

Wing microsculpturing in two Arabian species of termite genus *Amitermes* (Termitidae, Amitermitinae)

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Abstract. To understand the intra-generic variability of wing microsculpturing in *Amitermes* (hitherto known in a single species, *Amitermes belli*), two other species from Arabia (*Amitermes messinae* and *Amitermes* sp.) were studied. Microsculpturing consists of two elements—papillae and micrasters. There is an intra-generic range of complexity in micrasters, from the simple nonasteroids to the complex asteroids. The general pattern conforms to the condition in the subfamily Amitermitinae as a whole.

Keywords. Wing microsculpturing; *Amitermes*; Isoptera; termites.

1. Introduction

Wing microsculpturing in termites (Isoptera) has been studied extensively under both the light and the scanning electron microscopes by Roonwal and co-workers (Roonwal 1983, 1985a, b, 1986; Roonwal and Chhotani 1967; Roonwal and Rathore 1977, 1982, 1985; Roonwal and Verma 1980, 1983; Roonwal *et al* 1974). A dense and elaborate carpet of microstructures (size ca. 0.5–24 μm) occurs on both surfaces of wings. Its evolutionary, phylogenetic and systematic significance has also been discussed (Roonwal 1983, 1985a, b, 1986).

Several genera of the subfamily Amitermitinae (family Termitidae) have also been studied and intra-generic and inter-generic differences shown to occur (Roonwal 1983, 1985a; Roonwal and Rathore 1977, 1982, 1985; Roonwal and Verma 1980, 1983; Roonwal *et al* 1974). But the widespread genus *Amitermes* Silvestri has been studied inadequately, with only a single species, *Amitermes belli* (Desneux) from India examined. With two more species from Arabia, now available, we are in a much better position to examine intra-generic variability in microsculpturing.

2. Material and methods

Winged imagoes of both the species studied, viz. *Amitermes messinae* Fuller and *Amitermes* sp., were obtained from ground swarming holes near Muscat (Sultanate of Oman, at the south-eastern end of the Arabian Peninsula) in February 1986. Wings were mounted in glycerine (this gives a much better definition than Canada balsam mounts) and studied under the light microscope.

3. Results

3.1 *A. messinae*

Wings small, transparent, pale brown. Hairs common on the margins, fewer and

smaller on the membrane; length: upper margin 40–110 μm , lower margin 50–70 μm , on membrane 30–40 μm (figures 1 and 2).

3.1a *Microsculpturing*: Consists on both the upper and lower wing surfaces of two

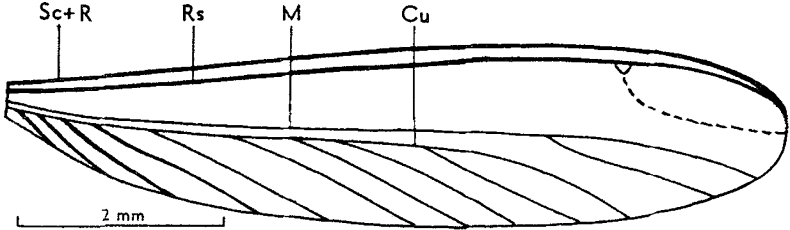


Figure 1. *A. messinae* outline of right forewing, to show venation. [Cu, Cubitus; M, media; Rs, radial sector (note the extra branch); Sc + R, subcosta + radius].

