

# **Veterinary Acarology**



**By**

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# Learning Objectives

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- At the end of this session students will be able to:
  - ✓ Define what does it mean by class arachnida?
  - ✓ Characterize the morphology of ticks
  - ✓ Explain the roles and effects of ticks on health and economy
  - ✓ Describe the life cycles and factors influencing occurrence of ticks
  - ✓ Diagnose and identify the different types of ticks
  - ✓ Treat and plan control strategies based on the life of ticks

# Class Arachnida

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- Includes the **ticks** and **mites**, which are of considerable veterinary importance and also **spiders** and **scorpions**
- Adults have **four pairs of legs** and their body is composed of a **cephalo-thorax** (unsegmented) and **abdomen**.
- Antennae are absent.
- Their mouthparts are extensively modified and carry **two pairs of appendages: chelicerae** and the **palps**.

# Class Arachnida

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- The mouthparts are borne on the basis **capituli** (**gnathosoma**), that consists
  - a pair of **chelicerae** with mobile digits adapted for cutting (serve for feeding purpose)
  - a pair of **sensory palps** (serve as antenna)
  - ventro-medially **unpaired hypostome** with recurved teeth; it bears a dorsal groove to permit the flow of saliva and host blood/feed
- Their life cycle consists: **eggs - larva - nymph – adult stages**

# Ticks

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- Ticks are obligate **blood-sucking** ectoparasites of worldwide veterinary significance.
- They are particularly important in **warmer and wetter** regions where they can be a serious constraint on agricultural production if not adequately controlled.
- Ticks have **no obvious** body segmentation
- Ticks vary in **size** according to **species, life-cycle phase** and **stage of engorgement**

# Ticks

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- Do have simple metamorphosis cycle:  $E \rightarrow L \rightarrow N \rightarrow A$
- Currently, about **867 species** are recorded of which approximately **10% acts as vectors of diseases**
- Ticks transmit a greater variety of pathogenic micro-organism like viruses, rickettsia, bacteria, spirocheates and protozoans than any other arthropods

# Ticks

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- They are the most important **vectors of diseases** affecting livestock, humans and companion animals
- For instance; tick and tick-borne diseases affect about **80% of cattle population of the world**
- Ticks rank **2<sup>nd</sup> only after mosquitoes as vectors of human diseases**
- More important in tropical and subtropical countries

# Impacts of ticks on livestock

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- **Direct effects:**

- ✓ irritation, tick worry, skin damage, tick-paralysis, tick toxicosis, local injury and blood loss (0.5-2ml blood sucked by a single female), secondary complications.
- ✓ **transmission of diseases:** babesiosis, East Cost fever, anaplasmosis, heartwater, African swine fever (by *Ornithodoros species*)



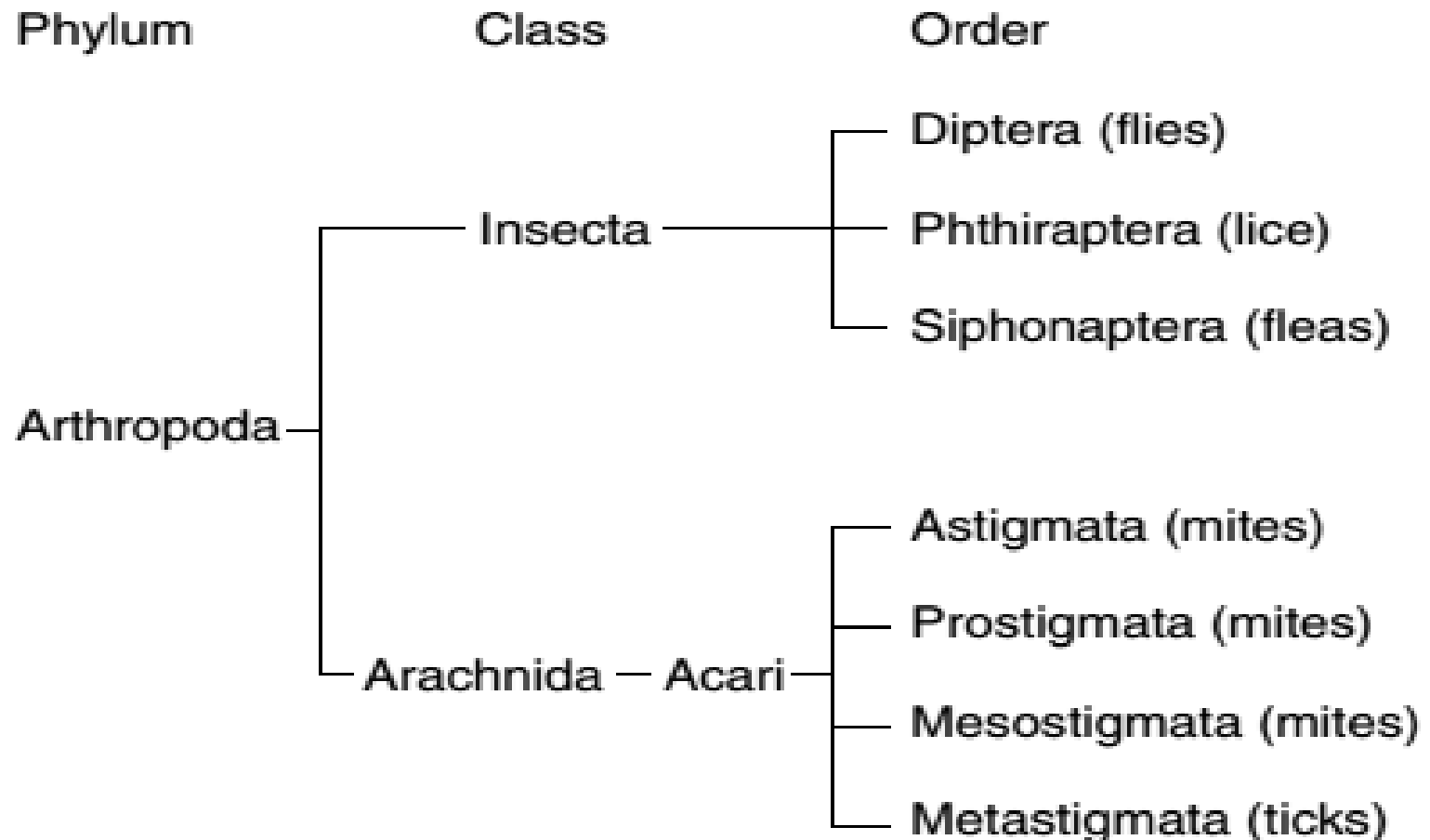
# Pathogens transmitted by ticks

9

322 species of ticks	transmit	84 bacteria
302 species of ticks	transmit	124 viruses
143 species of ticks	transmit	59 apicomplexan parasites
4 species	transmit	3 nematode species
3 species	transmit	<i>Trypanosoma theileri</i>
34 species of ticks associated with <b>toxicosis</b>		

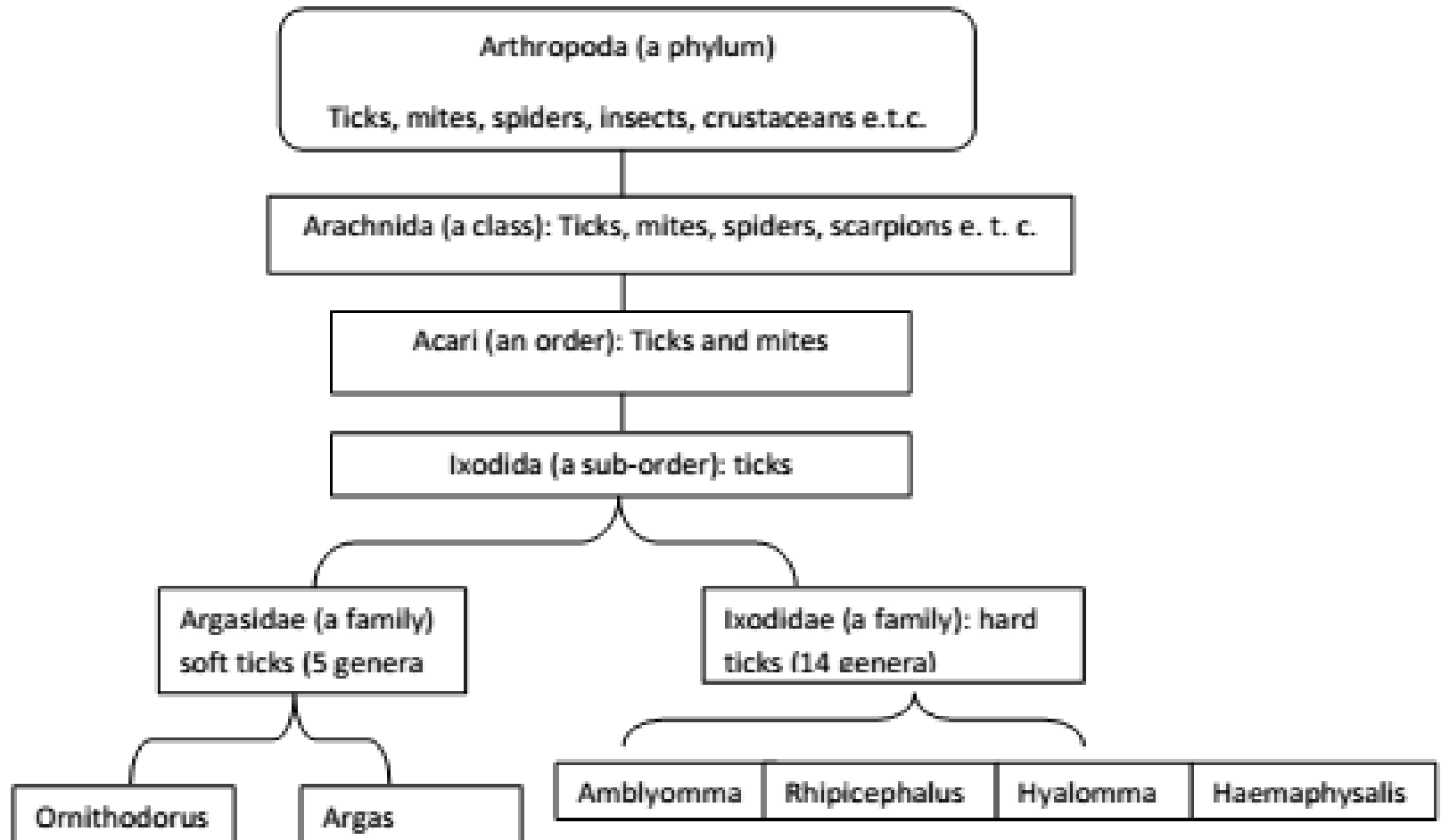
# Classification of Ticks

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# Position of Ticks in Phylum Arthropoda

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# Classification of Ticks

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- Tick genera fall into **two categories**:
  - ✓ **Ixodidae** (hard ticks): which have a **chitinous dorsal** plate and visible mouthparts
  - ✓ **Argasidae** (soft ticks): which do not have a **scutum**.  
Their mouthparts are hidden from view beneath the body.

# Ticks at feeding

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# Difference between soft and hard ticks

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	Argasidae (soft ticks)	Ixodidae (hard ticks)
1.	The integument is leather like and no scutum	The integument is hard and chitinous shield or scutum is present. In males the scutum covers the whole dorsal surface but in females, larva and nymphs it covers only a small portion behind the head.
2.	The capitulum and mouth parts are situated on the ventral surface and are not visible from the dorsal aspect	The mouth part is situated anteriorly and is well visible from the dorsal aspect
3.	There is one pair spiracles situated between the 3 <sup>rd</sup> and 4 <sup>th</sup> cox	The spiracle is situated posterior to the 4 <sup>th</sup> cox
4.	No porous areas	Porous areas present in females
5.	Festoon absent	Festoons generally present
6.	Eyes are situated on the lateral on the supra coxa folds	Eyes are situated on the side of scutum
7.	Coxa unarmed	Coxa generally armed with spurs
8.	Pulvilli absent or rudimentary	Pulvilli always present

# Hard tick (L) and Soft tick (R)

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# Family Ixodidae

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- The ixodids are important **vectors of various disease** pathogens
- Have a **chitinous** covering or **scutum** which extends over the whole dorsal surface of the male, but covers only a small area behind the head in the larva, nymph or female.
- The mouthparts carried on the **capitulum** are anterior and visible from the dorsal surface.



