We first visually inspected activity profiles during the annual cycle at a population level, comparing the activity profiles between (i) hybrids and their parental populations, (ii) the three migratory populations, and (iii) age groups. We then used linear mixed models to analyse these data in a manner similar to that described for changepoint-derived *Zugunruhe* periods. We compared mean and peak activity levels across all individuals of the stonechat populations regardless of their assigned *Zugunruhe* status.

Covariation of Diurnal and Nocturnal Activity Levels: We analysed the association between nocturnal and diurnal activity levels within individuals, including data from all photoperiods to achieve a larger and more representative dataset. For each migration period, we conducted two tests: we compared mean diurnal activity levels in the 15 days immediately preceding Zugunruhe onset to mean diurnal activity in the first 15 days after onset. We then did the same for the end of Zugunruhe. In this way, we minimised the possibility that activity differences could be explained by differences in day length at the time when birds showed Zugunruhe. We used two linear mixed models, beginning with the fixed effects of time (during Zugunruhe or not), sex, population, age, and all interactions; and a random intercept term of individual bird. We then eliminated non-significant terms with the "step" function in the lmerTest package (Kuznetsova et al. 2015) and by manual elimination.

We also studied the association between nocturnal and diurnal activity levels within individuals during both migration seasons and the 30-day neutral summer and winter periods. We used linear mixed models, with activity during each day as the response variable and corresponding nocturnal activity as a fixed continuous predictor. Sex, population, and photoperiod were added as additional fixed effects and iteratively removed if not significant. We included a random intercept term of individual bird (to account for average variation in nocturnal activity level among individuals) and a random slope term (to prevent