Electronic Supplementary Material

Climatic Change

Phenological tracking of a seasonal climate window in a recovering tropical island bird species

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Supplementary Methods

Ecological data

The majority (> 90%) of birds entering the Mauritius kestrel population in the Bambou Mountains are fitted with coloured leg rings (Senapathi et al. 2011) and can be identified by sight without the need for recapture. Intensive monitoring takes place in the breeding season, and teams start to visit known nest-sites in September. Inactive nest-sites are repeatedly checked to ensure that no breeding attempts are missed. Active nests are systematically monitored during the breeding season, and chicks are ringed and measured at 12–28 days of age, before they leave the nest (Nicoll 2004). Active nests are visited as often as possible within the constraints of the availability of field workers. Data are usually collected on first egg-laying date (FED), clutch size and number of fledglings. Where possible, the identity of the female and male are noted and from this the age and prior breeding experience of the pair can often be deduced. Data are also available on nest-site and territory characteristics. For the majority of clutches, visits take place at least once during the laying period and again to determine the total clutch size (Nicoll 2004). Longer gaps between visits can create uncertainty in data on clutch size and FED. Precise egg-laying dates are rarely recorded during fieldwork, thus standardised back calculations, based on data from a sample of nests visited daily, are used to estimate laying dates (Nicoll 2004). These calculations are applied when a nesting attempt is discovered prior to or during laying or when the complete clutch has been laid, although not when a clutch does not hatch or the clutch size is unknown. For these calculations, the incubation period is assumed to be 29 days (based on a range of 28–30 days), with incubation assumed to start when the penultimate egg is laid and a 3-day interval assumed between the laying of each egg (Nicoll 2004). Fieldwork continues until the end of February when the last chicks are usually fledging. The majority (> 90%) of breeding pairs are located and monitored each year (Senapathi et al. 2011). The data used in this study are drawn from 911 documented breeding attempts from 1988/1989 to 2014/2015; in this study a breeding attempt is defined as the laying of at least one egg.

Meteorological data

Quality control was carried out on rainfall and temperature data, including homogeneity tests and removal of consecutive repeat precipitation values. Homogeneity tests were carried out using R package *iki.dataclim* (Orlowsky 2014). Homogeneity tests on annual rainfall and temperature indices identified a break point (an abrupt change within a time series) in the Plaisance temperature data in 1975–1976 or 1985; this could have resulted from changes in data collection, but no adjustments were made to attempt to compensate for break points, as this is a challenging process for daily data and break points can occur because of genuine climate variation (Aguilar et al. 2003).

The cyclone best-track data comprise 6-hourly estimates of the location (latitude and longitude) and intensity (usually estimated as maximum sustained wind speed) of every recorded tropical cyclone during varying periods of record in each world region. Inhomogeneities in intensity estimation in the Indian Ocean dataset exist owing to the repositioning of a satellite and thus improvement of the view angle in 1998 (Elsner et al. 2008; Kossin et al. 2013). These inconsistencies are difficult to remove without re-analysing satellite images (Kossin et al. 2013), and they may affect the cyclone data used in this study.

Base models for exploratory analyses

A selection of candidate base (or background) models (e.g. Öberg et al. 2015) were tested and one selected before climate impacts were analysed. Details of the explanatory variables included in candidate base models are provided in Supplementary Table 1. Measures of prior breeding experience and age were included as linear terms and quadratic terms, as spline analysis and previous studies indicated quadratic relationships. All candidate base models for fledgling production, egg survival and clutch size included FED because it is known to directly affect breeding success and influence the exposure of each breeding attempt to weather conditions. Annual population density has been shown to influence clutch size and fledgling production in Mauritius kestrel breeding attempts (Nicoll 2004; Nevoux et al. 2011), although this pattern may be a consequence of more lower-quality territories becoming occupied as population density has increased (Nevoux et al. 2011). Cartwright et al. (2014) found that local density around each territory did not have an important influence on egg survival. In the present analyses, annual density was not included because an effect was only evident when FED was included in models, thus the effect may be an artefact of changes in FED. Year was included as a random effect in place of annual density as a fixed effect.

