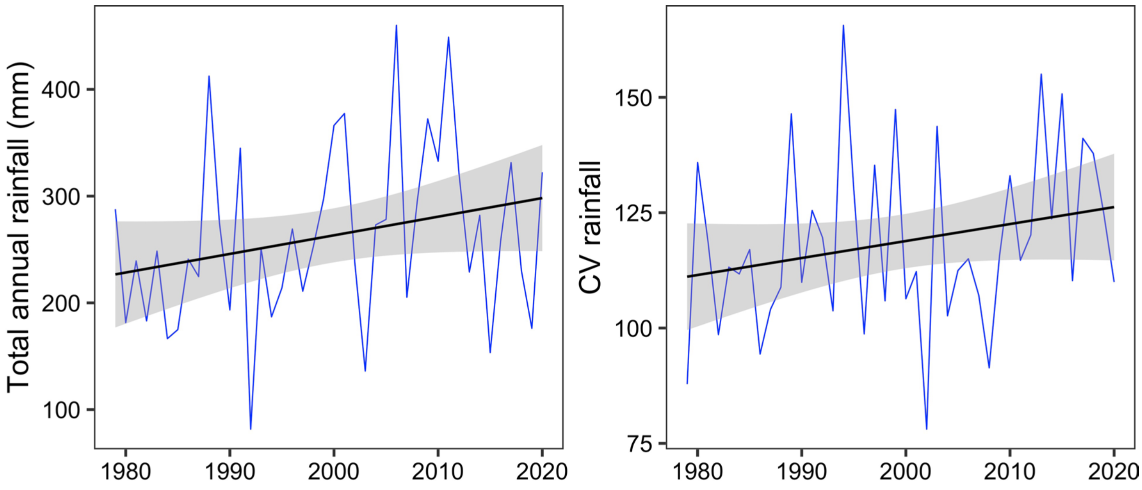
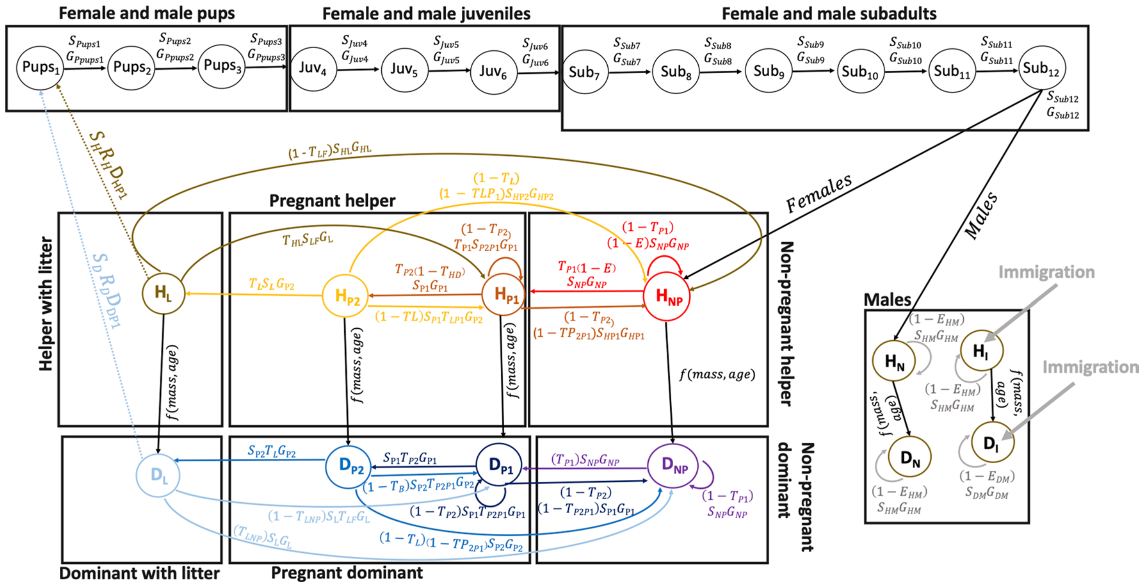
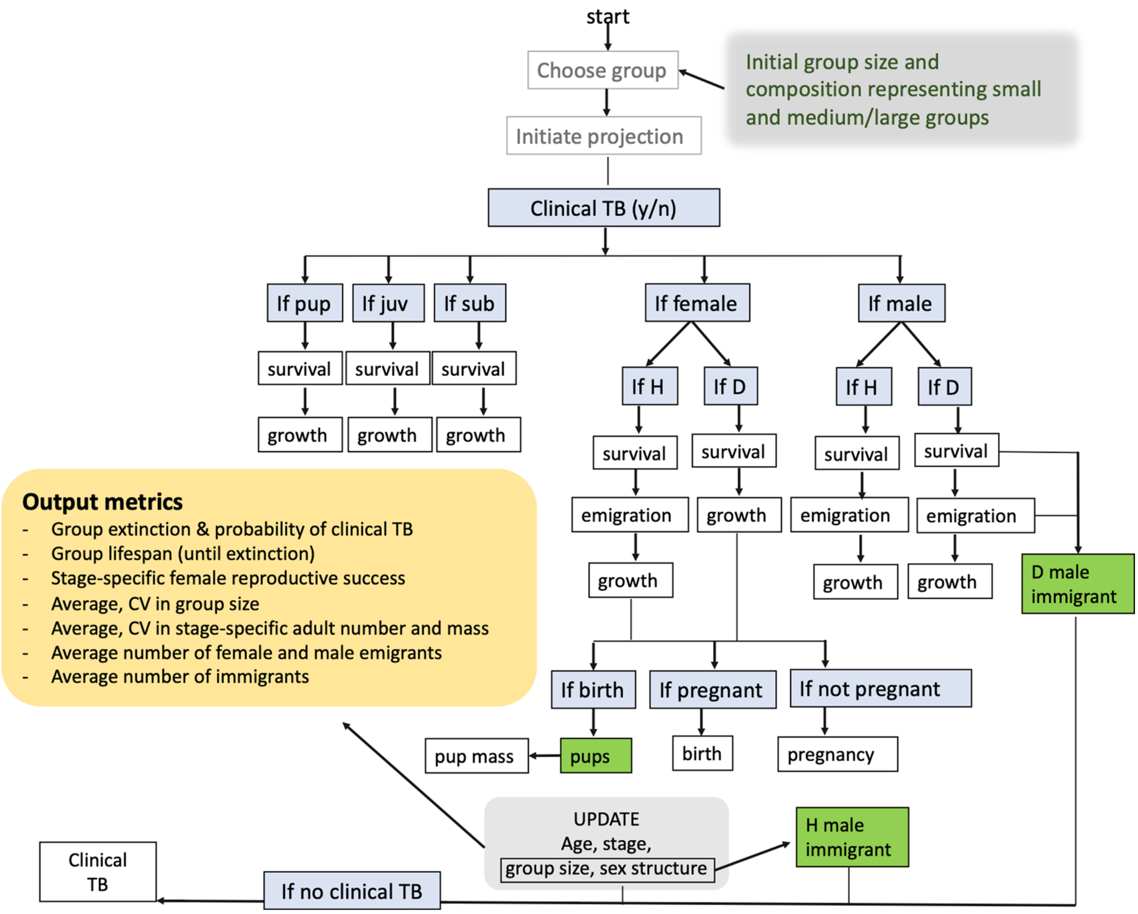


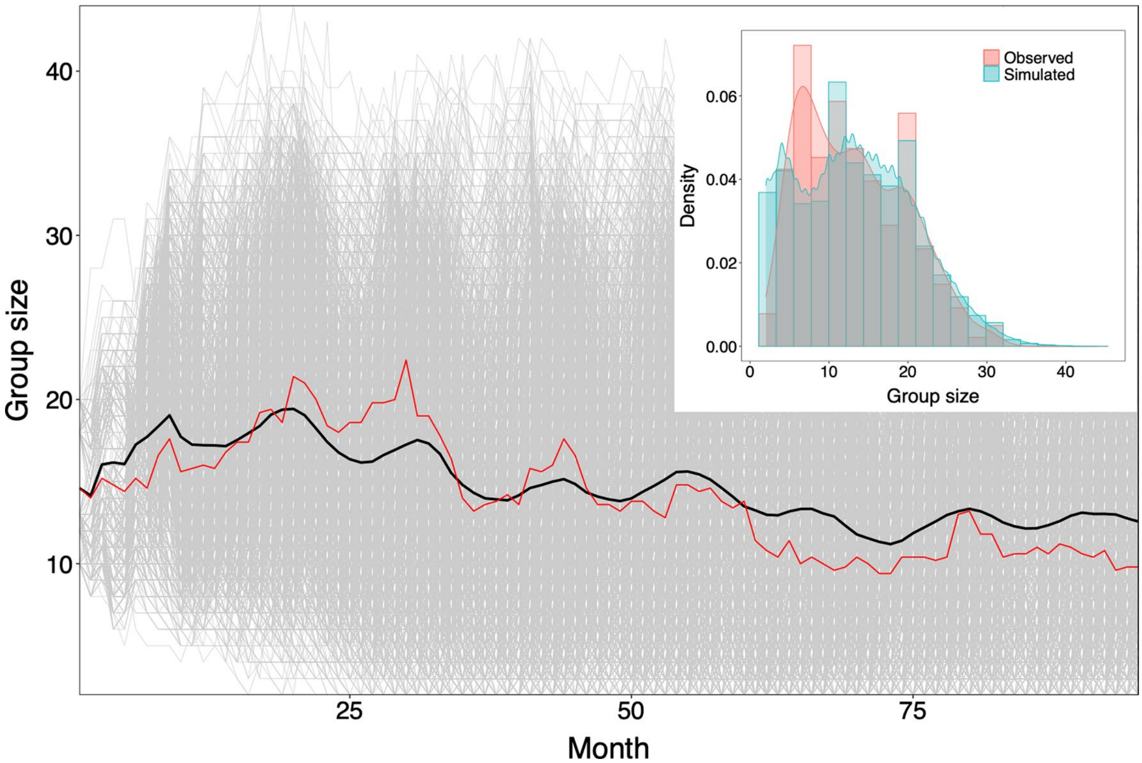
Extended Data Fig. 1 | Annual trends in total rainfall at the study site of meerkat demographic data collection. Blue lines depict observed values, as interpolated by NOAA GPCP Precipitation Data, while black lines depict mean predictions (± 95 % prediction intervals as shaded areas) from simple linear models fit to rainfall values through time.



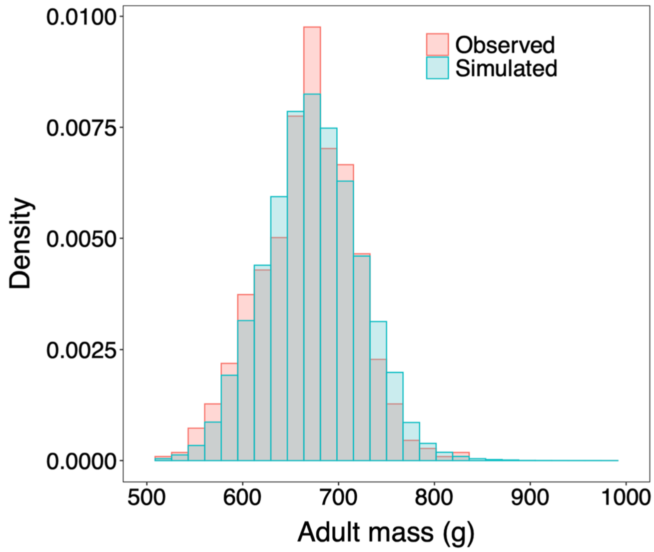
Extended Data Fig. 2 | Life-cycle diagram of Kalahari meerkats (*Suricata suricatta*) from which the individual based model was parameterized. Circles depict life-history stages. Rectangles depict nine major stages to aid visualization. Transitions (T) among stages, depicted by solid arrows, occur in discrete one-month intervals. Transitions depicted by black arrows are deterministic (*that is*, depend on rules set in the IBM and not on sampling from a distribution). Other transitions include survival (S) and, conditional on survival, growth (G). Adult helper (H) and dominant (D) females transition among pregnancy categories: first-month pregnant (P1), second-month pregnant (P2), and with their own litter of dependent, weaning pups (L). NP transition to P1 or remain NP. P1 either transition to P2 or abort. If they abort, they can become P1or NP. P2 give birth to a litter and wean it for a month (L), or they abort. In the latter case, they transition to P1 or NP. Females with litters (L) can remain NP or become pregnant again (P1). Surviving adult dominant and helper females contribute new recruits (R) of a given mass distribution (D) to one-month old pups, depicted by dashed arrows. Survival and growth of adult dominant and helper males (M) differ depending on whether the male was natal (N) to the group or immigrated (I) into a group.



