

COUNTER-STRATEGIES TO INFANTICIDE: THE IMPORTANCE OF CUBS IN DETERMINING LION HABITAT SELECTION AND SOCIAL INTERACTIONS

Appendix 2. Distance-based definition of proximity events, used as proxies for social interactions

Previous studies of carnivore dynamic interactions used lower distance thresholds (than 1km), such as 200m (Benhamou et al., 2014; Rafiq et al., 2020), 500m (Broekhuis et al., 2019), and 800m (Jordan et al., 2017), but using these did not lead to different patterns from when using 100m and 1km distance thresholds (Benhamou et al., 2014; Rafiq et al., 2020). Still, we preliminarily compared, for male-female dyads, the likelihood of simultaneous locations to be considered as being part of a proximity event using several distance thresholds, from 100m to 5km, with the classification of the distances obtained from a 2-state ('close' vs. 'far') univariate hidden-Markov model of the distances (see Figure S2.1 in Appendix S2). On average, 96% (respectively 83%) of dyad locations < 1km (respectively >1km) were classified by the hidden-Markov model as belonging to the 'close' state (respectively 'far' state).

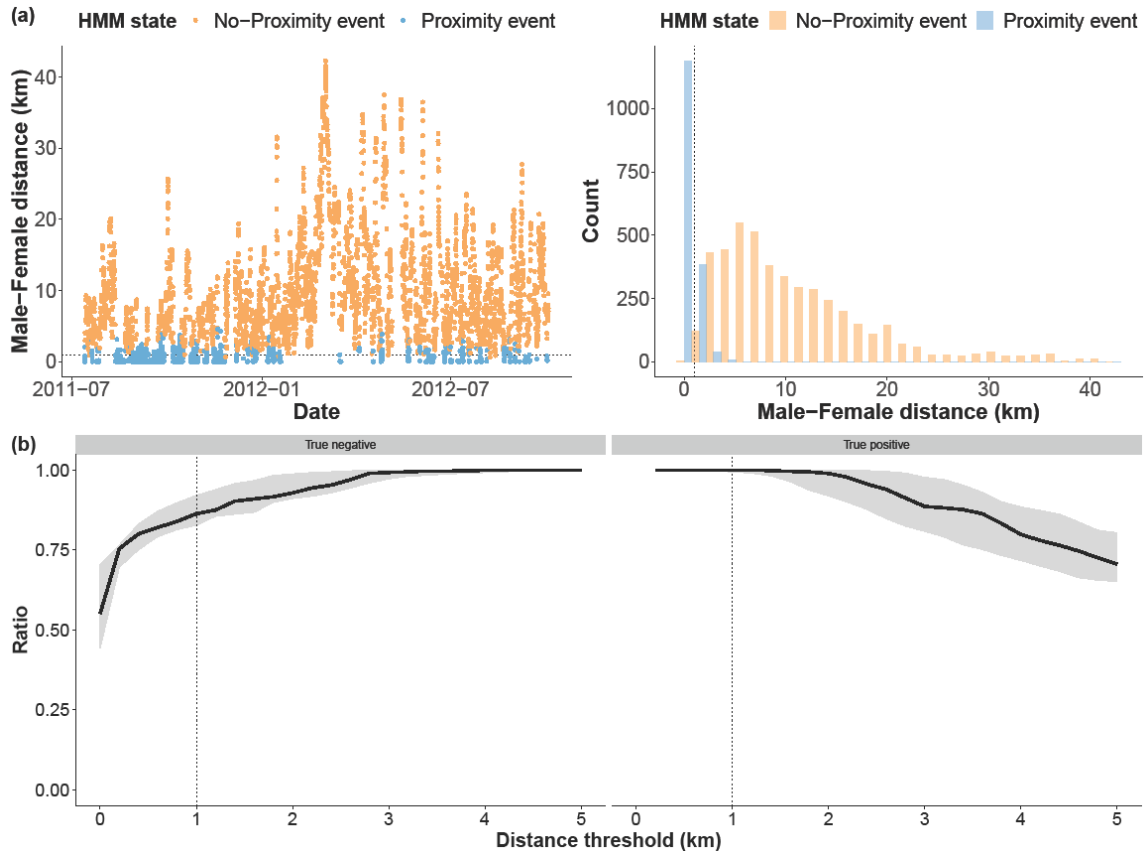


Figure S2.1 Methods to identify male-female interactions: comparison of male-female proximity events estimated by an univariate hidden-markov model based on the dyad distance, and estimated by a distance threshold from 100m to 5km. (a) Illustration of the temporal-dynamic of male-female distances (left) used to identify ‘close’ state (blue) and ‘far’ state (orange) based on the