Climate indices for exploratory analyses

Details of the climate indices tested for effects are provided in Supplementary Table 2. Extreme rainfall events were defined as those exceeding the 90th percentile of all raindays ($\geq$ 1 mm) in the season of interest, aggregated from the base period 1990/1991–2014/2015. The 90th percentile (rather than the 95th or 99th) was chosen to maximise the number of days sampled in the statistical analysis. In order to detect the influence of seasonal drought conditions on breeding success, binary indices were included to identify breeding attempts initiated during years when drought conditions occurred in the dry season (June-November). Droughts were identified as periods with a Standardised Precipitation Index value of $\leq$ -1.0 for total seasonal rainfall (McKee et al. 1993), based on mean seasonal rainfall for the base period 1990/1991–2014/2015. Hot days were defined as those exceeding the seasonal 90th percentile of all days in the same 25-year base period. Daily maximum temperature, rather than daily mean or minimum temperature, was used for temperature indices because daily temperature minima were based on UTC (Coordinated Universal Time) and could not be reliably attributed to a given calendar day in Mauritius. A binary index was included to identify the overlap of nesting activity with one or more days on which the centre of a tropical storm or cyclone (maximum 1-

minute sustained wind ≥ 34 knots) was located within 300 km of Mt Camizard (analysed using QGIS version 2.18.20). Previous research and anecdotal observations, including from Mauritius, indicate that cyclone winds and rain regularly impact areas within 275–300 km (~150 nm) of the storm centre (Shepherd et al. 2007; Nicoll et al. 2017). This index was used to indicate when a cyclone event was likely to have coincided with the active phase of a nesting attempt and may have had a direct impact. Climate indices were calculated where no more than 10% of days had missing data in the time window of interest. Indices were extracted from meteorological data using R packages *climdex.pcic* (Bronaugh 2015) and *SPEI* (Beguería and Vicente-Serrano 2013), and bespoke code.

Nest-level time windows for exploratory analyses

Specific time windows for each nesting attempt (e.g. Öberg et al. 2015) were estimated using the FED. The 80-day indices start 10 days before the FED. In clutches of three or more eggs, incubation is usually initiated on the day when the third egg is laid and eggs are laid at three-day intervals (M. A. C. Nicoll pers. obs.), thus for clutches of 1–2 eggs the incubation delay was assumed to be three days, and for clutches of 3–5 eggs the delay was assumed to be six days. In the case of the 80-day climate indices, the maximum delay of six days was assumed for all nests. The incubation period was assumed to be 29 days in all nests, as this usually ranges from 28 to 30 days and 29 days is used for the back calculation and estimation of the FED from field observations. Brood periods are known to range from 32 to 35 days (Cartwright et al. 2014), but the maximum of 35 days is assumed here for all nests to account for delays in the fledging of the youngest nestling in broods of three or more. The relevant time window may be overestimated for smaller clutches because of their shorter laying delay, but most clutches in the exploratory analyses for breeding success (379/403) numbered three or more eggs. For the calculation of brood phase climate indices, the expected hatch day (EHD) of the first egg in each clutch was estimated. The EHD was estimated from the FED by adding the assumed incubation delay, based on the clutch size, and then the assumed incubation period of 29 days for all nests. Once the EHD of a clutch had been estimated, the brood period was assumed to be 35 days including the EHD.

Rainy season analysis

Recently developed methods (Liebmann et al. 2012; Dunning et al. 2016) were used to identify the onset and cessation of the rainy season (RS) in the Bambou Mountains using rain gauge data from Mt Camizard. Leap days were removed, but daily values that were removed in the quality control processes were retained in the gauge time series, as treating missing values as zeros would strongly bias the results. The period in which the RS usually occurs, termed the climatological water season, was then identified in order to account for the fact that the rainy seasons span multiple calendar years. To identify this period, the climatological mean rainfall on each day of the calendar year was calculated and from this the climatological cumulative daily rainfall anomaly was derived. The minimum of these values indicates the start and the maximum indicates the end of the climatological water season. For each year in turn the daily cumulative rainfall anomaly was then computed for a period encompassing the climatological water season. The onset and cessation dates were determined by finding the minimum and maximum respectively in the cumulative daily rainfall anomaly. This anomaly increases when daily rainfall is above the climatological mean daily rainfall and decreases when daily rainfall is below this amount.

