anoxia. This fact appears to account for the extracellular specific fluorescence in liver, since in the study of liver preparations made in biopsy the principal specific fluorescence is detected intracellularly. However, even in the study of the liver of the man killed in accident, 2 h after death we were able to detect intracellular specific fluorescence.

In liver preparations (biopsy) from patients with Wilson disease, specific fluorescence was detected in less than 5% of all cells, whereas in liver preparations from patients with non-congenital liver disorders it was observed in more than 70% of cells. Slight fluorescence in liver preparations in Wilson disease is a direct evidence of almost entire absence of ceruloplasmin synthesis in these patients.

Almost entire absence of specific fluorescence in liver cells in Wilson disease confirms the idea that in Wilson disease there is genetically determined inhibition of ceruloplasmin synthesis.

Выводы. Установлено, что специфическая люминесценция характерная для церулоплазмина в клетках печени здоровых людей отмечается в 70% гепатоцитов, а при болезни Вильсона менее чем в 5% клеток. Это подтверждает предположение о блоке синтеза церулоплазмина при болезни Вильсона.

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The Caryotype of Some Teleostea Fish Obtained by Tissue Culture in vitro

Not a great deal is known about the fish caryology; only recently some qualitatively significant results have been obtained by using the squash technique[1,2].

Recently, through tissue culture in vitro, a tremendous increase of knowledge has become available as regards the caryotype of mammals and other higher vertebrates.

It is likely that these methods, if extensively applied to the super order of Teleostea, as we foresee, will contribute towards a solution of the numerous and complex problems of the systematics and phylogenesis of this group of vertebrates.

After modifying the in vitro culture technique used for mammals, we were able to apply it to the fish tissues[3].

This note refers to the caryotype of some of the commonest Teleostea which were used in our preliminary experiments. In the majority of plates prepared by us from fish tissues, chromosomes appeared shorter and thinner than those of mammals (Figure 3).

The sizes of chromosomes of *Carassius auratus*, for example, vary between 2.0–0.8 μ, while those of the human caryotype range from 1.5–8 μ.

These data are consistent with the histophotometric measurements of the nuclear DNA[4–6] according to which the interphasic nucleus of fish has a DNA content lower than that of mammals.

From the morphological standpoint[7] the diploid chromosome complement of *Tinca tinca* (Figure 3a) is made up of 23 (or 24) pairs with a pair marked by a peculiar hypopycnotic area on one of its arms.

The caryotype of *C. auratus* (Figure 1) shows 10 pairs of metacentric chromosomes and 42 pairs of chromosomes with a more or less terminal centromere, 6 of which seem to be acrocentric.

The same chromosome number and a similar set of chromosomes has been found for *C. carassius*.

The caryotype of *Anguilla anguilla* (Figure 4) shows 18 pairs of perfectly paired chromosomes and 1 pair (19) of dissimilar chromosomes.

The 18 pairs of matched chromosomes can be grouped into 6 pairs of roughly mediocentric chromosomes, 5 pairs of submetacentric chromosomes and into 7 pairs of roughly terminal centromere chromosomes.

The caryotype of *Scardinius erythrophtalmus* (Figure 2) is made up of 23 pairs of homologous chromosomes and 1 pair (24) of unpairable chromosomes. Though the possible presence of heterochromosomes in this species might be assumed, the fact that chromosome 24 (second) is

1 S. Ohno, J. Muramoto, L. Christian and M. B. Atkin, Chromosoma *23*, 1 (1967).
2 R. J. Shultz, Science *3796*, 1564 (1967).
3 O. Ferrantelli, B. Chiarelli and C. Cucchi, Boll. Soc. ital. Biol. sper., in press (1968).
4 M. G. Manfredi Romanini and A. Metzar, Boll. Zool. *24*, 565 (1967).
5 M. Vialli, Expl Cell Res. Suppl. *4*, 284 (1967).
6 S. Ohno and N. B. Atkin, Chromosoma *18*, 455 (1966).
7 The authors are indebted to Maria Monchietto for the diligent cooperation in organizing the caryotypes.

