

PRE-REDUCTION OF THE X CHROMOSOME IN LYCIDAE (COLEOPTERA: CANTHAROIDEA)

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Received May 10, 1978 / Accepted May 16, 1978

Male meiosis of an Antillean lycid beetle, *Thonalmus chevrolati* Bourg., was checked with special reference to the segregation mode of the X univalent. The karyotype formula was $16 \text{ II} + \text{X}$. The X chromosome was pre-reductional, which confirms some earlier findings. Occurrence of the pre-reductional X in *Lycidae* suggests that this family has branched off from the main cantharoid stock before the X chromosome, derived from the primitive Xy_p system, turned to post-reduction.

Introduction

The true cantharoid families (excluding *Cleridae* and *Melyridae*: Crowson 1960, Arnett 1968) share such cytological characteristics as symmetrical karyotypes, lack of autosomal heteropycnosis, chiasma frequency about 1 per bivalent, XO sex chromosome system, and post-reduction of the univalent X in male meiosis. Autosomal number is usually 9 pairs, except for the most 'modern' family, *Lycidae*, where 15 pairs have been found. When the number of studied species increases from the presently listed 28 (Smith & Virkki 1978), this cytological monotony is likely to be interrupted. Yadav (1973) has indeed reported already two species of *Cantharis* with the ancient polyphagan Xy_p sex bivalent which, as a rule, is pre-reductional.

Previous data on the reduction mode of the lycid X are scanty and controversial. Maxwell's finding on the Australian *Metriorrhynchus rhipidius* W.S.M. (in Smith 1960) meets the expectations: the X is post-reductional. Virkki (1963) came, however, to another conclusion. After careful observations on the late

meiotic phases of *Calopteron bifasciatum* Gorb., he felt obligated to propose pre-reduction of the X chromosome for this and other three Central American *Lycidae*. The conclusion was, however, based on a scanty cell material. Because Stevens (1909) observed a very late ('telophasic') division of the X in lampyrids, the lycid situation warrants a new study based on sufficient material.

Such an opportunity occurred when six males of *Thonalmus chevrolati* Bourg. were recently encountered at the peak of their meiotic process. This species belongs to *Lycinae*: *Thonalmini*, and is reported from Hispaniola and Puerto Rico (Blackwelder 1944). In the latter island it is supposedly a late introduction (Wolcott 1948).

Material and Methods

The six males were found November 28, 1977, and January 23, 1978, in Vacía Talega on the North coast of Puerto Rico, flying or sitting on low bushes of a narrow marshland between the coastal sand dune and mangrove swamp. The site is far from sugarcane fields, which shows that the species does not obligatorily associate with sugarcane, as might seem from its introduction and distribution history in Puerto Rico (Wolcott 1948, Martorell 1976).

Each testis of *Th. chevrolati* is composed of 22 whitish, rounded follicles. These were colored with Dyer's (1963) lacto-propionic orceine and squashed, one by one, on albuminised slides. A Zeiss Photomicroscope II provided with phase contrast optics was used for the study and photography.

Results

Spermatogonial mitoses were not encountered. This situation seems to be common in *Lycidae* and suggests a dormant or an exhausted germarium in the adult testes.