R packages used in statistical analyses

Linear models, linear mixed models and generalised linear mixed models (GLMMs) were run with package *lme4* (Bates et al. 2018). Model ranking and selection were carried out using package *MuMIn* (Barton 2018). The effects of explanatory variables were studied with the *effects* package (Fox et al. 2018). Interannual trends were analysed with Mann-Kendall tests using the package *Kendall* (McLeod 2011). Marginal and conditional Pseudo-r^2 values (Nakagawa and Schielzeth 2013) were calculated for mixed models using the *MuMIn* package.

Supplementary Table 1. Explanatory variables included in candidate base models for Mauritius kestrel first egg-laying date (FED), fledgling production (FP), egg survival to fledging (ES) and clutch size (CS), based on prior research.

Variable	**Base model**	**Description**	**References**
FED	FP, ES, CS	First Egg-laying Date (days from 1 September)	Burgess et al. 2011; Cartwright et al. 2014; Senapathi et al. 2011
Agriculture	FP, ES	Percentage of territory (1-km^2 circle around the nest-site) classed as agricultural land	Burgess et al. 2011; Cartwright et al. 2014
Elevation	FED, FP, ES	Elevation (m asl) of territory	Burgess et al. 2011; Cartwright et al. 2014
Cavity type	FP, ES	Two-level factor for natural and artificial cavities	Nicoll 2004; Cartwright et al. 2014
Clutch size	ES	Number of eggs in clutch	Burgess et al. 2011; Cartwright et al. 2014
Female Age	FED	Age (years) of female in pair	Senapathi et al. 2011
Male Age	FED	Age (years) of male in pair	Senapathi et al. 2011
Male PBE	FED, FP, ES	Prior breeding experience (years) of male in pair	Burgess et al. 2008, 2011; Cartwright et al. 2014
Pair PBE	FP, ES, CS	Prior breeding experience (years) of pair together	Nicoll 2004

Supplementary Table 2. Climate indices incorporated into models for the breeding phenology and success of Mauritius kestrels. Time windows: FED = July-September (JAS) for analyses of first egg-laying date; FP = 80-day period for analyses of fledgling production; ES = 35-day period for analyses of egg survival to fledging; CS = 10-day period for analyses of clutch size. SONDJF = September-February. Percentile thresholds and standardised precipitation index (SPI) were calculated from the standard reference period 1990/1991–2014/2015.

Climate index	**Analysis**	**Description**
Rainfall	FED, FP, ES, CS	Total rainfall (mm) on raindays (≥1 mm)
Raindays	FED, FP, ES, CS	Total number of days with ≥ 1 mm rain
Rainfall90	FED, FP, ES, CS	Total rainfall (mm) on days that exceed the SONDJF 90th percentile (40.7 mm), or JAS 90th percentile (20.4 mm) for FED
Raindays90	FED, FP, ES, CS	Total number of raindays that exceed the SONDJF 90th percentile (40.7 mm), or JAS 90th percentile (20.4 mm) for FED
Max Dry Spell	FP, ES, CS	Maximum number of consecutive dry days (< 1mm rainfall)
Max Rain Spell	FED, FP, ES, CS	Maximum number of consecutive raindays (≥1 mm rainfall)
Mean Tmax	FED, FP, ES, CS	Mean daily maximum temperature (°C)
Tmax90 Days	FP, ES	Total number of days with maximum temperature over the SONDJF 90th percentile (30.9°C)
Cyclone	FP, ES	Binary factor to indicate if there were one or more days when the centre of a tropical storm (≥ 34 knots) or cyclone was located within 300 km of Mt Camizard
Drought	FP, ES, CS	Binary factor to indicate if the breeding attempt coincided with drought in the dry season (June-November), defined as a Standardised Precipitation Index value of -1.0 or lower.

