Effects of divergent migratory strategies on access to resources for Cape buffalo (*Syncerus caffer caffer*)

Dr Emily Bennitt

Outline

- Introduction
- The Okavango Delta
- Hypotheses
- Methods
- Results
- Conclusions

Migration

- Seasonal movement between geographically distinct home ranges
- Costs and benefits
- Threatened by barriers
- Enforced residency
- Possible negative consequences on population and vegetation

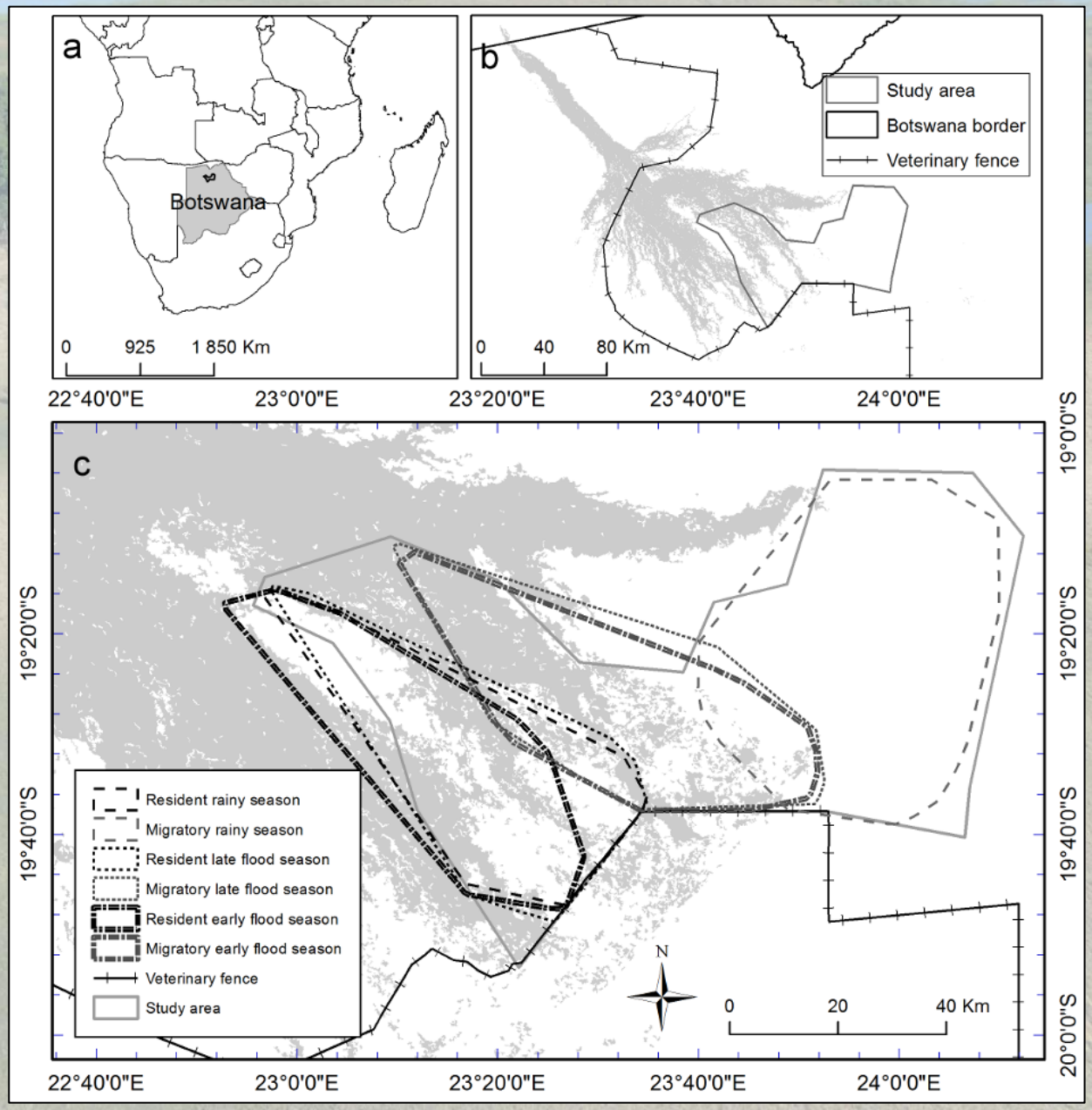
African buffalo

- Fusion-fission society
- Smaller herds and smaller home ranges in resource-poor areas
- Sexual segregation
- Breeding peak

The Okavango Delta

- Flood-pulsed ecosystem
- Two annual water influxes
- Water defines seasons
  - Flood rising: Apr – Jul
  - Flood receding: Aug – Nov
  - Rainy: Dec – Mar
- Central vs peripheral delta nutrient levels

