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# The ethics of conducting research in (behavioural) ecology:

## Research in the Serengeti as example

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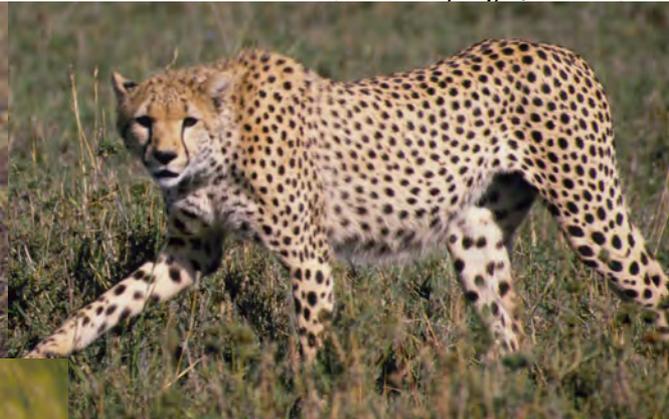


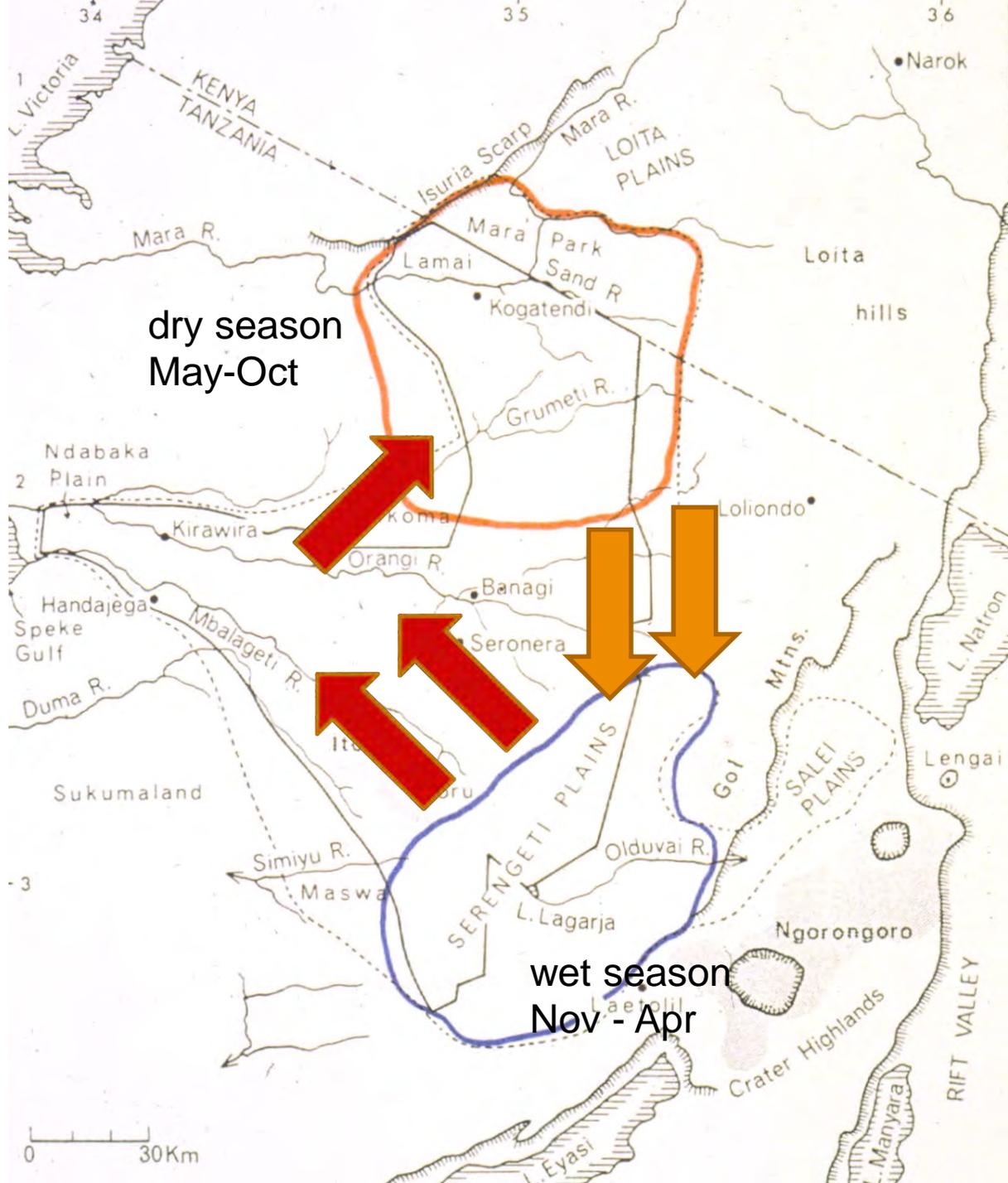






# Some carnivores in the Serengeti ecosystem







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## — Topics & ethical risks / issues

- (1) Moving in the habitat: destroying fragile vegetation?
- (2) Habituating study animals to humans: invitation to poachers? increase susceptibility to car accidents?
- (3) Handling and manipulating study animals: unnecessary suffering? changing quality of scientific results?
- (4) Intervention (e.g. snare removal) & treatment of study animals: interfering with natural selection? polluting the environment with persistent medications?
- (5) The logistics of running a camp: environmental footprint?
- (6) Dealing with local people: non-respectful treatment (exploitation)?
- (7) Running an academic research project in a range country: a lack of access and benefit sharing? (capacity building, ...)
- (8) Presenting and making use of important research findings: moving own role from science to advocacy = imposing own views on range country?



