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ARTHROPOD PARASITES OF SOME WILD ANIMALS IN SOUTH AFRICA AND NAMIBIA**

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ABSTRACT: Horak I.G. **Arthropod parasites of some wild animals in South Africa and Namibia.** *Journal of the South African Veterinary Association* (1987) 58 No. 4,207-211 (En). Department of Parasitology, Faculty of Veterinary Science, University of Pretoria, 0110 Onderstepoort, Republic of South Africa.

Earlier research on the parasites of wild animals in South Africa is reviewed and the findings of more recent research discussed. The life cycles of various gasterophilid and oestrid fly species are described and the seasonal abundance of their larvae in their zebra and antelope hosts is considered. The seasonal abundance of fleas, lice and ixodid ticks on their hosts is given and the role played by both small and large mammals and some birds in the maintenance of tick populations is described.

Factors contributing to severe parasitism of wild animals are listed and the chemical and biological control of ectoparasites of wild animals are discussed.

Key words: Arthropod parasites, wild animals, South Africa, Namibia.

INTRODUCTION

Early research on the parasites of wild animals in South Africa was devoted mainly to the description of new species. As data accumulated host-parasite checklists were compiled[6 15 17 52 63 69 71] and the geographic distributions, particularly of ticks and fleas, were described[15 63]. Publications of particular note in this regard are those of De Meillon *et al.*[15], Haeselbarth *et al.*[17], Ledger[52], Theiler[63] and Zumpt[69 71]. Later research included life cycles, seasonal abundance, pathology[1 3 5] and control[4 23 31 60 62].

The most important ectoparasites of wild animals are biting flies[17]; the larvae of calliphorid, gasterophilid and oestrid flies[71]; fleas[15 17]; lice[52]; ixodid and argasid ticks[63]; and mites[69]. The present paper reviews work published on the larvae of calliphorid, gasterophilid, hypodermid and oestrid flies, and on fleas, lice and ixodid ticks. It also discusses factors which could lead to severe parasitism of wild animals, and where applicable, deals briefly with control.

CALLIPHORID FLIES

Descriptions of the larvae of the calliphorid flies can be found in Zumpt[71]. Few cases of myiasis caused by the larvae of the metallic blowflies have been recorded in wild animals. Infestations with the larvae of the non-metallic fly *Cordylobia anthropophaga* have been found in black-backed jackal pups *(Canis mesomelas)* (De Vos, 1980 unpublished data) and recorded in the African wild cat *(Felis libyca)* and the leopard *(Panthera pardus)*[71]. The larvae of *Auchmeromyia bequaerti* inhabit warthog burrows where they feed upon the inmates, when these are at home[71].

GASTEROPHILID FLIES

Descriptions of these flies and their larvae may be found in Zumpt[71], who also lists references to earlier descriptions. *Gasterophilus* spp. are found in the gastro-intestinal tracts of zebras while those of *Gyrostigma pavesii* and *Platycobboldia loxodontis* are found in the black and in the white rhinoceros *(Diceros bicornis* and *Diceros simus)* and the African elephant *(Loxodonta africana)* respectively[71].

Burchell's zebras *(Equus burchelli)* can be infested simultaneously with the larvae of 5 or 6 *Gasterophilus* spp.[32 46], and the larvae of 6 *Gasterophilus* spp. have also been recorded in Hartmann's mountain zebras *(Equus zebra hartmannae)*[33 48]. Cape mountain zebras *(Equus zebra zebra)* in the Mountain Zebra National park are apparently infested with the larvae of only 3 species[36 59 67].

The flies attach their eggs to the hair of the limbs of the zebras or to the grazing, where they have to be licked to hatch, or close to the mouth, where they hatch spontaneously. First stage larvae may be found in the peridontal spaces and in the tongue, while second and third stage larvae, depending on their species preferences, are found attached at various sites in the gastro-intestinal tract[32 33 71]. Where the third stage larvae of 2 species use the same site for attachment, competition for space may be avoided by the larvae of 1 species maturing and detaching before those of the other[32]. The mature larvae pass out through the anus and pupate in the soil.

The eggs of *G. pavesii* are firmly attached to the rhinoceros' skin, mainly on the head. It is unknown how the larvae reach the stomach, where they attach and mature, before passing out through the anus[71]. The eggs of *P. loxodontis* are attached to the base of the elephant's tusks and the 3 developmental stages are found in the stomach where they are not attached to the wall. The mature larvae crawl up to the mouth from which they probably drop out when the elephant is feeding[70 71].

