Module # 9 - Component # 1

Parasites of Wildlife

Objective

Be aware of the impact that parasites have on wildlife and to know how to manage these parasites so as not to become a problem.

Expected Outcome

- List the most common parasites of wildlife
- Know the conditions under which parasites can become a problem
- List the control measures to ensure that parasites do not become a problem

Sable antelope: Hippotragus niger, an Eland: Taurotragus oryx and a Blesbok: Damaliscus pygargus phillipsi
General epidemiological considerations

Most wild animals are distributed according to species in fairly well defined geographic regions. Within these regions particular species will have preferred habitats. Animal species, geographic distribution and habitat preference will each contribute towards determining the species composition of parasite burdens as well as their numerical magnitude. Host behaviour and gender may also influence the size of burdens. Normal, healthy wild animals in large ecosystems frequently harbour nematode and tick burdens each exceeding several thousand. However, most of these parasites are usually in an immature stage of development and cause little damage. It is generally only when adult nematode and tick burdens exceed several hundred and, in some cases, several thousand that problems can be expected.

The dispersion of parasites however is one of over-dispersion. This means that most hosts have only a few parasites, but some have many. This implies that a few hosts harbour a high proportion of the total parasitic population of a particular parasite within a specific environment – of the parasites that are on hosts. Typically, 99% of ectoparasites are in the field and 1% are on hosts.

Impala: Aepyceros melampus
The reasons for over-dispersion are:

- **Free-living parasites are not randomly dispersed** within a host’s environment. 
  Example An ‘unlucky’ host will wander into a particularly dense patch of tick larvae.

- **Habitats vary:** thickets, riparian, streams, open plains, woodland etc.

- The **behaviour of ticks varies** from hunters, opportunistic waiters, host preferences.

- The **presence of ticks** on a host, **predisposes that host** to attract more ticks.

- The **hosts ability to limit infestations**

- The **hosts ecology and behaviour,** grooming, wallowing, swimming etc.

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One buffalo study revealed the following, and the animal was extremely healthy

<table>
<thead>
<tr>
<th>Parasite Type</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>7 ticks</td>
<td></td>
</tr>
<tr>
<td>3 lice</td>
<td></td>
</tr>
<tr>
<td>5 oestrid fly larvae</td>
<td></td>
</tr>
<tr>
<td>13 nematodes</td>
<td></td>
</tr>
<tr>
<td>4 tapeworms</td>
<td></td>
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<tr>
<td>1 trematode</td>
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An **average adult Kudu bull** will harbour a total of **100 000 ticks per year and remain healthy.** Healthy animals can carry many species of parasite in heavy numbers and remain healthy.

**Impala** as a species **carry too many ticks for their size.** At any one time an adult impala may be carrying up to **5000** individuals, kudu average at this number. **The larger the host, the better it is for the adult ticks.**
The Role of Parasites

In large ecosystems, free from human interference, parasites and predators fulfill an important role in the selection of host populations for fitness. Young animals, usually until the age of 12 to 18 months, are often subject to large parasite infections. Weaker individuals and those that do not develop an effective immune response, often succumb and are caught by predators before they can contribute towards the gene pool – this is the basis for Natural Selection.

Diseased, injured, stressed or maladapted, young or older animals and aged animals frequently have compromised immune systems. They become heavily infected with parasites resulting in a further deterioration in their condition and rapid removal from the environment by predators. Between the parasites and the predators, the population is thus screened for fitness.

Gemsbok skull: Oryx gazelle
Human Intervention

Human intervention has severely jeopardised this balance. Not only have humans translocated wild animals to regions in which they did not originally occur, but they have also eliminated predators as they have perceived these to be competition for a limited resource. The humans have themselves then failed to assume the role of the predators.

