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CYTOGENETIC SURVEY OF SOME BRAZILIAN CERAMBYCIDAE (COLEOPTERA, POLYPHAGA, CHRYSOMELIDAE)

Amilton Ferreira[1], Vera L. Condutta[1] and Vanderlei G. Martins[2]

ABSTRACT

Meioformula was determined in 16 species of the family Cerambycidae, seven of them of the subfamily Cerambycinae, eight of Lamiinae and one of Prioninae. Only two species of Cerambycinae and one of Lamiinae showed the basic Polyphaga karyotype ($9+Xy_p$) and the remaining ones showed occurrence of centric fusions and fissions that have modified the basic karyotypes. These results are in accordance with previous studies on other species of this family.

INTRODUCTION

The Order Coleoptera includes millions of unidentified species (Erwin, 1983) and only about 3,000 of them have been briefly checked cytologically. This is a number too small for a general view of the course of karyotype evolution associated with the successful series of speciations that has led to this largest of all animal orders. Primitive Polyphaga have nine pairs of metacentric autosomes, combined with sex chromosomes of a very different size (Smith, 1950, 1953, 1960; Smith and Virkki, 1978). In male meioses, these X and Y chromosomes form a parachute-shaped bivalent (Stevens, 1906). Since Smith (1950), it is usually marked Xyp (X>y; subindex p from parachute).

The polyphagan family Cerambycidae consists of phytophagous, especially xylophagous species of agricultural and silvicultural importance. In the Neotropics, many are large and colorful.

[1] Departamento de Biologia - UNESP, Caixa Postal 178, 13500 Rio Claro, SP, Brasil. Send correspondence to A.F.

[2] Faculdade de Filosofia e Ciências - UNESP, Caixa Postal 420, 17500 Marília, SP, Brasil.

Of the approximately 200 cerambycidae which have been cytologically examined, 1% belong to the subfamily Prioninae, 5% to Cerambycinae, 11% to Lepturinae, 34% to Aseminae and 53% to Lamiinae. The high proportion of Lamiinae studied may be due to the abundant presence of all spermatogenetic stages in the adults, whereas in the other subfamilies meiosis tends to be nearly absent in adult males (Ehara, 1956).

The chromosomes of the Brazilian Cerambycidae are practically unknown. There is only one record, 12 autosomes plus the parachute-shaped sex bivalent ($12+Xy_p$) in a prionine, *Callipogon armillatum* (Ferreira and Mesa, 1977). In the present paper, meiotic chromosomes of 16 species are presented.

MATERIALS AND METHODS

Only male meiosis was studied. Excised testes were treated for five minutes in hypotonic Na citrate solution (0.45%), then fixed in acetic ethanol (1:3) for 30 minutes. Thereafter, testis fragments were teased with pins and spread on a slide in a drop of 45% acetic acid. The preparations were dried on a hot plate and stained in a 0.5% acetic orcein solution for 40 minutes, then rinsed twice in 100% ethanol and mounted on a synthetic resin for microscopy.

Specimens were deposited in the insect collection of Departamento de Biologia of the Universidade Estadual Paulista "Julio de Mesquita Filho", Campus of Rio Claro, São Paulo, Brazil.

The species studied and the collection sites are as follows:

Cerambycinae

Acyphoderes hirtipes (Klug, 1825), Boraceia (São Paulo State)
Megacyllene acuta (Germar, 1824), Piquete (São Paulo State)
Minochroma equestris (Gounelle, 1911), Boraceia (São Paulo State)
Coleoxestia sp
Coleoxestia denticornis (Gahan, 1892), Rio Claro (São Paulo State)
Mionochroma distinguendum (Gounelle, 1911), Boraceia (São Paulo State)
Retrachides thoracicus (Olivier, 1895), Rio Claro (São Paulo State)

Lamiinae

Hypsioma gibbera (Serville, 1832), Rio Claro (São Paulo State)
Acanthoderes nigricans (Lameere, 1893), Sta. Rita do Passa Quatro (São Paulo State)

Dryocteres scropulosus (Germar, 1824), Rio Claro (São Paulo State)
Macrophora accentifer (Olivier, 1895), Rio Claro (São Paulo State)
Acrocinus longimanus (Lineu, 1758), Cruzeiro do Sul (Acre State)
Steirastoma marmoratum (Thunberg, 1822), Piquete (Minas Gerais State)
Acanthoderes vetusta (Bates, 1880), Rio Claro (São Paulo State)
Pachypeza teres (Pascoe, 1888), Itu (São Paulo State)

Prioninae

Pirodes nitidus (Fabricius, 1787), Boraceia (São Paulo State)

RESULTS AND DISCUSSION

Cerambycinae

Among the seven species studied, only *Acyphoderes hirtipes* (Figure 1A) and *Megacyllene acuta* have the basic Polyphagan karyotype 9+Xy_p, with all autosomes metacentric or submetacentric. The X chromosome is also metacentric, and the y chromosome punctiform. *Mionochroma equestre* (Figure 1D) and one species of *Coleoxestia* (Figure 1B) possess 22 chromosomes, which are associated with 10+Xy_p at MI. *Coleoxestia denticornis* has an additional autosomal pair: 11+Xy_p (Figure 1C), and another *Mionochroma, M. distinguendum*, shows 12+Xy_p in diakinesis (Figure 1E). The highest chromosome number in our material was found in *Retrachides thoracicus*: 15+Xy_p (not shown). *Retrachides thoracicus* specimens of Uruguayan origin have the same meioformula, whereas *T. striatus* has 10+Xy_p (de Vaio *et al.*, 1985).

