

KNP LION POPULATION ASSESSMENT:

How many lions are there in the north?



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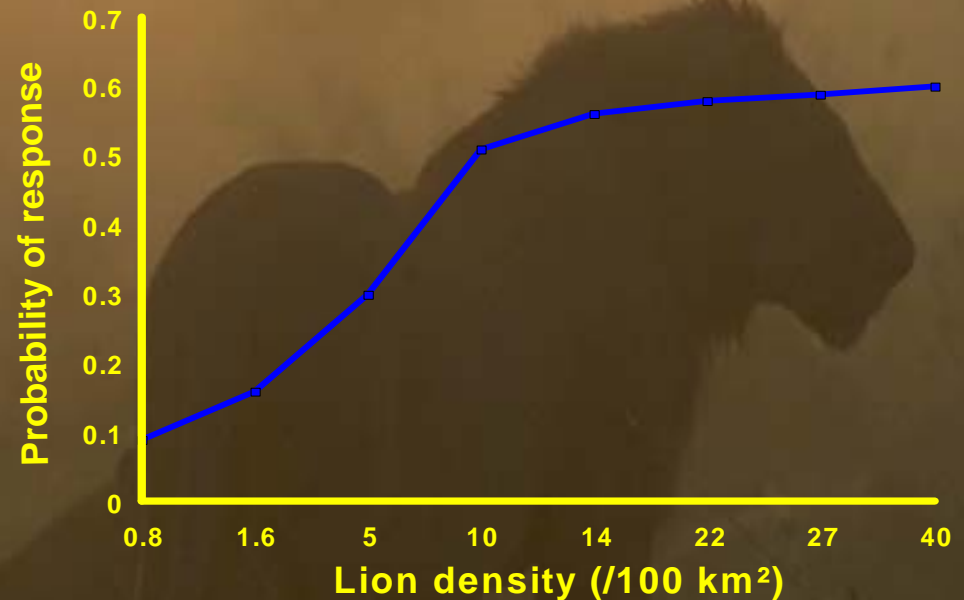


Objectives

- **To obtain reliable lion population estimates for three regions (South, Central, North) in Kruger National Park**
- **To obtain age-specific survival and fecundity parameters from which to derive population statistics for three regions in Kruger National Park**
- **To obtain population growth rates and compare the three regions of Kruger National Park characterized by different levels of disease incidences.**

How are lions counted?

1. **Direct counts:**
 - a. Detailed study
 - b. Home range analysis
 - c. Total counts

