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Climate change and animal disease: Vectors and vector borne pathogens in Croatia

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Croatian Veterinary Institute

Definitions

- A vector is an organism that does not cause disease itself, but spreads infection by conveying pathogens from one host to the other (mechanical, biological)
- A Vector Borne Disease (VBD) is one in which the pathogenic micro- organism is transmitted from an infected individual to another individual by an arthropod

Arthropods

- Metazoan invertebrate animals
- More than 1 million species
- More than 80% of all living species
- 39 000 species – parasitizing humans, domestic and wildlife
- Able to transmitt pathogens

Ticks


Mosquitoes

Biting midges

Sand flies

Flies

Lice

Changes in epidemiology of diseases

- Globalisation, animal and vector movement and trade
- Climate and atmospheric changes
- Habitat changes
- Adaptation of vectors and vector competence
- Increasing population of domestic animals and
- Wild animal protection
- Development of insecticide and drug resistance

We live in a global village

36 hours-two farthest points

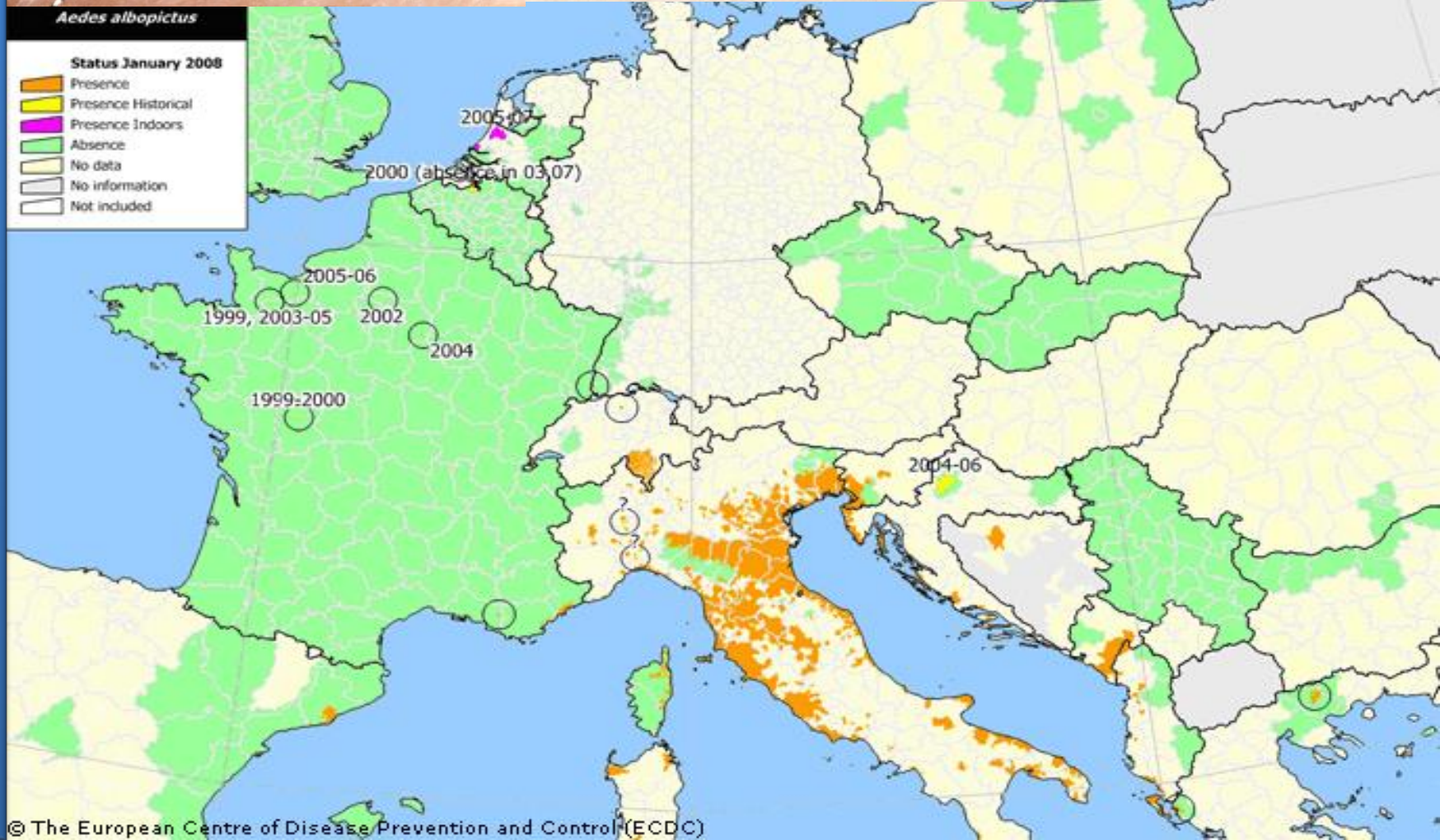
Global traffic and disease vector dispersal

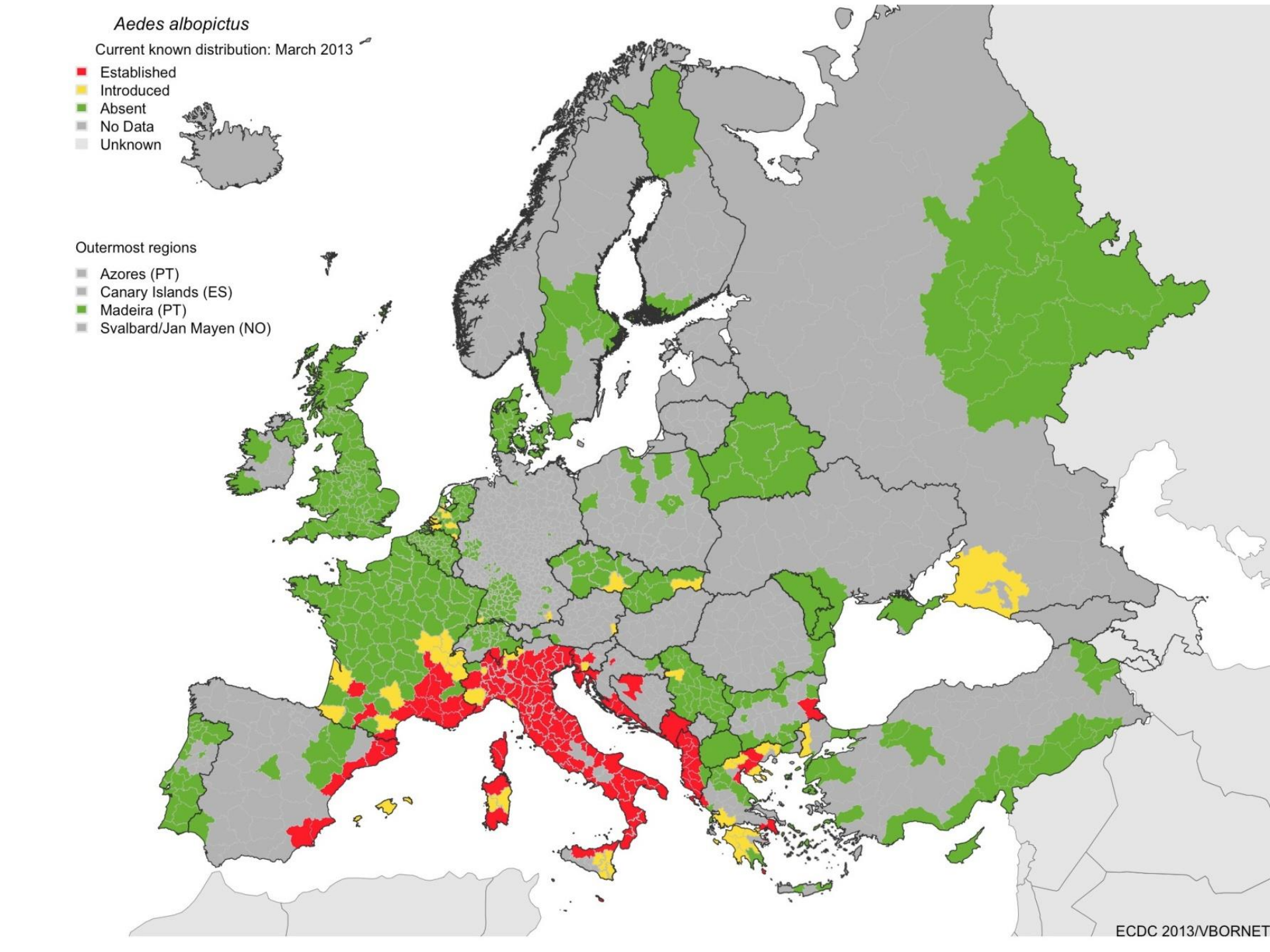
Andrew J. Tatem*†‡, Simon I. Hay*†, and David J. Rogers*

