

FIRST CONTRIBUTION TO THE CYTOGENETICS OF BRAZILIAN PSOCOPTERA

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ABSTRACT

Two Brazilian species of Psocoptera (Insecta), *Cerastipsocus fuscipennis* and *Seopsocus acuminatus* Roesler, were studied cytogenetically. Both species present $2n = 17 \text{♂} - 18 \text{♀}$, the same karyotype as that found for the majority of other species in the order. During first prophase, in many nuclei of *C. fuscipennis* the X chromosome is divided into two segments that join in a single block during first metaphase. The data reported here represent the first cytogenetic information about Brazilian Psocoptera.

INTRODUCTION

Few cytogenetic studies have been carried out thus far on Psocoptera, with only 24 species having been submitted to chromosome investigation. Pioneering work was first published by Boring (1913) who determined the chromosome number of *Cerastipsocus venosus* males as $2n = 17$ (XO). In Hong Kong, Wong and Thornton (1966) analyzed 21 species from 17 genera belonging to 12 psocid families, most of which presented $2n = 17$.

Two obligatory telitocous species were investigated by Jostes (1975): *Lepinotus reticulatus* ($2n = 18$) and *Liposcelis bostrychophilus* ($2n = 16$). According to Goss (1954), *L. bostrychophilus* presents $2n = 18$, as determined by the analysis of serial sections. Meinander *et al.* (1974, *apud* New, 1987) mentioned that psocids are a considerably homogeneous group in terms of chromosome complement. The mechanism of sex determination in males is of the XO type in all species studied.

The objective of the present study was to describe cytogenetically two species of Brazilian psocids belonging to the families Psocidae (*Cerastipsocus fuscipennis*) and Amphientomidae (*Seopsocus acuminatus*).

MATERIAL AND METHODS

Cerastipsocus fuscipennis (Burmeister) was mainly collected from September 1989 to March 1990 in small colonies from tree trunks in the vicinity of Rio Claro, State of São Paulo. *S. acuminatus* Roesler specimens were collected in July 1990 from tree trunks on the UNESP Campus of Rio Claro, State of São Paulo, as individuals dispersed along the trunk.

Adult *S. acuminatus* males, and male and female *C. fuscipennis* nymphs and adults were used to obtain chromosome preparations. Ovaries and testes were submitted to hypotonic treatment with 0.075 KCl for 5 to 10 minutes and squashed in a drop of 45% acetic acid. Slides were stained with 0.5% lactoacetic orcein.

RESULTS

Cerastipsocus fuscipennis presented $2n = 17$, XO for males and $2n = 18$ for females (Figure 1). The X chromosome behaved in a peculiar manner in the males of this species. During prophase, this chromosome at times appeared to be a normal univalent (Figure 1C) and at others it showed a small block attached by a chromatin filament (Figure 1A, D), or with no apparent connection (Figure 1B). During metaphases I and II, this chromosome appeared to be a normal univalent (Figure 1E, F).

S. acuminatus presented $2n = 17$, XO for males. In contrast to *C. fuscipennis*, the X chromosome of *S. acuminatus* showed the typical behavior of a univalent during prophase (Figure 2A). The chromosome complement presented a large pair (pair 1), and the remaining ones gradually decreased in size. The X chromosome appeared to be the smallest in the complement (Figure 2C).

A list of Psocoptera species studied thus far is presented below.

Family/Species	2n	Sex mechanism	Reference
Trogiidae			
<i>Lepinotus inquilinus</i>	17	XO ♂	Wong and Thornton, 1966
<i>Lepinotus reticulatus</i>	18	XX ♀	Jostes, 1975
Psoquillidae			
<i>Psoquilla marginepunctata</i>	19	XO ♂	Wong and Thornton, 1966

