

Intensity of *Zugunruhe*

We quantified *Zugunruhe* intensity as both the mean level of nocturnal activity (Supplementary material Appendix 2, Fig. A3) during a given *Zugunruhe* period and the peak nocturnal activity relative to a bird's winter and summer levels (Fig. 6). The two metrics yielded similar results.

Effect of population

Populations differed significantly in ways that generally aligned with their approximate degree of migratoriness (Fig. 6). Surprisingly, Irish stonechats, which are partial migrants, showed peak *Zugunruhe* intensities that were greater than or similar to those of obligate Austrian migrants in both autumn and spring and comparable to long-distance Siberian migrants in spring (Fig. 6A, B). For some, but not all, groups, intensity was significantly greater in spring compared to autumn: Irish (corrected peak: effect = 16.90, $t = 10.54$, $p < 0.0001$; overall mean: effect = 11.7, $t = 9.37$, $p < 0.0001$), Austrian (corrected peak: effect = 12.49, $t = 9.70$, $p < 0.0001$; overall mean: effect = 9.32, $t = 8.76$, $p < 0.0001$), and Austrian

× Siberian (corrected peak: effect = 9.05, $t = 5.27$, $p < 0.0001$; overall mean: effect = 7.91, $t = 6.03$, $p < 0.0001$).

Hybrids

Austrian × Siberian stonechats showed corrected peak intensities that were significantly higher than the intensities of Austrian birds but not significantly different from those of Siberian stonechats (Fig. 6C, D). Like their Austrian parents (and unlike their Siberian parents), Austrian × Siberian hybrids showed a significant difference between levels of autumn and spring *Zugunruhe*. Austrian × Kenyan stonechats showed spring peak intensities lower than Austrian birds, and not significantly different from those of Kenyan birds; autumn intensities of all three groups were similar.

Effects of age and sex

Average autumn peak *Zugunruhe* intensity and mean intensity were generally significantly lower after the first year (corrected peak: effect = -4.55, 303.58 DF, $t = -3.36$, $p = 0.0009$; overall mean: effect = -3.06, 262.97 DF,

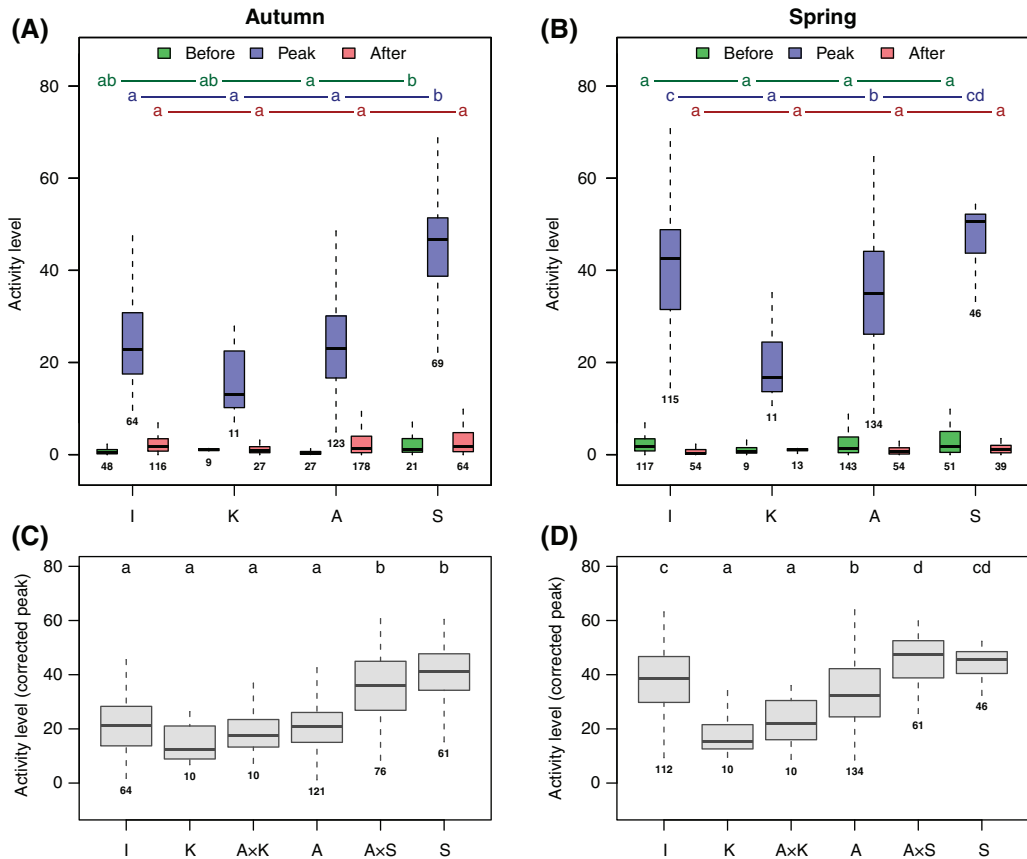


Figure 6. Intensity of *Zugunruhe* by population. (A) and (B) compare *Zugunruhe* with nocturnal activity during summer and winter ((A): autumn, (B): spring). (C) and (D) compare hybrids with their parental populations ((C): autumn, (D): spring). Activity level is defined as the number of active ten-minute periods during the night for an individual bird. Intensity of *Zugunruhe* (i.e. peak intensity) values are calculated as the mean activity level during the most-active 15-d period of *Zugunruhe*, as identified by changepoint analysis. Summer and winter values are the mean level of nocturnal activity across the least-active 30-d periods for each population. In (C, D), we show individual-specific corrected peak, calculated by subtracting the mean activity of flanking summer and winter periods from peak intensity. Numbers under boxplots show the number of migration periods in the given category; there are multiple periods for some birds with multiple years of data. Boxplots as in Fig. 2. Letters shown at the top of plots indicate significant pairwise differences: groups that do not share a letter are significantly different.