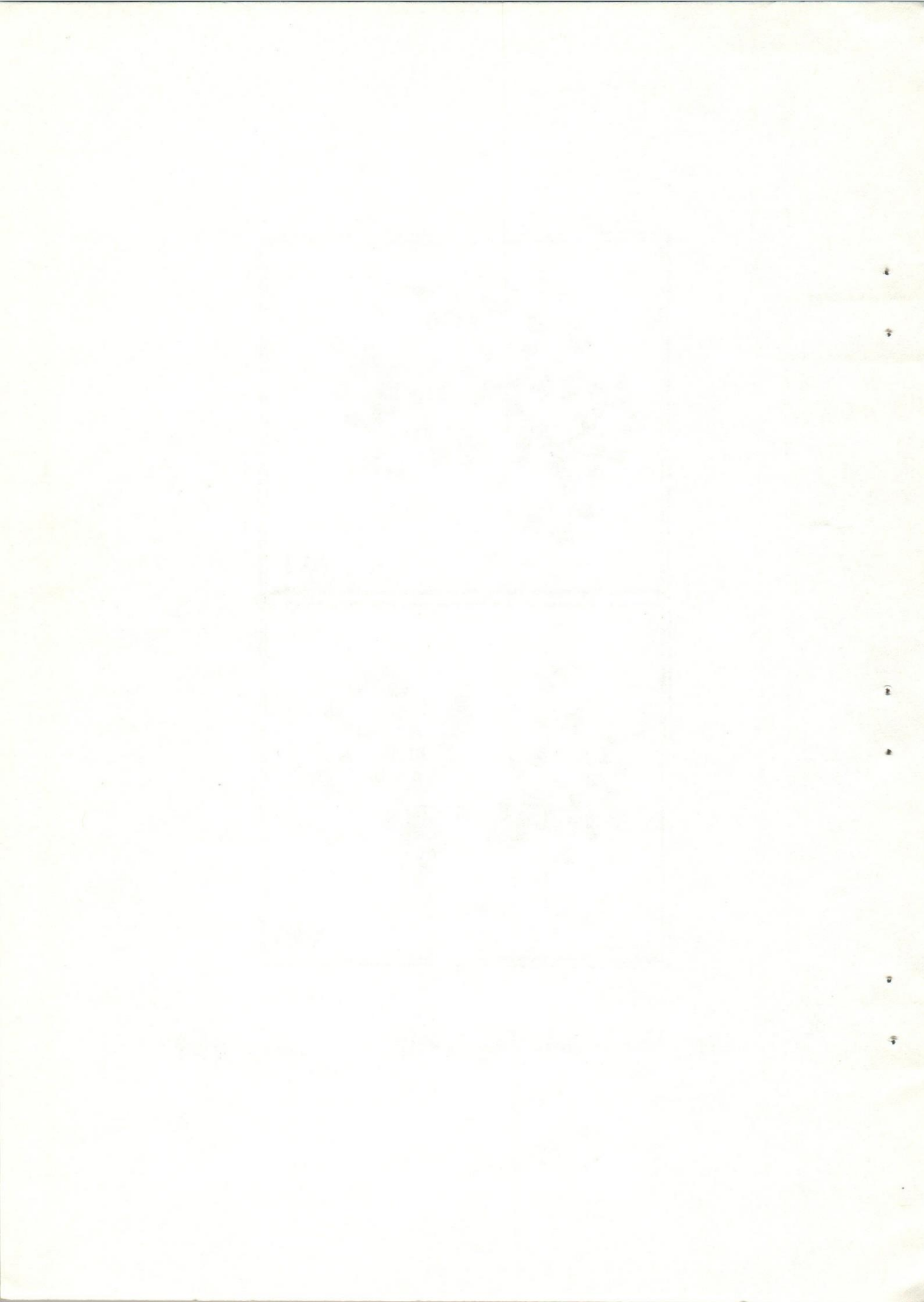


Fig. 1: Two metaphases from a male fish of Clarias lazera.