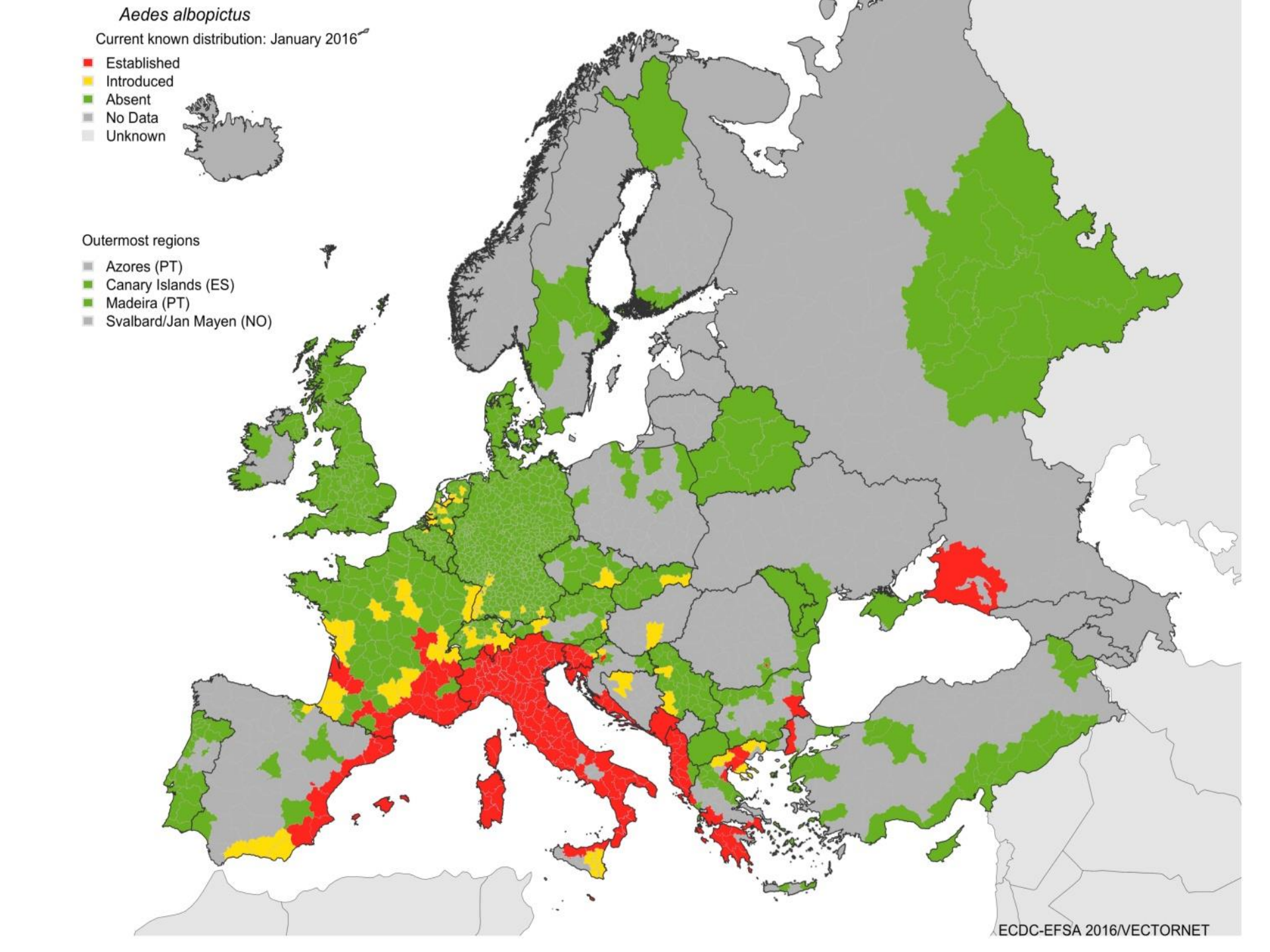
Rank	From	To	*Ae. albopictus* found?	*Ae. albopictus* established?
Shipping				
1	Chiba, Japan	New Orleans	Y	Y
2	Chiba, Japan	Genoa, Italy	Y	Y
3	Chiba, Japan	Fraser, Canada	N	?
4	Chiba, Japan	Brisbane, Australia	Y	?
5	Chiba, Japan	Auckland	Y	?
6	Chiba, Japan	South Louisiana	Y	Y
7	Yokohama, Japan	Fraser, Canada	N	?
8	Kobe, Japan	Fraser, Canada	N	?
9	Chiba, Japan	Miami	Y	Y
10	Yokohama, Japan	Genoa, Italy	Y	Y
Air				
1	Tokyo Narita, Japan	Honolulu	Y	Y
2	Osaka Kansai, Japan	Honolulu	Y	Y
3	Nagoya, Japan	Honolulu	Y	Y
4	Tokyo Narita, Japan	Seattle	Y	?
5	Tokyo Narita, Japan	Brisbane, Australia	Y	?
6	Fukuoka, Japan	Honolulu	Y	Y
7	Seoul, South Korea	Honolulu	Y	Y
8	Tokyo Hareda, Japan	Honolulu	Y	Y
9	Taipei Chang, Taiwan	Seattle	Y	?
10	Tokyo Narita, Japan	Portland, OR	Y	?

Air results are exclusive of short-haul routes to Hong Kong; Sapporo, Japan; and Pyongyang, North Korea.