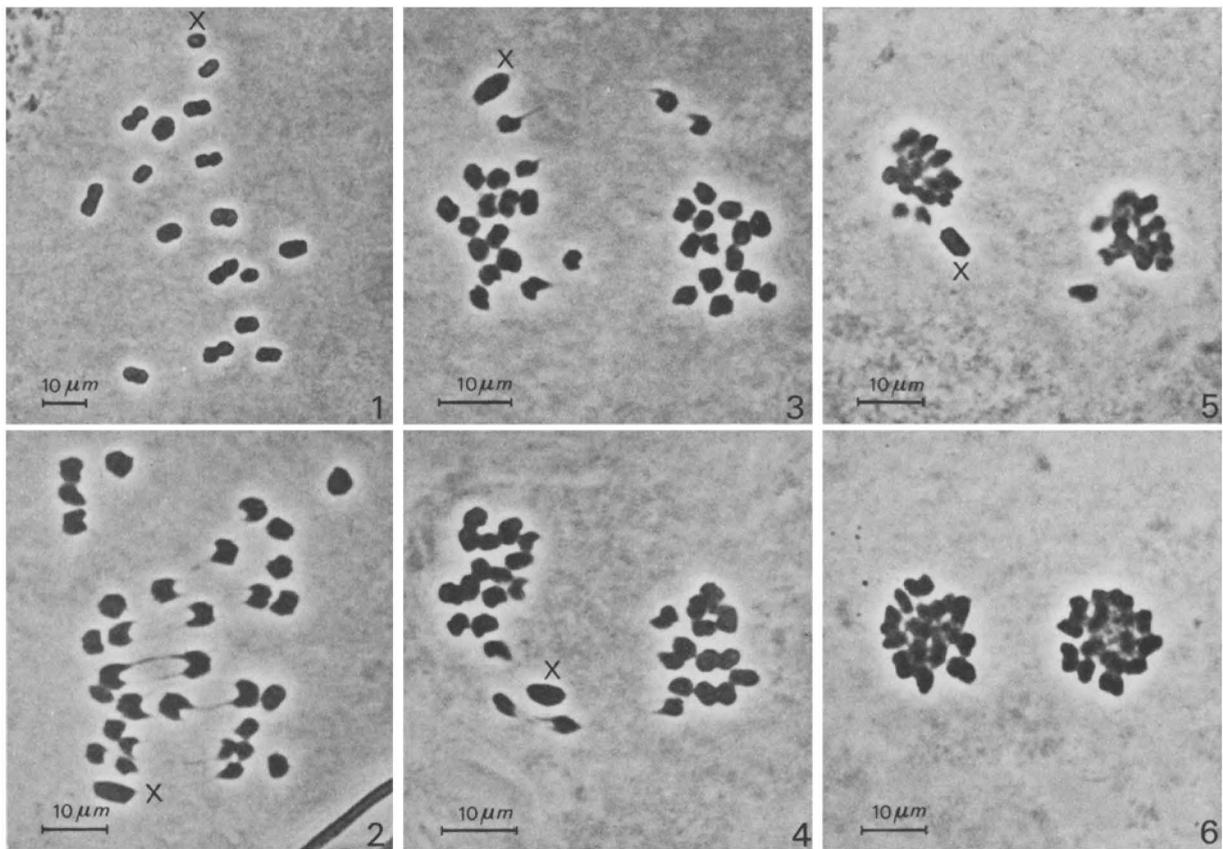
Meiotic prophase is typical of cantharoids: autosomes are euchromatic, the sex chromosome heteropycnotic.

Metaphase-I shows sixteen autosomal bivalents that form an evenly increasing series, and the unpaired X chromosome (Fig. 1). The haploid autosomal number is thus one higher than in the earlier studied lycids.

Four spermatocytes in three specimens were encountered in Anaphase-I. Although the number of spermatocytes I is 64 per cyst, only some of them were perfectly analyzable:

	X lagging	X cocessive
Specimen 1	5	11
	6	2
Specimen 2 (young A I)	0	10
Specimen 3	15	14
Total	26	37

At the beginning of the anaphase movement, the X tends to move together with one of the autosomal groups (specimen 2 above, and Figs. 2 and 3), but is then left behind and quite often lags until the latest A I (Figs. 4-6). In no case was division of X seen. Erroneous interpretations as to the division of X are possible in the relatively frequent cases of postcessive autosomal bivalents (Figs. 3-5).



Figs. 1-6. First meiotic division of male *Thonalmus chevrolati*, X chromosome marked with X: (1) M I; - (2) Early A I; - (3-4) Mid-A I; - (5) Late A I; - (6) T I.

