

Karyotype and Reproductive Organs of Male *Dorypteryx domestica* (Smithers, 1958) (Psocoptera: Trogiomorpha: Psyllipsocidae)

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The karyotype and male reproductive system, with special reference to the number of testicular follicles and shape of seminal vesicles, were studied in *Dorypteryx domestica* (Smithers, 1958) (Psocoptera: Trogiomorpha: Psyllipsocidae). This species displays $2n = 29$ (28+X), a single nucleolus connected with one of the largest autosome pairs, and paired testes, each consisting of a single, large seminal follicle and a long, slightly coiled seminal vesicle.

Key words: Psocoptera, *Dorypteryx domestica*, karyotype, reproductive organs.

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Psocoptera (psocids) are small, soft-bodied insects living on various plant materials in the wild. They constitute one of the smaller orders of pterygote insects with about 4400 species known worldwide (LIENHARD & SMITHERS 2002). About 1% of the species are associated with synanthropic conditions and are known to be stored-product pests, with a mostly cosmopolitan occurrence.

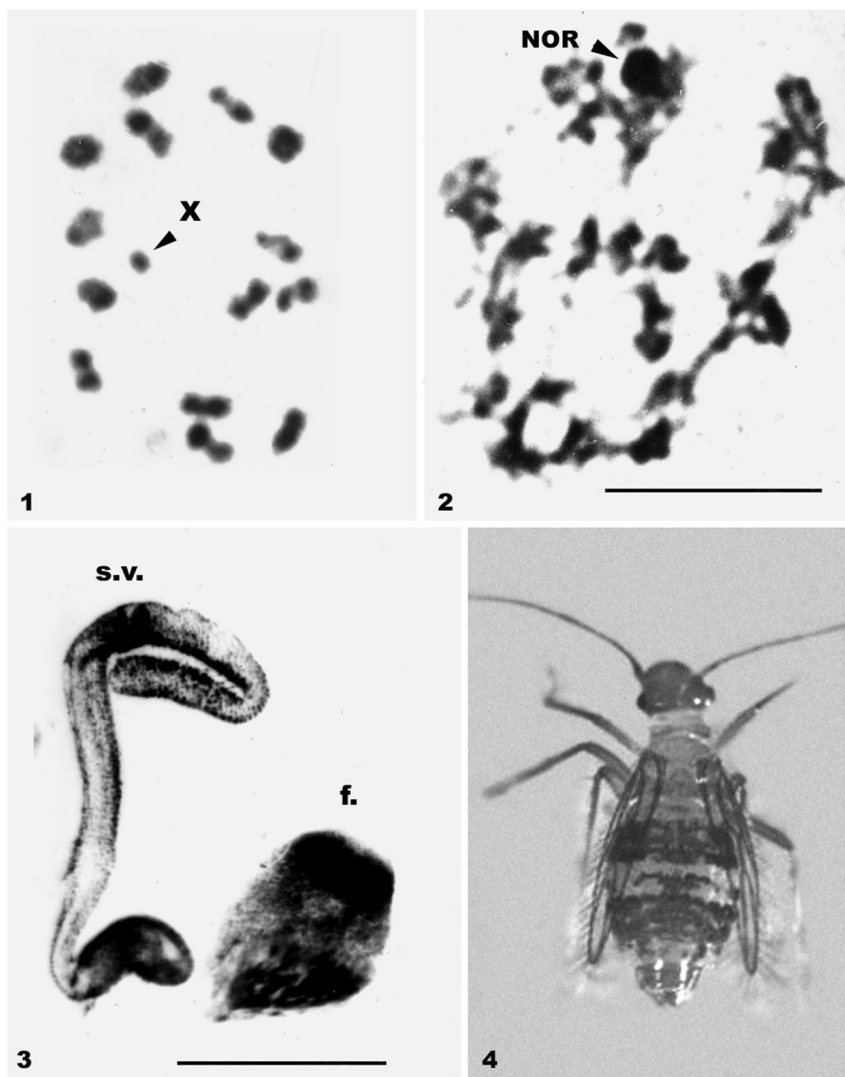
The Psocoptera is subdivided into three suborders. Suborder Trogiomorpha includes species with plesiomorphic characters and is considered as the sister group of the two other psocopteran suborders, Troctomorpha and Psocomorpha. This phylogenetic position is supported by morphological and also some molecular data (SMITHERS 1972; VISHNYAKOVA 1980; LIENHARD 1998; YOSHIZAWA & JOHNSON 2003). However, the phylogenetic relationships among psocopterans are still under scrutiny (BEES *et al.* 2006). A comprehensive study of Trogiomorpha is, therefore, of great importance for a clear understanding of the evolution of Psocoptera as a whole. Among over 340 described trogiomorphan species, only 5 and 7 species have been hitherto studied regarding karyotype and reproductive system, respectively (WONG & THORNTON 1966, 1968; MEINANDER *et al.* 1974; JOSTES 1975).