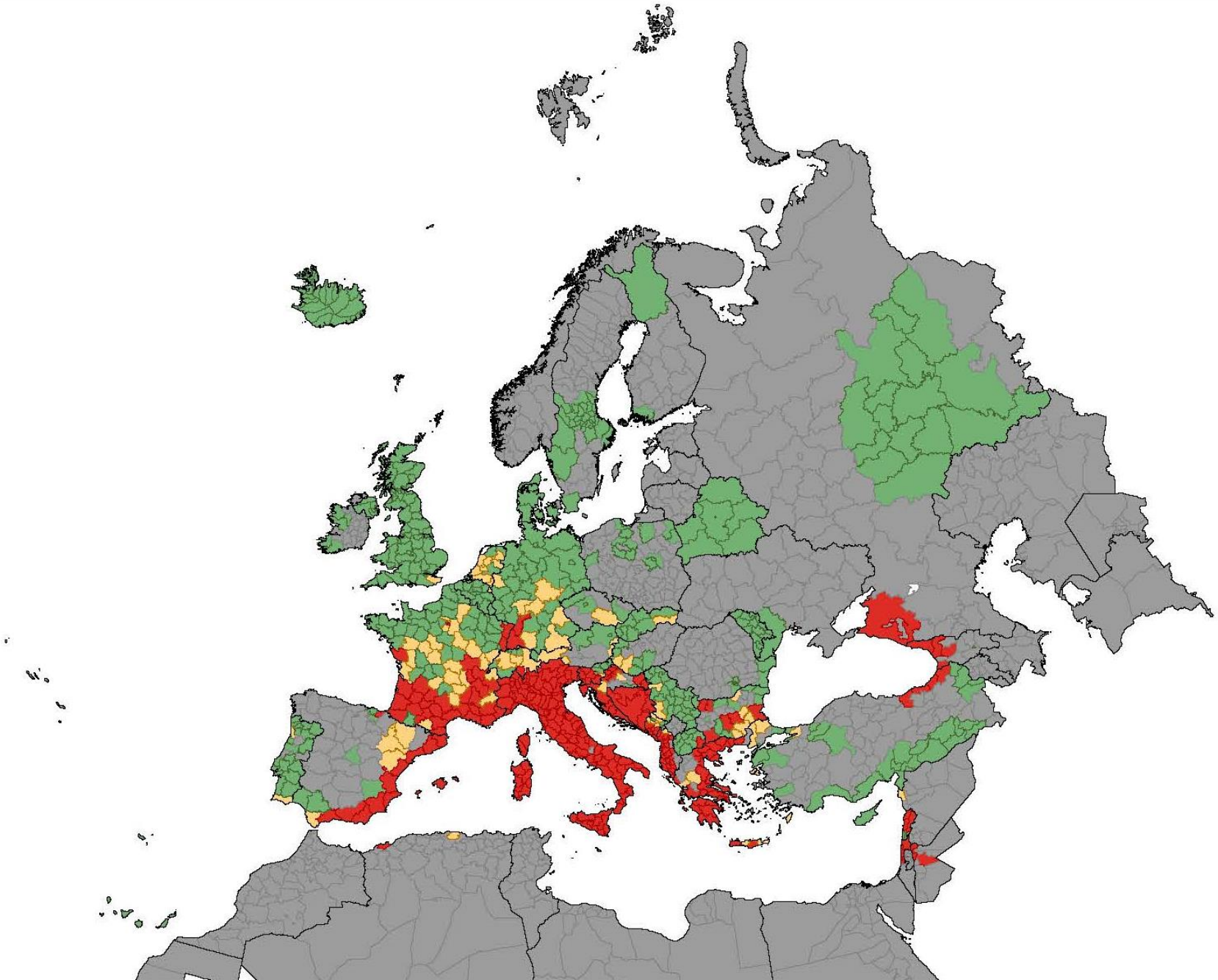
Aedes albopictus




Aedes albopictus
Current known distribution: March 2013
Established
Introduced
Absent
No Data
Unknown
Outermost regions
Azores (PT)
Canary Islands (ES)
Madeira (PT)
Svalbard/Jan Mayen (NO)
ECDC 2013/VBORNET


Aedes albopictus
Current known distribution: January 2016
Established
Introduced
Absent
No Data
Unknown
Outermost regions
Azores (PT)
Canary Islands (ES)
Madeira (PT)
Svalbard/Jan Mayen (NO)
ECDC-EFSA 2016/VECTORNET

Aedes albopictus - current known distribution: January 2018



Habitat changes

Mosquitoes

- Mostly viruses- West Nile Virus, encephalitis viruses; LSD?
- Nematodes- *Dirofilaria* spp. and *Setaria* spp.

Vector borne emerging diseses

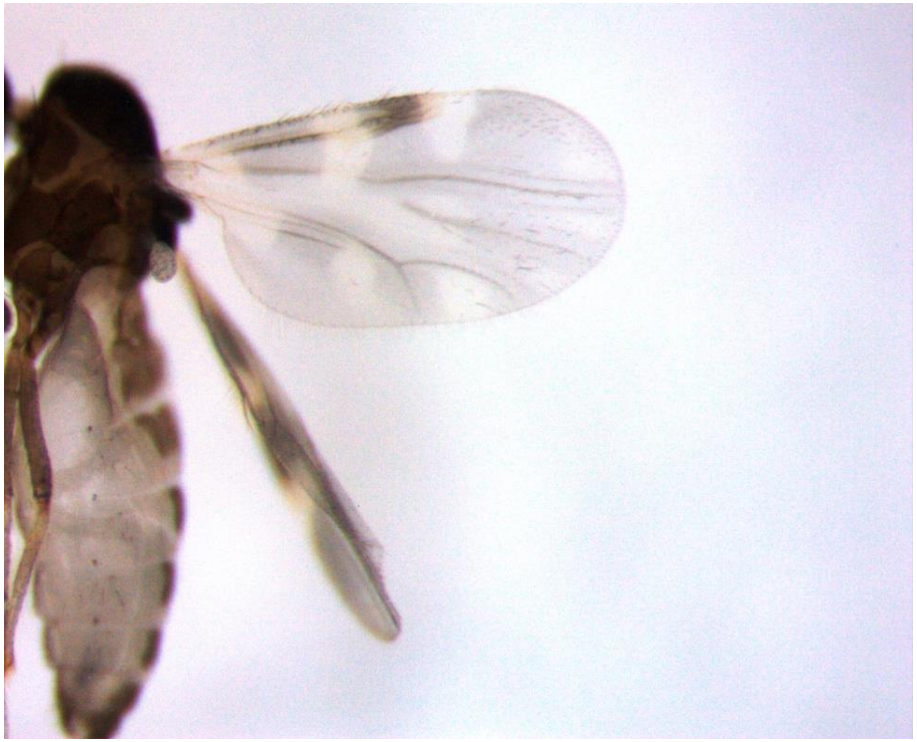
- They occur in areas where they have not been present
- Moving from South to North
- Often defined as Tropical
- Last epidemics / epizootic
  - Lumpy skin disease
  - Blue tongue disease

Biting midges (BTD)

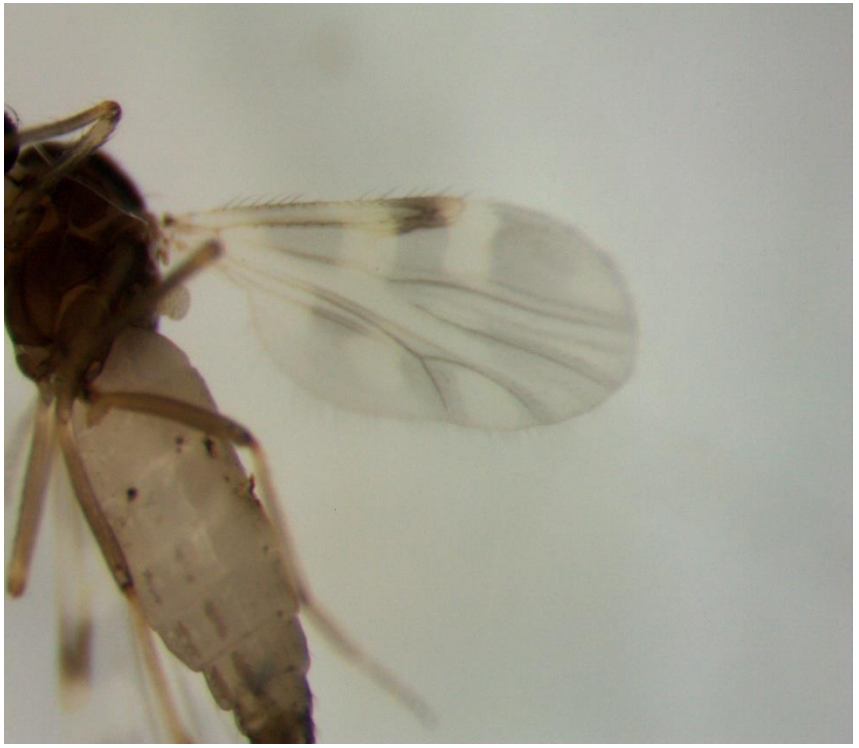
- *Culicoides* is a genus of in the family Ceratopogonidae
- There are over 1350 species in the genus
- At least 117 in Europe
- Blutongue virus, Schmalenberg

