Research Note

BRIEF NOTES ON THE CYTOLOGY OF NEOTROPICAL COLEOPTERA 4. CHALCOLEPIDIUS SILBERMANNI *CHEVROLAT (ELATERIDAE:PYROPHORINI)*[1]

Pyrophorini is noted for its low chromosome numbers[2], the record having been found in the Brazilian *Chalcolepidius zonatus* Esch.[3]: 2n=4. For this reason we have been curious to check the chromosomes of the Puerto Rican *Ch. silbermanni* Chevr. This species, an apparent accidental introduction from the Dominican Republic[4], is beneficial because it predates on Cerambycid larvae.

Several females were found flying around fresh fuel wood piles (mango, cupey) in Carraízo Alto in March 1986. Larvae found in dead mango branches were kept in captivity and fed with Cerambycid larvae until pupation occurred. Three males were found in this sample: one pupa and two adults. All specimens were injected with 0.02% colchicine in tap water, and killed 30 to 60 min later. The testes, composed of numerous unfused follicles in the Elaterid fashion, are inconspicuous and hard to localize even in adults. Therefore, the dissection was made under a stereomicroscope, the abdomen covered with a fixative, acetic methanol (1:3). After about 30 min in this fixative, single testis follicles were briefly (up to 2 min) refixed in Kahle-Smith fixative (1 part glacial acetic acid to 3 parts formalin to 7.5 parts 99% ethanol), and squashed on albuminized slides. The main features of the spermatogenesis were immediately studied and photographed under phase contrast; then cover slips were removed in 50% ethanol, and the slides were silver stained according to Pathak and Elder[5].

In *Ch. silbermanni*, the diploid chromosome number is 2n=12, the male meioformula being 5+Xy (figs. 1 to 3). We suppose that the smallest chromosome is y; it is only very slightly smaller than X. Both sex chromosomes appear isopycnotic with the autosomes, or y may look slightly undercondensed probably because of its prophasic activity.

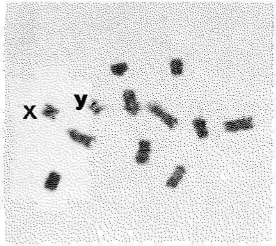

FIG. 1.—Spermatogonial metaphase; 2n=12 (X, y). Silver staining. 2136 ×.

[1] Manuscript submitted to Editorial Board 15 September 1986.

[2] Smith, S. G. and N. Virkki, Animal Cytogenetics: Coleoptera, edit. B. John, Borntraeger, Berlin-Stuttgart, 366 pp., 1978.

[3] Ferreira, A., D. Cella, J. R. Tardivo and N. Virkki, 1984. Two pairs of chromosomes: a new low record for Coleoptera, *Rev. Brazil. Genet.* 7: 231–40.

[4] Wolcott, G. N., The Insects of Puerto Rico: Coleoptera, 1948. *J. Agric. Univ. P. R.* 32: 225–416.

[5] Pathak, S. and F. F. B. Elder, 1980. Silver stained accessory structures in human sex chromosomes, *Hum. Genet.* 54: 171–75.

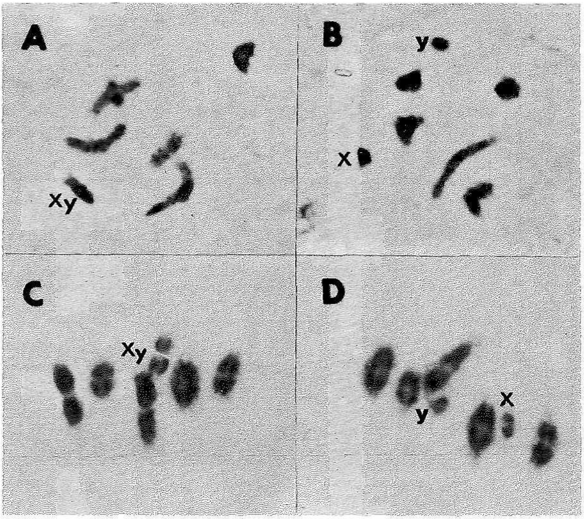

FIG. 2.—A to D.—First spermatocyte; 5+Xy or, occasionally, 5+X+y. Silver plus phase contrast. – A. Diplotene. One end of the Xy bivalent undercondensed (y?). – B. Diakinesis. Failure of sex chromosome pairing. – C. M I. Normal 5+Xy (y pointing upwards). – D. M I. Failure of sex chromosome pairing. The univalents apparently amphiorientated in the spindle. – A and D: 2136 ×, B and D: 2685 ×.

In the Puerto Rican *Ignilater* (*Pyrophorus*) *luminosus* (Ill.) we[6] recently found a mixed chiasmate/adhesive sex chromosome association, $X_p$neoXneoY_p, apparently derived from the primitive Polyphagan Xy_p by one evolutionary step: an autosomal incorporation through a translocation. In *Chalcolepidius*, the sex bivalent seems to be arranged either by a chiasma or by terminal contacts. It could be a "worn" neoXY, or its autosomal component might have been originally small. In about 5% of diakinesis (fig. 2B) and M I (fig. 2D) cells, the sex chromosomes show failure of pairing. Such sex univalents are capable of congression and, apparently, of amphitelic orientation in the M I spindle. As in other Pyrophorini, the chromosomes are provided with *distal collochores* (see Smith and Vir-

[6] Virkki, N., M. Flores and J. Escudero, 1984. Structure, orientation, and segregation of the sex trivalent in *Pyrophorus luminosus* Ill. (Coleoptera, Elateridae), *Canad. J. Genet. Cytol.* 26: 326–30.