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## — Topics & ethical risks / issues

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# — Manipulating and handling animals

Topic	Traditional techniques	Minimally invasive / non-invasive alternatives
Population abundance, size	Trapping / killing study animals	Live-traps; camera traps; aerial count; transect count; individual recognition
Individual recognition	<i>Capture/handling/anaesthesia</i> + ear tags / tattooing / freeze-branding / colour rings	Camera traps; characteristic fur or feather patterns; environmental / invertebrate DNA
Locating groups, individual (foraging) movements, dispersal, migration	<i>Capture/handling/anaesthesia</i> + tagging / radio-collaring (data loggers, VHF, GPS)	Capture & ringing; stable isotopes; individual recognition; knowledge of species; field craft; tenacity (+ time)
Reproductive health (fertility, fecundity)	Killing study animals, <i>Capture/handling/anaesthesia</i> + blood sampling	Faecal hormone metabolite assays; portable ultrasound / digital x-rays; carcasses arisen from other actions; medical training / habituation
Health assessment, allostatic load („stress“), blood biochemistry	<i>Capture/handling/anaesthesia</i> + blood sampling	Faecal hormon metabolite assays; hair; saliva; blood-sucking bugs; faecal virus/bacteria assays; faecal intestinal cell immune assays; parasite egg counts
Paternity; sexing; genetic origin of population	<i>Capture/handling/anaesthesia</i> + blood sampling	collecting hair; faeces; saliva; biopsy dart; museum specimens, road kills...



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## — Does the choice of methods entail ethically relevant trade-offs?

- **convenience** (saving time, money) vs inconvenience (time-consuming, expensive)
- **scientific quality**: accuracy vs inaccuracy of measurements (direct vs indirect)
- **animal welfare**: intrusive (suffering) versus non-intrusive; individual and group effects
- **fitness consequences**: disturbing / interfering with survival or breeding
- **type of research**: Basic / fundamental vs applied, conservation oriented
  - reproductive fertility / fecundity:
    - Traditional - killing an African buffalo ♀: **quick, direct, accurate** assess pregnancy, how many embryos, how many past pregnancies
    - Alternative non-invasive - faecal hormone metabolite assay, observations: **time-consuming, indirect**; validation (captive), collecting faeces, watch individual life histories; **repeatability is an option**

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Topic	Traditional techniques	Minimally invasive / non-invasive alternatives
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Individual recognition	<i>Capture (&amp; immobilisation) + ear tags / tattooing / freeze-branding / colour rings</i>	Camera traps; characteristic fur or feather patterns - observations / photographs
Locating groups, individual (foraging) movements, dispersal, migration	<i>Capture (&amp; immobilisation) + tagging / radio-collaring (data loggers, VHF, GPS)</i>	Capture & ringing; stable isotopes; knowledge of species; field craft; tenacity (+ time)
Reproductive health (fertility, fecundity)	Killing study animals, capture & immobilisation + blood sampling	Faecal hormon metabolite assays; portable ultrasound / digital x-rays; carcasses arisen from other actions; medical training / habituation
Blood biochemistry, health assessment, allostatic load („stress“)	Capture & immobilisation + blood sampling	Faecal hormon metabolite assays; hair; saliva; blood-sucking bugs; faecal virus/bacteria assays; faecal intestinal cell immune assays; parasite egg counts
Paternity; sexing; gene-tic origin of population	Capture & immobilisation + blood sampling	collecting hair; faeces; saliva; biopsy dart; museum specimens



# Science as an assembly of tribal rules ...

Gradient of fur / feather patterns & ranging behaviour



No help to individuals to identify / find animals:  
uniform fur / feather patterns, nomadic lifestyles, difficult habitats: (rain)forests...

Example: dwarf mongoose

Potential help to individuals to identify / find animals:  
subtle variations, flexible ranges or nomadic living, validation deemed necessary

Example: whooper swan

Much help to individuals to identify / find animals:  
obvious individual variation in fur / feather patterns, permanent ranges, stable habitats

Example: lion, spotted hyena

- Sub-discipline traditions:

- in carnivore biology: study animals are traditionally radio-collared (even if individual recognition by fur pattern is well established)
- in primatology: not

- Scientific scepticism:

- primatology, some carnivores: individual recognition easily accepted
- not in others: colour rings as standard in ornithology