Morphology- experts

Culicoides obsoletus

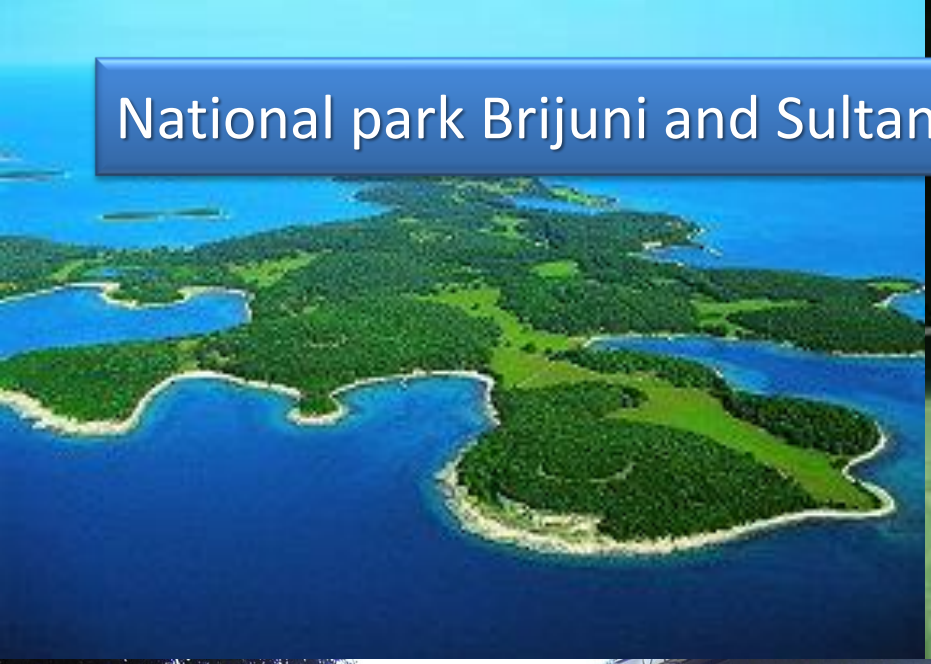


Culicoides scoticus



Indistinguishable- Obsoletus complex

National park Brijuni and Sultanate of Oman



- On 4 March 2010, ten individual oryx antelopes
oatia

nd before being transported
on in the United Kingdom

panying the animals
est for bluetongue

e animals were serologically
- 4 positive

and serotype 1

Entomological survey of *Culicoides* biting midges

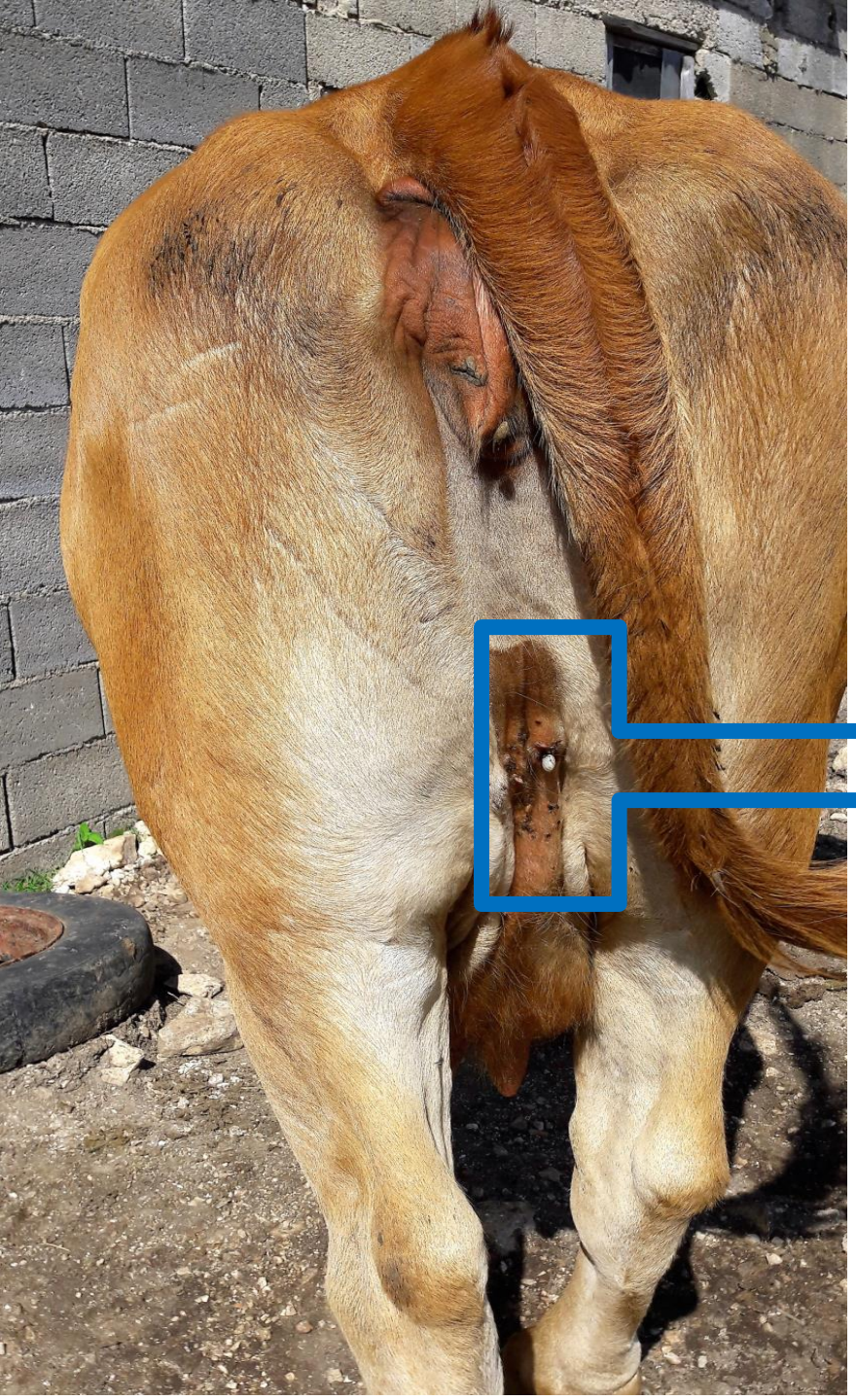
Insect samples were collected every second day until 5 April

None of the samples included insects of the genus *Culicoides*

One of the catches collected near to the sheep stables was identified as a vector of the Obsoletus Complex.

End of the story

Animals were safely returned with army airplane on the 5. April



Pathogens in CRO

Ticks and animls

- *Babesia canis canis*
- *Babesia canis vogeli*
- *Babesia gibsoni*
- *Babesia equi*
- *Babesia caballi*
- *Babesia microti*
- *Babesia sp. EU-1*
- *Babesia divergens*
- *Babesia crassa*
- *Theileria annae*
- *Theileria ovis*
- *Hepatozoon canis*
- *Acantocheilonema reconditum*
- *Borellia buradorferi s.s.*
- *Borellia garinii*
- *Borellia afzelii*
- *Anaplasma phagocytophilum*
- *Anaplasma platys*
- *Rickettsia conorii*
- *Rickettsia slovaca*
- *Rickettsia helvetica*
- *Rickettsia rhipicephali*
- *Rickettsia aeschlimannii*
- *Rickettsia raolultii*
- *Rickettsia monacensis*
- *Rickettsia massilae*
- *TBE virus*

Rhipicephalus sp

- *Wolbachia sp.*
- *Midychloria mitohondri*
- *Anaplasma ovis*
- *Theileria ovis*
- *Babesia ovis*
- *Babesia* sp. Angola izolat
- *Rickettsia masillae*
- *Hepatzoon felis*
- *Hepatozoon canis*