# Hard male and female ticks

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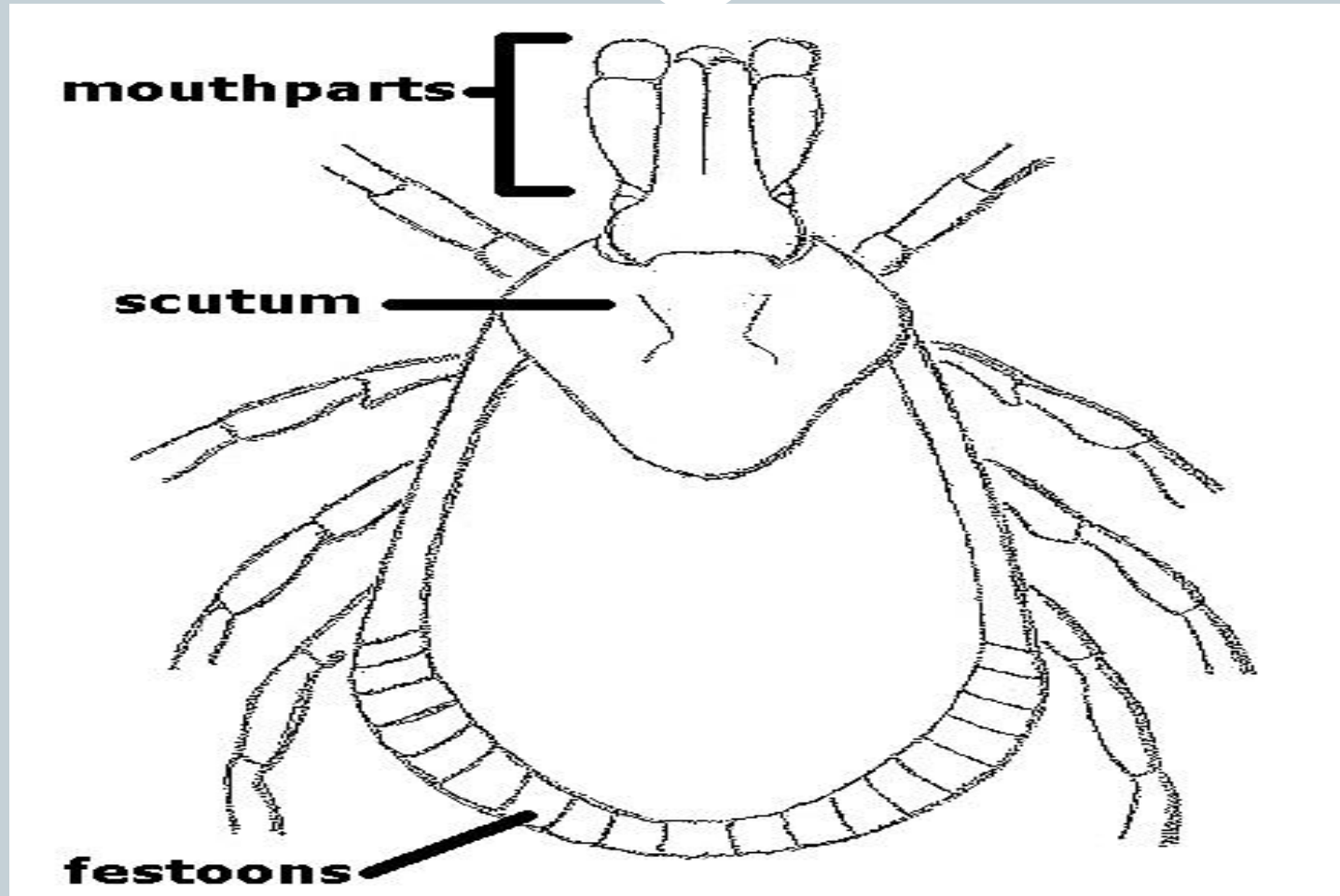
# Ixodidae

18

- They may or may not have a **row notches**, called **festoons**, on the posterior border of the body.
- **Genital opening** is in the ventral **midline** and the **anus** is posterior.
- Some ticks have coloured enamel-like areas on the body:  
**ornate ticks**
- **Spiracles**: are present behind the fourth pair of legs

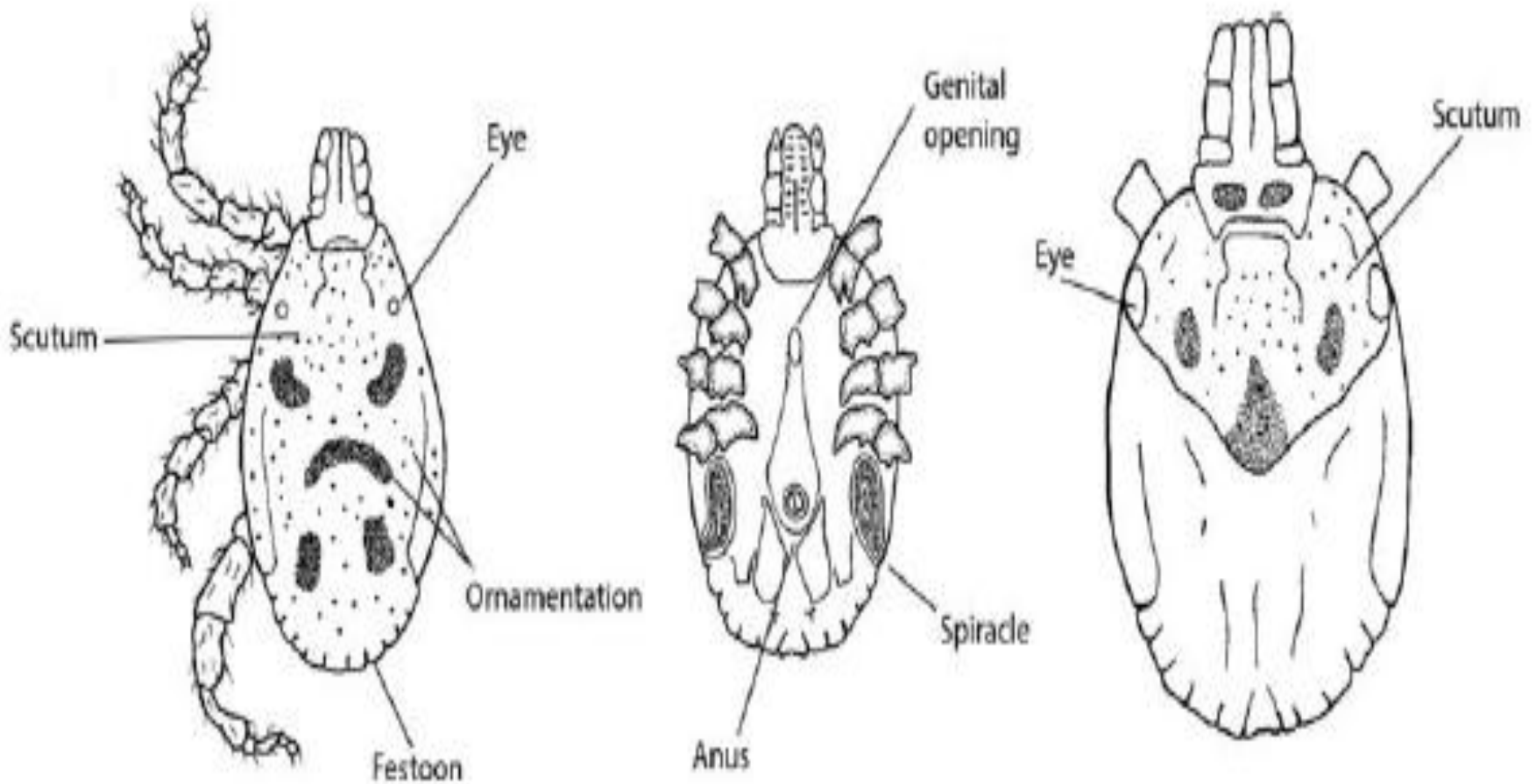
# Morphology of hard ticks

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# Structures of Ticks

20



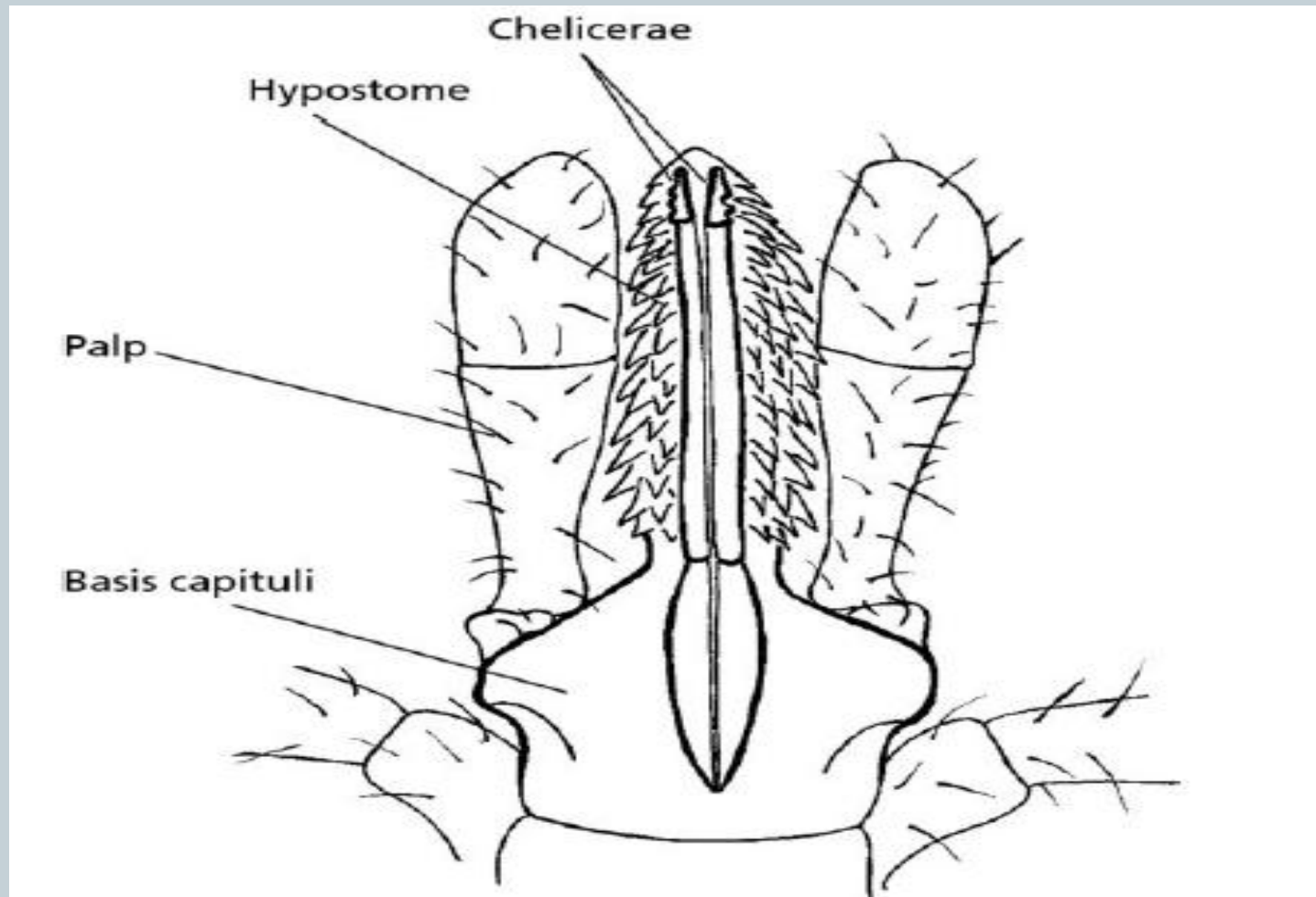
# Ixodidae

21

- **Eyes** may or may not present; if present, they are situated on the outside margin of the scutum
- Ticks have feeding apparatus with the following components:
  - ✓ **Basis capituli**: a platform supporting the functional mouthparts
  - ✓ **Palps**: a pair of sensory organs used for locating a suitable feeding site
  - ✓ **Chelicerae**: cutting structure; cut skin of the animal
  - ✓ **Hypostome**: feeding pipe

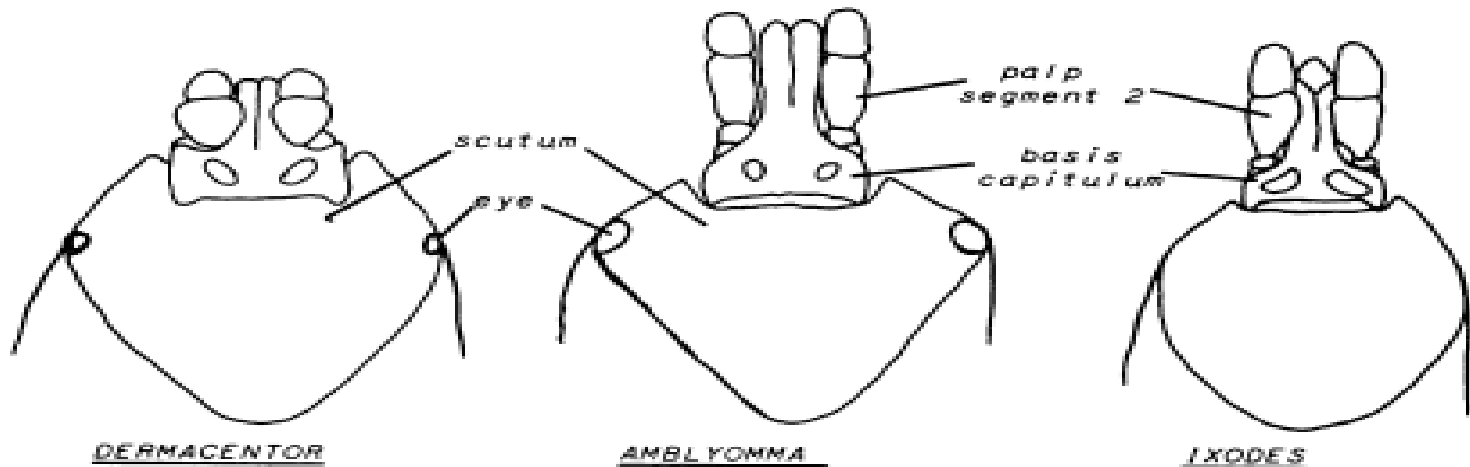
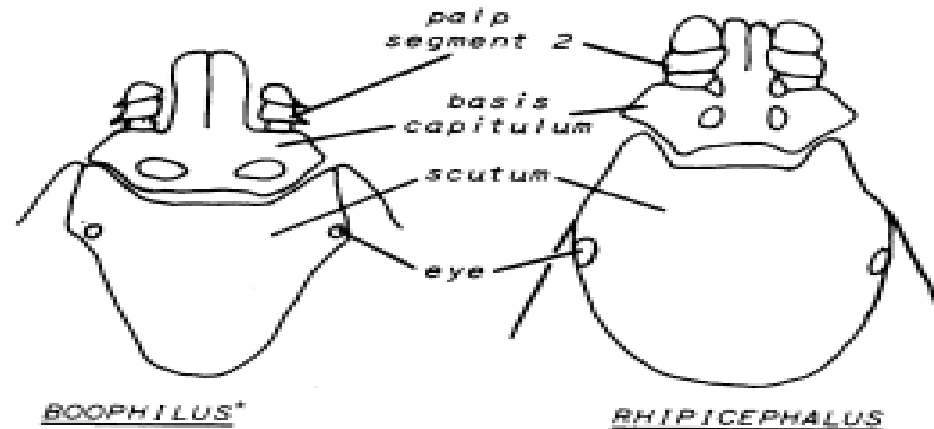
# Tick mouthparts