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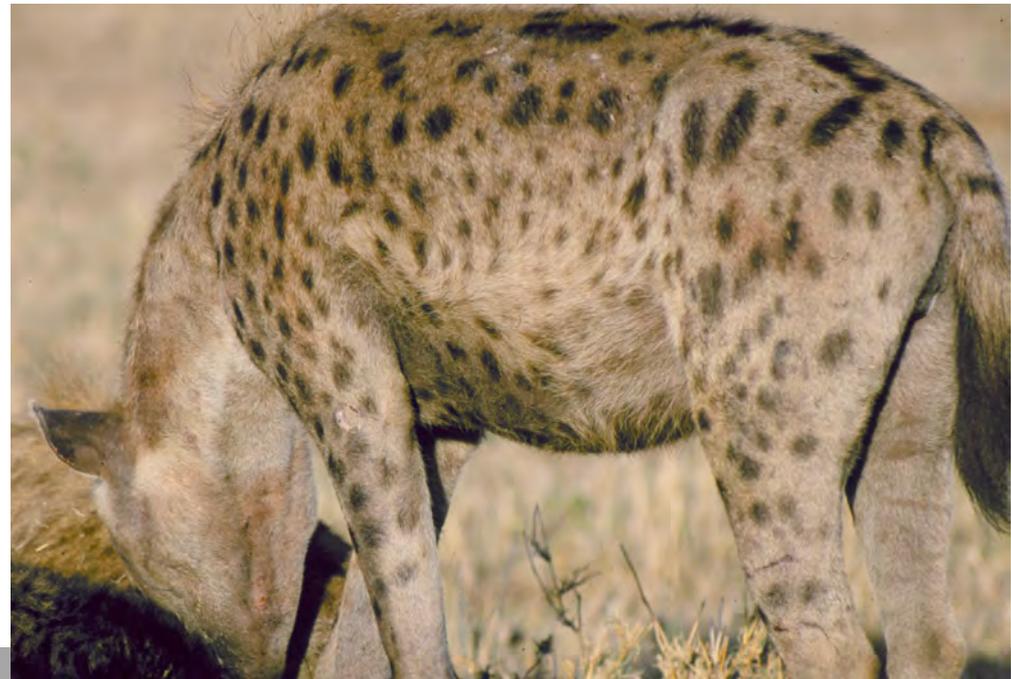
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# Science as an assembly of tribal rules ...

**Conclusion:** Recognise tribal conventions and assess their value

**Action option:** Establish / validate non-invasive techniques of individual recognition:

- Use zoological gardens or other captive collections
- Check how good you are at recognising individuals (statistics: Cronbach's & other consistency tests)





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# Individual recognition of whooper swans *Cygnus cygnus* by Dafila Scott





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# Individual recognition of dwarf mongoose *Helogale parvula* by Jon Rood

Individual recognition without markings?



Freeze-branding





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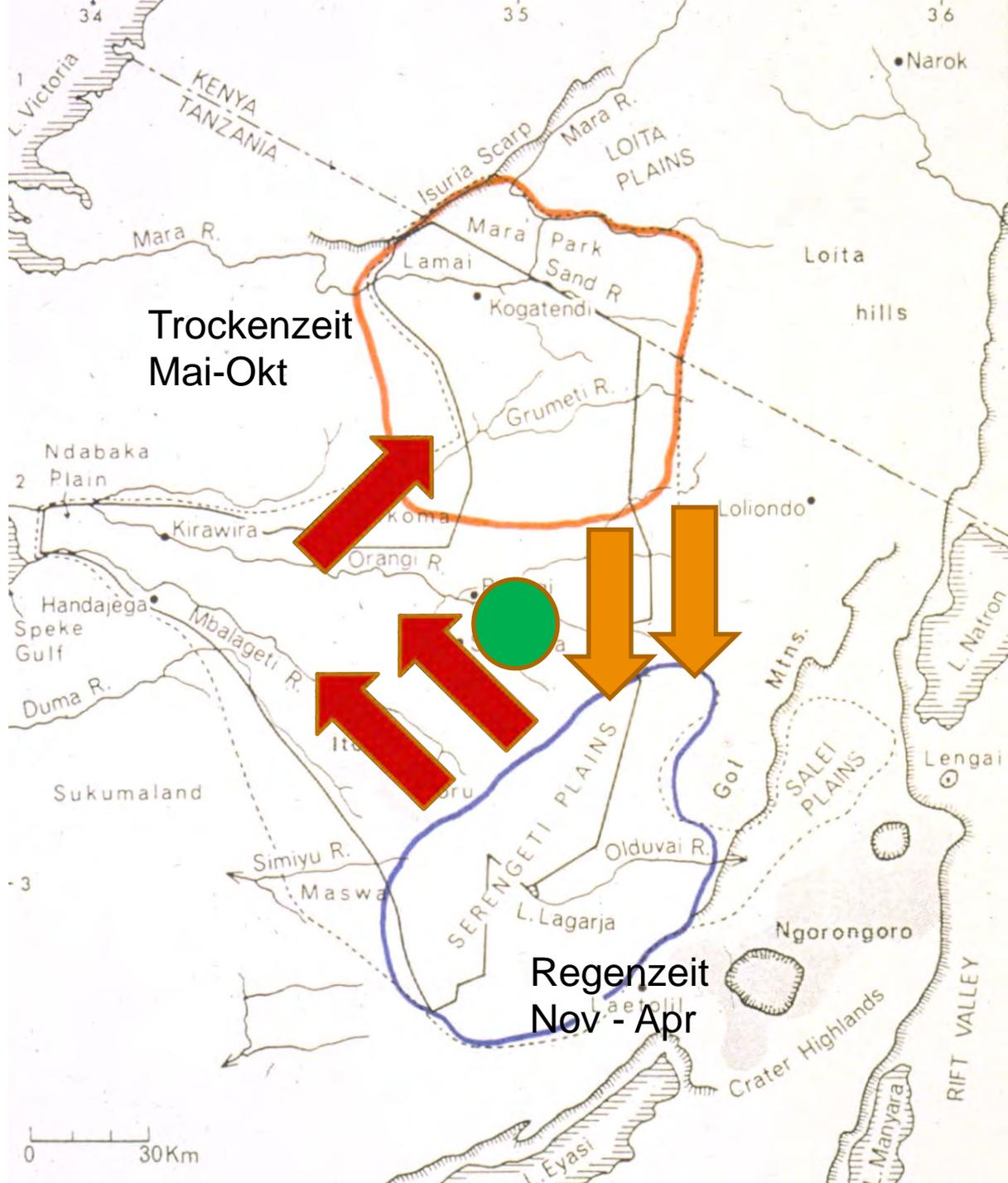
— Individual recognition of dwarf mongoose *Helogale parvula* by O. Anne E. Rasa





