VENOM APPARATUS OF *TRYPOXYLON POLITUM* SAY (HYMENOPTERA: SPHECIDAE)

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ABSTRACT

The venom apparatus of *Trypoxylon politum* Say is very similar to that of the smaller *Trypoxylon clavatum clavatum* Say. The venom apparatus has paired filamentous venom glands and a poorly defined convoluted gland. The furcula is large and receives an extensive muscle supply from the oblong plate. Lancet valves are large and fill the sting bulb chamber. Gonoplacs are distinctly bilobed. The sting is strongly descendent.

Key Words: Sting, furcula, valves, convoluted gland, Dufour's gland, gonoplacs.

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INTRODUCTION

Trypoxylon politum Say is commonly called the "pipe-organ muddauber" due to the particular shape of its nests (Rau 1928). It is the largest member of the genus in North America (Coville 1982).

Aggressive behavior expressed by females in this and other sphecid genera has not been documented except in rare cases (Lin 1978; Steiner 1975). In general, use of the sting by sphecids is primarily to paralyze their hosts, in which sting insertion is preferably through the host's venter (Rathmayer 1978; Steiner 1975, 1983). Like most sphecids (Lin 1978, pers. comm.), *Trypoxylon* species are reluctant to employ the sting as a defensive mechanism. Male-guarding at the entrance of the nest has been sufficiently reported on for the genus *Trypoxylon* (Coville and Coville 1980; Cross et al. 1975; Rau 1928).

Studies on the morphology of the sphecid venom apparatus have not been commonly reported on in the literature, but some isolated contributions have led to at least a little understanding of its component structures in sphecid wasps (Hermann and Gonzalez 1985). The purpose of this investigation was to examine the venom apparatus of *T. politum* and to compare it with the venom apparatus of *T. c. clavatum* Say, the only other *Trypoxylon* species investigated thus far (Hermann and Gonzalez 1985).

MATERIALS AND METHODS

Venom apparatuses of ten live *T. politum* females previously collected at the Okefeenokee Swamp, Ware County, Georgia, during the summer of 1984, were dissected from the abdomen, dehydrated in ethanol, cleared in methyl salicylate and mounted on slides with Permount. Apparatuses were examined *in toto* and in their various parts. Some of them were mounted after being disarticulated and cleaned

of muscles in order to obtain a clear view of each of the sclerites. Drawings were made with the aid of an ocular grid of a binocular dissecting microscope.

RESULTS AND DISCUSSION

As in its close relative, *T. c. clavatum,* the sting (= fused 2nd valvulae) and gonoplacs (= gonostyli) of *T. politum* are strongly sclerotized. Even though the paired rami, lancet shafts (= 1st valvulae), triangular plates (= gonangula) and dorsal bars of the oblong plates (= 2nd valvifers) are sclerotized, they are not as strongly tanned (Figs. 1 - 4). This relationship between well sclerotized and poorly sclerotized venom apparatus components is the same in *T. c. clavatum* (Hermann and Gonzalez 1985). Especially strong sclerotization was found in both posterior (dorsal and ventral) and the single anterior articulating points of the paired triangular plates and the point on each of the paired oblong plates that articulates with its respective triangular plate.

Each lancet shaft (LS, Fig. 1) has a length of 7.0 mm and supports a well developed valve (Va) which is 0.32 mm high and located near the proximal end of the former structure. The distal end of each lancet has 13 well-separated but poorly developed teeth (not illustrated). When the lancets are fully etracted, the valves rest in the expanded anteriormost portion of the sting bulb (SB, Fig. 2). As the lancets are extended and retracted by way of a tongue-and-groove articulation on the mesal side of the ventral wall of the sting bulb and shaft, the valves fully occupy the inner sting bulb chamber.

The hair plate (HP, Fig. 1) on each oblong plate (OP) has 38 - 40 trichoid sensilla (not illustrated). They lie below and project toward the articulating ventral apodeme of each triangular plate (TP). The distal end of the oblong plates articulates with bilobed gonoplacs (GO, Fig 1). The distal lobe (DL) of the gonoplacs is slightly longer (2.19 mm long) and more sclerotized than the basal lobe (BL) (2.09 mm long). The basal gonoplac lobes are relatively larger than the distal lobes in *T. politum* than in *T. c. clavatum.* In general appearance, however, they are very similar in the two wasp species. Gonoplac hairs are most pronounced on the distal tip of the distal lobe and on the ventral surface of the basal lobe (not illustrated). In addition, the hair tracts (ventral, lateral and dorsal on the distal gonoplac lobe and ventral on the proximal gonoplac lobe) are more strongly sclerotized (darkly stippled area on the gonoplacs in Fig. 1) than the remainder of the gonoplac structures.

The paired spiracular plates (= 8th hemitergites) (SP) are strongly joined to each other by a sclerotized dorsal bar (DB, Fig. 4). As in *T. c. clavatum,* the weakened area which is commonly found in some Formicidae is lacking in this species (Hermann and Gonzalez 1985).