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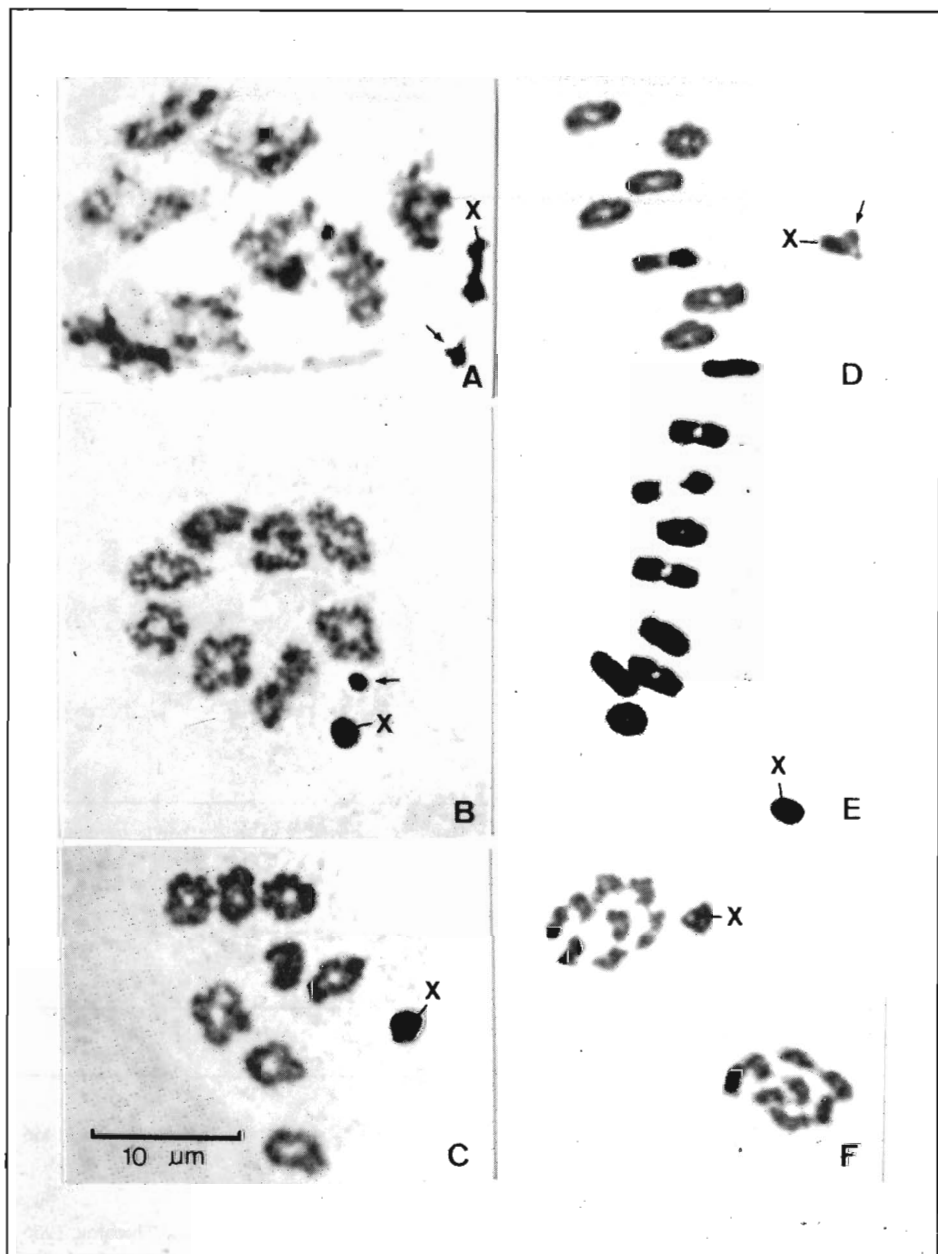


Figure 1 - Meiosis in *Cerastipsocus fuscipennis*. A, B, C, Diplotene; D, diakinesis; E, metaphase I; F, metaphase II (the arrows indicate a chromatin segment attached to the X chromosome).