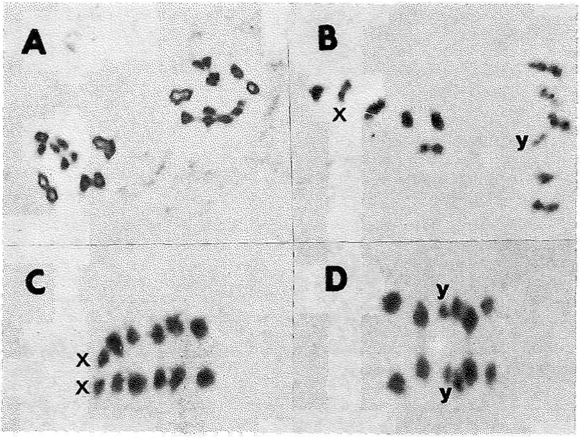

FIG. 3.—A to D.—Second spermatocyte; n=6 (with X, or with y). Silver plus phase contrast in A and B, silver only in C and D.—A.—T I. Number 12 can be counted in the lower cell, because sister chromatids are maintained together only by their distal collochores. Chromatids of the two lowest chromosomes of the upper cell have not yet opened up completely.—B.—M II, one plate with X, another with y chromosome. Note the "bivalent look" of the chromosomes, characteristics for M IIs where distal collochores are involved.—*C.—A II*, with X chromosome.—*D.—A II*, with y chromosome. – *2136* ×.

kki[2] p. 96, and Virkki[7, 8]), a characteristic shared—among other features[9]—with Lampyridae. An increased distance between sister chromatid centromeres caused by this condition, together with the small size of the sex chromosomes, should facilitate an amphitelic orientation of the univalents.[10] Contrary to those of Oedionychina (Chrysomelidae), where the sister chromatids open up around their distal collochores at PM II,[11] the chromatids of *Ch. silbermanni* have done so already at T I (fig. 3A).

Judging from spermatogonial and M II plates, all *Ch. silbermanni* chromosomes

[7] Virkki, N., *Colocores cromatidales proximales vs. distales en Coleoptera, Genética,* 1984. Res. VI Congr. Latinoam. Genética, Maracaibo, Venezuela, p. 241.

[8] Virkki, N., 1984. Chromosomes in evolution of Coleoptera, pp. 41–76. *In* A. K. Sharma and A. Sharma, Eds, Chromosomes in Evolution of Eukaryotic Groups, Vol. II, CRC Press, Florida, 269 pp.

[9] Crowson, R. A., 1967. The Natural Classification of the Families of Coleoptera, Classey Ltd., Hampton, England; reprinted by Bidders Ltd., Guilford, England, 214 pp.

[10] Peters, G. B., 1985. Behaviour of meiotic univalents during metaphase I: natural variants and computer simulations, *Cytobios* 43: 179–98.

[11] Virkki, N., 1985. The cytogenetic system of Oedionychina (Alticinae), *Entomography* 3: 489–97.

are telo- or acrocentric and thus well qualified for centric fusions. Three centric fusions would produce a meioformula 2+neoXY, of metacentric autosomes. Before this formula turns to the record 1+XY found in *Ch. zonatus*, further rearrangements are needed, perhaps as suggested by Ferreira et al.[3] (see also Virkki[8]).

Reduction of the chromosome number to 2n=4 is very rare in Eukaryote animals. Not counting the compound chromosomes of *Parascaris equorum*, only some Nematoda,[12] with the record, 2n=2, in *Diploscapter coronata*,[13] some Acari,[14] and some Coccoidea,[15, 16] remain, in addition to *Chalcolepidius zonatus*. Certainly, this small Pyrophorine genus, widely distributed in the Neotropics, is worth further cytogenetic studies.

Niilo Virkki
Aida Denton
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[12] Triantaphyllou, A. C., 1984. Chromosomes in evolution of Nematodes, pp. 77–101. *In* A. K. Sharma and A. Sharma, Eds, Chromosomes in Evolution of Eukaryotic Groups, Vol. II, CRC Press, Florida, 269 pp.

[13] Hechler, H. C., 1968. Postembryonic development and reproduction in *Diploscapter coronata* (Nematoda: Rhabditidae), Proc. Helminthol. Soc. Washington 35: 24–30.

[14] Oliver, J. H., 1971. Parthenogenesis in mites and ticks (Arachnida: Acari), *Am. Zool.* 11: 283–99.

[15] Hughes-Schrader, S., 1966. Hermafroditism in an African Coccid, with notes on other Margarodids (Coccoidea-Homoptera), *J. Morph.* 113: 173–84.

[16] Hughes-Schrader, S., 1966. Hermaphroditism in *Icerya zeteki* Cockerell, and the mechanisms of gonial reduction in Iceryine Coccids (Coccoidea: Margarodidae Morrison), *Chromosoma* 20: 15–31.