

Studies on the Chromosomes of Indian  
Orthoptera.

IV :—*The Idiochromosomes of Hierodula  
species (?) (Mantidæ).*

SEVERAL interesting forms representing the families Mantidæ and Phasmidæ are not uncommonly met with in the vicinity of the Ismail College, Jogeshwari, situated in the Salsette district about 20 miles north of the City of Bombay. So far as the writer is

---

<sup>1</sup> *Cur. Sci.*, 2, 126, 1933.

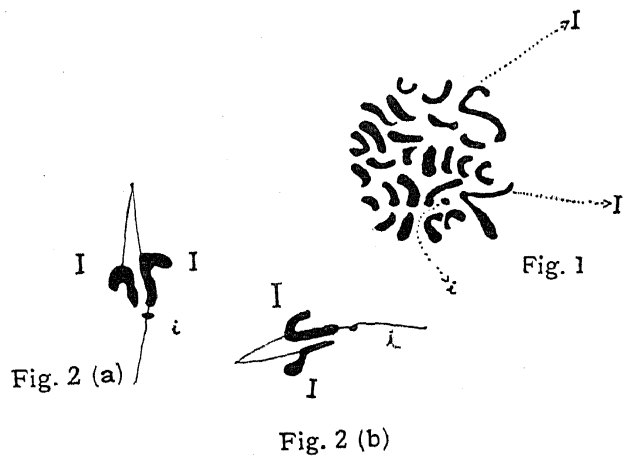
aware, barring three papers<sup>1</sup> published prior to 1912 and which are not easily accessible, no work has been done on the chromosomes of the above-named families of Orthoptera. In the present study on the meiosis as witnessed in the growing testis of Hierodula the writer has succeeded in making out not only the usual features such as the chromosome numbers, etc., but three peculiar idiochromosomes which can certainly be looked upon as sex-determinants.

Only the very minute testes of the earliest instar stages of Hierodula can reveal the diploid number of chromosomes. On the equatorial plate of a dividing spermatogonium at the metaphase 27 chromosomes are observed, 24 of which form 12 pairs of autosomes, which are all rod-shaped and vary in length. The remaining three, as subsequent observations show, are sex-determinants or idiochromosomes. Two of these three are very large, the largest of all chromosomes are almost always curved like V and lie always in the peripheral part of the equatorial plate. The remaining idiochromosome is the smallest of the three, almost dot-like and has no definite location on the spermatogonial spindle.

The most interesting feature in the meiosis is the form and position taken up by these three peculiar sex-determining chromosomes on the spindle at the metaphase of the primary spermatocytes. The two V's become large L-shaped chromosomes, and as seen in a tangential view of the spindle they lie side by side, though not connected with each other. They both are always directed towards one and the same pole, their longer arms lie parallel and the shorter arms at an acute angle with the axis of the spindle. The smallest of the three idiochromosomes appears at this stage almost as a small point and is directed towards the opposite pole and is united by a very thin thread to the longer arm of one of the L-idiochromosomes as shown in the diagram.

It is of interest to note that this smallest member of the group of idiochromosomes in

the Japanese form worked out by Oguma<sup>1(c)</sup> is fairly large, almost half the size of the other two idiochromosomes.



**Fig. 1.** Polar view of spermatogonial metaphase chromosomes, 27 chromosomes; 'I', 'I' and small 'i' are three Idiochromosomes.

**Fig. 2 (a)** and **Fig. 2 (b).** Tangential views from two different cells of all the three Idiochromosomes at the metaphase on the primary spermatocyte spindle. Other chromosomes, autosomes, have not been drawn. The two large Idiochromosomes, 'I' and 'I' go towards one and the same pole, the small dot-like chromosome, the small 'i', is drawn towards the opposite pole.

In the ensuing anaphase of the reduction division the two L-shaped major sex-determinants always go towards one pole, while their associate, the smallest idiochromosome, is drawn towards the opposite pole. Thus are produced two classes of secondary spermatocytes. Their chromosome contents as seen on the equatorial plate of the metaphase are: (1) 12 autosomes+2 Ls (two major parts of the idiochromosome complex); (2) 12 autosomes+a small dot-like chromosome (the smallest of the sex-determinants).

An attempt is being made to investigate the form, structure and behaviour of these peculiar idiochromosomes (sex-determinants) in a few forms of insects representing some groups of Mantidæ.

J. J. ASANA.

Ismail College,  
Jogeshwari, Bombay, S. D.  
December 7, 1933.

<sup>1</sup> (a) Giardina, 1897; as quoted by E. B. Harvey in her paper "A review of the chromosome numbers in Metazon," Part I. *Journ. of Morphology*, 28, 1916.

(b) Sinety, R., 1901, *Recherches sur la biologie et l'anatomie des Phasms*, La Cellule, 19.

(c) Kan Oguma, 1912, "The Idiochromosomes of the Mantis," *Journ. of the College of Agriculture*, Hokkaido Imperial University, 10, Part I.