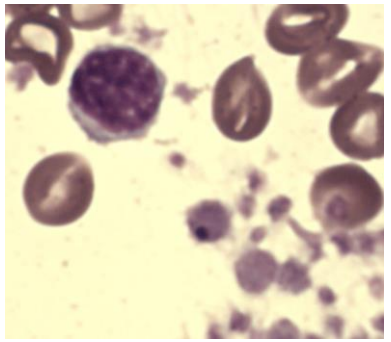
January 2017

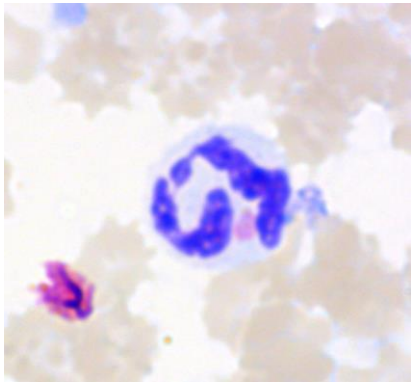
Changes in ticks' seasonal activity

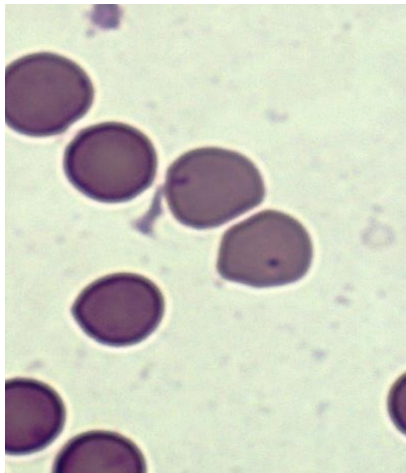
Anaplasmosis

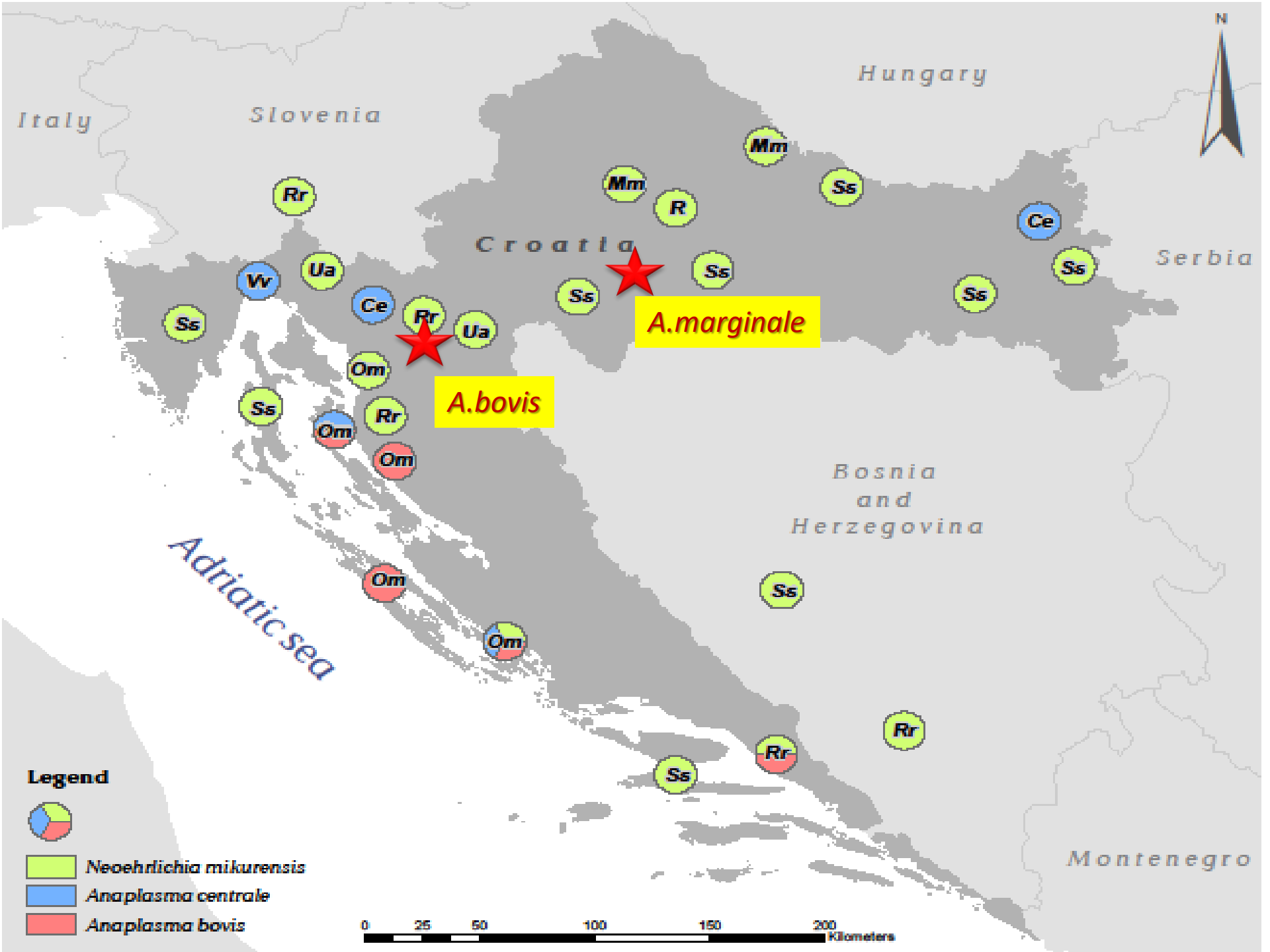
Anaplasma

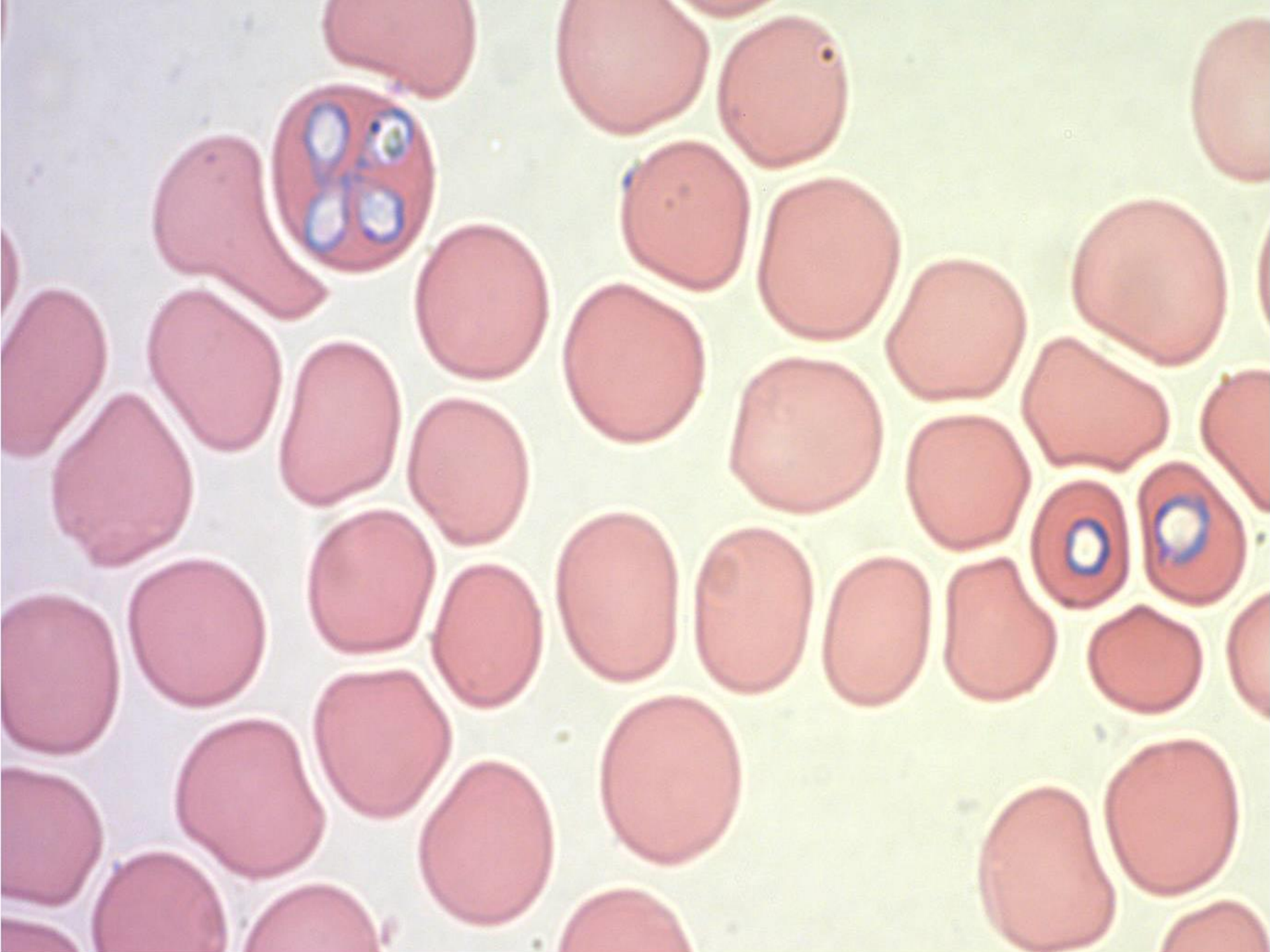
- A.platys
- A. phagocytohilum
- A.centrale
- A.marginale
- A.bovis
- A.ovis

