Investigating zoonotic diseases at the wildlife livestock interface in the Okavango Delta and Chobe National Park.

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11th AHEAD-GLTFCA Working Group Meeting
2nd to 4th March, 2011, Mopani Camp, Kruger National Park

Introduction

- Protected wildlife areas from Northern Botswana are well known hot spots for conservation and tourism development in Southern Africa and are part of the KAZA TFCA since 2009.
- The progressive development of TFCAs allows increased
  - interactions between distinct ecological habitats.
  - opportunities for pathogens to meet new and diverse host populations
  - Scenarios for the emergence or re-emergence of zoonotic diseases at the wildlife/livestock/human interface (WLHI).

Introduction

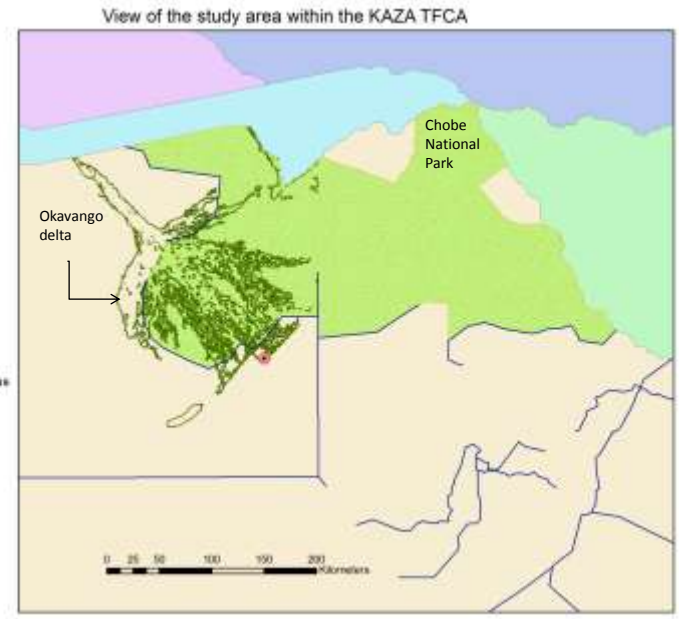
- Bacterial zoonoses like BTB, Brucellosis have been reported in several protected areas in Southern Africa (GLTFCA, Hluhluwe-iMfolozi, Kafue Basin,..)
- In addition, Rift Valley Fever (RVF) is re-emerging in Southern Africa and the role of wildlife as a reservoir of this disease hasn't been sufficiently studied.
- Very limited information on the presence or absence of these pathogens exists in the WLHI from protected areas in Northern Botswana.

General Goal

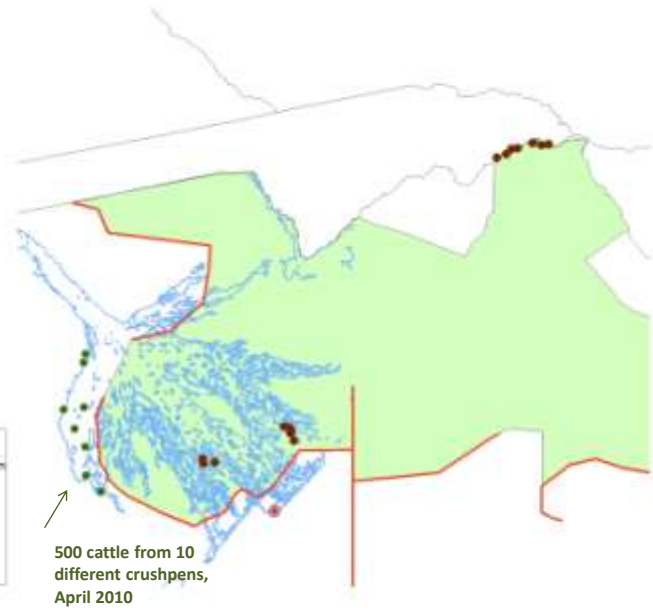
- To generate baseline data on the presence or circulation of selected zoonotic disease such as
  - BTB
  - Brucellosis (*Brucella abortus*)
  - RVF virus

  at the WLI of the Chobe National Park and the Okavango Delta.
- Identify potential risks for human communities in that interface.
- Identify potential epidemiological roles for wildlife (buffalo) concerning those diseases.
  - Potential reservoirs
  - Spread to other areas and species