HYPODERMID FLIES

The only representatives of this group found in South Africa belong to the genus *Strobiloestrus*[71]. The larvae and adults of these flies have been illustrated by Zumpt[71], while Howard[44] has suggested a possible life cycle and Horak *et al.*[37] have determined the seasonal abundance of the larvae of *Strobiloestrus clarkii* in the gray rhebok *(Pelea capreolus)*. The eggs are attached to the hosts' hair and once the larvae hatch they probably follow a subdermal migration to the site of warble formation[44].

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In South Africa the preferred hosts of the larvae are klipspringer *(Oreotragus oreotragus)*, grey rhebok, steenbok *(Rhapicerus campestris)*, mountain reedbuck *(Redunca fulvorufula)*, common reedbuck *(Redunca arundinum)* and kudu *(Tragelaphus strepsiceros)*[49 71]. Cattle, sheep, goats and bontebok *(Damaliscus dorcas dorcas)* that are sympatric with the natural hosts may also be infested[9 24 37 71]. In the south-western Cape Province the life cycle in grey rhebok takes a year to complete[37]. First stage larvae are present in the subcutaneous tissue during December, second stage larvae from December to June and third stage larvae during June[37].

OESTRID FLIES

The flies belonging to this group and their larvae have been described by various authors[1 2 22 45 57 66 68 71], and host-parasite checklists have been compiled by Bedford[6] and Zumpt[71]. Flies of the genera *Kirkioestrus, Oestrus* and *Rhinoestrus* lay first stage larvae in and around the nostrils of their definitive hosts[22 30 71]. The remainder of their parasitic life cycles is completed in the nasal passages, paranasal sinus cavities or peripharyngeal regions. In the case of *Oestrus* spp. in the blesbok *(Damaliscus dorcas phillipsi)*, first stage larvae may migrate to the lungs via the trachea, or they could be aspirated into the lungs, before migrating back up the trachea to the nasal passages[21]. The mature third stage larvae leave their hosts via the nostrils to pupate in the soil. *Oestrus macdonaldi* in the blesbok, *Rhinoestrus antidorcitis* and *Rhinoestrus vanzyli* in the springbok *(Antidorcas marsupialis)*, and *Rhinoestrus steyni* and *Rhinoestrus usbekistanicus* in Burchell's zebras all appear to complete only 1 life cycle annually[16 21 32]. In contrast *Oestrus variolosus* in the blesbok and blue wildebeest *(Connochaetes taurinus)*, and *Kirkioestrus minutus* and *Oestrus aureoargentatus* in the blue wildebeest appear to complete more than 1 life cycle annually[21 22 30].

Flies of the genus *Gedoelstia* deposit first stage larvae on the corneae of the eyes of their definitive alcelaphine antelope hosts[1 3 21]. Two migratory routes to the nasal passages and sinus cavities may then be followed. The one, which is encountered in blesbok and bontebok, involves migration of the first stage larvae in the blood stream from the eyes to the heart and thence to the lungs. Here the larvae break through into the alveoli and then migrate up the bronchi and trachea to the pharynx and soft palate and thence to the nasal passages where they moult to the second and then third stages[3 21 37]. The other, which is followed in the blue and the black wildebeest *(Connochaetes gnou)*, involves migration of the first stage larvae along the optic nerve from the eyes to the subdural space and thence via the nerve tracts and foramina in the cribriform plate to the nasal passages where they moult to the second and then the third stages[3 30]. The remainder of the life cycle is similar to that described for the other oestrid flies.

Gedoelstia spp. larvae may aberrantly infest other antelope species as well as sheep and cattle causing specific oculo-vascular myiasis. The pathology of these infestations in antelope as well as in domestic stock has been described by Basson[1 3 5].

Basson[4] was also able to reduce the incidence of blindness as well as mortality in naturally infested sheep by the oral administration of 3 organophosphate antiparasitic compounds. Snijders & Horak[62] successfully treated natural infestations of *Gedoelstia hässleri* in blesbok with rafoxanide (Ranide, MSD), while measures aimed at preventing the introduction of antelope infested with *Gedoelstia* larvae into small nature reserves have been suggested[23].

FLEAS

All animal species which spend part of their lives in nests or lairs are infested with fleas. Most fleas are host-specific, but some may be found on a variety of animals[15 17]. Fleas of prey animals may be encountered on the animals predatory upon them[17].