Study site location

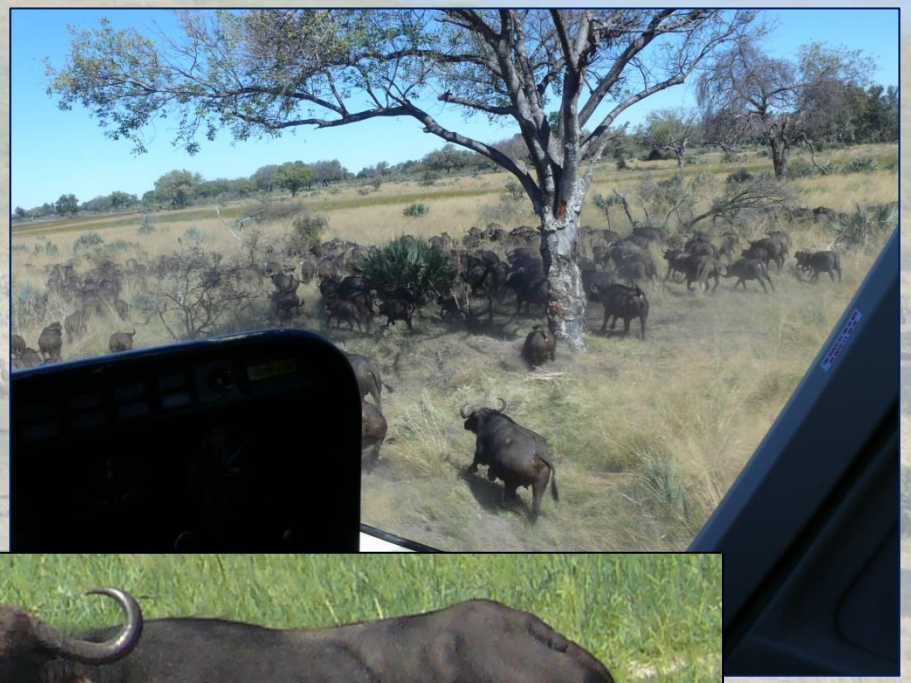


Hypotheses

- Residents have access to less productive forage than migrants
- Residents occupy smaller home ranges and live in smaller herds than migrants
- Reproductive productivity is lower in resident herds
- Residents have poorer body condition than migrants

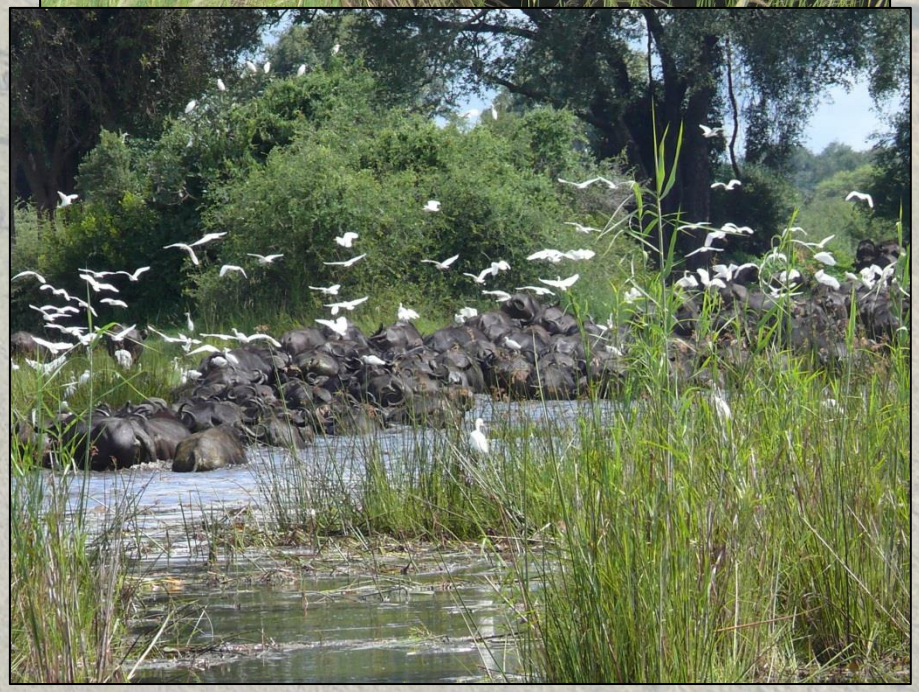
Collaring

- Darted from helicopter and vehicle
- 15 cows collared over 2 years (2008-10)
- 7 residents, 8 migrants
- 3 – 16 months
- GPS-enabled satellite collars (Followit, Sweden)
- Recorded hourly GPS fixes



Grazing site identification

- Distance and turning angle
- Clusters for behaviour
- Habitat map, 88.1% accuracy
- Grazing sites in each of 3 – 4 seasonal habitat types
- Access problems

