A Note on a Comparative Study of the Chromosomes in Ten Species of Indian Dragonflies.

LEFEVRE AND MCGILL[1] as co-workers (1908), Smith[2] (1916) and Oguma[3] (1930) are the only authors who so far have devoted their attention to the chromosome studies in this very ancient family of insects. In a paper published by Oguma and Asana[4] (1932) attention was drawn to a very interesting observation, whose significance is not yet quite clear, that the so-called *m*-chromosome (the smallest among the autosomes) presents every grade of size reduction among the testicular cells of a single individual belonging to a species of *Odonata*, *Tramea chinensis*, collected in the vicinity of the Gujarat College, Ahmedabad, Western India.

This rather remarkable observation led us to make a comparative study of the chromosomes in the male germ cells of some ten species of Indian dragonflies so far collected, from a very restricted area situated in the neighbourhood of the Ismail College, Jogeshwari, about 20 miles north of Bombay. The following observations are based on the species listed below.

May we take this opportunity to express our thanks to Colonel F. C. Frazer who very

kindly identified the species for us. A short account of our observations on the chromosome numbers, the X-chromosome and the *m*-chromosome of these Indian species of dragonflies is given below:

Species	Haploid	Diploid
Sub-Order Anisoptera		
Sub-family Libelluniæ		
1. *Pantala flavescens* ..	13	25
2. *Trameа limbata*	13	25
3. *Trithemis palladinervis* ..	13	25
4. *Diplacodes trivialis* ..	13	25
5. *Brachythemis contaminata* ..	13	25
6. *Crocothemis servilia* ..	13	25
7. *Potamarcha obscura* ..	13	25
8. *Orthetrum sabina*	13	25
Aeschininæ		
9. *Ictinus rapax*	12	23
Sub-Order Zygoptera		
Family Coenagrionidæ		
10. *Ceriagrion rubiæ*	14	27

As will be seen from the above table, all the members of Libelluniæ show a constancy in the number of chromosomes, 25 in diploid and 13 in haploid. In *Ictinus* which belongs to another group, Aeschininæ, the diploid is 23, the haploid 12. The chromosome number in *Ceriagrion* (Coenagrionidæ), whose chromosomes have been studied for the first time, the number is the largest among all the dragonflies studied so far.

Despite the variation in the chromosome number, there is present an unpaired X-chromosome, without exception, in all the species investigated. In every case, the X-chromosome always takes a peripheral position on the outer circle of the spindle both in the spermatogonial and primary spermatocyte metaphases and acquires a peculiar eccentric position in the metaphase of the secondary spermatocyte. And a special emphasis may be laid on the fact that it separates into two equal halves in the primary spermatocyte division, but migrates to one pole entire without separation, ahead of other chromosomes, in the second spermatocyte division.

However, regarding its size or magnitude in relation to other chromosomes it does not show a uniform behaviour in all the ten species studied. Taking first all the species of Libelluniæ, the X-chromosome in all of them looks nearly, though not exactly, equal in magnitude to the second smallest autosome univalent in the spermatogonial complex. While in *Ictinus rapax* (Aeschininæ), it is interesting to note, the X-chromosome stands as the largest element in its chromosomal complex. It is remarkably large and occupies a central position in the spermatogonial metaphase. In *Ceriagrion rubiæ*, a representative of our third group, Coenagrionidæ, the X-element, in its size relation to other members of the complex, resembles the X-chromosome in the species of Libelluniæ.

Finally, throughout all these Indian species of dragonflies the smallest autosome, the so-called *m*-chromosome, is present without exception. And it is a remarkable fact that the relative magnitude of this *m*-chromosome to that of the X-element varies from species to species.

A full account of these observations will be published elsewhere.

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[1] Lefevre, G., and McGill, C. C., "The Chromosome of *Anasa tristis* and *Anax junius*," *Amer. Jour. Anat.* 1908, **7**.

[2] Smith, E. A., "Spermatogenesis of the dragonfly, *Sympetrum semicinctum* (Say) with remarks upon *Libellula basalis*," *Biol. Bull.*, 1916, **31**.

[3] Oguma, K., "A comparative study of the spermatocyte chromosomes in allied species of the dragonfly," *Jour. Fac. Sci. Hok. Univ.*, Ser. VI, 1930, **1**.

[4] Oguma, K., and Asana, J. J., "Additional data to our knowledge on the dragonfly chromosomes, with a note on occurrence of X- and Y-chromosomes in the ant-lion (Neuroptera)," *Jour. Fac. Sci. Hok. Imp. Univ.*, Series VI, 1932, **1**.