distribution of male-female distances (right). (b) Assessment of potential distance thresholds to identify male-female proximity events. The true negative ratio (resp. the true positive ratio) is the proportion of no-interaction cases (resp. interaction cases) identified by the HMM for which the pairwise distance was further (resp. closer) than the distance threshold. Ribbon extremities represent the first and third quartiles, whereas the black line represents the median value of the true negative and true positive ratios calculated on the 17 male-female dyads. The dotted lines (a-b) show the 1km-distance threshold used in this paper. The HMM model was run by using the R package *depmixS4* (Visser and Speekenbrink 2010)

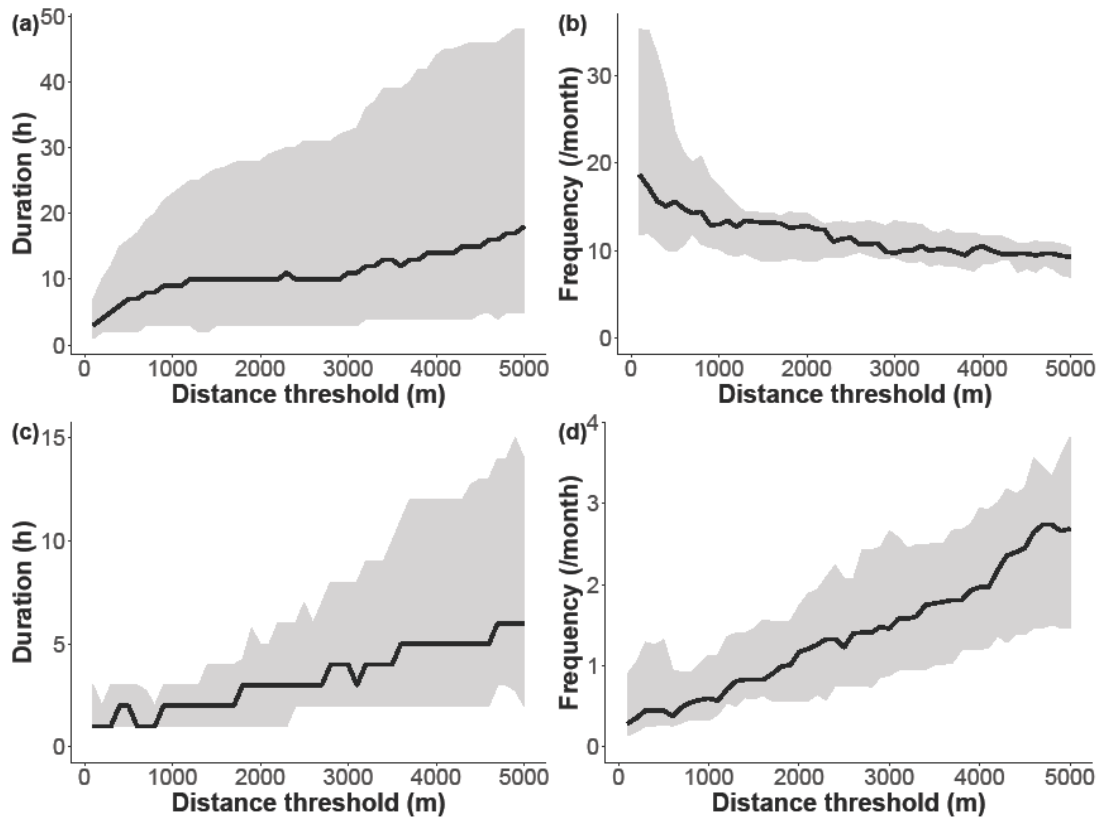


Figure S2.2 Distance-threshold sensitivity of the duration and frequency measures describing the temporal dynamics of male-female (a-b) and male-male proximity events (c-d). For male-female dyads ($n=17$), lower distance threshold induced higher segmentation risk of the proximity bouts and so lower durations and higher frequencies. For male-male dyads ($n=30$), higher distance threshold allows to detect more events of proximity between competing males. Ribbon extremities represent the first and third quartiles, whereas the black line represents the median value of the durations and frequencies.

Reference

Visser, I., & Speekenbrink, M. (2010). depmixS4: An R Package for Hidden Markov Models. *Journal of Statistical Software*, 36, 1–21. <https://doi.org/10.18637/jss.v036.i07>