

Contacts between domestic cattle and African buffalo in the Great Limpopo Transfrontier Conservation Area: potential for disease spread.



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Context

General: Wildlife reservoirs of emerging/(re)emerging diseases

Growing evidence that wildlife plays a major role in the epidemiology of several (re)emerging or endemic diseases in livestock and human populations living at the periphery of conservation areas.

Africa: Buffalos as a reservoir of livestock diseases in Africa

In Southern Africa the African buffalo (*Syncerus cafer*) has long been demonstrated to play a role in the maintenance and spread of important diseases:

- Foot-and-Mouth disease
- Bovine tuberculosis
- Corridor disease
- Brucellosis...

Management has mainly concentrated on the confinement of free-ranging buffaloes inside protected areas, associated with surveillance and/or vaccination of livestock populations at the periphery. Despite these measures, buffaloes and other wildlife species have repeatedly spread pathogens across boundaries of conservation areas during the past decade.

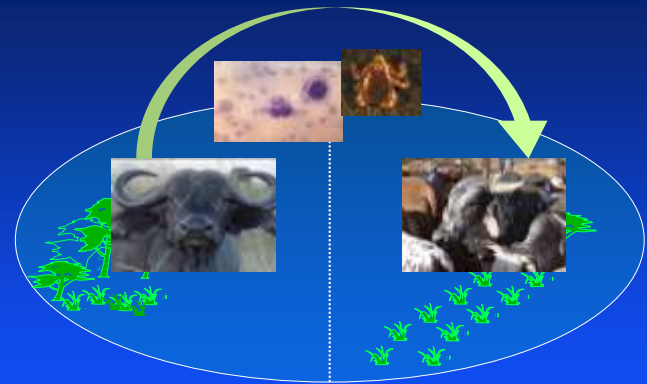
Context

Lack of information on contacts between wildlife and livestock



Context

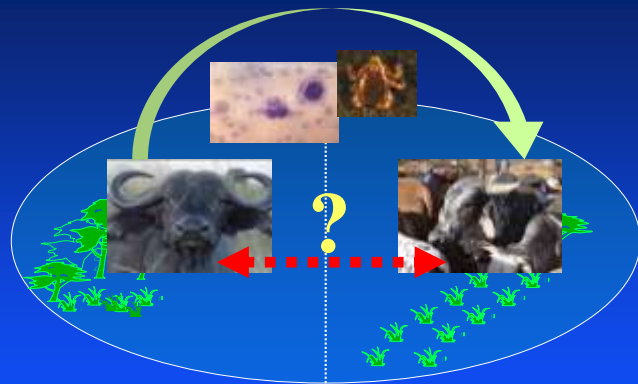
Lack of information on contacts between wildlife and livestock



Growing indirect evidence (molecular epidemiology) of pathogen transfer between wild and domestic hosts via various transmission modes (direct contact/aerosol, vectors, ...)

Context

Lack of information on contacts between wildlife and livestock



Growing indirect evidence (molecular epidemiology) of pathogen transfer between wild and domestic hosts via various transmission modes (direct contact/aerosol, vectors, ...)

Little information on wildlife-livestock contacts (frequency, intensity, where, when... ?)

Material and Methods

Radiotracking sympatric buffalos and cattle

3 studies sites

Different wildlife-livestock interfaces:

- South-East lowveld : Mabalauta/Malipati CL

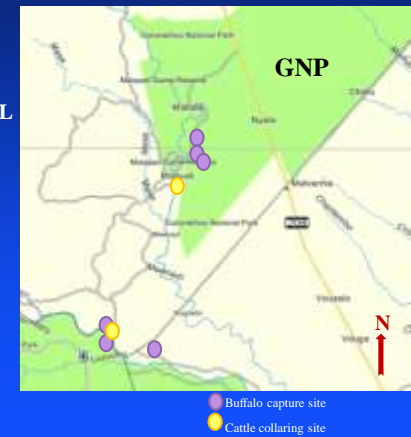
(October 2008-November 2009)

