

THEILERIOSIS TODAY

A NATIONAL CRISIS

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THEILERIOSIS TODAY

- What is theileriosis?
- What is happening?
- Why is it happening?
- What can be done about it?

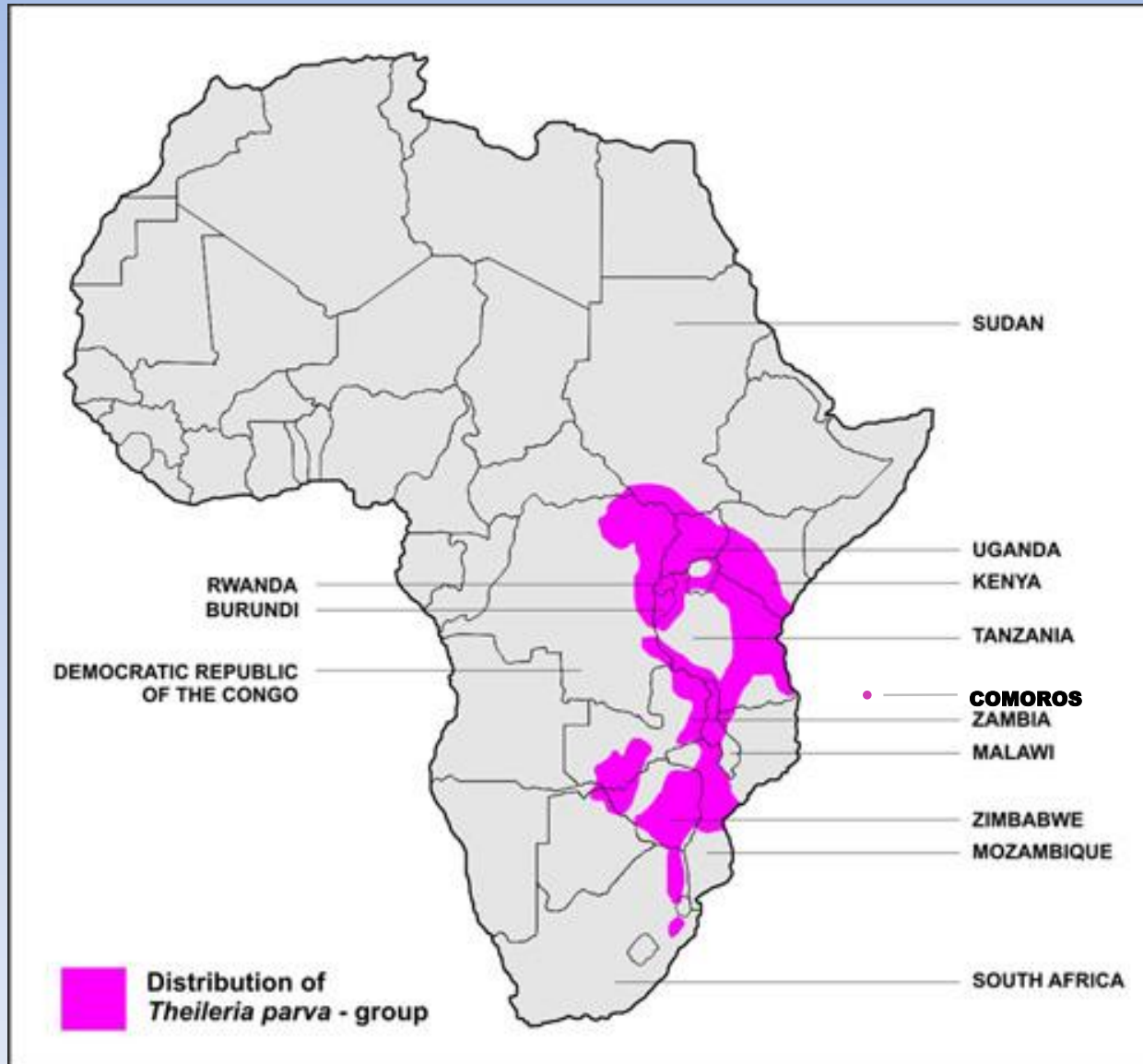
WHAT IS THEILERIOSIS

- What is theileriosis?
 - Definition
 - Distribution
 - Variants
 - Life cycle
 - Clinical signs
 - Post-mortem findings
 - Diagnosis
- How is it transmitted?

Theileriosis: Definition

- “A disease of animals caused by protozoa of the genus *Theileria*”
- Various species carried by various ticks cause heavy economic losses in cattle, sheep, goats and wildlife in Africa, southern Europe, Middle East, Asia and Australasia
- In Zimbabwe, specifically “a disease of cattle caused by *Theileria parva*”

Theileria Parva: Distribution

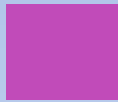


Theileria parva: Variants

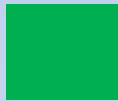
- Three distinct epidemiological variants of disease caused by *T. parva*.

DISEASE	TRANSMISSION	SEASONALITY	MORTALITY	SPREAD
East Coast fever	Cattle - cattle	Non-seasonal	High	Rapid
Zimbabwe theileriosis	Cattle - cattle	Rainy season	Low	Slow
Corridor disease	Buffalo - cattle	Non-seasonal	High	Self-limiting

Theileria parva: Variants



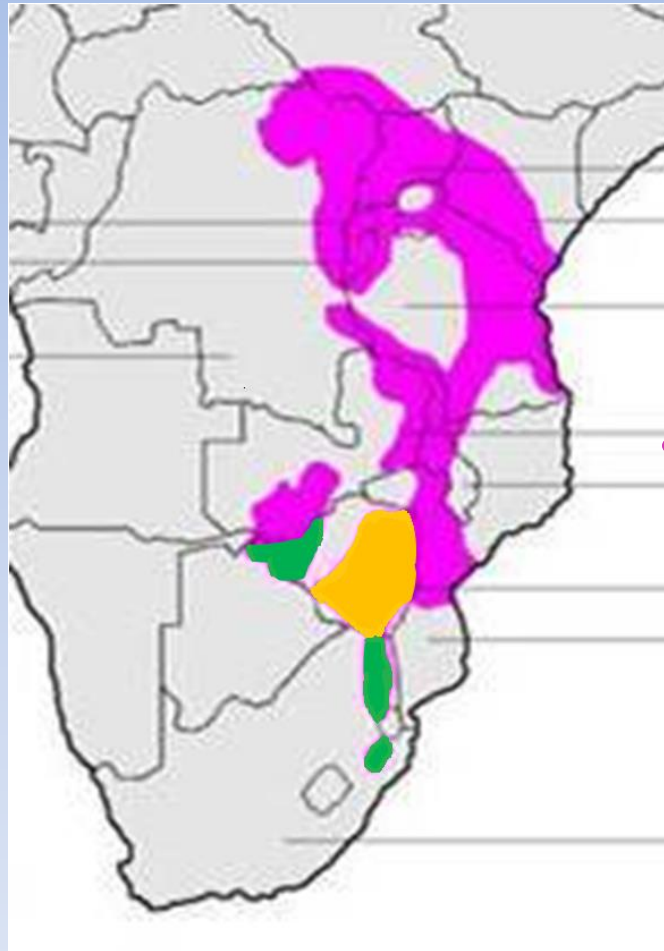
East Coast fever +
Corridor disease



Corridor disease



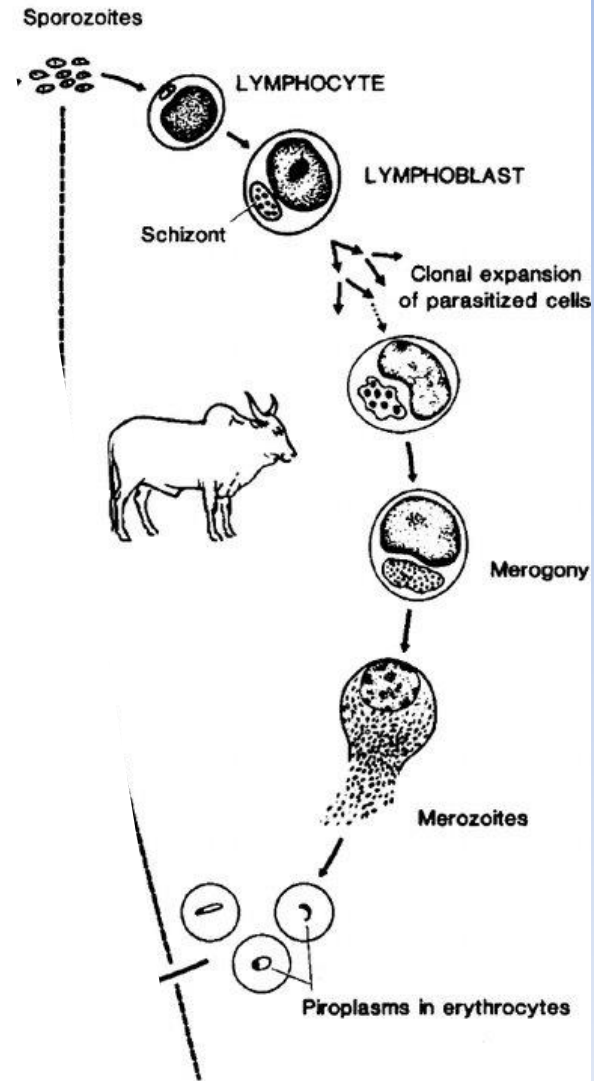
Zimbabwe theileriosis +
Corridor disease