## — Radio-collaring (spotted hyenas): a guide

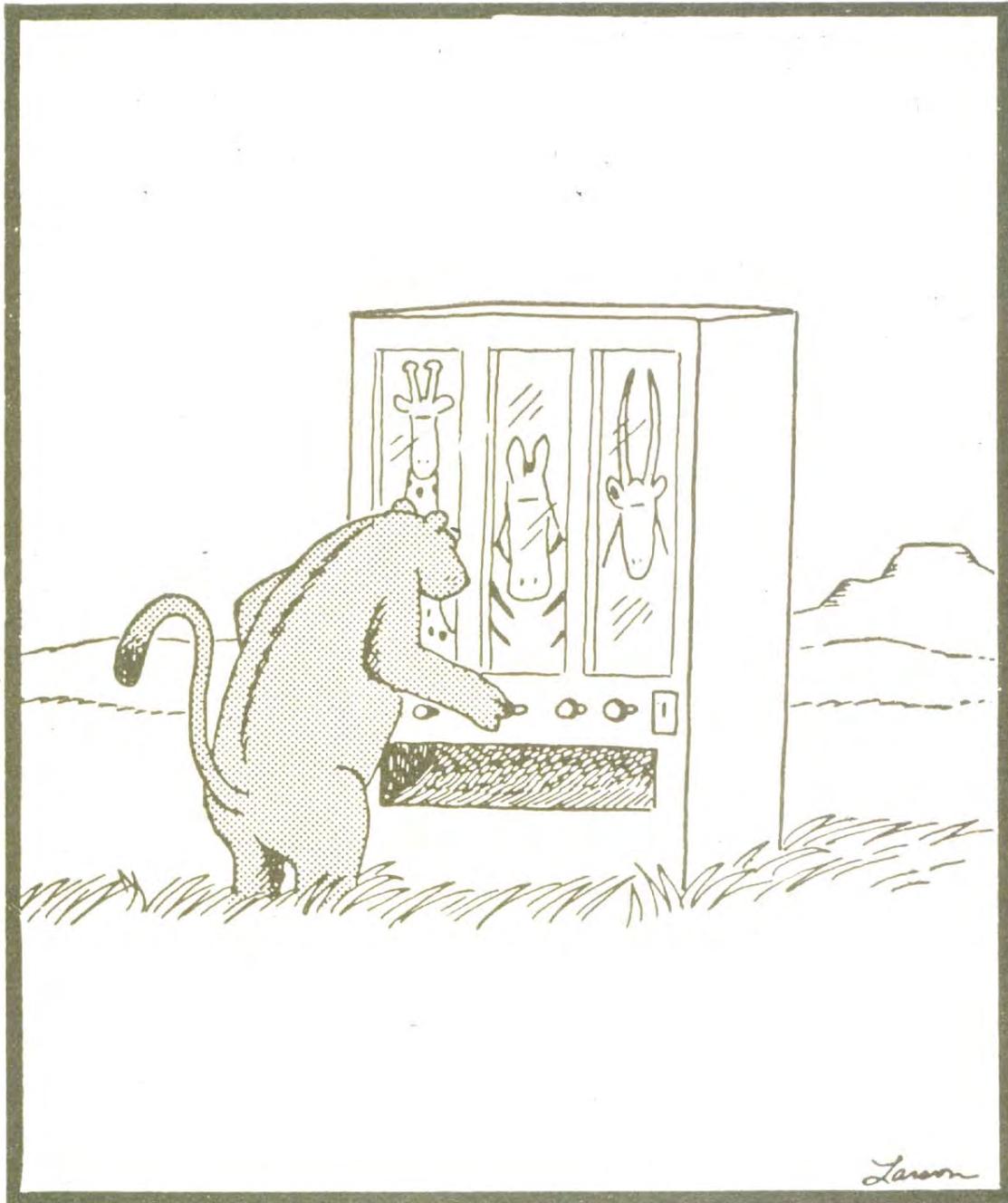
issue	implementation
Clear scientific question	Spatial organisation of sp. hyenas
Chose timing to minimise temperature, monitor recovery from the anaesthetic	Early in the morning, at least one hour before from sunset
Minimise disturbance, impact on habituation, and allostatic load (stress), particularly in social, group-living animals	anaesthetise individuals away from groups avoid subordinates being attacked by dominants when succumbing avoid group members watching procedure avoid target animal watching procedure best when animal is resting
Minimise chance of losing darted animals in thick vegetation	drugs work faster when animal is resting maximise speed of anaesthesia: use a drug formula to accelerate tissue uptake
Avoid intestines becoming entangled	Turn large mammals over on their fronts, not on their backs (although this appears easier)
Protect eyes	Cover eyes with cloth, keep eyes hydrated
Monitor temperature, heart beat, blood pressure, respiration	Have reversal drug ready (if animal shows signs of being compromised)
Keep safe (them/yourself): hurting itself, drowning, predation, you being attacked	Monitor state of anaesthesia/recovery; remove yourself from animal before it wakes up



Trockenzeit  
Mai-Okt

Regenzeit  
Nov - Apr

0 30Km



Larson

Vending machines of the Serengeti



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# Radio-tracking



By car and by air...