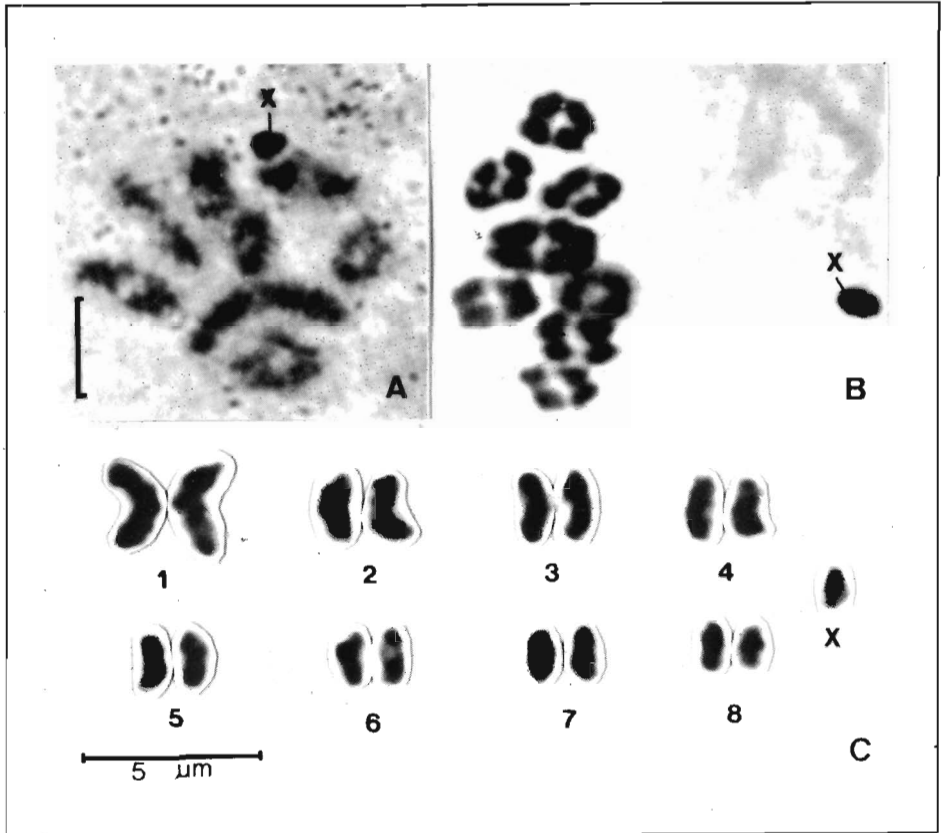


Figure 2 - Chromosomes of *Seopsocus acuminatus*. A, Diplotene; B, metaphase I; C, karyotype mounted from a spermatogonial metaphase preparation.

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Family/Species	2n	Sex mechanism	Reference
Psyllipsocidae			
<i>Psocatropos</i> sp	29	XO♂	Wong and Thornton, 1966
Amphientomidae			
<i>Seopsis</i> sp	15	XO♂	Wong and Thornton, 1966
<i>Seopsocus acuminatus</i>	17	XO♂	This paper