Study area

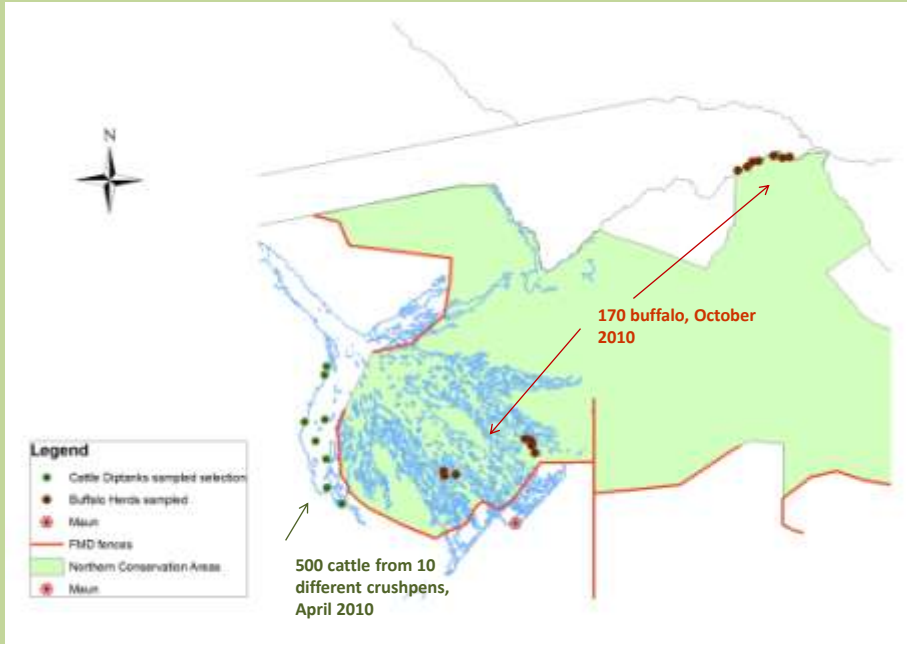


Sampling locations



500 cattle from 10 different crushpens, April 2010

Sampling locations



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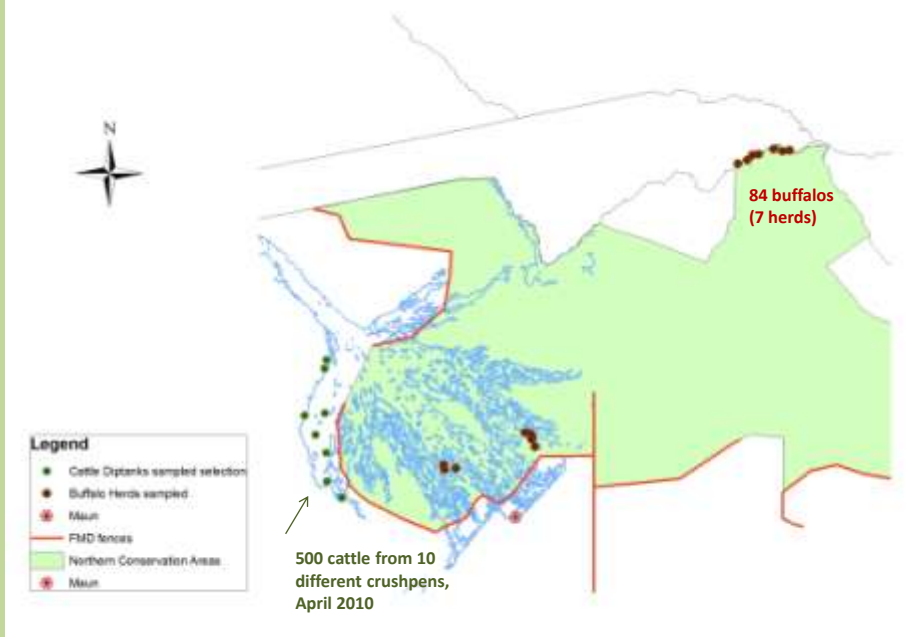