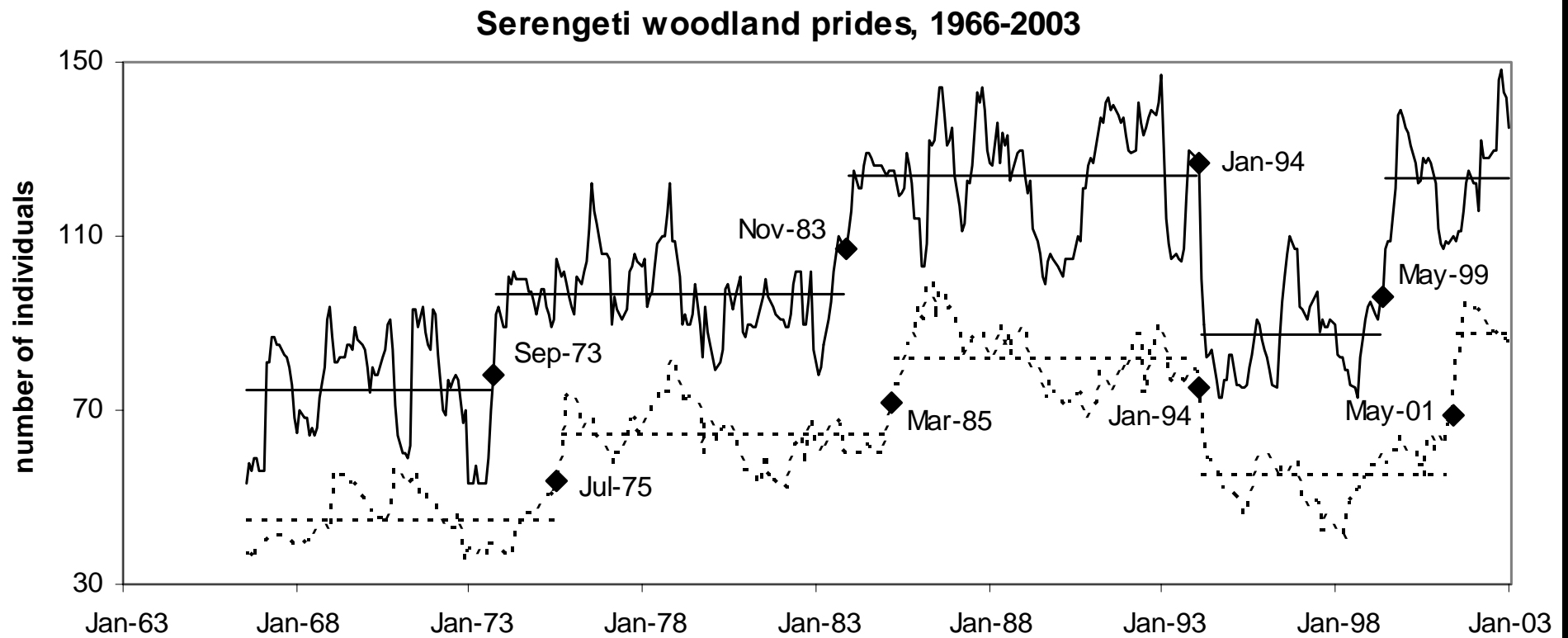


2. **Indices**
 - a. Mark-recapture (Lincoln Index)
 - b. Calling stations - based on response probabilities
3. **Other indices**
 - a. Spoor frequency counts
 - b. Public sightings
 - c. Questionnaire surveys

Detailed studies – Serengeti Lion Project

- very high quality long-term data

- measure growth rate, factors affecting, etc.



Kalahari Transfrontier Lion Project



Home Range Analysis – Kgalagadi Transfrontier Park

Mata Mata

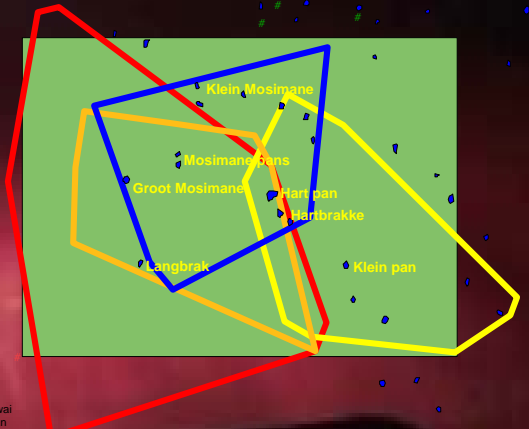


Legend

- Fence males(s)
- Lorettepan pride
- Kij Kij pride
- Kij Kij males
- Vaalpan pride
- Dune study area
- ▲ Waterpoints
- ◆ Pans

Legend

- Footchew pride
- Hartpan pride
- Mosimane males
- Mosimane pride
- Mosimane study area
- ◆ Pans
- ◆ Kwai pride
- ◆ Langbrak pride
- ◆ Khokwe pride
- ◆ Sesatswe pride