22



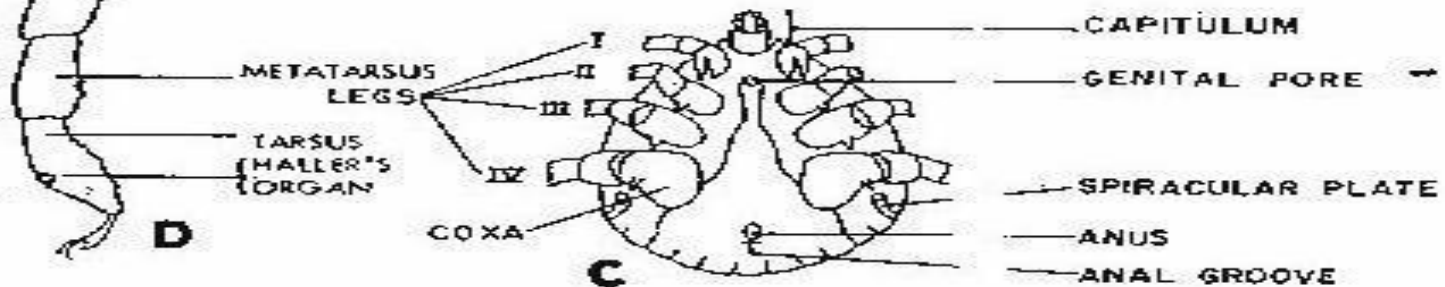
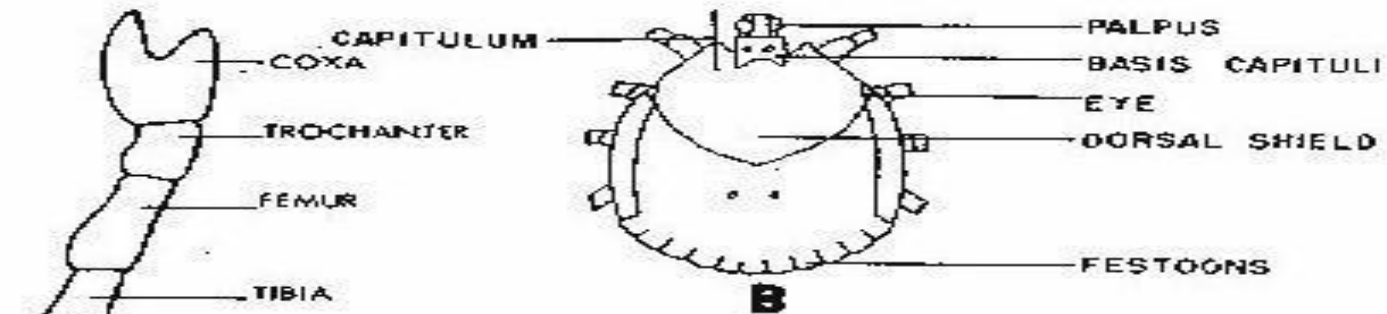
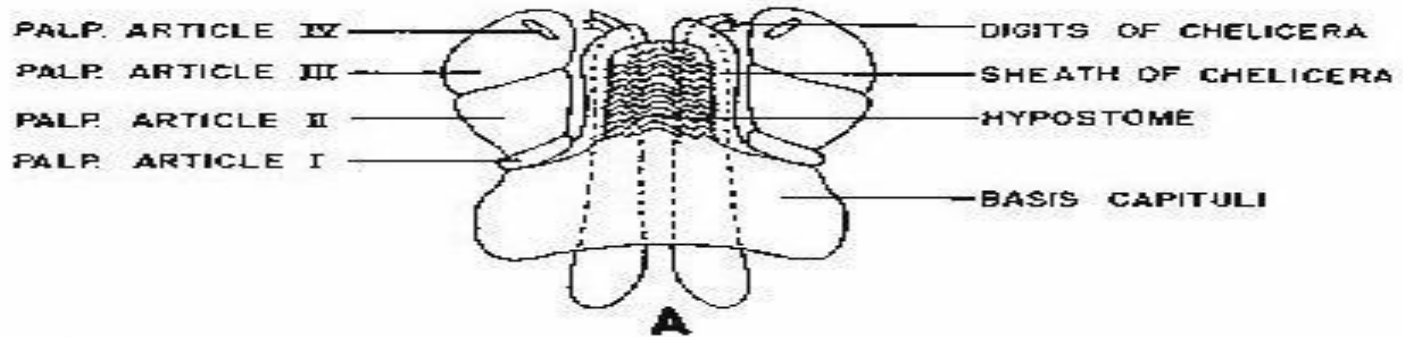
# Structures of basis capituli and mouth parts of important hard ticks

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# Structures of hard ticks

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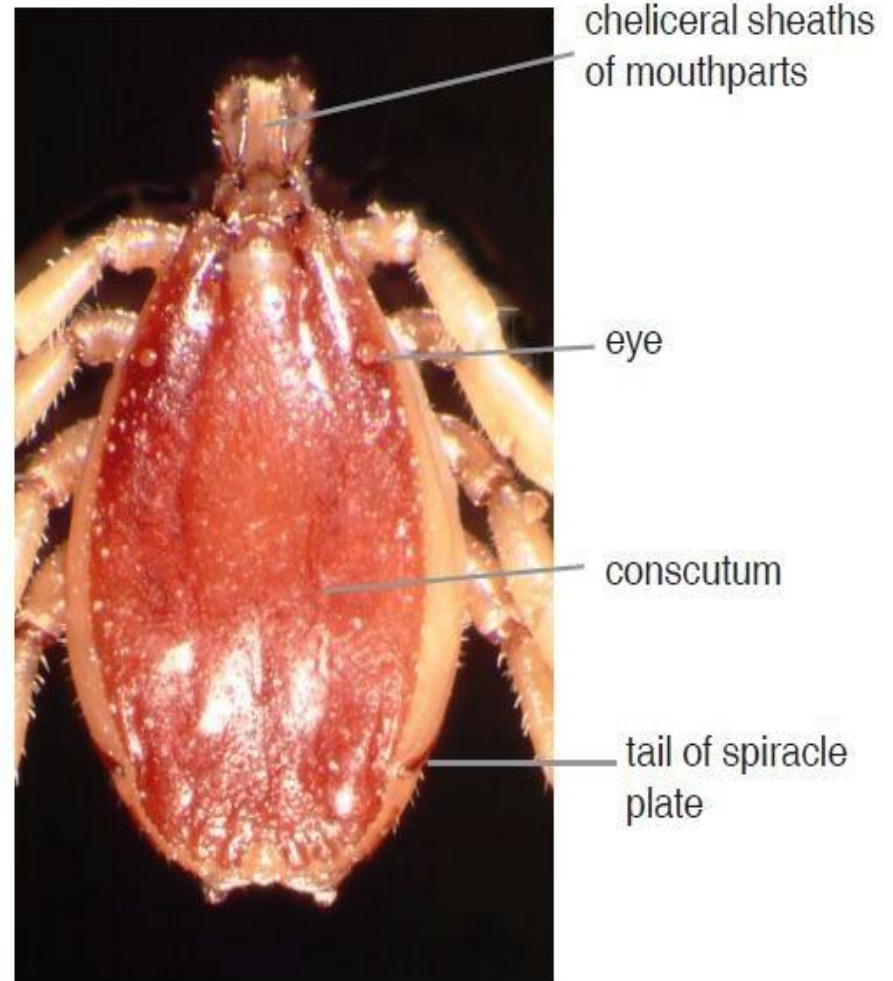
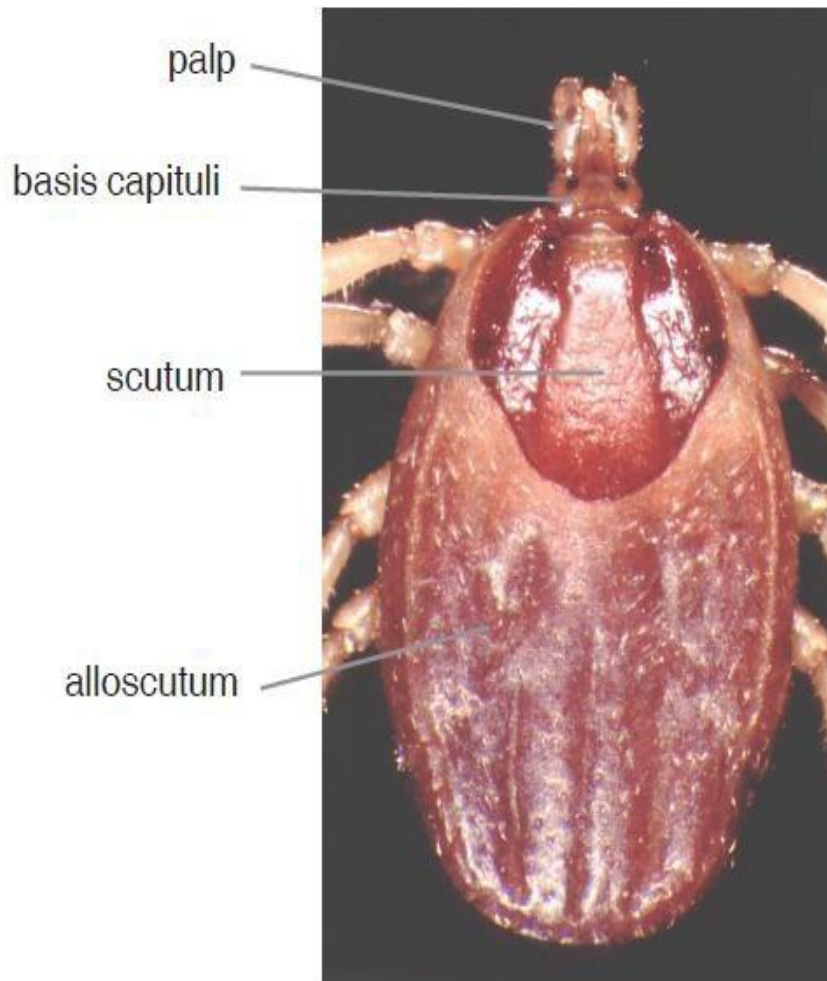
# Identification of hard ticks

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- ✓ **Unfed ticks:** flattened dorsoventrally
- ✓ have **capitulum** or **gnathosoma** (anteriorly) and **idiosoma** (posteriorly), which **bears legs**
- ✓ have a **pair of four segmented palps** (4<sup>th</sup> one is reduced):  
simple sensory organs
- ✓ **Chelicerae** present b/n palps; housed in cheliceral sheaths
- ✓ **Basis capituli** present: formed from **fused coxae of the palps**

# External structure of *Hyalomma species*: dorsal view

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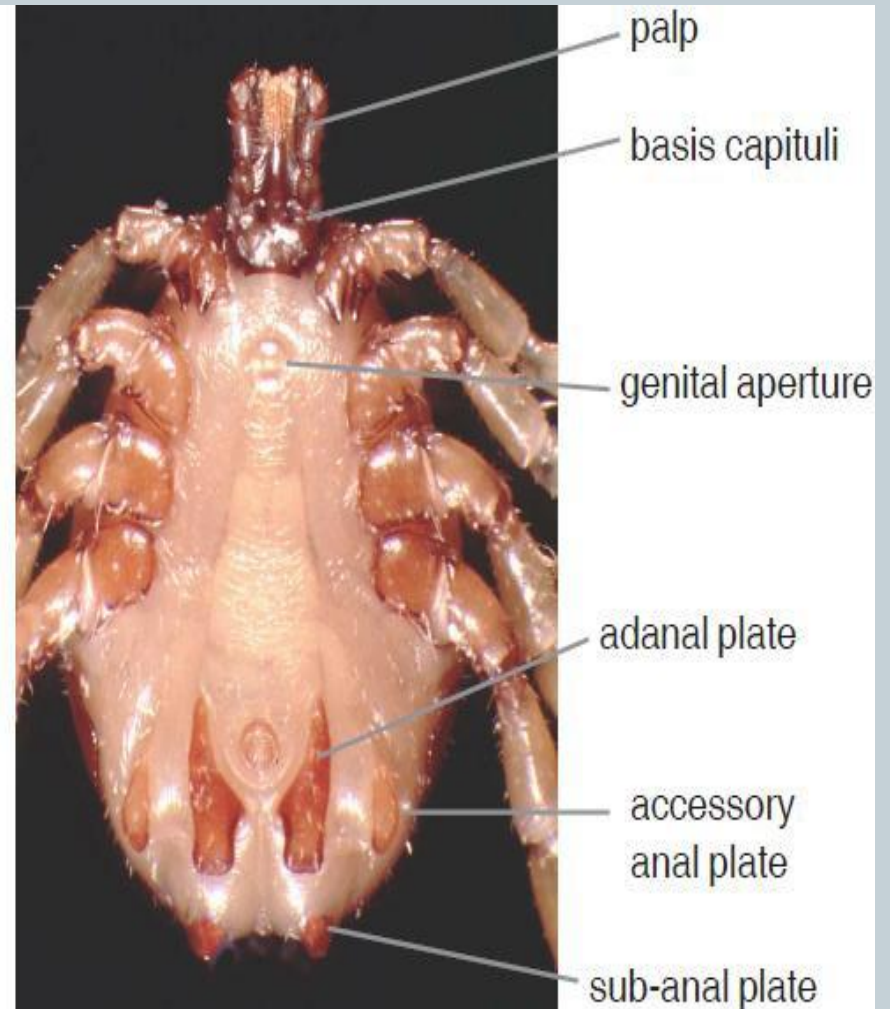
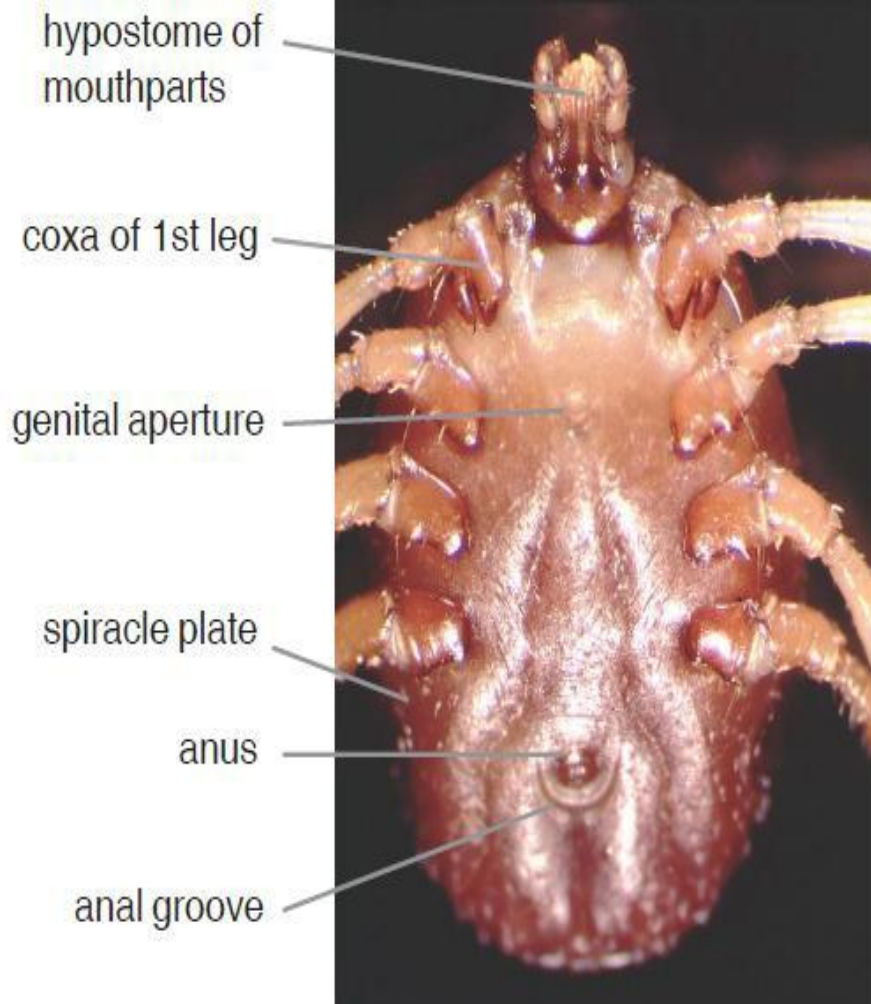
# Identification of hard ticks