Metaphase-II (Figs. 7 and 8) confirms the Anaphase-I observations. Two cysts of M II were found, each one in a different specimen. The small portion of the 128 cells per cyst that was perfectly analyzable suggests a regular segregation of X in the first division:

	16AA	16AA+X
Specimen 1	6	5
Specimen 2	16	16
Total	22	21

Conclusion: The karyotype formula of *Thonalmus chevrolati* is 16 + X, the X being pre-reductional.

Discussion

The phylogenetic implications of the pre-reductional X chromosome in *Lycidae* and the (still undocumented) Xy_p in *Cantharidae* (Yadav 1973) are as follows:

The tendency to lose the sex nucleolus and y_p are apparently early and common for the true cantharoid families. Still the Xy_p may survive in some sections of them. *Lycidae* retains the original orientation and reduction modus of the Xy_p : only the nucleolus and y_p have disappeared. In other families, the X derived from Xy_p has turned to post-reduction (nucleolar association cannot cope with post-reduction). Thus branching off of *Lycidae* from the main cantharoid stock must have occurred before the switch of X to post-reduction. Otherwise, the very unlikely double switch of X from pre-reduction to post-reduction to pre-reduction had to be postulated. If post-reduction really occurs in *Lycidae* (*Metriorrhynchus?*), it should be due to convergent evolution; some tendency to X post-reduction might date back to the branching off from the main Cantharoidea.

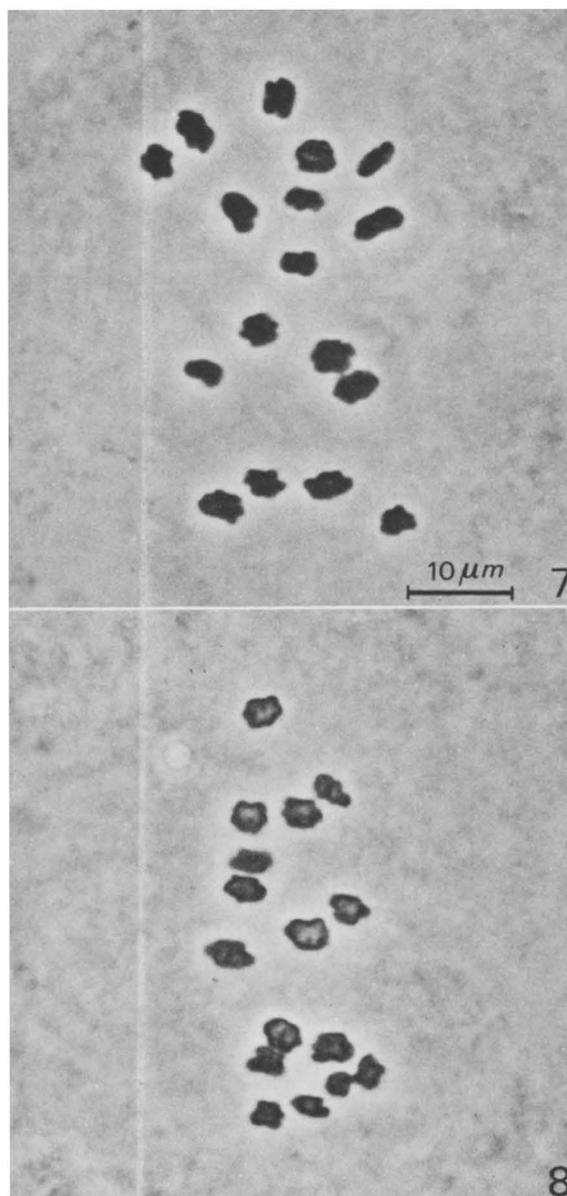
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Figs. 7 and 8. Second meiotic division of male *Thonalmus chevrolati*: (7) M II, 16 AA + X; - (8) M II, 16AA.

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