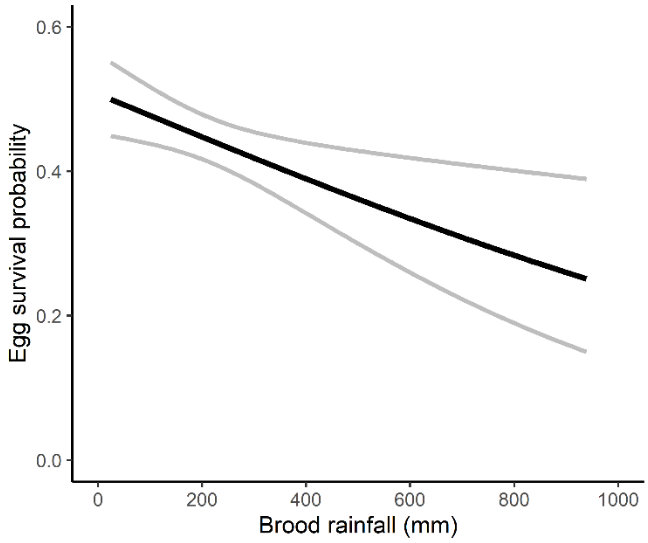
Supplementary Results

Rainy season analysis

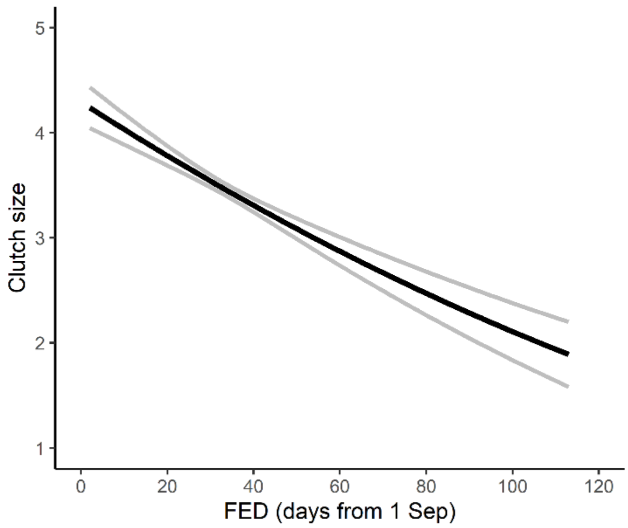
The analysis of RS onset and cessation using the Mt Camizard rain gauge data indicates that the climatological water season, in which the RS usually occurs and which is based on the climatological mean rainfall for each calendar day, runs from 19 December to 4 May. The mean (± 1SD) duration of the RS over the period 1963/1964–2014/2015 is 99.4 ± 55.2 days. The RS durations identified for the years 1963/1964, 1964/1965, 1965/1966, 1983/1984, 1993/1994 and 1998/1999 were more than 1.5 standard deviations below the mean (z-score < -1.5, duration < 17 days) and treated as completely missing seasons in terms of potential impacts on kestrel breeding success. The RS in all other years ranged from 26 days (in 1989/1990) to 209 days (in 2014/2015).

Rainfall impacts on breeding success

The seasonal decline in clutch size (Supplementary Table 10, Supplementary Fig. 2) could influence the pattern of lower fledgling production in later nests that overlap with the RS, so we also tested the effect of the number of days of overlap with the RS (where no overlap = 0 days) on fledgling production and egg survival as an additive effect in mixed models that included FED. For fledgling production, a model including only a fixed effect for FED (AICc = 1318.171) is improved by the inclusion of an additive term for the number of days of overlap with the RS (AICc = 1315.128). Likewise, a model for egg survival including only FED (AICc = 1236.396) is improved by the same additive term for the amount of overlap (AICc = 1232.411). These analyses support the finding that overlap with the RS influences the decline in fledgling production within seasons.



Supplementary Fig. 1. Effect plot of egg to fledging survival probability (with 95% confidence intervals) in relation to total rainfall (mm) during the brood phase of nests, extracted from a model incorporating the effects of first egg-laying date, agriculture proportion in territory, and their interaction; with female identity and year as random effects. *n* = 403 clutches (1990/1991–2014/2015).