- Crooks' corner: KNP-LNP-SC/Pesvi CL

(phase 1 July 2010)

Hwange NP: Main Camp/Dete CL

(Feb 2010)



Material and Methods

Radiotracking sympatric buffalos and cattle

12 herds cattle (120 individuals)

1 adult cow/herd equipped with GPS collar

1 GPS position/1 hour



Material and Methods

Radiotracking sympatric buffalos and cattle

4 herds (38 individuals sampled)

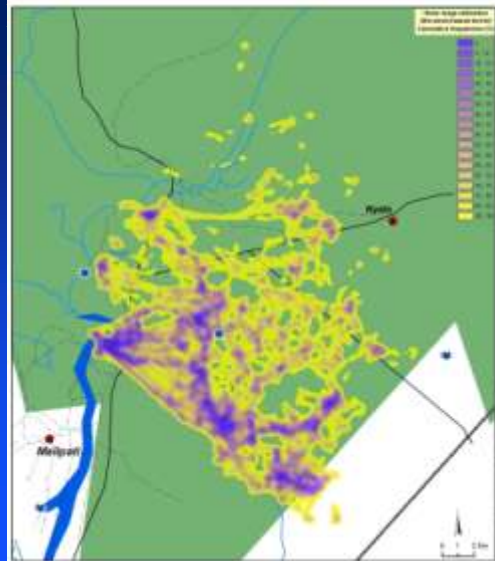
12 adult females equipped with GPS collar





Results

Buffalos



Spatial distribution

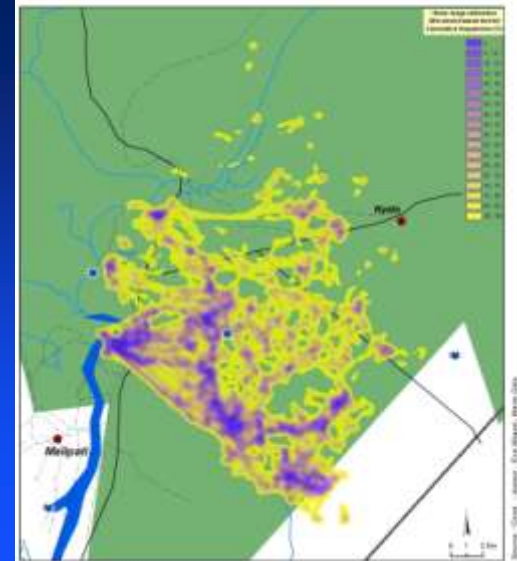
Buffalo AU089

- Cities
- Water holes
- River
- Watercourse
- Roads
- Dust roads
- Gonarezhou national park

