

Caught in the Act – Assessment of Intensity and Spatial Variation of Cattle Intrusion by a Network of Camera Traps in Tsimanampetsotsa National Park, Madagascar

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Introduction

Keeping livestock is very important for the population living around Tsimanampetsotsa National Park, SW-Madagascar.

During dry season, forage scarcity on communal land and influx of transhumant herds are believed to lead to livestock intrusion in the protected area.

This study determined:

- seasonal and circadian variation of cattle movements in and around the park
- importance of existing paths for herds
- direction of cattle herd movements

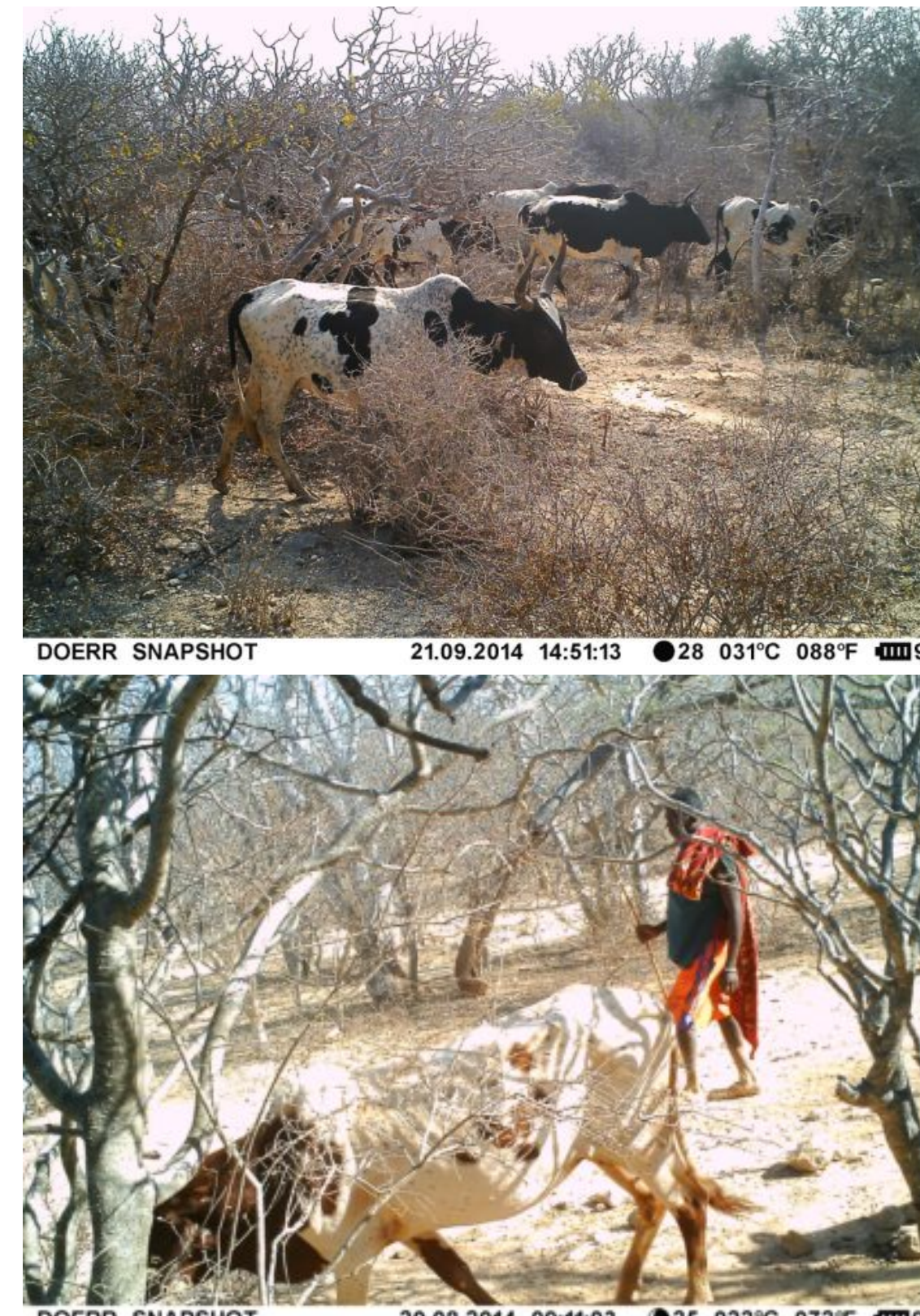


Fig. 1: Camera-trapped cattle in Tsimanampetsotsa National Park

Materials and Methods

- During 2014 dry season (mid-May - mid-Oct), 30 camera traps in 49 locations recorded cattle movements inside and around the park along existing paths.
- Cameras operated for 2.5 months each in the southern and northern region (Fig. 2). The total area covered was 337 km².
- At each triggering event, 3 photos were taken within 1-2 seconds (Fig. 1), followed by a period of deactivation of 15 seconds.
- 4 seasonal periods (1: early dry season - 4: late dry season) of ~1 month each were distinguished. Time of day was subdivided into 5 classes (Fig. 3).
- Depending on results of testing of variables on spatial autocorrelation using Moran's I, statistical analysis used Generalized Linear Models or Generalized Linear Mixed Models, where camera location was treated as random factor.

