

Health and demographics of African buffalo (*Syncerus caffer*) in Ruaha National Park, Tanzania



IUCN 2nd African buffalo Symposium

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Collaborators and funding



Ruaha NP

- Epaphras Alex Muse
- Daniel Mathayo
- Paul Banga

HALI project & UC Davis

- Deana Clifford
- Woutrina Smith
- Jonna Mazet

HALI project & Sokoine University of Agriculture

- Goodluck Paul
- Rudovick Kazwala
- Donald Mpanduji

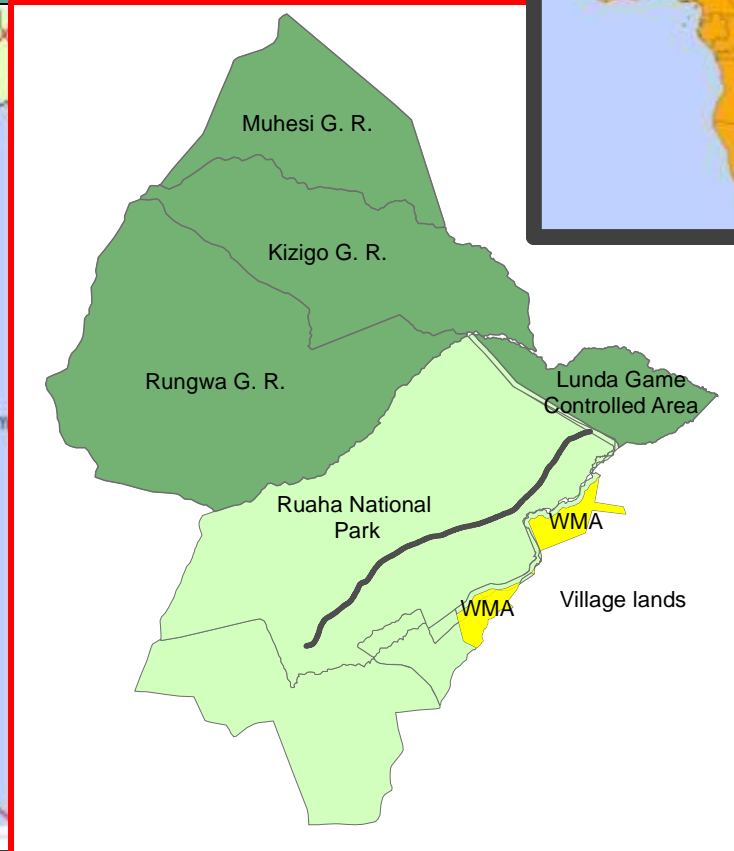
Funding

- Safari Club International Foundation
- Conservation foundation, Vermont
- UC Davis Wildlife Health Center
- National Institutes of Health

Overview

- **Study area**
- **Ruaha buffalo study**
 - **Background and preliminary data**
 - **Population data**
 - **Demographics**
 - **Health and movement**

Study area



Regional problems

- Drying of Great Ruaha River
- Increased sharing of resources
- Bovine tb and brucellosis in cattle
- Wildlife – human conflict
- Poaching
- Decline of African buffalo?



P. Coppolillo

Pre 1993 – year round flow



D. Clifford

2005 – 119 days of no flow



J. Brownlee

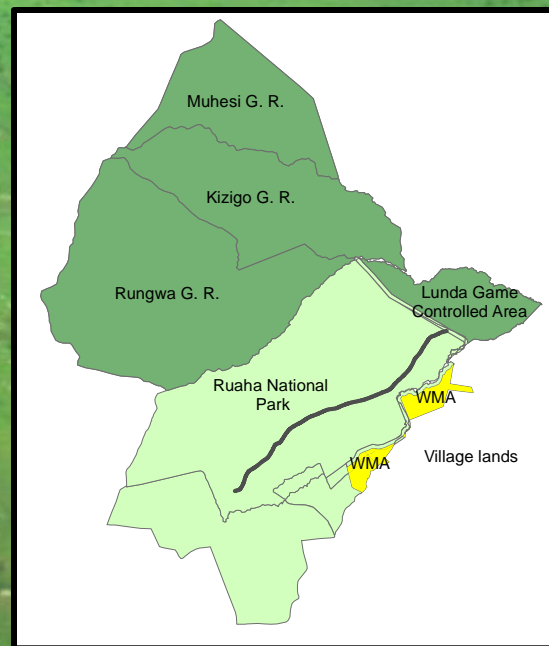
Decline of buffaloes in Ruaha NP?

