

Ultraviolet-B and Amphibia

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The differences in scientists' personalities can affect the ways in which they practice their science and interpret their results. The debate on the importance of ultraviolet-B (UVB) radiation in amphibian declines underscores this point. Lawrence Licht, who finds no support for the hypothesis that UVB radiation is a causal factor in amphibian declines (his latest article on the subject appears in this issue of *BioScience*), and Andrew Blaustein are poles apart in terms of their personalities and their approaches to research; these differences have resulted in scientific conflict. Each of these researchers proclaims the other's work to be scientifically misleading; each is both right and wrong in his assertions.

Since he first witnessed amphibian declines in his study ponds in Oregon, Blaustein has dedicated his research career to searching for the causes of global amphibian declines. Blaustein's research agenda is sweeping; he is willing to take risks to understand the big picture; and he just might overlook some details in order to move on to the next set of hypothesis-testing experiments. Licht, in contrast, bristles at scientific characterizations that he believes are based on faulty assumptions and research design, and he dedicates considerable research effort to verifying which assumptions and protocols are faulty and whether they affect the original research conclusions.

When Blaustein first reported on his UVB research (Blaustein et al. 1994), the media focus was on whether UVB radiation was *the* cause of global amphibian declines. In 1994, the amphibian research community was still divided on whether, in fact, there was a global amphibian problem. Consensus on this issue was not reached until 1996. Licht was not the only amphibian biologist to be dismayed by Blaustein's media exposure. Although Blaustein was careful in his public presentations, the impression from his interviews (at least to me) was that UVB radiation might be what the scientific community was looking for to explain amphibian declines. However, if Blaustein

thought at one time that UVB radiation was the only cause of global amphibian declines, he now espouses another conclusion regarding the role of UVB radiation, discussed below.

So, what to make of Licht's criticisms of the UVB hypothesis? From my restricted perspective, Licht provides convincing evidence that the recent increase in UVB radiation, in and of itself, is a factor in compromising populations for very few species, if any (Licht 2003). However, there are two interpretations in Licht's article that I find just as misleading as those he finds in Blaustein's work. First, he suggests that there was no value in Blaustein's early laboratory experiments because they were ecologically and biologically unrealistic. However, at the time Blaustein started his UVB experiments, there was no background information on the effects of UVB radiation on amphibian eggs and embryos. If his laboratory experiments, with unrealistically high UVB exposures to what the organisms would experience in the wild, had not shown any adverse UVB effects, then UVB radiation could have been ruled out immediately as a factor in amphibian declines. If those studies showed causative effects, then additional experiments would be called for to incorporate more biologically and ecologically realistic parameters.

Second, Licht's conclusion that "realistic environmental factors and the biology of amphibians do not support the hypothetical link between ambient UVB radiation and amphibian population declines" (2003) is only true based on the unrealistic assumption that, for such a link to exist, UVB radiation must be the sole factor causing amphibian declines. The research community has rightfully moved from trying to identify single causal factors for amphibian declines to studying synergistic effects of interacting factors, each of which is sublethal in its effects. Further, it seems probable that the multiple factors that negatively affect amphibian populations are site specific and probably include both factors that arise locally and factors that are worldwide, such as increased UVB exposure and global warming. Blaustein is now in the forefront, with others, of making the case that UVB radiation may be a synergistic factor in amphibian declines (see, for example, Blaustein and Johnson [2003], especially figure 4, and Blaustein and colleagues [2003]). The idea that ambient levels of UVB radiation may increase the toxicity of chemical contaminants to amphibians is an ecologically and biologically plausible explanation for some amphibian population declines. In this sense, Licht's article seems to be shooting at a target that is historically dated.

What is needed to understand complex issues such as amphibian declines: Licht's approach or Blaustein's? Both. Time will resolve what is rhetoric and what is scientifically important in furthering our understanding of the global amphibian crisis.

References cited

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