Theileria parva: History in Zimbabwe

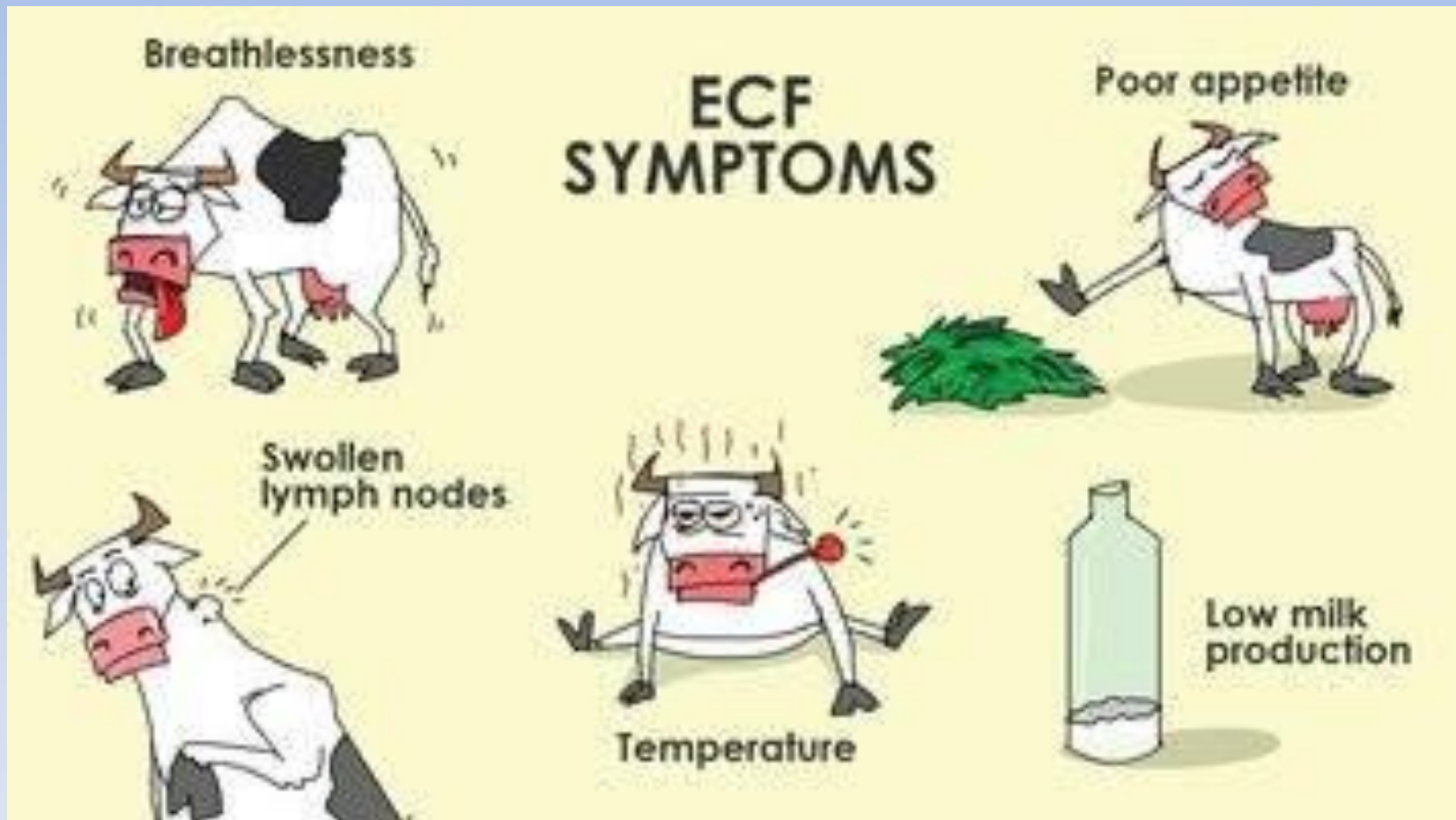
- 1901/2 East Coast fever introduced
- 1934 Corridor disease recognized
- 1936 Zimbabwe theileriosis (January disease) recognized
- 1954 East Coast fever eradicated, Corridor disease and Zimbabwe theileriosis persist