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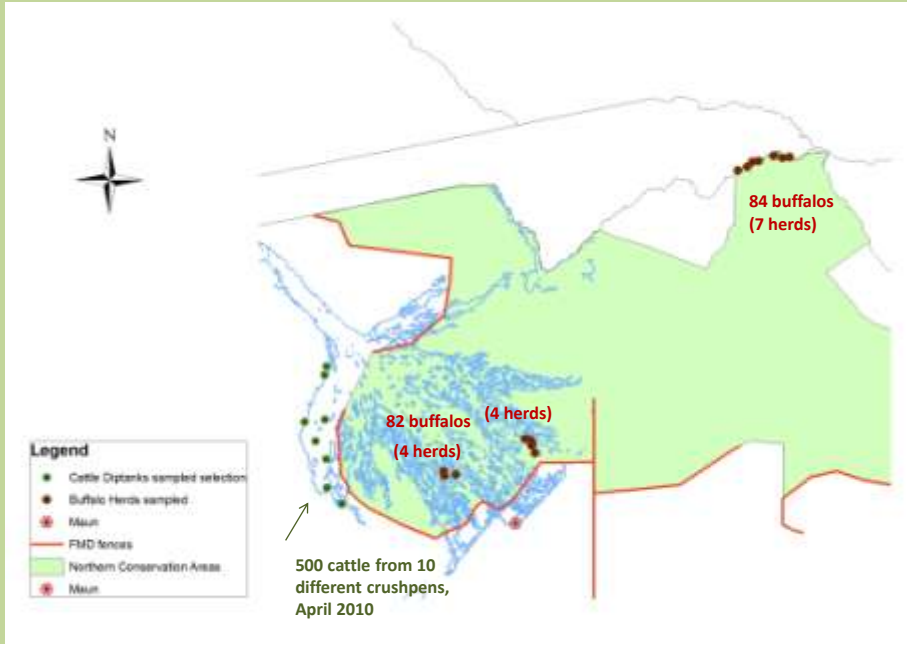


Capture procedure

Searching and spotting

Capture procedure

Helicopter herding and darting

Capture procedure

Ground teams approaching herd

Capture procedure

Sampling at a rate of 15-20 buffalo per day.

More information available in You Tube

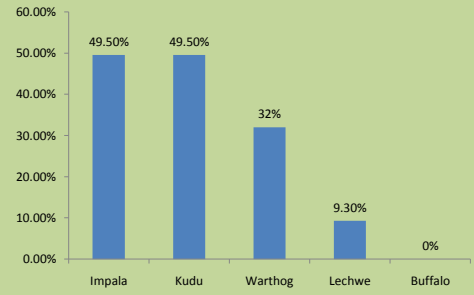
Details of the buffalo samples October 2010

Location	Herd ID	Sample size	Size of the herd	Type of herd
Kabulebule	CH1	14	250	Mixed
Kabulebule	CH2	11	Megaherd*	Mixed
Ihaha	CH3	7	40	Mixed
Serondela	CH4	21	300	Mixed
Simwanza	CH5	8	30	Mixed
Simwanza	CH6	6	25	Bachelor
Ngoma	CH7	22	Megaherd*	Mixed
Moremi	NH1	10	150	Mixed
Moremi	NH2	2	5	Bachelor
Moremi	NH3	17	Megaherd*	Mixed
Moremi	NH4	11	50	Mixed
Khurunxaragha	NH5	10	250	Mixed
Khurunxaragha	NH6	13	350	Mixed
Khurunxaragha	NH7	7	150	Mixed
Khurunxaragha	NH8	10	150	Mixed

Details of the cattle samples

Median Herd size: 38 IQR [21;81]
Kraaling at night: 94.8%
Deworming: 15%
Origin of cattle: heritage 84.4%; outside 13.5%
Water sharing with wildlife: 77.3%

