Module # 2 – Component # 3

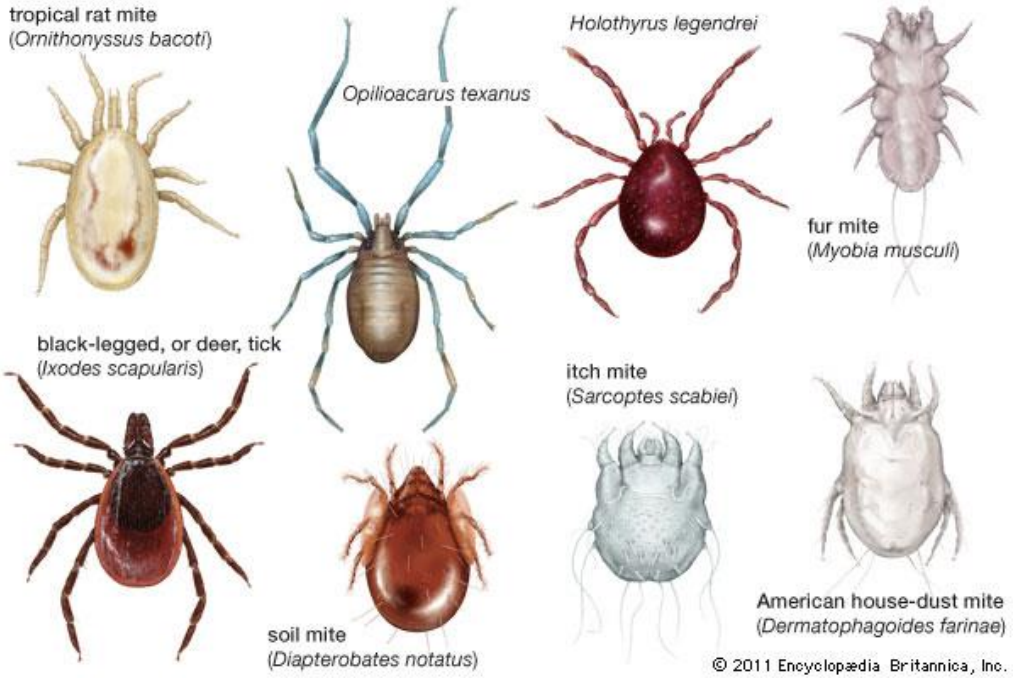
Ticks and Mites

Objectives:

To achieve an introduction to and understanding of the Order Acari within the Class Arachnida.

Expected Outcomes:

- To be able to recognise ticks and mites based on their external anatomy
- To gain insight into their general anatomy and physiology
- To become familiar with the different ecologies of ticks



Representative members of subclass Acari (mites and ticks).

Introduction

Order Acari: Ticks and Mites

- There are some **30 thousand species** of mites and ticks known to science.
- They are among the most significant groups of arthropods since they are important **vectors of disease**.
- They may be either **free-living** or **parasitic**.
- None have body segments since the abdomen is fused to the cephalothorax.
- Their mouthparts (called the **Gnathosoma**) are adapted for sucking and biting.

These organisms are unsurpassed as being the most important arachnids with reference to mankind. Other than just their enormous importance as being vectors (carriers and spreaders) of disease to both man and domestic stock, they are also largely responsible for a significant amount of crop loss.

These animals are highly successful for several reasons:

- Their small **size**
- Their ability to exploit **micro-habitats**
- Their wide **radiation** (movement) into most of the major world biomes including the oceans and freshwater.
- Feeding on very **specialised diets**.
- Their ability to survive relatively long periods **without feeding**.

Although more than **30 000 species** have thus far been described, some **acarologists** (tick and mite specialist scientists) believe that this figure only represents a small fraction of their total number of species. Unfortunately, most of these '**undiscovered species** 'will remain just that - undiscovered. This is because the probable habitat for these 'undiscovered' are the **tropical rain forests**, a habitat that is fast disappearing. Somewhere in the region of 470 square kilometres of tropical rainforest is cut down daily **±181.5 square miles per day**).

Other than in tropical forests ticks and mites may be encountered in just about all habitats. Many prefer **humus** and **leaf litter**, others the **bark** of trees or inside **flowers**. In savanna ecosystems ticks are frequently found in swards of tall **grass**. From here they simply latch on to passing game or unsuspecting game rangers and tourists. **Savanna species** have even been shown to be able to detect the presence of potential hosts and climb to the top of grass stems. Here they extend themselves outwards to increase their chances of climbing onto a host.