Theileria parva: Life Cycle

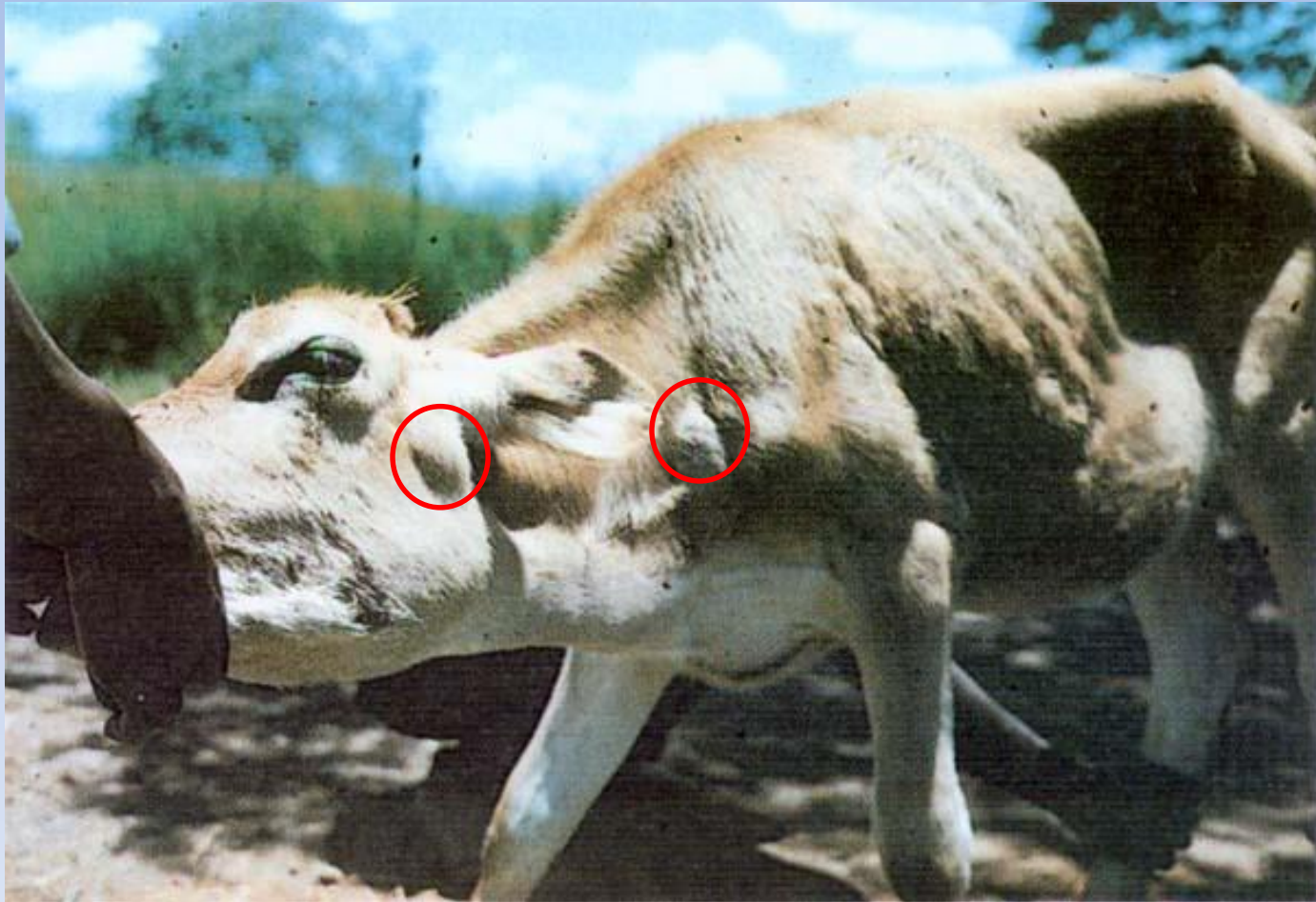


Transformation

Theileria parva: Clinical signs



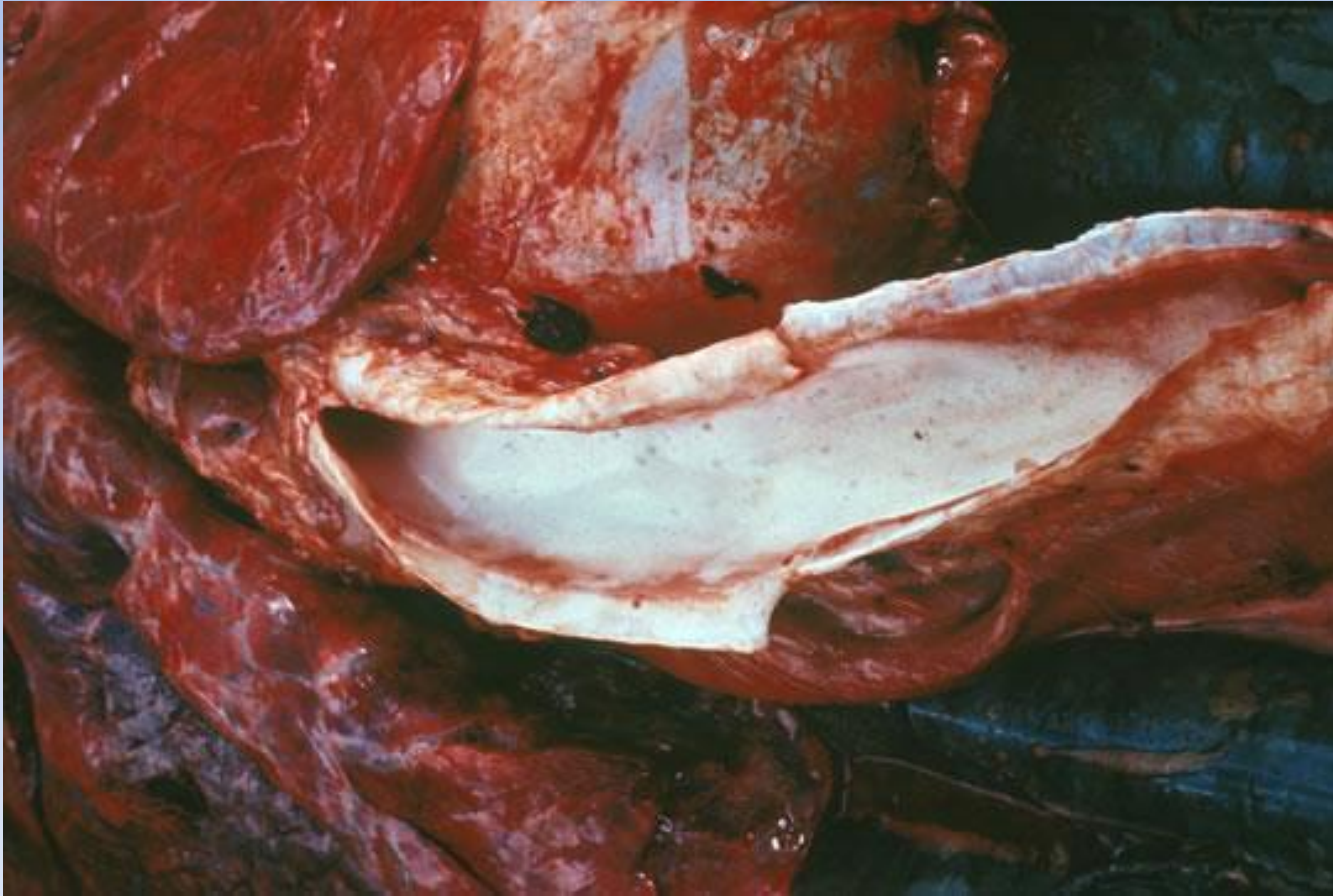
Theileria parva: Clinical signs



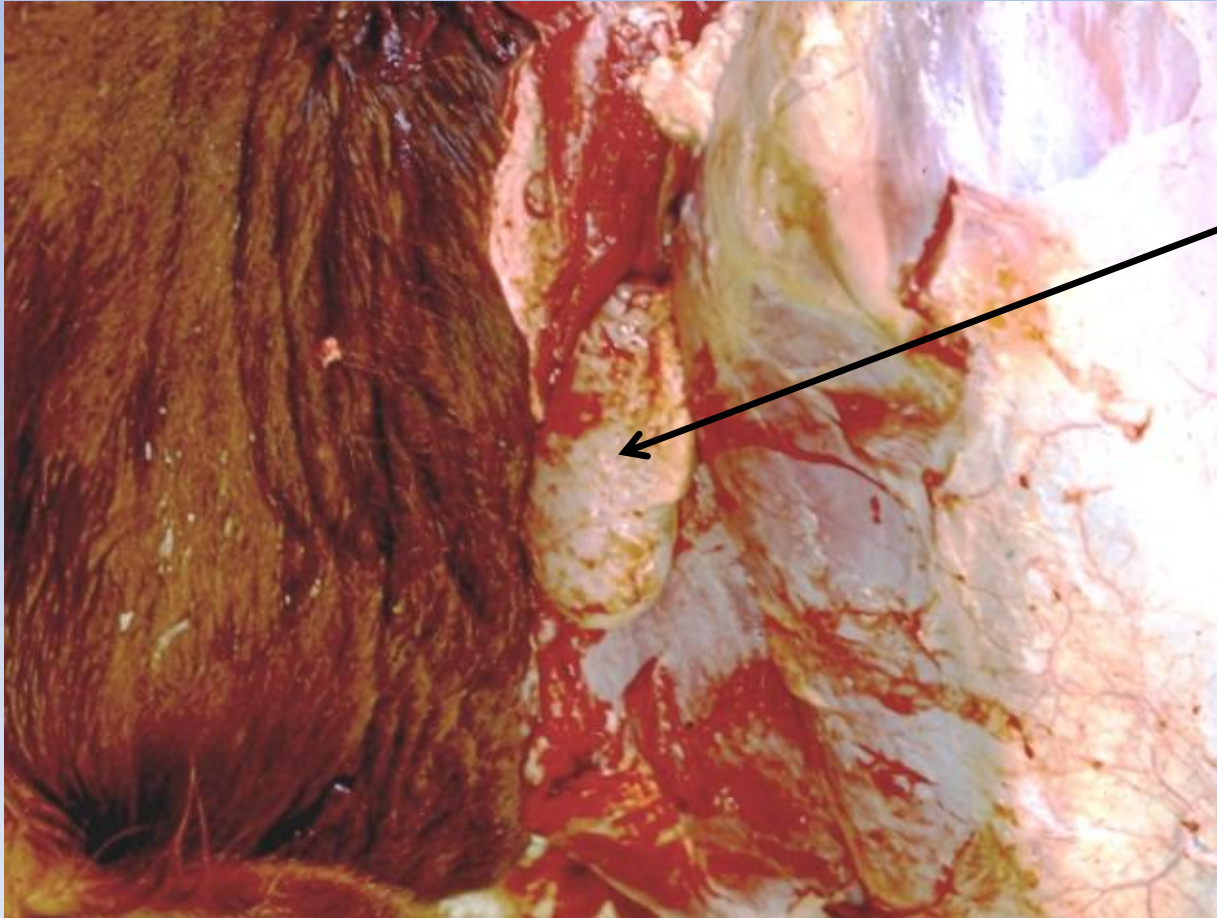
Theileria parva: Post-mortem findings



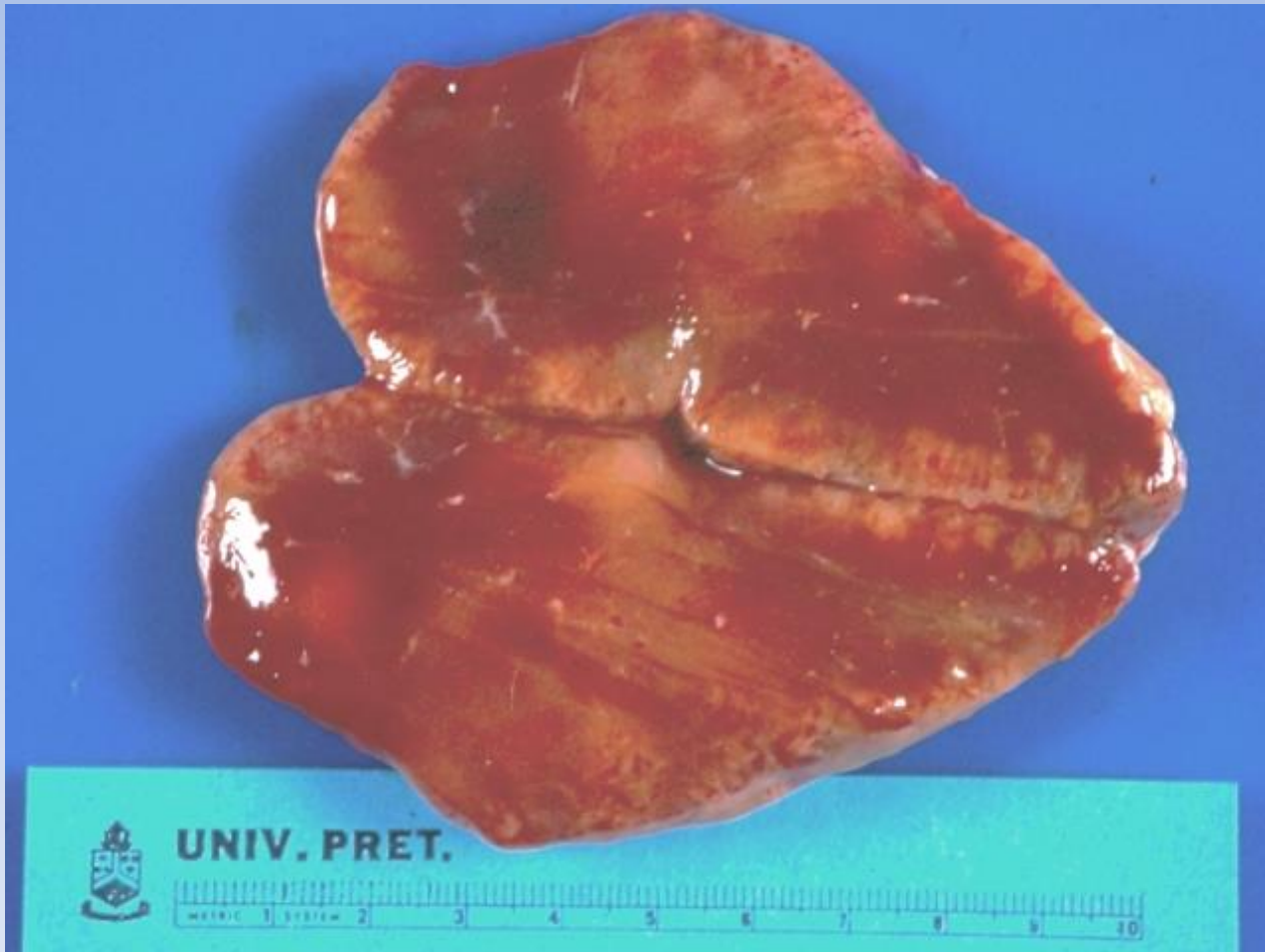
Theileria parva: Post-mortem findings



Theileria parva: Post-mortem findings



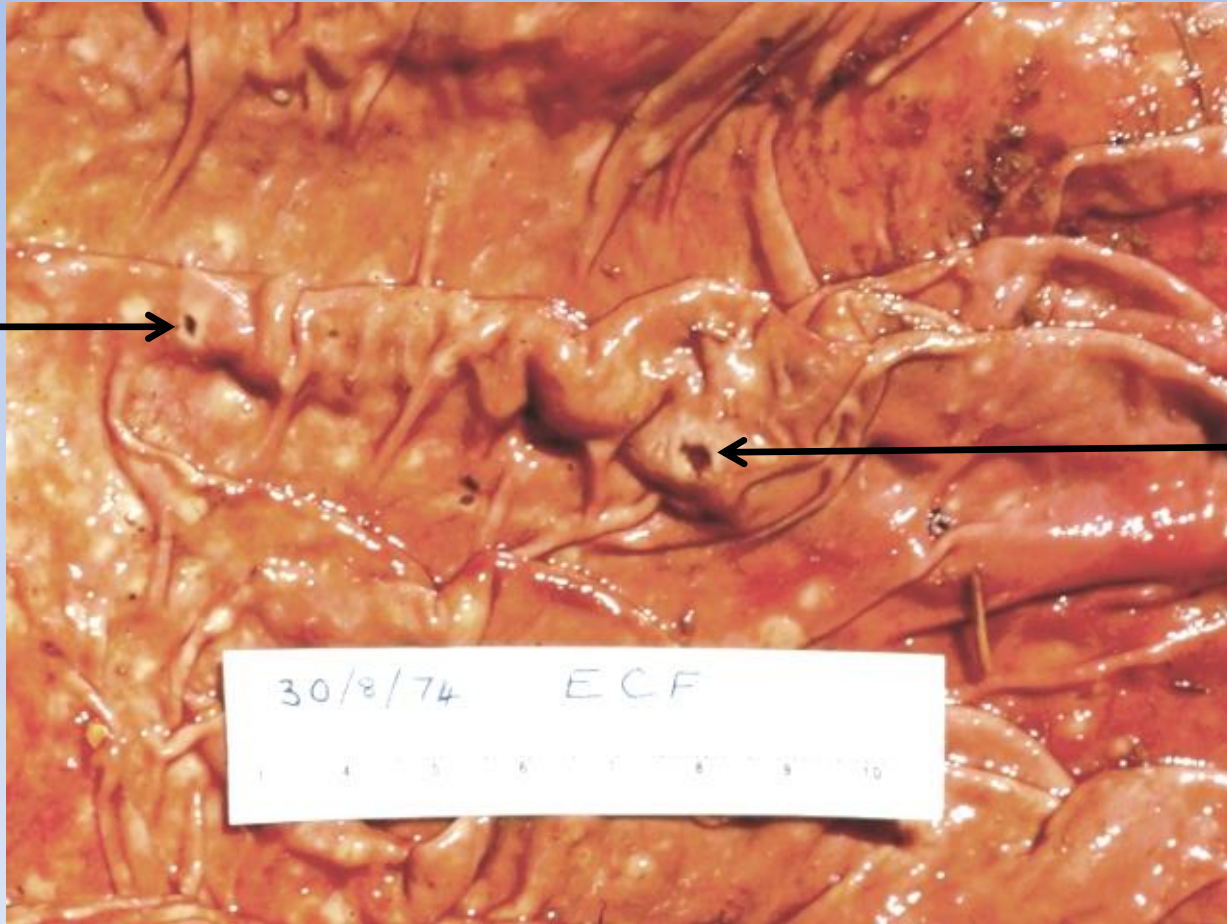