Reported contacts with wildlife in grazing area



Samples and analysis

Diseases	Cattle	Buffalo
Bovine Tuberculosis	500	131
Brucellosis (RBT, SAT, CFT)	500	167
Rift Valley Fever (IgM& IgG)	500	168

- Brucellosis :
  - Screening with Rose Bengal test
  - Positive animals re-tested with SAT and CFT
- Bovine Tuberculosis
  - Gamma interferon test
- RVF
  - Indirect ELISA to detect IgG and IgM, respectively.

Results: Brucellosis in buffalo

ID	RBT	SAT	CFT
NH1011	Positive	Negative	Negative
NH2002	Positive	Negative	Negative
NH3005	Positive	Negative	Negative
NH3009	Positive	Positive	Positive
NH4002	Positive	Positive	Positive
NH4006	Positive	Positive	Negative
NH4007	Positive	Positive	Positive
NH5003	Negative	Negative	Positive
NH5004	Positive	Positive	Positive
NH6003	Positive	Positive	Negative
NH6007	Positive	Positive	Negative
NH8005	Positive	Negative	Positive
CH1006	Positive	Positive	Negative
CH1009	Positive	Positive	Negative
CH5003	Positive	Positive	Positive
CH7010	Positive	Positive	Negative
CH7013	Positive	Negative	Negative

Late infection (IgG)

Early infection (IgM)

No infection

Prevalence: 8% (13/167)

95% CI [4.3-13.3]

Apparent prevalence in buffalo and cattle (Percentage and 95% CI)

Disease	Cattle Ngamiland	Buffalo Ngamiland	Buffalo Both areas
Brucellosis	2/500 1.4% [0.2-5.0]	9/80 11.3% [5.6-21.3]	13/167 8% [4.3-13.3]

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Brucellosis	2/500 1.4% [0.2-5.0]	9/80 11.3% [5.6-21.3]	13/167 8% [4.3-13.3]
Bovine Tuberculosis	3/449 0.7% [0.2 -2.1]	2/73 2.7% [0.3- 9.5]	2/135 1.4% [0.2- 5.2]

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Bovine Tuberculosis	3/449 0.7% [0.2 -2.1]	2/73 2.7% [0.3- 9.5]	2/135 1.4% [0.2- 5.2]
RVF (IgM)	10/500 2% [0.9 - 10.5]	0/80	0/179
RVF (IgG)	78/500 17.5% [14.3-21.2]	5/80 6.3% [2.2-14.3]	32/172 18.6% [13.1-25.2]

Comparison of buffalo prevalence in both study areas

Disease	Chobe	Ngamiland	P value *
Brucellosis	5.3% (5/94)	11.3% (9/80)	0,19
Bovine tuberculosis	0 (0/62)	2.7% (2/73)	0,19
RVF	24.5% (23/94)	6.3% (5/80)	0,001

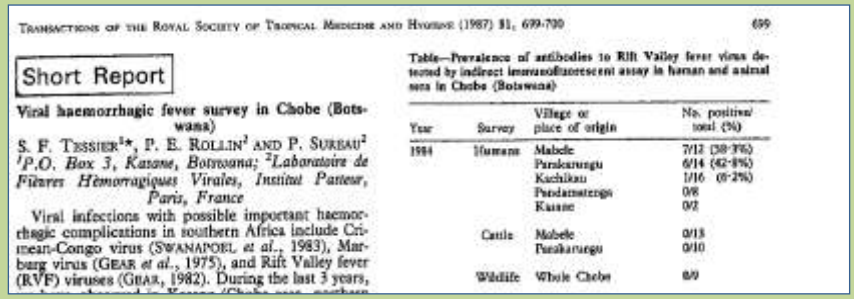
* T test for inequality of population means

Brucellosis

- To our knowledge, first report of Brucellosis in buffalo in Botswana.
- Prevalence detected in buffalo is within the range of those observed in other protected areas.
  - KAZA: Caprivi Strip: 10% (Du Preez & Naidoo, 2008)
- These findings suggest a possible spillover from infected livestock in the past and possible sustainable infection within the buffalo population
- Livestock seroprevalence very low (1.4%) suggests
  - Previous vaccination campaigns have probably been efficient
  - Our sampled livestock has not been recently vaccinated

RVF in northern Botswana

- Antibody activity and human clinical cases in Chobe (Tessier et al., 1987).



