New unconventional methods of estimating habitat quality: strengths and weaknesses

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Given the worldwide loss, deterioration and fragmentation of natural habitats due to anthropogenic activity, ecologists are increasingly challenged to identify populations under threat before their demographic and/or genetic properties are irreversibly affected. Traditional indicators of habitat quality, such as density and age structure, or individual quality, such as survival and reproductive success, are often burdensome to measure, and populations may go extinct before appropriate datasets can be collected. More recently, ecologists have started to explore the suitability of presumed phenotypic markers of environmental quality and stress that do not require repeated captures and are easy to measure. I discuss two such markers: growth bar dimension in feathers and left-right asymmetry in bilateral symmetrical traits. Both methods are first described from a conceptual perspective. Their potential strengths and weaknesses for the study of ecological traps are then illustrated with examples from ongoing case studies on a temperate zone species, the House Sparrow (Passer domesticus) and a suite of Afrotropical bird species that inhabit a critically-endangered biodiversity hotspot in south-east Kenya.

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Habitat quality and ecological traps when prey species avoid predators

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Increased predation risk has often been identified as a cause of ecological traps, partly because many generalist predators gather opportunistically in increased numbers near human settlement or in recently modified habitats. Studies suggest that although songbirds may prefer some modified habitats, the density of generalist predators, especially of egg- and nestling-preying corvids, can transform them into ecological traps. I investigated habitat preference and reproduction in one such songbird, the Red-backed Shrike (Lanius collurio), in relation to corvid density over nine years. In this period, corvid abundance increased dramatically, especially close to human settlement. Results show that Red-backed Shrike nests were often depredated and that the risk of predation was positively related to corvid abundance. As Red-backed Shrikes have a strong preference for breeding in shrub-rich grasslands, and many grasslands in the study area were located close to human settlement, it might be expected that some Red-backed Shrikes bred close to a corvid territory. This, however, is not the case because Red-backed Shrikes intentionally avoid nesting close to the corvid territories. Thus, the between-year variation in spatial distribution of corvids in conjunction with the avoidance behavior of shrikes effected a strong between-year variation in abundance and spatial distribution in the shrives. The results suggest that ecological traps created by elevated levels of predation are less likely to happen in species with an evolutionary history of predator avoidance. It therefore seems likely that site-specific density and reproductive success in such species in one year may be poor indicators of habitat quality over a longer time frame.

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Providing nest boxes for birds: Does habitat matter?

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Nest boxes are a popular management tool to increase nest site availability for hole-nesting birds, but the biological consequences of their provision in different habitats have been studied little. In our study area, nest boxes for small passerines were set up in deciduous and coniferous woods. Great Tits (Parus major) preferred deciduous habitat for breeding, as judged by higher nest box occupation, earlier egg-laying and larger clutches and eggs. In coniferous habitat, however, more and heavier young fledged per nest, and the return rate of both fledglings and adults was higher. We propose two mutually non-exclusive explanations, both related to the maladaptive outcome of the provision of nest boxes: (1) in preferred habitat, nest boxes caused a supra-optimal breeding density leading to an ecological trap, and (2) boxes drastically improved the non-preferred habitat,