The group of **Acari** known as **water mites**, which contains **±** 2800 individual species, shows some remarkable examples of being able to radiate widely. These species have been found not only in freshwater, but also in the **intertidal zone** off beaches. More remarkable than this is the fact that they have also been found in **ocean trenches** that are several miles deep.

Food and Feeding

Ticks and especially mites show a great diversity and specialisation of food items and feeding habits. In the mainstream, however, they have retained the **arachnid mode of food ingestion** of sucking out fluids. In the case of solid prey items an initial liquefaction of tissue occurs inside the prey before the nutrients are sucked out.

The **free-living species** feed mainly on small insects, on the eggs of invertebrates and on other arachnids, nematodes (round worms), insect larvae and other mites.

The principal prey item for most freshwater mites is crustaceans.

Many of the free-living mites are scavengers of one type or another, while many have very specialised diets. Some of these **specialised 'foods'** include:

- **Dried skin**
- **Dried fruit**
- **Body oils**
- **Flour**
- **Feather fragments**
- **Mattress and upholstery stuffing**
- **Cheese**
- **Hay**
- **Fur**

Herbivorous mites have specially adapted mouthparts called **stylets** for piercing plants and **sucking the sap** from them. In particular, are the spider mites. Many of these species have become significant **agricultural pests** feeding on fruit trees, clover, alfalfa and cotton.

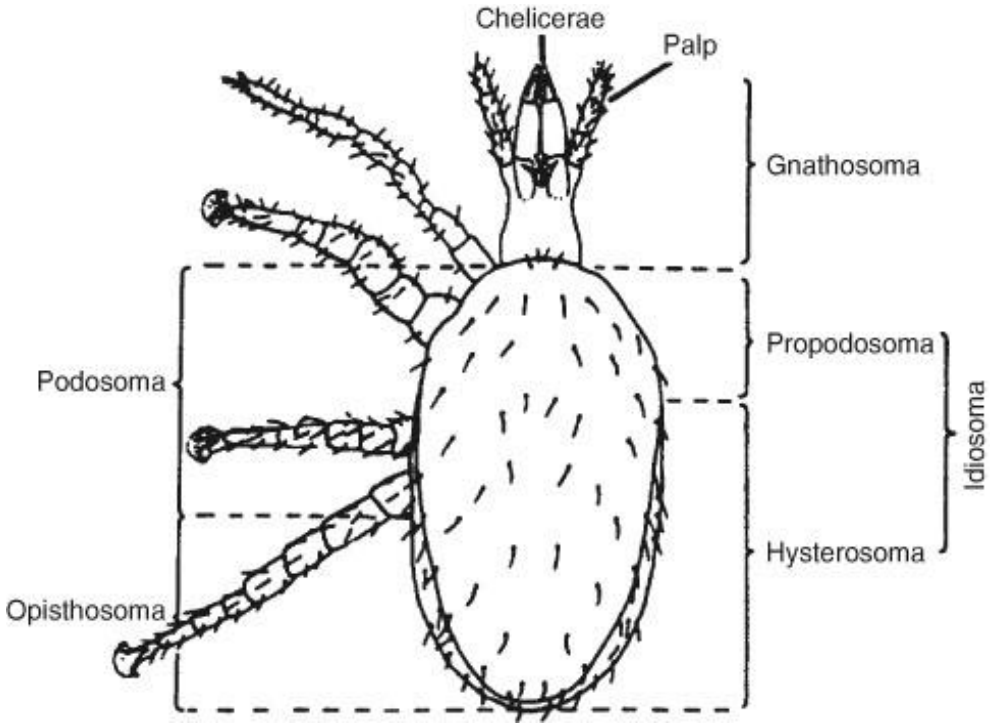
Ectoparasitic (parasites that attach to the **outside** of their host) mites feed on the blood of their hosts, on which they are dependent for their survival. The ticks fall into this feeding category. Ticks' bodies are soft so that they can **distend** and take in a large quantity of blood at a sitting.

Some mites, however, have become **internal parasites** (endoparasites), having invaded the bodies of many vertebrates through their **airways**, and the cavities of Arthropods via their **tracheal system** of respiration.

Although most Acari are **parasitic** throughout their entire life cycle, most are only attached to their host during periods of feeding. Ticks attach to their host by means of highly specialised mouthparts that penetrate the skin.

However, the actual 'bite' of ticks is very seldom felt as the mouthparts are exceedingly small and sharp. Once attached the tick begins to suck blood. Many species can live well **over a year between feedings**.