The present work provides the first data on karyotype and some characters of the male internal reproductive system of the synanthropic species *Dorypteryx domestica* (Smithers, 1958) (Trogiomorpha: Psyllipsocidae). This species commonly occurs as a brachypterous form with the occasional appearance of wing-polymorphic forms (KUČEROVÁ 1998).

Material and Methods

Specimens used for this study originate from a laboratory culture of *D. domestica* (Crop Research Institute, Prague, Czech Republic). Six brachypterous males (age 3-6 days) were selected according to the morphological characters of external genitalia. The specimens were fixed in a mixture of 96% ethanol and glacial acetic acid (3:1) and kept in a refrigerator. The abdomens of the insects were stained in 2% acetic orcein for 48 hours, afterwards, testes were dissected and squashed on slides in a drop of 45% acetic acid. The preparations were made permanent using the dry ice technique (CONGER & FAIRCHILD 1953).

Ag-staining was performed according to the technique developed by HOWELL & BLACK (1980):



Figs 1-4. Figs 1-2. Male meiotic chromosomes of *Dorypteryx domestica*, $n=14+X$. Fig. 1. Metaphase I. Fig. 2. Prophase I after AgNOR-staining. X – X-chromosome, NOR – nucleolar organizing region. Bar=10 μm . Fig. 3. Reproductive organs of *D. domestica* (lateral view): f. – testicular follicle; s.v. – seminal vesicle. Bar=1 mm. Fig. 4. *D. domestica*, brachypterous adult.

slides were incubated with 50% AgNO_3 and 1% gelatine developer during 6-8 min at 65°C , air-dried and mounted in Entellan.

Results

Karyotype

The meiotic complement of males comprises 14 pairs of autosomes and a univalent X chromosome (Fig. 1). In meiotic metaphase (MI), bivalents gradually decrease in size; the X-chromosome is close in size to half of a middle-sized bivalent. The formula of the male diploid karyotype was determined as $2n=29(28A + X)$.

After AgNO_3 -staining, a single nucleolus attached to one of the largest autosomal bivalents was detected in every cell (Fig. 2). The nucleolus

material is gradually dissipated during meiotic prophase and completely disappears by MI.

Reproductive system

Each testis comprises a single large follicle of roundish form and a long seminal vesicle, slightly coiled in its apical part (Fig. 3). The seminal vesicles of each testis are fused in their basal parts.

Discussion

Dorypteryx domestica is the second psocopteran species possessing the highest chromosome number, $2n = 29$, so far reported for Psocoptera as a whole. The other species, *Psocathropos* sp. ($2n = 29$), belongs to the same family Psyllipsocidae (WONG & THORNTON 1966). According to MOCKFORD

(1993) the genus *Dorypteryx* stands closest to the genus *Pseudorypteryx*, Garcia Aldrete, 1984, and these two genera probably form a sister clade to *Psocathropos* Ribaga, 1889. Besides $2n = 29$, the following numbers were revealed in Trogiomorpha: $2n = 22$ in females of *Trogium pulsatorium* (L.), $2n = 17$ in males of *Lepinotus inquilinus* Heyden, $2n = 18$ in parthenogenetic females of *L. reticulatus* Enderlein (Trogiidae), and $2n = 19$ in males of *Psoquilla marginepunctata* Hagen (Psoquillidae) (WONG & THORNTON 1966; MEINANDER *et al.* 1974; JOSTES 1975).

Troctomorpha and Psocomorpha are mainly characterized by lower chromosome numbers, however all three suborders share the same karyotype with $2n = 17$, X0, which is considered ancestral for Psocoptera, at least for the largest suborder Psocomorpha (GOLUB 2004).

Males of *D. domestica* have testes each consisting of a single follicle and a long coiled seminal vesicle. These characters are typical of Trogiomorpha, as found in all eight species examined in this respect (WONG & THORNTON 1968, present paper). The species differ by follicle shape (roundish or falciform) and by the degree of coiling and fusion of seminal vesicles that can be connected up to half of their lengths. Long, coiled and partly fused seminal vesicles probably represent an autapomorphy of Trogiomorpha. Troctomorpha and Psocomorpha differ from Trogiomorpha in having a more variable number of seminal follicles (1, 3, 4) and short seminal vesicles, fused along their full lengths with rare exceptions in which cases their apical parts are free.

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