- **Safari operators, park personnel:**
 - Observe fewer buffalo
 - Buffalo “disappear” in the rainy season
- **Wildlife Conservation Society:**
 - Population survey in 2004
 - Possible range contraction



Main questions

- Population numbers compared to 2004?
- Demographics?
- Disease?
- Movements outside the park?
- Seasonal movements?



Preliminary disease data, 2006 - 2010

2006 – 2010: HALI project

- Postmortem sampling of wildlife outside the park
- *M. bovis* detected in 8 wildlife species including buffalo (Clifford et al., 2013)
- Prior to 2011, no health data on buffaloes inside the park



Study components

- **2011 - Collaboration with a FMD study to test one herd within the park for bTB**
- **2013 - Aerial population survey**
- **2011-2016 – Demographic surveys**
- **2014-2017- Satellite collar, movement, and health study**



2011 – Collaboration with FMD project

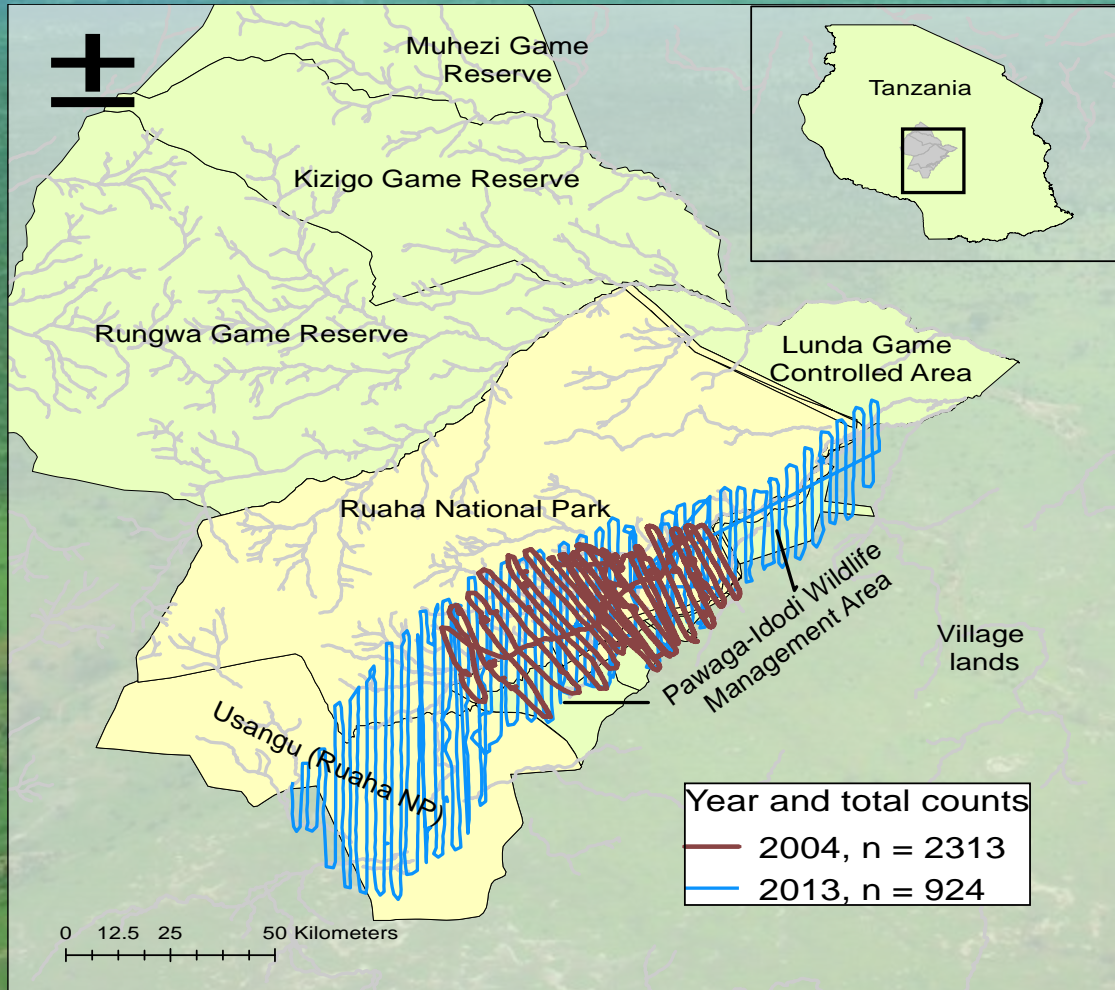
Tested 30 buffaloes from one herd for:

- Bovine tb using Y-IFN test - 10% (3/30) positive
 - First confirmation of bTB in buffaloes within Ruaha NP
- *Brucella* using Rose Bengal test - 10% (2/19) seropositive
- Good body conditions, low parasite loads



Population numbers?