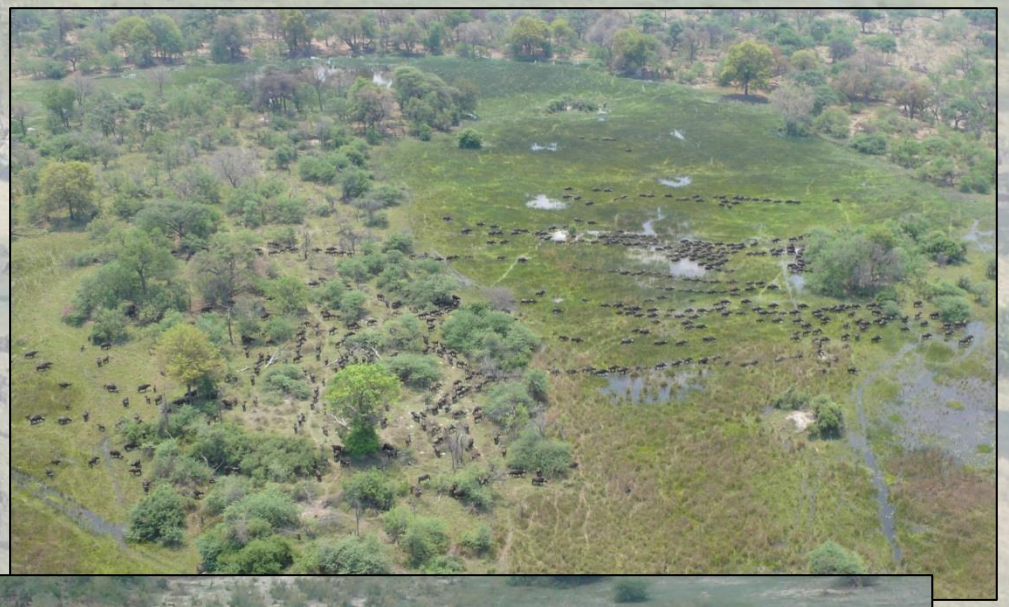


Forage characteristics

- Abundance (Biomass)
  - Disc Pasture Meter
- Diversity (Species richness)
  - Quadrats
- Palatability
  - Leaf proportion index
- Quality
  - % Crude Protein
- Generalised linear models
- Model selection

Home range and herd size

- Seasonal LoCoH
  - General linear mixed model
- Categorical estimations
  - Ground-based
  - Aerial
  - Charter flight data
  - Loglinear model