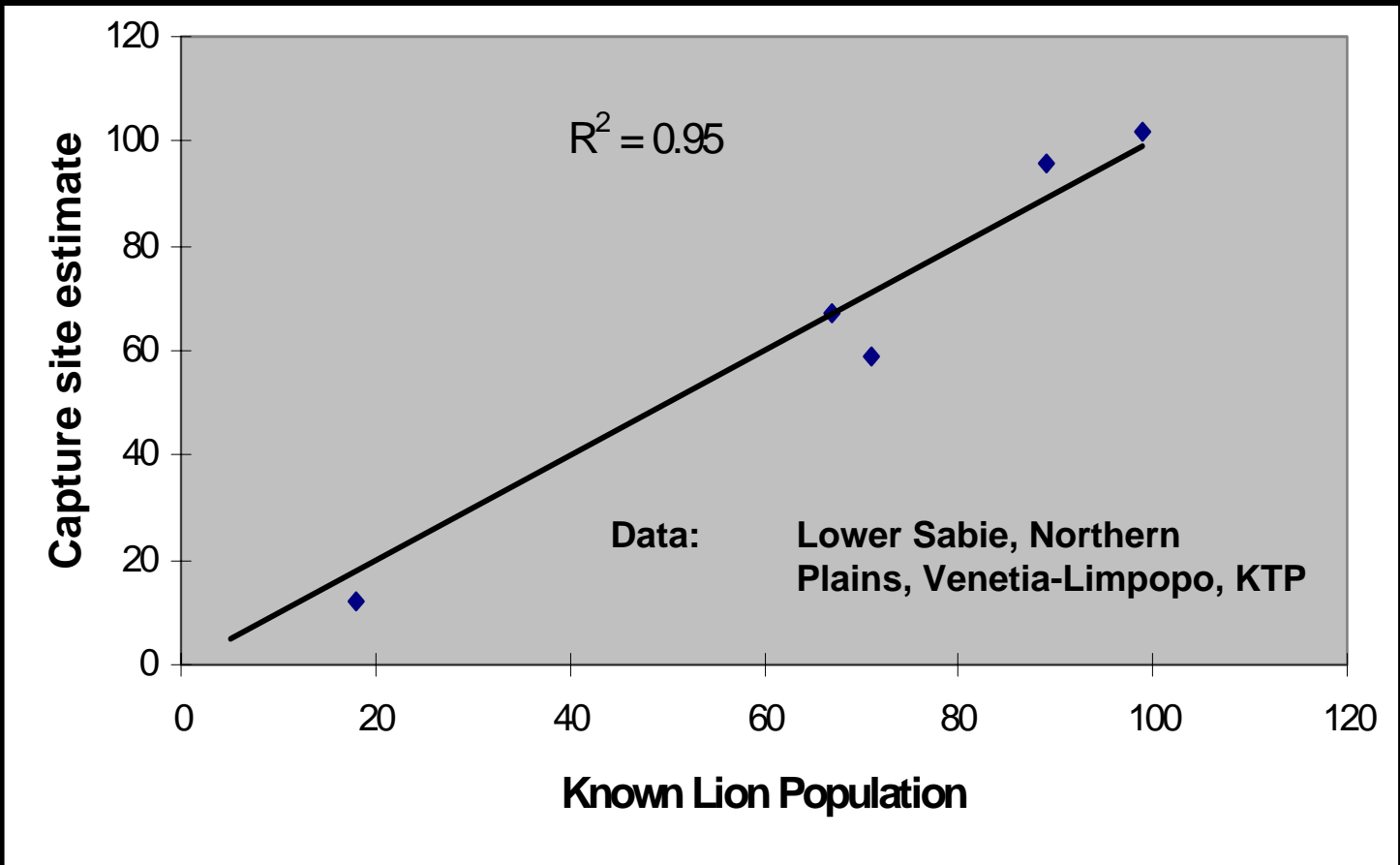


- **Average home range size was $1462 \pm 388 \text{ km}^2$ ($n = 14$)**
- **Dune-savanna: $2823 \pm 498 \text{ km}^2$, range 1762 – 4532 ($n = 5$)**
- **Tree-savanna: $707 \pm 143 \text{ km}^2$, range 266 – 1567 ($n = 9$)**

Total Counts (Smuts, Whyte & Dearlove 1977)

- Survey whole area (effective radius – about 5 km)
- Attract lions to baits (drag bait/calling)
- Count all lions (id individuals)
- High accuracy (95%) in areas with high lion density and responsive lions







Mark-Recapture (110 ± 11.5 , 95 %
confidence limits = 87–133 vs 100-103 observed
total count; Castley *et al.* 2002)

Calling Stations

Spotted hyaenas - Mills, Juritz & Zucchini 2001:

- 3.2 km response radius
- 2-3 6 min intervals
- 0.61 response probability

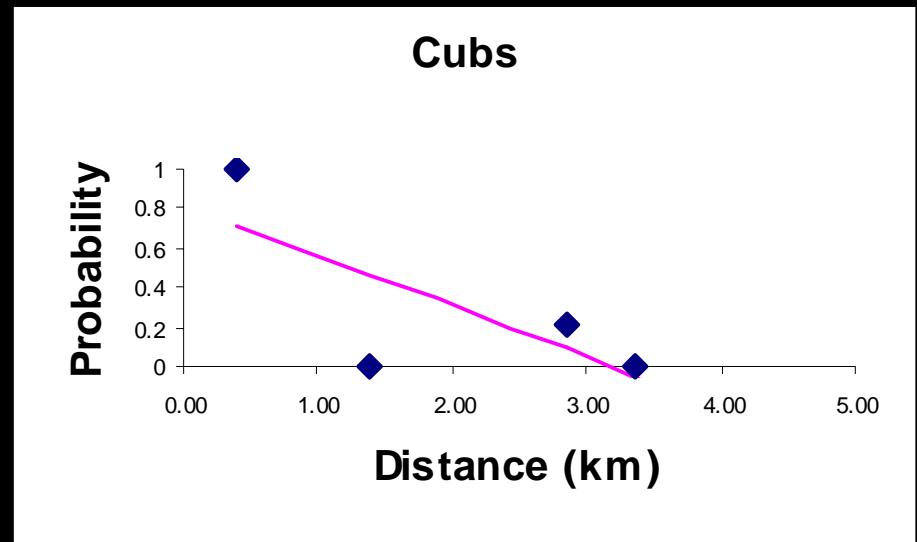
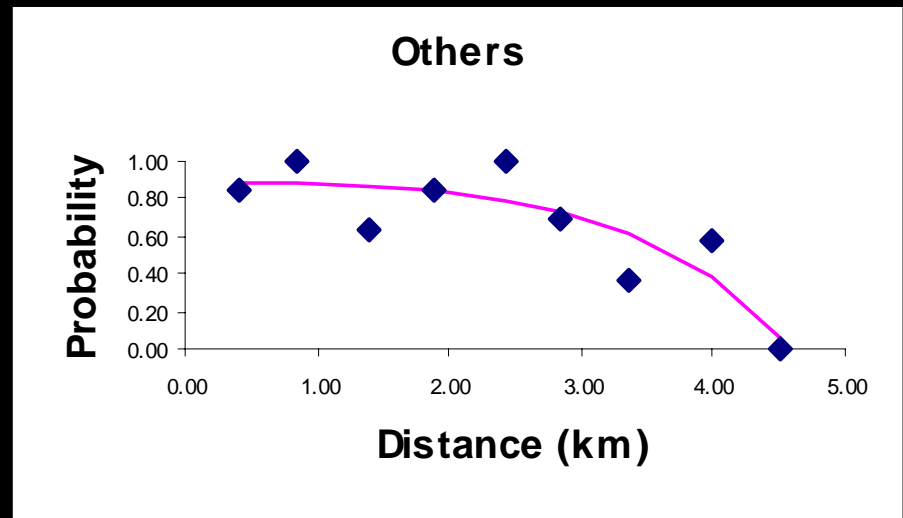
Lions/spotted hyaenas – Ogutu & Dublin 1998:

- 2.5 km response radius
- 3 x 5 min intervals
- 0.25 response probability



Calibration

- Done in the Satara area – high lion density
- Needed to know response probability of lions
- 170 lions (n = 37 groups) in six weeks, ± 100 km/night – lions almost all but two nights
- Played 1 hour, turn speaker every 15 min
- Response time: 18.8 ± 17.2 min (58 min maximum, 32.3 ± 17.5 - survey)



Calibration Corrections

		No Cubs	Cubs
Probability that a pride will turn up	Pp	0.734	0.286
Variance in Pp	Var(Pp)	0.006	0.035
Standard Deviation of Pp	SD(Pp)	0.075	0.452
Number of prides in calibration	n Prides	28	9
Probability that a lion in a responding pride will turn up	Pi	0.902	0.957
Variance in Pi	Var(Pi)	0.088	0.042
Standard Deviation of Pi	SD(Pi)	0.297	0.204
Number of lions in the calibration	n Lions	109	61
Distance from which lions responded	Rad	4.29	4.29
Variance in Rad	Var(Rad)	0.81	0.81
Standard Deviation of Rad	SD(Rad)	0.90	0.90
Effective area sampled by a call-up station	A	57.76	57.76
Variance in A	Var(A)	621.35	621.35
Standard Deviation of A	SD(A)	24.93	24.93

Input Data North

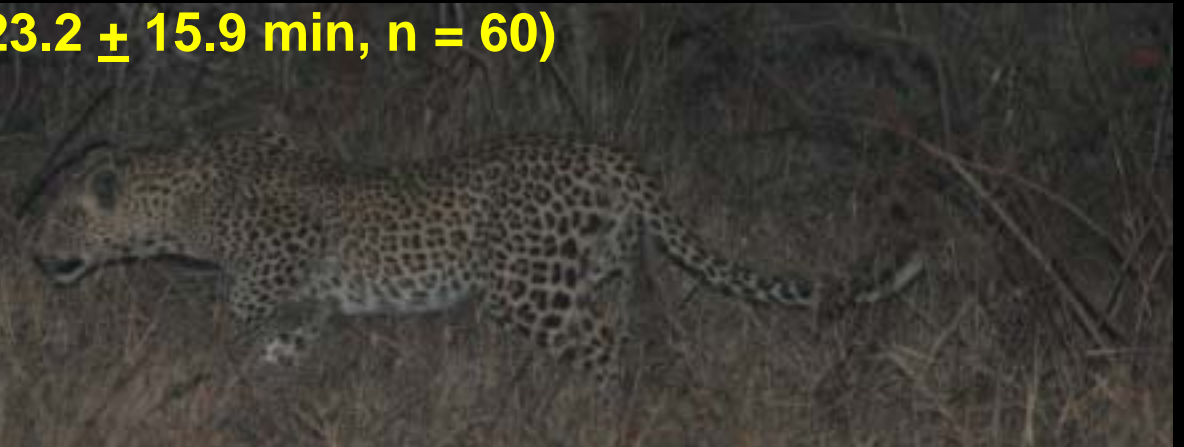
		No Cubs	Cubs
Number of call-up stations	n	106	106
Number of lions seen during the survey	x	96	54
Number of prides seen during the survey	n-Sprides	28	3
Total area of interest	At	10039	10039