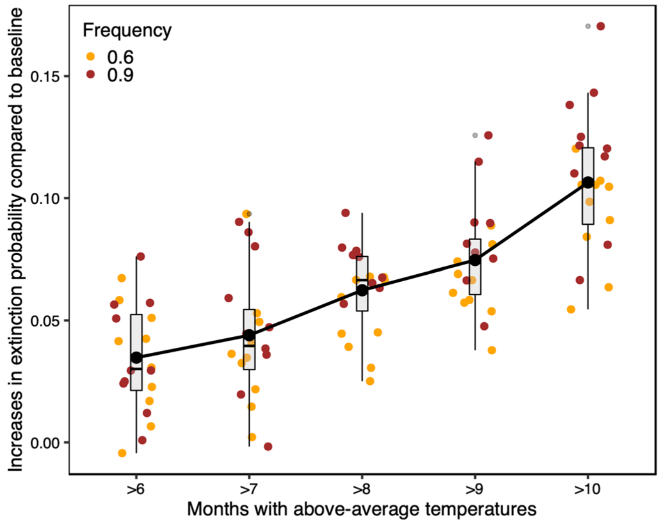
Extended Data Fig. 3 | Structure of the individual-based model (IBM) to simulate meerkat group dynamics. White/green boxes represent models of stage-specific demographic rates and group transition to a TB state, while blue boxes show conditions to decide the structure of a given demographic-rate model. Green boxes represent models in which new individuals are added to the group (through birth or immigration). Stages include pups, juveniles (juv), subadults (sub), and adult helpers (H) and dominants (D). The IBM is initiated with a group under specified characteristics (grey box; see Supplementary Table 3.1), and individuals go through life events (modelled probabilistically) in distinct one-month steps. At the end of each month, individual and group characteristics are updated, new individuals can immigrate into the group, and the group can remain without apparent TB cases or show clinical TB cases for the first time (upon which the entire group is considered TB affected). Monthly simulations of group dynamics are based on different scenarios of climate change. For each simulation, several output metrics are calculated.



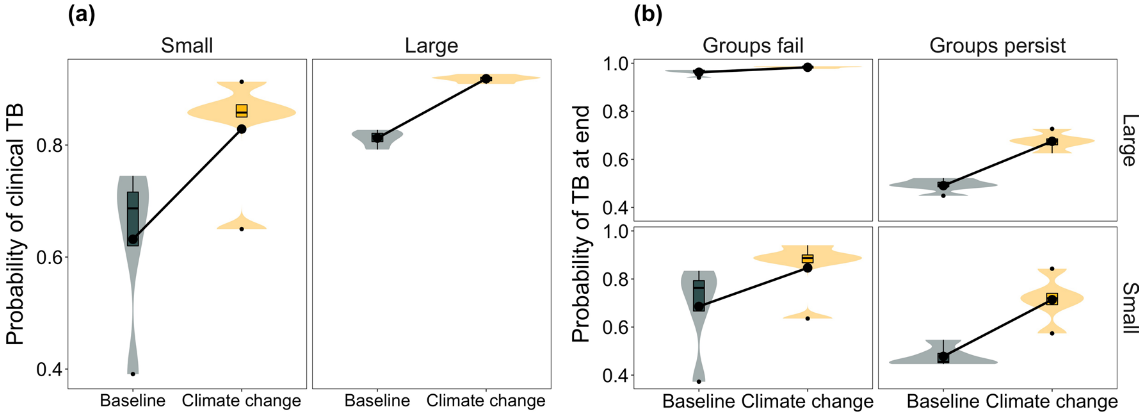
Extended Data Fig. 4 | Simulated meerkat group sizes overlap the distribution of observed group sizes. Simulations were based on an individual-based model which projected dynamics of 10 groups in discrete monthly intervals for the entire life span of a group starting from a specific date. Group size refers to the number of subadult and adult individuals (> 6 months old). Red line: Average observed group size for groups that were monitored for > 6 years. Black line: average simulated group size across 1000 simulation runs from IBM simulations initiated with large group sizes. Grey lines: group size in each simulation run. Insert shows distribution of all simulated and observed group sizes. Total number (n) of data points to calculate observed and simulated distributions in insert is n = 650 and n = 256076, respectively. The higher discrepancies between observed and simulated values at lower group sizes in the insert is due to demographic stochasticity implemented in the IBM, which has a higher impact in smaller groups, causing more variable simulation outcomes compared to observed data.



