

# A historical perspective and critique of the declining amphibian crisis

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Losses of amphibian species and populations are of global concern (Blaustein and Wake 1990, Wyman 1990, Wake 1991, Vial and Saylor 1993, Blaustein 1994) and have been the focus of an increasing number of studies. Still, neither all regions nor all species have declines (Dodd 1997; Green 1997; Corn, in press). There also is wide variation in abundance of many species over different years (Pechmann et al. 1991, Meyer et al. 1998); consequently, natural variation needs to be clearly separated from regional declines in populations.

Amphibian declines are considered by many biologists and the public to represent an unprecedented "crisis" and, since about 1990, have been frequently featured in media (e.g., Booth 1989, Yoffe 1992, Watson 1998). Never has so much publicity been directed at amphibian protection and management. However, some reports of amphibian losses and causative factors for declines are reported in the press prematurely, inaccurately, or sensationally. Errors or misinterpretations of results may occur from the rapid release of such information or when a sound foundation of history and peer-reviewed literature is lacking.

Here, I review the historical development and scope of amphibian declines and offer a critique of the current situation to dispel or correct several common misconceptions in the mass media or other reports. My perspective is that of a biologist

and, it is hoped, offers an approach without an alarmist or biased stance.

## Scope of problem

It is important for conservation efforts to differentiate between 2 ecological groups of amphibians (Table 1): endemic species (generally those with small ranges and specialized habits) and widespread forms (large geographic ranges, often habitat generalists). The endemics include most of the species that are listed as threatened or endangered; examples include the Santa Cruz long-toed salamander (*Ambystoma macrodactylum croceum*), which occurs only in a small area in coastal California, and the Texas cave salamander (*Typhlomolge rathbuni*), found in one large aquifer. Endemic species often are naturally rare or isolated and could be lost due to localized human impacts.

Nevertheless, in recent years, a worrisome issue has been the increased number of widespread species with suspected losses (Table 1). Some examples include the western toad (*Bufo boreas*) in the Rocky Mountains of western North America (see Corn 1994) and the hellbender (*Cryptobranchus alleganiensis*), a large salamander of eastern North America (see Dodd 1997). Such losses suggest that there are broad environmental problems causing declines in amphibians with large geographic ranges.

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**Key words:** amphibians, declining populations, management, history, newsreporting

Table 1. Number of species of North American amphibians considered endangered, threatened, or imperiled nationally, by state or other list. Updated from Bury et al. (1995).

Group	Number of Species	
	1980	1998
Endemic	33	54
Widespread	5	33

## Historical review

Although it is widely reported that amphibian collapse is a recent phenomenon, declines have been known or suspected for decades. There is a clear lack of historical perspective evident in warnings by many reporters and biologists of a current "crisis." In most cases, reports either disregard or miss the concern about loss of amphibians voiced by the foremost experts of prior times.

Declines of single species were noted about a century ago, including the apparent overharvest of bullfrogs (*Rana catesbeiana*) in eastern North America (Chamberlain 1897, Dickerson 1906) and red-legged frogs (*Rana aurora draytoni*) in California before the early 1900s (see Jennings and Hayes 1985). Declines in isolated populations or endemics 4–5 decades ago include the disappearance of the Vegas Valley leopard frog (*Rana onca*) in Nevada (Wright and Wright 1949) and the possible decrease in Great Plains toads (*Bufo cognatus*) in Oklahoma (Bragg 1960).

Broad declines in amphibians were fairly evident 2–3 decades ago from reports in Illinois (Smith 1961), Alabama (Mount 1975), the central United States (Gibbs et al. 1971), and continentwide in the United States (Porter 1972, Ashton 1976, Bury et al. 1980). Further, Gibbs et al. (1971) wondered about the factors surrounding "The Frog Crisis" (their quotes), stating that "...an educated guess suggests a 50% decline in the frog population of the United States during the past 10 years."

Conant (1958, 1975) reported that reptiles and amphibians were disappearing rapidly from many areas where they were formerly abundant and that ruination of habitats and pollution were probably the worst enemies of these species. Stebbins (1966) recognized that at a time of growing awareness of the value of reptiles and amphibians, their numbers were declining largely because of habitat disturbance and alteration:

"The trend is toward an ordered, domesticated world, reduced in organic variety and crowded with people and their possessions. Interest in wildlife preservation cannot be separated from concern with efforts to limit human population growth and prevent careless exploitation of remaining natural areas."

Thus, amphibian losses in North America were evident over 100 years ago, and concern has increased steadily in recent decades to the present crescendo. Although many biologists warned earlier of the negative impacts from habitat loss and pollution, most of their predictions fell on deaf ears. Thus, statements in the media that scientists were unaware of an impending problem clearly is not a fair assessment of their interest and hard work on the topic.

A complicating factor is the inexplicable losses of amphibians in pristine areas (or areas presumed to be undisturbed). Most of these are high-elevation wilderness areas or National Parks that generally lack obvious habitat loss or alteration. However, they are not free of pollutants or effects from introduced species such as trout (Bury et al. 1995; Bradford et al. 1998; Tyler et al. 1998; Corn, in press). Declines of amphibians in such remote areas are alarming and appear to be more recent in origin. Still, for a considerable period of time there has been concern among many experts about overall amphibian declines.