Supplementary Fig. 2. Effect plot of clutch size (with 95% confidence intervals) in relation to first egg-laying date (FED, days from 1 September), extracted from a model incorporating FED^2, with female identity and year as random effects. *n* = 433 clutches (1994/1995–2014/2015).

Supplementary Table 3. Results of candidate base model analysis for first egg-laying date, using data from 356 Mauritius kestrel breeding attempts (1994/1995–2014/2015). All models include female identity and year as random effects. Where linear and quadratic terms are included, only the quadratic term is shown in the model notation for brevity. df = degrees of freedom; ln(L) = log-likelihood.

Model	**df**	**ln(L)**	**AICc**	**ΔAICc**	**AIC Weight**	**Marginal Pseudo-r^2**	**Conditional Pseudo-r^2**
Female Age^2 + Male Age^2	8	-1404.290	2824.996	0.000	0.936	0.181	0.427
Female Age^2 + Male PBE^2	8	-1407.353	2831.121	6.125	0.044	0.167	0.406
Male Age^2	6	-1410.213	2832.667	7.671	0.020	0.163	0.415
Male PBE^2	6	-1414.758	2841.757	16.761	0.000	0.143	0.390
Female Age^2	6	-1427.019	2866.279	41.283	0.000	0.091	0.360
Female Age + Male Age	6	-1429.154	2870.548	45.552	0.000	0.086	0.331
Female Age + Male PBE	6	-1430.114	2872.469	47.473	0.000	0.080	0.330
Male Age	5	-1432.931	2876.033	51.037	0.000	0.072	0.337
Male PBE	5	-1434.442	2879.055	54.059	0.000	0.063	0.335
Female Age	5	-1436.474	2883.119	58.123	0.000	0.054	0.300
Elevation	5	-1445.941	2902.053	77.057	0.000	0.004	0.296
Null	4	-1447.328	2902.771	77.775	0.000	0.000	0.278

Supplementary Table 4. Results of July-September climate impacts analysis on first egg-laying date, using data from 356 Mauritius kestrel breeding attempts (1994/1995–2014/2015). Base model: Female Age^2 + Male Age^2. All models include female identity and year as random effects. Where linear and quadratic terms are included, only the quadratic term is shown in the model notation for brevity. df = degrees of freedom; ln(L) = log-likelihood.

Model	**Standardised climate index coefficient**	**df**	**ln(L)**	**AICc**	**ΔAICc**	**AIC Weight**	**Marginal Pseudo-r^2**	**Conditional Pseudo-r^2**
Base + Mean Tmax^2	-4.367/-0.778	10	-1394.751	2810.139	0.000	0.543	0.285	0.437
Base + Mean Tmax	-4.582	9	-1396.003	2810.526	0.387	0.448	0.282	0.436
Base + Raindays^2	2.494/-0.500	10	-1400.186	2821.010	10.871	0.002	0.203	0.430
Base + Raindays	2.561	9	-1401.326	2821.171	11.032	0.002	0.204	0.426
Base + Rainfall90^2	-1.684/1.109	10	-1401.489	2823.616	13.477	0.001	0.181	0.435
Base + Max Rain Spell^2	-1.158/0.702	10	-1401.530	2823.698	13.559	0.001	0.180	0.437
Base + Rainfall^2	0.255/0.299	10	-1401.783	2824.204	14.065	0.001	0.177	0.436
Base + Max Rain Spell	-0.669	9	-1402.854	2824.228	14.089	0.001	0.180	0.431
Base + Rainfall	0.711	9	-1402.900	2824.320	14.181	0.001	0.179	0.431
Base + Raindays90^2	-0.388/0.013	10	-1401.856	2824.350	14.211	0.000	0.178	0.438
Base + Raindays90	-0.376	9	-1402.955	2824.429	14.290	0.000	0.181	0.432
Base + Rainfall90	0.056	9	-1403.028	2824.576	14.437	0.000	0.179	0.432
Base	-	8	-1404.290	2824.996	14.857	0.000	0.181	0.427

Supplementary Table 5. Results of July-September climate impacts analysis on de-trended first egg-laying date, using data from 356 Mauritius kestrel breeding attempts (1994/1995–2014/2015). All models include female identity and year as random effects. Where linear and quadratic terms are included, only the quadratic term is shown in the model notation for brevity. df = degrees of freedom; ln(L) = log-likelihood.