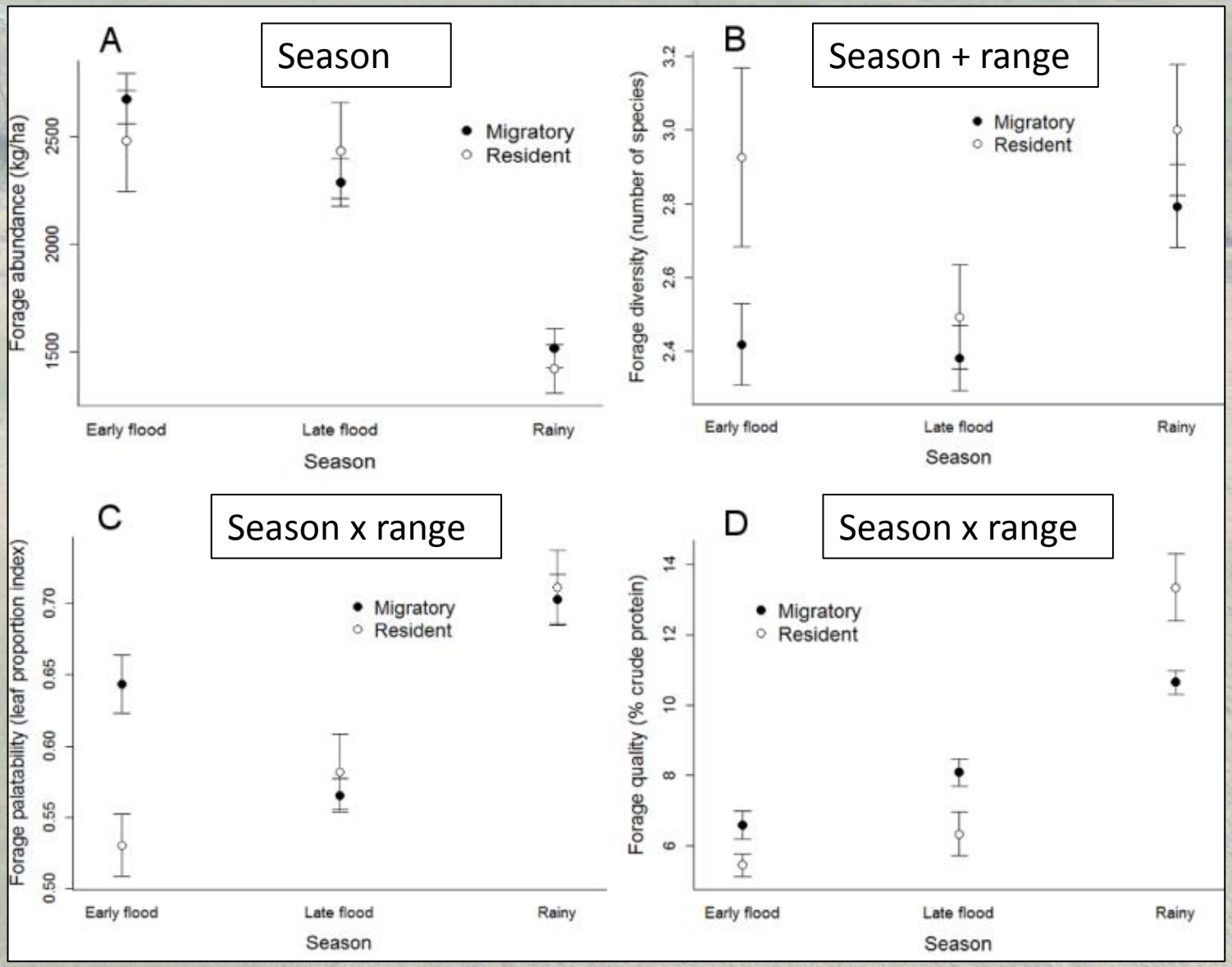


Population demographics and body condition score

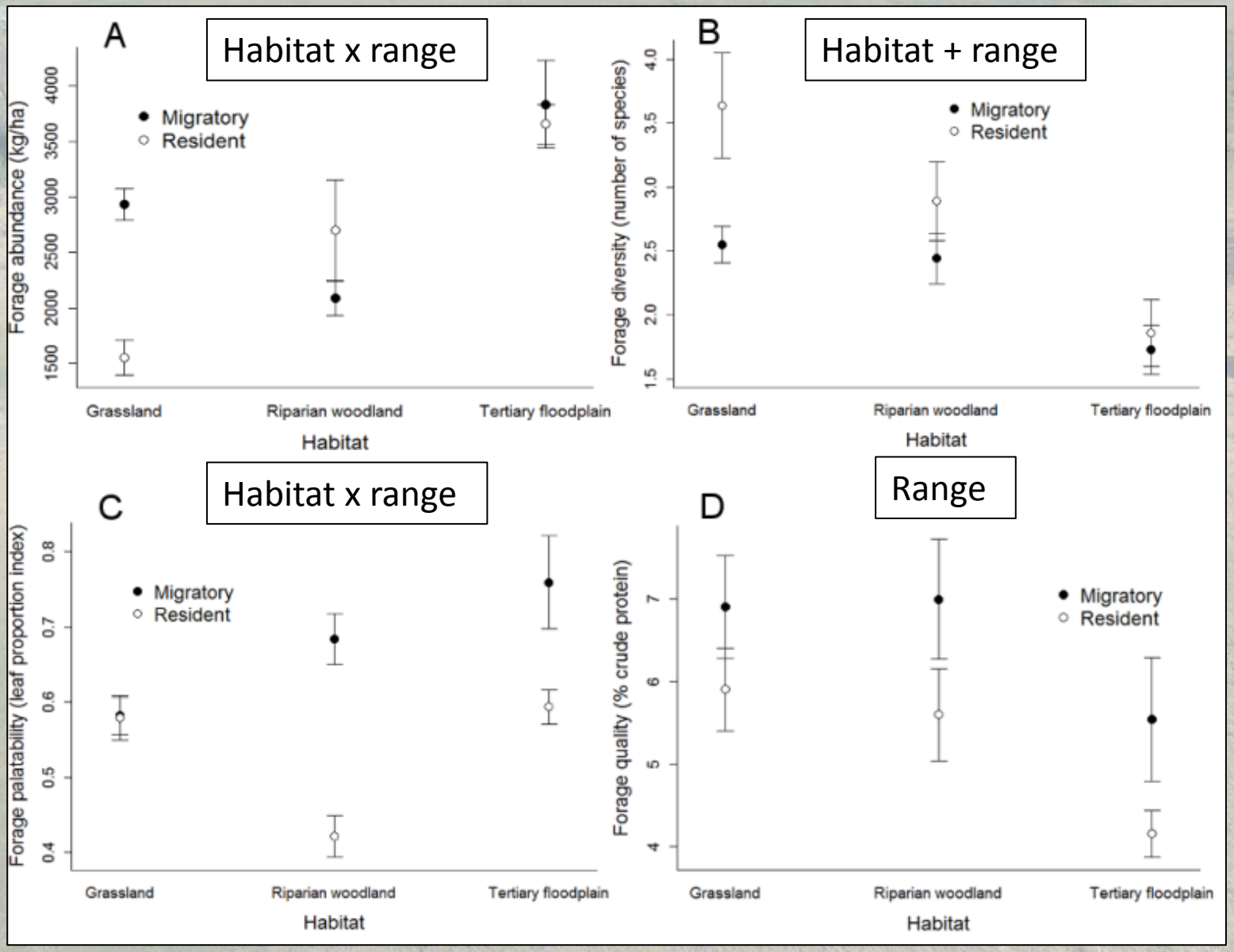
- Gender
- Age: Calf (0-6 months); Juvenile (6 months-2 years); Sub-adult (2-4 years); Adult (>4 years)
- Generalized linear models on ratios