Theileria parva: Post-mortem findings



Theileria parva: Post-mortem findings



Theileria parva: Post-mortem findings



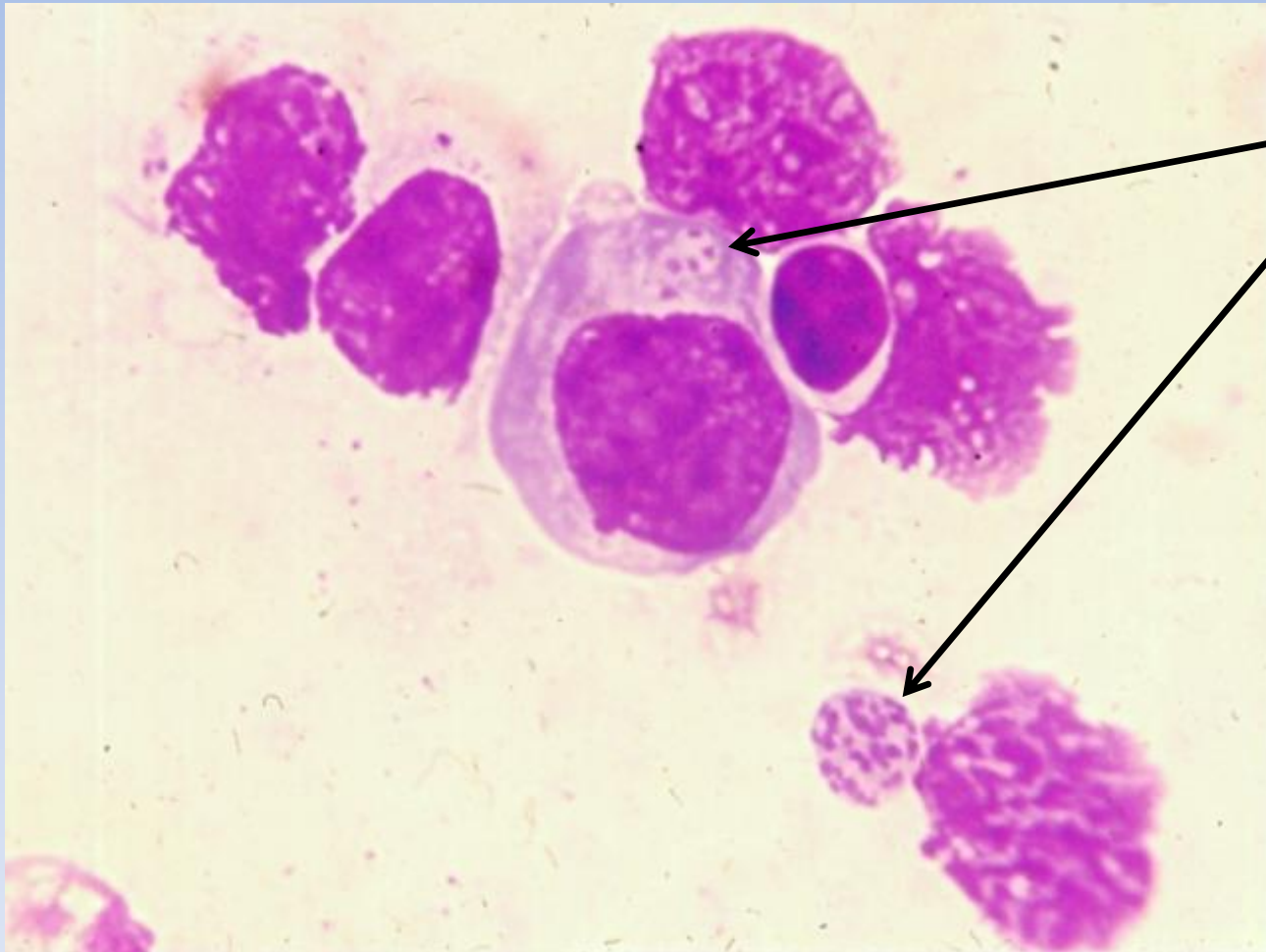
Theileria parva: Post-mortem findings



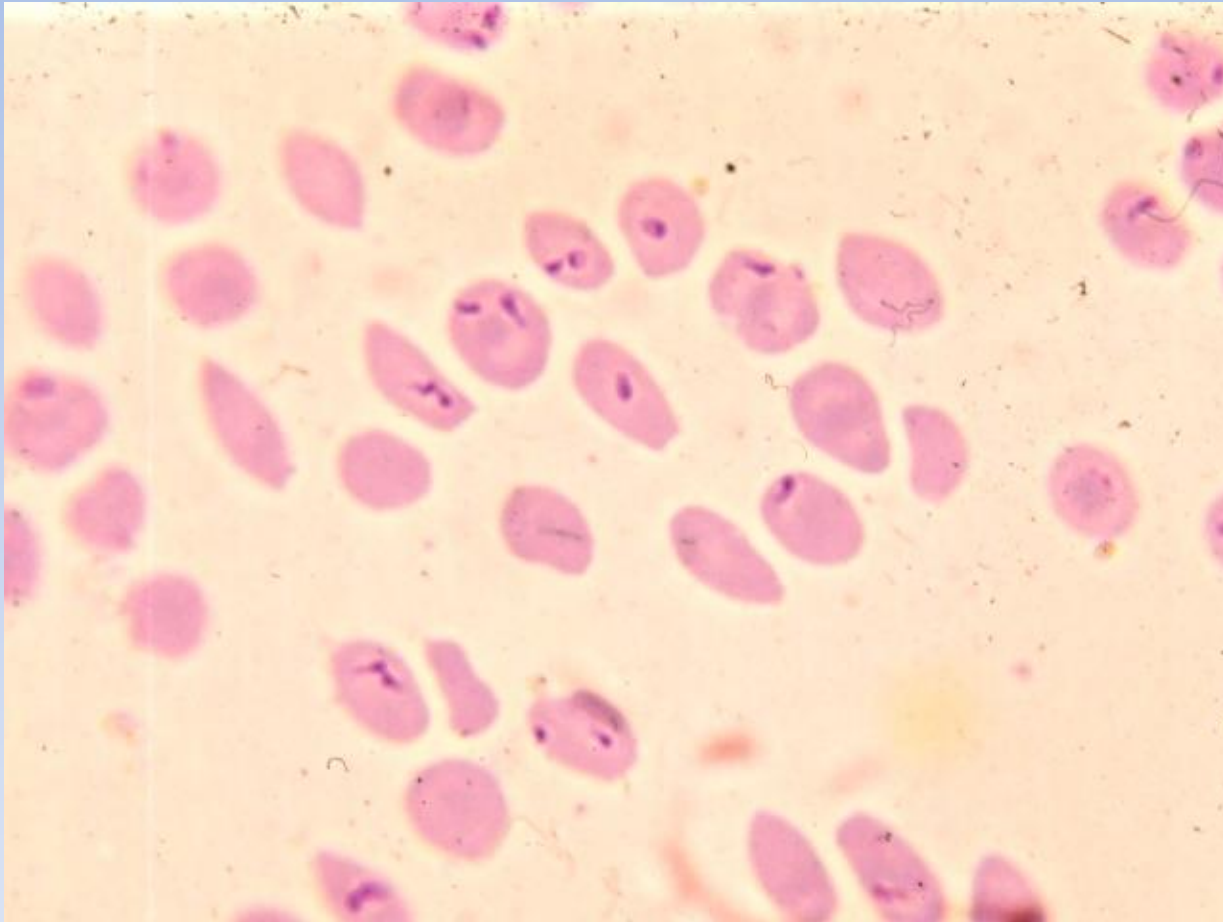
Theileria parva: Diagnosis

- Based on the detection of schizonts in blood, lymph node and spleen smears, in conjunction with history, clinical signs and post-mortem findings