## Clarion call

The urgency of the need to understand amphibian losses came to a head in 1989 during the First World Congress of Herpetology convened in Canterbury, England, where many scientists were able to compare firsthand their studies of amphibians globally. Soon thereafter, David B. Wake and others convinced the National Research Council Board on Biology to convene a symposium on "Declining Amphibian Populations—A Global Phenomenon?" The February 1990 event was held in Irvine, California, and triggered widespread news coverage and scientific response. It led to the formation of the Declining Amphibian Population Task Force (DAPTF), organized under the auspices of the Species Survival Commission, International Union for Conservation of Nature. DAPTF produces a newsletter called FROGLOG (<http://acs-info.open.ac.uk/info/newsletters/FROGLOG.html>) and sponsors field research projects on amphibians globally.

## News and scientific reporting

In my opinion, sometimes the press has exaggerated the urgency of the amphibian situation and created a crisis atmosphere. Further, some reporting has promoted sensational stories, and a few storylines have played more on differences in scientists' personalities than on exploration of scientific issues associated with amphibian declines. Although news reporters have clear rights and needs to express themselves, amphibians are a poorly studied group of wildlife, and publicity about a crisis has had its down sides (e.g., muddling the issue of when the problem arose).

People love to solve problems and are enticed by mysteries. Not surprisingly, mysterious losses are the major theme for most amphibian stories (e.g., Barinaga 1990, Milstein 1990, Phillips 1990, McDonald 1998, Souder 1998). The popular media have made implied or explicit statements that paint scientists as baffled by the losses or unable to unravel the case. However, many biologists have invested considerable time addressing the status, trends, and biology of amphibians. The presumed inability of scientists to explain every decline is simplistic at best, particularly in light of the lack of media attention to conservation of this group of animals.

In recent years, scientific news reporting has provided an insightful distillation of discoveries about amphibian declines based on published literature, in-depth interviews, and other well-documented sources. Many of these papers were written by reporters trained in science and some by scientists (e.g., Sarkar 1996, Pechmann and Wake 1997, Wake 1998, this piece). However, not all scientists express themselves well in general writing, or care to. A happy medium may be amphibian-decline stories written with increased analytical rigor and credibility and with input from biologically trained journalists or scientists themselves.

### Are losses of amphibians unique?

Questions remain as to whether amphibian losses are greater than or equivalent to those observed in other taxonomic groups (i.e., beyond the general biodiversity crisis; Pechmann and Wilbur 1994). Should amphibian losses merit more attention than other imperiled groups? Up to one-third of the amphibian species of the United States demonstrate or are suspected of having declines (Bury et

al. 1995), an estimate that includes aquatic and terrestrial species. At the same time, 25% of North American fishes are imperiled to some degree (Johnson 1995), and 45% of the freshwater turtles of the United States need conservation action (Lovich 1995). Moreover, up to 55% of United States freshwater mollusks are threatened with extinction or imperiled (Williams and Neves 1995). Thus, amphibian losses in the United States are roughly comparable to the plight of other freshwater groups, although it is difficult to be more precise because the measures used to indicate the status of groups differ in definition.

Whether we argue that amphibians or other freshwater taxa are the best bioindicators of environmental degradation may be less important than protection of their habitat because an estimated 53% of the original wetlands in the conterminous United States have already been lost (Dahl 1990). Most remaining aquatic habitats are used intensively by humans to varying degrees, and wetlands continue to be modified from their natural state. Thus, wetland habitats are in dire straits, and we need to recognize the broader implication that entire aquatic faunas are in danger of collapsing.

## Conclusions

Recent attention directed at amphibians in the news and by scientists is a mostly positive development. Publicity is vital to conservation efforts and the level of protective measures usually reflects the amount of public concern. However, inaccurate reporting by the news media and premature predictions by scientists about amphibian declines may result in confusion or false starts. This critique is not meant to chide news reporting *per se*, but to encourage patience by reporters or at least a better appreciation for the cautious nature of scientific investigation.

Synchronous loss or collapse of amphibians nationally and worldwide is a dire prognosis, and we need to document the extent and severity of losses. It is sobering to face the possible loss of amphibians, a group that has over 4,000 species globally, and their associated habitats that are home to entire biotas. However, evidence presented here suggests that not all declines are recent; scientists were aware of problems prior to an amphibian publicity boom around 1990. Amphibian losses also are roughly equivalent to those noted for other taxa tied to freshwater habitats.

We are entering a vital phase of work: hypotheses testing, identification of factors causing declines, and debate of the results. To date, there simply has not been sufficient effort or funding for rigorous field surveys, ecological research, and identification of the causative factors surrounding amphibian declines. Many biologists have started studies to determine the extent and causes of amphibian declines, but a "silver bullet" or multiple remedies to explain losses and reverse them should not be expected soon.

*Acknowledgments.* I thank M. J. Adams, P. S. Corn, D. J. Germano, and C. A. Pearl for their helpful reviews on the manuscript. All opinions are my own.

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