Mitotic Chromosomes of the Mosquito *Eretmapodites quinquevittatus* Theobald[1]

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ABSTRACT. The karyotype of *Eretmapodites quinquevittatus* consists of 1 metacentric and 2 submetacentric pairs (2n=6). The average lengths of late metaphase chromosomes are: I = 8.1 µm, II = 8.3 µm, III = 9.6 µm, with average arm ratios of: I = 1.159, II = 1.000, III = 1.155. Somatic pairing is exhibited by the mitotic chromosomes. A secondary constriction is found in one of the larger pairs.

INTRODUCTION

The genus *Eretmapodites* Theobald of the family Culicidae is confined to the Ethiopian region and Madagascar (Gillett 1971). The genus is divided into at least 44 species and 3 subspecies (Knight and Stone 1977, Knight 1978). Many of the diagnostic characteristics of this genus are the same as those of the *Aedes* and the form of the genitalia suggests some affinity with the subgenera *Stegomyia* and *Aedimorphus* (Edwards 1941). Since mosquitoes of the genus *Eretmapodites* are very similar to the genus *Aedes*, more knowledge of the genetics and cytogenetics of this genus could provide information that would lead to a greater understanding of speciation within the Culicidae.

To date, the chromosome complement of only one member of the genus, *Eretmapodites chrysogaster*, has been described (Rai 1966). The current study gives a brief description of the mitotic chromosomes of a second member, *Eretmapodites quinquevittatus*.

MATERIALS AND METHODS

Specimens of *Er. quinquevittatus* used in this study were randomly selected from a colony maintained at the Mosquito Genetics Laboratory at Georgia Southern College. The colony was originally established from larvae collected in the Kisutu section of Dar es Salaam, Tanzania, in 1969. The colony has been maintained according to procedures described by Hartberg and Gerberg (1971).

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Third and fourth instar larvae were selected at random from the colony and fixed in a solution of 6 parts methanol, 3 parts chloroform and 2 parts propionic acid (Pienaar 1955). The brains of the larvae were dissected in this solution. The chromosomal slide preparation of the larval brains was essentially the same as that described by Breland (1961) except that a 1% lacto-aceto-orcein stain was used. After staining for 15-20 minutes, the preparation was gently squashed using coverslips and slides treated with Siliclad®. The slides were then sealed with fingernail polish. All measurements were made using a micrometer disc and slide micrometer. Each measurement and arm ratio in Table 1 are based on an arithmetical mean of three separate measurements of chromosomes judged to be in metaphase.

All photographs of dividing cells were taken under phase at 1000x magnification with an Olympus PM-7 camera mounted on an Olympus FHA microscope. Kodak Plus-X Pan film was used and prints were made on Kodabromide F-4 single weight paper.

RESULTS AND DISCUSSION

The diploid chromosome number of *Er. quinquevittatus* is 6 (2n=6). The karyotype consists of 3 pairs of homomorphic chromosomes (Figs. 3-4), with two slightly submetacentric pairs and one metacentric pair (Table 1). The chromosomes have arbitrarily been numbered according to the system used by Rai (1963) in which the shortest chromosome is designated as chromosome I and the longest is III. The assignment of chromosome numbers on the basis of length is tentative, recognizing that a final number assignment will need to be based on the correlation of linkage groups and chromosomes as was done by McDonald and Rai (1970).

Somatic pairing (close association) of the homologous chromosomes is evident during prophase (Fig. 2). The homologous chromosomes begin to separate towards late prophase (Fig. 2), but remain closely associated in the region of their centromers during metaphase (Figs. 3, 4). A secondary constriction (achromatic gap) was observed in one of the two larger pairs of chromosomes (Figs. 3, 4). Rai (1966) observed the same type of secondary constriction in *Er. chrysogaster*.

As indicated by the data in Table 1 and Figs. 1-6, the karyotype of *Er. quinquevittatus* can be described as 1 large and 2 smaller pairs. Overall dimensions of the chromosomes (Table 1) are fairly large, but they compare favorably with measurements from other groups (Rai 1963, Asman 1974). The ratio of length of chromosome I to chromosomes II + III is 0.453.

Rai (1966) did not give arm length data for the chromosomes of *Er. chrysogaster* which we could compare to those of *Er. quinquevittatus* in the present study. Centromere position appears to be slightly different with Rai (1966) reporting "3 pairs of more-or-less metacentric chromosomes" in *Er. chrysogaster*, whereas we found 1 metacentric and 2 submetacentric pairs in *Er. quinquevittatus*. Both species are similar in having a secondary constriction

in the homologs of one of the larger pairs. It would be interesting to use techniques, such as the Giemsa C-Banding used by Motara and Rai (1978) with *Stegomyia* mosquitoes, to further establish additional similarities and differences between these two mosquitoes.

REFERENCES CITED

Asman, S. M. 1974. Cytogenetic observations in *Culex tarsalis*: mitosis and meiosis. J. Med. Entomol. 11:375-382.

Breland, O. P. 1961. Studies on the chromosomes of mosquitoes. Ann. Entomol. Soc. Amer. 54:360-375.

Edwards, F. W. 1941. Mosquitoes of the Ethiopian Region. III: Culicine adults and pupae. London: British Museum (Nat. Hist.). 499 pp.

Gillett, J. D. 1971. Mosquitoes. Weidenfeld and Nicolson, London. 274 pp.

Hartberg, W. K. and E. J. Gerberg. 1971. Laboratory colonization of *Aedes simpsoni* (Theobald) and *Eretmapodites quinquevittatus* Theobald. Bull. Wld. Hlth. Organ. 45:850-852.