Theileria parva: Diagnosis



Theileria parva: Diagnosis



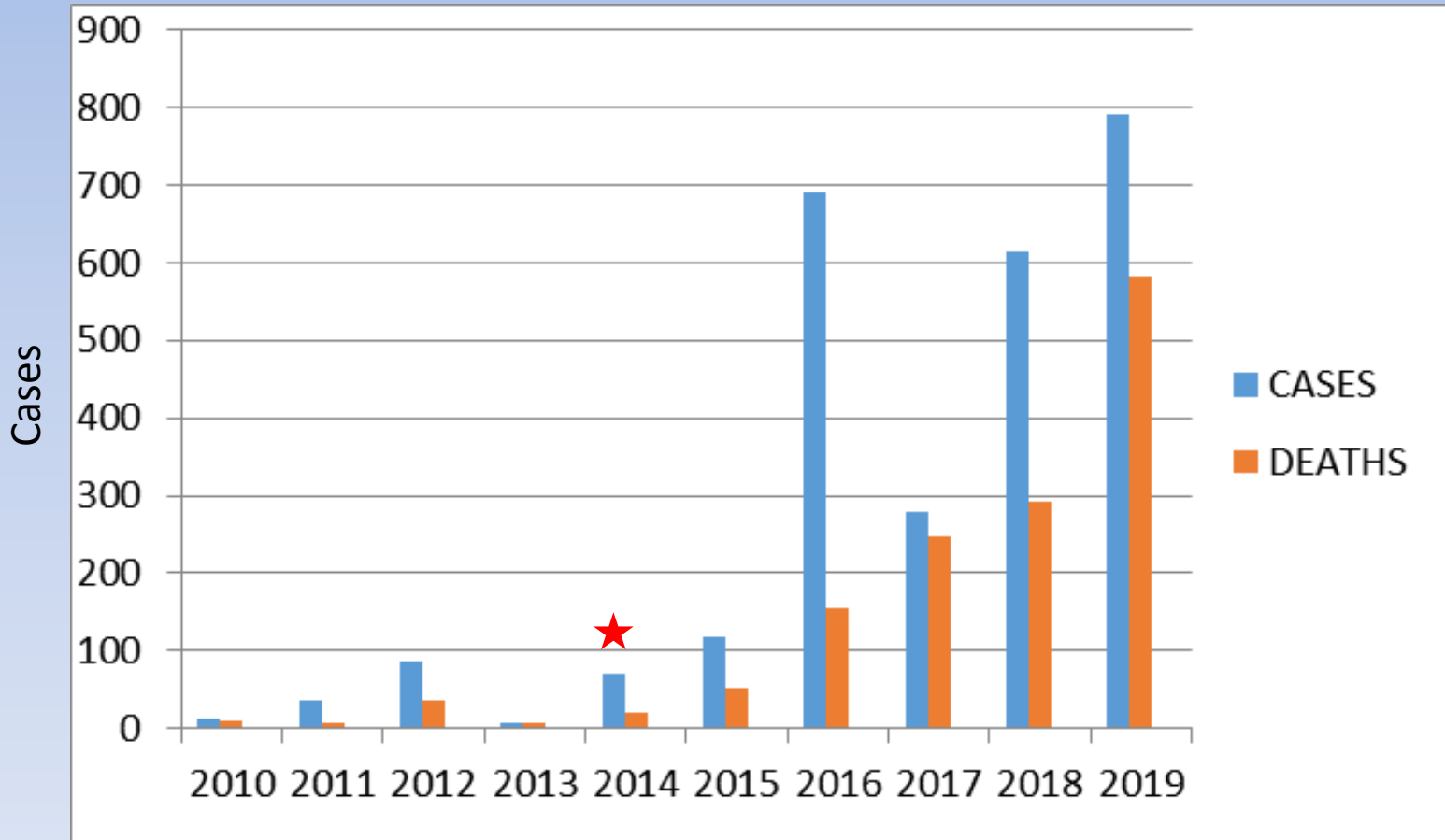
Theileria parva: Diagnosis

- Based on the detection of schizonts in blood, lymph node and spleen smears, in conjunction with history, clinical signs and post-mortem findings
- Piroplasms are non-specific
- Differentiation from other *Theileria* species is based on serological and molecular techniques

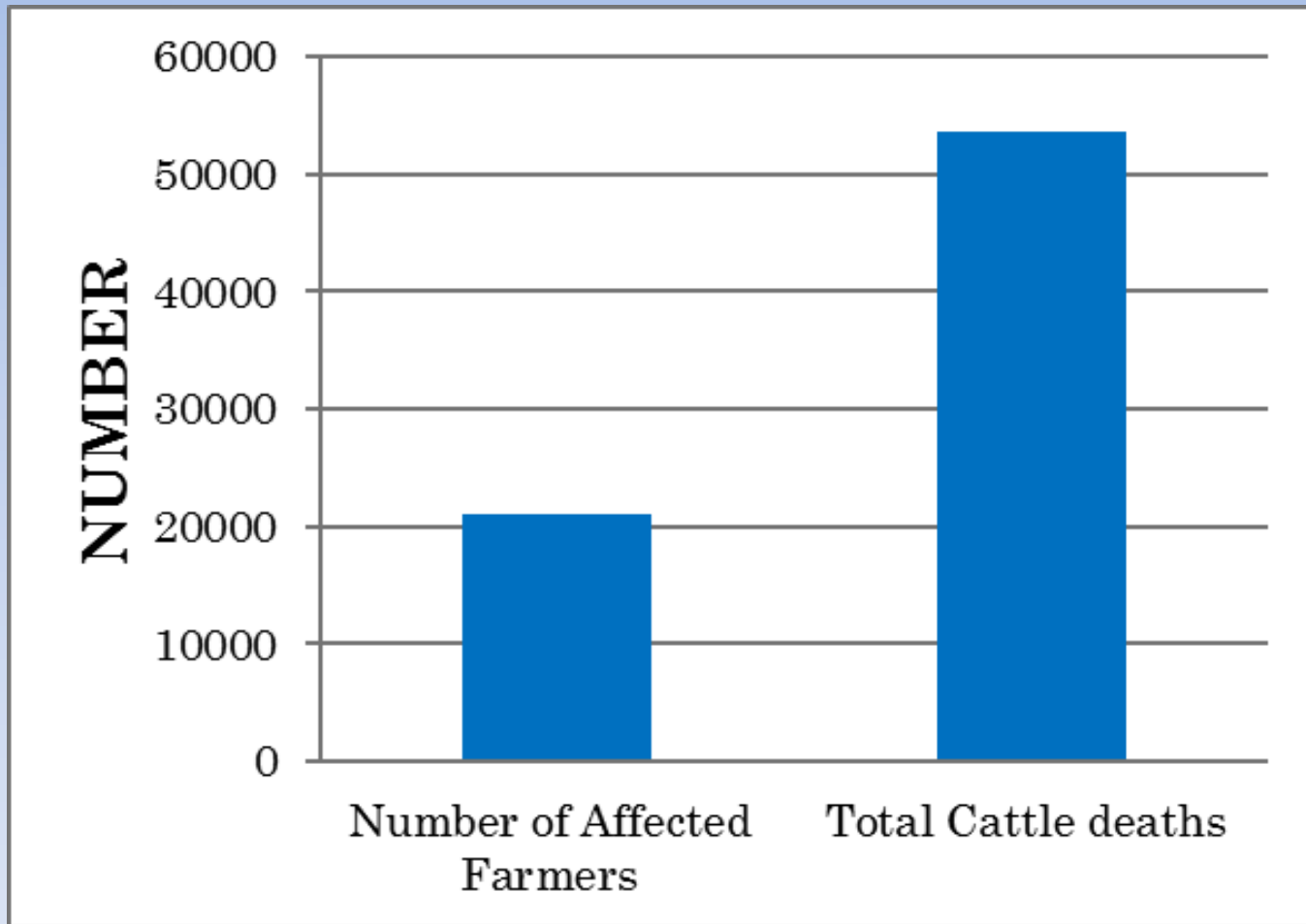
Theileriosis in Zimbabwe

What Is Happening

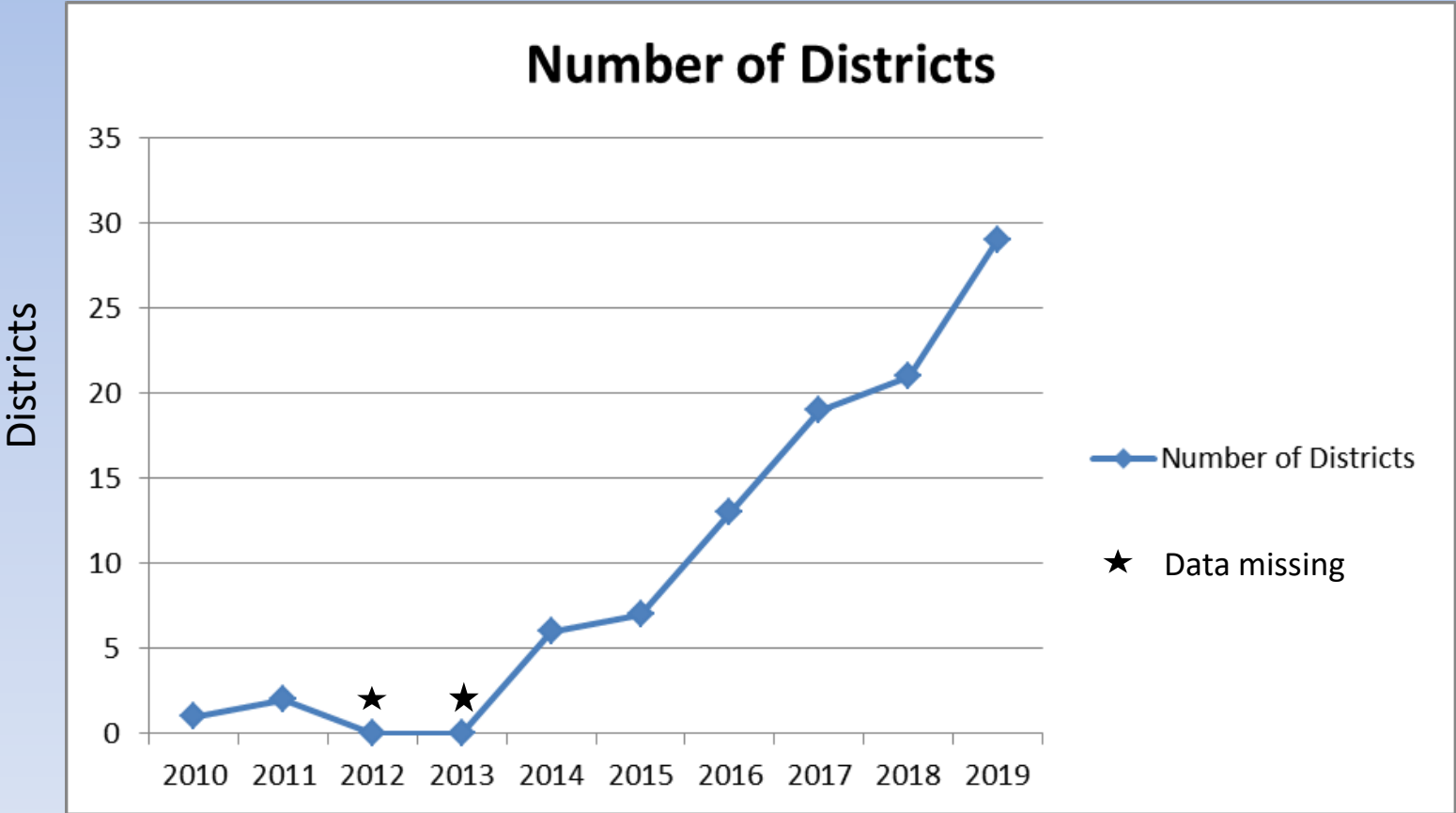
Theileriosis Confirmed At Central Veterinary Laboratory 2010-2019