The basic Polyphagan 9+Xy_p was encountered only in *Hypsioma gibbera* (not shown). *Acanthoderes vetusta* shows 14+Xy_p (Figure 1F). 10+Xy_p was found in *Macrophora accentifer* (Figure 2A) and *Steirastoma marmoratum* (Figure 2B), as well as in *Acanthoderes nigricans, Dryocteres scropulosus*, and *Acrocinus longimanus*. *Pachypeza teres* had the lowest number but the largest chromosomes in our study: 5+Xy_p (Figure 2C).

Prioninae

The only prionine studies, *Pirodes nitidus*, had the highest chromosome number: 17:Xy_p (Figure 2D).

In summary, only two cerambycinaes and one lamiine were found to have the basic polyphagan meioformula 9+Xy_p. The autosome number was generally higher than the basic nine pairs, with one exception, five pairs in the lamiine *Pachypeza teres*. This

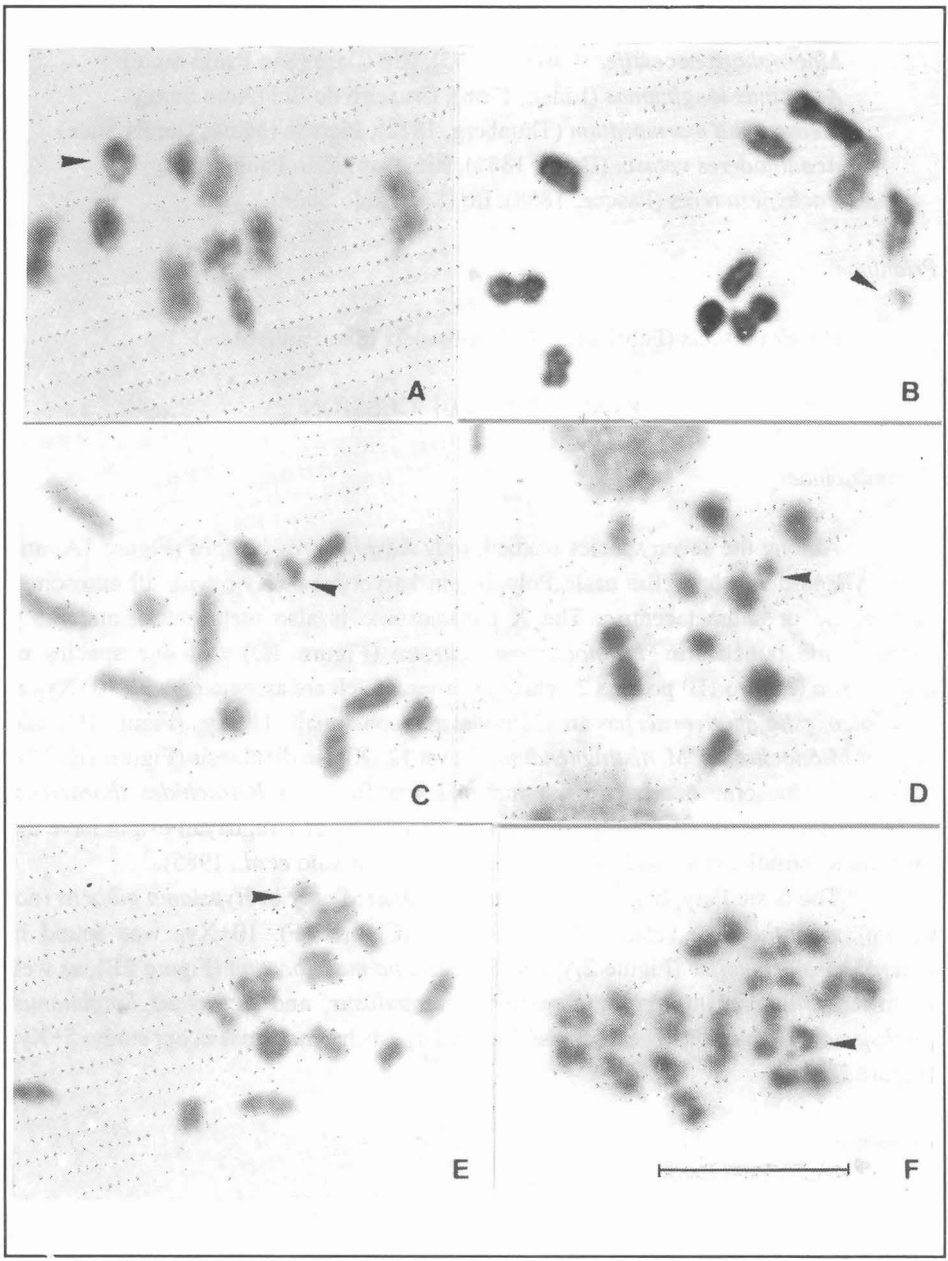

Figure 1 - A, *Acyphoderes hirtipes* (M.I.); B, *Coleoxestia* sp (M.I.); C, *Coleoxestia denticornis* (M.I.); D, *Mionochroma equestre* (M.I.); E, *Mionochroma distinguendum* (Diakinesis); F, *Acanthoderes vetusta* (M.I.). The arrows indicate the sex bivalents (Xy_p). The bar in F is 10 μm.

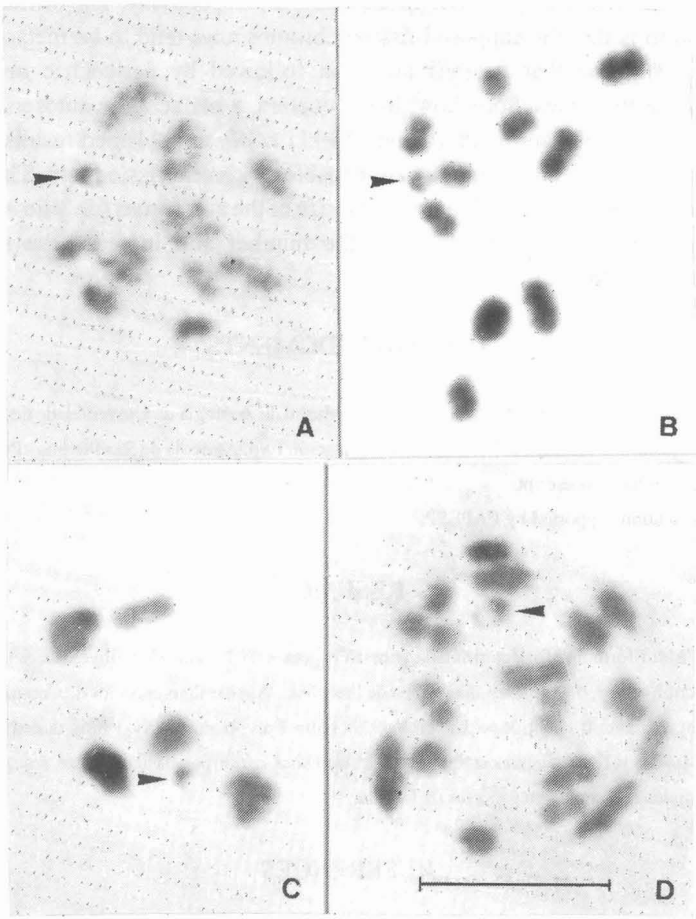

Figure 2 - A, *Macrophora accentifer* (Diakinesis); B, *Steirastoma marmoratum* (M.I.); C, *Pachypeza teres* (M.I.); D, *Pirodes nitidus* (M.I.). The arrows indicate the sex bivalents (Xy_p). The bar in D is 10 μm.

variation nearly covers the formerly recorded range for Cerambycidae, from *Plocaederus obesus* (four pairs, Nath *et al.*, 1951) to *Apriona japonica* (seventeen pairs, Abe *et al.