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# — Non-invasive measurement of cub body mass



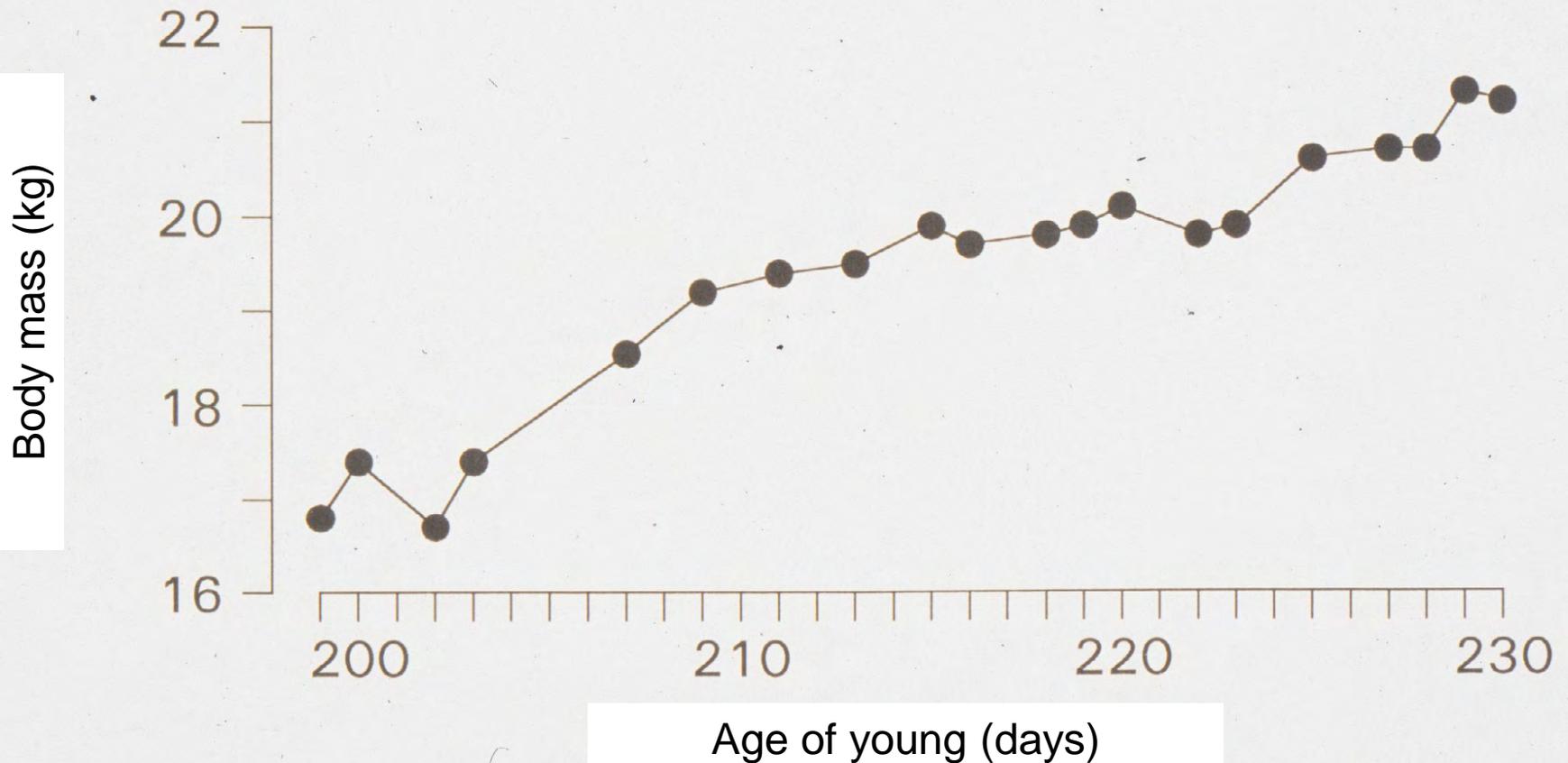


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When the herds are inside the territory...

...mothers kill prey inside the territory and nurse their young every day

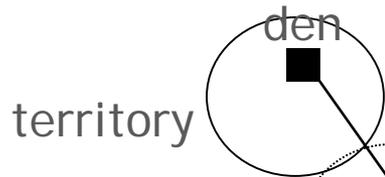




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# When the herds are outside the territory...

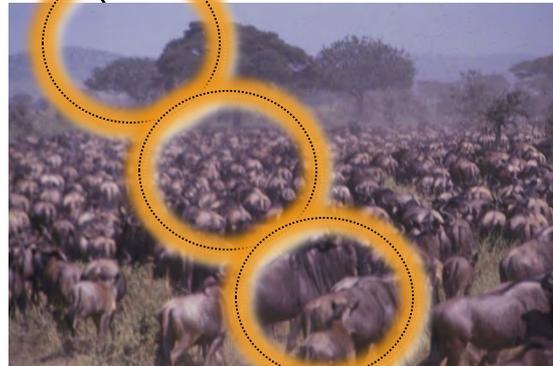


territory

den

...9 months per year...

