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MORTALITY OF BLOW-FLY LARVAE (DIPTERA: CALLIPHORIDAE) IN THE DIGESTIVE TRACT OF VULTURES

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Abstract — The blow-flies *Chrysomyia albiceps* and *C. marginalis* are abundant in the Kruger National Park and depend on carrion as a food-source during their larval stages. Vultures occasionally consume maggot-infested meat and the question arises whether such larvae survive passage through the digestive tract and so contribute to the population of blow-flies in that area. Three vultures were fed baboon meat inoculated with blow-fly larvae, and none of the larvae were found to survive.

Introduction

Adult blow-flies have long been regarded as major transmittors of anthrax *(Bacillus anthracis)* during periodic epizootics affecting especially larger herbivorous mammals in the northern Kruger National Park (Pienaar 1961; De Vos 1973; Braack 1984). *Chrysomyia albiceps* (Wd.) and *C. marginalis* (Wd.) are the most numerous of the blow-flies in the outbreak area (Braack 1981, 1984), and data on these species are therefore essential for a better understanding of the epidemiology of the disease.

Both *C. albiceps* and *C. marginalis* occur widespread and abundantly in southern Africa (Smit & Du Plessis 1927; Hepburn 1943; Zumpt 1965) and breed most commonly in medium-sized and large mammal carcasses (Smit 1929, 1931; Mönnig & Cilliers 1944; Braack 1984). The high population levels of these two species outside conservation areas can almost certainly be ascribed to dead livestock on farms and animals such as dogs and cats killed on national roads. The vertebrate-scavenger population is sparse in most of these areas so that many carcasses remain available for blow-fly larval development (*pers. obs.*).

Within the protected environs of the Kruger National Park, however, a near natural ecosystem has been maintained since well before its proclamation in 1926 (Stevenson-Hamilton 1947). By studying deliberately-placed and naturally occurring carcasses in the northern area of the Kruger National Park, it has been found that few mammal carcasses escape detection by scavengers such as spotted hyaena *(Crocuta crocuta)* and a variety of vulture species

(Braack 1984). Analyses of the frequency and distribution of occasionally undetected or partially consumed carcasses suggest, however, that such carcasses suffice to maintain the blow-fly population at their presently existing levels (Braack *in prep.*).

If, however, blow-fly larvae swallowed by vultures during feeding survive passage through the digestive tract, a high population level of the two blow-fly species could in theory be more easily sustained. Larvae of Calliphoridae, Sarcophagidae, and a variety of other dipteran species have been reported by Zumpt (1965) and James & Harwood (1970) as having survived extended periods in mammalian digestive tracts, and the possibility increases when considering the larval stages of the family Gasterophilidae – a near relative of blow-flies – which are obligate internal parasites within the gastric tracts of various mammals.

It was therefore decided to test the possibility that larvae of the two blow-fly species could successfully survive the time necessary to pass through the alimentary canal of a vulture.

Methods

Three vultures (one adult Cape Vulture, *Gyps coprotheres;* one immature Whiteheaded Vulture, *Trigonoceps occipitalis;* and one immature White-backed Vulture, *Gyps africanus)* were caught between 6-9 June 1980 using nylon leg-traps set at a buffalo carcass in the Pafuri area of the Kruger National Park. They were transported to a field research station at Pafuri and placed in metal-barred cages measuring 1,2m × 1,8m × 1,2m, one vulture per cage.

The vultures were each provided daily at 08h00 with a basin of fresh water and a basin containing 450 g fresh baboon meat cut into small lumps (about gholf-ball size) with between 150-200 *C. albiceps* and 200-300 *C. marginalis* 2nd and 3rd instar larvae added to the meat. At 12h30 the basin with any leftover meat and larvae was removed and large trays placed below each cage to receive faeces and regurgitation. Inspections were made at hourly intervals until 22h00 for the presence of larvae in the trays.

The above procedure was followed for seven days, after which it was decided to withold all meat for six days and then to give each vulture 200 g baboon meat again cut into small lumps, blow-fly larvae of all sizes being added to the meat. Trays were again placed under each cage during the six-day pre-feeding period, and for four days afterwards.

During February 1981 three adult White-backed Vultures were kept in the same cages and fed 450 g portions of baboon meat with blow-fly larvae of all sizes. They were fed at five-day intervals for fifteen days. Trays were placed below each cage as before.

Results

No viable larvae were found in the faeces during the period of investigation. A few observations, however, are worth noting.

During the initial July 1980 experiments the vultures were not yet accustomed to the proximity of humans, so that occasionally when approaching the cages they would regurgitate some of the contents of the crop. Blow-fly

larvae were often expelled with meat in this way, and in each case all the larvae of both species were dead.

No larvae were found in the faeces, but clean, flattened larval skins of both species were frequently found lying individually or in small batches in the trays.

On two occasions in February 1981 "hairballs" or pellets (vultures had been fed whole baboons in January and early February), approximately 3cm × 2cm, were found in which larval skins of both species of blow-fly were matted.

Conclusions

The results indicate that larvae of *C. albiceps* and *C. marginalis* are unable to survive the conditions in the alimentary canal of the three species of vultures mentioned.

The other species of vertebrate scavenger responsible for bulk removal of carrion in the northern Kruger National Park is the spotted hyaena, and it seems inconceivable that blow-fly larvae would be able to survive the unusually potent digestive enzymes present in the stomach of that animal.

It appears therefore that blow-fly larvae establishing themselves at carcasses and consumed by vultures and hyaenas are precluded from forming any contribution to the adult blow-fly population.

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