

Glucocorticoids link forest type to local abundance in tropical birds

ABSTRACT

1. Selective logging is a major driver of environmental changes in the tropics. Recently, there has been increasing interest in understanding which traits make bird species resilient or vulnerable to such changes. Physiological stress mediated by the steroid hormone corticosterone (CORT) might underlie changes in local abundance of species because it regulates a range of body functions and behaviours to maintain homeostasis in changing environments.

2. We conducted a three-year study to assess: (i) the variation in CORT levels in feathers (where CORT is deposited during the moult) of ten understory bird species across both unlogged old-growth forest and selectively logged forest in Borneo, (ii) how this variation is associated with within-year variation in population abundance between forest types, and (iii) whether the difference in feather CORT (fCORT) between co-specific populations living in unlogged and logged forests in one year is related with their difference in population abundance the following year.

3. We used effect size estimates to measure standardized magnitude and direction of fCORT changes between unlogged and selectively logged forest. We found small to large effect sizes, indicating large among species variation in physiological acclimatization to changes in forest conditions. In 2016 and 2018, species with relatively higher fCORT in unlogged forest were relatively more abundant in logged forest in the same year; in 2017, species with relatively higher fCORT in logged forest were relatively more abundant in logged forest. Importantly, we found that for a given species, the difference in fCORT at year (x) between unlogged and logged forests was negatively related with a difference in its local abundance between the two forest types in the following year ($x+1$).

4. Our results point to glucocorticoid hormones as potential mediators of carry-over effects on population abundance due to direct and indirect effects of silvicultural practices in tropical forests of Borneo, suggesting fCORT as a potential marker of population changes.