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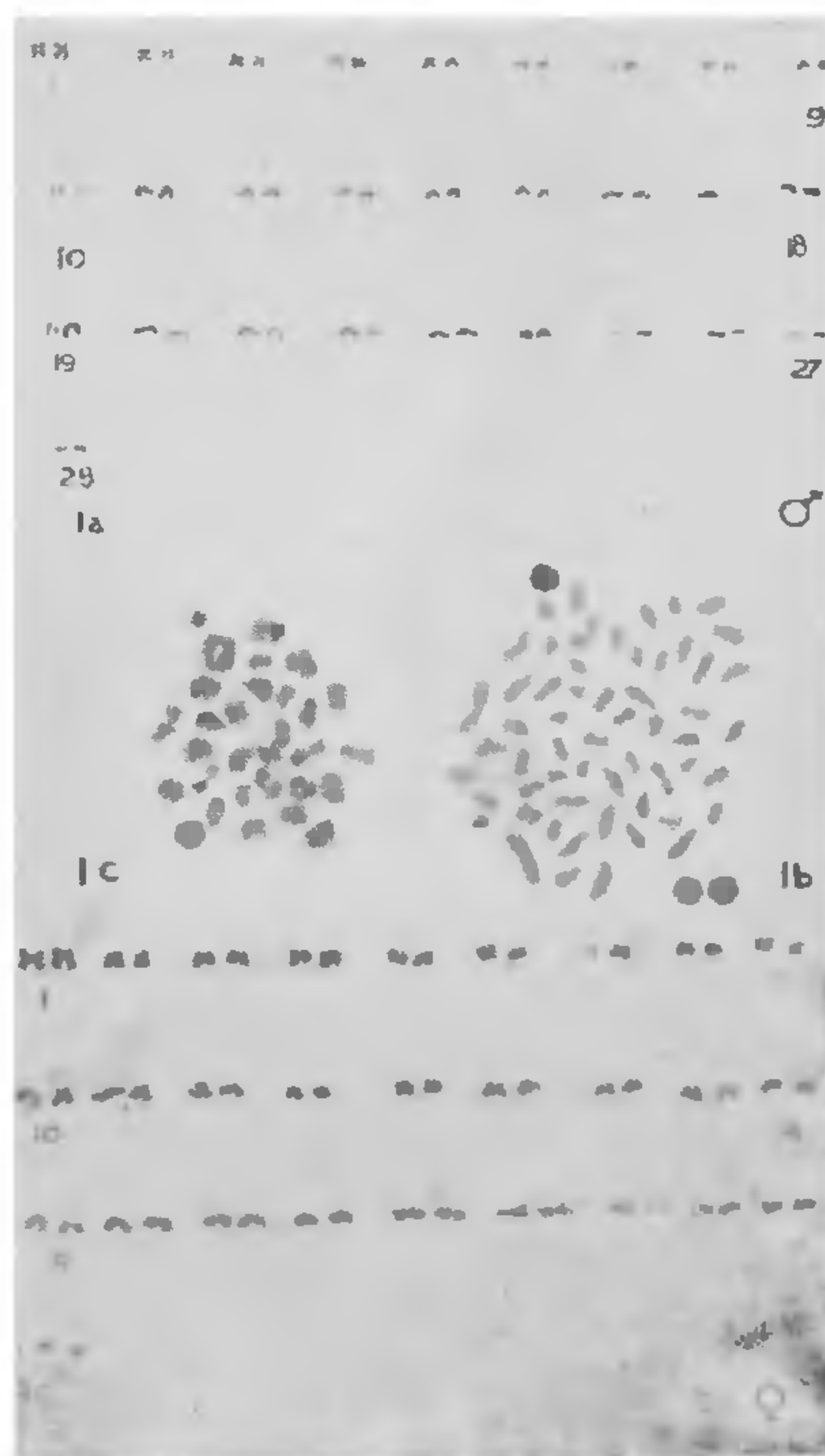
### SOMATIC AND MEIOTIC CHROMOSOMES OF *HETEROPNEUSTES FOSSILIS* (BLOCH)

AMONG vertebrates, karyological studies of fishes are comparatively less documented and this is more so for the fishes of the Indian sub-continent<sup>5,6</sup>. Recently, various techniques have been reported for preparing fish chromosomes<sup>4,6,7</sup>. We report here the somatic and meiotic chromosomes of the Indian cat fish, *Heteropneustes fossilis* (Bloch) by a simple technique for obtaining chromosomes from kidney, spleen, and testis. *Heteropneustes fossilis* (Bloch) shows a clear external sexual dimorphism, and it would be, therefore, of interest to study whether any chromosomal differences exist.

Male and female (ten each) fishes were injected with 0.5 ml colchicine (0.2%) intra-muscularly and six hours later sacrificed. Kidney and spleen were removed to a clean petridish containing 10 ml saline and cut into small pieces which were later made into a cell suspension. The latter was centrifuged for five minutes at 600 rpm and the cell pellet was suspended in 5 ml KCl (0.56%) at 26° C for 25 minutes. The suspension was again spun down at 600 rpm for five minutes and fixed in acetic-alcohol for 30 minutes. After two changes in fixative, slides were prepared for chromosomes by air dry method.