Translocated animals often suffer severe stress and may never adapt to the new habitat or to the resident parasites that are foreign to them. They thus become a bountiful source of infection not only for themselves but also for the wildlife endemic to the region. Because of the costs involved in the translocated wild animals' purchase and transportation it is unlikely that they will be purposely exposed to predators nor will their owners destroy them if they become heavily parasitized, and consequently they persist as a reservoir of infection.

Humans have also introduced domestic livestock into wildlife regions and reintroduced wildlife into regions now used for stock farming. This has led to the introduction of parasites foreign to either one of these host groups and to cross infection taking place. In some cases, the parasites have adapted to the new host species with little visible reaction while in others morbidity or mortality may be high.

Stock farming and the human activities associated with it may lead to disturbance of the habitat preference of wildlife on the farm. Thus, the practice of removing sheep from the mountainous veld of the south-western Free State and Karoo in autumn and winter and placing them in plains camps to avoid contact with Ixodes rubicundus (Karoo paralysis tick), and hence paralysis, has led to springbok leaving the plains for the hills where they then become paralyzed.

The erection of fences has not only interfered with wildlife movement but also with its migration and has also placed a finite size on the area available. Movement, and more particularly migration (or micro-migration), allows animals to move from areas of high parasite contamination, while containment ensures their confinement, often at high stocking densities, in highly contaminated localities. In the latter type of environment cross infection with parasites between host species is very likely.
Helminthes

Helminthes are **internal worm parasites**.

### Little cross-infection normally occurs between the helminths of wildlife and those of domestic ruminants, with possible exception of:

- Trichostrongylus axei (stomach bankruptworm)
- Trichostrongylus falculatus (bankruptworm)
- Nematodirus spathiger (long-necked bankruptworm)
- Gaigeria pachyceles (sandveld hookworm)
- Moniezia spp. (tapeworm)
- Schistosoma matheei

Some of the large strongyles, as well as Habronema spp., Draschia megastoma and Oxyurus equi can **infect both zebras and horses**, while Physocephalus sexalatus is the only nematode commonly present in the stomachs of both warthogs and domestic pigs.

### The nematodes of wildlife are generally host specific, or infect animals within a particular genus or within a grouping of generically related animals, except for:

- Trichostrongylus thomasi (an abomasal or stomach parasite)
- Trichostrongylus instabilis (bankruptworm)
- Trichostrongylus falculatus
- Nematodirus spathiger, which seem capable of infecting a wide variety of wild animals.

Although host specificity for the nematode parasites of wildlife and domestic stock exists, similar or equivalent helminths to those found in domestic stock are encountered in wild animals.

The **nematode burdens of grazers** (blesbok) and **mixed feeders** (impalas) kept under extensive conditions will invariably be considerably larger than those of browsers (kudus, bushbuck) under similar conditions (infective third stage nematode larvae climb grass not trees).
Insects

Oestrid flies / Oestrid larvae (nasal bot fly larvae)

These insects lay their eggs in either the nasal passages or on the eyes of their hosts.

- *Oestrus ovis*: sheep, goats, aberrant host grey rhebuck
- *Oestrus macdonaldi, O. variolosus*: wildebeest, blesbok
- *Rhinoestrus* spp.: springbok, zebras
- *Kirkioestrus minutus*: wildebeest
- *Gedoelstia* spp.: wildebeest, blesbok, bontebok; aberrant hosts sheep, goats, cattle, grey rhebuck, other antelope species

Gasterophilid larvae (horse bot fly larvae)

These insects lay their eggs in the coat (hair) of their hosts. The animal takes the eggs into their mouths inadvertently through self-grooming or allo-grooming. The larvae end up in the stomach of their host.

- *G. temicinctus, G. meridionalis*: zebras
- *G. intestinalis*: horses

The larvae of the other gasterophilid flies are common to both zebras and horses

Hypodermid larvae (warble fly larvae)

These are parasites of the skin, with larvae burrowing under the skin.

