

NOTES ON COPULATION OF THRIPS

BY

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INTRODUCTION

The copulation of thrips has been rarely observed due to its short duration, the small size of the thrips and their hidden way of living. We happened to possess eight copulating pairs of Terebrantia, viz., five of *Aeolothrips intermedius* Bagnall and one of each *Kakothrips robustus* Uzel, *Oxythrips brevistylis* Trybom and *Thrips angusticeps* Uzel. Mr. KYRAN DONCHEV had collected three of the above mentioned copulae of *A. intermedius* Bagnall in Bulgaria and Dr. J. DOEKSEN, one of the same species in the Netherlands. The remaining pairs were collected by us.

As far as we know no pictures of copulating thrips have ever been published. With our method of mounting the thrips appeared very clear and the mounts showed more details of the genitalia than prepared in any other way. Therefore we are publishing our findings here together with photographs taken by Mr. A. KOEDAM.

THE METHOD OF MOUNTING

The thrips are submerged in 70% ethylic alcohol. Before mounting they have to be macerated in order to permit the study of the position of the chitinous parts of the genitalia during copulation. We followed the slightly modified method of HILLE RIS LAMBERS (1950): the maceration is carried out in small test tubes in a water bath at a temperature of 100° C. First the material is heated carefully in a tube with 10% KOH for 4 to 7 minutes, depending on the size and the species of the thrips. Then KOH is replaced by a few cm³ of chloral phenol, a saturated solution of chloral hydrate in phenolum liquefactum. In this solution the material is heated again during the same time. The macerated thrips can be stored for 24 hours in cold chloral phenol. For mounting the thrips are poured with the chloral phenol in a watch glass and transferred to the mixture of FAURE, modified by us as follows: gummi arabicum 12 gram, distilled water 20 cm³, chloral hydrate 20 gram and glycerine (with specific gravity of 1,23) 16 gram or 13 cm³. With the exception of *Thrips angusticeps* Uzel, the copula was not disturbed during the maceration and mounting.

Dr. J. DOEKSEN had mounted the copula pair of *Aeolothrips intermedius* Bagnall in 1937, probably after maceration with 75% lactic acid.

The internal reproductive organs, the intestine and the membranous areas of the external genitalia disappear during maceration.

Before entering into details we will describe shortly the genitalia of the females and the males of thrips.

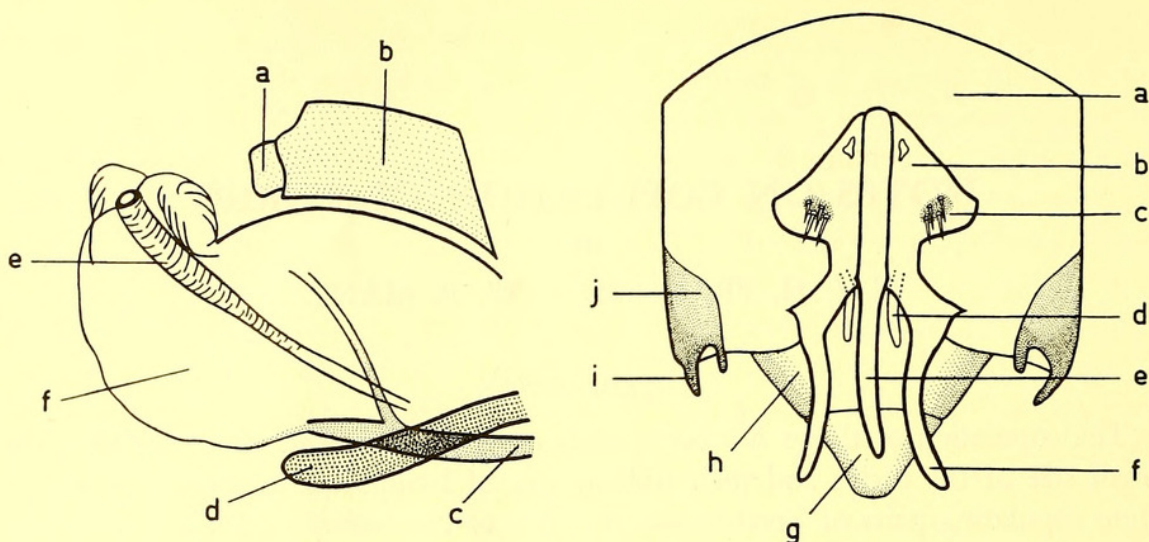


Fig. 1. External male genitalia of *Stenothrips graminum* Uzel (after DOEKSEN, 1941), a — XIth abdominal segment, b — Xth abdominal segment, c — aedeagus, d — ventral parameres, e — ductus ejaculatorius and f — vesicle. Fig. 2. Chitinous parts of the external male genitalia of *Aeolothrips intermedius* Bagnall. a — hypandrium, b — periandrium, c — bristles at the basal thickening of the ventral parameres, d — dorsal parameres, e — aedeagus, f — ventral parameres, g — XIth tergite, h — Xth tergite, i — coxite and j — coxal lobes

REPRODUCTIVE ORGANS OF THE FEMALE

Female Terebrantia have a pair of ovaries each composed of four ovarioles grouped more or less on each side of the body cavity. The apices of the ovarioles are joined by filaments to the posterior connective tissue of the short salivary glands. Each ovariole is a long tube in which the oocytes are situated in a single chain. The four pairs of ovarioles of one side open into an oviduct converging with that of the other side to form a common median oviduct (the vagina), leading to the exterior between the VIIIth and IXth (Terebrantia), or the IXth and Xth abdominal sternites (Tubulifera). Leading from the vagina is a tube which expands into a sack-like receptaculum seminis. In Tubulifera the organs are similar except that the ovarioles are connected by filaments to the long salivary glands (KLOCKE, 1926).