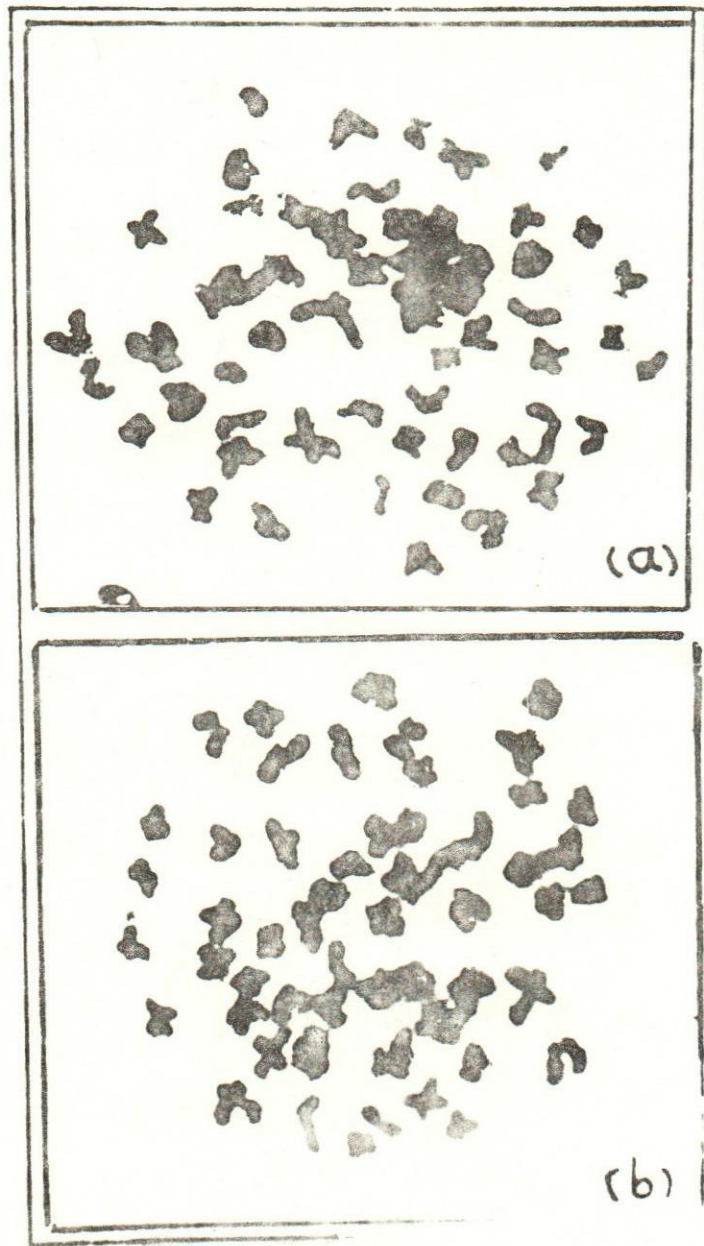
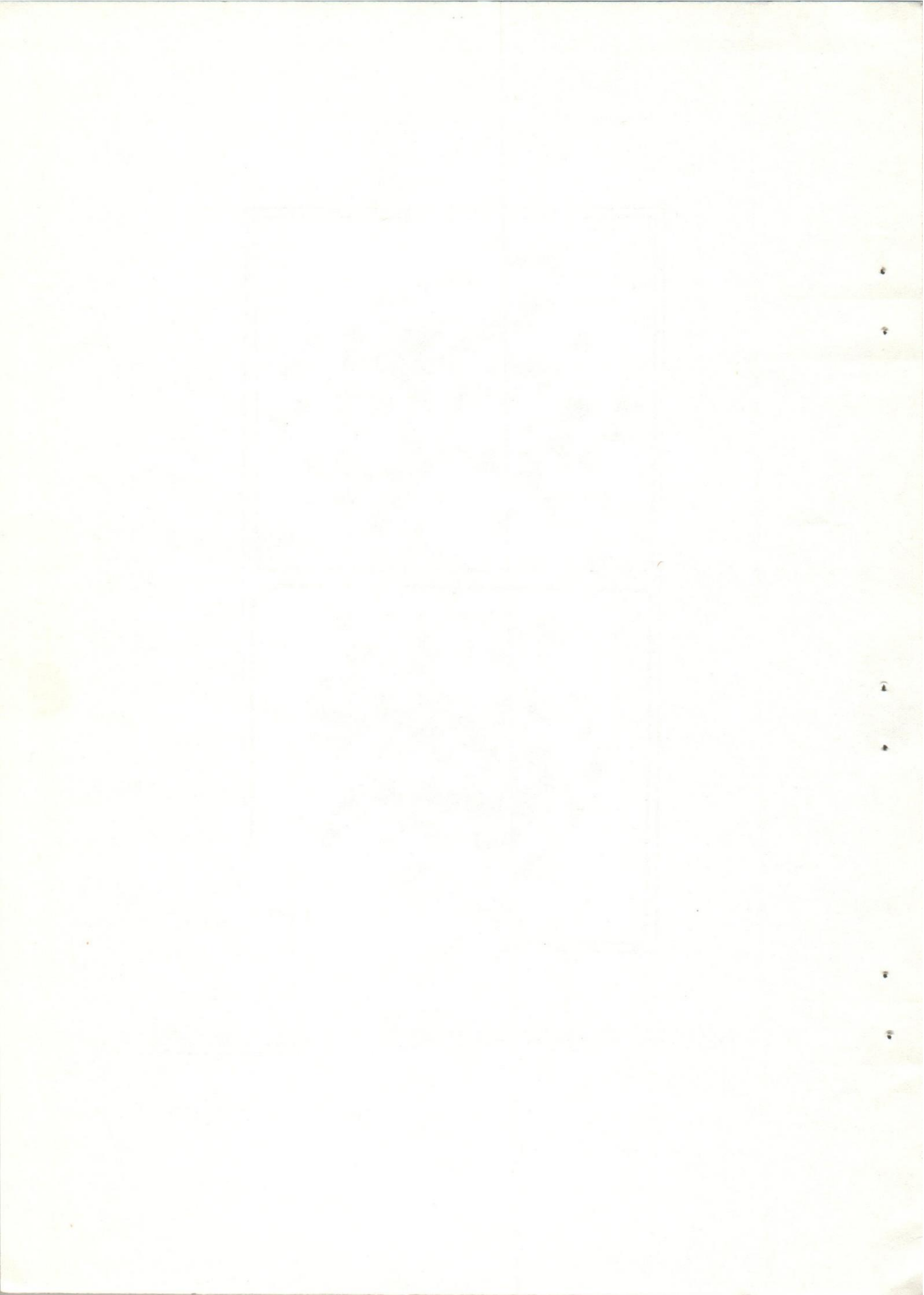
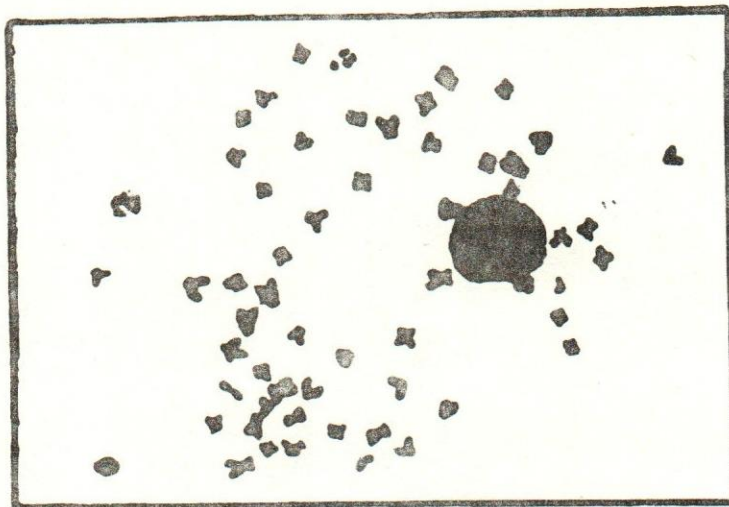