...all clan members forage outside the territory  
(commute)



distance  
40.2 17.5 km  
(n = 67)



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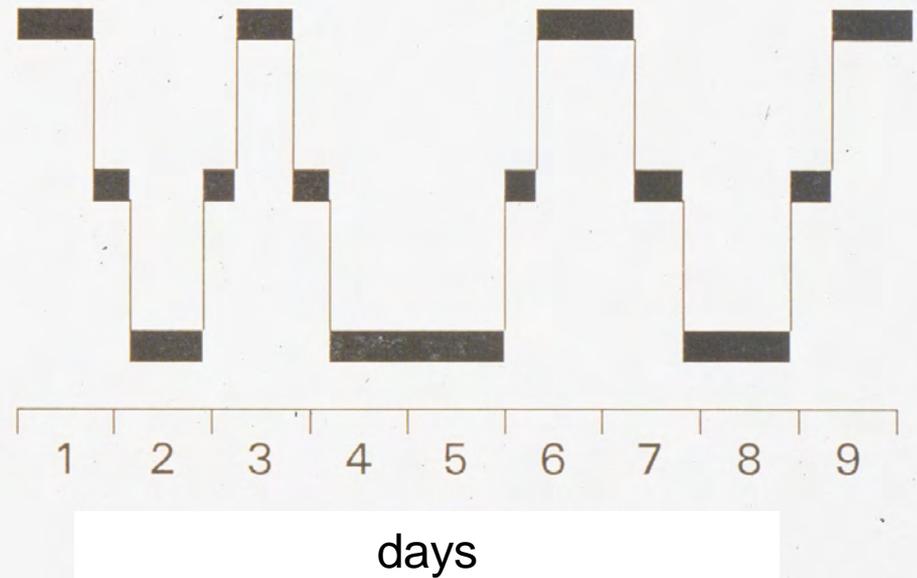
# When the herds are outside the territory...

...mothers commute between the communal den at home and the herds

at home, nursing

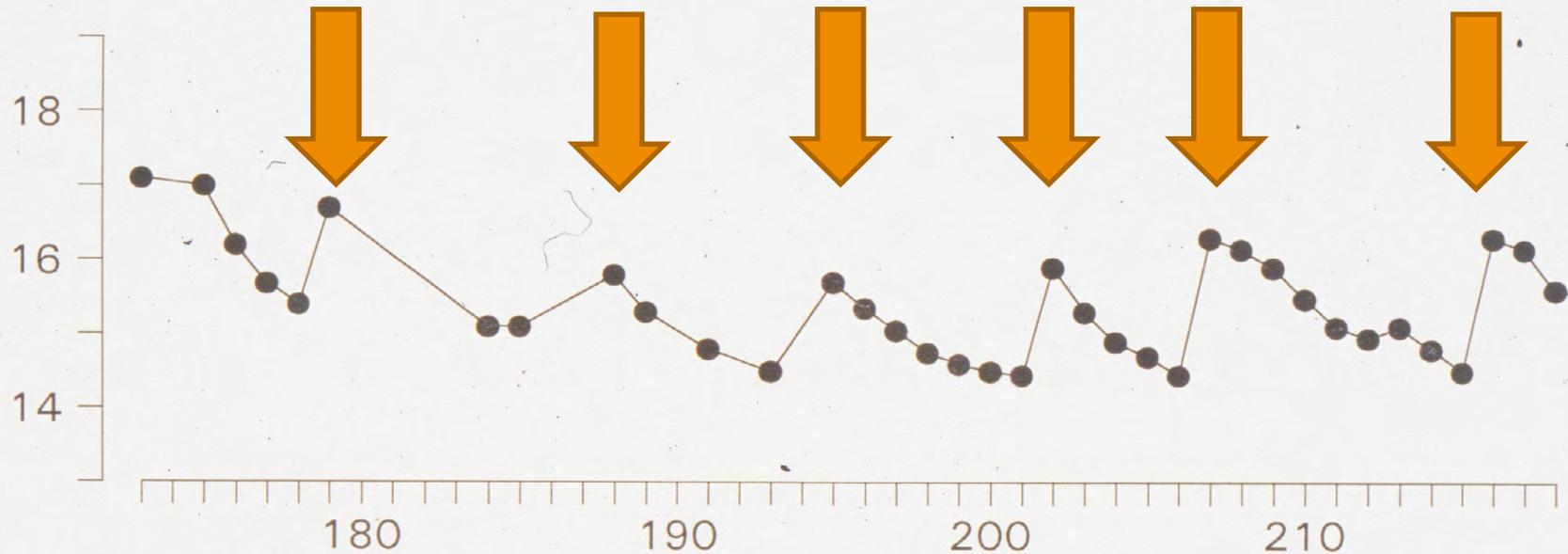
commuting

at the herds



## When the herds are outside the territory...

Body mass (kg)



Age of young (days)