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- ✓ **Hypostome** is present: an extended basis capituli
- ✓ **Ventral spurs** may be present: if present it gives **armed coxa**
- ✓ **Pulvillus** present
- ✓ **Scutum** present (dorsal shield/plate); in males covers the entire dorsal surface, but in females, larva and nymph covers small areas

# External structure of *Hyalomma* species: ventral view

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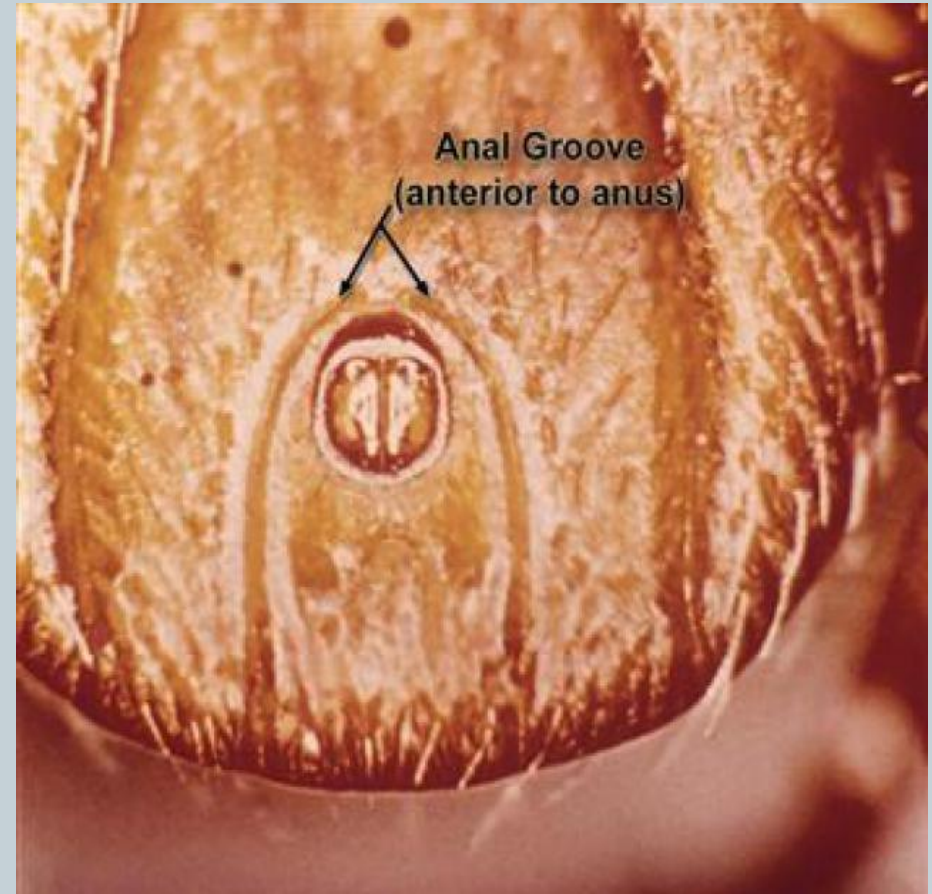
# Identification of hard ticks

29

- ✓ **Eyes:** may or may not present; if there, they are simple and situated on the outside margin of the scutum
- ✓ **Festoons** may be present: a rectangular rows of notches on the posterior border of the body
- ✓ A paired **spiracles/stigmata** present behind the **fourth pair** of legs; absent in larvae
- ✓ **Anal** groove present
- ✓ **Integument:** may be ornate or inornate

# Position of Anal groove

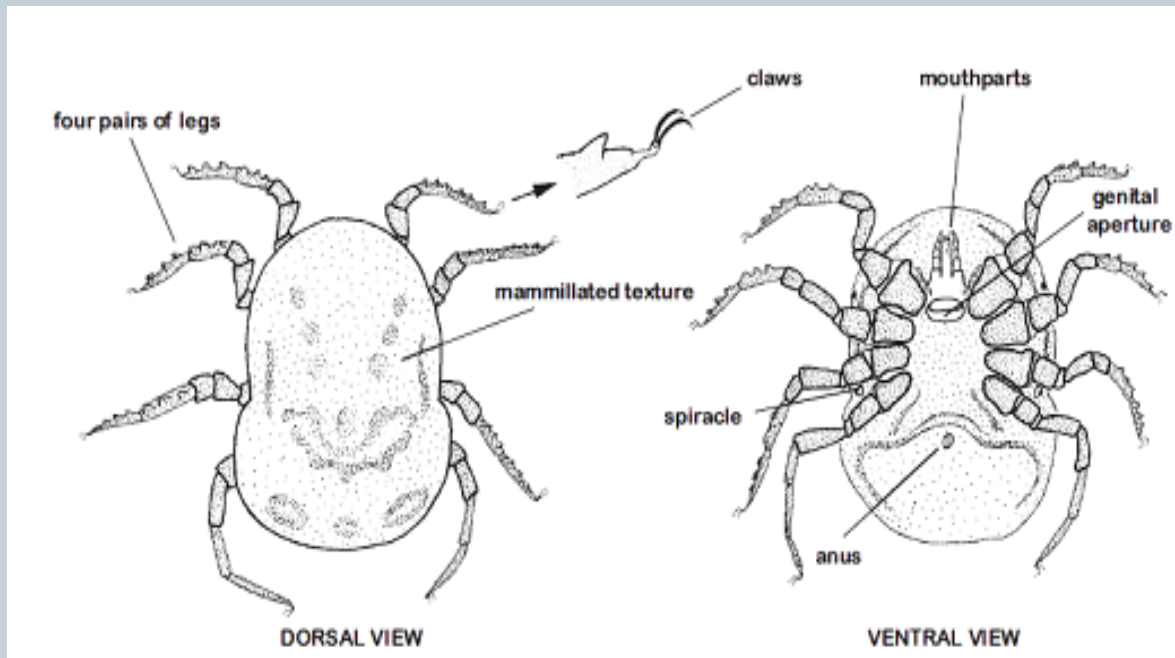
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# Identification of soft ticks

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- ✓ Capituli /gnathosoma not visible
- ✓ Integument is inornate
- ✓ Pulvilli usually absent or rudimentary



# Main features of ticks affecting domestic animals

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Group	Size	Mouthparts	Other features	Genera
Group 1	Large,	ventral and short,	scutum absent, pulvilli absent	<i>Argas</i> , <i>Ornithodoros</i> , <i>Otobius</i> .
Group 2	Large,	anterior and long,	pale rings on legs, eyes present and large.	<i>Amblyomma</i> , <i>Hyalomma</i> .
Group 3	Medium,	anterior and long,	plain dark legs, eyes absent.	<i>Ixodes</i>
Group 4	Medium,	anterior and short,	eyes present and large, coxae 1 with paired spurs.	<i>Dermacentor</i> , <i>Rhipicephalus</i> .
Group 5	Small,	anterior and short,	eyes small or absent, coxae 1 with small paired spurs or single spur.	( <i>Boophilus</i> ), <i>Margaropus</i> , <i>Haemaphysalis</i> .



# *Rhipicephalus* spp (L) & *Ixodes* spp (R): Questing

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# Discussion points

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- **Why ticks prefer hidden areas?**
- **What does it mean questing?**
- **How ticks locate/seek their hosts to attach?**
- **How ticks feed on their host?**
- **How ticks reproduce?**

# Ticks attachment

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*Amblyomma variegatum* feeding. A typical aggregation of females and males.

# Life cycle of Ticks

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- Ticks have **four developmental stages**:
  - ✓ one inactive stage: egg
  - ✓ three mobile stages: larvae, nymph and adults
- Apart from **size** and **sexual maturity**, larvae, nymph and adult are similar except that larvae have **six legs, and genital aperture**

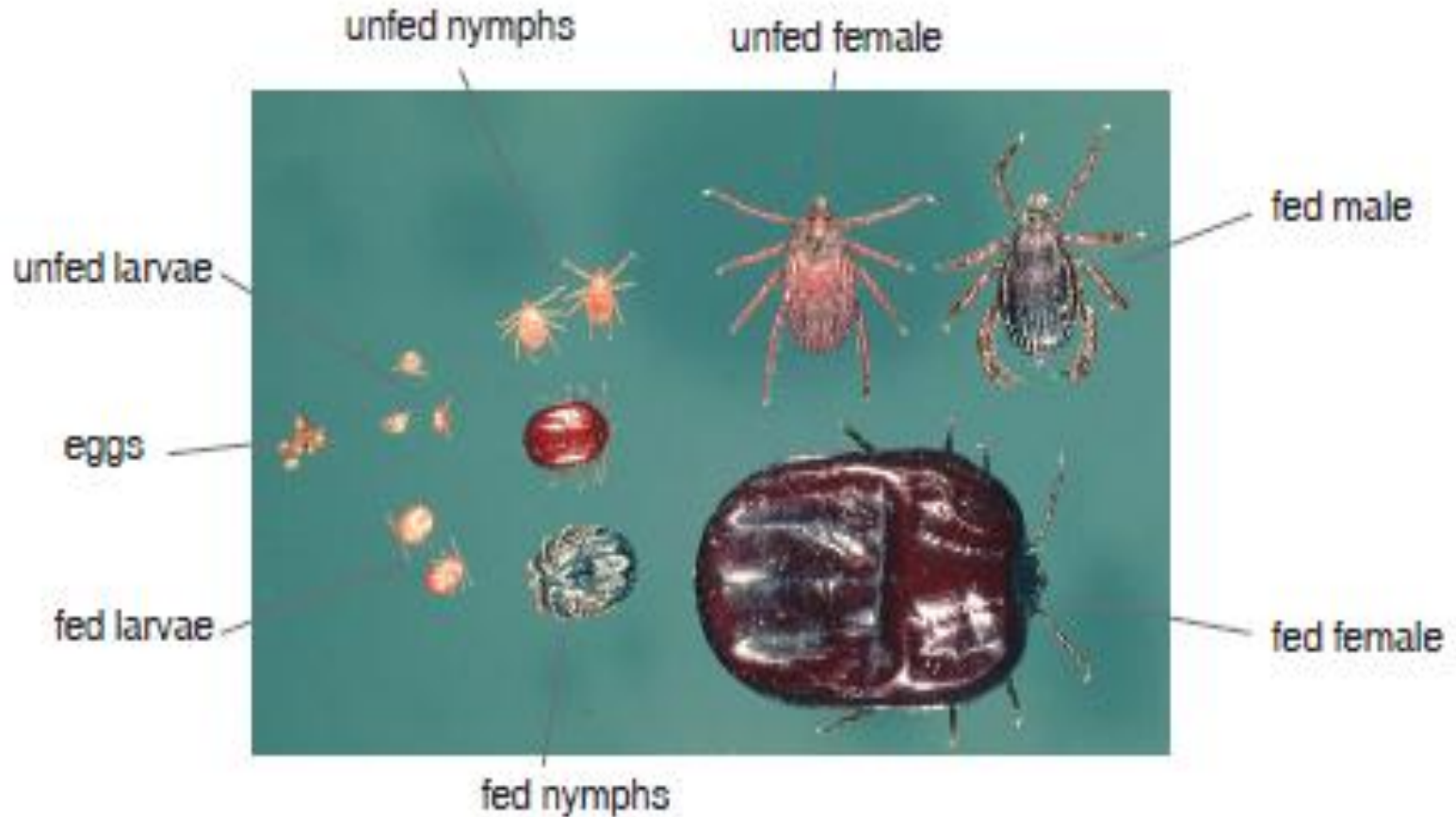
# Life cycle of Ticks

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- Ticks have **three** different life cycles based on their host involvement:
  - ✓ **one-host ticks:** *Boophilus* & *Dermacentor* species
  - ✓ **two host ticks:** *Hyalloma*, and *Rhipicephalus* species
  - ✓ **Three-host ticks:** *Amblyomma*, *Ixodes* & some *Rhipicephalus* & *Hyalloma* species

