

DESERT - Namib - beetles - tenebrionids

- Beetles - tenebrionids - physiology

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SEM STUDY OF WAX BLOOMS IN TENEBRIONID BEETLES

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- thermoregulation

- waxy blooms

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Waxes on the surface of plants are well known and function to assist in withstanding adverse conditions of temperature and humidity. Wax blooms also occur in arthropods but they are much less common, and have received little study with respect to the physical factors relating to occurrence, morphology and function in the ecology of each species<sup>1</sup>. The role appears to be similar to that in plants.

Clues to the function and dynamics of secretion of wax filaments lie in their morphology, and it is thus very important to maintain the natural integrity while viewing under the SEM. Heating during sputter coating<sup>2</sup> can cause damage to sensitive specimens. Elytra of *Zophosis mniszzechi* Deyrolle, *Cardiosis fairmairei* Perringuey, *Orymacris rugatipennis albotessallata* Schulzer, were viewed uncoated in a Cambridge S180. Selection of operating parameters (KV 5.6, Aperture 400µm, Beam Current 25µA, C<sub>1</sub>=C<sub>2</sub>=1.2A, Probe Current 2 X 10<sup>-12</sup>A) combined with minimal exposure to the beam before recording, enabled successful micrographs to be recorded (Figs. 1,2,3 & 4). Specimens were then Au/Pd coated in a manner to reduce heating effects, (8mA, 25mm distance pulsed mode for 5 min) and a maximum temperature of 294K (3K above ambient) was recorded. After viewing (Fig. 5) it was found that some damage occurred (noticeable in *Z. mniszzechi*). Coating using routine conditions (12mA, 20mm, not pulsed, 5 min) gave rise to temperatures of 310.5K (19.5K above ambient) and severe damage occurred (Figs. 6,7,8).

The full wax bloom of *O. rugatipennis* occurs in patches of about 1mm in diameter in depressions of the elytra and is made up of loose network of 0.21µm diameter filaments (Figs. 1,2). Slightly thicker 0.22µm short rods are found in other areas (Fig. 5). In *C. fairmairei* the filaments (0.22µm diameter) occur in areas of spines and are concentrated around the spines in small clumps (Fig. 3). In *Z. mniszzechi* a dense mat of filaments (0.25µm in diameter) shown in Fig. 4 occurs in longitudinal rows.

Individuals kept under various conditions of temperature and humidity were similarly examined to assist in understanding the relationship of the extent of wax and the physiological adaptation to the harsh environment.

References

1. Hadley, N.F., 1981, *Biol. Rev.* 56, pp23-47.
2. Witcomb, M.J., 1981, *J. Microsc.*, 121 (3) 289.

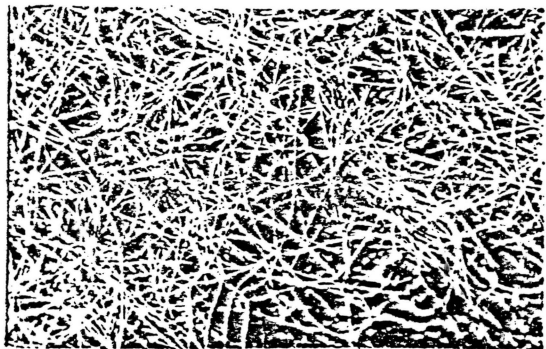


Fig. 1. *O. rugatipennis*  
Uncoated. Bar=10µm

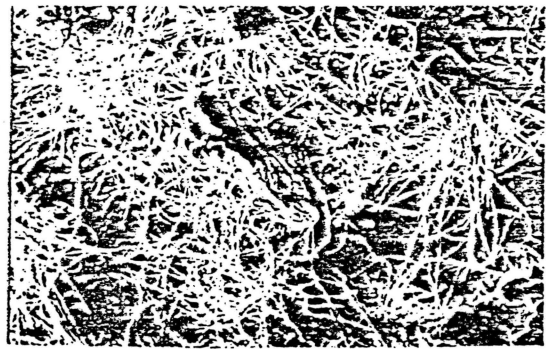


Fig. 3. *C. fairmairei*  
Uncoated. Bar=10µm

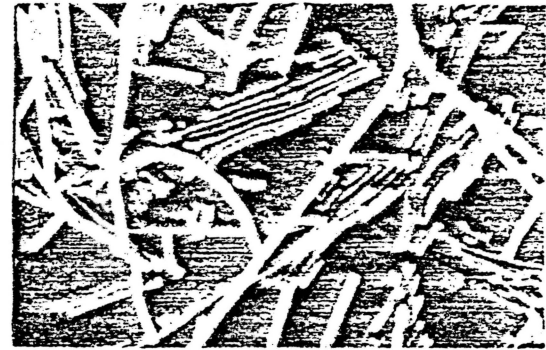


Fig. 5. *O. rugatipennis*  
Light Coated. Bar=1µm



Fig. 7. *O. rugatipennis*  
Coating damage. Bar=1µm

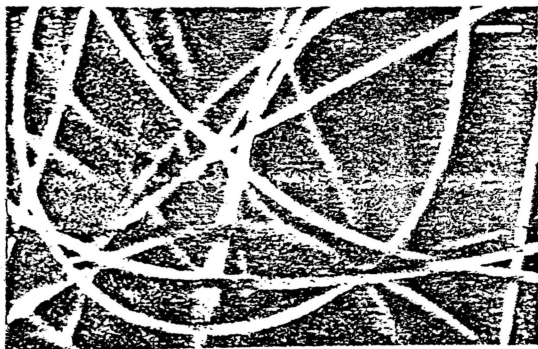


Fig. 2. *O. rugatipennis*  
Uncoated. Bar=1µm

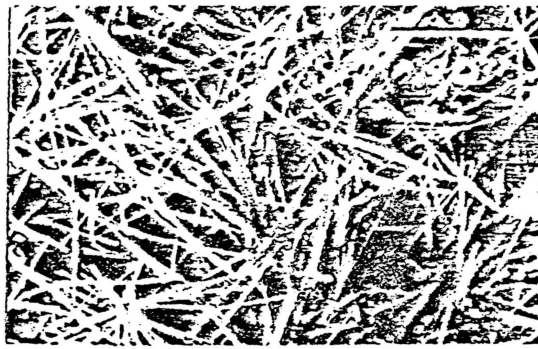


Fig. 4. *Z. mriszschii*  
Uncoated. Bar=10µm

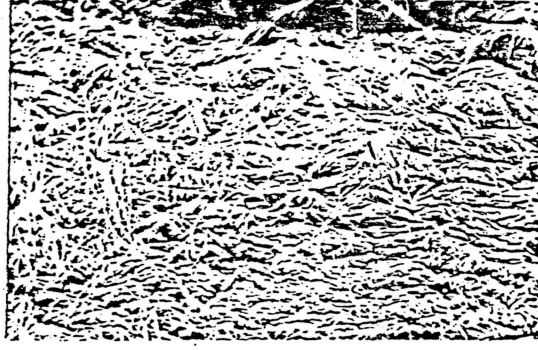


Fig. 6. *O. rugatipennis*  
Coating damage. Bar=10µm



Fig. 8. *Z. mriszschii*  
Coating damage. Bar=10µm