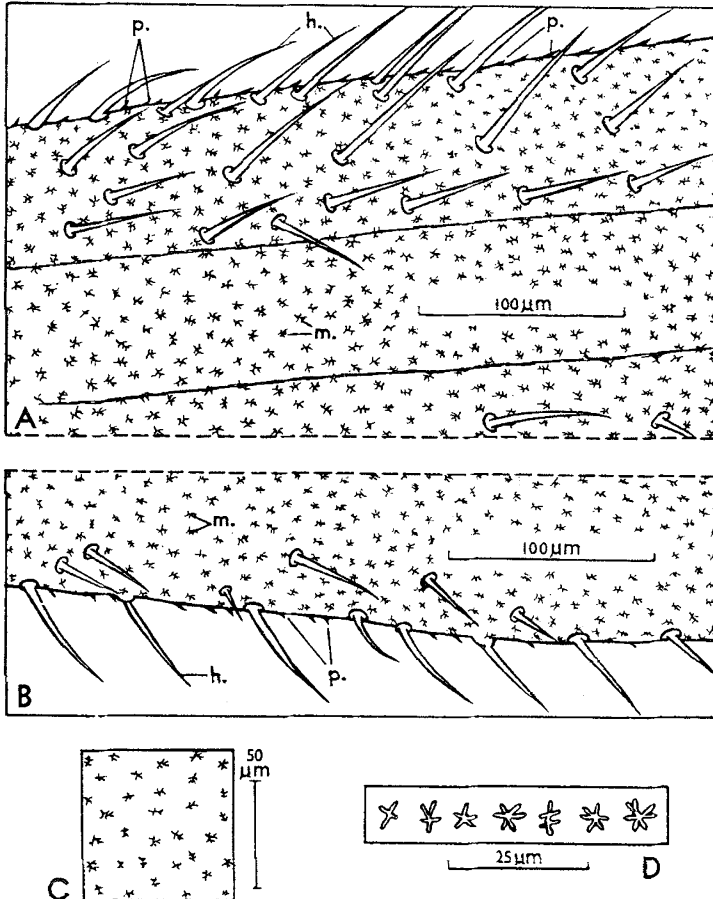


Figure 2. *A. messinae* portions of right forewing in middle part, to show microsculpturing. A. Upper edge. B. Lower edge. C. Middle of wing membrane, to show micrasters. D. Micrasters enlarged and rearranged. (h, Hairs; m, micrasters; p, papillae).

elements, viz. papillae and micrasters. (i) Papillae: Small (length 3–5 μm), pointed and thorny. In a single row on the upper and lower wing margins, none on the membrane; larger on the upper margin than on the lower. (ii) Micrasters: A dense carpet (density 7200/ mm^2) (size 6–7 $\mu\text{m} \times$ 6–8 μm) of various types, both asteroid and nonasteroid (with 4–7 arms) present all over wing.

3.2 *Amitermes* sp.

Wings and hairs as in *A. messinae*. Length of hairs on upper wing margin 50–110 μm , on lower margin 40–70 μm and on membrane 30–40 μm (figures 3 and 4).

3.2a *Microsculpturing*: As in *A. messinae*. (i) Papillae: Small (length 2–4 μm), pointed and thorny. Present as a single row at the upper margin of wing; absent on the lower margin. (ii) Micrasters: As in *A. messinae*, but only the simple types, the nonasteroids, present with 1–5 arms.

4. Discussion

With wing microsculpturing now known in 3 species of *Amitermes*, we can have a fairly good idea of intra-generic variation. In all the 3 species, only two types of elements occur, viz. papillae and micrasters. The papillae are always small, pointed and thorny and occur in a single row on the wing margins (figure 5) in *A. messinae* on both the upper and lower margins, and in *A. belli* and *Amitermes* sp. on the upper margin only.

The micrasters display considerable range of diversity, the increasing complexity being in the following order (figure 1):

Amitermes sp. \rightarrow *A. belli* \rightarrow *A. messinae*.

In *Amitermes* sp. only the simple, nonasteroid micraster, with 1–5 arms, occur, while in *A. belli* both asteroids and nonasteroids, with 5–7 arms, occur. The same condition as in *A. belli* is found in *A. messinae*, but the range of nonasteroids is slightly greater and 4-armed micrasters also occur in addition. Furthermore, the micrasters are of the thin, stringy type in *A. belli* and thick in the other two species.

Thus, the condition in *Amitermes* is consistent with that in the subfamily Amitermitinae as a whole (Roonwal 1983), and the relative primitiveness of this subfamily within the family Termitidae (the higher Termites) is confirmed.

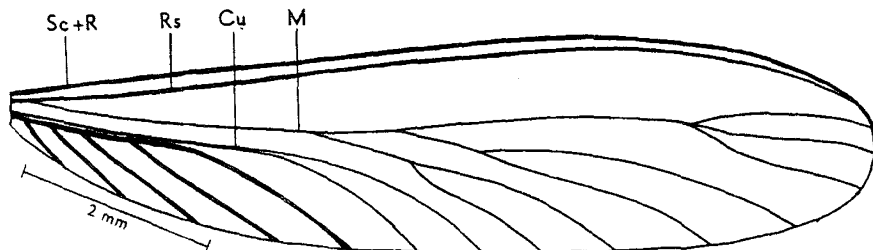


Figure 3. *Amitermes* sp. outline of right hindwing, to show venation. (Cu, Cubitus; M, media; Rs, radial sector; Sc + R, subcosta + radius).