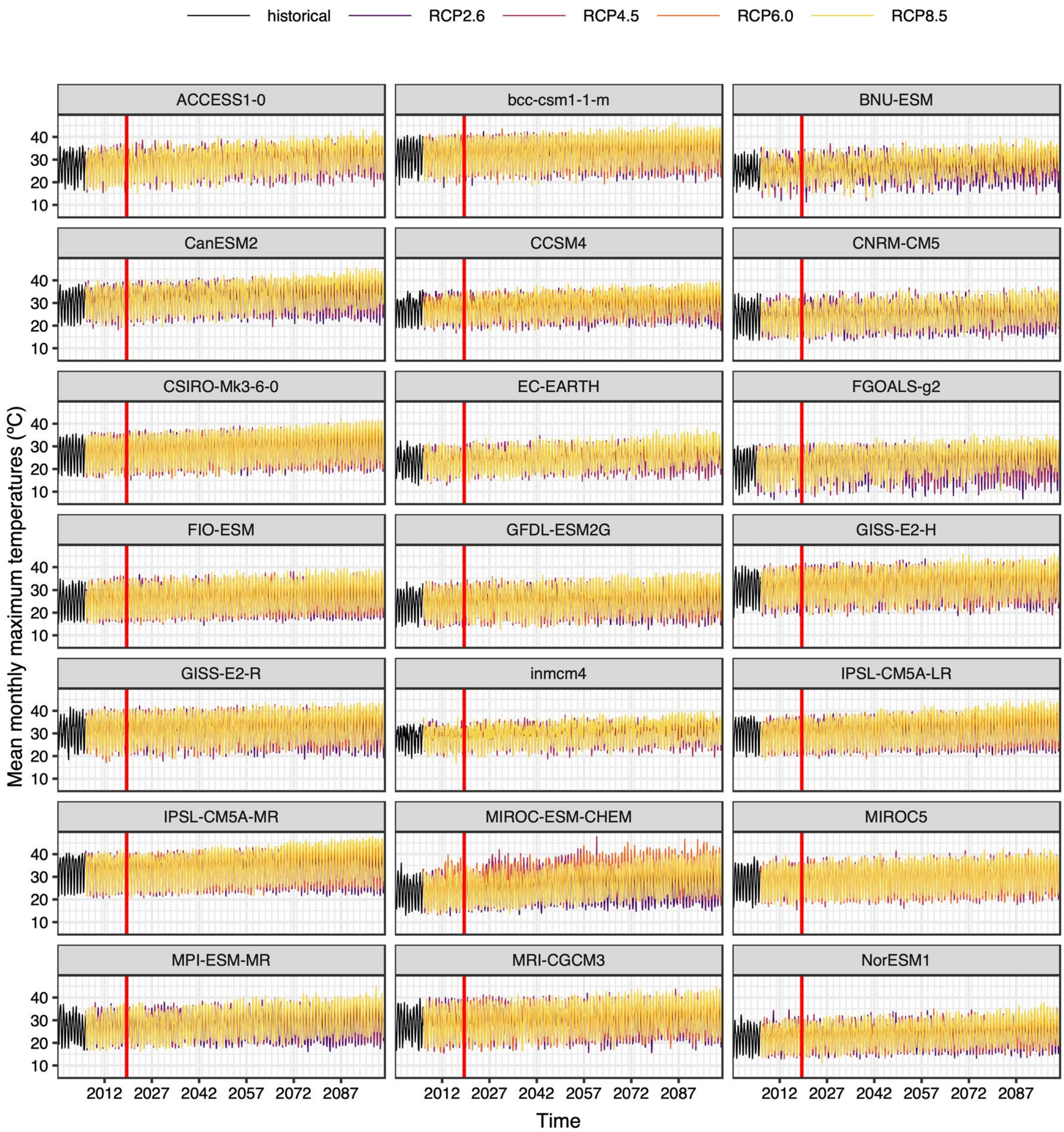
Extended Data Fig. 5 | Simulated adult mass of meerkats falls within the distribution of observed masses. Simulations were based on an individual-based model which projected dynamics of 10 groups, including mass change, in discrete monthly intervals. Total number (n) of data points to calculate observed and simulated distributions is n = 647 and n = 256076, respectively.