Knight, K. L. 1977. A catalog of the mosquitoes of the world (Diptera: Culicidae), Vol. VI, 2nd ed. Thomas Say Foundation, Washington. 611 pp.

_____. 1978. Supplement to a catalog of the mosquitoes of the world (Diptera: Culicidae). Thomas Say Foundation, Washington. 107 pp.

McDonald, P. T. and K. S. Rai. 1970. Correlation of linkage groups with chromosomes in the mosquito, *Aedes aegypti*. Genetics 66:475-485.

Motara, M. A. and K. S. Rai. 1978. Giemsa C-banding patterns in *Aedes (Stegomyia)* mosquitoes. Chromosoma 70:51-58.

Pienaar, R. de V. 1955. Combinations and variations of techniques for improved chromosome studies in the Gramineae. J. S. Afr. Bot. 21:1-8.

Rai, K. S. 1963. A comparative study of mosquito karyotypes. Ann. Entomol. Soc. Amer. 56:160-170.

_____. 1966. Further observations on the somatic chromosome cytology of some mosquitoes (Diptera: Culicidae). Ann. Entomol. Soc. Amer. 59: 242-246.

Table 1. Measurements of mitotic metaphase chromosomes in *Eretmapodites quinquevittatus*.

Chromosome Number	Centromere Location	Total Length in μm	Arm Ratio*
I	Submetacentric	8.1	1.159
II	Metacentric	8.3	1.000
III	Submetacentric	9.6	1.155

*Arm ratio = length of longer arm/length of shorter arm.

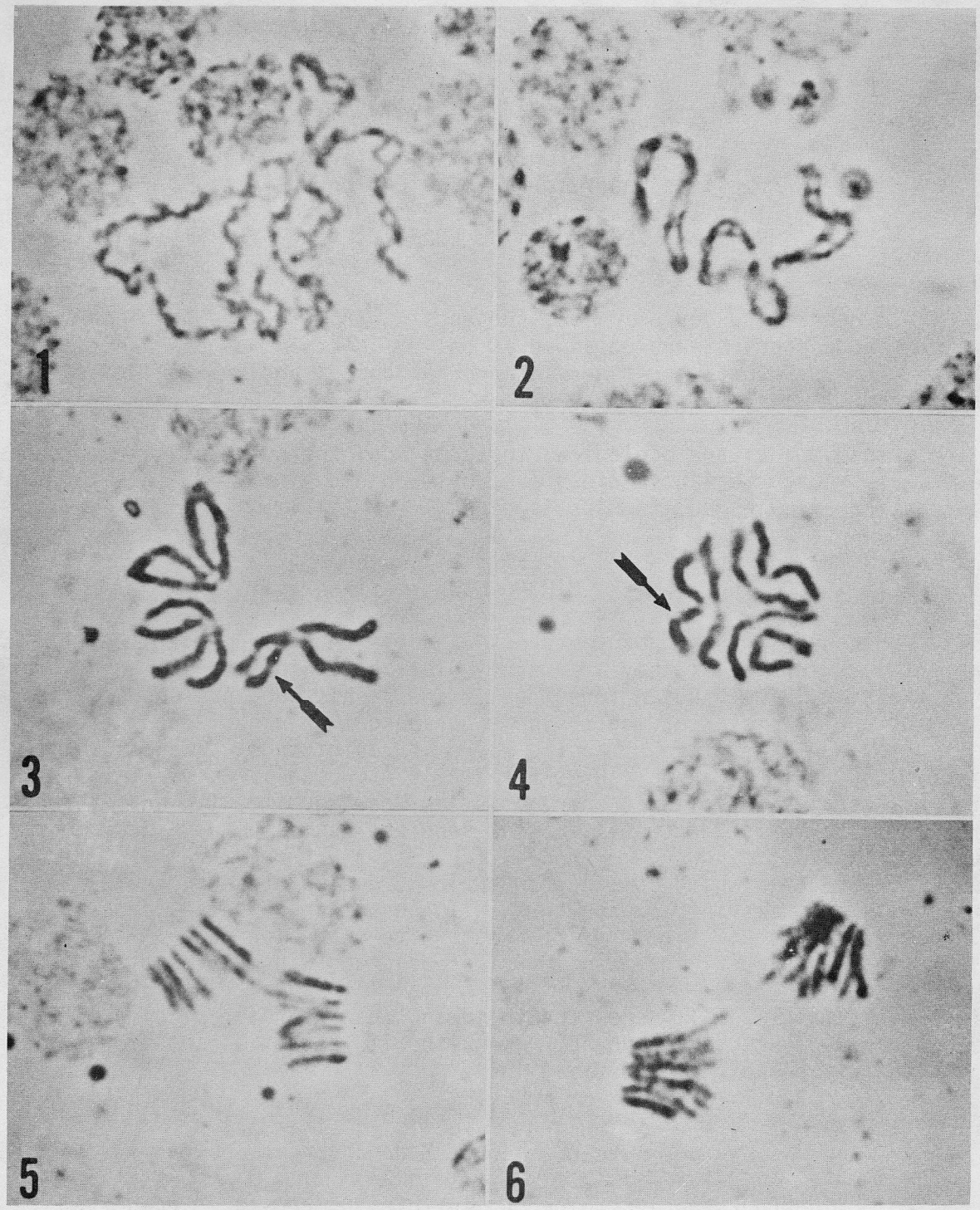

Plate I. Mitotic divisions in *Eretmapodites quinquevittatus*.

Fig. 1 - Early prophase
Fig. 2 - Late prophase
Figs. 3, 4 - Metaphase. Note secondary constriction (arrow)
Fig. 5 - Early anaphase
Fig. 6 - Late anaphase