Many fleas and their distributions have been illustrated by De Meillon *et al.*[15], while both De Meillon *et al.*[15] and Haeselbarth *et al.*[17] have produced host-parasite checklists.

Surveys have been conducted in which the total numbers of fleas infesting rock dassies *(Procavia capensis)* and warthogs *(Phacochoerus aethiopicus)* have been determined[28 35 43]. No pattern of seasonal abundance could be determined for the fleas *Procaviopsylla creusae* on rock dassies or of *Echidnophaga larina* on warthogs in one of the warthog surveys[28 35]. In the other the sticktight fleas *Echidnophaga inexpectata* and *E. larina* reached peak levels of abundance on warthogs during May and September, while no pattern of seasonal abundance could be determined for the jumping flea *Moeopsylla sjoestedti* on the same animals[43].

LICE

Many of the lice infesting wild animals in South Africa have been described, but many still remain undescribed. Ledger[52] has produced a host-parasite checklist of the lice infesting mammals and birds in South Africa and also lists the references applicable to the descriptions of the lice. Comparatively small animals such as rock dassies and helmeted guinea fowls *(Numida meleagris)* may be infested with large numbers of lice (Horak, 1986 unpublished data) of numerous species[52]. Larger animals again frequently harbour fairly small burdens comprising only a few species[26 30 37].

Although the actual lice burdens of several mammal species have been determined[8 25 26 27 30 31 37], their seasonal abundance has been ascertained on only a few species. Peak burdens of *Damalinia theileri* are encountered on blue wildebeest during April and September of the first year of life, while *Linognathus gorgonus* reaches peak numbers on the same animals from February to April and during August and September[30]. Peak numbers of *Damalinia peleae* are encountered on grey rhebok in the south-western Cape Province from April to August[37]. On common duiker *(Sylvicapra grimmia)*, in the Transvaal, *Damalinia lerouxi* reaches peak numbers during May and *Linognathus breviceps* during October[8]. *Haematopinus phacochoeri* is present in peak numbers on warthogs in Namibia during June, and during August on warthogs in the Kruger National Park[28 43].

The control, with ivermectin (Ivomec, MSD), of natural populations of the sucking lice *Linognathus aepycerus* and *Linognathus nevilli* on captive impala *(Aepyceros melampus)* has been described[31]. This antiparasiticide had no effect on the biting lice *Damalinia aepycerus* and *Damalinia elongata* infesting the impala at the time of treatment[31].

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IXODID TICKS

Descriptions of the ixodid ticks infesting wild animals in South Africa have been published by numerous authors.

Theiler[63] lists the references applicable to these descriptions and she has also produced a host-parasite checklist for these ticks as well as describing their geographic distributions. Subsequent to Theiler's work a number of new tick species from wild animals have been described[10-13 18-20 50 64]. Howell *et. al.*[47] have illustrated the geographic distribution of several of the ticks and described their seasonal abundance on domestic stock. The geographic distribution of *Rhipicephalus glabroscutatum* has been illustrated by MacIvor[53], while Clifford *et al.*[14] and Norval *et al.*[58] have illustrated that of *Rhipicephlus kochi* and *Rhipicephalus zambeziensis* respectively. Morel[56] has described the distribution of *Rhipicephalus nitens,* and those of *Amblyomma hebraeum* and *Amblyomma marmoreum* have been illustrated by Walker & Olwage[65].

The development of techniques to accurately quantify the tick burdens of slaughtered animals has made a valuable contribution to our knowledge on this subject[25 29 34 55]. Consequently it has been possible to determine fairly closely the actual numbers of various tick species infesting a variety of animals from mice to giraffes in size[29 37 40].

Using these techniques it has been shown that the helmeted guinea fowl is an important host of the immature stages of *A. hebraeum, A. marmoreum* and *Haemaphysalis silacea*[34]. Small ground-frequenting birds may be infested with the immature stages of both sub-species of *Hyalomma marginatum* and small rodents with those of *Hyalomma truncatum*[40]. The scrub hare *(Lepus saxatilis)* is the preferred host of the immature stages of *H. truncatum* and of both subspecies of *H. marginatum*[40]. The rock dassie harbours virtually only its own host-specific ticks as well as the immature stages of *Rhipicephalus arnoldi,* which infests red rock rabbits *(Pronolagus ruprestris)*[35].

The larger the host species the more likely it is to harbour large numbers of adult ticks[29 41]. Thus eland *(Taurotragus oryx)* and buffalo *(Syncerus caffer)* are excellent hosts of adult ticks of several species[29]. Some animals such as the springbok and the blue and black wildebeest appear to be resistant to ticks and are generally only lightly infested[25 30].