Results

Buffalos

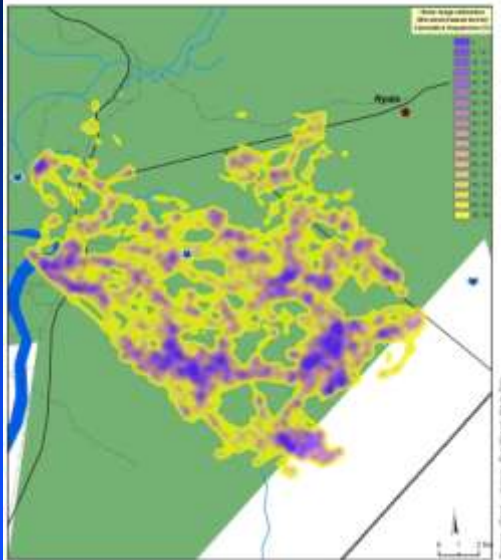
2 herds



Results

Buffalos

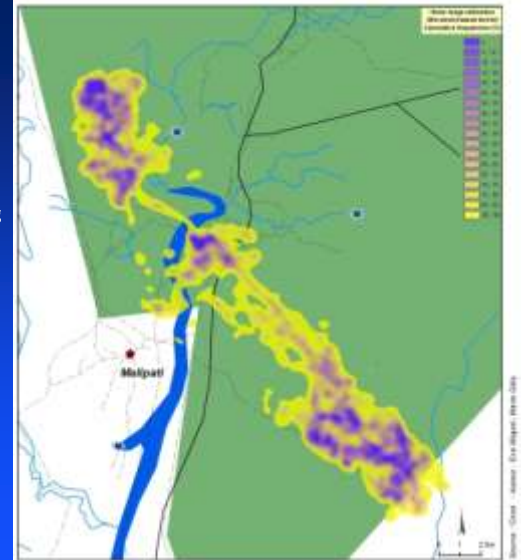
- 2 herds
- home range structured according to water availability (grazing)



Results

Buffalos

- 2 herds
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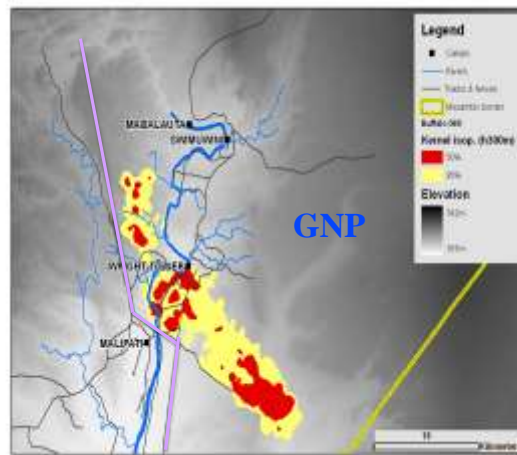


Results

Buffalos

- 2 herds
- home range structured according to water availability (grazing)
- little overlap between herds

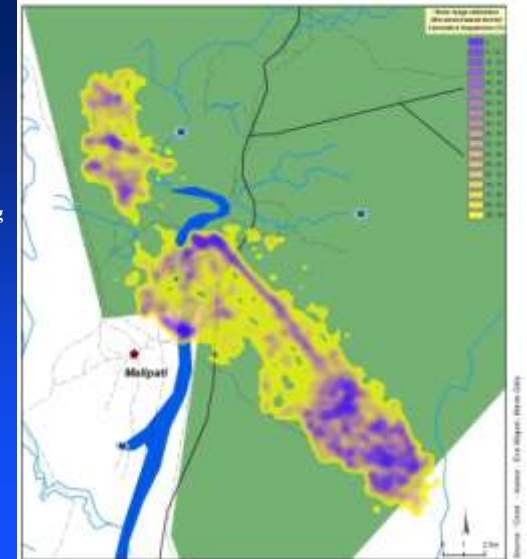
Kernel density map



Results

Buffalos

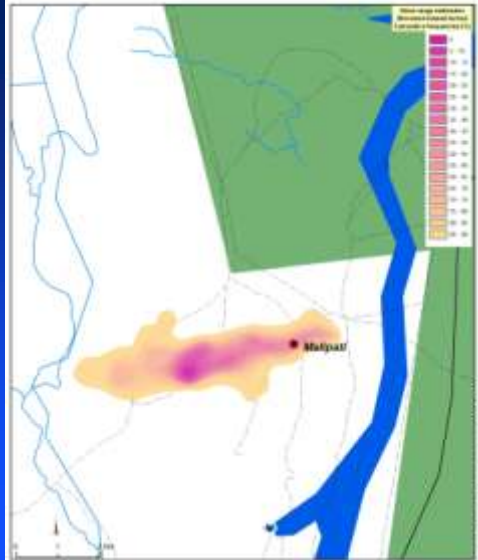
- 2 herds
- home range structured according to water availability (grazing)
- little overlap between herds
- rare excursions outside NP