TRANSACTIONS OF THE ROYAL SOCIETY OF TROPICAL MEDICINE AND HYGIENE (1987) 81, 699-700 699

Short Report

Viral haemorrhagic fever survey in Chobe (Botswana)

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Viral infections with possible important haemorrhagic complications in southern Africa include Crimean-Congo virus (SWANAPOEL *et al.*, 1983), Marburg virus (GEAR *et al.*, 1975), and Rift Valley fever (RVF) viruses (GEAR, 1982). During the last 3 years,

Table—Prevalence of antibodies to Rift Valley fever virus detected by indirect immunofluorescent assay in human and animal sera in Chobe (Botswana)

Year	Survey	Village or place of origin	No. positive/ total (%)
1984	Humans	Mabele	7/12 (58·3%)
		Parakarungu	6/14 (42·8%)
		Kachikau	1/16 (6·2%)
		Pandamatenga	0/8
		Kasane	0/2
	Cattle	Mabele	0/13
		Parakarungu	0/10
	Wildlife	Whole Chobe	0/9

- First report in cattle and wildlife in both areas.
- No clinical symptoms detected in cattle despite high levels of IgG and 2% presented IgM antibodies.

RVF in northern Botswana

- Buffalo prevalence shows similar values than in other areas: Overall 18.6%
  - Kenya : 15.6% (Evans et al, 2008)
  - Pafuri area, KNP: 11% (CIRAD, unpublished)
- The study areas provides abundant surfaces of ideal habitat for proliferation of mosquito populations.
- Significantly higher buffalo prevalence in Chobe than in Ngamiland: Possibly, better habitat for mosquito proliferation.
- Ngamiland, prevalence much lower in buffalo than in cattle.
- Further studies are being undertaken to understand the cycle of RVF in both areas
  - Capture and virological monitoring of vectors
  - Serological monitoring in cattle

Bovine Tuberculosis

- The apparent prevalence of BTB reactors among cattle and buffaloes was below 1.5%.
- Considering Sp of IFNg assay below 98.5%(Michel et al., 2011), one could consider that this falls within the range of expected false positive reactors.
- However, very low infection rates cannot be ruled out.
  - Positive animals showed high reactivity
  - Similar prevalence levels were found in BTB surveys in buffaloes in the northern Kruger National Park (Grobler et al., 2002).
- A final conclusion is not possible since the true infection status of the reactor animals could not be confirmed by post-mortem examination nor isolation of *M. bovis.*

Conclusion

- This study has provided preliminary baseline data on the circulation of the selected zoonotic diseases in two of the most representative wildlife areas of Botswana and the KAZA TFCA.
- Considering the re-emergence of RVF in Southern Africa, additional investigations are under way in order to identify the circulating strains and the possible links with recent outbreaks (RSA 2010, Namibia 2010, Botswana 2010)
- The detection of immune reactivity to BTB in a tiny proportion of the cattle and buffaloes tested suggests that *M. bovis could be* circulating in the WLIH in the studied areas, it could have important implications for the health of wildlife, livestock and humans
- Further surveys will be necessary in the area in order to confirm this hypothesis.
  - Additional cattle sampling in Chobe
  - Implementation of increased abattoir surveillance
  - Additional buffalo surveys
  - Positive reactors to *M. bovis* will be carefully investigated


Acknowledgements
FAO Empress Wildlife Unit
FAO ECTAD
Kalahari Game Services
Department of Wildlife and National Parks
National Veterinary Services in Kasane and Maun.
Ministry of Agriculture
Botswana National Veterinary Laboratory
Botswana Vaccine Institute


Thank you for
your attention !