**Supplementary Online Material S1**: Expected changes in activity patterns of Aldabra giant tortoises with a projected temperature increase of 3˚C.



**Methods**

To visualise the observed patterns of activity of giant tortoises and predict the changes in activity patterns under climate change, we used data from Falcón et al. [1], available at <https://datadryad.org//resource/doi:10.5061/dryad.b4v22>. Briefly, Falcón et al. [1] derived activity patterns of Aldabra giant tortoise on Aldabra Atoll, Seychelles, based on accelerometer (ACC) data obtained from data loggers deployed on eight tortoises for a period of two years (activity time: 06:00–24:00; years: 2012-2013). ACC data was recorded in five minutes intervals for a burst of five seconds during which 36 voltage readings were recorded. They assigned the state of tortoises as either active (1) or inactive (0) for/within each five-minute period by using a rolling mean of the standard error (SE) of the ACC data to capture the fluctuations in the ACC waveform. To create binary data for the activity state of tortoises, the threshold of the rolling average SE was set to five, and the activity data was then coupled with air temperature readings obtained from a weather station located at the research station on Picard Island, which was collected every five minutes. In addition to air temperature, for this paper, we also used solar radiation because solar radiation is known to influence the thermoregulatory behaviour and dynamics of ectotherms.

We performed all visualisations and analyses using R v. 3.3.0 [2]. To visualise the observed activity patterns of giant tortoises, we fitted non-parametric locally weighted regressions using the nearest neighbour approach (loess; with t-based approximation 95% CI), using the package ‘ggplot2’ [3]. To construct the generalised linear mixed effects model (GLMM) for the activity data, which explained the factors affecting tortoise activity patterns, we used the function ‘glm’ from package ‘stats’ following Zuur et al. [4]. We specified the following fixed effects in the model: time, season (wet and dry), air temperature, solar radiation, and tortoise ID on tortoise activity (active or inactive state; using logistic regression analysis with binomial family and link “log”). The analysis was limited to 06:00–20:00, and the wet season comprised the months November–April and the dry season May–October. To account for the non-linear relationship between activity and time, we discretised continuous time into four periods (I– IV), following the overall activity turning points through time, and comprising 06:00–08:00, 08:15–13:30, 13:45–17:30 and 17:45–20:00, respectively (see S1 in Supplementary Information in Falcón et al. 2018). To predict the activity patterns of Aldabra giant tortoises under climate change (i.e., increasing temperature), we assume a temperature increase of 3˚C [5], and left all the other fixed effects unchanged. We then used the function ‘predict’ of R package ‘stats’, which uses the fitted GLMM (with the observed data) in combination with the desired values for the fixed effect(s) to be manipulated (expected temperature increase under climate change) to predict the values of the response variable (probability of giant tortoise activity). Thus, the resulting activity pattern represents the predicted response to an increase in temperature of 3˚C assuming no changes in precipitation patterns nor in the other fixed effects.

**References**

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