- Body condition scored according to Prins (1996)
- Categories merged for body condition: young, sub-adults, adult males, adult females
- Cumulative link mixed models on condition

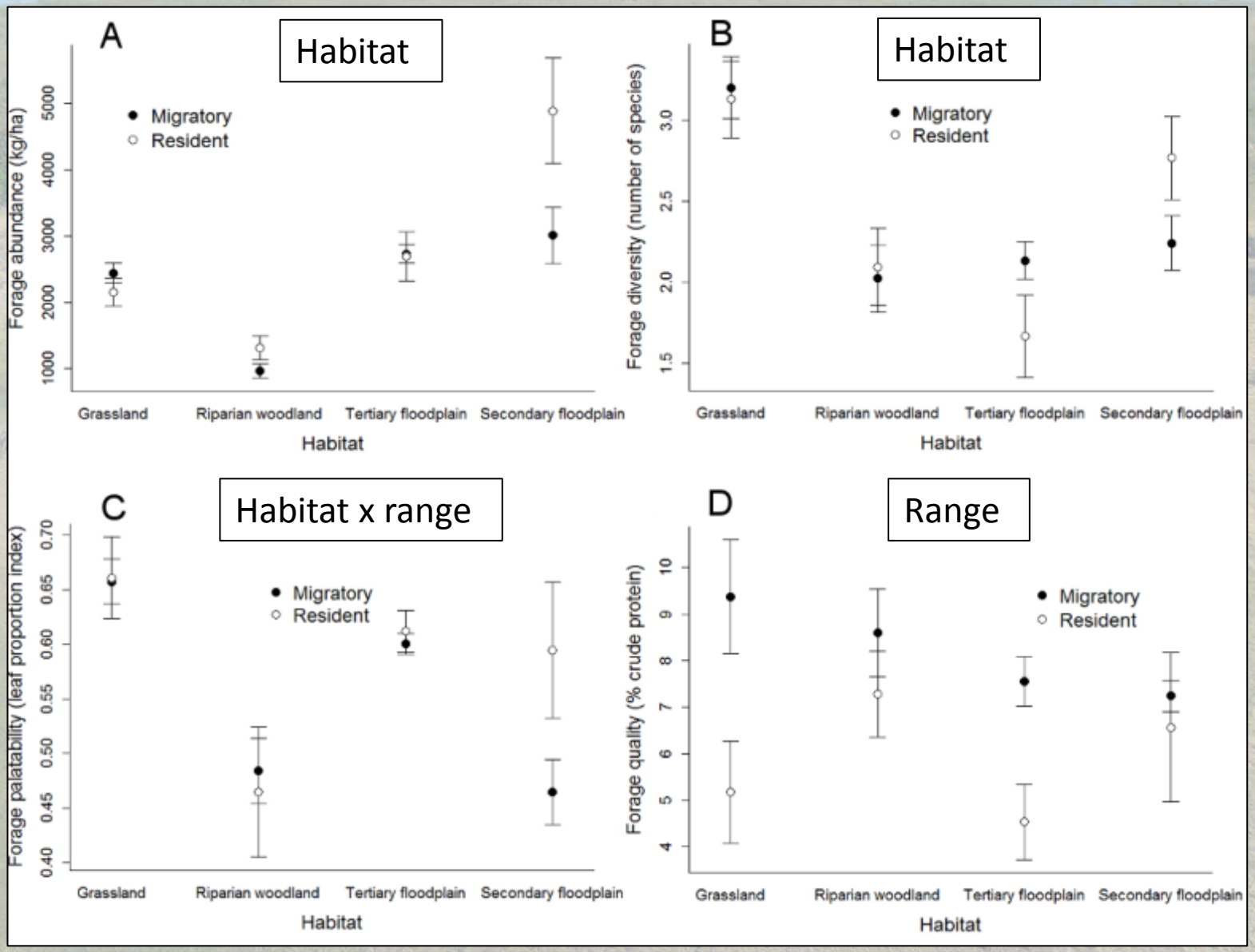
Seasonal forage characteristics



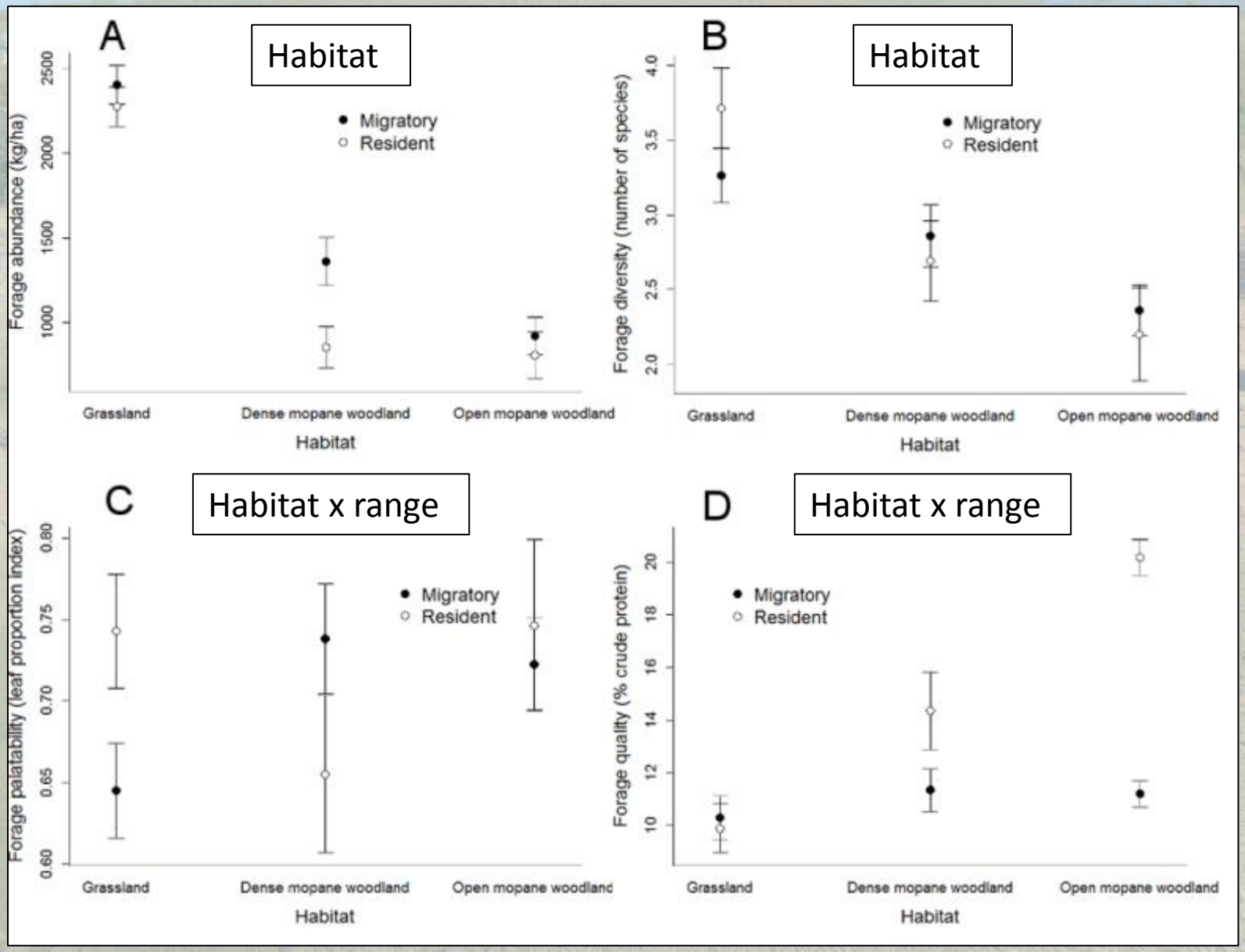
Early flood forage characteristics



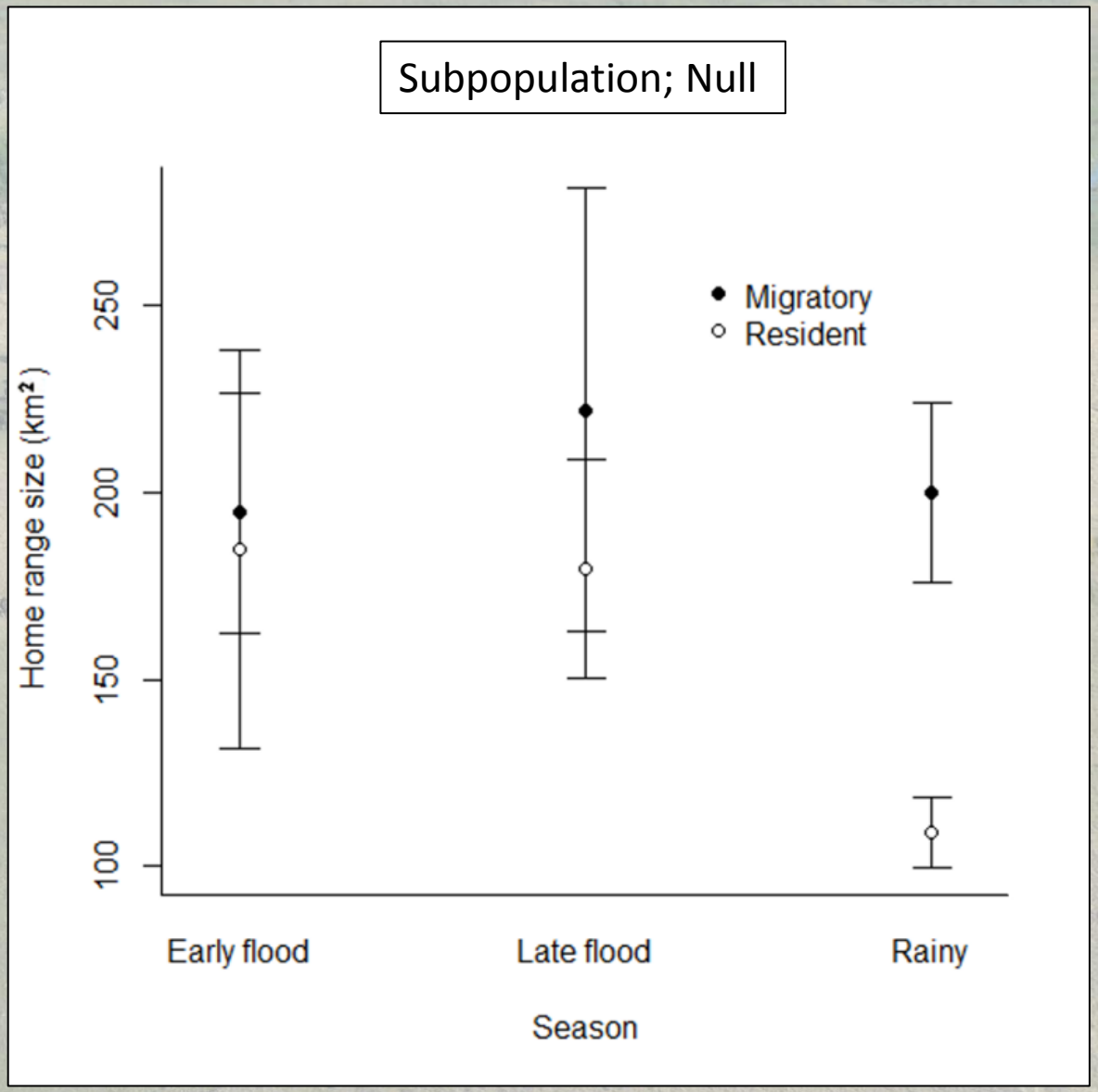
Late flood forage characteristics



Rainy forage characteristics



Home range size



Herd size

Herd size	Migratory		Resident	
	Early flood	Late flood	Early flood	Late flood
< 10	2	9	0	1
10–50	9	4	1	0
50–100	10	14	8	5
100–200	16	17	3	7
200–300	14	9	5	2
300–400	5	8	1	1
400–500	1	5	0	0
500–750	5	1	0	0
750–1,000	1	1	0	0
> 1,000	3	2	0	0
Number of herds	64	61	18	16
Median	100–200	100–200	50–100	100–200