# Stages of Ticks

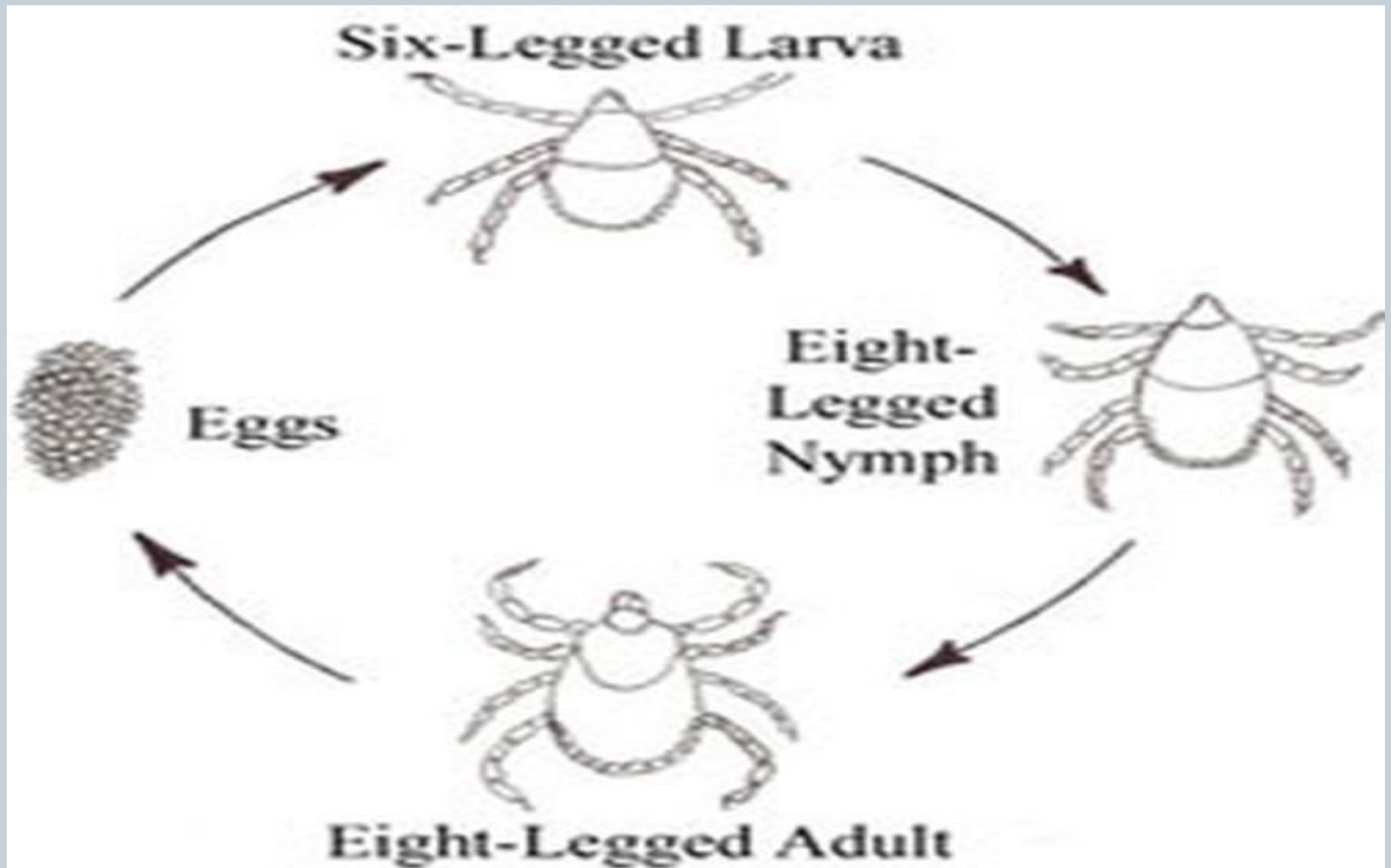
38



Stages of the life cycle of an ixodid tick (*Rhipicephalus appendiculatus*).

# Life cycle of Ticks

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# Life cycle of Ticks

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- **One-host ticks**
  - ✓ Female ticks lay eggs on the ground
  - ✓ Eggs hatch and release larvae on the ground
  - ✓ Larvae searching for and attach the host
  - ✓ On the host the larvae feed and moult to nymph
  - ✓ The nymph also feed on the same host and then moults and develops to the adult stage



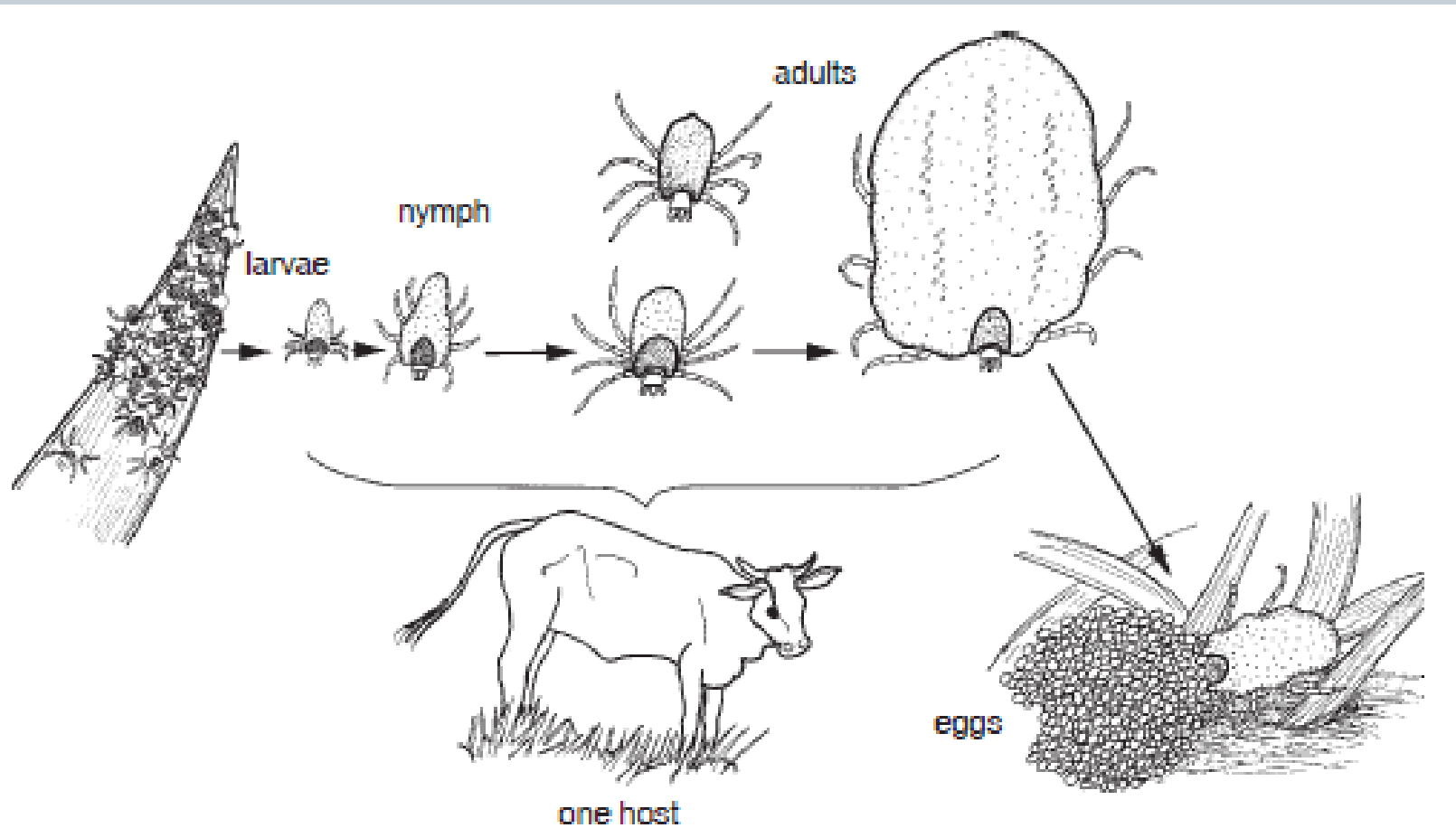
# Life cycle of Ticks

41

- **One-host ticks**
  - ✓ Adult male and female ticks feed on blood meal on the same host and then mate before engorgement of females
  - ✓ After mating, females engorge and drop on the ground and then lays eggs.

# Life cycle of Ticks

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A one-host feeding sequence of an ixodid tick (a *Boophilus* species).

# Life cycle of Ticks

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- **Two-host ticks**

- ✓ After mating, female ticks engorge and drop on the ground
- ✓ On the ground they lay eggs → eggs hatch and release larvae
- ✓ The larvae accumulate on one area (= **questing**) and then search for host
- ✓ Then the larvae feed on the host and moult into nymph.

# Life cycle of Ticks

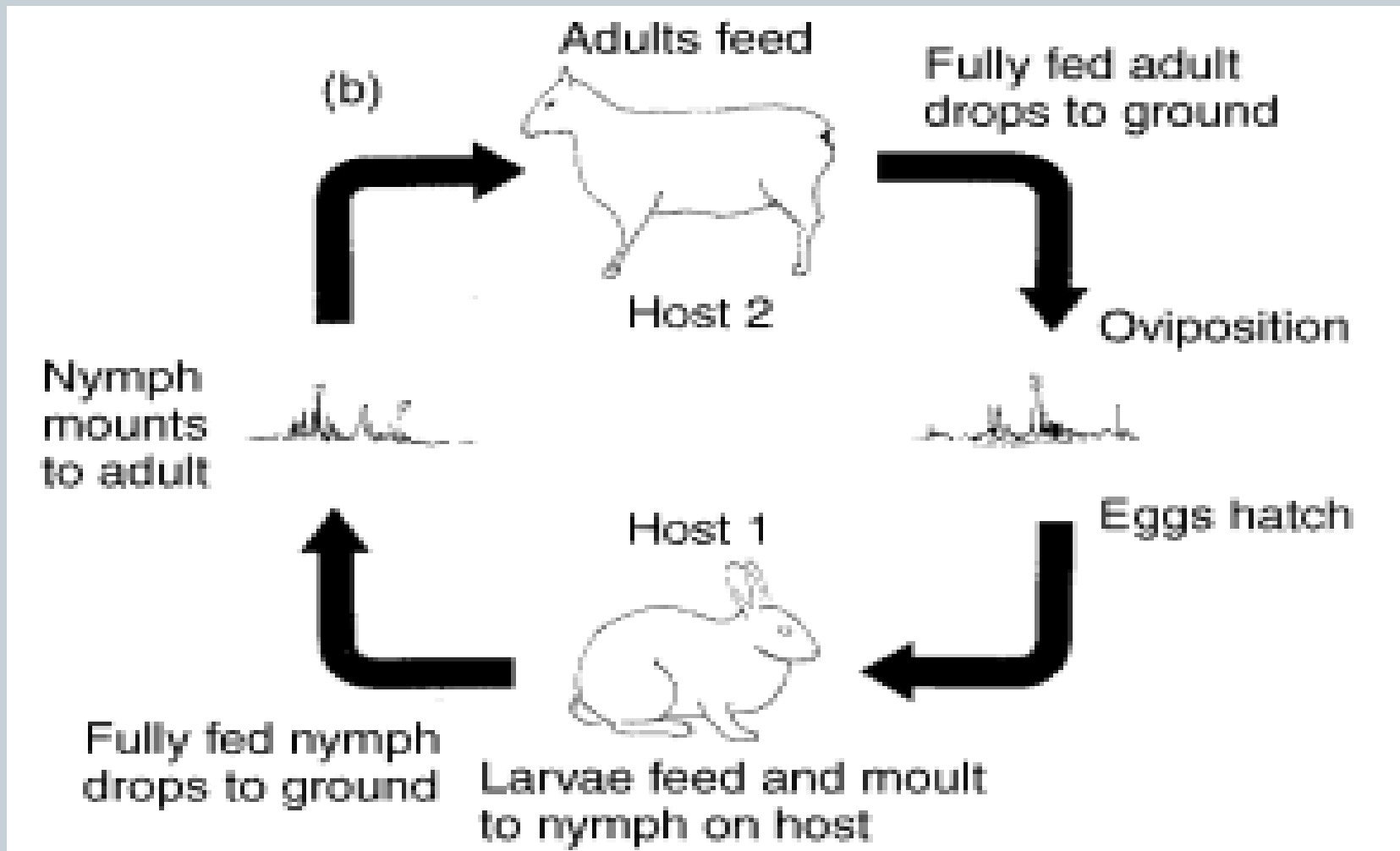
44

- **Two-host ticks**

- ✓ The nymph feed on the same host and, drop and moult on the ground to adults
- ✓ Adults search for other host (not the same host) for feeding. Then on that host they mate. Females then engorge and lay eggs.