*, 1971c). The only sex chromosome system encountered was Xy_p, which is in accordance with earlier observations that this system prevails in Cerambycidae (Ehara, 1956; Yadav, 1971; Abe *et al.*, 1971a,b; Kudo *et al.*, 1972, 1974; Ferreira and Mesa, 1977; Smith and Virkki, 1978; Virkki, 1984; de Vaio *et al.*, 1985).

Series of increasing and decreasing autosomal numbers in related coleopterans are usually attributed to centric fissions and fusions, respectively. The difficulty met by this explanation is that the supposed fission chromosomes tend to be metacentric. It is necessary to suppose that fissions are soon followed by pericentric inversions in coleopteran chromosomes. Somehow, in Coleoptera, a metacentric autosome seems to be favored over its telocentric alternative (Virkki *et al.*, unpublished results). The new metacentric formed by insersion is again capable of centric fission, etc. The recurrent fissions increase the number and decrease the size of the autosomes (de Vaio *et al.*, 1985). The fusions, on the contrary, decrease the number and increase the size of the chromosomes (Figure 2C).

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RESUMO

A "Meio fórmula" foi determinada para 16 espécies da família Cerambycidae, sete das quais da subfamília Cerambycinae, oito de Lamiinae e uma de Prioninae. Apenas duas espécies de Cerambycinae e uma de Lamiinae apresentaram o cariótipo básico da subordem Polyphaga ($9+Xy_p$) e as demais mostraram a ocorrência de fusões e fissões cêntricas que modificaram seus cariótipos básicos. Estes resultados estão de acordo com estudos anteriores em espécies da família.

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