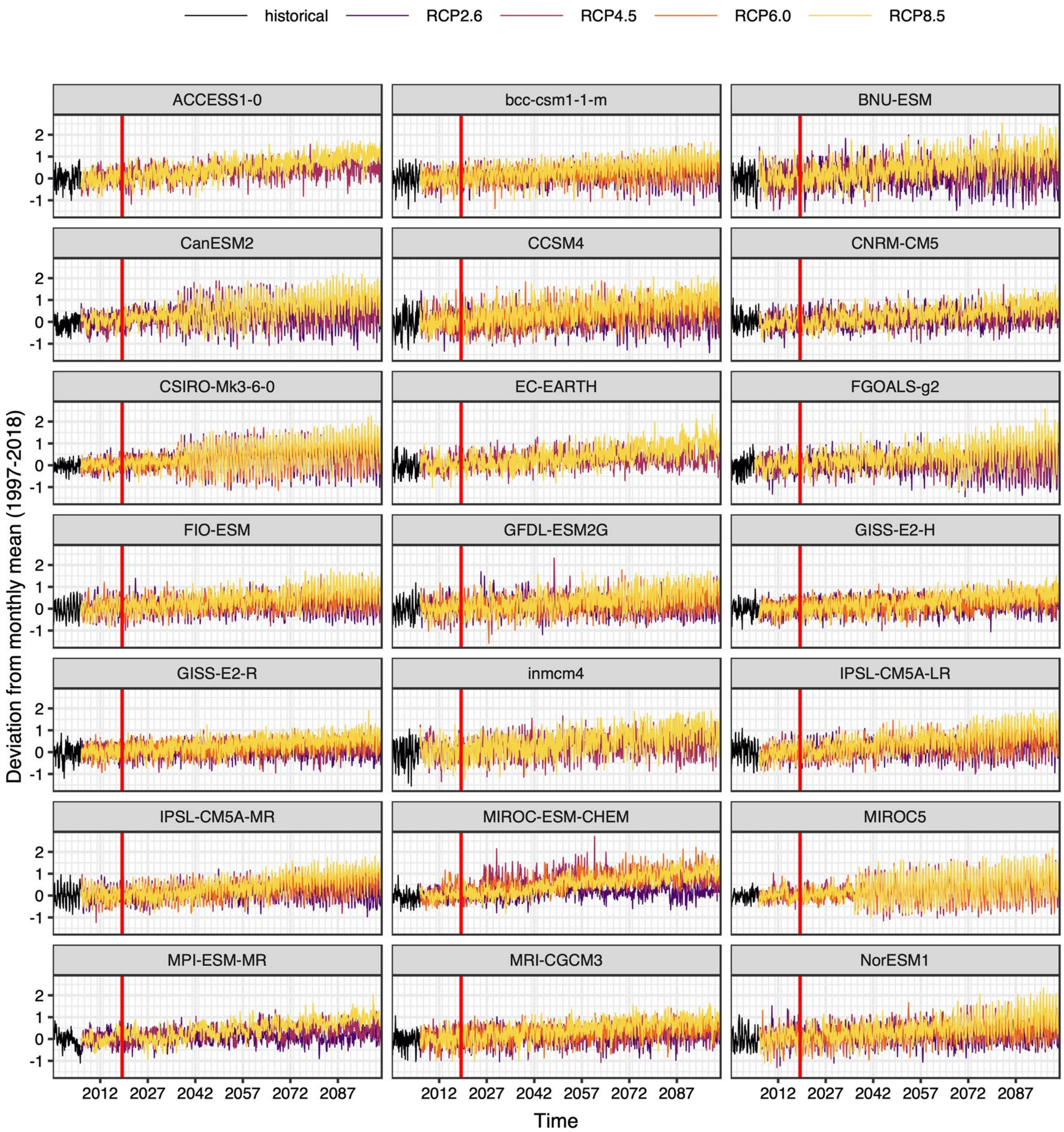
Extended Data Fig. 6 | Proportion of IBM simulations that result in group extinction increases under scenarios of higher temperature extremes. Boxplots summarize the distribution of changes in group extinction probability (proportion of 1000 total simulations that result in group extinction), compared to a baseline, when increasingly more extreme years are sampled in IBM simulations (scenarios are depicted on the *x* axis). Red/orange points show changes for the ten initial group sizes and two probabilities with which extreme years were sampled in simulations. Back points depict average values for each scenario connected by lines to better visualize changes in extinction probability.



