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# "EPIDERMAL STREAMING" AND ASSOCIATED PHENOMENA DISPLAYED BY LARVAE OF *Chrysomyia marginalis* (Wd.) (DIPTERA: CALLIPHORIDAE) AT CARCASSES

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*Abstract* — Competition with vertebrate scavengers for carrion necessitates blow-fly larvae to make rapid and effective use of dead animals. Blow-fly eggs are deposited in shaded, concealed positions at a carcass, and the larvae need to enter the body to feed on muscle and other soft tissues as soon as possible after eclosion. They do so by digesting away the skin with enzymes, but this is often preceded by an exploratory phase in which larvae migrate over the carcass to find wounds by which they are able to gain more rapid entry into the body. Epidermal streaming is one method of performing this exploratory phase, and involves movement by small larvae below the superficial outermost layer of skin. Several possible benefits of this behaviour are discussed.

## *Introduction*

The bodies of dead animals represent a compact nutrient-rich commodity which is avidly sought after by a range of animals specifically adapted to locate and utilise this food-source (Richardson 1979). In an environment such as the Kruger National Park (KNP) competition for carcass-resources is intense and generally involves interaction between vultures, spotted hyaenas, jackals and blow-fly larvae. Despite adult blow-flies generally being present at a carcass very soon after death of an animal – often within minutes – the developmental period of maggots resulting from eggs deposited at the carcass by blow-flies is such that several days are required before sufficient nutrients are ingested to allow successful pupariation by these larvae (Meskin 1980; Prins 1980; Braack 1981). In summer they require an average of three full days of feeding before such a stage is reached, and this is more than doubled in winter (Braack 1984). Vertebrate scavengers therefore represent a serious threat to successful completion of larval life in blow-fly species which depend solely on carrion as a breeding medium, and considerable evolutionary pressure must therefore have been exerted on such blow-flies to minimise or compensate for this threat. One of the adaptive features exhibited by larvae of such blow-flies as *Chrysomyia marginalis* is epidermal streaming, a commonly observed phenomenon especially at carcasses of antelope species in South Africa (*pers. obs.*).

*Definition of the term*

I have been unable to find in the literature any reference to the behaviour which I term "epidermal streaming", and which was first briefly referred to in an earlier publication (Braack 1981). Epidermal streaming describes the process whereby recently emerged blow-fly larvae, generally hatched from eggs laid at the soil/carcass interface, enter beneath the thin outer layer of skin and migrate upwards to the top of the carcass and often over to the opposite side, leaving a blackened, almost entirely dehaired hide covered with a thin film of moisture which soon dries (Fig. 1).

*Oviposition and larval habits*

Female *Chrysomyia marginalis* flies generally deposit their eggs in situations where they are protected from the desiccating rays of the sun, commonly in the mouth, nostrils and especially at the carcass/soil interface (Braack 1981). For rapid access to carcass soft-tissues below the skin, two alternatives appear to be available to the maggots when hatching. Either pour out sufficient digestive enzymes to dissolve the skin and then enter the abdomen from below, or move up the carcass to where vertebrate predators or scavengers are likely to have punctured the carcass thus providing a more easy and quick route to the tissues inside. From observations at well over 100 carcasses it emerged that the maggots display both behavioural patterns. The most feasible explanation for the migratory movement over the carcass would seem that natural selection favored this as an exploratory phase to find the most rapid means of entering a carcass, as there exists a very real need to utilise the carcass as quickly as possible due to the high likelihood of further scavenging by vertebrates. Should no point of entry be encountered, the skin is dissolved from below the carcass by enzyme action.

*Modes and benefits of epidermal streaming*

In mutilated carcasses, epidermal streaming may proceed only as far as the wounds where the whole mass of maggots will move into the cavity. At scratches or superficial wounds not penetrating the body wall the maggots continue their exploratory movement upwards and over the carcass. Provided a site is not directly exposed to the full desiccating rays of the sun, blow-fly larvae occasionally congregate around superficial wounds and use these as entry sites into the abdomen. If fully exposed to the sun, even open wounds are passed over.

The exploratory movement of *C. marginalis* is also observed at large carcasses such as buffalo, although not as frequently or as clearly. At such carcasses they occasionally engage in limited upward epidermal streaming and if the maggots encounter suitable tick puncture sites, they may enlarge these to enter the body.

In cases where liquid exudes from a wound due to bloating or scavenging, larvae often forego exploratory behaviour to move directly along the liquid path in a compact mass over the skin from the carcass/soil interface to the wound site.

Fig. 1. "Epidermal Streaming" and associated phenomena displayed by larvae of *C. marginalis*.

Although the mass exploratory migration is more often exhibited by young larvae, it may occasionally be observed in nearly full-grown maggots generally when competition for limited resources is particularly intense and alternate locations are sought. In such cases where large larvae undertake exploratory movement they do so externally by moving above the skin between the hairs.

The potential advantages of epidermal streaming as a means of performing the exploratory phase may be as follows. By moving below the outer layer of skin the larvae avoid tumbling off the side of the carcass, and purchase is provided for the upward climb. Some protection against the drying sun is provided and the high humidity within this protective sheath also reduces the potential for desiccation in the highly susceptible first instar stage. Additionally, some protection is afforded against predatory beetles and ants which are present soon after hatching of the maggots (Braack 1981).

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