The furcula (Fu, Figs. 2 and 3) (0.6 mm high and 0.9 mm wide at the base, and 1.0 mm long) is Y-shaped and is strongly articulated to the anterodorsal tip of the sting base (SB). The furcula has a well developed anterodorsal flange that receives an extensive supply of posterior gonocoxapophyseal muscles from the paired oblong plates. The furcula is usually a small sclerite in aculeate Hymenoptera. However, it is extremely large in this species when compared with the other venom apparatus sclerites which indicates a definite importance in sting manipulation. The furcula's basal area is less concave on its ventromesal surface than the furcula of *T. c. clavatum* (Hermann and Gonzalez 1985).

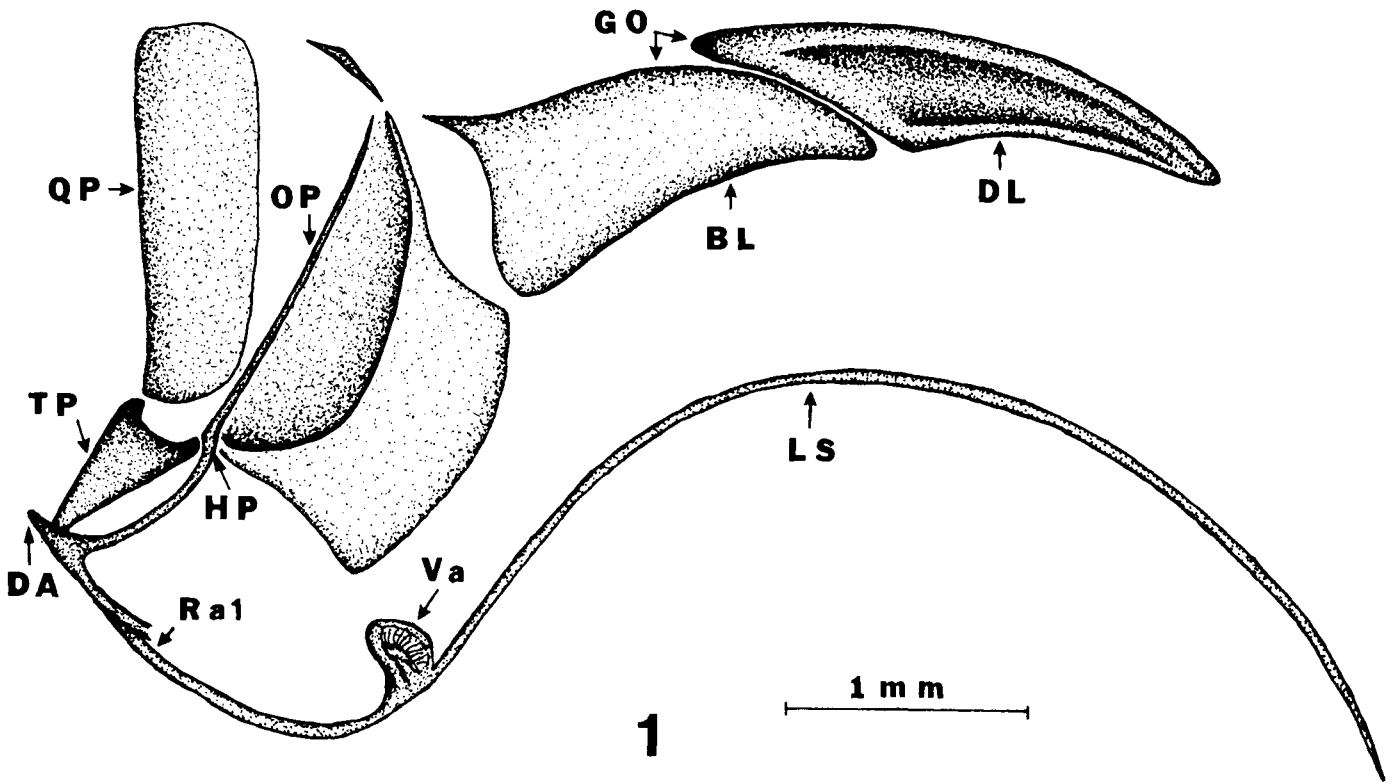
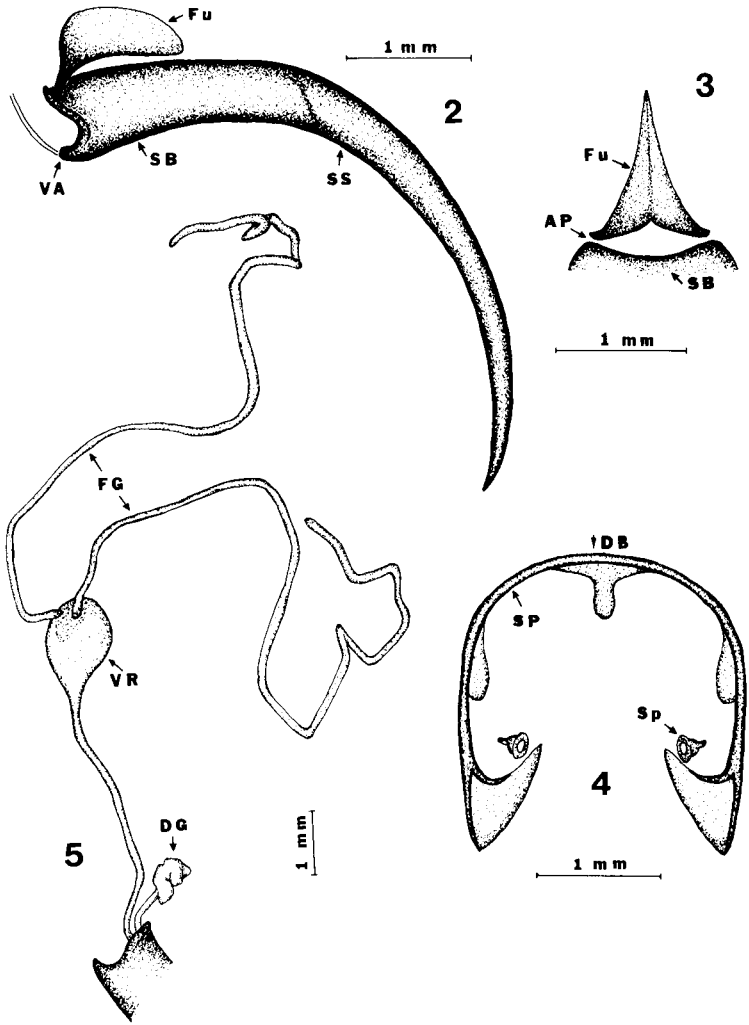