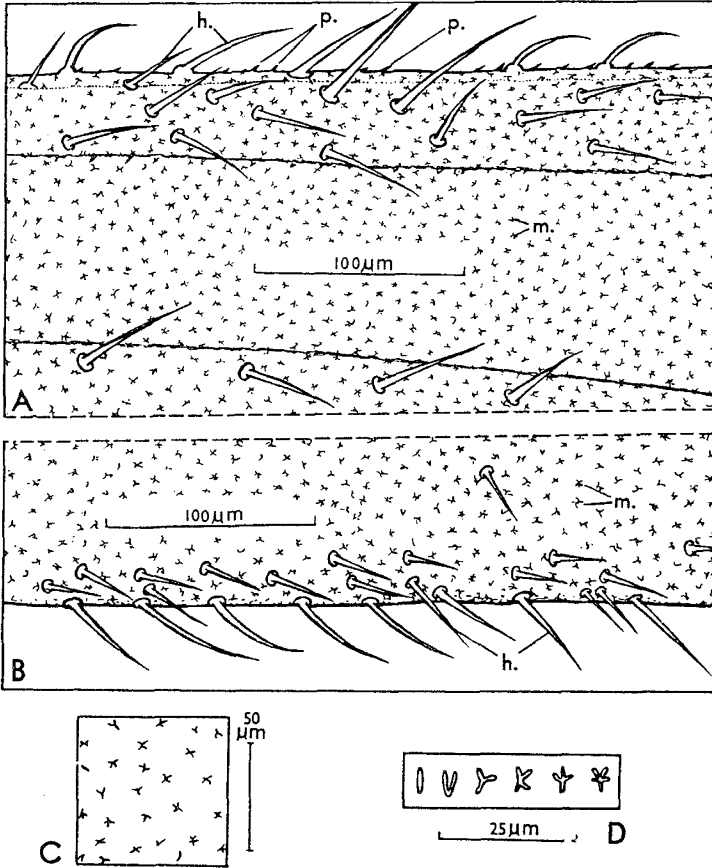


Figure 4. *Amitermes* sp. portions of right hindwing in middle part, to show microsculpturing. A. Upper edge. B. Lower edge. C. Middle of wing membrane, to show micrasters. D. Micrasters enlarged and rearranged. (h, Hairs; m, micrasters; p, papillae).

AMITERMES	NONASTEROID						ASTEROID			
	I	II	III	IV	V	VI	VII	VIII	IX	X
A. BELLI					Y X	X X	X	X	X	
A. MESSINAE				Y	Y X		X	X X	X	
A. SP.	I	V	Y Y	K Y	Y					

Figure 5. Variation in the complexity of micrasters on the wings of 3 species of *Amitermes* (*A. belli*, *A. messinae* and *Amitermes* sp.).

References

Roonwal M L 1983 Evolution and systematic significance of wing micro-sculpturing in termites. XIII. Order Isoptera; *Proc. Indian Natl. Sci. Acad.* **B49** 359-391
 Roonwal M L 1985a Recent researches on wing microsculpturing in termites (Isoptera) and its evolutionary and biological significance; *Proc. Indian Natl. Sci. Acad.* **B51** 135-168

- Roonwal M L 1985b Wing microsculpturing in termites (Isoptera) under the scanning electron microscope; *Zool. Anz. Jena* **215** 219–230
- Roonwal M L 1986 Second contribution to wing microsculpturing in termites (Isoptera) under the scanning electron microscope; *Zool. Anz. Jena* **216** 81–89
- Roonwal M L and Chhotani O B 1967 Wing microsculpturing in termite genera *Odontotermes*, *Hypotermes* and *Microtermes* (Termitidae: Microtermitinae) and its taxonomic value; *Zool. Anz. Jena* **178** 236–262
- Roonwal M L and Rathore N S 1977 Third study of evolution and systematic significance of wing microsculpturing in termites. Micrasters in some Rhinotermitidae and Termitidae; *Zool. Anz. Jena* **198** 298–312
- Roonwal M L and Rathore N S 1982 Evolution and systematic significance of wing microsculpturing in termites (Isoptera): XII. Sculpturing on wing scales; *Proc. Indian Natl. Sci. Acad.* **B48** 322–343
- Roonwal M L and Rathore N S 1985 Wing microsculpturing in the termite genus *Amitermes* (Termitidae, Amitermitinae); *Proc. Indian Acad. Sci. (Anim. Sci.)* **94** 317–321
- Roonwal M L and Verma S C 1980 Evolution and systematic significance of wing microsculpturing in termites (Isoptera). VIII. (Subfamily Amitermitinae of family Termitidae); *Proc. Indian Natl. Sci. Acad.* **B46** 250–263
- Roonwal M L and Verma S C 1983 New data on wing microsculpturing in termites (Kalotermitidae, Rhinotermitidae and Termitidae); *Ann. Entomol. (Dehra Dun)* **1** 27–34
- Roonwal M L, Verma S C and Rathore N S 1974 On a new systematic character in termites, the micrasters; *Z. Zool. Syst. Evolutionsforsch.* **12** 55–75