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An Association of Habitat with Color Dimorphism in Finches

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Sexual dimorphism in the color of birds is often attributed to sexual selection (Møller and Birkhead 1994), although there are alternative explanations (e.g. Baker and Parker 1979). One of the more puzzling observations is that many closely related species differ in degree of dimorphism. For example, the House Sparrow (*Passer domesticus*) is dimorphic and the Tree Sparrow (*P. montanus*) monomorphic. Understanding differences such as these would be aided if environmental associations with dimorphism could be detected. In one of the few examples of such an association, Crook (1964a, b) showed that the forest-dwelling weaver finches have dispersed territories and are monogamous and monomorphic, whereas savannah species are colonial, polygynous, and dimorphic. In this note I demonstrate an association of habitat with dimorphism across finches on five different continents.

Schluter (1986) presented lists of finch species occurring in similar habitats in five different regions of the world (North America, South America, Europe, Africa, Australia). Finches come from four different families (the Emberizidae, Frigillidae, Estrildidae, and Ploceidae), and no species are held in common across all five regions investigated (for detailed discussion of dataset, see Schluter 1986). Distributions of monomorphic and dimorphic finches in different habitats are shown in Figure 1. Following Schluter (1986) and Schluter and Ricklefs (1993), I used a two-way ANOVA (region × habitat) to test for differences between habitats in the proportion of finch species that are monomorphic. Since there are no replicates per cell, the interaction term cannot be tested and is used as the error term in the ANOVA. There is a significant difference among habitats ($F_{8,10} = 4.8, P < 0.05$). There is no significant difference among region ($F_{4,10} = 1.1, P > 0.4$). Tests weighting by sample size in each habitat and after arcsin-transforming the data gave similar significance values.

Reasons for the association of sexual dimorphism with habitat are unclear. While an association between habitat and mating system does seem to be generally upheld across bird species (Vehrencamp and Bradbury 1984), the association between mating sys-

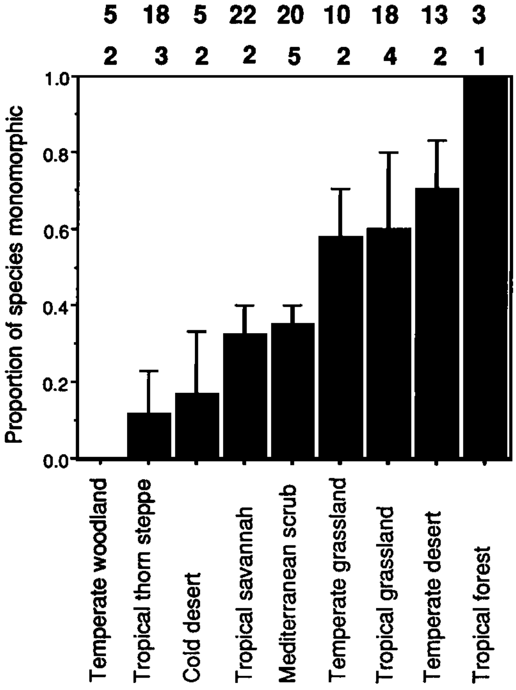

Fig. 1. Associations of habitat type and the proportion of finch species that are monomorphic based on species lists in Schluter (1986) for 23 sites. Whiskers indicate standard errors of proportions in each habitat, using site as replicate. Numbers at top of figure are total species for each habitat (above) and total number of sites (below). Average number of species per site is 5.0 ± SD of 2.8.

tem and degree of dimorphism does not (Møller 1986, Hoglund 1989, Møller and Birkhead 1994). Recently, Møller and Birkhead (1994) used a comparative study to show that sexual dimorphism across a variety of bird species is associated with a high frequency of extrapair copulations. Within species, populations at high density tend to have a higher frequency of extrapair copulation than populations at low density (Alatalo et al. 1989, Hill et al. 1994). In the data presented here, the most striking result is the difference between tropical and temperate forests: tropical forests have a predominance of monomorphic species, whereas temperate forests have a predominance of dimorphic species. It may be that finches in temperate forests breed at a high density, and also are readily visible to conspecifics searching for extrapair copulations. There are many other ways in which habitat could drive selection on color patterns, such as through differing predation risks across habitats (Baker and Parker 1979), or through use of alternative sensory systems (e.g. sound) in some habitats (Endler 1992). Distinguishing among these alternatives awaits further tests.

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