# Life cycle of Ticks

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# Life cycle of Ticks

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- **Three-host ticks**

- ✓ After hatching, the larvae will quest for several days to wks depending upon **temperature** and **humidity**.
- ✓ On finding the suitable host, usually a small mammal or bird, the larvae begin to feed on blood meal
- ✓ After engorgement, the larvae drop and moult on the ground to become nymphs

# Life cycle of Ticks

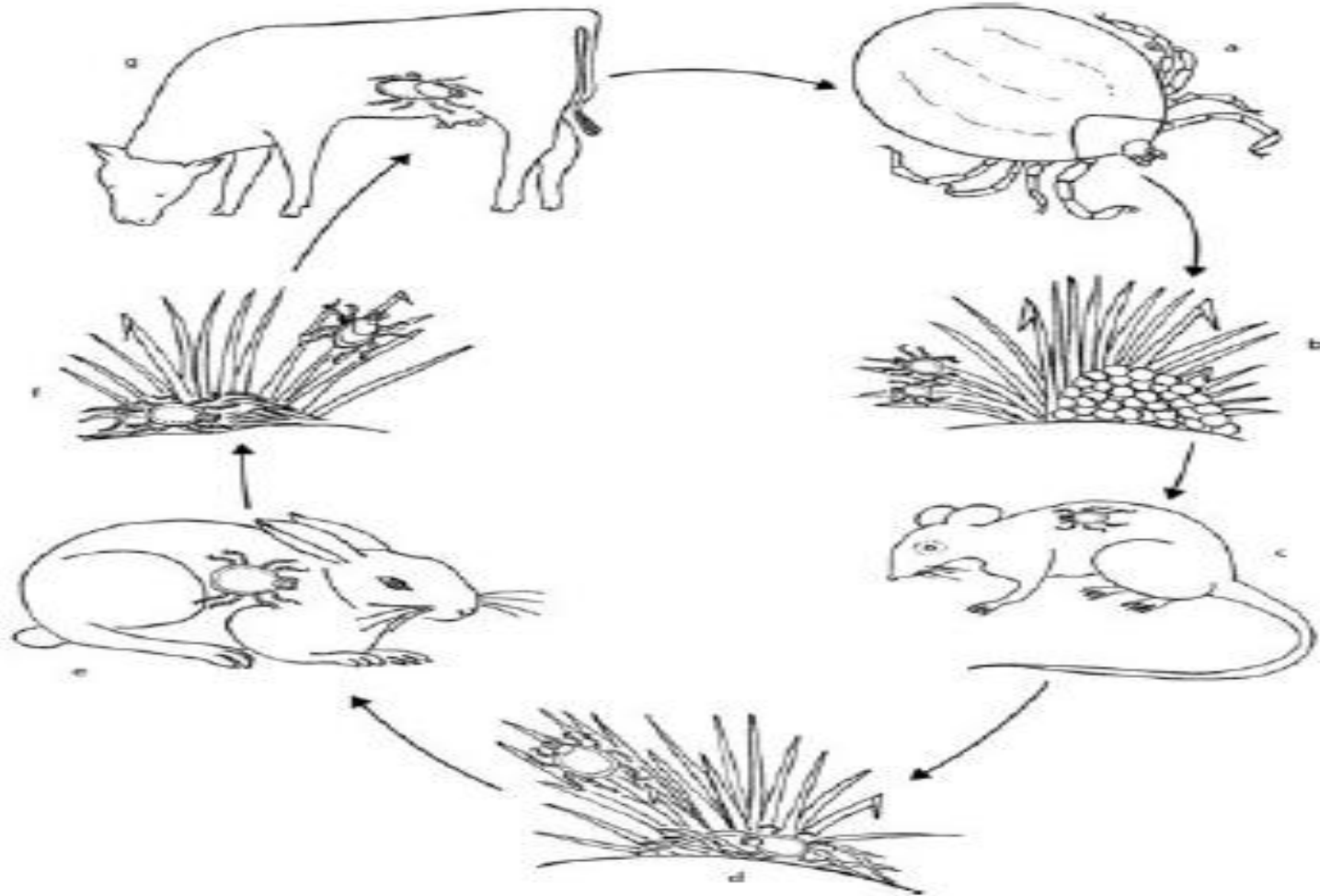
47

- **Three-host ticks**

- ✓ Depending on environmental conditions, nymphs also begin to quest for a 2<sup>nd</sup> host (may or may not be the same host)
- ✓ After feeding, the nymphs drop on ground and then moults to adults.
- ✓ After a further interval, adults begin to quest for a 3<sup>rd</sup> host (usually a large mammal). On the final host females mate and then engorge. Following the final blood meal adult females drop on the ground: large batches of eggs

# Life cycle of Ticks

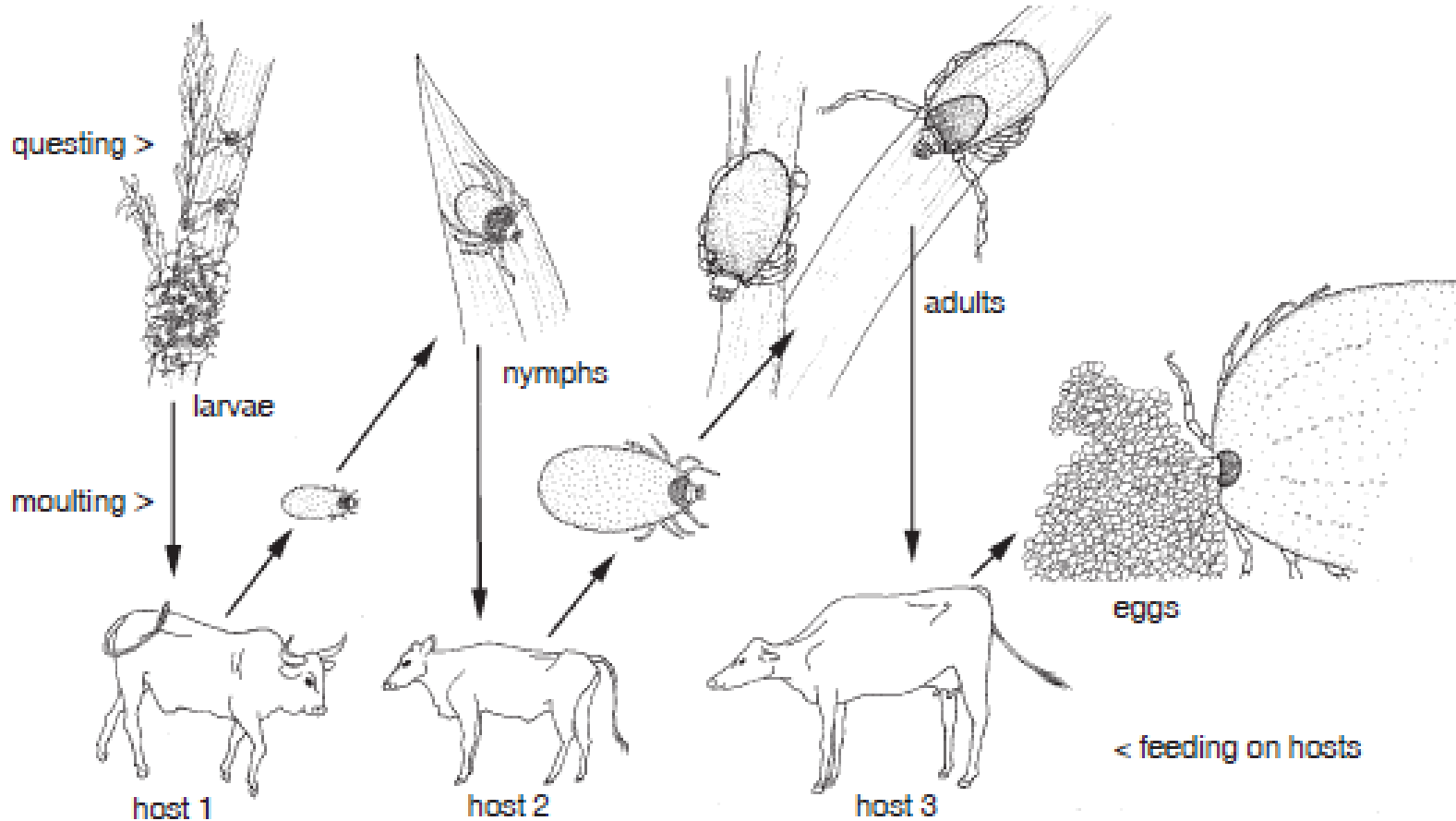
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# Life cycle of Ticks

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A three-host feeding sequence of an ixodid tick (*Rhipicephalus appendiculatus*).

# Egg-laying Behaviour of Ticks

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Mating *Amblyomma variegatum* on their host.

males

females

Egg laying in *Amblyomma variegatum*. The female at the right has laid about 20,000 eggs and will die. The female in the centre is fully engorged and about to start ovipositing. For comparison a fed male is shown at far left.



# Typical Tick Habitat

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# Factors Affecting the Biology of Ticks

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- Suitable host availability for reproduction;
- Altitude/geographical location
- Ecological requirements: land-use and cover
- Blood meal: maturity and development
- Temperature & humidity: hatching of eggs: 20 days
  - ✓ ticks, particularly in the immature stages: are very susceptible to desiccation.

# Factors Affecting the Biology of Ticks

53

- ✓ diapauses: hypobiosis
- ✓ complete life cycle: few months (3-4, some 9 months);  
in cold climates: up to 5yrs
- Climate (temperature and humidity) is the most important of the physical habitat of a tick
- Amount of rainfall or season of the year: sufficient rain for long grass → good habitat for tick

# Pathogenic Effects of Ticks

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- Ticks are primarily parasites of wild animals and only about 10% of species feed on domestic animals
- The effects of ticks on host species can be divided into:
  - ✓ **Cutaneous effects:** inflammation and infection: reducing skin quality by damaging skin/hide. Annoyance (**tick worry**) of the animals rubbing, irritation also damage the skin: restlessness

# Pathogenic Effects of Ticks

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## ✓ Systemic effects:

- **Transmission** of micro-organisms from another host
- **Paralysis** of the host: acute ascending motor paralysis when engorged female ticks release a **toxin secretion** (protein) with enzymes: **salivary neurotoxins**
- **Bacteriaemia** or viremia: resulting from introduction of micro-organisms: **secondary complication**
- **myiasis, blood loss, loss of productivity: milk, meat**

# Discussion

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**Why ticks are efficient vectors?**



# Major tick (hard and soft) species in Ethiopia

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- ✓ Ticks are common in all **agro-ecological** zones of Ethiopia
- ✓ The major tick genera reported to occur in the country are *Amblyomma*, *Boophilus*, *Haemaphysalis*, *Hyalomma* and *Rhipicephalus*
- ✓ More than **60 species** of tick infesting both domestic and wild animals have been recorded in Ethiopia (Morel, 1980)
  - of this about **37 species** and subspecies have wide distribution

# Major ticks (hard) species in Ethiopia

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- ✓ They cause considerable losses to the livestock economy, ranking **3<sup>rd</sup>** after **trypanosomosis** and **endoparasitism** (Pegram et al., 1981)
- ✓ Still there is a lack of full information on species of ticks that occur in different parts of the country.
  - **So what shall we do?**

# Ticks of veterinary importance in Ethiopia

59

- ✓ *Boophilus*: *B. decoloratus*, *B. annulatus*
- ✓ *Hyalomma*: *H. dromedarii*, *H. marginatum rufipens*
- ✓ *Amblyomma*: *A. variegatum*, *A. cohaerens*, *A. gemma*, *A. lepidum*
- ✓ *Haemaphysalis*: *H. aciculifer*, *H. laechei*, *H. parmata*
- ✓ *Rhipicephalus*: *R. evertsi evertsi*, *R. pulchellus*, *R. sanguineus*

\* ( *R. appendiculatus* not present in Ethiopia)

# Genus *Boophilus*

60

- ✓ **Inornate ticks** with eyes present and **festoons absent**
- ✓ Palps and hypostome: are **short**
- ✓ **Oval** in shape
- ✓ **Basis capituli**: hexagonal dorsally like *Rhipicephalus*
- ✓ Males have **adanal or accessory ventral shields** and **caudal** appendix; **yellowish** conscutum
- ✓ Common in tropical and subtropical habitats

# Genus *Boophilus*

61

- ✓ Often known as ‘**blue-ticks**’: it has bluish colour
- ✓ **One-host tick** and the most important vectors of *Babesia* species and *Anaplasma marginale* in cattle in subtropical & tropical countries including Ethiopia.
- ✓ It is the scourge of cattle production in many hot, humid climates
- ✓ *B. decoloratus* and *B. annulatus* are reported from Ethiopia (Mekonnen *et al.*, 2007).

# *Boophilus annulatus*

62

- Common name: blue cattle tick
- Inornate tick & lack festoons
- Affects: cattle (more preferred), horse, shoats, camel, dog and other mammals as well as birds
- Life-cycle: it is one-host tick species
- Distribution: America, Africa, Russia, middle east. In Ethiopia, it has reported in Southwest of Ethiopia.
- Prefers altitude of **400-600m**asl and annual rainfall from 800-1200mm in riverine forest (de Castro, 1994).

# Importance of *B. annulatus*

63

- ✓ Most important vectors of *Babesia* specie (e.g., *B.bovis*, *B. bigemina*) and *Anaplasma* species
- ✓ also causes damage to **hide and skin** (de Castro, 1994).
- ✓ The preferred sites of attachment are **neck, dewlap, belly and legs**
- ✓ Skin irritation induces scratching and licking, sometimes leading to secondary infections.
- ✓ Severe infestations may cause anaemia.

# *Boophilus decoloratus*

64

- Common name: Blue tick.
- Engorged females have ‘**slaty-blue**’ coloured bodies with **pale yellow legs**.
- Host: cattle, equine, shoat, dog and wild ungulates
- Life-cycle: one-host tick
- Distribution: Indigenous to Africa and most likely evolved as a parasite of **ungulates in East Africa**.