*Strobiloestrus* sp.: klipspringer, grey rhebuck; aberrant hosts cattle, sheep, bontebok
**Calliphorid flies (blow flies)**

These insects are recognizable as being the metallic green and blue flies.

The larvae of these flies **fulfil an important role in wildlife systems in the utilisation of carcasses.** Lucilia and Chrysomyia larvae may, however, also cause **myiasis**, which is the parasitic infestation of **LIVE** animals. This is observed particularly in injured, sick or aged wild animals. Heavy infestations of Cordylobia anthropophaga larvae may occur in jackal pups.

Adult Chrysomyia marginalis can play an important role in the spread of anthrax amongst **browsing antelopes** by **disseminating anthrax spores** from infected carcasses to the surrounding vegetation.

**Hippoboscid flies (louse flies)**

These insects are **ectoparasites.** The flies land on the coat of animals, **lose their wings** and mirror the general ecology of **lice.** They display an amazing ability to be able to **move quite quickly** around the coat of their hosts.

**Flies belonging to the genus Hippobosca. are generally host specific to their wild hosts:**

- H. alva: impalas
- H. longipennis: cheetahs
- H. struthionis: ostriches

The exception being H. ruftes which in addition to cattle and horses also infests **large wild herbivores** particularly in the **drier western regions** of the country.

**Lipoptena paradoxa** infests **kudus, nyalas, bushbuck and duikers** (all browsers) in the same south-eastern, eastern and northern regions of the country in which Amblyomma hebraeum is found. L. annalizeae infests **springbok** in the central drier regions of the country and L. binocula infests **steenbok** and springbok in the arid western regions. Flies of this genus thus **display not only host preferences but also habitat preferences.**
Fleas

Fleas are generally host specific and usually infest those animals that have lairs, burrows or nests. Some host species may be infested with more than one flea species. The abundance of Ctenocephalides felis strongylus, infesting scrub hares in this country, is not affected by the breeding cycle of the hares as is that of Spilopsyllus cuniculi which infests pregnant rabbits and new-born leverets in Europe. C. felis strongylus is most abundant on scrub hares from early winter to spring irrespectively of whether the hares occur in summer or winter rainfall regions. Some of the fleas of wild rodents can play a role in the transmission of plague (Yersinia pestis) to humans.

Large animals such as warthogs which utilise burrows can be very heavily infested with the stick-tight fleas Echidnophaga larina and Phacopsylla inexpectata.

**Warthog: Phacochoerus africanus**
Lice

Lice are probably one of the **most host specific groups of ectoparasites**. In addition, they are also **permanent parasites** and may occupy specific sites on their hosts’ bodies. Most host species are infested with more than one species of louse. **Impalas harbour five species** while **18 species** have been recorded on rock dassies. The largest louse burdens appear to be **present in the winter months**. Louse burdens may become very large on stressed or aged animals. Lice can be **transported from one host to the next by attaching to the legs of flies**. This probably occurs most frequently when animals have died.

**Young Impala: Aepyceros melampus**
Ticks

Ixodid ticks (hard ticks, shield ticks)

The majority of adult ixodid ticks of veterinary importance are not host specific, but they do have host preferences. Their general Life Cycle is one of:

Adult → Egg → Larvae → Nymph → Adult.

However different species have different variations with either one, two or three hosts. The detailed life cycle of ticks may be found in The Game Ranging Course, Module # 2, Component # 3 – Ticks and Mites.

