

**MALE GERM CELL CHROMOSOMES OF TWO CALOPTERYGOIDEA
FROM THE DARJEELING HIMALAYA
(ZYGOPTERA: CHLOROCYPHIDAE, EUPHAEIDAE)***

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Received March 2, 1973

Spermatogonial and spermatocyte chromosomes of *Rhinocypha quadrimaculata* Selys (*Chlorocyphidae*) and *Bayadera indica* (Selys) (*Euphaeidae*) are described and illustrated. Material originates from different localities in Darjeeling, India. In both species the chromosome number is $2n \delta = 25$, $n \sigma = 13$, including a pair (bivalent) of *m*-chromosomes. *R. quadrimaculata* is the first member of the family so far studied cytologically. The karyotypes of *Epallage fatime* (Charp.) and *B. indica* are briefly compared. The former is the only other representative of *Euphaeidae* hitherto examined and deviates from the latter by the lack of *m*-chromosomes.

INTRODUCTION

So far notes on karyotypic morphology of 25 species and subspecific taxa of the superfamily Calopterygoidea have been made available (KIAUTA, 1972 a, annotated review with bibliography; 1972 b). The record covers five out of eight calopterygoidean families (cf. FRASER, 1957), viz *Pseudolestidae*, *Polythoridae*, *Euphaeidae* (syn. *Epallagidae*; cf. MONTGOMERY, 1967), *Hetaerinae* and *Calopterygidae*. Their cytophylogenetic affinities were discussed by KIAUTA (1970).

* Communication No. 8 of the Netherlands Centre for Alpine Biological Research, Utrecht.

In the present note the chromosome conditions in *Rhinocypha quadrimaculata* Selys (*Chlorocyphidae*) and *Bayadera indica* (Selys) (*Euphaeidae*) are brought on record. The cytological observations are thus still completely lacking only for the *Amphipterygidae* and *Heliocharitidae*.

MATERIAL AND METHODS

The observations are based on preparations of seven adult males of *R. quadrimaculata*, collected in the Rangeet Valley, Darjeeling District, West Bengal, India (May, 1971), and on those of five adult males of *B. indica*, captured at a hill stream near Darjeeling (April, 1971).

For fixing and staining the lacto-acetic-orcein squash technique was used. The micrographs were taken from fresh preparations with an Olympus photomicroscope (100 × oil immersion, green filter, Orwo panchromatic film). The positives were printed 2000 × and are reproduced in the present note unreduced.

OBSERVATIONS ON THE KARYOTYPES

(1) *Rhinocypha quadrimaculata* Selys 1853. (*Chlorocyphidae*)

There are 25 elements in the polar views of the spermatogonial metaphase and 13 in those of metaphase I. Two pairs of spermatogonial chromosomes are slightly but distinctly longer than the others, which are of more or less gradually decreasing magnitude, save for a pair of small *m*-chromosomes. The unpaired X is the second smallest element at this stage. The spermatogonial chromosome absolute lengths range between 1.8 and 0.5 μ .

In polar views of the primary spermatocyte metaphase the two larger bivalents are clearly distinguishable. The univalent sex chromosome and the *m*-bivalent are nearly equal in size.

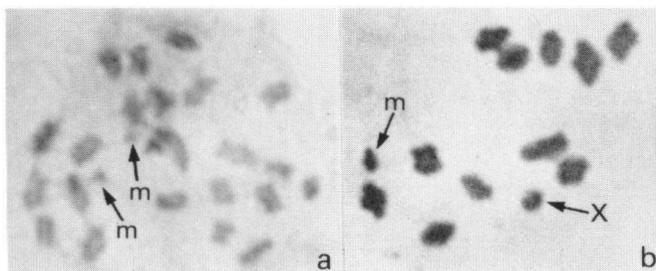


Fig. 1. *Rhinocypha quadrimaculata* Selys (*Chlorocyphidae*). Polar views of spermatogonial (a), and primary spermatocyte metaphase (b). (Lacto-acetic-orcein squash; 2000 ×).

(2) *Bayadera indica* (Selys, 1853). (*Euphaeidae*).

The chromosome number is $2n \sigma = 25$, $n \delta = 13$, including a pair (bivalent) of small *m*-chromosomes. The spermatogonial chromosome absolute lengths range from 1.8 to 0.5μ . The sex element is the second smallest chromosome in spermatogonial metaphase, while it is practically equal in size to *m* in the primary spermatocyte. At diakinesis a single chiasma occurs per bivalent.

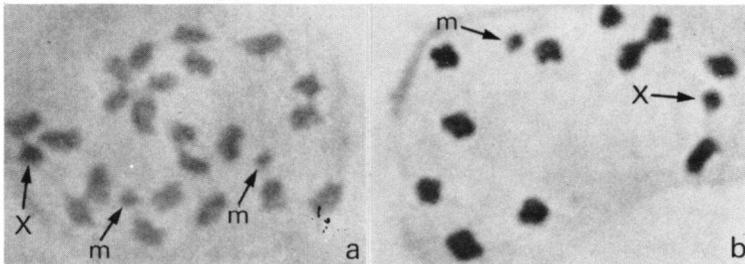


Fig. 2. *Bayadera indica* (Selys). (*Euphaeidae*). Polar views of spermatogonial (a), and primary spermatocyte metaphase (b). (Lacto-acetic-orcein squash; 2000 x).

DISCUSSION

Rhinocypha quadrimaculata is the first representative of the large, but primitive Chlorocyphidae so far studied cytologically. The family has a wide distribution in the tropics of the Old World, from West Africa to the Pacific. Because of the entire absence of basal antenodals, the persistence of the two primary antenodals and the complete failure of the secondary antenodals to coincide in their costal and subcostal series, FRASER (1957) considered the family as one of the most primitive in the Calopterygoidea, and suggested its origin from somewhere in the amhipterygidan stock.

It is interesting, in this light, that there are no peculiarities or any unusual features in the karyotype of *Rhinocypha quadrimaculata*. Though it is impossible to deduce the karyotypic characters of a family from observations on a single species, it seems that at least in *R. quadrimaculata* the karyotype has reached a similar, high evolutionary level as those of the most advanced calopterygoidean families, viz. *Euphaeidae*, *Hetaeriniidae* and *Calopterygidae*. If it may be judged from the chromosome numbers, *Rhinocypha* certainly stands higher than the two cytologically studied members of the *Polythoridae*, though the latter family is considered by FRASER (1957) to have reached the same level of advancement as *Calopterygidae* and is thought to represent one of the most advanced families of Calopterygoidea and of the Zygoptera in general.

The karyotype of *Bayadera indica* appears quite distinct from that of *Epallage fatime* (Charp.), the only other member of *Euphaeidae* studied cytologically (cf. KIAUTA, 1970). The peculiar features of the two species are given in Table I.

Table I

Distinctive karyotypic features in two representatives of *Euphaeidae*

Character	<i>Epallage fatime</i> (Charp.)	<i>Bayadera indica</i> (Sel.)
size variation of spermatogonial elements	nearly no gradation	small, but clear gradation
<i>m</i>	none	present
X in spermatogonial metaphase	usually negatively heterocyclic	normal

From a cytological point of view, thus, the *Euphaeidae* seem to exhibit the same broad variation as the far better studied *Calopterygidae*.

ACKNOWLEDGEMENTS

The first author is indebted to Dr. S. ADHIKARI (Darjeeling, India) for providing the laboratory facilities. Dr. M.A. LIEFTINCK (Rhenen, The Netherlands) kindly identified the specimens.

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