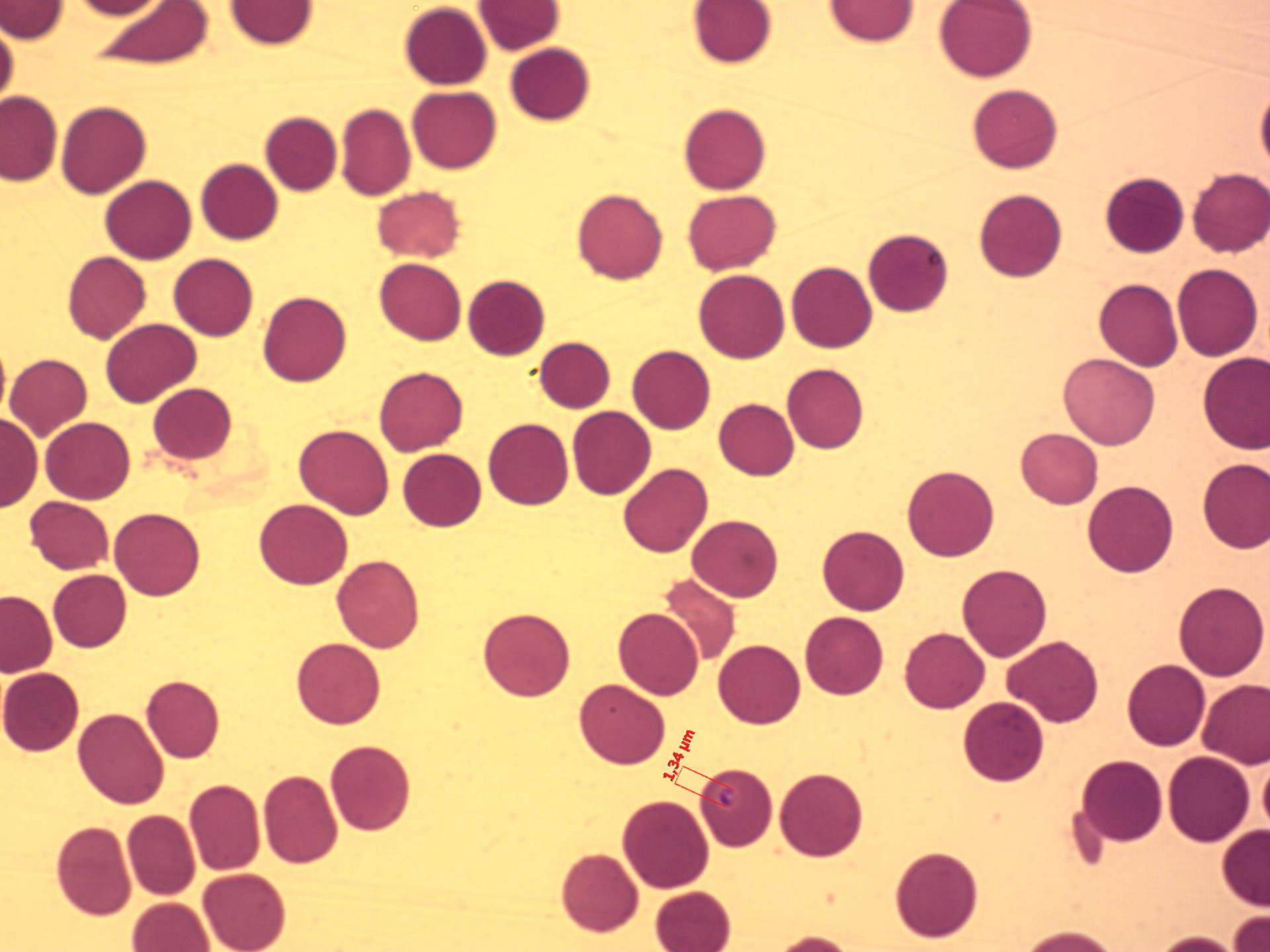


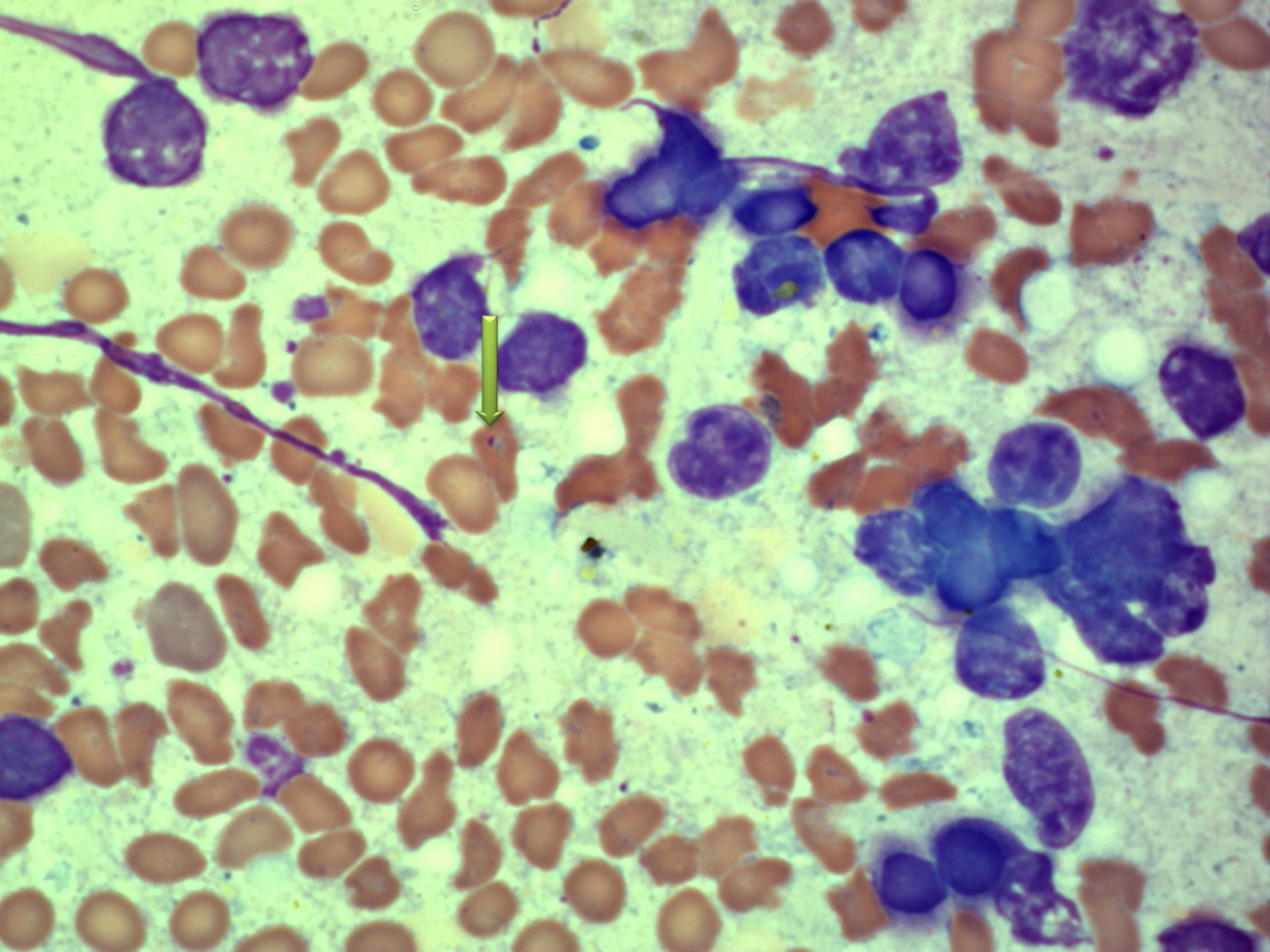





Italy
Slovenia
Hungary
Croatia
Serbia
Bosnia and Herzegovina
Montenegro
Adriatic sea
N
A.marginale
A.bovis
Mm
Mm
Ss
R
Ce
Ss
Ss
Ss
Ss
Ss
Rr
Ua
Vv
Ce
Rr
Ua
Ss
Om
Ss
Om
Rr
Om
Om
Om
Ss
Rr
Rr
Ss
Legend
Neoehrlichia mikurensis
Anaplasma centrale
Anaplasma bovis
0
25
50
100
150
200
Kilometers




