

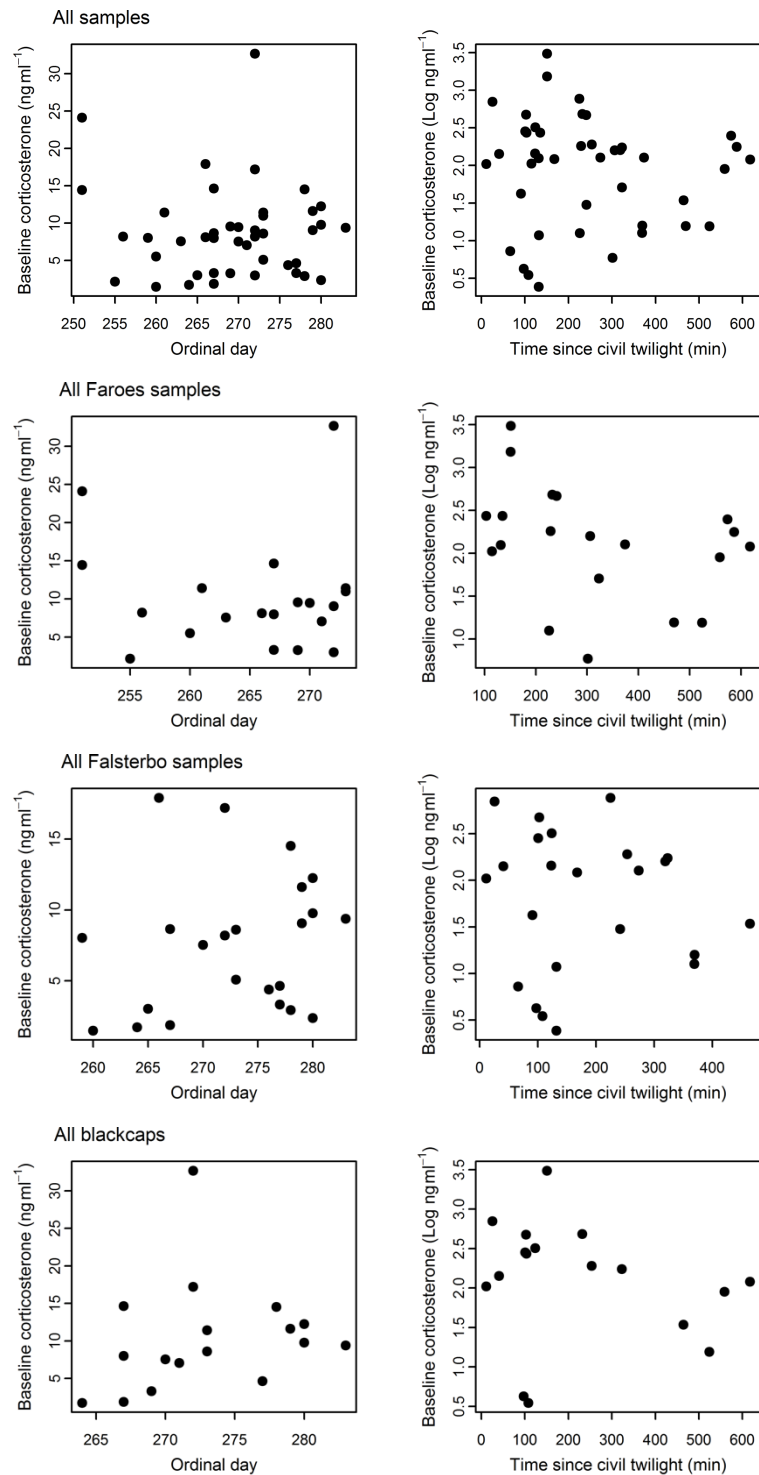
## Supplementary Material

### **Integrating orientation mechanisms, adrenocortical activity and endurance flight in vagrancy behaviour**

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**Fig. S1** Corticosterone concentration measures (ng ml<sup>-1</sup>) by season (ordinal day) and by location-corrected time of day (time since civil twilight (min)) for all sample groups (All samples: all species all sampling locations; All samples from the Faroes: both SW vagrants and SE vagrants; All samples from Falsterbo: SW control; and All blackcaps: both SW vagrants and SW controls). No linear relationship was detected for season or time of day.