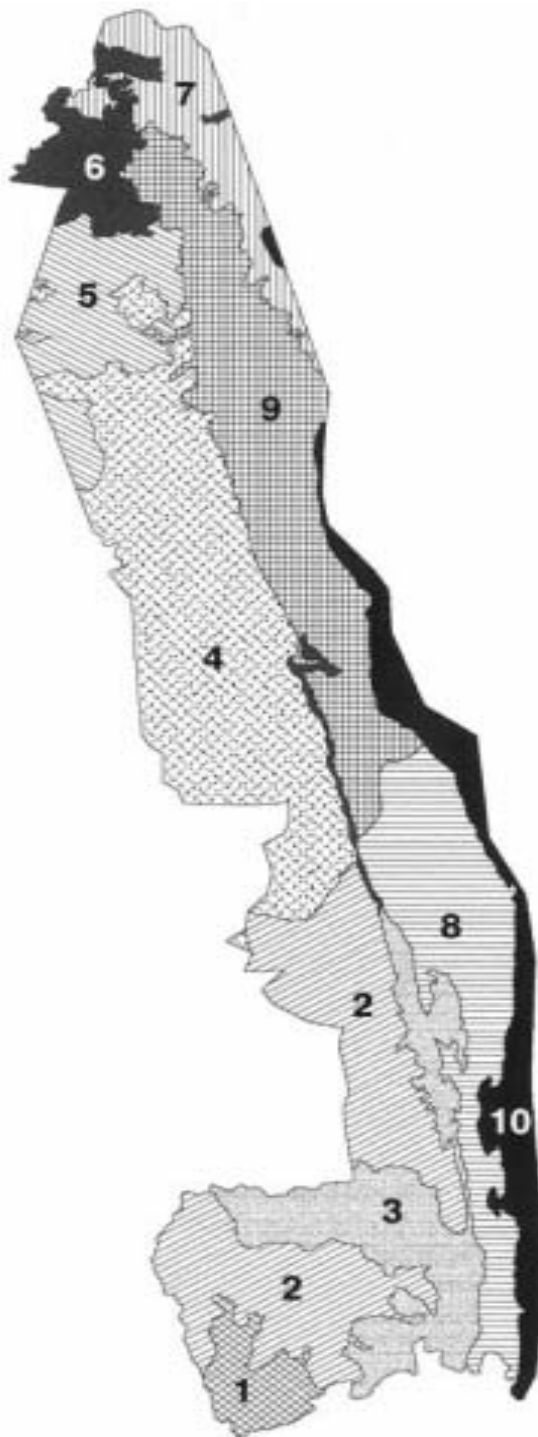
Proportion of area surveyed	Psurv	0.610	0.610
Variance in Psurv	Var(Psurv)	0.238	0.238

Output		No Cubs	Cubs	Total
Population estimate	Est	238	324	562
Variance in Est	Var(Est)	2810	2605	5415
Standard Error of the estimate	SE	53	51	74
95% Lower Confidence Limit	LCL	134	224	417
95% Upper Confidence Limit	UCL	342	424	706
Percentage Confidence Limit	PCL	44%	31%	26%

	West	East
	Granites/Punda sandveld	Basalts/Pafuri rugged
Area surveyed	5813 km ²	4277 km ²
No calling stations	43	63
No lions observed		
With cubs	29	25
Without cubs	27	69
Population estimate	344 (285-404)	320 (190-451)
Population density	5.92 lions/100km ²	7.48 lions/100km ²

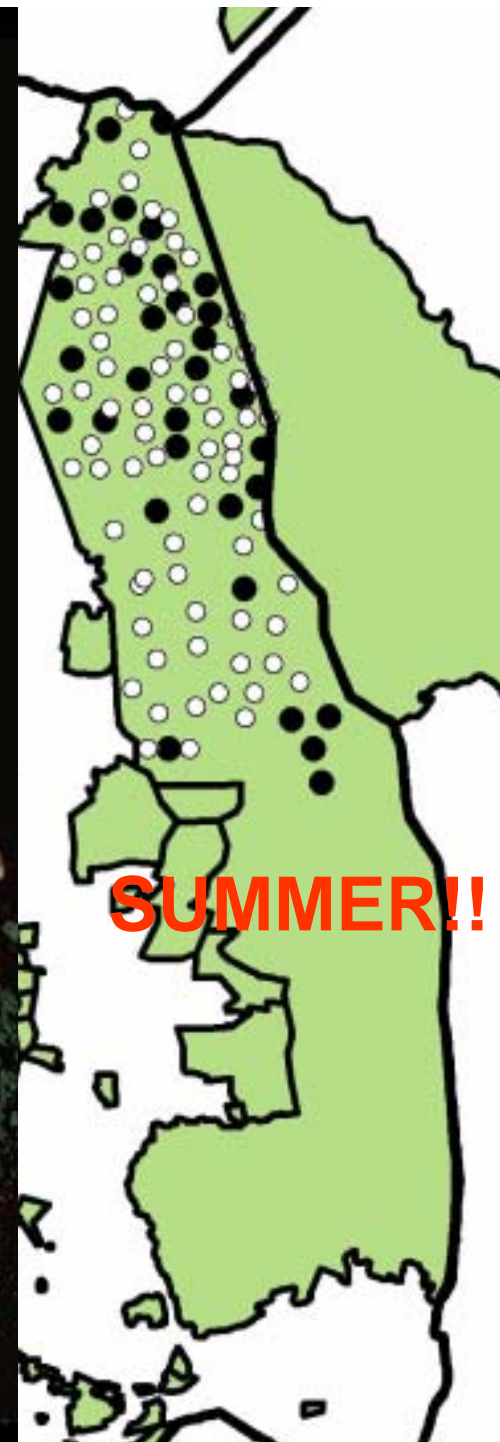
118 spotted hyaenas (23.2 ± 15.9 min, n = 60)
 55 black-backed jackal
 22 side-striped jackal
 22 leopards
 2 wild dog packs