- Amblyomma hebraeum
- Boophilus decoloratus
- Haemaphysalis leachi
- Hyalomma spp.
- Ixodes rurbicundus
- Rhipicephalus appendiculatus
- Rhipicephalus evertsi evertsi
- Rhipicephalus glabroscutatum
- Rhipicephalus punctatus
- Rhipicephalus simus
- Rhipicephalus zambeziensis

Source: www.afrivip.org
### Host preferences (adult ticks)

<table>
<thead>
<tr>
<th>Tick Species</th>
<th>Hosts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. hebraeum</strong> <em>(bont tick)</em></td>
<td>buffaloes, giraffes, eland, rhinoceroses, cattle, goats</td>
</tr>
<tr>
<td><strong>B. decoloratus</strong> <em>(blue tick)</em></td>
<td>kudus, nyalas, bushbuck, impalas, giraffes, eland, zebras, cattle, horses</td>
</tr>
<tr>
<td><strong>H. leachi</strong> <em>(yellow dog tick)</em></td>
<td>lions, leopards, hyenas, wild dogs, dogs, cats</td>
</tr>
<tr>
<td><strong>Hyalomma spp.</strong> <em>(bont-legged ticks)</em></td>
<td>giraffes, eland, buffaloes, zebras, cattle, horses</td>
</tr>
<tr>
<td><strong>I. rubicundus</strong> <em>(Karoo paralysis tick)</em></td>
<td>mountain reedbuck, eland, caracals, sheep, goats</td>
</tr>
<tr>
<td><strong>R. appendiculatus</strong> <em>(brown ear tick)</em></td>
<td>buffaloes, kudus, nyalas, impalas, cattle</td>
</tr>
<tr>
<td><strong>R. evertsi evertsi</strong> <em>(red-legged tick)</em></td>
<td>zebras, eland, giraffes, horses, sheep</td>
</tr>
<tr>
<td><strong>R. glabroscutatum</strong> <em>(smooth brown tick)</em></td>
<td>kudus, bushbuck, mountain reedbuck, gemsbok, goats, sheep</td>
</tr>
<tr>
<td><strong>R. punctatus</strong> <em>(brown paralysis tick)</em></td>
<td>scrub hares, goats, sheep</td>
</tr>
<tr>
<td><strong>R. simus</strong> <em>(glossy brown tick)</em></td>
<td>warthogs, lions, leopards, hyenas, zebras, cattle, horses, dogs</td>
</tr>
<tr>
<td><strong>R. zambeziensis</strong> <em>(Zimbabwe brown ear tick)</em></td>
<td>kudus, nyalas, bushbuck, impalas, cattle</td>
</tr>
</tbody>
</table>

Several tick species are, however, specific to their wild hosts:

<table>
<thead>
<tr>
<th>Tick Species</th>
<th>Hosts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amblyomma rhinocerotis</strong></td>
<td>Rhinoceroses</td>
</tr>
<tr>
<td><strong>Amblyomma tholloni</strong></td>
<td>Elephants</td>
</tr>
<tr>
<td><strong>Dermacentor rhinocerinus</strong></td>
<td>Rhinoceroses</td>
</tr>
<tr>
<td><strong>Haemaphysalis hyrachophila</strong></td>
<td>Dassies</td>
</tr>
<tr>
<td><strong>Rhipicephalus arnoldi</strong></td>
<td>Red rock rabbits</td>
</tr>
<tr>
<td><strong>Rhipicephalus distinctus</strong></td>
<td>Dassies</td>
</tr>
<tr>
<td><strong>Rhipicephalus oculatus</strong></td>
<td>Cape and scrub hares</td>
</tr>
<tr>
<td><strong>Rhipicephalus simpsoni</strong></td>
<td>Cane rats</td>
</tr>
</tbody>
</table>

**Rodents, shrews, hares, rabbits and ground-frequenting birds**

These small animals are fair to excellent hosts of the immature stages of many ixodid tick species important to domestic animals. They may also harbour the disease organisms spread by these ticks to animals and man.
**Preferred hosts**

- **Mice and rats**: H. Leachi, R. Simus; Rickettsia conori
- **Gerbils**: Hyalomma truncatum
- **Rock elephant shrews**: L. rubicundus, R. Punctatus, Rhipicentor nuttalli
- **Scrub hares**: A. Hebraeum, Hyalomma spp., R. Appendiculatus, R. Evertsi evertsi, R. Glabroscutatum, R. Punctatus, R. Zambeziensis; Cowdria ruminantium,
- **Red rock rabbits**: L. rubicundus
- **Helmeted guineafowls**: A. Hebraeum, H. Marginatum rufipes; C. Ruminantium

**Buffaloes**

Cape buffaloes are **excellent hosts** of all stages of development of *R. appendiculatus*, in addition much of the habitat to which the buffaloes have now been confined in South Africa overlaps that of this tick.

