

Chromosome numbers in the Auchenorrhyncha and their taxonomic significance

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A little more than 70 papers on the karyology of the Auchenorrhyncha have been published including the latest list of the chromosome numbers (Kirillova, 1986, 1987) and very useful reviews by Emelyanov and Kirillova (1989, 1991).

So far, 575 species (1.9% of the known species) from 340 genera, 26 families and all 4 superfamilies have been studied cytologically, the vast majority of these species representing the Cicadelloidea and Fulgoroidea. The known chromosome numbers range from 8 to 38 in the female set; sex chromosomes are of XX/XO and XX/XY-types, a single species seems to have a multiple system $4X/2X+Y$. In the Auchenorrhyncha, the modal numbers lay between 16 and 30; approximately 90% of the species have XX/XO.

The Auchenorrhyncha are a group characterized by holokinetic chromosomes. Chromosome numbers are constant within a species. There are only a few examples of the intrapopulation polymorphism and geographical variability. Within genera and suprageneric taxa, the karyotype features usually either vary slightly or are stable. In a number of cases, there are discrete karyotype differences between high rank taxa (tribes, subfamilies, families and even superfamilies). Thus, the chromosome data can provide a good basis for classification and reconstruction of phylogenetic relationship within the Auchenorrhyncha.

In the Cicadelloidea, 354 species (2%) and 206 genera have been analyzed; almost all of them belong to the Cicadellidae and Membracidae. Chromosome numbers vary between 8 and 26, the overwhelming majority of species having $2n=16-22$. In the Fulgoroidea, 179 species (1.8%) and 111 genera, mainly belonging to the Delphacidae and Dictyopharidae, have been studied. Here, chromosome numbers are notably higher, they vary between 20 and 38 with clear modal numbers 26-30. It is not yet possible to characterize the Cicadoidea and Cercopoidea by certain typical chromosome numbers owing to poor karyological data. In the Cicadoidea, only 9 species (0.4%) from 9 genera of the advanced family Cicadidae are known cytologically. In one species $2n=12$ and in 8 others - $2n=20$. Thus, one can assume that the latter is the modal number for the Cicadidae. In the Cercopoidea, 33 species (1.3%) and 14 genera have been studied; 23 species and 10 genera belong to the Aphrophoridae. Chromosome numbers vary from 14 to 32, and 30 is assumed to be the modal number for the Aphrophoridae.

Some families and taxa within them demonstrate marked karyotype peculiarities. So, all the so far examined species of the most primitive fulgoroid family Tettigometridae have ne-XY-system, while their chromosome numbers vary within a relatively wide range. Two other families, the Dictyopharidae and the Fulgoridae, are very similar morphologically, but differ from each other in morphology of the sex-chromosomes. They have the system XY which developed in them

independently, due to different chromosome rearrangements. Within the Dictyopharidae, the differences in karyotypes agree with accepted sub-families and some tribes. The same seems to be true for the Fulgoridae and some other families. For the Dictyopharidae, it even seems possible to reconstruct the sequence of chromosome rearrangements which had place in their evolution. For many taxa it is possible to suggest an ancestral karyotype. It looks probable that $2n=30(28+XX/XO)$ was the primitive karyotype in the evolutionary stock which gave rise to the Fulgoroidea. Such a karyotype occurs in many fulgoroid families, including the primitive Cixiidae and Delphacidae. There seems little doubt that the ancestral karyotype of the Cicadelloidea was $2n=22(21+XX/XO)$, as found in all cicadelloid families, including the most primitive Aetalionidae and Ulopidae.

All the usual processes of the chromosome evolution have played their role in the Auchenorrhyncha, though the fusions and dissociations predominated. The fusions seem to have been more frequent (or more successful in the evolutionary sense) than the dissociations.

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