Ho: Southern basalts
12-15 lions/100 km²
Southern granites
10-12 lions/100 km²

KNP: 1700-2200 lions



Body Condition Score: 1 - 5

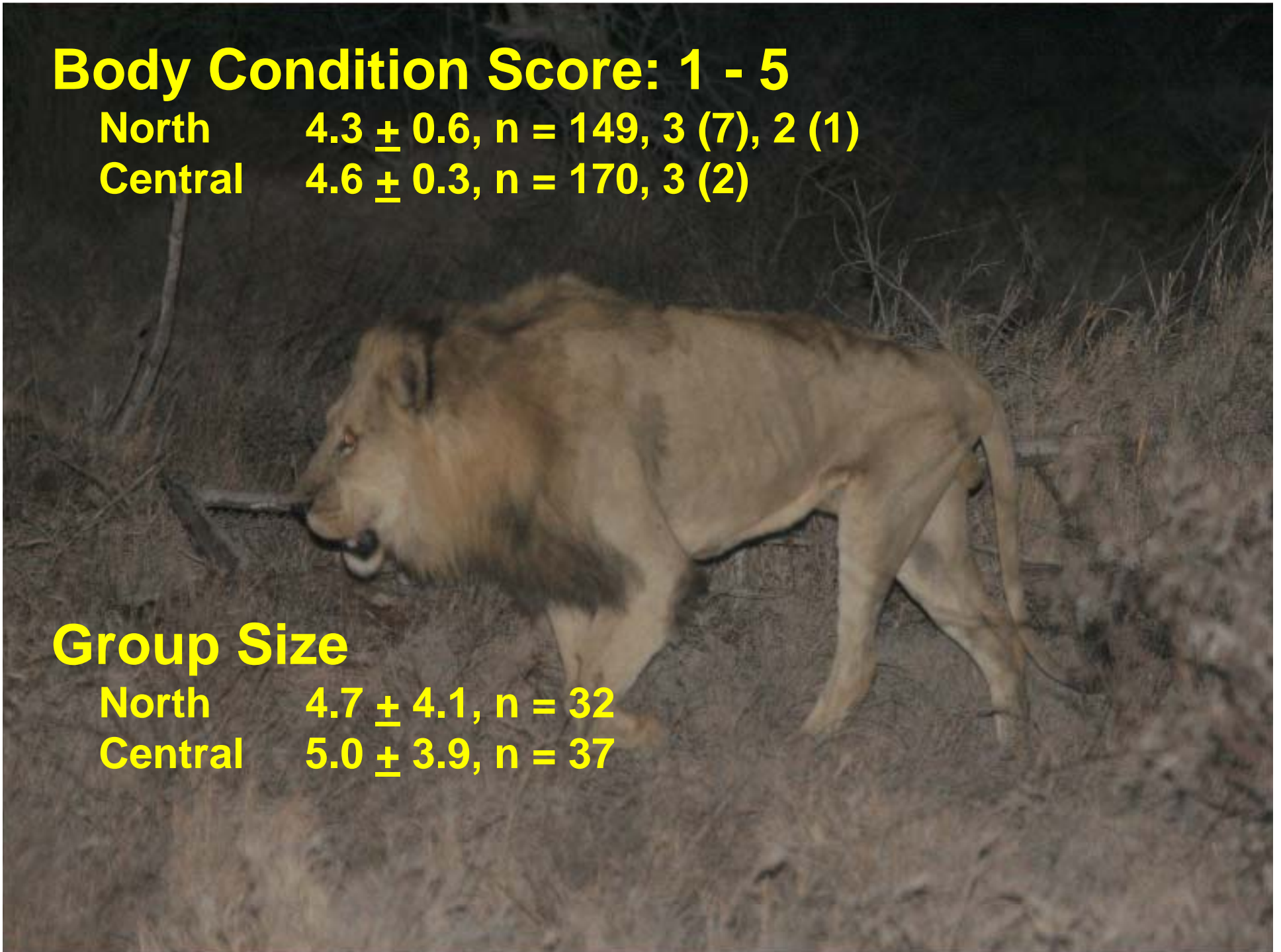
North 4.3 ± 0.6 , n = 149, 3 (7), 2 (1)