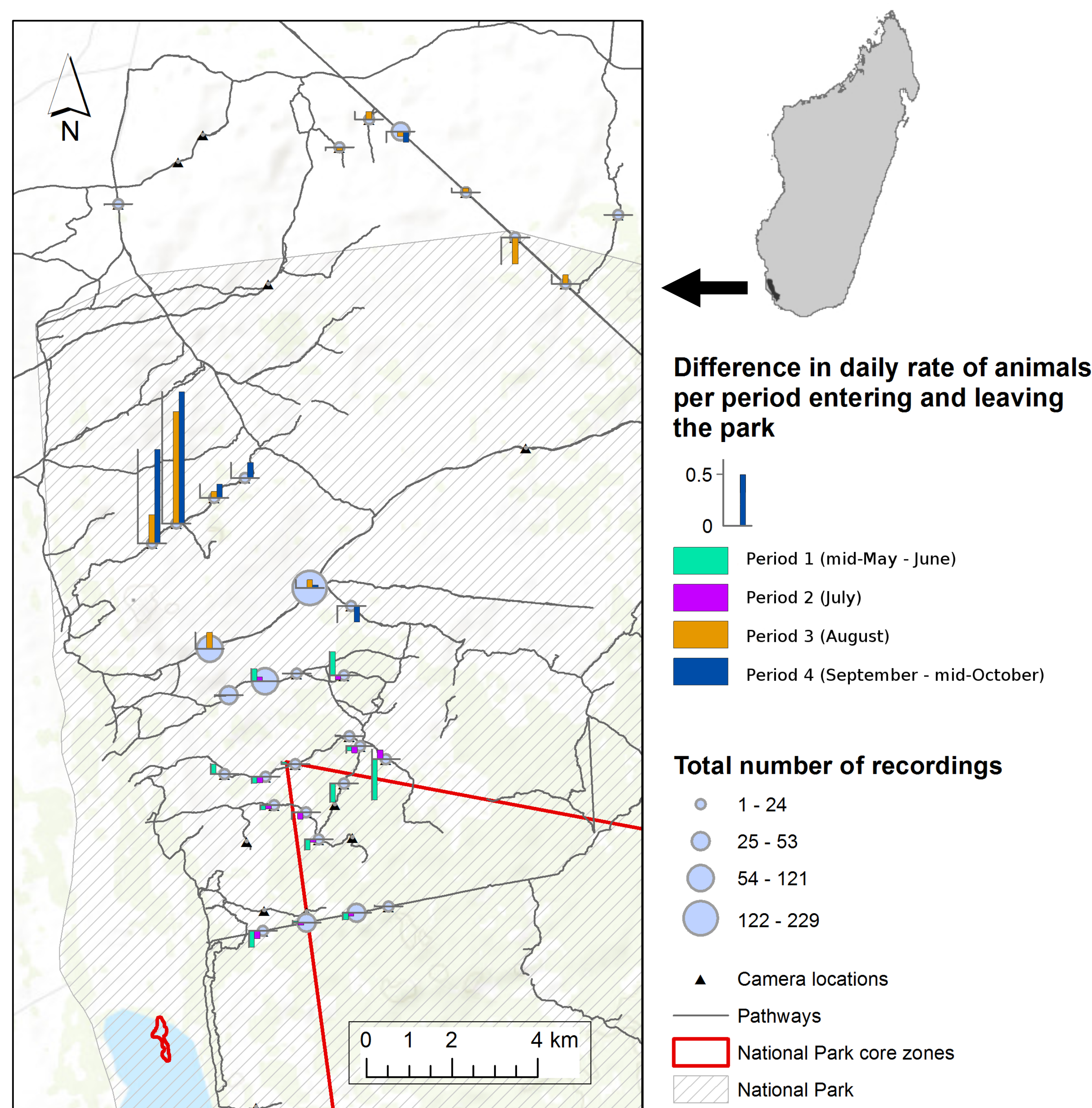


Fig. 2: Location of camera traps along paths in and around Tsimanampetsotsa National Park, their number of recordings during the study period, and mean daily rate of cattle entering (positive bars) or leaving (negative bars) the park per period.

Results and Discussion

- During 1811 operation days, 4'939 cattle were recorded in the park, of which 71.6% were ranging unaccompanied by any herder (Tab. 1).
- The ratio of animals intruding into the core zone is between 5.3 and 17.7% (Tab. 1).

