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Color Pattern Asymmetry as a Correlate of Habitat Disturbance in Spotted Salamanders (*Ambystoma maculatum)*

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Recent work has suggested that amphibian populations are declining worldwide (Lips, 1998; Houlahan et al., 2000). Although global amphibian declines are receiving increased attention, most research focuses on identifying biotic and abiotic causal agents (e.g., Berger et al., 1998; Kiesecker et al., 2001). In addition to identifying agents responsible for declines, we need to identify at-risk populations in a timely fashion such that intervention is possible. One promising monitoring tool is the use of fluctuating asymmetry as an indicator of developmental stability, and ultimately of population stress and fitness (Leary and Allendorf, 1989; Clarke, 1995). If asymmetry proves to be an indicator of population fitness, it could be an inexpensive and useful technique as a precursor to more detailed toxicology and demographic studies of environmental impacts on populations.

Developmental stability is a process by which an organism correctly executes a genetically programmed developmental pathway, producing a predetermined phenotype despite developmental accidents or perturbations (Clarke, 1995). Normal development can be disrupted by genetic and environmental stresses experienced during ontogeny (Palmer and Strobeck, 1986; Leary and Allendorf, 1989), and the ability to buffer against these stresses is an important fitness component (Clarke, 1995). Because both sides of a bilaterally symmetrical trait are expressions of the same genotype, deviations from perfect bilaterality in the terminal phenotype reflect the efficacy of the stability mechanism. Fluctuating asymmetry (FA) is one such measure of stability, defined as the random deviations in right minus left differences in the value of

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