**Table S1** General linear models with backwards stepwise model refinement method to test covariates of the group (migratory group or arrival status) and fat score as predictor variables. We included the nuisance variable of sampling time in all appropriate models. Data tested as natural and log transformed. The models were tested for normal distribution of residuals with Shapiro-Wilk Normality Test and where violated the output is given in grey italics. Best fit models are given in bold.

| natural scale         |        |             |     |                                            |           | log-transformed          |                                                       |                          |               |         |                             |                                                   |                             |  |  |
|-----------------------|--------|-------------|-----|--------------------------------------------|-----------|--------------------------|-------------------------------------------------------|--------------------------|---------------|---------|-----------------------------|---------------------------------------------------|-----------------------------|--|--|
| Independent variables |        |             |     | Estimate, F and P-values for each variable |           |                          |                                                       |                          |               |         |                             |                                                   |                             |  |  |
| Data                  | IP1    | IP2         | IP3 | Adj R-squared                              | shapiro   | r 1; F1; P 1             | r 2; F2; P 2                                          | r 3; F3; P 3             | Adj R-squared | shapiro | r 1; F1; P 1                | r 2; F2; P 2                                      | r 3; F3; P 3                |  |  |
| BC                    | Time   | Time×Origin | Fat | 0.4811                                     | 0.06409   | 9.444; 6.3448; 0.0256    | 1.414; 1.643; 0.222                                   | -1.138; 2.711; 0.1235    | 0.6964        | 0.5825  | 1.4336; 22.533; 0.000381    | 0.1341; 2.280; 0.154904                           | -0.090; 2.616; 0.129765     |  |  |
|                       | Time   | Time×Origin |     | 0.4177                                     | 0.03916   | 11.727; 10.0981; 0.00671 | 2.196; 4.3326; 0.0562                                 |                          | 0.6614        | 0.9905  | 1.6142; 29.669; <0.001      | 0.1960; 5.355; 0.03635                            |                             |  |  |
|                       | Time   | Fat         |     | 0.4573                                     | 0.007857  | 8.36; 5.0104; 0.0420     | -1.52; 5.6699; 0.0320                                 |                          | 0.6687        | 0.3914  | 1.3310; 18.7441; 0.000692   | -0.1262; 5.780; 0.03061                           |                             |  |  |
| a priori              | Time   |             |     | 0.2883                                     | 0.001173  | 11.125; 7.4811; 0.01534  |                                                       |                          | 0.5631        | 0.7408  | 1.5604; 21.619; 0.000314    |                                                   |                             |  |  |
| BCx                   | Time   | Time×Origin | Fat | 0.5742                                     | 0.1279    | 7.505; 11.903; 0.00480   | 0.2066; 0.094; 0.76345                                | 0.8040; 4.036; 0.06756   | 0.6535        | 0.3716  | 1.36858; 20.9493; 0.00063   | 0.09369; 1.0316; 0.3298321                        | -0.07883; 2.0540; 0.1773450 |  |  |
|                       | Time   | Time×Origin |     | 0.4748                                     | 0.4435    | 8.9610; 15.472; 0.00171  | 0.672; 0.923; 0.35410                                 |                          | 0.6254        | 0.9224  | 1.51131; 26.5794; 0.0001849 | 0.13935; 2.3964; 0.1456053                        |                             |  |  |
|                       | Time   | Fat         |     | 0.6039                                     | 0.1525    | 7.3271; 13.123; 0.00309  | -0.8466; 5.461; 0.03609                               |                          | 0.6526        | 0.911   | 1.28775; 19.913; 0.00063    | -0.098; 3.604; 0.0800                             |                             |  |  |
| a priori              | Time   |             |     | 0.6039                                     | 0.463     | 8.587; 14.7155; 0.00182  |                                                       |                          | 0.588         | 0.9737  | 1.4338; 22.4071; 0.00032    |                                                   |                             |  |  |
| WW                    | Time   | Time×Origin | Fat | -0.2387                                    | 0.5945    | -5.23; 0.3501; 0.596     | 4.322; 1.057; 0.3795                                  | -1.506; 0.1754; 0.7035   | -0.4018       | 0.9379  | -0.27393; 0.5141; 0.5251    | 0.4353; 0.6754; 0.4714                            | -0.03472; 0.0059; 0.9437    |  |  |
|                       | Time   | Time×Origin |     | 0.01668                                    | 0.3991    | -5.295; 0.5872; 0.4862   | 4.565; 1.5146; 0.2859                                 |                          | -0.05341      | 0.977   | -0.2754; 0.7558; 0.4337     | 0.4409; 0.9400; 0.3872                            |                             |  |  |