Tab. 1: Total number of recorded cattle, percentage of free-ranging cattle, and percentage of cattle recorded inside the core zone during the 4 seasonal periods

Seasonal period	Number of cattle recorded	% of free-ranging cattle	% of cattle recorded inside core zone
1	1'602	77.0	17.7
2	339	92.9	5.3
3	2'121	61.3	n.a.
4	877	78.3	n.a.

n.a.: not applicable, as no traps were placed in core zone during the period.

- More herds were entering (62.3%) than leaving the park (37.7%).
- Number of recordings and daily animal rate entering/leaving the park varied highly between different trails and camera locations (Fig. 2).
- Since the relation between movement direction and season was not statistically significant, **records primarily reflect daily intrusion for forage extraction, no transhumant movements.**
- Herds most frequently entered the park during afternoon and evening, and generally left in late morning (9-12am; Fig. 3).
- The size of observed herds increased in the course of the day (Fig. 3).
- Herd size and number of recorded herds per day decreased from May to July and from August to October, though during the latter period the change in herd size was not statistically significant (Fig. 4).

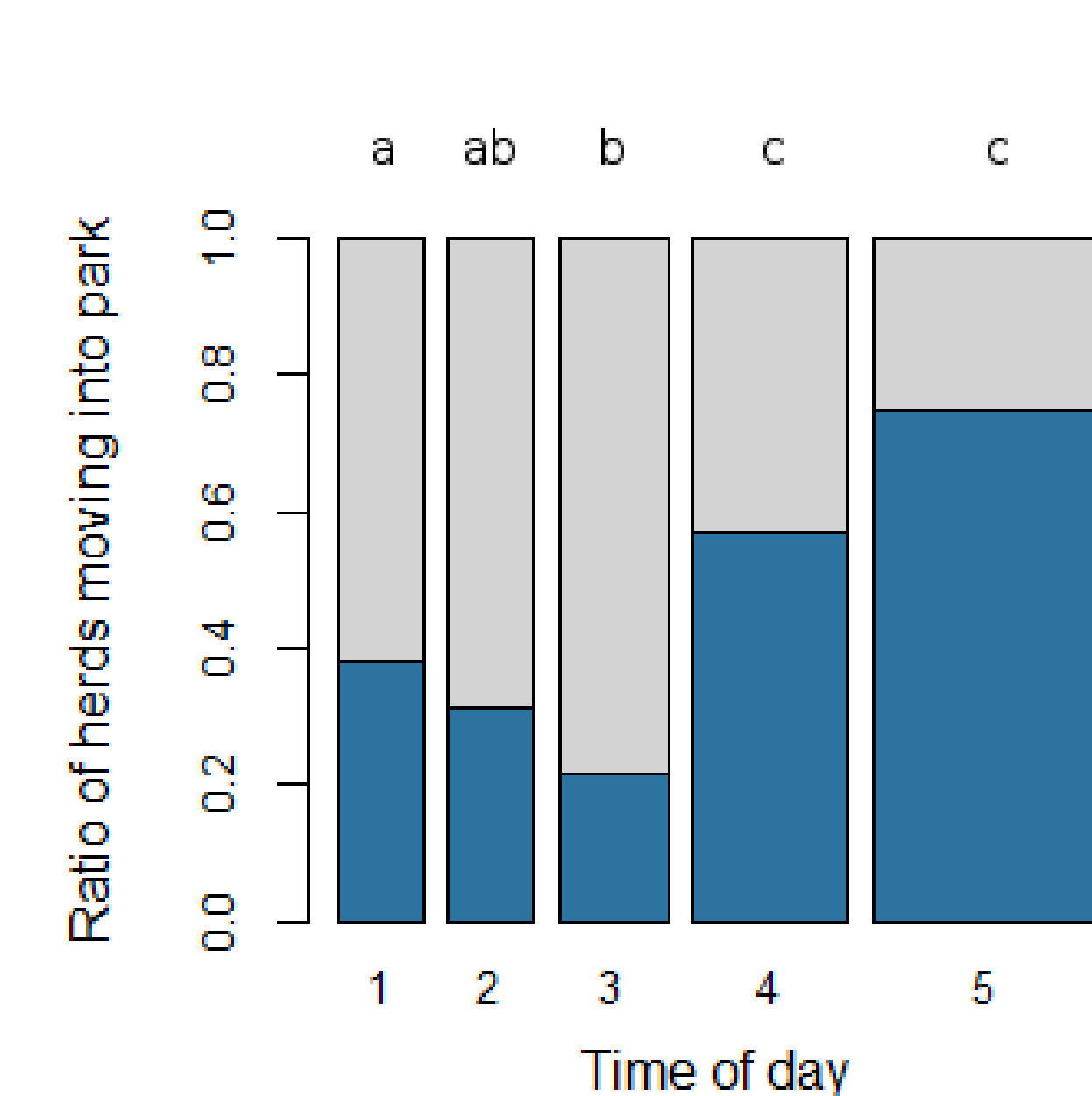


Fig. 3: Percentage of herds to enter (blue) or leave (light grey) the park during each day (1: night, 2: 6-9am, 3: 9-12am, 4: 12am-3pm, 5: 3-6pm); bar width indicates relative size of herds