Fig. 1. Mesal view of venom sclerites with sting and its ramus removed. BL — basal lobe of gonoplac; DA — Dorsal apodeme of oblong plate; DL — Distal lobe of gonoplac; GO — Gonoplac; HP — Hair plate; LS — Lancet shaft; OP — Oblong plate; QP — Quadrate plate; Ra1 — First ramus; TP — Triangular plate; Va — Lancet valve.



Figs. 2 - 5. Venom apparatus sclerites and glands. 2. Lateral view of sting and furcula, showing the sting's descendant nature. 3. Furcula in dorsoposterior view, showing its relationship to the anterior tip of the sting base. 4. Dorsal view of spiracular plate. 5. Lateral view of venom-producing components and Dufour's gland. AP — Articulating point between furcula and sting base; DB — Dorsal bar, linking paired spiracular plates; DG — Dufour's gland (ventrad of entry point of main duct of venom reservoir), showing its twisted appearance; FG — Filamentous glands, showing their independent departure from the reservoir wall in the vicinity of the surface-oriented convoluted gland (darkly stippled area); Fu — Furcula; SB — Sting base; Sp — Spiracle; SP — Spiracular plate; SS — Sting shaft; VA — Ventral apodeme of sting base; VR — Venom reservoir.

The paired anterior gonocoxapophyseal muscles (antagonistic to the posterior gonocoxapophyseal muscles) originate along the entire length of the posterior wall of each 2nd ramus and insert on the anterodorsal tip of the sting base. The sting shaft (SS) has a strong and uniformly descendant (= decurved) appearance. Its anterodorsal region in dorsal view is concave (SB, Fig. 3), thus extending slightly dorsolaterally as paired anterolateral projections that articulate with the ventral extensions of the furcula.

Two filamentous glands (FG, Fig. 5) extend independently from the side of the venom reservoir. They measure approximately 14.3 mm in length. The venom reservoir (VR) has a length of 1.5 mm and a width of 1.0 mm. The main duct between the venom reservoir and the sting base has a length of 4.13 mm. While the convoluted gland (shaded area around the base of the filamentous glands in Fig. 5) appears to be a well defined area inside the venom reservoir in most aculeates (Blum and Hermann 1978), here it is only a slightly distinguished part of the reservoir's surface. Such a convoluted gland has been found in at least one other species of the same genus (Hermann and Gonzalez 1985).

Dufour's gland (DG) (1.3 mm length, 0.8 mm width) was found to be a twisted and slender sac at the base of the sting (Fig. 5). However, the appearance of Dufour's gland may, perhaps, change throughout the year, depending on its use. Such a change is found in *Xylocopa virginica* L. (Anthophoridae) (Hermann and Mullen 1974). However, its similarity in having a twisted appearance like the Dufour's gland in *T. c. clavatum* is interesting. The function of Dufour's gland in both species is unknown.

CONCLUSION

Anatomical features in the venom apparatus are extremely similar in the two *Trypoxylon* species examined thus far, i.e., *T. politum* and *T. clavatum* (Hermann and Gonzalez 1985). Both sclerites and glands are almost identical and the prime difference between them is size.

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