Model	**Standardised Year coefficient**	**df**	**ln(L)**	**AICc**	**ΔAICc**
Base + Year + Mean $Tmax^2$ + $Raindays^2$	-3.477	11	-1388.281	2799.330	0.000
Base + Year + Raindays	-4.701	10	-1391.437	2803.511	4.181
Base + Year + Mean Tmax	-3.043	10	-1391.637	2803.911	4.581
Base + Year + $Raindays^2$	-4.701	11	-1390.608	2803.984	4.654
Base + Year + Mean $Tmax^2$	-2.963	11	-1390.656	2804.079	4.749
Base + Year	-4.726	9	-1395.998	2810.516	11.186

Supplementary Table 6. Results of candidate base model analysis for fledgling production, using data from 403 Mauritius kestrel breeding attempts (1990/1991–2014/2015). All models include female identity and year as random effects. Where linear and quadratic terms are included, only the quadratic term is shown in the model notation for brevity. df = degrees of freedom; ln(L) = log-likelihood.

Model	**df**	**ln(L)**	**AICc**	**ΔAICc**	**AIC Weight**	**Marginal Pseudo-r^2**	**Conditional Pseudo-r^2**
FED + Elevation	5	-615.842	1241.835	0.000	0.276	0.160	0.202
FED + Pair PBE^2	6	-615.053	1242.317	0.482	0.217	0.157	0.208
FED + Agriculture	5	-616.359	1242.869	1.034	0.165	0.156	0.213
FED × Agriculture	6	-615.443	1243.099	1.264	0.147	0.183	0.235
FED + Male PBE^2	6	-616.394	1244.999	3.164	0.057	0.150	0.208
FED + Cavity Type	5	-617.483	1245.117	3.282	0.053	0.152	0.212
FED + Male PBE	5	-617.676	1245.503	3.668	0.044	0.149	0.210
FED + Pair PBE	5	-617.740	1245.630	3.795	0.041	0.148	0.209
Null	3	-640.290	1286.641	44.806	0.000	0.000	0.105

Supplementary Table 7. Results from the analysis of nest-level climate impacts (during an 80-day period) on fledgling production, using data from 403 Mauritius kestrel breeding attempts (1990/1991–2014/2015). All models include female identity and year as random effects. The base model is a combination of the four highest ranking models in the candidate selection analysis and includes elevation, pair PBE^2, agriculture and the FED × agriculture interaction. Where linear and quadratic terms are included, only the quadratic term is shown in the model notation for brevity. df = degrees of freedom; ln(L) = log-likelihood.

Model	**Standardised climate index coefficient**	**df**	**ln(L)**	**AICc**	**ΔAICc**	**AIC Weight**	**Marginal Pseudo-r^2**	**Conditional Pseudo-r^2**
Base + Rainfall	-0.104	10	-608.639	1237.840	0.000	0.221	0.222	0.231
Base + Rainfall90	-0.087	10	-609.306	1239.174	1.334	0.113	0.214	0.225
Base + Raindays90	-0.086	10	-609.393	1239.346	1.506	0.104	0.214	0.225
Base + $Rainfall^2$	-0.092/-0.013	11	-608.586	1239.848	2.008	0.081	0.230	0.239
Base + $Raindays90^2$	-0.058/-0.046	11	-608.691	1240.057	2.217	0.073	0.246	0.259
Base + $Rainfall90^2$	-0.043/-0.040	11	-608.766	1240.208	2.368	0.068	0.239	0.251
Base	-	9	-611.096	1240.650	2.810	0.054	0.198	0.220
Base + Cyclone	-0.245	10	-610.275	1241.111	3.271	0.043	0.206	0.228
Base + Raindays	-0.054	10	-610.345	1241.252	3.412	0.040	0.209	0.233
Base + Max Dry $Spell^2$	0.046/-0.072	11	-609.505	1241.686	3.846	0.032	0.209	0.232
Base + $Raindays^2$	-0.040/-0.046	11	-609.587	1241.850	4.010	0.030	0.224	0.248
Base + Max Rain Spell	-0.032	10	-610.870	1242.302	4.462	0.024	0.203	0.224