Results

Cattle

- 11 herds

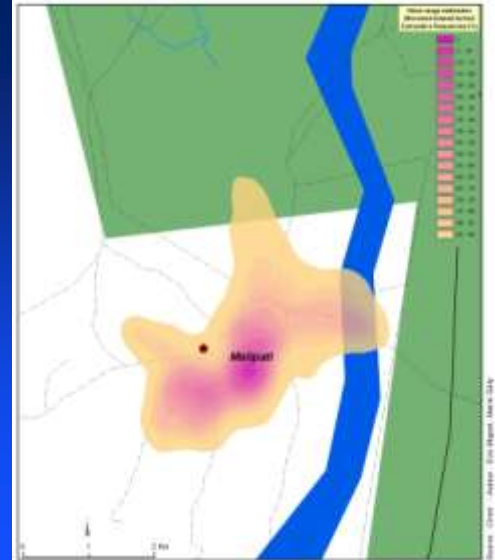


Results

Cattle

- 11 herds

- home range structured according
to water availability /grazing



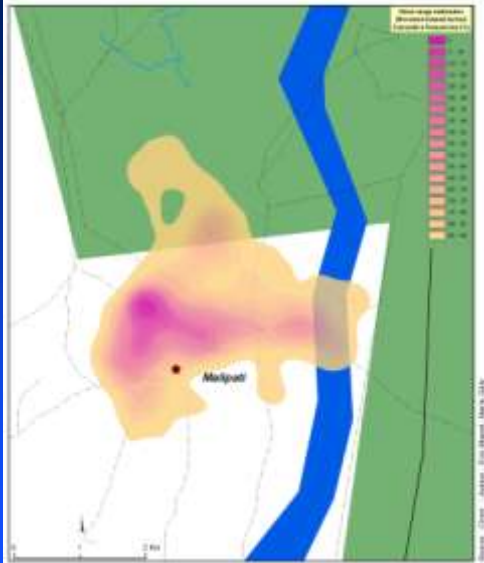
Results

Cattle

- 11 herds

- home range structured according to water availability /grazing

- Seasonal incursions inside GNP: field crops/grazing



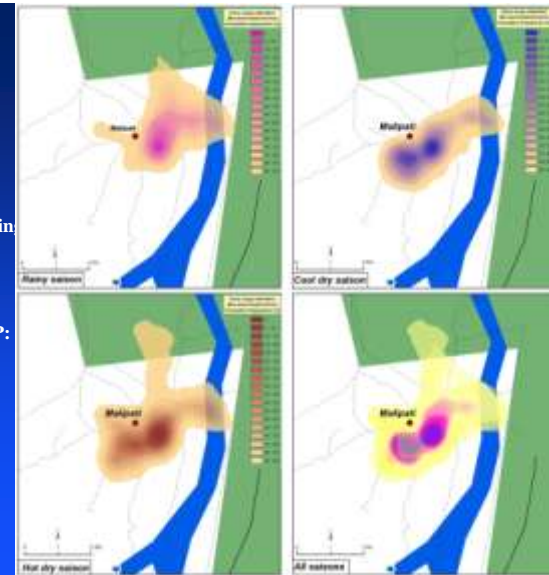
Results

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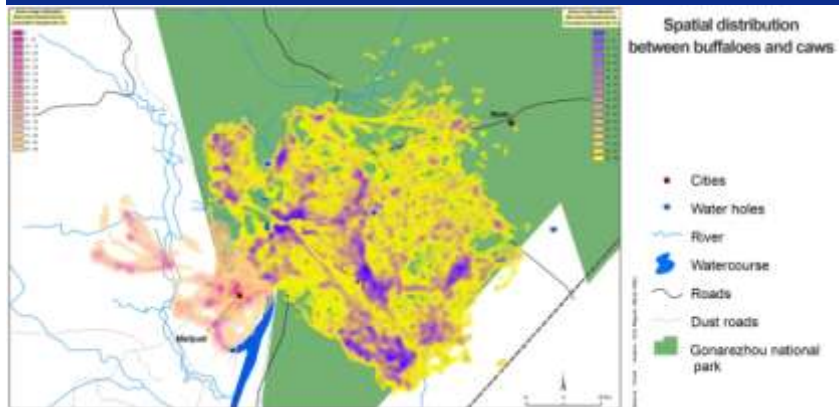