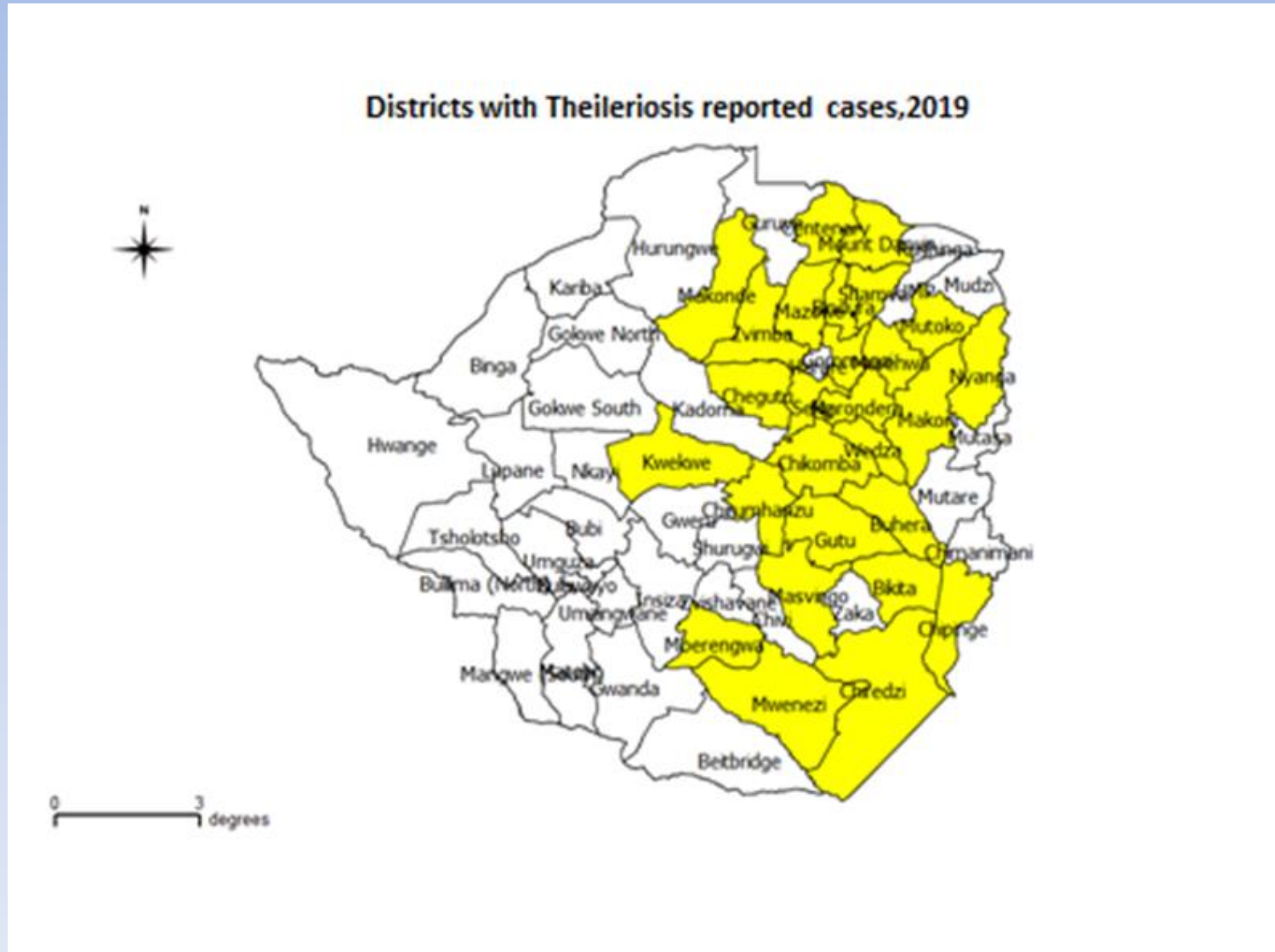
Theileriosis In 2018



Districts With Theileriosis 2010-2019



Districts With Theileriosis 2019



Theileria parva is primarily a parasite of ticks

The Brown Ear Tick

Rhipicephalus appendiculatus

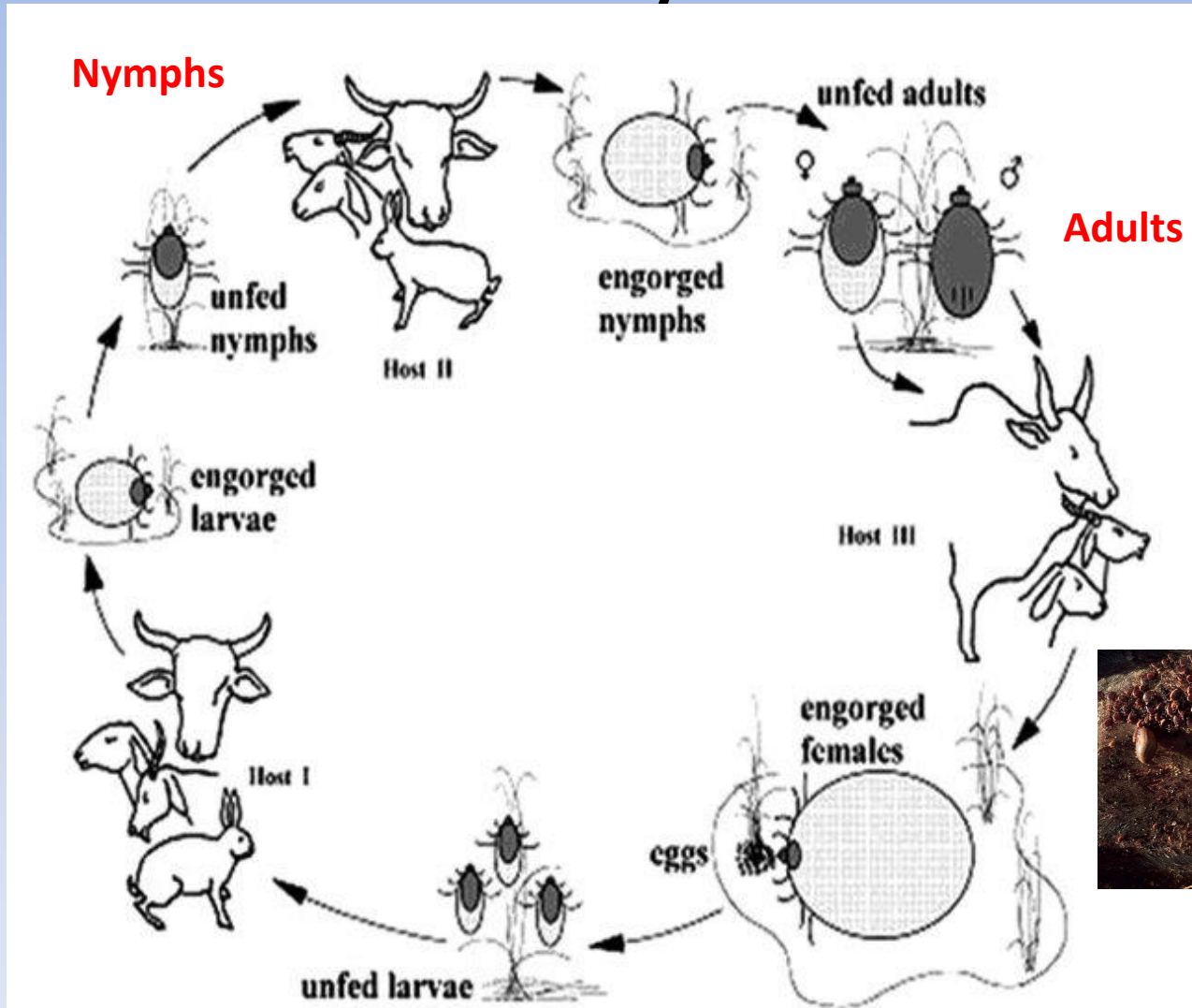
- The main vector of *Theileria parva*
- Three host tick
- Preferred hosts are cattle and large wild ungulates
- Adults feed preferentially on the ears
- Immatures feed on the head and neck