# *Boophilus decoloratus*

65

- ✓ common and most widely distributed in Ethiopia
- ✓ collected from all administrative regions but not from **Afar**
- ✓ in central Ethiopia *B. decoloratus* is more abundant on **cross** and **exotic cattle** breed.
- ✓ mainly collected from **wetter highland** and **midlands** with more than 800mm annual rainfall.
- distribution coincides with *Amblyomma variegatum*

# *Boophilus decoloratus*

66

- ✓ *B. decoloratus* apart from downgrading the quality of hides and skins it also transmits *Babesia bigemina* and *A. marginale* to cattle (Mekonnen *et al.*, 2007)
- ✓ It serves as a vector for *Babesia bigemina*, *B. ovis* and *Anaplasma marginale* in ruminants
- ✓ It also transmits spirochaetosis, *Borrelia theileri*, in cattle, horses, goats and sheep and *Babesia traubmanni* in pigs in east Africa.

# *Boophilus decoloratus*

67

## *Rhipicephalus microplus*

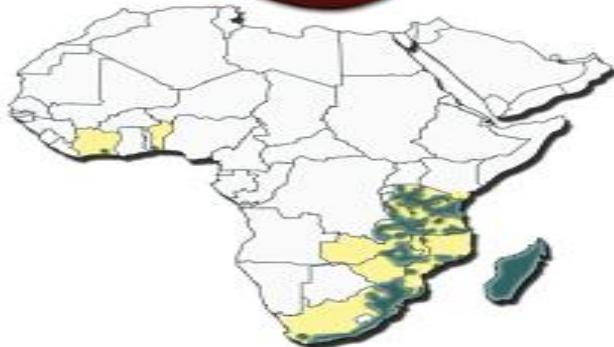
Male



Female



Distribution



## *Rhipicephalus decoloratus*



# *Boophilus decoloratus*

68



*Boophilus decoloratus* on belly.

# *Boophilus* or *Rhipicephalus*?

69

✓ *Boophilus* is the name by which these ticks are best known deposit their recent re-classification within the genus *Rhipicephalus*. This change was the result of studies on the nucleic acids of ticks.

- *Rhipicephalus (Boophilus) annulatus*
- *Rh. (B.) decoloratus*
- *Rh. (B. ) microplus*
- *Rh. (B.) geigy*

# Engorged *A. variegatum*(L) and *Boophilus microplus* (R)

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# Genus *Hyalomma*

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- ✓ It is also known as ‘**bont-legged ticks**’
- ✓ It is medium sized or large tick, with eyes and long mouthparts
- ✓ **Inornate** pale to dark brown scutum and **banded-leg** tick
- ✓ Festoons present in females
- ✓ palps & hypostome are long like *Amblyomma*
- ✓ Males have **adanal plate** or shields
- ✓ Two or three host ticks

# Genus *Hyalomma*

72

- ✓ **Coxa 1** has very long spurs (internal/posterior one)
- ✓ **Stigmata** is surrounded by many hairs: unique feature
- ✓ Prefers legs, udder, tail, **anus** and **genital area** and causes **lameness** in sheep
- ✓ **Distribution:** It occurs throughout Africa, Asia and S. Europe
- ✓ It has reported as vectors of several babesial, theilerial and rickettsial infections



# Genus *Hyalomma*

73

- This genus mainly responsible for **tick toxicosis** (due to toxin produced by adult ticks: **sweating sickness**), an entity distinct from tick paralysis.
- A total of **9 species** of *Hyalomma* tick were recorded in Ethiopia of which *Hy. m. rufipes* and *Hy. truncatum* are the major causes of damage to livestock and humans in Ethiopia and elsewhere in the world

# *Hyalomma* species

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## *Hyalomma dromedarii*

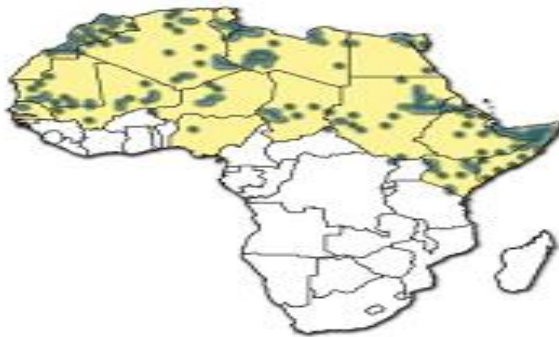
Male



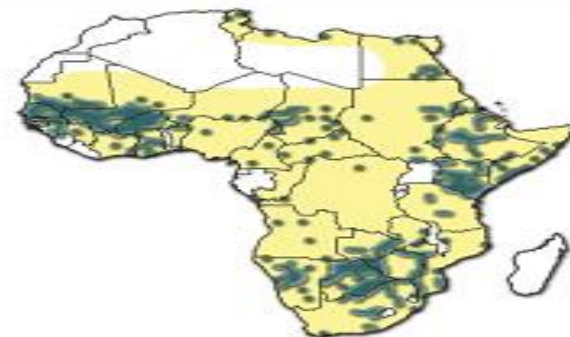
Female



Distribution



## *Hyalomma rufipes*



# *Hyalomma marignatum rufipes*

75

- *Hy. m. rufipes* also known as the **hairy *Hyalomma*** is widespread on cattle and camel in Ethiopia
- The tick prefers the **hairless** areas around the **anus** and on the **genitalia**
- In sheep, it is found around **hooves** causing lameness, because *Hyalomma* is responsible for **tick-toxicosis or paralysis**

# *Hyalomma marginatum rufipes*

76



# *Hyalomma truncatum*

77

- Occurs throughout Ethiopia in different ecological zones from 300 to 3500masl and between 250-1500mm rainfalls
- adapted to **dry habitat** and is common in **deserts steppe** and **savanna climatic** regions (Walker et al., 2003)
- de Castro (1994) recorded the tick on cattle in **Anger-Gutin** in East Wollega and in East Shoa, West Shoa and North Shoa, Gurage, Kembata, Alab-Tembarro and Afar  
on cattle

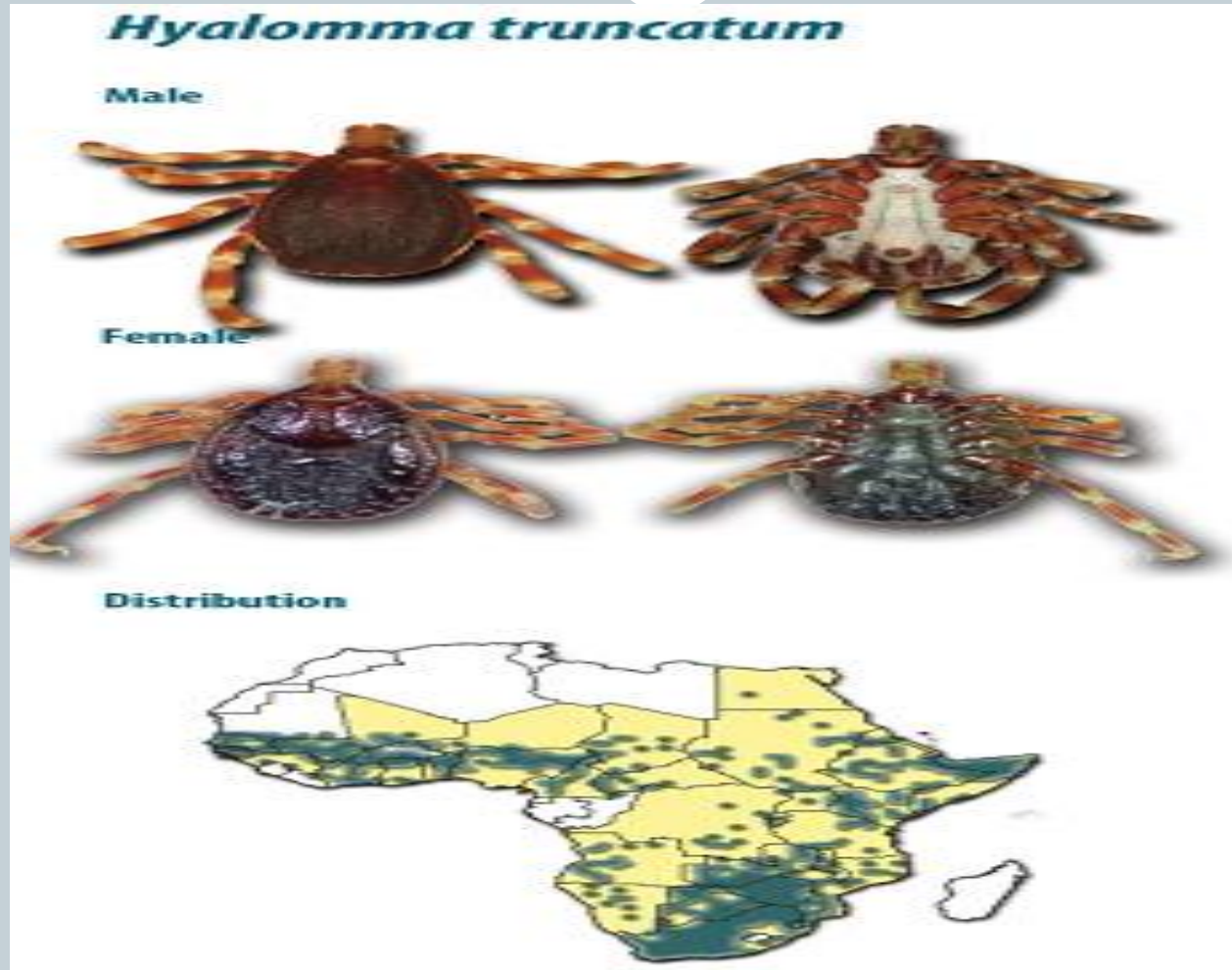
# *Hyalomma truncatum*

78

- Morel (1980) also reported this tick species on camel and goats in Dire -Dawa and on cattle in Bale, Yabello, Moyalle and Dollo areas
- Seasonal activities reach peak in **August and September.**

# *Hyalomma truncatum*

79



# *Hyalomma dromedarii*

80

- ✓ Known as the **camel *Hyalomma***
- ✓ needs **two or three hosts** to complete its life cycle depending on the **weather condition suitable**
- ✓ It is well adapted to inhabit **extreme dryness and camel hosts**
- ✓ This tick is reported from arid ecological zone of **eastern and southern Ethiopia**



# *Hyalomma dromedarii*

81

- ✓ The distribution coincides with that of **pastoralists** and **their camels** (Pegram et al., 1981)
- ✓ It was collected on camels in Dire-Dawa, Harrar, Jigjiga and Negelle Borena, Tigray and Afar areas (Dioli et al., 2001).

# *Genus Amblyomma*

82

- ✓ Are large, usually **ornate**
- ✓ Their legs have **bands of colour**; eyes & **festoons** are present
- ✓ palps and hypostome are long and ventral plates absent in males
- ✓ Its bite is **deep & painful**, probably due to the long mouthparts
- ✓ three host ticks

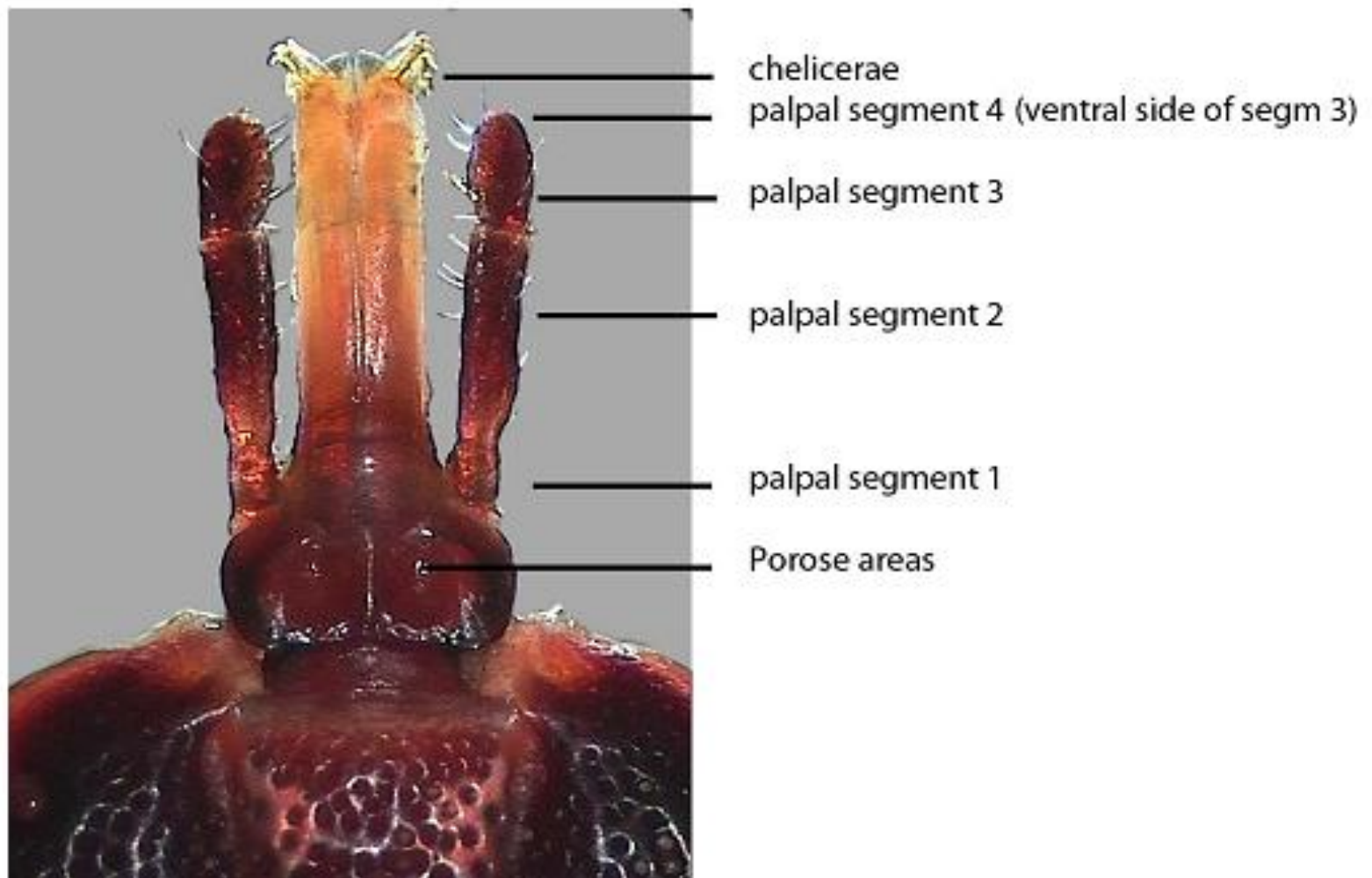
# *Genus Amblyomma*

83

- ✓ Important species are *A. variegatum* & *A. hebraeum*, the so-called ‘**bont ticks**’: with patterns of colour on the back and legs.
- They are distributed mainly in Africa and transmit the important disease, heartwater, in cattle, caused by the rickettsia, *Cowdria ruminantium*.
- ✓ Eight species of *Amblyomma* are identified in Ethiopia

# Mouthparts of *Amblyomma* species

84



# *Amblyomma variegatum*

85

- ✓ also known as **tropical bont tick**
- ✓ females are brown with a **large pale patch** on the posterior scutum while males are brightly **ornamented** with **orange** coloration and a dark brown border to the idiosoma
- ✓ is the most important tick of livestock
- ✓ ‘**bont tick**’: with patterns of colour on the back and legs
- ✓ distributed mainly in Africa
- ✓ transmit the important disease: **heart water disease**

# *Amblyomma variegatum*

86

- have **long mouthparts** and **banded legs**, but have different colour patterns on the **conscutum** and **scutum**, the colour pattern on the male conscutum is dark-orange.
- Males also have uniformly **dark festoons**
- Widely distributed in Ethiopia and also in Western, Central, North-east and East Africa and in Southern Africa.