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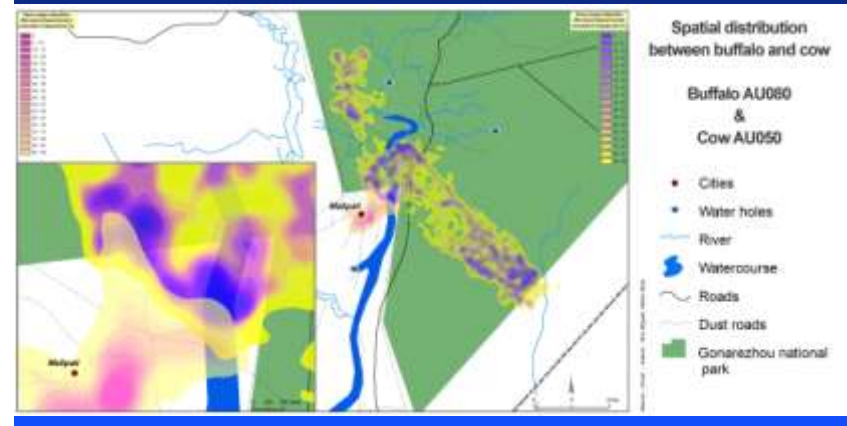
Results

Home range overlap



Results

Home range overlap



Results

Defining contacts

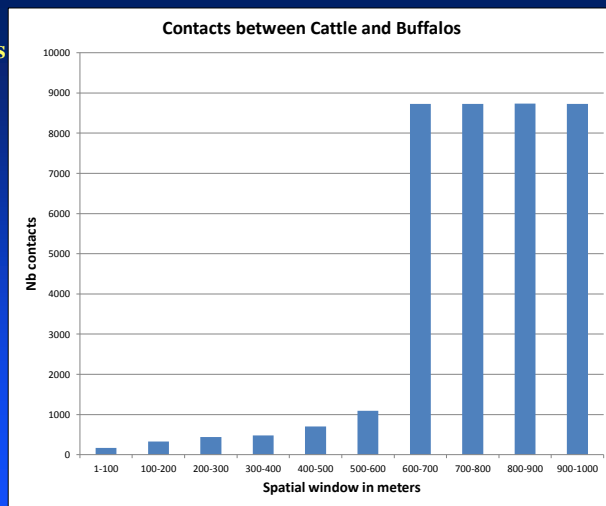
Spatial window

Error GPS position

Herd spread

→ 0-600 m between
cattle and buffalo

($r = 300$ m)



Results

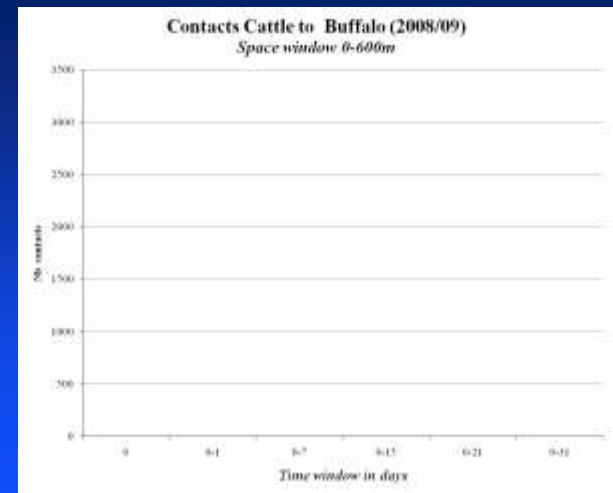
Defining contacts

Time window

Direct contact [T0]

Indirect contact

[T0 - T0+t]



Results

Defining contacts

Time window

Direct contact [T0]