Supplementary Table 7 continued:

Model	Standardised climate index coefficient	df	ln(L)	AICc	ΔAICc	AIC Weight	Marginal Pseudo-r^2	Conditional Pseudo-r^2
Base + Max Rain Spell^2	-0.008/-0.031	11	-609.876	1242.428	4.588	0.022	0.241	0.259
Base + Tmax90 Days	0.020	10	-611.033	1242.626	4.786	0.020	0.197	0.218
Base + Drought	-0.053	10	-611.054	1242.668	4.828	0.020	0.198	0.221
Base + Mean Tmax	0.013	10	-611.079	1242.719	4.879	0.019	0.198	0.221
Base + Max Dry Spell	-0.007	10	-611.082	1242.725	4.885	0.019	0.198	0.220
Base + Tmax90 Days^2	0.072/-0.026	11	-610.667	1244.009	6.169	0.010	0.217	0.236
Base + Mean Tmax^2	0.009/-0.017	11	-610.960	1244.596	6.756	0.007	0.205	0.228

Supplementary Table 8. Results of candidate base model analysis for egg survival to fledging, using data from 403 Mauritius kestrel breeding attempts (1990/1991–2014/2015). All models include female identity and year as random effects. Where linear and quadratic terms are included, only the quadratic term is shown in the model notation for brevity. df = degrees of freedom; ln(L) = log-likelihood.

Model	**df**	**ln(L)**	**AICc**	**ΔAICc**	**AIC Weight**	**Marginal Pseudo-r^2**	**Conditional Pseudo-r^2**
FED × Agriculture	6	-568.102	1148.417	0.000	0.384	0.079	0.223
FED + Agriculture	5	-569.387	1148.926	0.509	0.297	0.067	0.219
FED + Elevation	5	-570.537	1151.225	2.808	0.094	0.066	0.204
FED + Pair PBE^2	6	-569.507	1151.227	2.810	0.094	0.062	0.203
FED + Male PBE^2	6	-570.277	1152.765	4.348	0.044	0.060	0.207
FED + Pair PBE	5	-571.800	1153.751	5.334	0.027	0.059	0.210
FED + Male PBE	5	-571.934	1154.019	5.602	0.023	0.059	0.207
FED + Cavity Type	5	-572.077	1154.305	5.888	0.020	0.059	0.206
FED + Clutch Size	5	-572.248	1154.647	6.230	0.017	0.057	0.206
Null	3	-592.526	1191.113	42.696	0.000	0.000	0.152

Supplementary Table 9. Results from the analysis of brood-level climate impacts (during a 35-day period) on egg survival to fledging, using data from 403 Mauritius kestrel breeding attempts (1990/1991–2014/2015). Base model: FED × Agriculture. All models include female identity and year as random effects. Where linear and quadratic terms are included, only the quadratic term is shown in the model notation for brevity. df = degrees of freedom; ln(L) = log-likelihood.

