

## meeting reviews

DECLINING AMPHIBIAN  
POPULATIONS—A GLOBAL  
PHENOMENON?

A workshop chaired by David Wake of the University of California, Berkeley, and sponsored by the Board on Biology of the National Research Council and the National Academy of Sciences, Irvine, California, 19–20 February 1990.

Amphibians are important components of many ecosystems, often comprising the highest fraction of vertebrate biomass. Moreover, amphibians are top carnivores and are major consumers of invertebrates, especially insects, and other vertebrates. Amphibians are excellent biological indicators of environmental stresses because they inhabit both aquatic and terrestrial habitats, which makes them susceptible to both aquatic and terrestrial pollutants. Moreover they are chemically sensitive due to their extremely permeable skin, which can rapidly absorb toxic substances. Furthermore, the egg stage is highly susceptible to chemical pollutants; exposure to unnaturally high concentrations of certain chemicals may result in developmental abnormalities. Thus, it was with some urgency that this workshop was held 19–20 February 1990 at Irvine to assess the increasing evidence that amphibians around the world are declining in numbers.

Scientists representing the United States, Canada, The Federal Republic of Germany, France, Australia, and Panama presented evidence that both population sizes and geographical ranges are diminishing for many species. Disappearances of frogs, toads, and salamanders have been reported in areas of North America, Central and South America, Europe, Asia, Africa, and Australia.

Many mountain-dwelling amphibians of western North America, especially those in the Oregon Cascade range and in the high Sierra of California, living in relatively pristine habitats devoid of obvious habitat destruction, have been especially hard-hit. However,

western North American species living at sea level also have been affected. Amphibians in other regions of North America such as the Northeastern U.S. and eastern Canada are also in decline, but the data in these regions are fragmentary.

The decline is not seen in all amphibian groups at all locales. For example, the southeastern U.S. seems to show little evidence of amphibian declines except in areas where there has been obvious habitat destruction. In some regions (e.g., the Rockies of Colorado) there are species that are in decline that co-occur with species that are not apparently in decline. Furthermore, declining and thriving species may be closely related, suggesting that taxonomic affinity is not correlated with the declines. There is little evidence for declines of low equatorial (between 10° north and south of the equator) low-altitude amphibians, except as a result of the massive habitat destruction in those areas.

There is little evidence, at this time, for a single global causal factor for the amphibian declines. However, the panelists discussed a variety of potential causes for the declines and these included habitat destruction, introduction of predators such as fish and bullfrogs to areas where they are not naturally found, pesticide pollution, acid rain, and consumption by humans. The importance of frog legs as a food item in France apparently has been linked to a marked decline in native frogs in Europe, India, and Bangladesh. There may be synergistic effects between the above more local factors and such global factors as long-term, low-level exposure to increases in ultraviolet light, and higher temperatures due to global warming.

The panel recommended several immediate courses of action. There are plans to initiate long-term studies of selected populations to identify and monitor both abiotic and biotic factors that could potentially contribute to the declines. Historical records of geographic ranges of species will be compared with current ranges. Experiments investigating responses of certain factors that may be con-

tributing to the declines are being planned. A future meeting will assess the changes in amphibian species richness and diversity globally, compare the analytical methods used to assess the declines, and will formulate methodology to detect accurately future declines.

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