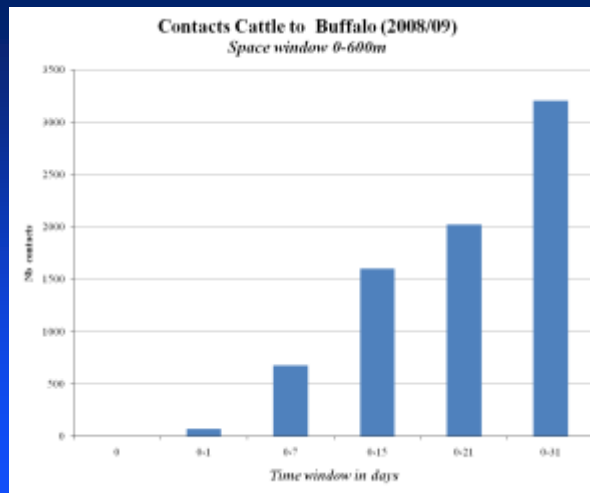
Indirect contact

[T0 - T0+t]

No direct contacts

Few contacts < 24h
(abortion products)

>3000 contacts after
1 month (BTB, ticks)



Results

Network analysis

Matrix of cattle to buffalo contacts

0-600m/0-1 month

No direct contacts



Results

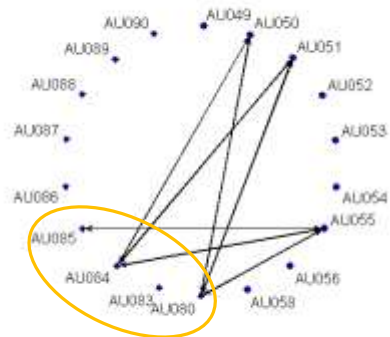
Network analysis

Matrix of cattle to buffalo contacts (0-600m/0-1 month)

No direct contacts

Few contacts < 24h

(AU50/51/55; Buff Southern herd)



Results

Network analysis

Matrix of cattle to buffalo contacts (0-600m/0-1 month)

No direct contacts

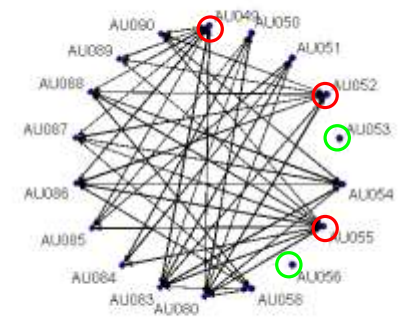
Few contacts < 24h

(AU50/51/55; Buff Southern herd)

Many contacts < 1 week

(Cattle at risk: AU49/52/54/55)

No contact AU 53/56)



Results

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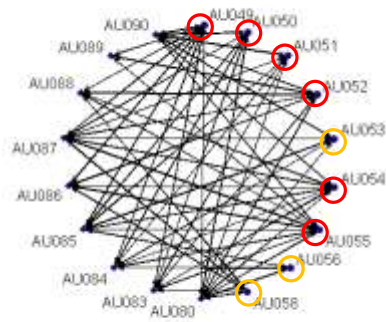
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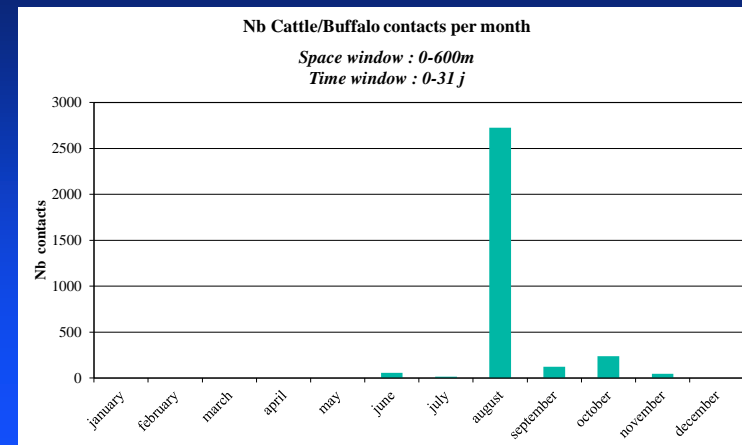
No contact AU 53/56)