2013: Aerial total count by TANAPA, TAWIRI, & HALI project



2004: n = 2313
2013: n = 924
Since 2013: Stable



Demographics, BCS, and parasites?

- September 2011, 2013, 2014, 2015, and 2016
- Demographic surveys (Age & sex), BCS (1-5)
- Herd level GI parasites (McMaster, culture)

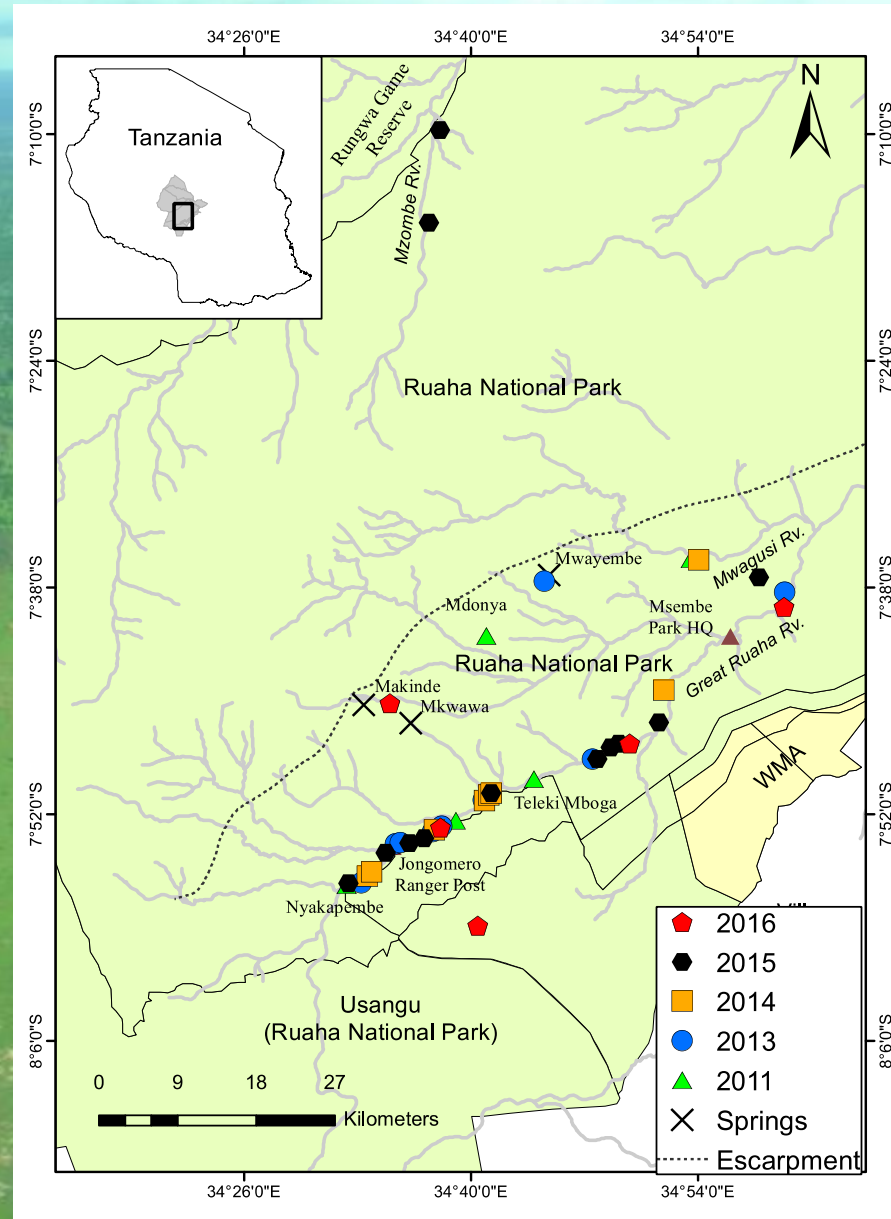


2011, 2013 - 15, Demographics, BCS, parasites

Parameter	2011	2013	2014	2015	Literature*
Number of herds \geq 20 animals observed and evaluated	4	6	2	6	-
Approx. herd sizes of herds \geq 20 animals	40 - 350	20 - 400	300-500	20 - 700	-
Adults, % of herd	66 - 93	73 - 95	66 - 80	62 - 91	47 - 71
Subadults, % of herd	7 - 21	5 - 20	10 - 24	0 - 14	20 - 25
Calves, % of herd	0 - 17	0 - 11	10	5 - 31	8-17
Adult females, % of herd	36 - 71	15 - 55	35 - 43	27 - 68	35-55
Adult males, % of herd	17 - 29	22 - 80	31 - 37	15 - 64	20-33
Median (range) of calves: 100 cows	31 (0 - 44)	16 (0 - 25)	15 - 22	24 (18 - 40)	21-49
Herd mean (range) BCS	2.9 (2.8 - 3.1)	2.9 (2.3 - 3.2)	3.2	3.1 (3.0 - 3.2)	2.5 - 3.2
Range of herd mean eggs/gram feces	83 - 140	28 - 113	88 - 150	-	-
Groups with $<$ 20 animals observed	1	2	3	3	-
Herds \geq 20 animals, insufficient data				3	-