For meiotic chromosomes testes were freed from the surrounding material in saline before they were cut into small pieces. They were transferred to a small petridish containing 5 ml glass distilled water (hypotonic treatment). The hypotonic treatment was carried at room temperature for 8 to 10 minutes and thereafter fixed in 10 ml acetic-alcohol. After 30 minutes the fixative was removed and a few drops of 45% acetic acid was added to make a homogeneous cell suspension and centrifuged at 600 rpm. for five minutes. Freshly prepared fixative (acetic-alcohol) was slowly added to the cell pellet and agitated vigorously. After two changes in fixative, slides were prepared by air dry method.

The diploid number of *Heteropneustes fossilis* (Bloch) was found to be 56 in both sexes (Figs. 1 a, 2). Chromosome number scored from testicular preparations confirms the diploid number of 56 (Fig. 1 b). The karyotypes of both male and female show 9 pairs of metacentric, 9 pairs of submetacentric and 10 pairs of acrocentric, chromosomes. No heteromorphic pair that could be described as sex-chromosomes were found. In leptotene, a typical "bouquet" arrangement was not observed; so also the sex-vesicle at zygotene. Metaphase I showed 28 (Fig. 1 c) ring bivalents. None of the pairs showed an end-to-end association characteristic of the sex-chromosomes. All the chromosomes segregate in the first division.



FIGS.1-2. Fig. 1 a, Karyotype of male *Heteropneustes fossilis* from spleen showing nine pairs of metacentrics, 9 pairs of submetacentrics and 10 pairs of acrocentrics. Note the absence of any heteromorphic pair; Fig. 1 b, Spermatogonial metaphase showing 56 chromosomes; Fig. 1 c, Metaphase I from the testis, showing 28 bivalents. Fig. 2, Karyotype of female *Heteropneustes fossilis*, from spleen, showing 9 pairs of metacentrics, 9 pairs of submetacentrics and 10 pairs of acrocentrics. Note absence of a heteromorphic pair.

Our observation on the chromosome number of *Heteropneustes fossilis* ( $2n = 56$ ) is in agreement with the earlier report<sup>8</sup>. From our study it is reasonably clear that three different types of chromosomes, viz., metacentric, submetacentric and acrocentric chromosomes make up the karyotype.

Prasad and Manna<sup>8</sup> reported the existence of female heterogamety in *Heteropneustes fossilis*. We have failed to confirm this. Yet male heterogamety has been reported in *Channa striatus*, *Tilapia labiosus*, *Boleophthalmus glacus*, *Mystus punctatus*, *Mystus vittatus*<sup>9</sup> and female heterogamety in *Gambusia affinis*<sup>2</sup>, *Gambusia noblis*, *Gambusia gaidei* and *Gambusia hartoch*<sup>1</sup>. It is clear from this study that there seems to be no heteromorphic pair of chromosome either in the male or female *Heteropneustes fossilis*.

Earlier cytological and genetical investigation in *Lebistes reticulatus*<sup>10</sup>, *Orizius latipes*, *Platygoceolus maculatus*, suggests that in fish, sex determination must be assumed to occur at the genic rather on chromosome level.

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### EFFECT OF SURFACTANTS ON THE ACTIVITIES OF $C_1$ AND $C_x$ CELLULASES IN THE CULTURE FILTRATE OF *ASPERGILLUS TERREUS*

CELLULASE serves as a biocatalyst during microbial degradation of cellulose, but under controlled conditions, it has immense application potential as an instrument for softening and upgrading cellulosic textiles and fibres. It has been found in this context that the scouring of grey cloth with a dilute solution of alkali is a most beneficial precursor to treatment with a cellulase solution. However, an alkaline scouring treatment is a costly operation. A surfactant dissolved in the enzyme bath may function, at least partly, as a substitute for scouring by increasing the permeability of jute fibres, provided it does not adversely affect the different components of cellulase. Moreover, the feasibility of a concomitant use of surfactants with cellulase and related enzymes may broaden the avenues open for many practical softening treatments.

$C_1$  and  $C_x$  are the principal components of cellulase<sup>1</sup>; the former, during cellulose digestion, does the spade work by breaking the lateral bonds and cross-linkages of native crystalline cellulose, whilst the latter is mainly responsible for hydrolytic cleavage of the linear cellulose chain molecules into cellobiose and glucose. In the present communication, reactions of cellulase to surfactants—cationic, anionic and non-ionic—have been studied by measuring the activities of  $C_1$  and  $C_x$  components of a cellulase preparation at varying concentrations of these surfactants. The surfactants investigated were Kata-softener-AC, a cationic product of Ahura Chemicals, Bombay; Teepol, an anionic detergent supplied by Glaxo Laboratories (India) Ltd.; and P-40, a non-ionic wetting agent of N & B Products of Calcutta. Although Kata-softener-AC is a weak wetting agent, it has promise of being used as a synergistic softening additive with cellulase. These surfactants were used in the concentration range of between 0.025% and 0.15% (w/w). Aqueous extract of a 6-day-old wheat bran culture of *Aspergillus terreus* (IIRA 6.2) was used as a source of cellulase rich in both  $C_1$  and  $C_x$  activities. A 3-litre volume of this extract referred to as "filtrate" was preserved with toluene and acetic acid at 8°–10° C in the refrigerator and was earmarked for the study. Protein content of the filtrate was determined colorimetrically by the biuret reaction and was found to be 0.944 mg/ml. Portions of the filtrate were vacuum-concentrated in a rotary evaporator at 30–35° C for assay of cellulase  $C_1$  activity,