All tick species prefer attaching themselves to specific areas on the host's body. These areas are called **predilection sites**. These congregations make it easier to **find a mate**. These predilection sites are also chosen for the **availability of blood** and **accessibility to the host**. Predilection sites include the groin area, ears, under the armpits, ankles and around the anus.



Acari as Vectors of Disease

Many tick species are of great **veterinary importance as vectors of disease**. Ticks transmit disease in a similar fashion to mosquitoes. When they begin to feed, the first action is not to suck, but rather to inject an **anti-coagulant** so that the blood does not clot, which makes feeding easier. However, with this anti-coagulant also comes whatever parasite or disease that the tick may be harbouring, whether it be a **bacteria**, **virus, pathogen** or other organism.

One very important ecological example is that of the **heart water tick** and **Springbok**. These antelope are particularly susceptible to a disease called heart – water, which is transmitted by the Heart-water tick. Once infected the disease (a **bacterium**) causes fluid accumulation in the **pericardium** (tissue around the heart) leading to the death of the Springbok. What is significant here, is the fact that these ticks cannot survive in the **drier regions** preferred by Springbok and are only found in Bushveld areas.

This is the reason why you seldom see Springbok on the cams. The one notable exception to this is the **Pilanesberg Reserve**. If Springbok are released into the **Lowveld region** of South Africa (around the Kruger National Park) they quickly die.

We also find ticks that are very **host specific**, meaning that they only attach to a specific species. Host species that have host – specific ticks include:

- **Elephant**
- **Rhino**
- **Cane rats**
- **Hyrax**
- **Scrub hares**
- **Red rock rabbits**

One further significant example is the **Argasid tick**. One of its species is called the warthog tampan tick. This arachnid is responsible for spreading The **African Swine Fever Virus.** There are two things other than its vector status that make this tick remarkable.

- When not on a host it remains buried in sand to a depth of **±**20cm (8 Inches). From this position, it is able to **detect the carbon dioxide emissions** of potential hosts from up to 13 meters (42 Feet) away.
- Equally incredible is that it can **survive up to 5 years** between blood meals.

One last example is of veterinary important mites. One species, *Carcotes scabiei* causes in a wide variety of terrestrial mammals, causing them hair loss and irritation.

It is important to realise that tick and mites are part of the **ecosystem dynamics** and should not be viewed with disdain. Normal healthy medium -sized antelope can easily cope with **external parasite loads** of up to **5,000** and more. It is only when the animal is weakened from a secondary ailment that the parasite will cause a decline in and eventual death of the animal. This is one further way in which nature balances itself.

It is generally accepted that animals **smaller than Impala** very seldom act as hosts to the adults of any tick species. Small game species are usually only host to larval and nymph ticks. The reason for this is that the burden of massive ticks on a small animal such as a steenbok would certainly lead to the decline or death of the animal. This is obviously **counterproductive** to a parasitic animal that is dependent on the host for supplying its food.

Among humans, the most common medical complaint due to tick bites, is **tick – bite – fever**. This is not a lasting debilitating condition. Symptoms include a high temperature, headache, stomach complaints and light headedness. Treated or untreated, symptoms disappear with 3 – 4 days with no long-lasting effects felt.

The Lifecycle of Ticks

All species of ticks have either a **one**, **two** or **three host lifecycles**:

The lifecycle of a **one-host tick** (for example the **Blue Tick**) is as follows:

- The female drops off the host to lay her eggs on the ground.
- The eggs hatch into six-legged larval ticks (note six legs and not 8 normally associated with arachnids) often called pepper ticks (since they look like small red dots).
- The larvae climb to the top of a grass stem and await the arrival of a suitable host.
- When the host is boarded, the larva takes its first blood meal. It continues to feed and grow until it moults and turns into a nymph while still on the host.
- The nymph attaches itself to the same host again and feeds until it moults into an adult.
- The adult tick, still on the same host, finds a mate and copulates. If it is a female, she will drop off the host to lay her eggs on the ground.
- Males will remain on the host in search of other mates.

Two Host Lifecycle

The lifecycle of a two-host species follows the same pattern, except that the nymph always drops off the first host after its blood meal, before it moults into an adult. The newly moulted tick finds a second host and completes its lifecycle there. **Red-legged** and **Bont-legged ticks** are examples of this type.

Three Host Lifecycle

The lifecycle of three-host species differs in that the larva drops off the host after its first blood meal, before moulting into a nymph. It then finds a new host, takes second blood meal, grows some more and then drops off again to moult into a secondary nymphal stage. It then finds a third host, feeds and completes its lifecycle, by moulting into an adult. The **brown ear tick** and the **bont tick** are examples of these species.