|                       | Time   | Fat         |     | -0.2564                                    | 0.4026    | 4.865; 0.3452; 0.5884    | -2.016; 0.3161; 0.6040                                |                          | -0.288        | 0.6597  | 0.24288; 0.5596; 0.496      | -0.08614; 0.0401; 0.851                           |                             |  |  |
|                       | Origin | Fat         |     | 0.0387                                     | 0.1215    | 9.046; 1.6790; 0.2648    | -1.385; 0.1889; 0.6863                                |                          | -0.04745      | 0.9656  | 1.09418; 1.6069; 0.2737     | -0.01963; 0.0025; 0.9627                          |                             |  |  |
|                       | Origin |             |     | 0.1947                                     | 0.4264    | 9.738; 2.4503; 0.1783    |                                                       |                          | 0.1615        | 0.9428  | 1.1040; 2.1558; 0.202       |                                                   |                             |  |  |
| a priori              | Time   |             |     | -0.08453                                   | 0.2264    | 5.552; 0.5324; 0.4983    |                                                       |                          | -0.04077      | 0.4603  | 0.77223; 0.7649; 0.4218     |                                                   |                             |  |  |
| All                   | Time   | Time×Origin | Fat | 0.3113                                     | 0.0007123 | 6.0719; 9.4327; 0.00393  | -0.3291(E) 1.2961(W); 1.8873; 0.65330(E) 0.10852(W)   | -0.6043; 1.7414; 0.19486 | 0.4078        | 0.4253  | 1.01105; 21.7876; <0.0001   | -0.04123(E) 0.10237(W); 1.1519; 0.608(E) 0.243(W) | -0.03482; 0.4816; 0.492     |  |  |
|                       | Time   | Time×Origin |     | 0.2982                                     | 0.0004321 | 6.4095; 10.4907; 0.00245 | -0.4682(E) 1.5507 (W); 3.1426; 0.52282(E) 0.05150 (W) |                          | 0.4157        | 0.2701  | 1.03051; 23.3300; <0.0001   | -0.04924(E) 0.11703(W); 1.7593; 0.533(E) 0.168(W) |                             |  |  |
|                       | Time   | Fat         |     | 0.2807                                     | <0.001    | 6.3535; 11.7495; 0.00142 | -0.9004; 4.1858; 0.04738                              |                          | 0.4033        | 0.7334  | 1.02053; 26.1749; <0.0001   | -0.06060; 1.6371; 0.208                           |                             |  |  |
| a priori              | Time   |             |     | 0.2248                                     | <0.001    | 6.911; 13.182; 0.00077   |                                                       |                          | 0.3941        | 0.4813  | 1.0580; 28.3138; <0.001     |                                                   |                             |  |  |
| Faroes                | Time   | Time×Arr    | Fat | 0.2969                                     | 0.008167  | 6.88; 3.559; 0.775       | -1.878; 2.131; 0.167                                  | -1.0194; 2.281; 0.1504   | 0.5417        | 0.8629  | 1.03215; 0.731; 0.40494     | -0.2395; 6.1392; 0.024757                         | 0.0434; 0.731; 0.40494      |  |  |
|                       | Time   | Time×Arr    |     | 0.2439                                     | 0.0001828 | 8.446; 5.6375; 0.0296    | -2.092; 2.4904; 0.1329                                |                          | 0.5489        | 0.3139  | 1.09882; 16.8328; 0.000742  | -0.24871; 6.8043; 0.018354                        |                             |  |  |
|                       | Time   | Fat         |     | 0.2501                                     | 0.01912   | 7.0485; 3.3371; 0.0853   | -1.128; 2.6514; 0.12185                               |                          | 0.4031        | 0.4194  | 1.05366; 10.8078; 0.0043    | -0.05726; 0.9902; 0.333658                        |                             |  |  |
|                       | Fat    |             |     | 0.1527                                     | 0.1109    | -1.4857; 4.424; 0.0497   |                                                       |                          | 0.07787       | 0.5729  | -0.11072; 2.6045; 0.124     |                                                   |                             |  |  |
| a priori              | Time   |             |     | 0.1813                                     | 0.0002248 | 8.824; 5.2064; 0.03489   |                                                       |                          | 0.4034        | 0.6497  | 1.1438; 13.8490; 0.001562   |                                                   |                             |  |  |

Adjusted R-squared values are given for each model and the estimate, F and P-values for each variable. Data sets for testing the effect of (i) migratory group on corticosterone concentrations are as follows: BC - all blackcap data; BCx - Blackcap data excluding the ELHS outlier; WW - all willow warbler data; All - all data. We report the origin statistic of the vagrant group relative to the control group, in the case of All data the SE and SW vagrant groups are denoted by (E) and (W) respectively. For testing the effect of (ii) arrival status (Arr) on corticosterone concentrations we used all data from the Faroes. We report the arrival status statistic of the Newly arrived group relative to the Others. For each data set we a priori tested the effect of time to indicate if this variable must be included in all models.