During the past decade the seasonal abundance of several tick species on a variety of wild hosts has been determined. Listed in alphabetical order these ticks are:

(i) *A. hebraeum* on helmeted guinea fowl, warthogs, common duiker, kudu and Burchell's zebras[8 32 34 43 51 54]. The larvae generally are present in autumn, the nymphae in spring and the adults from spring to summer.

(ii) the immature stages of *A. marmoreum* on helmeted guinea fowl[34]. The larvae are most abundant from autumn to early winter and the nymphae from spring to summer.

(iii) *Boophilus decoloratus* on blue wildebeest and Burchell's zebras on which all stages occur in the greatest numbers during spring[30 32].

(iv) *H. silacea* on helmeted guinea fowl and on kudu[34 51]. Larvae occur mainly from autumn to early winter, nymphae during winter and spring and the adults in early summer.

(v) *Haemaphysalis hyracophila* on rock dassies on which the adults are present from April to December[35].

(vi) the immature stages of *Hyalomma marginatum rufipes, Hyalomma marginatum turanicum* and *H. truncatum* are most abundant on scrub hares from autumn to winter[40 61] and the adults of the latter 2 species on Cape mountain zebras and eland during summer[40].

(vii) *Ixodes pilosus* on scrub hares, caracals *(Felis caracal)*, grey rhebok and bontebok on which the larvae are generally most abundant during autumn, the nymphae during winter and spring and the adults during early or late summer[37 42].

(viii) *Ixodes rubicundus* of which the larvae and nymphae are most prevalent on red rock rabbits and caracals from autumn to winter and during spring respectively and the adults on caracals, mountain reedbuck and eland from autumn to spring of the following year[39].

(ix) *Margaropus winthemi* on Cape mountain zebras on which massive numbers of all stages of development occur during July[36].

(x) *Rhipicephalus appendiculatus* on common duiker, impala and kudu[8 26 51]. Larvae are generally present from autumn to winter, nymphae from winter to spring and the adults during the late summer.

(xi) the immature stages of *R. arnoldi* exhibit no clear pattern of seasonal abundance on rock dassies[35].

(xii) *Rhipicephalus distinctus* on rock dassies[35]. Larvae are present in peak numbers from December to March, nymphae during January and March and adults from August to January.

(xiii) *Rhipicephalus evertsi evertsi* on impala, Burchell's zebras and Cape mountain zebras[26 32 36] and *Rhipicephalus evertsi mimeticus* on Hartmann's mountain zebras[33]. Except for the impala on which the immature stages of *R. evertsi evertsi* are present in the largest numbers from May to July[26], no clear pattern of seasonal abundance can be established for either of the ticks.

(xiv) *R. glabroscutatum* on common duiker, grey rhebok, mountain reedbuck, bontebok, kudu, eland and Cape mountain zebra[36 37 54]. This is a 2-host tick and the larvae and nymphae are generally most abundant in autumn and the adults from August to February.

(xv) the larvae of *Rhipicephalus nitens* are present on scrub hares, grey rhebok and bontebok in the greatest numbers during autumn, the nymphae during spring and the adults during summer[37].

(xvi) the adults of *Rhipicephalus simus* are most abundant on Burchell's zebras and warthogs during summer[32 43].

(xvii) and the nymphae of *R. zambeziensis* are most numerous on warthogs during August[43].

Stressful conditions such as a broken leg may lead to increased tick burdens even on animals that are normally tick resistant[30]. Drought, with the resulting reduced resistance of animals and the possible accompanying reduced time spent on grooming, can also lead to a marked increase in tick burdens[41]. These may also be high on animals kept in a habitat in which they did not originally occur[29], or where overstocking of a nature reserve of limited size occurs[23 27].

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The role of the red-billed oxpecker *(Buphagus erythrorhynchus)* in the control of ixodid ticks on wild animals has recently been investigated[7]. Although these birds daily consume large numbers of ticks[7], they are unlikely to achieve complete tick control as their own survival depends on the presence of sufficient ticks as prey.

It has been demonstrated that the effective control of ticks on domestic stock on a farm, by means of acaricidal treatment, can result in a marked reduction in the numbers of particularly *A. hebraeum* on wild animals on the farm[38 60]. No effective means of controlling all ectoparasites on free-ranging wild animals has yet been devised.

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