Model	**Standardised climate index coefficient**	**df**	**ln(L)**	**AICc**	**ΔAICc**	**AIC Weight**	**Marginal Pseudo-r^2**	**Conditional Pseudo-r^2**
Base + Rainfall	-0.193	7	-565.606	1145.495	0.000	0.199	0.085	0.222
Base + Raindays90	-0.170	7	-566.031	1146.345	0.850	0.130	0.082	0.221
Base + Rainfall90	-0.165	7	-566.167	1146.617	1.122	0.114	0.082	0.221
Base + Max Dry Spell^2	0.257/-0.116	8	-565.467	1147.299	1.804	0.081	0.086	0.226
Base + Rainfall^2	-0.194/0.001	8	-565.606	1147.576	2.081	0.070	0.085	0.222
Base + Raindays90^2	-0.116/-0.046	8	-565.687	1147.739	2.244	0.065	0.084	0.224
Base + Rainfall90^2	-0.106/-0.038	8	-565.929	1148.224	2.729	0.051	0.083	0.223
Base	-	6	-568.102	1148.417	2.922	0.046	0.079	0.223
Base + Mean Tmax	0.154	7	-567.206	1148.695	3.200	0.040	0.081	0.226
Base + Raindays^2	-0.059/-0.099	8	-566.417	1149.200	3.705	0.031	0.086	0.230
Base + Drought	-0.355	7	-567.676	1149.635	4.140	0.025	0.079	0.224
Base + Tmax90 Days	0.086	7	-567.685	1149.654	4.159	0.025	0.078	0.221
Base + Cyclone	-0.291	7	-567.710	1149.703	4.208	0.024	0.080	0.223
Base + Raindays	-0.066	7	-567.825	1149.933	4.438	0.022	0.080	0.223
Base + Max Dry Spell	0.052	7	-567.890	1150.063	4.568	0.020	0.080	0.224

Supplementary Table 9 continued:

Model	**Standardised climate index coefficient**	**df**	**ln(L)**	**AICc**	**ΔAICc**	**AIC Weight**	**Marginal Pseudo-r^2**	**Conditional Pseudo-r^2**
Base + Mean $Tmax^2$	0.139/0.044	8	-566.900	1150.165	4.670	0.019	0.080	0.224
Base + Max Rain Spell	0.050	7	-567.970	1150.224	4.729	0.019	0.078	0.224
Base + Tmax90 $Days^2$	0.132/-0.017	8	-567.580	1151.526	6.031	0.010	0.079	0.222
Base + Max Rain $Spell^2$	0.107/-0.028	8	-567.641	1151.648	6.153	0.009	0.083	0.228

Supplementary Table 10. Results of candidate base model analysis for clutch size, using data from 403 Mauritius kestrel breeding attempts (1990/1991–2014/2015). All models include female identity and year as random effects. Where linear and quadratic terms are included, only the quadratic term is shown in the model notation for brevity. df = degrees of freedom; ln(L) = log-likelihood.

Model	**df**	**ln(L)**	**AICc**	**ΔAICc**	**AIC Weight**	**Marginal Pseudo-r^2**	**Conditional Pseudo-r^2**
FED^2	6	-348.882	709.977	0.000	0.486	0.189	0.342
FED	5	-350.122	710.395	0.418	0.394	0.166	0.337
FED^2 + Pair PBE	7	-349.906	714.096	4.119	0.062	0.194	0.343
FED + Pair PBE	6	-351.061	714.334	4.357	0.055	0.172	0.339
FED + Pair PBE^2	7	-353.519	721.321	11.344	0.002	0.172	0.344
FED^2 + Pair PBE^2	8	-352.578	721.521	11.544	0.001	0.194	0.347
Null	4	-382.451	773.003	63.026	0.000	0.000	0.224

Supplementary Table 11. Results from the analysis of climate impacts (during a 10-day pre-laying period) on clutch size, using data from 403 Mauritius kestrel breeding attempts (1990/1991–2014/2015). Base model: FED^2. All models include female identity and year as random effects. Only models <7 ΔAICc compared to the base model are shown. df = degrees of freedom; ln(L) = log-likelihood.

Model	**Standardised climate index coefficient**	**df**	**ln(L)**	**AICc**	**ΔAICc**	**AIC Weight**	**Marginal Pseudo-r^2**	**Conditional Pseudo-r^2**
Base	-	6	-348.882	709.977	0.000	0.590	0.189	0.342
Base + Drought	0.167	7	-349.264	712.812	2.835	0.143	0.191	0.347
Base + Raindays	-0.063	7	-349.577	713.437	3.460	0.105	0.202	0.326
Base + Max Rain Spell	-0.047	7	-350.380	715.044	5.067	0.047	0.197	0.329
Base + Mean Tmax	0.047	7	-350.545	715.373	5.396	0.040	0.194	0.345
Base + Max Dry Spell	0.019	7	-351.314	716.912	6.935	0.018	0.191	0.337

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