After 1 month: all cattle have had indirect contact with > 3 buffalos



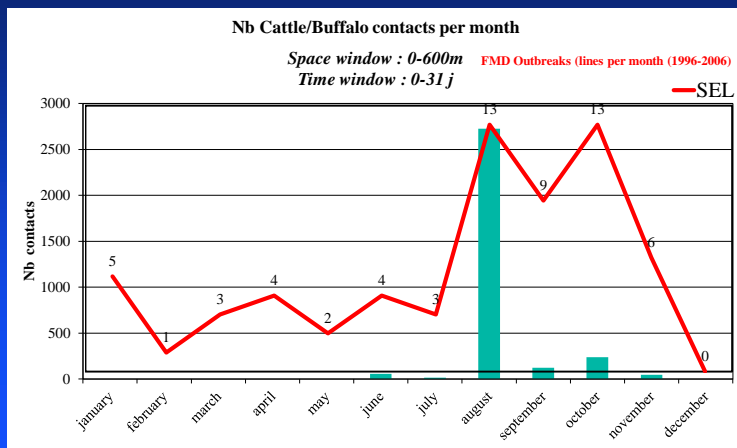
Results

Seasonal variations of cattle/buffalo contacts



Results

Seasonal variations of cattle/buffalo contacts



Preliminary conclusions

Direct contacts between cattle and buffalos seem to be very rare

Most contacts involve few individual cattle

Contact are restricted in space (limited area) and time (seasonal trend)

Contacts occur mostly inside the protected area, but some also occur outside

With a time window of > 1 month, all cattle have had indirect contacts with buffalos



Way forward

Further analysis

Ecological determinants of movements of buffalo and cattle (vegetation, water)

Sociological analysis of livestock owners' strategies (grazing, herding, ...)

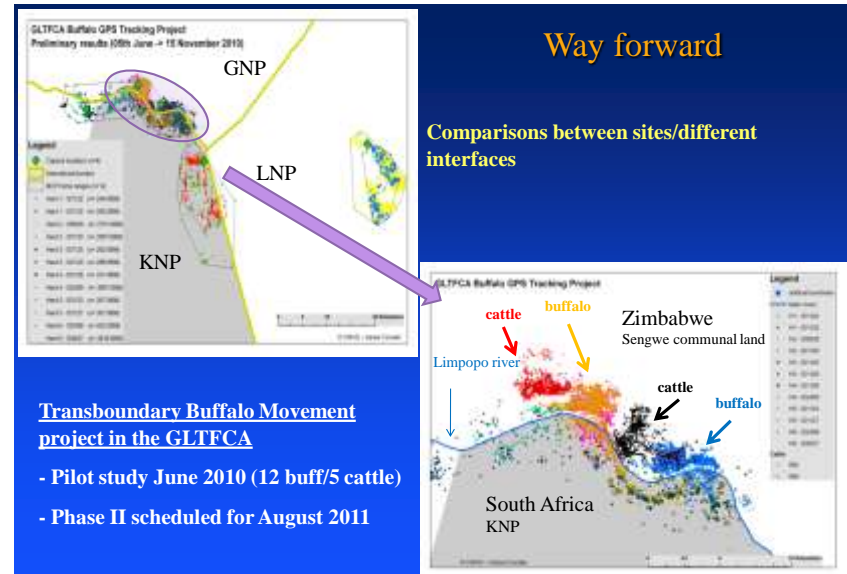
Network analysis: Cattle → Buffalo ; Buffalo → Cattle ; Cattle ↔ Cattle...

Modelling of spread (simulations according to disease transmission)

Comparisons between sites/different interfaces

Hwange/Dete communal land (13 buffalos/9 cattle):

distribution of water → movements/contact patterns



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Merci/Thank you
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