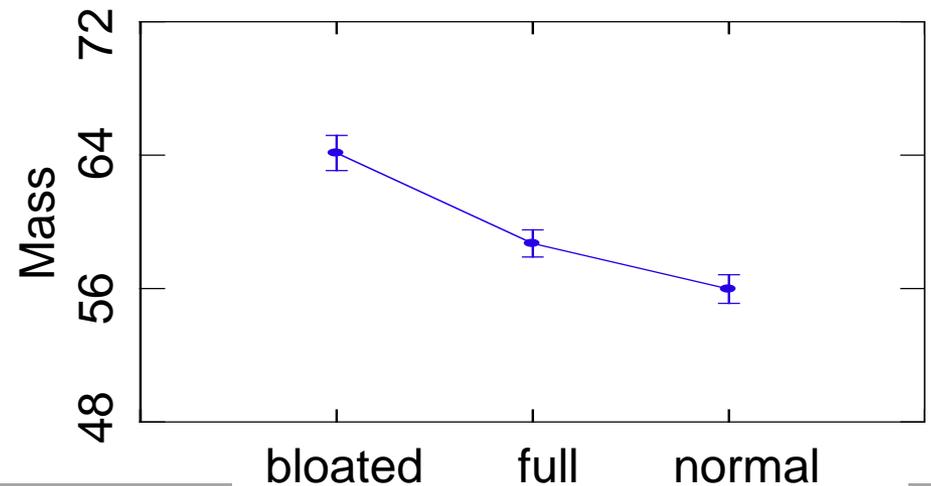
...cubs are nursed only after a few days



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# — Belly score (= degree of stomach fill) I: spotted hyena

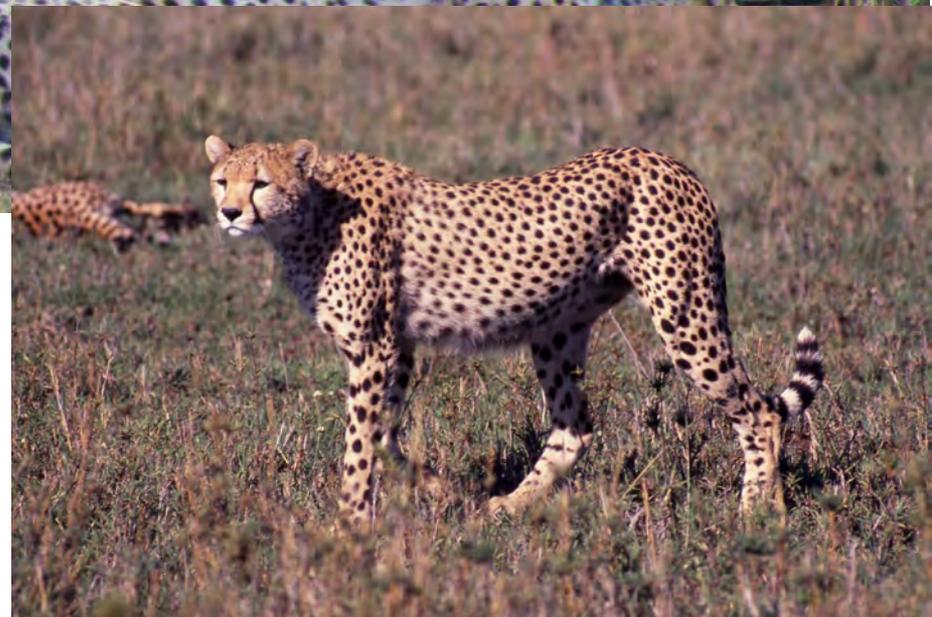




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## Belly score II: Cheetah



# A history of Serengeti research

years	species	action	purpose	Comment
1960s	<b>African buffalo</b> <i>Syncerus caffer</i>	> 100 ♀ shot by NP staff on behalf of PhD student ARE Sinclair	assess reproductive condition / fertility	observations; faecal hormones (validation)
1960s	<b>Wildebeest</b> <i>Connochaetes taurinus</i>	Immobilise & attach orange collars	describe migratory movements	oddity effect: killed < 14 days
2000s	<b>Wildebeest</b> <i>Connochaetes taurinus</i>	Immobilise & attach white GPS radio-collars	describe migratory route in detail	ecologists ignore behaviour
Since 1970s	<b>Lion</b> <i>Panthera leo</i>	Immobilise & attach brown VHF / GPS radio-collars	locate pride to monitor pride demography, also: foraging, movements	whisker spots allow individual recognition
1970s-1980s	<b>Dwarf mongoose</b> <i>Helogale parvula</i>	Capture & freeze-brand dozens of individuals	assess life histories, social behaviour, reproduction	no alternative in this species
1980s	<b>African wild dog</b> <i>Lycaon pictus</i>	Immobilise, attach VHF radio-collars, vaccinate against rabies	monitor population	extinction of Serengeti AWD population
1960s-1980s	<b>Cheetah</b> <i>Acinonyx jubatus</i>	Immobilise & attach brown VHF radio-collars	relocate study animals, foraging, demography	non-invasive since 1996
Late 1980s	<b>Spotted hyena</b> <i>Crocuta crocuta</i>	<b>Immobilise &amp; attach (white) VHF radio-collars</b>	<b>assess spatial organisation, movements</b>	<b>non-invasive since 1991</b>

## Further references

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- o *an update with respect to population consequences in the context of conservation medicine*

Sapolsky R (2001): *A primate's memoirs. Love, death and baboons in East Africa*. Vintage Books, New York

- o *excellent chapter on how to immobilise baboons and avoid destroying the habituation of clever study species*

Stearns BW & Stearns S (1999): *Watching from the edge of extinction*. Yale University Press.