The Brown Ear Tick



The Brown Ear Tick Life Cycle

Larvae



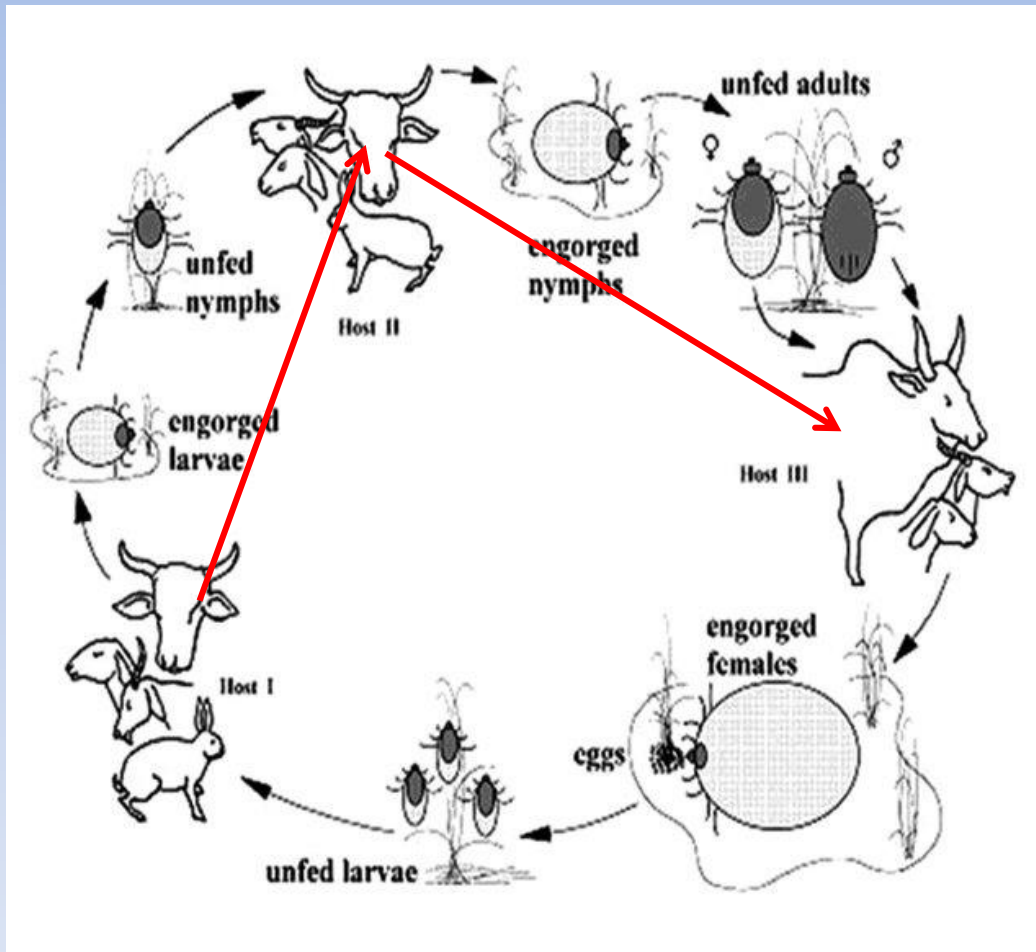
Nymphs

Adults



The Brown Ear Tick

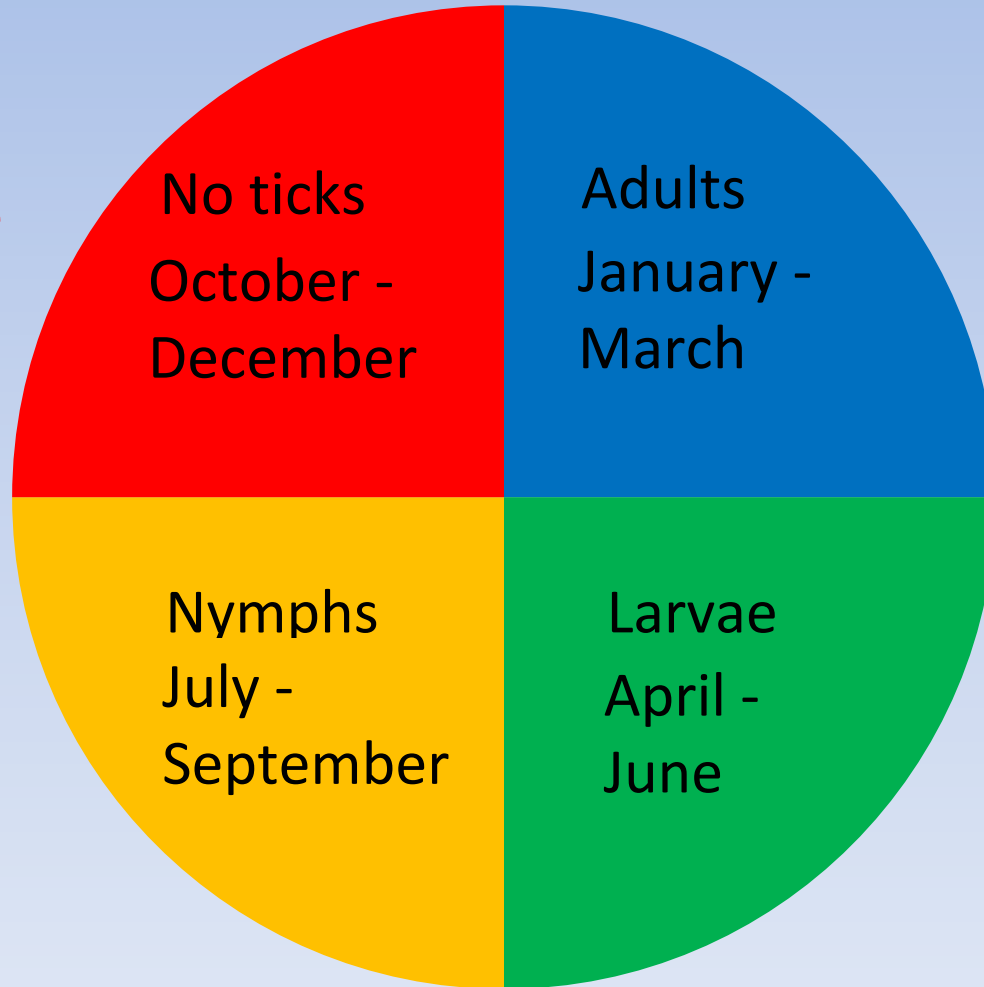
Transmission of *Theileria*



The Brown Ear Tick

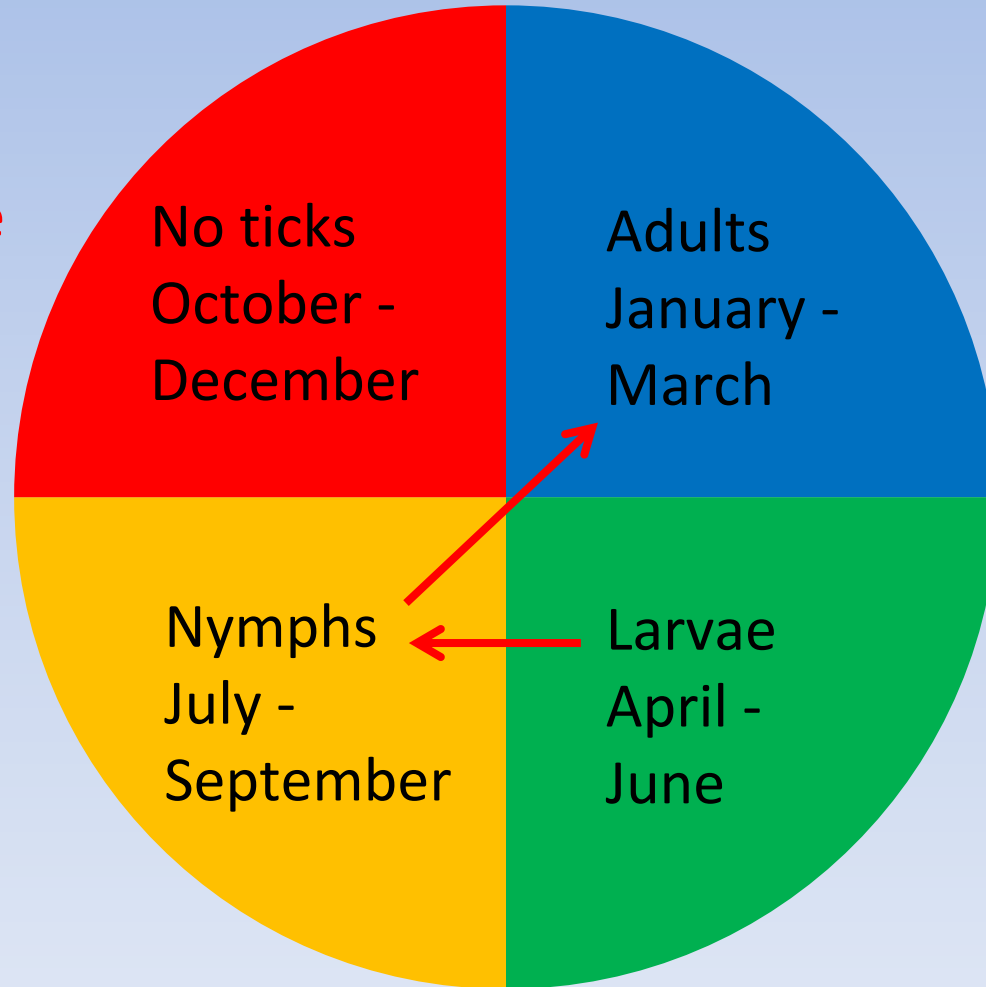
Seasonality in Southern Africa

Diapause



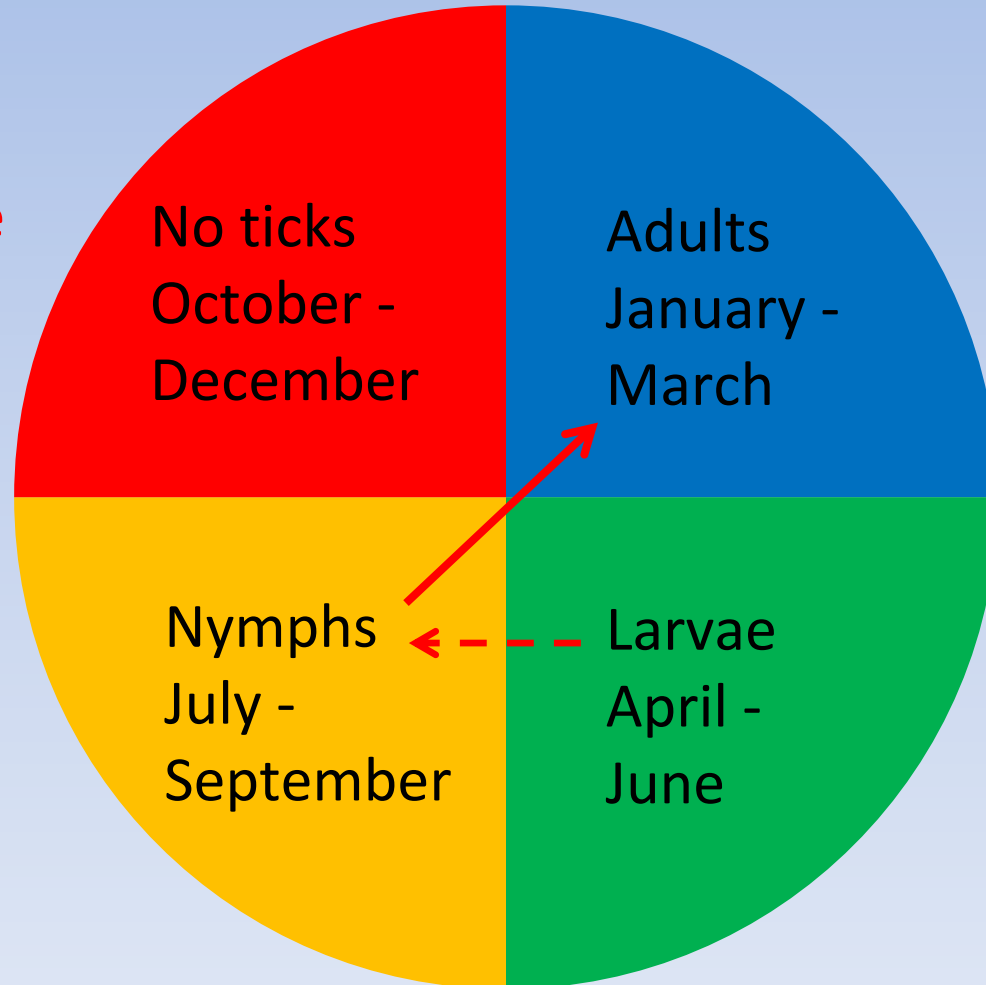
East Coast Fever Seasonality in Zimbabwe