1,34 µm



Ixodes ricinus- Cres

Theileria cf. buffeti and Babesia sp. Angola Isolate

Ripicephalus sp. and Haemaphysalis

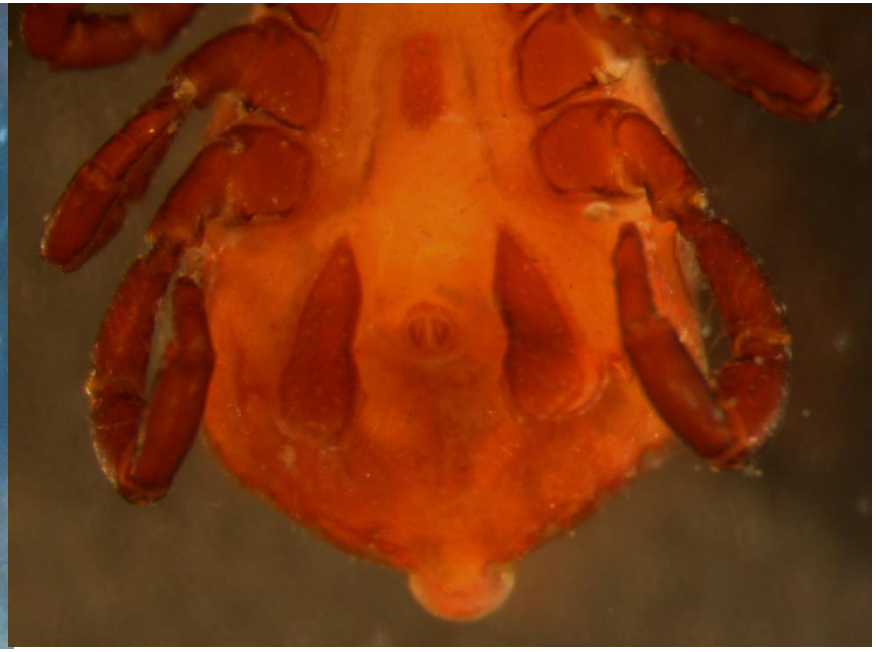
Babesia cf. crassa


T. buffeti

Ripicephalus sanguineus sensu lato

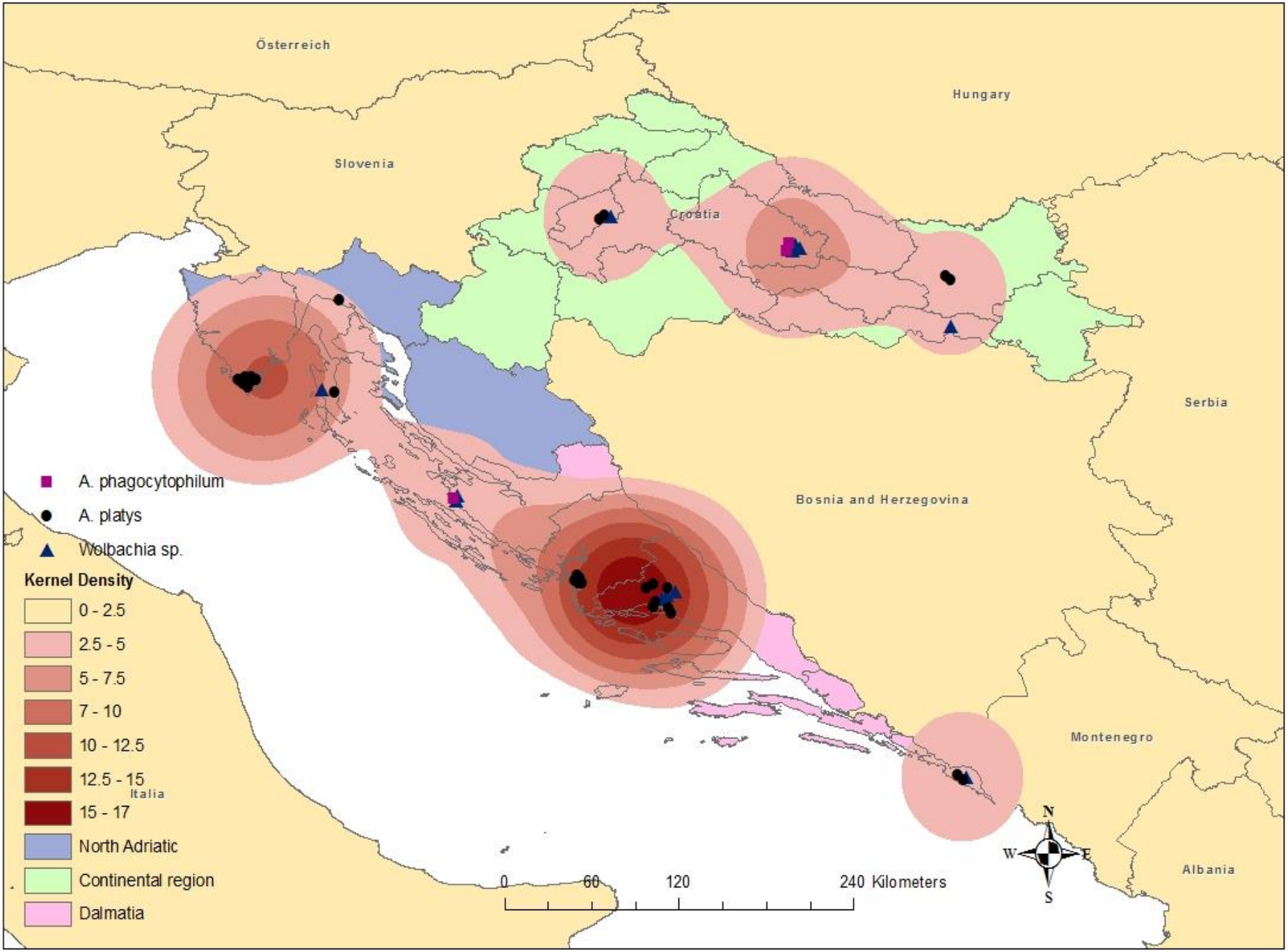
R. sanguineus

R. turanicus



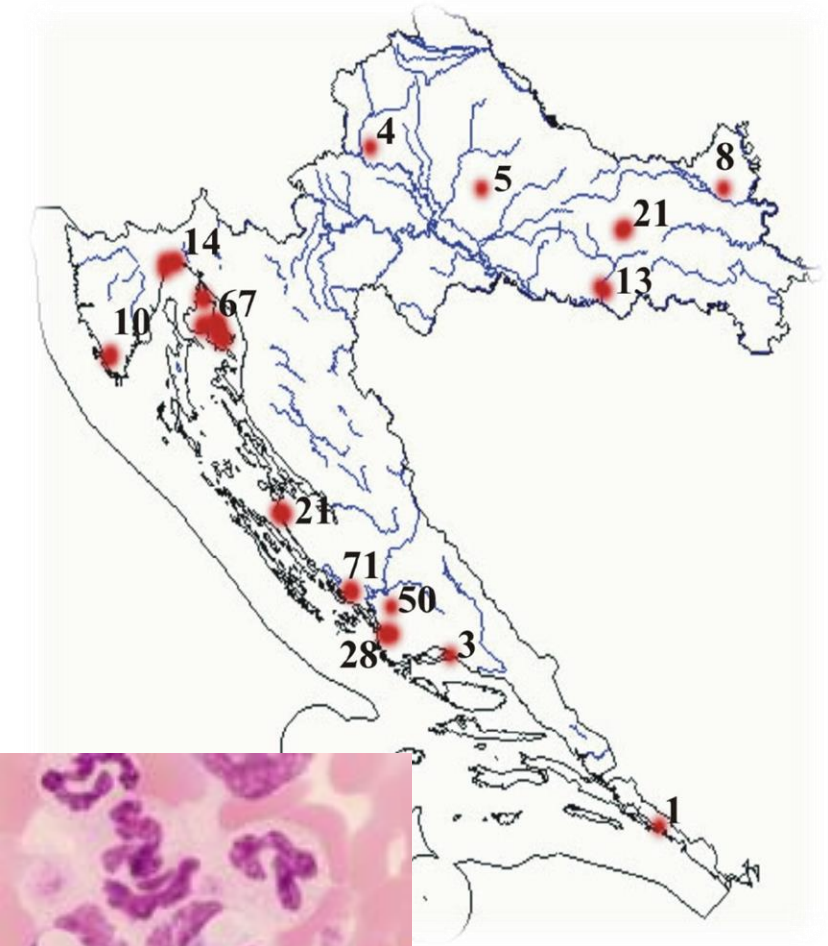
17 species within group

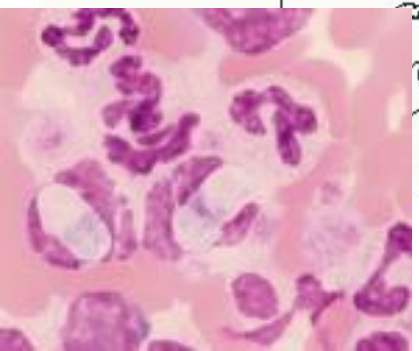

KC243886
JX394209
KU556743-6,
KC243887-90
KC243892
KC243885
KC243891
KM494916
KX519706-13
KF219744-6
KU214592

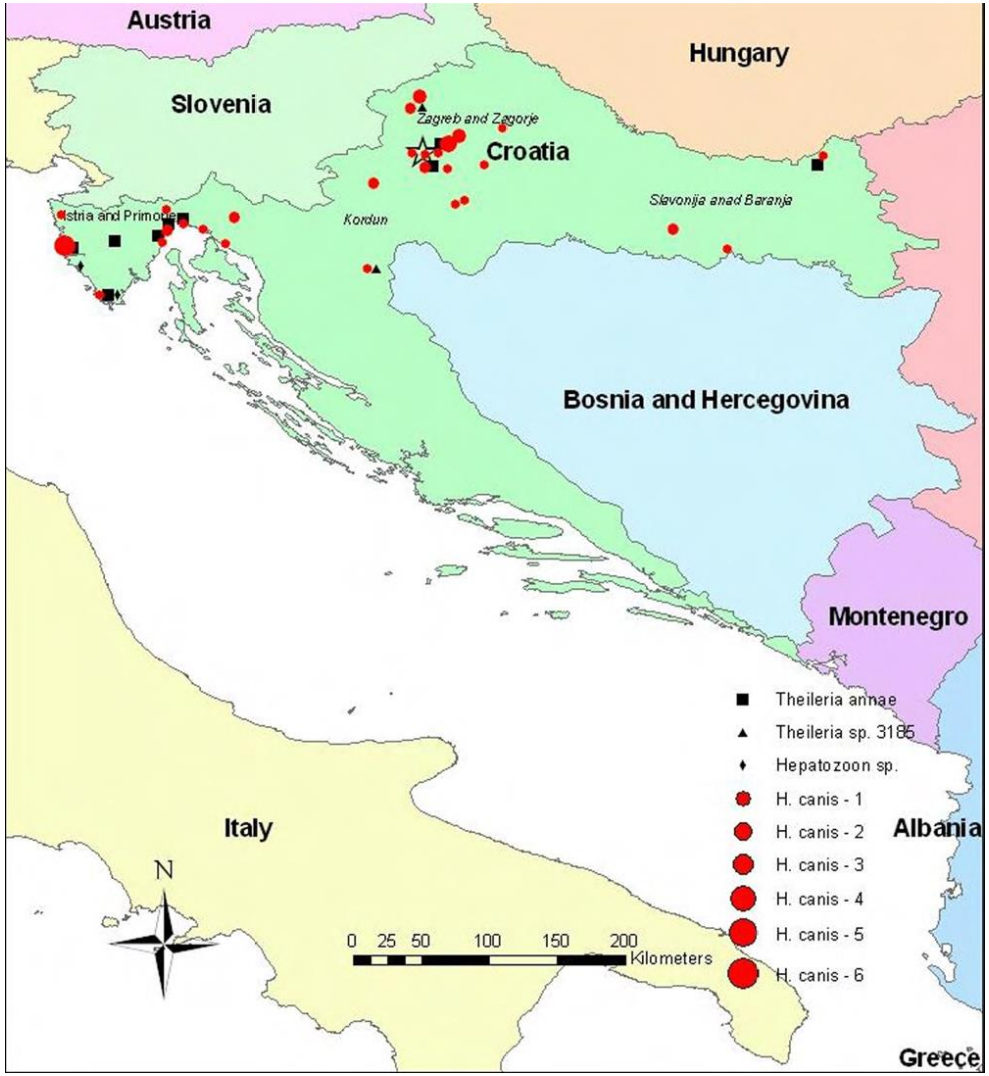

Österreich
Hungary
Slovenia
Croatia
Serbia
Bosnia and Herzegovina
Montenegro
Albania
Italia
A. phagocytophilum
A. platys
Wolbachia sp.
Kernel Density
0 - 2.5
2.5 - 5
5 - 7.5
7 - 10
10 - 12.5
12.5 - 15
15 - 17
North Adriatic
Continental region
Dalmatia
0
60
120
240 Kilometers
N
W
E
S

Hepatozoon canis- 11% of dogs in Croatia (PCR)

Hepatozoon canis- in foxes (40%)







To conclude

- Climate changes have influence on habitat change and vector spreading together with pathgens
- New vectors- new pathogens
- EU- lack of control between “borders”
- To expect new pathogens and their spreading
- Activity is not seasonal
- Free raising animals

- Continous arthropod monitoring and control of vector populations remain essential for surveying and preventing VBD


Thank you for listening!