Herd size x subpopulation

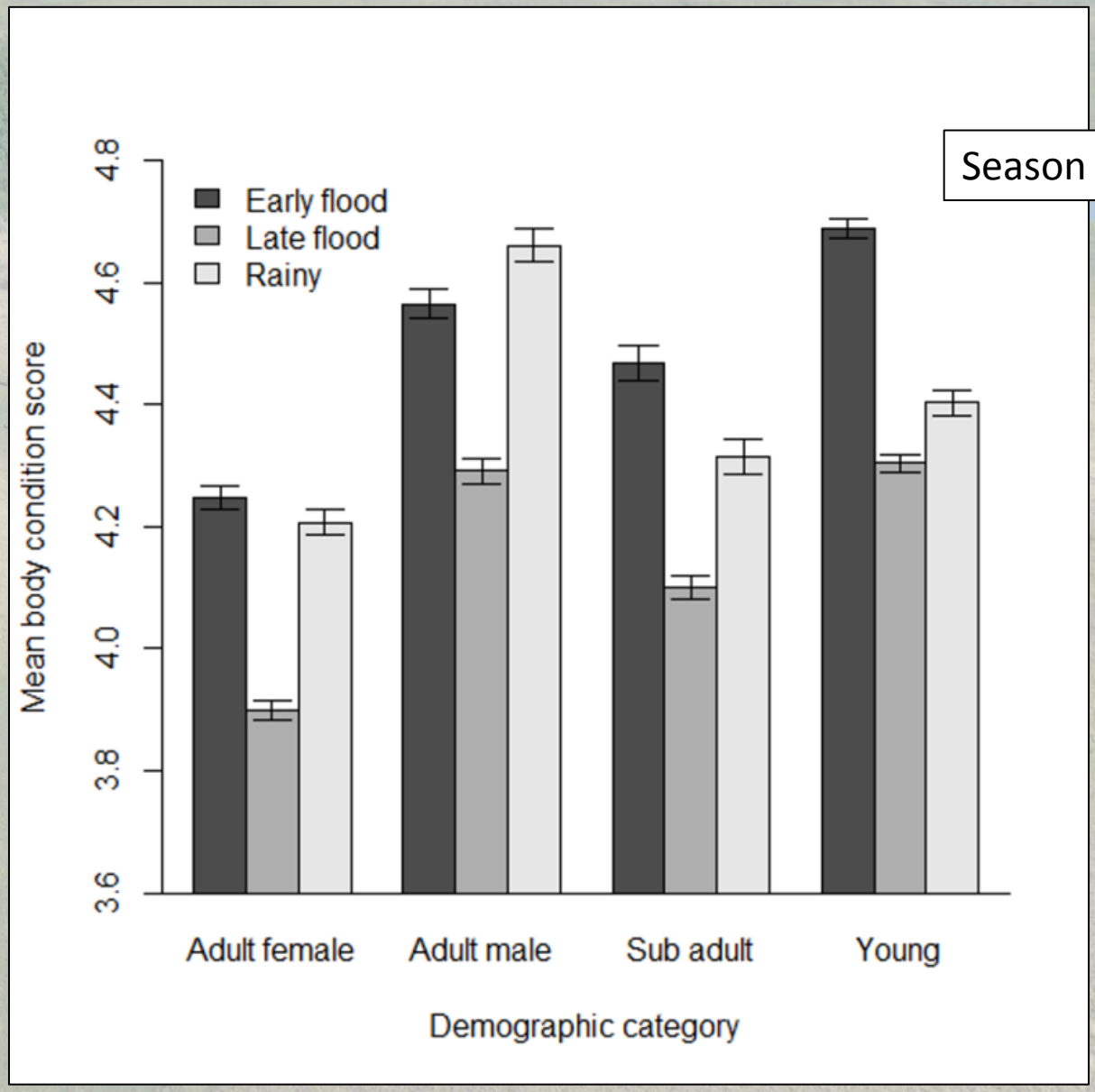
Reproductive productivity

Ratio	Early flood		Late flood		Rainy	
	Migratory	Resident	Migratory	Resident	Migratory	Resident
	n = 17	*n* = 2	*n* = 32	*n* = 2	*n* = 33	*n* = 5
Adult male: adult female	0.521 ± 0.28	0.506 ± 0.06	0.418 ± 0.27	0.178 ± 0.02	0.441 ± 0.29	0.509 ± 0.29
Calf:adult female	0.304 ± 0.06	0.265 ± 0.05	0.145 ± 0.12	0.191 ± 0.11	0.142 ± 0.14	0.158 ± 0.19

Null

Season

Body condition



Season x category

Summary

Variable	Migratory	Resident
Seasonal forage	Higher diversity	
Early flood forage	Higher quality	Higher diversity
Late flood forage	Higher quality	
Rainy forage	No difference	
Home range size	Larger home range size	
Herd size	Larger herd size	
Reproductive productivity	No difference	
Body condition	No difference	

Discussion

- Limited differences between ranges
- Quality primary difference
- Possibly overgrazing in flood seasons despite central location
- Could cause smaller home ranges and herd sizes in resident range
- No effect on reproduction or body condition

Conclusions

- Strong seasonal effects
- Limited detrimental impact of residency
- Time elapsed since fence
- Adaptability
- Other possible benefits of migration
- Importance of heterogeneity

Thank you

- Funded by Jenny and Martin Bennitt; the Dulverton Trust; Harry Ferguson; Ian Fuhr; Rodney Fuhr; Dane Hawk; Idea Wild; the North of England Zoological Society; the Roberts Fund; and the Wilderness Safaris Wildlife Trust

- Bennitt E, Bonyongo MC, Harris S. 2016. Effects of divergent migratory strategies on access to resources for Cape buffalo (*Syncerus caffer caffer*). Journal of Mammalogy. *In press*