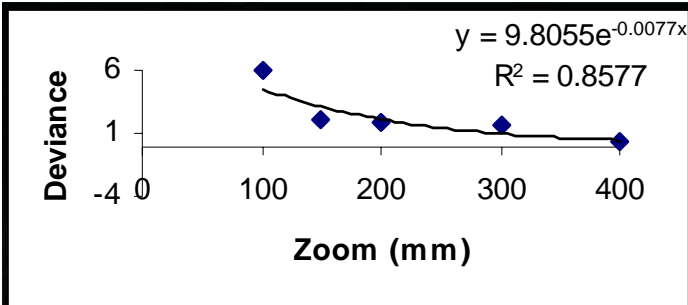
Central 4.6 ± 0.3 , n = 170, 3 (2)

Group Size

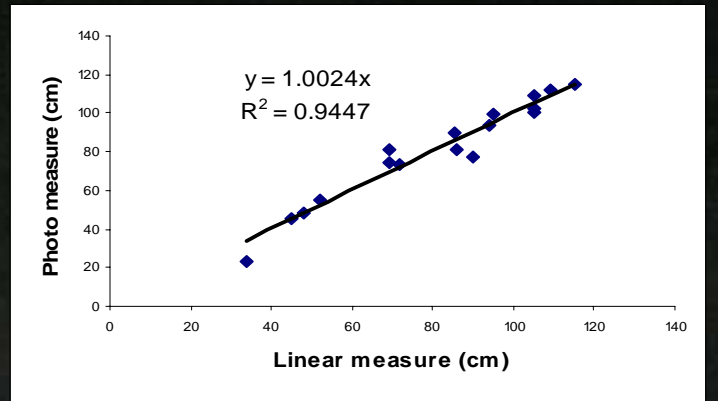
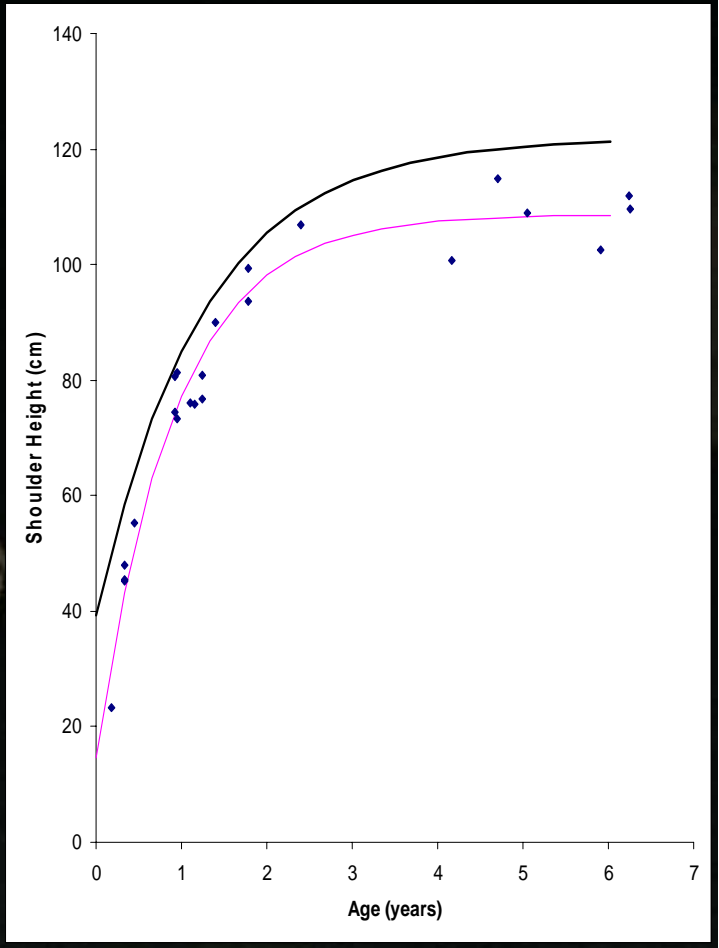
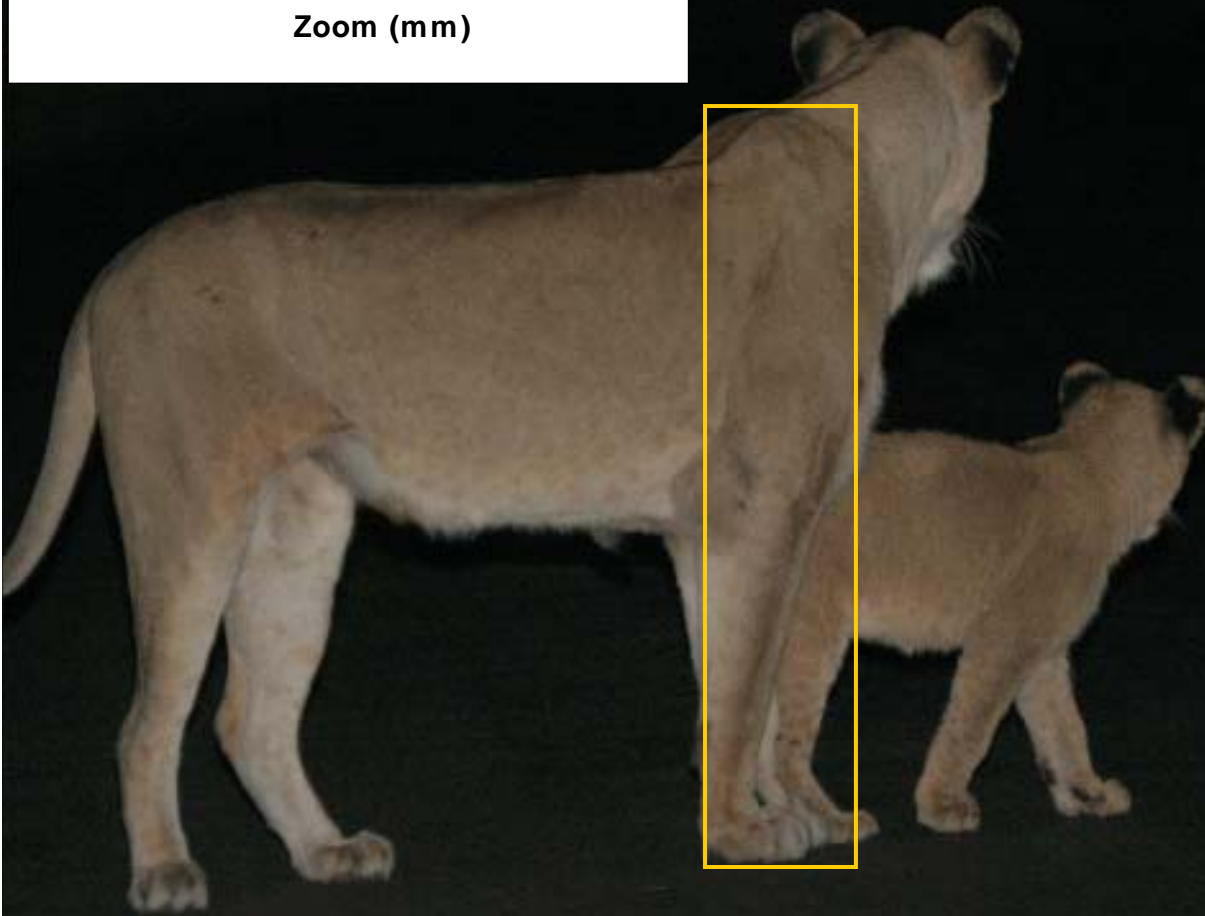
North 4.7 ± 4.1 , n = 32