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Family/Species	2n	Sex mechanism	Reference
Caeciliidae			
<i>Caecilius singaporensis</i>	17	XO♂	Wong and Thornton, 1966
<i>Caecilius</i> sp	17	XO♂	Wong and Thornton, 1966
<i>Dypsocus</i> sp	17	XO♂	Wong and Thornton, 1966
Mesopsocidae			
<i>Mesopsocus hongkongensis</i>	17	XO♂	Wong and Thornton, 1966
Philotarsidae			
<i>Haplophallus orientalis</i>	17	XO♂	Wong and Thornton, 1966
Peripsocidae			
<i>Ectopsocopsis cryptomeriae</i>	17	XO♂	Wong and Thornton, 1966
<i>Ectopsocus maindroni</i>	17	XO♂	Wong and Thornton, 1966
<i>Peripsocus fasciatus</i>	17	XO♂	Wong and Thornton, 1966
<i>Peripsocus quercicola</i>	17	XO♂	Wong and Thornton, 1966
<i>Peripsocus</i> sp	17	XO♂	Wong and Thornton, 1966
Hemipsocidae			
<i>Hemipsocus</i> sp	17	XO♂	Wong and Thornton, 1966
Pseudocaeciliidae			
<i>Pseudocaecilius hirsutus</i>	17	XO♂	Wong and Thornton, 1966
Archipsocidae			
<i>Archipsocus</i> sp	17	XO♂	Wong and Thornton, 1966
Psocidae			
<i>Cerastipsocus venosus</i>	17	XO♂	Boring, 1913
<i>Cerastipsocus fuscipennis</i>	17	XO♀	Present paper
<i>Liposcelis bostrychophilus</i>	18?	XX♀	Goss, 1954
	16	XX♂	Jostes, 1975
<i>Psococerastis sinensis</i>	17	XO♂	Wong and Thornton, 1966
<i>Ptycta incurrata</i>	17	XO♂	Wong and Thornton, 1966
<i>Trichadenotecnum medium</i>	17	XO♂	Wong and Thornton, 1966
<i>Trichadenotecnum nudum</i>	17	XO♂	Wong and Thornton, 1966

DISCUSSION

According to the observations made on species studied by several investigators, including the two species reported here, the $2n = 17\delta - 18\varphi$ karyotype with an XO $\delta - XX\varphi$ mechanism of sex determination seems to be the basic karyotype of psocids.

The division of the X chromosome into two blocks of different sizes observed in most nuclei during prophase in *C. fuscipennis* suggests a X_1X_2O type mechanism in males, with both blocks migrating to the same pole during anaphase II, as is the case for most species of spiders of the family Salticidae (Maddison, 1982) and for the cricket *Cycloptylodes americanus* of the family Mogoplistidae (A. Mesa, unpublished results). However, observations made on females show that the sex mechanism of males is indeed XO. The division of the X chromosome during prophase I is probably due to the presence of an elastic constriction such as that described by White (1957) for *Moraba scurra* and by Mesa (1964) for the X_2 chromosome of the cricket *E. surinamensis*.

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RESUMO

Dois espécies brasileiras de Psocoptera (Insecta) foram estudadas; ambas apresentam $2n = 17\delta - 18\varphi$, o mesmo cariótipo encontrado por outros autores, na maioria das espécies. Durante a profase I a espécie *Cerastipsocus fuscipennis* apresenta, em alguns núcleos, o cromossomo X dividido em dois blocos, mas na metáfase I o mesmo aparece sempre como um univalente normal.

REFERENCES

- Boring, A.M. (1913). The odd chromosome in *Cerastipsocus venosus*. *Bid. Bull. Mar. Biol. Lab., Woods Hole* 24: 125-132.
- Goss, R.J. (1954). Ovarian development and oogenesis in the book louse, *Liposcelis divergens*. Bandonnell (Psocoptera, Liposcelidae). *Ann. Ent. Soc. Amer.* 47: 180-207.
- Jostes, R.F. (1975). A method for determining the chromosome numbers of parthenogenetic psocids (Insecta: Psocoptera). *Cytologia* 40: 553-555.
- Maddison, W.P. (1982). XXXY Sex chromosomes in males of the jumping spider genus *Pellenes* (Araneae: Salticidae). *Chromosoma* 85: 23-37.
- Mesa, A. and Bran, E.J. (1964). Acerca de los cromossomas de *Eneoptera surinamensis*. *Ann. II. Congr. Zool. S. Paulo* 1: 9-16.

New, T.R. (1987). Biology of the Psocoptera. *Oriental Insects* 21: 1-109.

White, M.J.D. (1957). Cytogenetics of the grasshopper *Moraba scurra*. IV. Heterozygosity for "Elastic Constrictions". *Austr. Jour. Zool.* 5: 348-355.

Wong, S.K. and Thornton, I.W.B. (1966). Chromosome numbers of some Psocid genera (Psocoptera). *Nature* 211: 214-215.

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