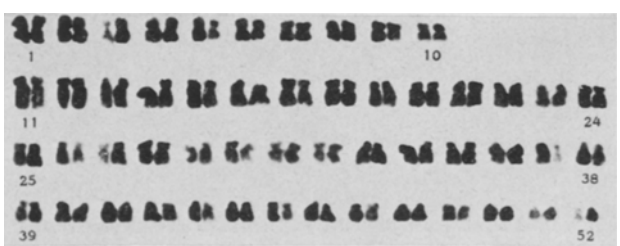

Fig. 1. Tentative pairing of the chromosomes of *Carassius auratus*.

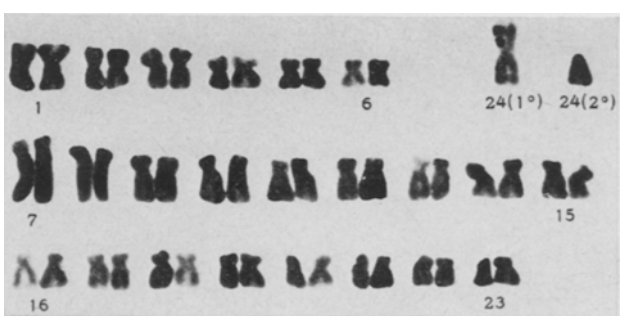

Fig. 2. Tentative pairing of the chromosomes of *Scardinius erythrophtalmus*.