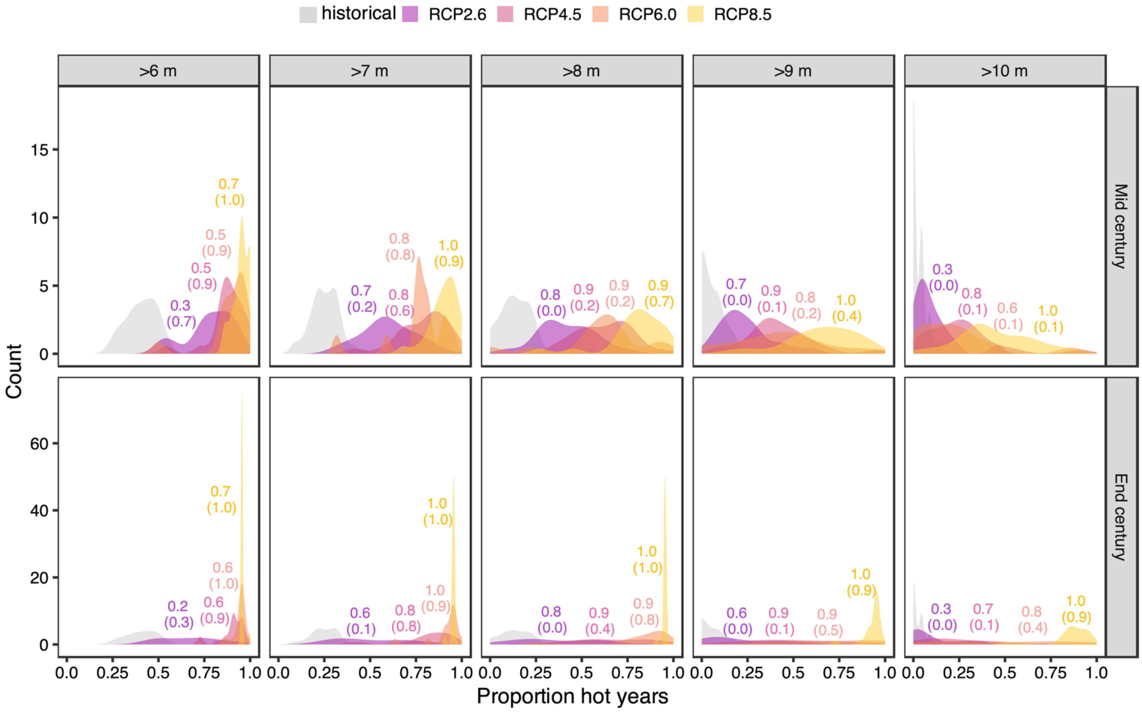
Extended Data Fig. 7 | Effects of climate and TB perturbations on relationship between group extinction and clinical TB. Boxplots and violin plots show the distribution of (a) the proportion of 1000 IBM simulation runs that resulted in clinical TB occurring in groups within 12 years among 10 IBM configurations initiated with different group characteristics. The simulations were run under either a baseline scenario (no climate change) or sampling temperature and rainfall from extreme years (2015 & 2016) with probability of 0.75 (climate change). In (b), distributions (across IBM configurations initiated with small or large group sizes) show the proportion of simulations where clinical TB occurred in at least the last three months prior to group failure or prior to the end of simulations (12 years).



Extended Data Fig. 8 | Temperatures become more extreme in the future under four greenhouse-gas Relative Concentration Pathways (RCPs) across different global circulation models (GCMs). Plots show values of historical (1997–2018) and future (2019—2100) monthly means of maximum temperatures for four RCP across 21 GCMs (different subplots; see Supplementary Table 3.2 for details on GCMs). Red horizontal line depicts year 2019.



Extended Data Fig. 9 | Temperatures deviations become more extreme in the future under four greenhouse-gas Relative Concentration Pathways (RCPs) across different global circulation models (GCMs). Plots show monthly standardised deviations from long-term (1997–2018) seasonal means of historic (1997–2018) and future (2019–2100) monthly maximum temperatures for four RCP across 21 GCMs (different subplots; see Supplementary Table 3.2 for details on GCMs). Red horizontal line depicts year 2019.



Extended Data Fig. 10 | Climate-change impact risks for the Kalahari. Plots show the distribution of GCM outputs as proportion of hot years (that is, >6, 7, 8, 9, or >10 months if above-average temperatures) by mid century (2041–2061) and end century (2079–2100) for each Relative Concentration Pathway (RCP) and historic/current conditions (1997–2018). Number indicate the proportion of models for which hot years in each category will at least double; and numbers in parentheses indicate proportion of models for which hot years will occur with a probability of > 0.75.