

The male genitalia of *Monochamus sutor* (L.), *M. galloprovincialis* (Olivier) and *M. urussovi* (Fischer von Waldheim) (Coleoptera, Cerambycidae)

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Comparison of the male genitalia of the three *Monochamus* species occurring in Finland revealed differences in the structure and size of the median lobe: the shape of the apex is rounded in *M. sutor*, whereas in *M. galloprovincialis* it is slightly concave. *M. urussovi* has a completely flattened apex and the uppermost part of the basal struts extends far upward, almost reaching the apex. The length of the median lobe is distinctly larger in *M. urussovi* than in the two other species.

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1. Introduction

The genus *Monochamus* is represented by three species in Finland, *M. sutor*, *M. galloprovincialis* (Olivier) and *M. urussovi* (Fischer von Waldheim) (Saalas 1949). The larval stages of these beetles damage timber. In Finland *M. sutor* breeds on Norway spruce (*Picea abies* (L.)) and Scots pine (*Pinus sylvestris* L.) (Saalas 1949). *M. galloprovincialis* breeds exclusively on Scots pine and *M. urussovi* on Norway spruce.

The current worldwide interest in the genus is due to the role the adult beetles have as vectors of the pinewood nematode (PWN) *Bursaphelenchus xylophilus* (Steiner & Bühner 1934) (Aphelenchoididae) and its close relative *B. mucronatus* Mamiya & Enda 1979 (Mamiya & Enda 1972, 1979, Linit et al. 1983, Kobayashi et al. 1984, Magnusson & Schroeder 1989, Tomminen et al. 1989, Tomminen 1990).

According to the literature, one of the primary characters used in distinguishing *M. sutor* and *M. galloprovincialis* is the difference in the hair cover

of the scutellum (Saalas 1949, Freude et al. 1966, Hellrigl 1971, Schwenke 1974). In the former species a hairless transverse slit extends right across the scutellum, whereas in the latter species the hairless area extends only about halfway across the scutellum. It has also been suggested that in *M. sutor* the first segment of the tarsus of the legs is longer and narrower than in *M. galloprovincialis* (Saalas 1949).

The subspecies *M. galloprovincialis pistor*, occurring in Finland, has black legs like *M. sutor*. *M. galloprovincialis galloprovincialis*, with reddish legs, is distributed in central and central-western Europe (Freude et al. 1966).

M. galloprovincialis and *M. sutor* can usually be distinguished by the characters mentioned above. In general, the color of the elytral pubescence of *M. galloprovincialis* is somewhat greenish, as compared to the blacker wing covering of *M. sutor*. Also, the color of the hair of the scutellum is more orange in *M. galloprovincialis* than in *M. sutor*, where it is yellow or whitish. As

intermediate individuals occasionally occur, we investigated the male genitalia of these two species to see whether distinguishing characters could be found.

The third species, *M. urussovi*, was also included in the study. It differs clearly from *M. sutor* and *M. galloprovincialis*, being larger in size and having a small but distinct dent on the first half of the elytra as measured posteriorly from the scutellum.

Our approach is similar to that of Pershing & Linit (1985) in their study of two North American *Monochamus* species.

2. Materials and methods

The male genitalia of 13 individuals of *M. sutor*, 15 individuals of *M. galloprovincialis* and 12 individuals of *M. urussovi* were removed after the upper portion of the abdomen had been opened with microscissors. The specimens of *M. sutor* and *M. urussovi* were of museum origin (Dept. of Agricultural and Forest Zoology, University of Helsinki), having been collected in several locations in Finland and in a few places in the Soviet Union and in Poland. The specimens of *M. galloprovincialis* were from a laboratory population of the authors, originating from Tuohikotti, Finland (61°05'N, 27°03'E).

The dissected genitalia were placed in 10% potassium hydroxide, boiled, and moved through 70% to 94% alcohol. The treated genitalia were glued to a piece of white cardboard and the median lobes drawn using a dissecting microscope with a drawing tube.

The length of the median lobe was measured for each individual, and each beetle specimen was measured from the vertex of the head to the tips of the elytra. The differences in the measurements between species were tested using a one-way

Table 1. Body length and the length of the median lobe of the genitalia of *Monochamus sutor*, *M. galloprovincialis* and *M. urussovi*, mm, mean \pm SD.

Species	N	Body	Median lobe
<i>M. sutor</i>	13	22.3 \pm 2.06	2.89 \pm 0.18
<i>M. galloprovincialis</i>	15	22.4 \pm 2.1	3.07 \pm 0.26
<i>M. urussovi</i>	12	27.5 \pm 3.58	3.82 \pm 0.30

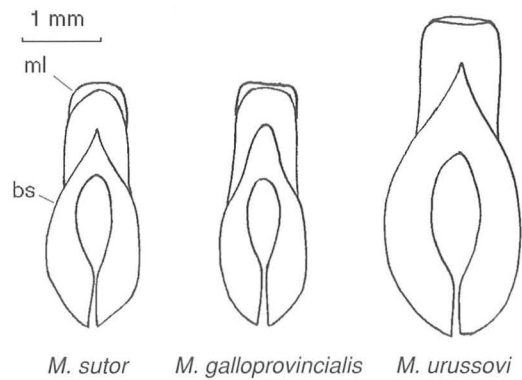


Fig. 1. *Monochamus* male genitalia, median lobe in ventral view. — ml = median lobe; bs = basal struts.

analysis of variance and pair-wise comparisons with the *t*-test. Before analysis the data values were transformed by inversion to obtain normality.

3. Results and discussion

The structure of the male genitalia complex of the genus *Monochamus* is extensively discussed in Pershing & Linit (1985). The general appearance of the genitalia of the three species occurring in Finland is very similar to that of the two North American species, *M. carolinensis* (Olivier) and *M. titillator* (Fabricius) (Pershing & Linit 1985). Pershing & Linit illustrated the internal sac, median lobe, tegmen and lateral lobe for *Monochamus*. They found that the two species compared differed only with regard to the characters of the median lobe. This is also the case for the three Finnish species. Consequently, only the median lobe in ventral view is illustrated for each species (Fig. 1).

The lateral margins of the median orifice in *M. sutor* are curvilinear, resulting in a somewhat bluntly rounded apex. In *M. galloprovincialis* the apex is more or less flattened, having a slightly concave shape.

In *M. urussovi* the apex of the median orifice is completely flattened, and the upper common portion of the basal struts extends far upwards, almost reaching the apex.

Measurements of the body length and the length of the median lobe (measured along a line

drawn from the apex of the median lobe to the base of the basal struts) are presented in Table 1. The only clearly significant differences are those between *M. urusovi* and the two other species.

Thus, the best character for separating *M. sutor* and *M. galloprovincialis* is the shape of the apex of the median lobe of the male genitalia.

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