

Decline of disjunct green salamander (*Aneides aeneus*) populations in the southern Appalachians

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Received 25 January 2000; received in revised form 5 June 2000; accepted 12 June 2000

Abstract

Coincident with other amphibians around the world *Aneides aeneus*, a terrestrial plethodontid salamander, suffered a population collapse in a disjunct portion of its range in the mid-late 1970s. Long-term monitoring of seven historical green salamander populations throughout the 1990s showed a 98% decline in relative abundance since 1970. Three out of six populations first discovered in 1991 also crashed in 1996–1997. The synchronized suddenness of the declines, their region-wide impact, and effects on both small and larger populations, suggest the role of a novel agent of mortality beginning in the mid-late 1970s. Acting alone, but more likely in concert, habitat loss, overcollecting, epidemic disease and climate change could account for this region-wide decline.

Published by Elsevier Science Ltd

Keywords: Amphibian declines; *Aneides aeneus*; Metapopulations; Plethodontid salamanders; Population monitoring

1. Introduction

Following the First World Congress of Herpetology in 1989, reports of widespread amphibian declines spawned heightened interest in the global status of amphibian populations. In addition to site-specific factors such as logging (Petranka et al., 1993), overcollecting (Hairston and Wiley, 1993), road kill (Fahrig et al., 1995), and introduced predators (Gambrandt and Kats, 1996), several factors operating at regional scales have been invoked to explain amphibian declines. These include acid deposition (Beebe et al., 1990), UV-B radiation (Blaustein et al., 1994a, 1995), pathogen epidemics (Daszak et al., 1999), extreme weather (Crump et al., 1992), pesticides and other endocrine disruptors (Stebbins and Cohen, 1995), and synergisms of some of these factors (Carey, 1993; Drost and Fellers, 1996).

Five attributes commonly characterize amphibian declines in North America and elsewhere: (1) declining populations are most often in montane regions; (2) many declines have occurred in seemingly pristine localities; (3) the first declines were noticed in the mid-late

1970s; (4) not all species and geographic areas have been similarly affected; and (5) anurans apparently have been more affected than salamanders. Given our poor understanding of amphibian population dynamics (Sarkar, 1996), some (Pechmann et al., 1991; Pechmann and Wilbur, 1994) have questioned whether such population fluctuations can be expected, or are reflective of metapopulation dynamics (Blaustein et al., 1994b), whereas others (Laurance et al., 1996; Pounds et al., 1997) have marshaled convincing evidence demonstrating that the observed declines have occurred at rates above background levels.

2. Decline of *Aneides aeneus* in the Blue Ridge Escarpment (BRE)

Green salamander populations collapsed in a disjunct (Fig. 1) portion of their range sometime in the mid-late 1970s (Snyder, 1983; USFWS, 1987; Corser, 1991; Corser and Gaddy, 1991; Snyder, 1991), but those in the main range seem to have remained stable (Snyder, 1991). Prior to the mid-1970s, Gordon (1952), Bruce (1968), and Snyder (1971) reported finding this species at high densities in BRE. In the early 1990s Corser

→ synergistic climatic change from 1970's: + in summ. max temps ↓ 1970's long cold period ↓