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Cauricara phalangium rufofemorata (Koch), a flightless beetle found on on the gravel planes of the Namib desert is a short lived winter species found between April and September. Ventral and lateral surfaces of this black beetle become white in colour as a result of the secretion of a waxy bloom. This secretion is known to reduce water loss and is significant in terms of reflectance, thereby helping to reduce heat stress! Observations of field populations have indicated that ability to renew the wax bloom declines with age. During studies of the activity of the wax secretory glands various other changes in relation to aging were noted.

Beetles collected from the field were examined at three stages in the adult phase of the life cycle, namely just after emergence, mid-season and late in the season. Beetles were beheaded and the elytra were removed and cut into long narrow strips ½ - 1 mm in width. They were then fixed in cacodylate buffered glutaraldehyde, routinely processed for electron microscopy and embedded in Epon Araldite.

The beetles wings or elytra which bear much of the bloom are fused over the dorsal surface of the abdomen to form a substantial carapace. Blood spaces lined with epithelial cells connect the elytra to the body cavity. These spaces run in an anterior posterior direction through the elytra and are separated by pillars of cuticle known as trabeculae (Fig. 1).

The elytra of newly emerged beetles had very thin cuticle, with the complete exocuticle and negligible endocuticle. The trabeculae were narrow and in many cases did not reach the ventral elytron surface so that the blood spaces were incompletely separated. The blood spaces were proportionately very large and lined by a distinct cuboidal epithelium, which was separated from the cavity by a basement membrane. The cells that formed the glands were situated below the epithelium but were contained within the basement membrane. Large haemocytes were found within the blood space closely apposed to these cells. These cells are known to be involved in transport of cuticular material and possibly lipids².

. The mid season beetle was found to have a cuticle that was much thicker as additional endocuticle had been layed down on the inner surface in successive layers (Fig.1). Trabeculae became progressively thicker during this process. The dermal gland cells were closely apposed to the epithelium but were filled with secretion during their active phase and were considerably larger, almost filling the blood space (Fig. 2).

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Haemocytes were seldom found.

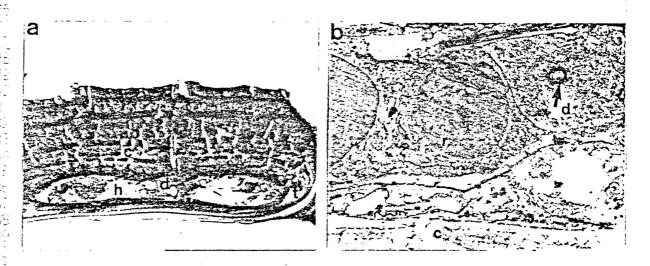
Elytra of beetles killed late in the season possessed a thick distinctly laminated cuticle. The epithelium was reduced to a very attenuated structure with few if any organelles present in the cell cytoplasm. Gland structures remained but were reduced in size and lacked secretory product.

These results show that the epithelium continued its usual function of cuticle secretion, however as a result of this activity the blood spaces became greatly reduced in size possibly reducing the efficiency of the blood circulation. Reduction in ability to renew bloom production apparently resulted from the reduced number of haemocytes conveying materials to the gland structures as well as a decline in cell activity. Both these features probably represent progressive senescence.

References

1.

Henwood, K. (1975) Ecology <u>56</u>, 1329. Wigglesworth, V.B. (1970) Tissue Cell <u>2</u>, 155.



T.S. of elytron of midseason adult C. phalangium

General view

Detail of dermal gland

c = cuticle

h = blood space

r = reservoir of secretion

d = duct cell of gland

= duct

t = trabeculum