Central 5.0 ± 3.9 , n = 37





$$h_i = \frac{p_i}{(1.5174f)d^{-1}}$$



Population structure

CENTRAL

NORTH

	F	M	Ratio		F	M	Ratio
0-1yrs	10	10	1.00	0-1yrs	21	11	1.90
1-2 yrs	14	15	0.93	1-2 yrs	9	8	1.13
2-3 yrs	8	10	0.80	2-3 yrs	4	21	0.19
3-4 yrs	1	3	0.33	3-4 yrs	2	1	2.00
adults	68	30	2.27	adults	57	16	3.56

Calling stations

- **Calling stations should be > 10 km apart (4.28 km effective radius)**
- **Effective area = 57.5 km², which = 230 km² / night (4 stations)**
- **Sampling intensity (area coverage) > 20%**
- **At 50% sampling intensity 1000 km² takes 2.2 nights or 9 calling stations**
- **Play call continuously for 1 hour (buffalo/wildebeest calf or spotted hyaena) – not lions!**
- **No noise and listen for lions/hyaenas, use shaded torch (not spotlight) to scan every ten minutes**
- **Count all lions, sex/age, photograph – and NB classify as Cub Group or Other Group**



ACKNOWLEDGEMENTS

KRUGER NATIONAL PARK

Conservation Force – John Jackson III

Rodney Fuhr / Ian Melass– Lion Park

Tshwane University of Technology

Gus Mills

Louis Olivier

Kobus Wentzel

Albert Machaba

Section Rangers

Angela Gaylard

Camp Managers

Gordon Ramsdon

Thembi Khoza

Sandra Mac Fadyen

HENNIE DE BEER



ANDREI SNYMAN