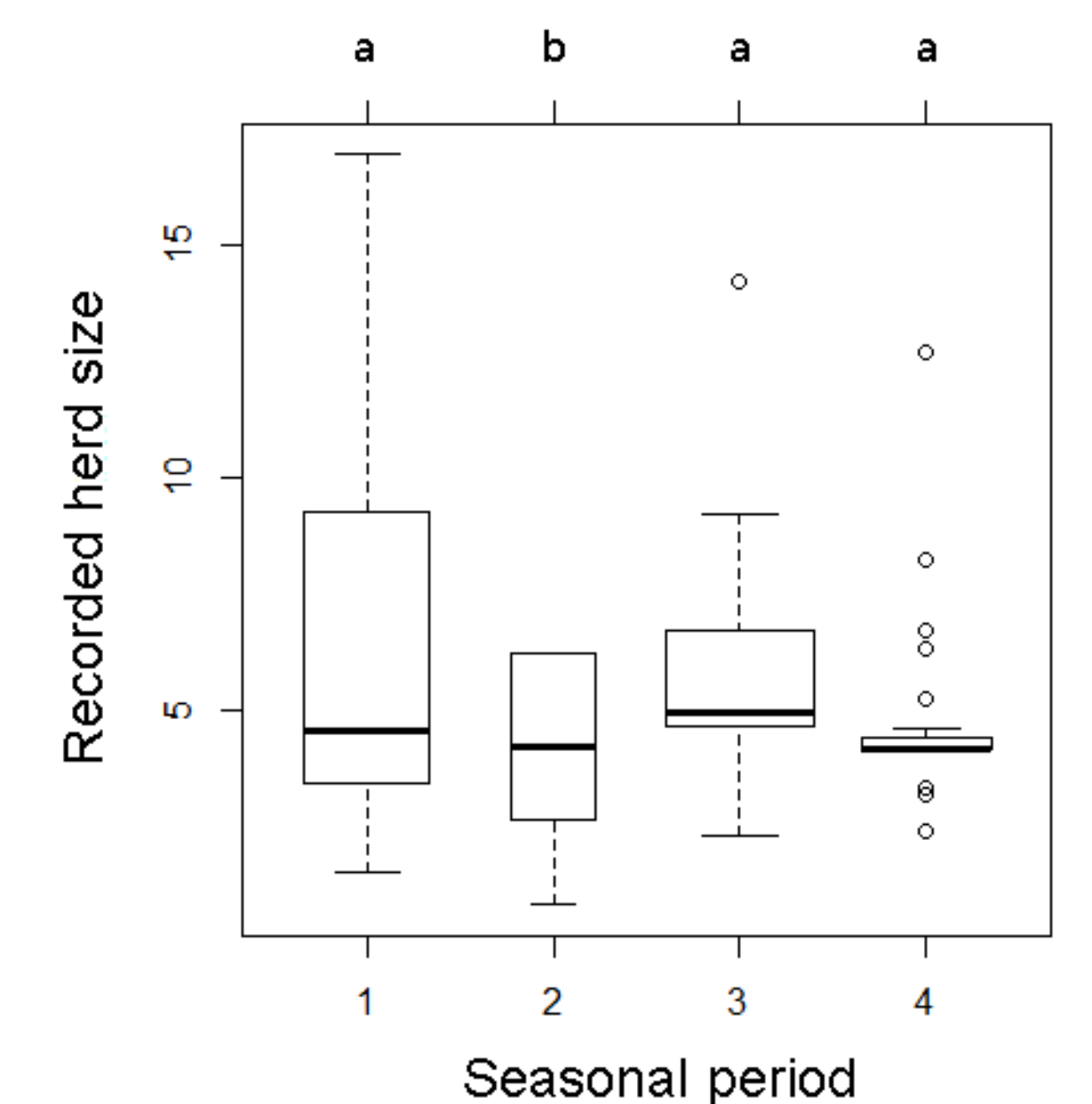


Fig. 4: Herd size during each seasonal period; bar width indicates relative number of recorded herds

Conclusions

- The number of cattle recorded by camera traps in the park indicates a high intrusion intensity during the dry season, even in the core zone.
- Intrusion intensity decreased slightly in the course of the dry season.
- Frequently used trails for daily access to the park and transhumant movements could be identified.
- Profound analysis of the extensive trail network requires longer study intervals and more camera traps simultaneously operating.

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