*Caron et al., 2003, Mloszewski, 1998, Sinclair, 1977, Prins, 1996

Dry season locations of herds across years



2014 –Satellite Collar Study

Purpose:

- **Understanding**
 - Seasonal movements
 - Regional movements of herds
 - Home ranges
 - Habitat use
 - High risk interface areas, livestock/ poaching
 - Expand disease sampling to multiple herds



Capture and collaring, methods

- Immobilized from vehicle with Etorphine/ Azaperone/ Hyaluronidase
- Blood and fecal samples taken
- Satellite (Iridium GPS, AWT) collar placed
- Reversal with Diphrenorphine and Naltrexone



Preliminary laboratory work

- Heparinized plasma processed for gamma interferon test within 8 hours of capture
- Plasma incubated with PPD for 16-24 hours, then harvested, frozen, and later tested at Sokoine University of Agriculture (SUA)
- Samples saved for RVFV & Brucella testing at SUA
- Fecal samples and blood smears for parasite analysis



Ruaha NP Veterinary Lab

Animals and locations

- **Oct 2014 and 2015:** 12 adult females from 4 herds collared with satellite collars
- **Oct 2014 – Sept 16:** 5 GPS fixes a day
- **Sept 2016 – 17:** 2 GPS fixes a day
- Remote download



Preliminary Test Results

2014:

- 2/10 (20%) gamma-INF positive

2015:

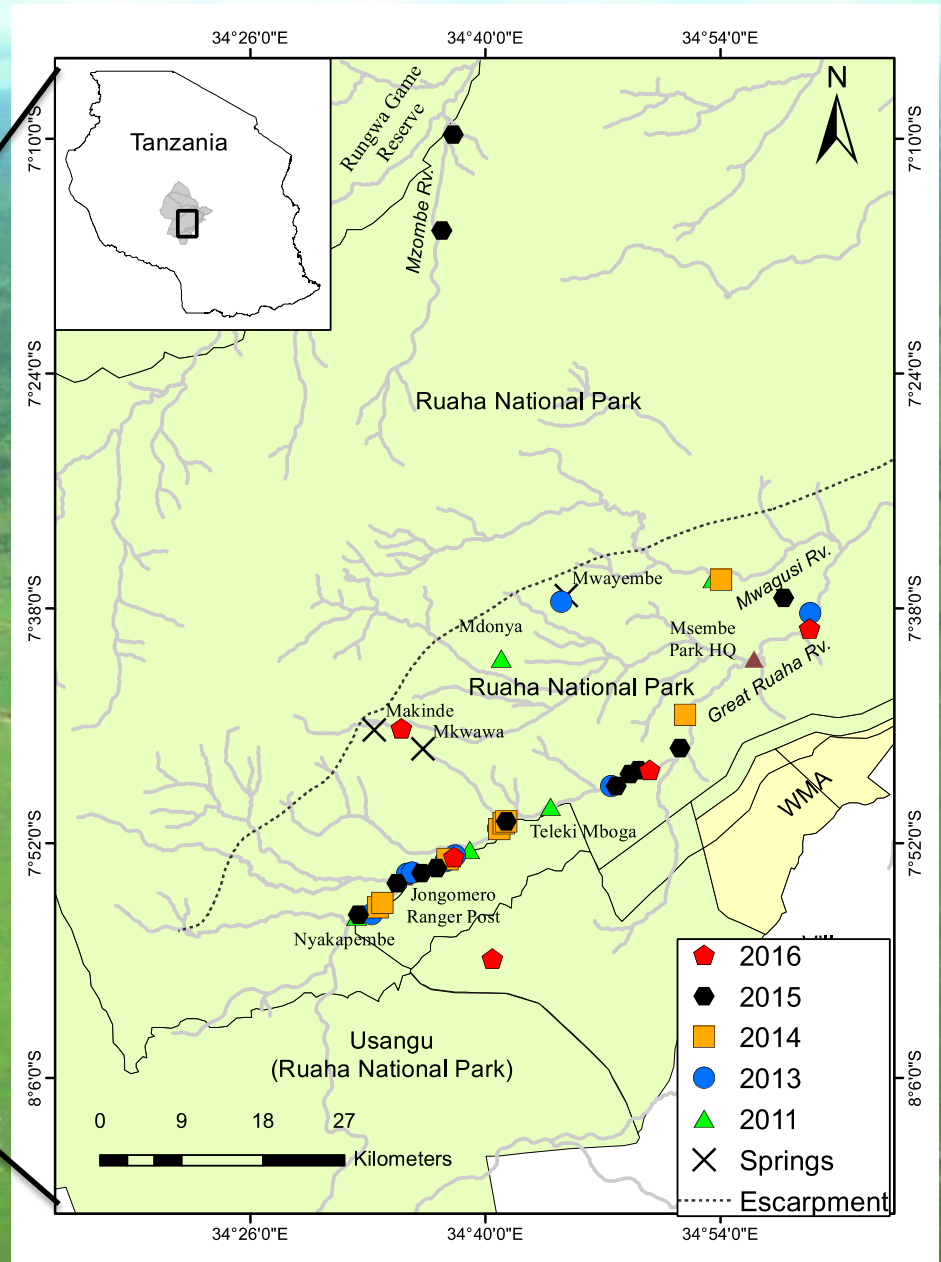
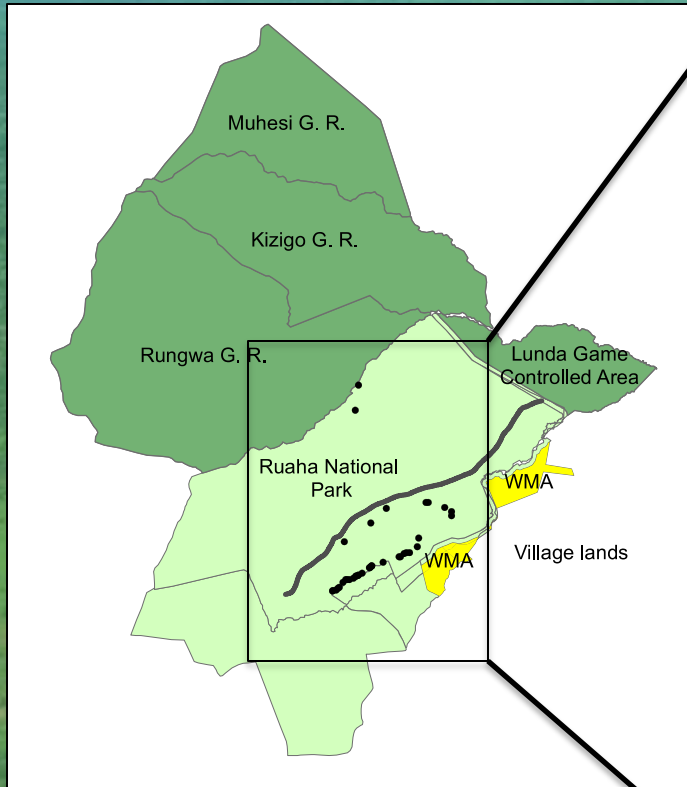
- 3/15 (20%) gamma-INF positive
- Positives come from 3 herds

2016: 9 animals sampled, results pending

- No hemoparasites on blood smears
- Low fecal parasite count
- Very few ectoparasites
- RVFV and *Brucella* testing pending
- No clinical signs of disease observed