- o *based on first hand accounts, an examination of the mindset of many researchers & conservationists, and how aspirations in science and conservation can go spectacularly wrong*



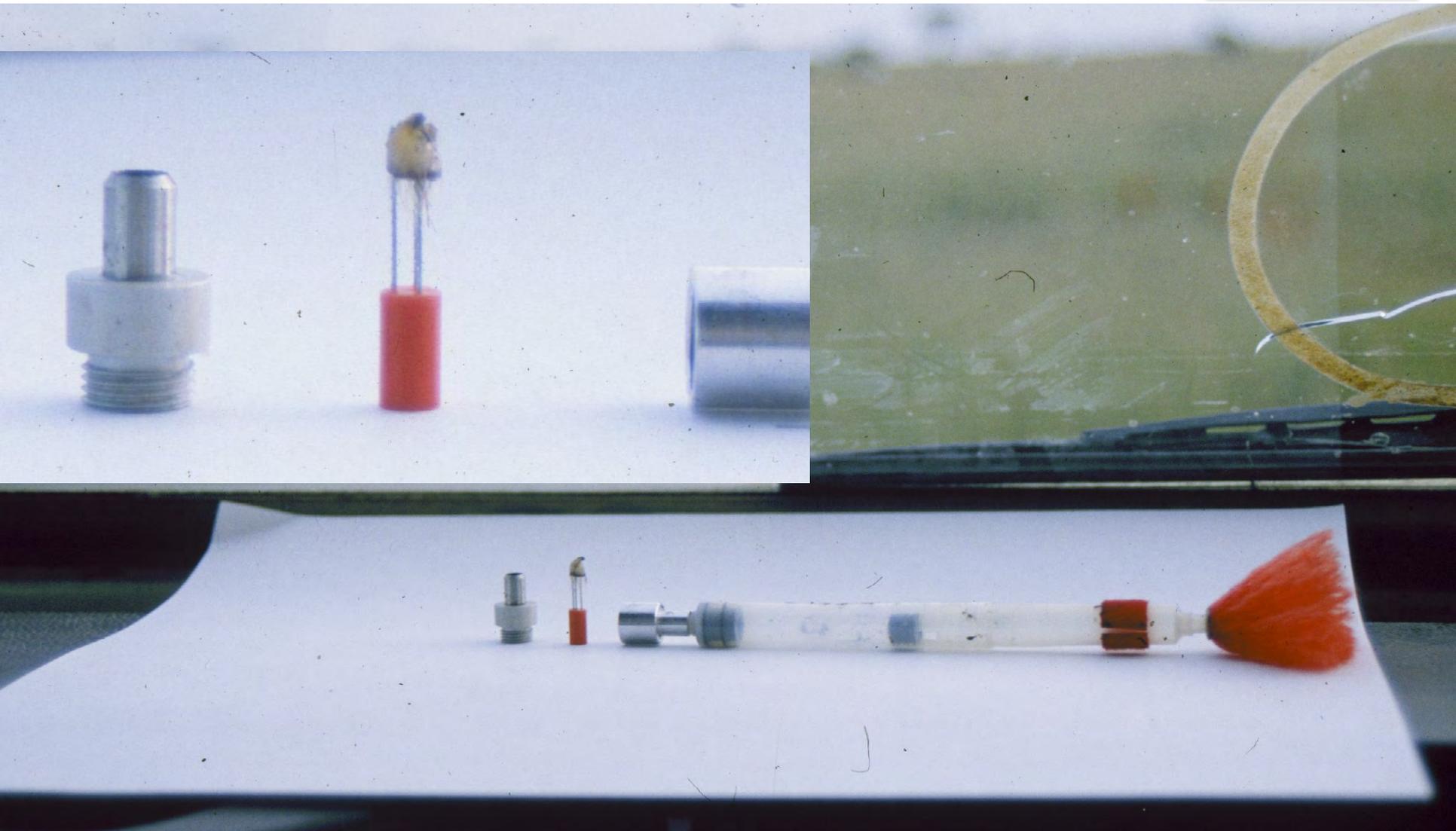




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# Biopsy dart, suitable for spotted hyenas

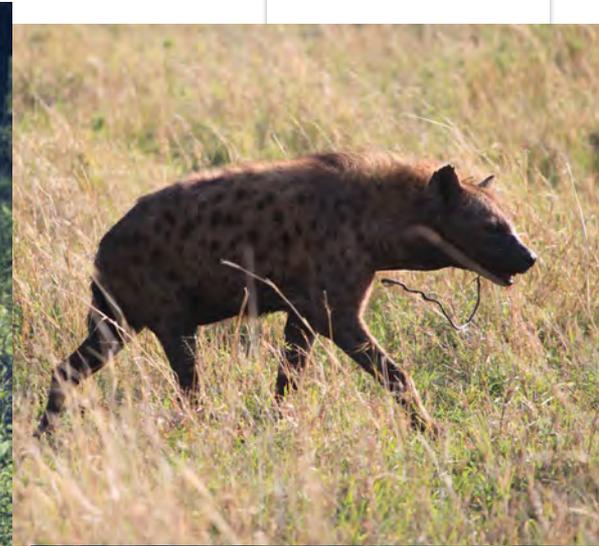




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# Serengeti: "by-catch" through wire snares





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# Anaesthetised spotted hyena and radio-collar