# *Amblyomma variegatum*

87

- The preferred host of adult tick is **cattle but also infests sheep and goats (Mekonnen *et al.*, 2007).**
- requires **moistures and warmth for its survival and it is not found in open grass land**
- Activity of adult tick commences when **spring rains**

# Male *Amblyomma variegatum*

88





# Questing of *A. variegatum*

89





***Amblyomma variegatum* on dewlap.**

# *Amblyomma variegatum*

91

- Is potential vector of **diseases**: heartwater, benign theileriosis, bovine ehrlichiosis, Nairobi sheep disease and dermatophilosis
- Its infestation is frequently associated with **damage to cow udder causing teat losses or mastitis (results milk production reduction) and to the scrotum of bull leading to sterility**

# *Amblyomma variegatum*

92

- The adult tick attachment results **painful bites → large wounds: exposes secondary infection and infestation (myiasis).**
- Heavy infestation results in **immunosuppression in cattle: making worse the bacterial skin disease**

# *Amblyomma variegatum* adults on teat of cow

93



# Engorged *A. variegatum* female (newly detached)

94



## Other *Amblyomma* species are

95

- *A. cohaerens*: common in Southwest Ethiopia
- *A. gemma*
- *A. lepidum*: east African bont tick
- *A. marmoreum*
- *A. nuttalli*
- *A. sparsnum*
- *A. tholloni*

# *Genus Haemaphysalis*

96

- Inhabit humid, well-vegetated habitats
- **three-host ticks**, with the larvae and nymphs feeding on **small mammals** and **birds** while adults feed on larger mammals: livestock
- easy to differentiate from other genera by the characteristic **lateral projection of 2nd palpal articulate beyond the margins of the basis capituli**



# *Genus Haemaphysalis*

97

- has **rectangular** basis capituli, festoons, posterior anal groove and inornate; mouthparts short and broad
- Its head is **triangular** because its **2nd palpal** is wider but not longer
- **coxae 1: not forked (no division or no spurs: only one)**
- All species are **eyeless**
- Males have **no ventral or adanal plate**

# *Genus Haemaphysalis*

98

- A total of **4 species** of this genus were recorded in **Ethiopia**
- Of these only *Ha. leachi* is known as a vector of TBDs.
  - *Haemaphysalis aciculifer* (Pegram et al., 1981)
  - *Ha. leachi*, *Ha. parmata*, *Ha. spinulosa*

# *Haemaphysalis aciculifer*

99

- Is found in **highland or midland areas in Ethiopia**
- It was collected from cattle, sheep, goats and equines at altitude of 1400-2600masl.
- *Ha. aciculifer* was mainly recorded in **East and west Wollega, Illubabor, Tulu-Bolo, Wolaita Sodo, Hagere-Selam, Kaffa and East-Shoa**

# *Haemaphysalis leachi*

100

- Adult *Ha. leachi* also known as **yellow dog tick**
- Infests mainly domestic dog whereas **immature** stage prefer **rodents**
- It has been recorded on dogs in Addis Ababa, Debre Zeit, Hawassa and Shashemane
- It was also collected on **cattle and other livestock** in areas where there is close association between domestic **dog and livestock** (Morel, 1980)
- It is the major vector of ***B. canis*** in Addis Ababa dogs.

# *Haemaphysalis parvata*

101

- *Ha. parvata* is found in **humid forest and woodland of midland areas of Ethiopia.**
- This tick is reported on **cattle in Debre-Zeit and horses in Arsi.**
- It also reported in SNNP (Kaffa, Shaka and Dawro Zones) regional state (Morel, 1981)
- Prefers regions with **1600-2600masl and annual rainfall of 1200mm**
- Role as a **vector of diseases** is not well known

# *Genus Rhipicephalus*

102

- Are veterinary importance since they act as **reservoirs** and **vectors** of disease pathogens
- The basis capituli is **hexagonal** dorsally
- Males have **adanal plates** on each side of the anus
- Conscutum is **yellowish** in colour
- **inornate** with **eyes** and **festoons** are present
- The genus includes **one-host, two-host & three-host** ticks

# *Genus Rhipicephalus*

103

- The **palps & hypostome** are short
- The first **coxa** has **two spurs**
- **Two important** species are found exclusively in Africa south of the Sahara.
  - ✓ The **three-host** tick, *Rhipicephalus appendiculatus*, the '**brown ear tick**', is the most efficient vector of **East Coast Fever** of cattle caused by *Theileria parva* and also transmits *Babesia bigemina* and the **virus of Nairobi sheep disease**

# *Genus Rhipicephalus*

104

- Two important species are →:
  - ✓ The **two-host** tick *R. evertsi*, the '**red-legged tick**', can also transmit **theilerial infections** and *B. bigemina* and *B. equi*.
- A total of **15** *Rhipicephalus* species were recorded in Ethiopia
- Of these species, *Rh. e. evertsi*, *Rh. praetextatus* and *Rh. pulchellus* are the most important and widely distributed tick in the country.





***Rhipicephalus appendiculatus* on ear**

# *Rhipicephalus evertsi evertsi*

106

- Known as the **red legged tick**
- **Scutum** and **conscutum**: very **dark-brown** contrasting with **reddish-orange** body wall.
- All stage of *Rh. e. evertsi* frequently feed on the same hosts such as horses, donkeys and cattle
- Widely distributed and common on livestock in Ethiopia
- The tick shows **no apparent preference** for any particular **altitude, rainfall or season.**
- Vector of *B. equi*, *B. bigemina* & *Theileria* species

*Rhipicephalus evertsi evertsi*

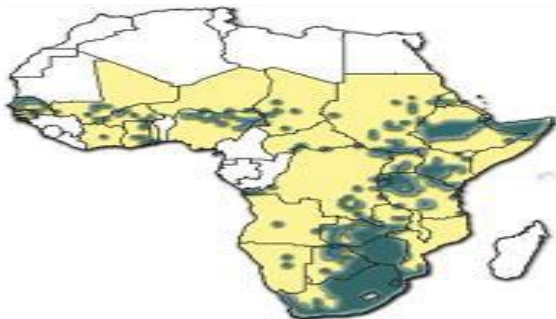
Male



Female



Distribution



*Rhipicephalus pravus*



# *Rhipicephalus praetextatus*

108

- It is more abundant during the **rainy season**
- It is found in a wide range of ecological habitat from **semiarid area** with 250mm annual rainfall through **tropical and subtropical savanna too woody highlands** with 1500mm annual rainfall.
- Adults prefer cattle mainly on the **tail brush** and **around the feet**

# *Rhipicephalus pulchellus*

109

- It is the **zebra tick** with a striking dark-brown and an **ivory-coloured** pattern on the conscutum
- Prefers **cattle** but also infests camel, sheep and goats
- It survives in **savanna** and **desert climate**
- It is common in **eastern** part of Ethiopia
- It transmits the **virus Nairobi sheep disease**

# *Rhipicephalus pulchellus*

110



# *Rhipicephalus sanguineus*

111

- Is also called **kennel tick** or **brown dog tick** or the **pan-tropical dog tick**: three-host tick
- **dogs** are the preferred host, but can be found on cattle
- adults attach on the **ears, neck, and shoulder** of the host
- occurs in **warm** and **moist** climates
- it was mainly collected on **cattle** and **dogs** from several parts of Ethiopia

# *Rhipicephalus sanguineus*

112

- is yellowish, reddish or blackish brown tick with **hexagonal basis capituli** and short mouthparts
- The **coxa** of the **1<sup>st</sup> pair of legs** has a **large external spur (bifurcate)**.
- **Inornate** with eyes and festoons present
- It is the potential vector of *Babesia canis* and *Ehrlichia* of dogs & can also cause **tick-toxicosis** in the dog
- found all over the world



# Genus *Ixodes*

113

- **Reading assignment**

# Argasid ticks from Ethiopia

114

- *Argas persicus*:
  - ✓ also known as ‘**fowl tick**’
  - ✓ has been recorded and widely distributed in the country
  - ✓ is found in the **warmer part** of the country because it is closely associated with **poultry**.
  - ✓ is parasite of domestic fowl, turkeys, ducks and geese.

# Argasid ticks from Ethiopia

115

- transmits the bacterium *Borrelia anserine* causing **avian spirochaetosis** and protozoa *Aegyptianella pullorum* responsible for **avian piroplasmosis**.
- Heavy infestation can cause anaemia and the larval stage produce a **toxin** that causes **paralysis** in chickens (Walker *et al.*, 2003).

# Genus *Ornithodoros*

116

- *Ornithodoros moubata*:
  - ✓ is a soft tick also known by the common name ‘**the eyeless or warthog tampan**’
  - ✓ infests humans, poultry, domestic pigs and warthogs (Horak *et al.*, 2003).
  - ✓ is an important vector of the virus of **African swine fever**.
  - ✓ Apart by **transovarian** transmission this virus may pass between male and female ticks during mating

# Genus *Ornithodoros*

117

- *Ornithodoros moubata*:

- ✓ In Ethiopia, *Or. moubata* was collected from warthog in Gondar, Harrar and Dire-Dawa areas (Morel, 1980).



# Information on Tick Control

118

- ✓ **Target tick species:** biological characteristics & pathogenic roles (direct impact and disease vectors)
- ✓ Campaign objectives
- ✓ Target location
- ✓ Campaign schedule
- ✓ **Control methods:** biological control, ecological control, chemical control, genetical control, immunological control

# Information on Tick Control

119

- ✓ **chemical control:** cutaneous treatment (dip, pressure spray, dusting) and systemic treatment (subcutaneously oral route)

# Control of Tick infestation

120

- **Off-the host:**
  - ✓ **Burning of pasture:** may kill a large number of larvae and other stages
  - ✓ **Cultivation of land:** reduce tick life by controlling the movement of animals as well as expose eggs to sunlight or burying them deeply by ploughing.
  - ✓ **Grasses as repellent:** the grass genera: *Melinis*, *Cynodon* and *Pennisetum*



# Control of Tick infestation

121

- **Off-the host:**
  - ✓ **Starvation:** method is not practicable because ticks live for long periods without food
  - ✓ **Repellents:** Indalone, Dimethylphthalate are most effective
  - ✓ **Sterile hybrids:** *B. annulatus* x *B. microplus*:- hybrid male off-springs are sterile and hybrid female produces sterile males.

# Control of Tick infestation

122

- **Off-the host:**

- ✓ **Natural enemies:** *Ixodiphagus* and *Hunterellus* lay eggs on nymphs which are eaten out by the larvae of the parasites.

And certain birds *Buphagus erythrorhynchus* and *B. africanus* destroy large number of ticks

# Control of Tick infestation

123

- **On-the host:**
  - ✓ the selection of the method depends on:
    - host species
    - target parasite
    - size of population
    - type of insecticide
  - ✓ **Chemical method of treatment:** dip, spray and dusting (cutaneous treatment)

# Treatment & Control of Tick infestation

124

- **On-the host:**
  - ✓ **Immunological control:** by salivary glands and by whole internal organs
  - ✓ Australian scientists developed a vaccine against *B. microplus*. This vaccine known as **tick guard**.

# Additional references

125

- Kahin, M. (2007): The Merck veterinary manual
- Hoy, Marajorie, A. (2003): Insect molecular genetics: Sf.765. H-6.
- Shapiro, Leland, S. (2004): Pathology and Parasitology of veterinary technicians. Sf. 769. J-82.
- Hendrix, Charles. M. (1998): Diagnostic veterinary parasitology. Sf 810. H-46.
- Lamann Gregory, V.(1987): Veterinary parasitology. SF.810. L-36.
- Sloss, Margaret, W. (1994): Veterinary clinical parasitology. Sf810. S-58.
- Urguhort, G.M. (1996): Veterinary parasitology. Sf810. U-77.
- Tylor, M.A. (2007): Veterinary parasitology. Sf.810. T-425.
- Zajec, Anne.M.(2006): Veterinary clinical parasitology. Sf. 810.Z-35.
- Maximav, V.I.(1982): A series of parasitological studies of the helminthes, arthropods and protozoa . Sf.810. M-39.
- Lefebvre. (2010): Infectious and parasitic disease of livestock one and two. Sf. 996, I. 54.

**I THANK YOU VERY MUCH  
FOR YOUR PATIENCE!!!**