Fig. 2: Two metaphases from a female fish from Clarias lazera.





18 17 16 15 14 13 12

11 10 9

8 7 6 5 4 3 2

1 19 18 17

16 15 14 13 12 11 10 9 8

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Fig. 3: A karyotype and a metaphase of a male fish from Clarias lazera.





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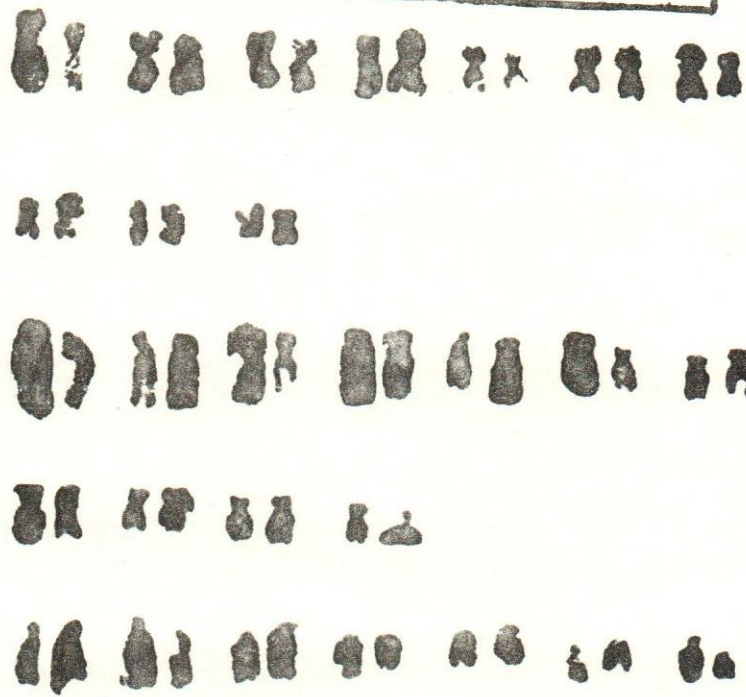
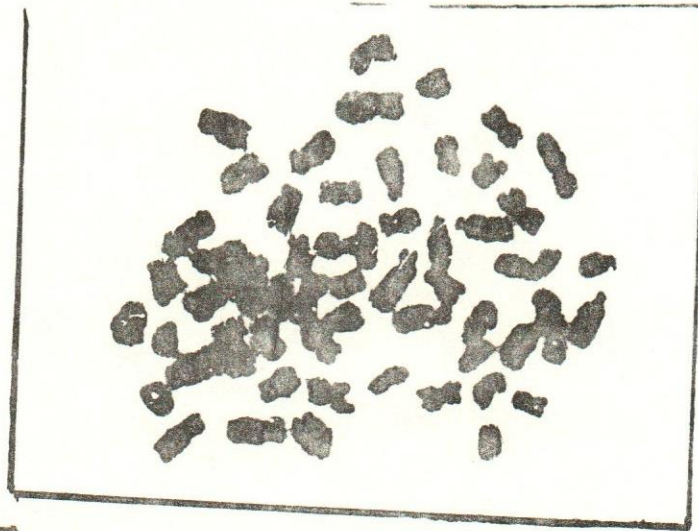


Fig. 4: A metaphase and its karyotype of a female fish from Clarias lazera.



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