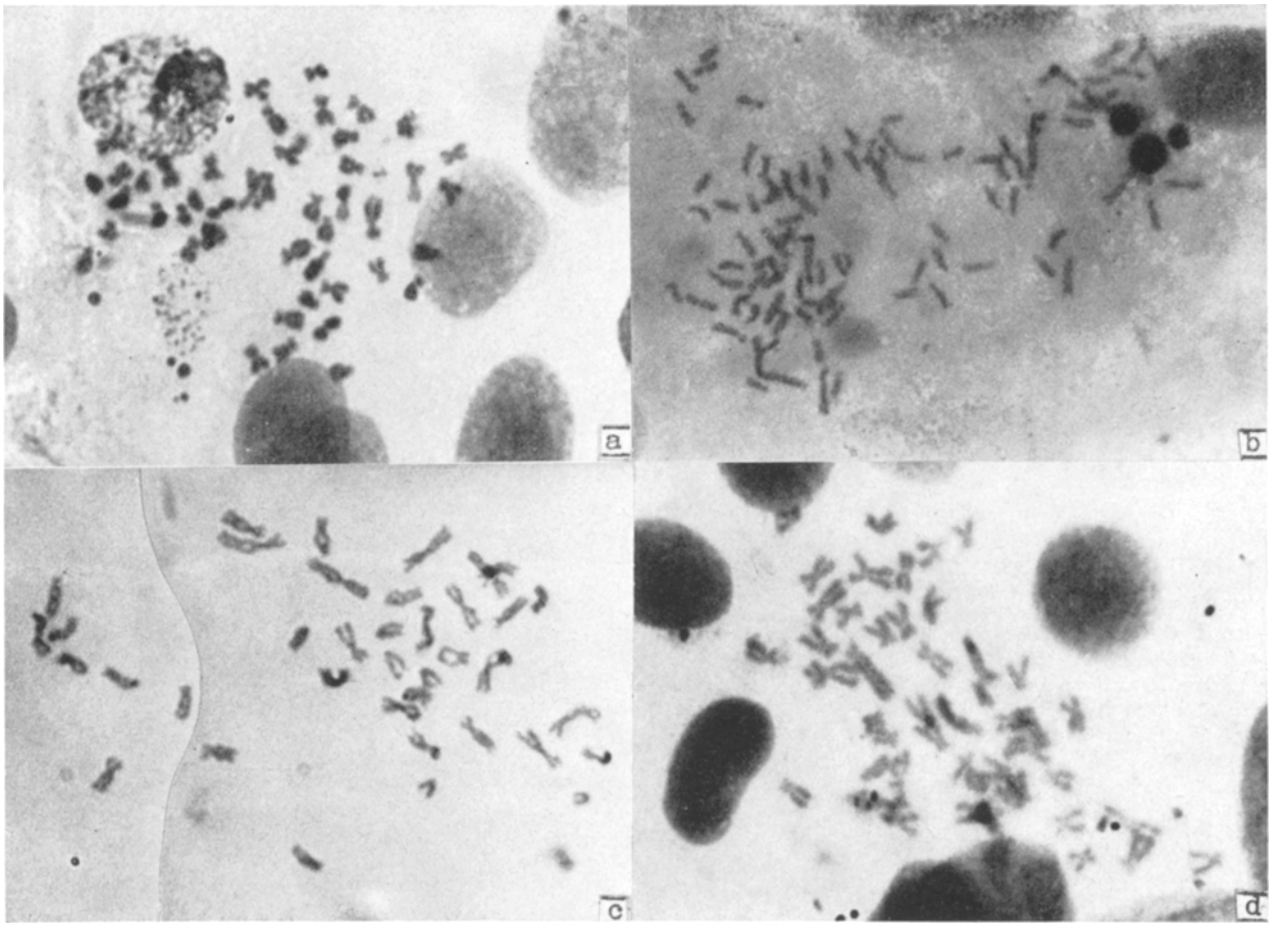

Fig. 3. Metaphasic plates from different species of fishes obtained by tissue culture in vitro: a, *Tinca tinca*; b, *Carassius auratus*; c, *Anguilla anguilla*; d, *Scardinius erythrophtalmus*.

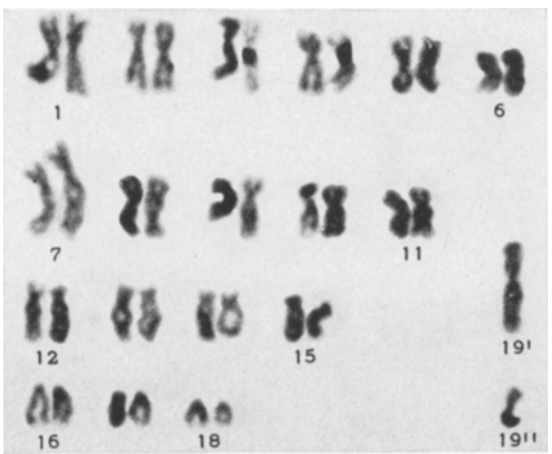

Fig. 4. Tentative pairing of the chromosomes of *Anguilla anguilla*.

equal in size to one of the arms of 24 (first), leaves open the possibility that in the individual examined the deletion of one arm of the chromosomes may have occurred.

The caryotype is made up by 6 chromosome pairs with roughly median centromere and 17 pairs with a roughly terminal centromere with a definite predominance of telocentric over acrocentric elements.

Though of a preliminary nature and pertaining to different species, these findings give a glimpse of the more interesting lines of research open to study, utilizing the numerical and morphological data relating to chromosomes. The importance of investigations on the systematic affinities and phylogenesis of Teleostea, and also the importance of the problem regarding sex chromosomes of differentiation, in other words, the significance of heterochromosomes in hermaphroditic species, deserve emphasis.

Riassunto. In questo lavoro vengono riportati dati numerici e morfologici sul cariotipo di diverse specie di Pesci Teleostei (*Tinca tinca, Carassius auratus, C. carassius, Scardinius erythrophtalmus, Anguilla anguilla*), ottenuti mediante culture in vitro.

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28 November 1968.