Buffaloes are also **asymptomatic carriers** of *Theileria parva lawrencei* the **cause of Corridor disease in cattle**. This organism is **transmitted transstadially** by *R. appendiculatus* and *R. zambeziensis*. Should buffaloes **break out of reserves** or game farms **on to surrounding cattle ranches infected**, **engorged**, immature ticks may **detach from these animals**. The ticks will moult to the next stages of development and these could attach to cattle which will then develop Corridor disease. Because of this there are **strict regulations and even prohibitions on the translocation of buffaloes** from regions in which *R. appendiculatus* and/or *R. zambeziensis* occur to other regions.

**Buffalo populations** from the following **reserves/provinces** which all lie outside the distribution of *R. appendiculatus* and of *R. zambeziensis*, **consequently fetch premium prices**:

- Addo elephant park
- Eastern cape province
- Vaalbos park
- Northern cape province
- Willem prinsloo reserve
- Central free state
Argasid ticks (soft ticks, tampans)

*Ornithodoros porcinus* (warthog tampan) feeds on warthogs while they are in their burrows. Fairly large numbers can be transported by warthogs when they leave these burrows. These ticks are the vectors of the African swine fever virus and can survive for long periods without feeding. It is thus possible for them to meet domestic pigs kept on open range in bushveld regions.

- **Soft ticks** may go 8 years without a meal
- **Tampans** may go 5 years between meals

*Ornithodoros savignyi* (sand tampan) was originally probably a parasite of wildlife. Man has now not only removed the wildlife and replaced it with domestic stock but has also killed or disturbed the natural predators of the tick such as guineafowls.

The tampan detects potential hosts by being able to pick up the carbon dioxide emissions of host. Incredibly the tampans can do this from 20 cm (8 in.) below the soil from 13 ½ m (44 ft.) away.

Warthog: *Phacochoerus africanus*
Mites

Mites are generally host specific or may be specific to closely related host species. However, Sarcoptes scabiei (causing sarcoptic mange) has a wide range of hosts. The large carnivores are particularly susceptible to infestation with this mite and animals under stress exhibit very severe clinical signs.

It is quite probable that S. scabiei infestation plays an important role in population control of the large carnivores, especially when carnivore populations have become too large and prey resources are dwindling. Antelopes under stress may also develop severe infestations of S. scabiei.

These arachnids are tiny and are generally considered ‘permanent parasites’.

Image source: www.galluradisinfestazioni.com
Conclusion

Wild carnivores by their method of killing and feeding, come into close contact with their prey. They often acquire temporary infestations of the ectoparasite species which are host specific to their prey and the carnivores' recent kills can often be identified from these. Carnivores are also the final hosts of the tapeworms Echinococcus spp. and Taenia spp. The cystic stages of these tapeworms are found in the preferred prey species of the carnivores.

Parasites of wildlife need to be considered from two points of view. They are a naturally occurring phenomenon and game has become conditioned to dealing with them over thousands of years. They are an important natural control mechanism. However, through our own actions we have produced artificial systems from natural systems and it is therefore our responsibility to manage. The degree of management and intervening in the natural processes of parasite and host will differ with every situation. We need to make a very careful assessment of the scenario presented and make decisions that may either restore balance or end up with a system more artificial than when we began.

In the following component, we examine all the factors that account for the general biology and control of wildlife and their parasites.

Impala: Aepyceros melampus