

Among the worrisome indicators of deteriorating environments worldwide is the well-documented decline in the number of amphibians—frogs and toads, salamanders and newts, and their legless, wormlike kin, the caecilians. To understand the full scope of the problem, scientists need to determine not only how many species are declining but also how many living amphibian species there are in the first place. The latter task is complicated by the recent realization that this number is much higher than previously thought.

remote localities in Mexico, Brazil, New Zealand, and Nepal. Closer to home, a new species of slender salamander, genus *Batrachoseps*, turned up in 1997 in the San Gabriel Mountains, less than thirty miles from downtown Los Angeles.

Others have been uncovered in the lab, with the help of molecular techniques. Analyzing geographic variation in DNA and proteins, biologists have identified many cases of wide-ranging “species” that turned out to be several identical-looking but genetically distinct species, each with its own restricted distribution. The mountain dusky salamander (*Desmog-*

concept, defining species according to their ability to interbreed. Today many taxonomists instead favor a historical approach that emphasizes the independent evolution of particular populations. This approach allows taxonomists to regard certain potentially (or even actually) interbreeding populations as separate species, as long as it can be shown (or safely presumed) that the populations will remain evolutionarily independent. Amphibians are especially likely to diversify this way, because they tend to remain near home their whole lives and to have little to do with individuals from other populations, sometimes even those living less than a mile away. Given enough time, these independently evolving populations may become separate species.

Regardless of how one defines a species, amphibian taxonomy can be anything but straightforward. The *Ensatina* salamanders of the Pacific coast of North America are an extreme case. These beautiful amphibians vary widely in coloration (often strikingly blotched with black or orange) and habitat (some living in damp fir forests, others in nearly dry canyons), but because their overall distribution is more or less continuous, and because many distinct types appear to interbreed, they have been regarded as a single species, *Ensatina eschscholtzii*. In response to ongoing genetic and morphological studies, however, opinions now range widely on how many species there are. Some put the number as high as eleven.

Species number is a critical component of biological diversity; every species is a unique experiment in evolution, often going back millions of years. As biologists discover new species of amphibians, they remind us just how richly endowed with life our planet is. Unfortunately, their findings underscore the magnitude of the current global crisis in biodiversity.

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4,780 and Counting

As amphibians disappear, scientists race to discover how many species are out there.

By James Hanken



Allegheny mountain dusky salamander, *Desmognathus ochrophaeus*

The total number of known, named amphibian species grew by nearly 20 percent (from 4,003 to 4,780) between 1985 and 1995—an astonishing increase, especially for such a well-liked and well-studied group. Moreover, the count is likely to exceed 5,000 by the year 2000.

There are several reasons for this surge. One is that species continue to be discovered in the traditional way: by people who keep their eyes and ears open while in the field. In just the past year, several new frogs and salamanders were reported from

nathus ochrophaeus), which lives along streams in the Appalachian Mountains from New York to Alabama, was recently split into four species—and some researchers believe that more divisions may be in order. Such species often differ from one another in subtle but important ways—in their behavior, reproductive biology, physiology, and habitat use.

Some new classifications are the result of a change in the working definition of species. Until a few years ago, most biologists accepted the “biological species”