

**THE KARYOTYPE OF *RISIOCNEMIS INCISA* KIMMINS, 1936  
FROM LUZON, THE PHILIPPINES (ZYGOPTERA: PLATYCNEMI-  
DIDAE)**

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The  $\sigma$  chromosome number is  $2n = 21$ ,  $n = 11$ , incl. an  $m$ -pair and the univalent X. The complement is of a secondary origin, the result of a fusion of 6 elements of the primary,  $2n \sigma = 25$  set. The fusion is obligatory in all cells and permanent in all stages of the mitotic cycle. This is the first case of a low- $n$  complement in Platycnemididae. Chiasma frequency is not increased, hence the recombination index is extremely low. This situation favours the survival value and reproductive capability of *incisa*, makes the sp. fit to settle down over a wide geographic range, but it restricts its adaptability to substantial ecological diversity of habitats. Considering the deviation of the recombination index from the family level, coupled with structural affinities and geographic range of the genus, it is suggested that *Risiocnemis* is likely to represent a phylogenetically young offshot of the calicnemine stock.

**INTRODUCTION**

With his clarification of the various pending taxonomic problems in the Philippine endemic genus *Risiocnemis*, appearing on the foregoing pages of the present issue of this journal, Dr. M.A. LIEFTINCK (1981) enabled us to record and discuss briefly the peculiar karyotypic morphology, encountered in a single examined male of *R. incisa* from Luzon. A brief reference to this specimen has been made earlier (cf. KIAUTA & KIAUTA, 1980).

Although a single specimen was examined, and this is the only cytologically studied member of the genus, its karyotypic morphology deviates so much from what is considered the usual calicnemine (and platycnemidide) chromosome pattern, that for this reason alone it is worth-

while to be briefly recorded.

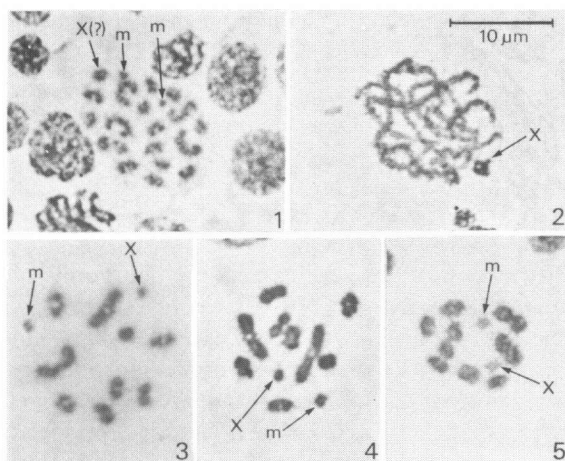
### THE KARYOTYPE

**Material.** — 1 ♂, Pagsanjan Falls, Laguna Prov., 13-V-1979. — [33 complements photographed]. — **Notes:** a pair collected; — at Pagsanjan the species is restricted to the rapids and waterfalls; its activity did not seem to be significantly disturbed by heavy showers and generally rainy weather prevailing during our visit at the locality.

$2n = 21$ ,  $n = 11$ ;  $m$ , XO. — The spermatogonial metaphase karyotype (Fig. 1) is characterised by two nearly equal pairs of exceptionally large autosomes and by a small  $m$ -pair. The large autosomes are about twice as long as the longest of the remaining chromosomes. The sex element is among the medium-sized chromosomes, but it is not readily discernable at this stage.

At pachytene, the heteropycnosis and the heterocyclic behaviour of X are normal (Fig. 2). At diakinesis, no increase in chiasma frequency is apparent. At metaphase I (Figs 3-5), there are two giant- and seven medium-sized bivalents. The  $m$ -bivalent and the X are small and nearly equal in size.

Judging from the extra large size of the two pairs (bivalents), the complement of *R. incisa* is of a secondary origin, the result of a fusion of six chromosomes of the original,  $2n = 25$  calicnemine set. The fusion occurs in all cells and in all stages of the mitotic cycle. The sex chromosome is unaffected and its behaviour is normal.



Figs 1-5. Male germ cell chromosomes of *Risiocnemis incisa* Kimmins (Feulgen squash, 1500 X): (1) spermatogonial metaphase; — (2) pachytene; — (3-4) early metaphase I; — (5) late metaphase I.

## DISCUSSION

This is the first member of the genus and the third calicnemine genus so far cytologically examined; the others are *Coelliccia* (KIAUTA, 1975) and *Calicnemia* (KIAUTA, 1975, TYAGI, 1978a, 1978b).

In both the Platycneminiinae (genera studied are *Copera* and *Platycnemis*) and the Calicneminae, the recombination index is generally stabilized at the  $2n-1$  level in males, i.e. at the 24 mark. This is about the same absolute value as in Platystictidae, but it is significantly lower than in Protoneuridae and Coenagrionidae, the  $n = 13$  taxa of the latter family inclusive. Minor deviations from this pattern, always in the upward direction, may occur sporadically in the Platycnemididae, and are due, without exception, solely to an incidental increase of the number of chiasmata in one, very seldom in two bivalents, always only in some cells of some individuals in certain populations. Secondary reduction of chromosome numbers (i.e. fusions in the karyotype) has hitherto never been reported in any platycnemidide species.

The *Risiocnemis incisa* recombination index (20) strikingly deviates from this pattern and, indeed, is unique, though not the lowest, in the Coenagrionidae. It is the result of chromosome fusions, that were not accompanied by simultaneous increase in chiasma frequencies in the neo-bivalents.

Such a low recombination potential promotes the survival value and reproductive capability of the *incisa* genotype, as compared with the other genotypes in the population, but it is unfavourable from the point of view of ecological adaptability. It makes the species more fit to settle down over a wide geographic range, but it is restricting its ability of adaptation to a substantial ecological diversity of habitats.

Platycnemididae are, generally, a rheophilous family, though different of its members are so to a different degree. Very little has been published so far on the ecological requirements of *Risiocnemis*. As far as we are aware, it seems to be restricted to a small variety of habitats, which circumstance certainly is not contradicted by our cytological observations.

As pointed out by various workers, including most recently LIEFTINCK (1981), *Risiocnemis* is venationally a well-defined taxon, somewhat aberrant structurally, and clearly restricted in its geographic range, though the latter is, in our opinion, a result of the topographic barrier (archipelago) rather than of the inability of the genotype to disperse geographically. Although the karyotype of a single species has so far become known, it does suggest, irrespectively of the karyotypic morphology prevailing in the other members of the genus, that *Risiocnemis* did not stabilize at the adaptive level of the family, hence it is likely to represent a phylogenetically young offshot of the calicnemine stock. Its structural affinities with *Coelliccia* and its im-

mediate allies in the western part of the Oriental region, and with a number of Papuan genera (cf. LIEFTINCK, 1958, 1963, 1981), coupled with its limited geographic range, seem to support this hypothesis.

#### ACKNOWLEDGEMENT

The completion of the present note has been solely made possible through the taxonomic help of Dr. M.A. LIEFTINCK (Rhenen, The Netherlands). Without his continuous help, encouragement and valuable suggestions, enjoyed for well-nigh two decades now, our work on dragonfly cytotaxonomy would be almost impossible.

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