EXTERNAL GENITALIA OF THE FEMALE

The external genitalia of the female form the ovipositor, which is absent in the Tubulifera. The ovipositor consists of four blades (valves) between the VIIIth and IXth abdominal segments on both sides of the outlet of the vagina. In the Tubulifera the structure of the genital organ is quite different. The genital armature only consists of a small longitudinal apical chitinous rod (fustis, fus) and two aciculae (aci), curved needles situated in the segments VIII and IX of the abdomen. Thus external organs are entirely lacking.

REPRODUCTIVE ORGANS OF THE MALE

Male Terebrantia have a pair of testes. From each testis a narrow vas deferens leads backwards and expands a little into a vesicula seminalis before meeting with the other in a common duct, the ductus ejaculatorius. The upper end is somewhat

expanded and the expansion may serve as spermatheca. The ductus ejaculatorius opens in the phallus between the IX and X abdominal segments, in front of, and ventral to, the anus. It passes through the phallus and leads finally to the exterior (fig. 2). In the Tubulifera the organs are similar, except for the presence of two pairs of accessory glands. For further peculiarities we refer to DOEKSEN (1941), KLOCKE (1926) and PRIESNER (1928).

EXTERNAL GENITALIA OF THE MALE

The external male genitalia or phallus for the greater part consist of a membranous, balloonlike portion, armed and supported by chitinous structures of various shapes (DOEKSEN, 1941; HARTWIG, 1952; PRIESNER *in* TUXEN, 1956). The phallus (fig. 2) is distended and extruded during copulation only. DE GRUYSE & TREHERNE (1924) were under the wrong impression that the aedeagus functioned as a phallus so that they called it the phallus. All the extrusible parts of the genitalia however must be looked upon as forming the phallus because the ductus ejaculatorius passes right through this organ.

The terminology of the basal sclerotized portions of the phallus may cause confusion since not all authors use the same names for corresponding parts (DE GRUYSE & TREHERNE, 1924; PRIESNER, 1928; DOEKSEN, 1941; HARTWIG, 1952; ANANTHAKRISNAN, 1953). PRIESNER treated the external genitalia of Thysanoptera (PRIESNER *in* TUXEN, 1956). In the present paper his terminology is adopted.

The ninth sternite forms the genital plate or hypandrium (fig. 1, a). The tenth sternite (fig. 1, b) in the Tysanoptera has been interpreted as forming the basal portion of the phallus and has been called the periandrium or subgenital plate. To the periandrium are attached the abductor and adductor muscles of the genital apparatus, as well as the phallus and its accessory structures. The chitinous armatures of male genitalia in Terebrantia consist of a median process (aedeagus) and four lateral hypophallic arms (parameres, hypophallus, see fig. 1, d and f); attached to it, from the base, there is a membranous vesicle (epiphallus) bearing various chitinous thickenings and small tooth-like appendages.

The aedeagus is a chitinous rod (fig. 1, e). This piece is surrounded by a pair of much shorter rods (dorsal parameres, fig. 1, d), and another pair of usually somewhat longer parts (ventral parameres, fig. 1, f); the former shorter ones lie closest to the aedeagus and more dorsal, whereas the ventral parameres are the most conspicuous parts. The dorsal parameres may be absent so that instead of five appendages only three can be seen.

At the basal thickening the ventral parameres invariably have a set of bristles which are conspicuous in most species of *Aeolothrips* (fig. 1, c).

However, there is much difference in structure of the male organ between the two suborders Terebrantia and Tubulifera. Quite different and much reduced is the phallus of Tubulifera. Considerable fusions are apparent. For peculiarities we refer to the publication of PRIESNER *in* TUXEN (1956).

In the *Aeolothrips*-species on the dorso-lateral angles of the hypandrium there appears a rather short but distinct chitinous plate, bearing setae and a bifid hook-like process as illustrated in fig. 1. These are the coxal lobes and coxites (DE GRUYSE & TREHERNE, 1924 or "Greifzangen" or "Haltezangen" (PRIESNER, 1928).

COPULATION

Before copulation the male places itself in a slanting position under the female, with the ventral side attached to the partner. Then the copulation takes place (pl. 25—27).

From the photographs the following is apparent. The chitinous skeleton of the external male genitalia is clearly visible in the vagina, as well as the part of the vesicle remaining after maceration. It is also clear that the genital opening is located at the base of the valves forming the ovipositor.

The photographs (pl. 25, above, right, and pl. 26, below, right) show that the coxal lobes of the ninth sternite have no definite function during copulation and it remains an open question whether these organs play any role whatever before copulation.

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