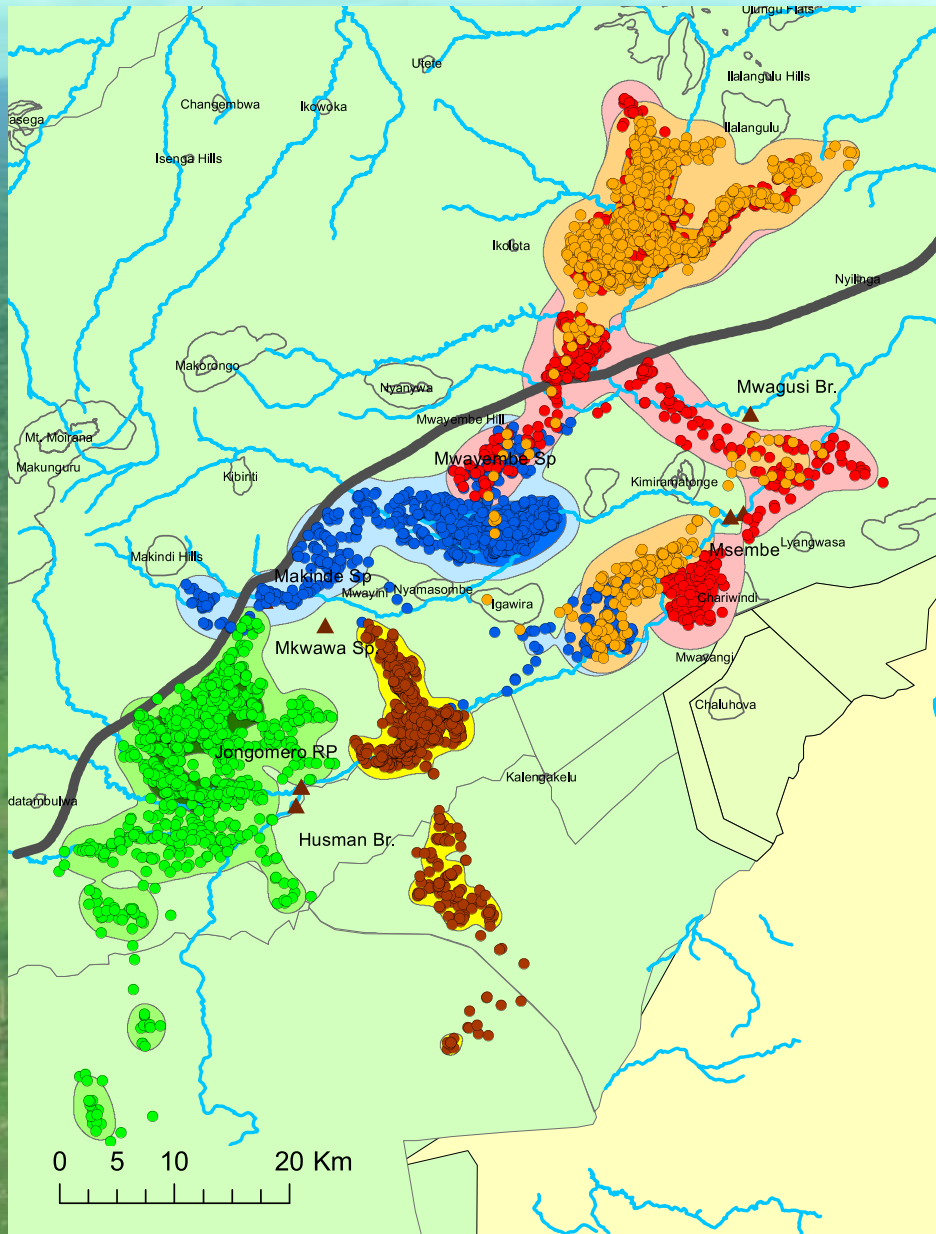


Buffalo movements



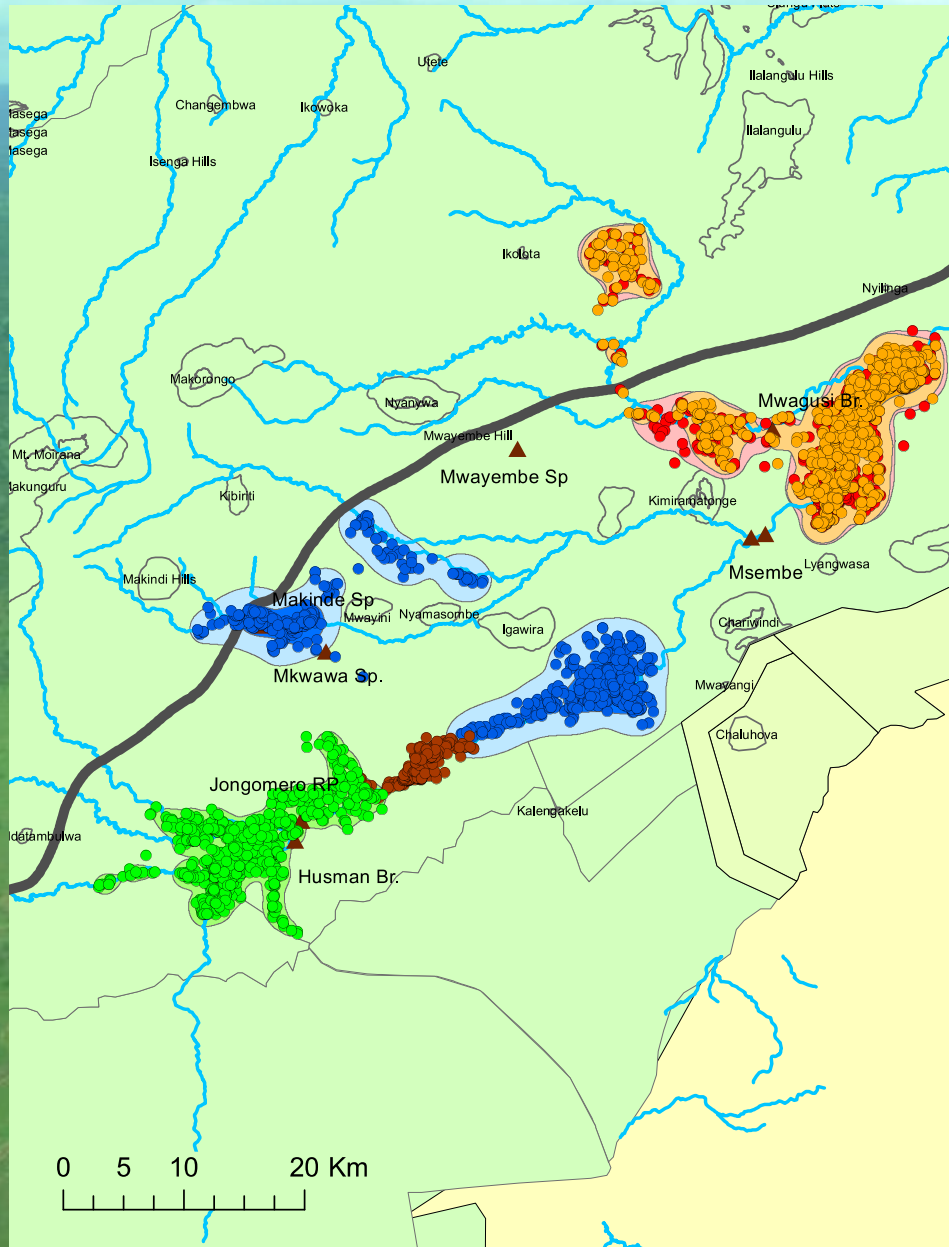
Buffalo movements Nov 14-May15

1st Wet season



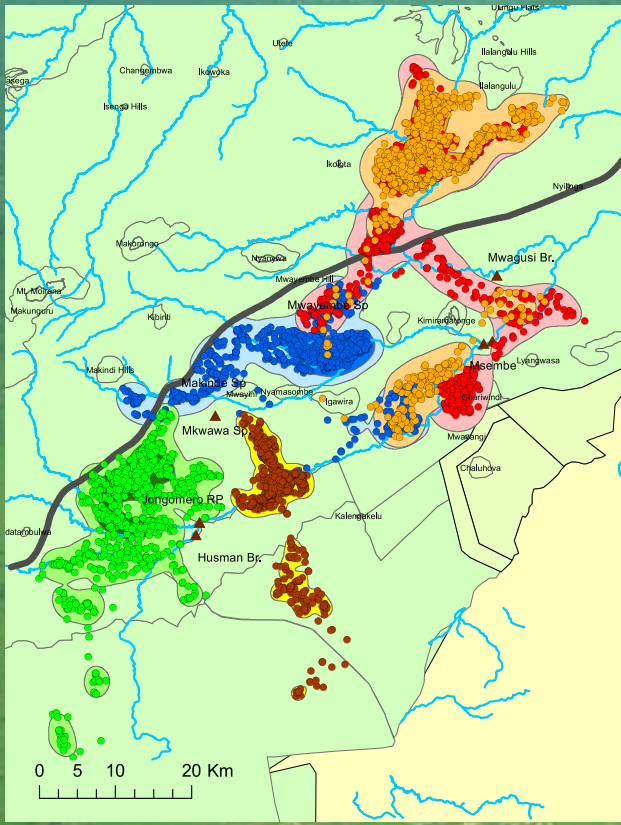
Buffalo movements Jun 15 – Oct 15

Dry season

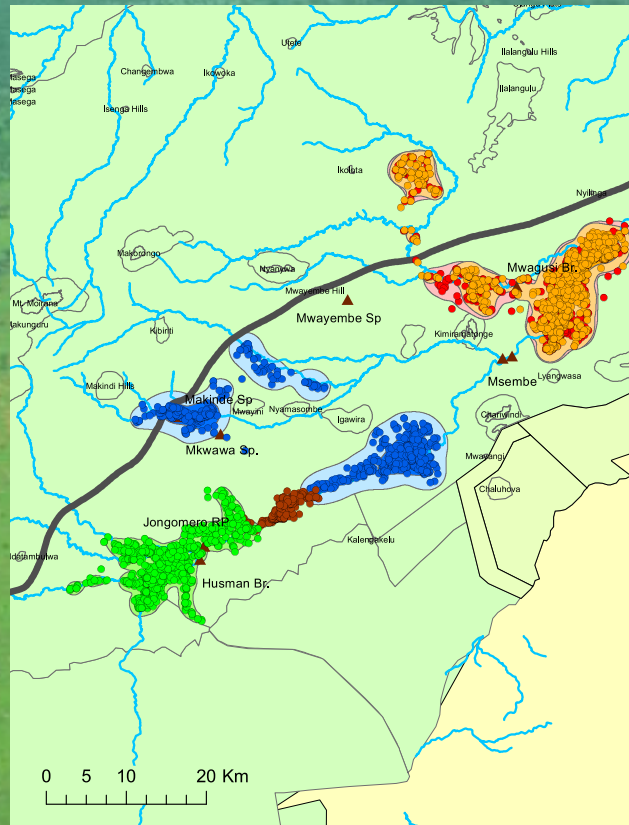


Buffalo movements by season

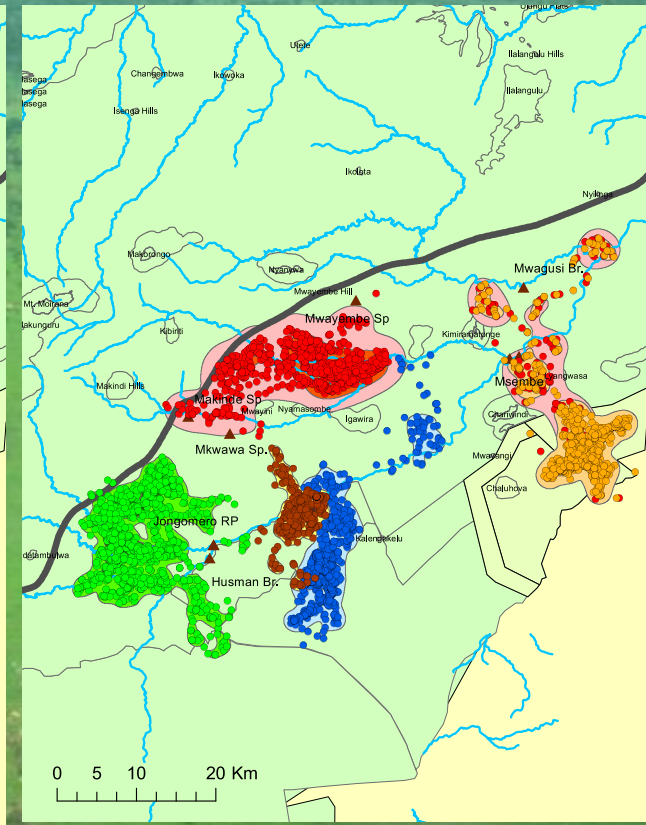
Nov 14-May15
1st Wet season



Jun 15-Oct15
Dry season



Nov 15-May16
2nd Wet season



General observations to date

Year 1	Year 2
Herds appear to occupy distinct areas	Two herds split and mixed
One herd left the valley in the wet season	All herds stayed in the valley
No herds left the park	One herd left the park
2/10 (20%) bTB prevalence	3/15 (20%) bTB prevalence
Low internal and external parasite loads	
Good body conditions (3-4/5)	
Cow-calf ratio comparable to stable herds in Eastern and Southern Africa	



Preliminary conclusions

- **The buffalo population may have declined due to drying of the Ruaha River**
- **Currently, the herds are in good health with normal recruitment**
- **Calf numbers appear to be correlated with rainfall**
- **TANAPA: Population numbers stable since 2013**
- **Herds are affected with bTB but clinical signs have not been observed**
- **When buffaloes “disappear”, they spend time in less accessible areas of the park or leave the valley**

Next steps

Year 3:

- **Third year wet season data**
- **Analysis of home ranges, habitat use, daily movements**
- **Complete health screening (goal: 35 animals total)**
- **Complete RVFV and Brucella testing**
- **6th annual demographic survey in Sept 2017**

Future goals:

- **Place 1-2 collars in all known herds**
 - **Tourism and anti-poaching, additional ecology data**
- **Health of carnivores?**
- **Carnivore – buffalo ecology and movement?**



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