Diapause



Zimbabwe Theileriosis Seasonality

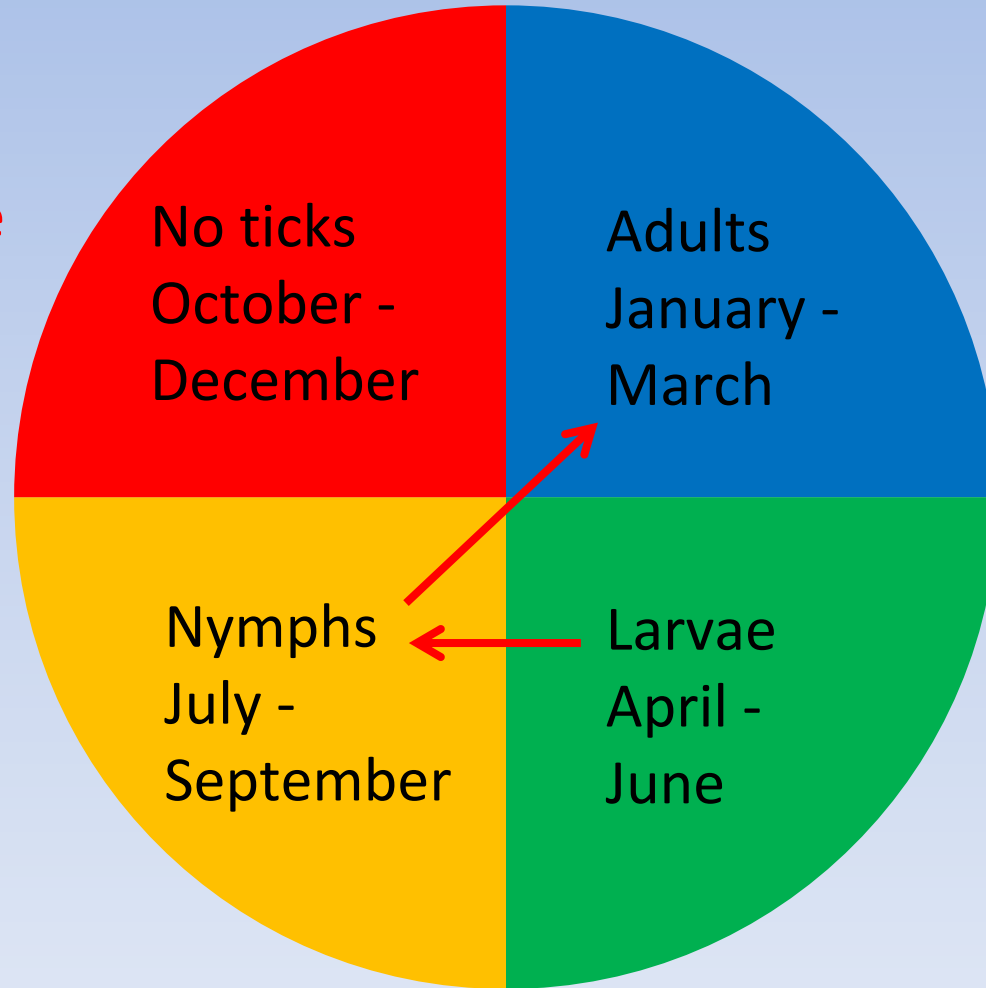
Diapause



Theileriosis In Zimbabwe

Change In Seasonality

Diapause



What Is Happening?

- *Theileria parva* is changing from seasonal to non-seasonal, with rapid spread and high mortality

DISEASE	SEASONALITY	MORTALITY	SPREAD	1930's	today
East Coast fever	Non-seasonal	High	Rapid	↓	↑
Zimbabwe theileriosis	Rainy season	Low	Slow		

Why Is It Happening?

- Change in cattle?
- Change in the *Theileria*?
- Change in the tick?

Change In The *Theileria*

- Has the *Theileria* that was present in Zimbabwe for 80 years suddenly changed its character?
- Has an East African type of *Theileria* been reintroduced?

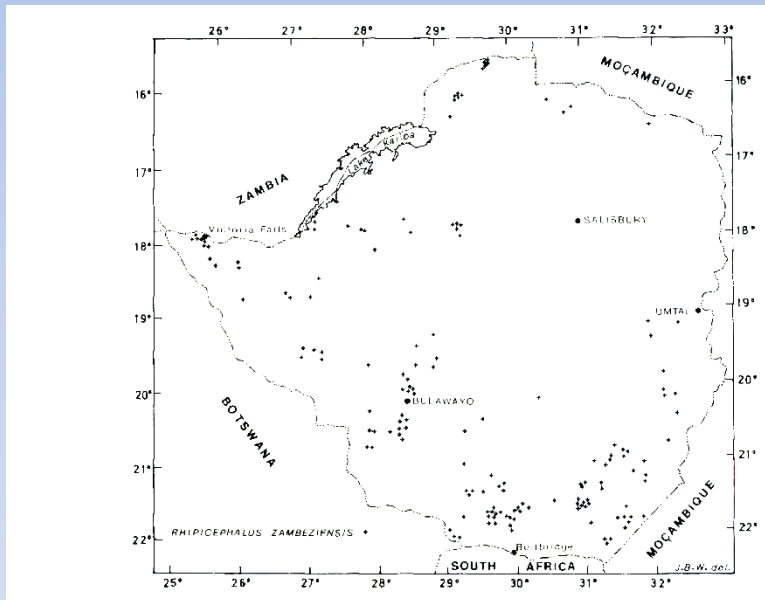
Change In The Tick?

- Has the Brown Ear Tick increased in numbers to overwhelm the seasonal effect? Are nymphs so numerous that they can transmit fatal disease?
- Has the Brown Ear Tick changed its character? Can nymphs now transmit *T. parva* more efficiently than before?
- Has another species of tick become involved in transmission?

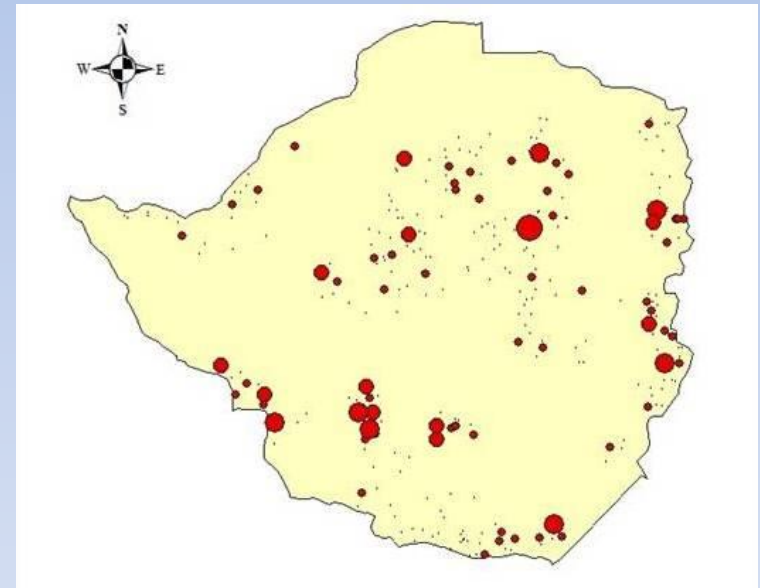
Lowveld Brown Ear Tick

- Brown Ear Tick (*Rhipicephalus appendiculatus*) was identified in 1901
- Lowveld Brown Ear Tick (*Rhipicephalus zambeziensis*) was not identified until 1981
- Differences
 - Adults almost identical – feed on ears
 - Lowveld Tick larvae and nymphs more easily differentiated – feed on legs
 - Lowveld Tick more tolerant of dry conditions
 - Lowveld Tick nymphs efficient vectors of *T. parva*

Distribution of Lowveld Brown Ear Tick in Zimbabwe



1982



2014

Lowveld Brown Ear Tick: Distribution In Zimbabwe

- Why has the distribution changed?
 - Failure of dipping
 - Lack of movement control
 - Climate change?

Lowveld Brown Ear Tick: Transmission of Theileriosis

- The Lowveld Brown Ear Tick is known to be a major vector of East Coast fever, especially in winter, in the Southern Province of Zambia
- It is likely that it is the tick responsible for transmission of theileriosis in Zimbabwe in winter
- Transmission throughout the year favours the appearance of strains of *Theileria parva* that are more virulent, spread more easily and cause higher mortality

What Can Be Done To Control Theileriosis?

National level

- National control/eradication programme
 - Intensive dipping
 - Movement control
 - Quarantine of infected properties
 - Destocking

What Can Be Done To Control Theileriosis?

Farm level

- Effective fencing (double along public roads/vulnerable boundaries)
- Effective dipping, throughout the year
- Prevention of introduction of tick-infested or *Theileria*-infected cattle (including vaccinated animals)
- Prevention of introduction of tick-infested hay
- Surveillance – disease and ticks (NB legs)
- Early treatment of clinical cases

What Can Be Done To Control Theileriosis?

Immunization

- Live parasites in blood and spleen - ineffective
- Molecular vaccine – no vaccine yet developed
- Cell culture vaccine – not effective with *Theileria parva*
- **Infection and treatment**
- Block treatment with tetracyclines – unreliable
- NB Infection and treatment and block treatment create carriers

Infection and Treatment

- Bulk up selected isolate of *Theileria* in cattle, infect ticks, prepare deep-frozen stabilate, establish safe/effective dose, and inoculate simultaneously with long-acting tetracycline
- Shortcomings
 - Immunization is generally most effective with a local isolate
 - Immunized cattle are likely to be carriers
 - Logistical difficulties
 - Expense – up to USD7/head (2019)

Immunization In Zimbabwe

- A local isolate, Boleni, was developed and tested in the mid-1990's by an FAO project
- It proved to be effective against all isolates tested, except those originating from buffalo
- It could be administered without tetracycline coverage
- No vaccine available since 2005

Conclusions

- Theileriosis has re-emerged as a serious constraint to cattle production
- The major reason may be the reintroduction of the Lowveld Brown Ear Tick to the highveld
- There is little prospect of an effective national control programme
- Cattle owners must accept responsibility for control in their herds
- Immunization may play a role in control programmes