Have You Ever Wondered...

by Steve Mroczkiewicz

Biology is messy. Over centuries of biological study, scientists have devised all manner of rules that help define biological concepts. But if there's one area where the phrase "exception to the rule" fits especially well, it is in biology. One of the tenets of biology is the definition of a species, because that definition is the foundation upon which we build our understanding of speciation, extinction, mutation, etc. Problem is, our definition of what makes a species a species is imperfect. The most accepted definition of a species is the largest group of organisms that can interbreed to produce fertile offspring. Seems simple enough, but that definition is immediately limited by its reference to interbreeding. There are myriad species of organisms that don't need any breeding interaction in order to reproduce themselves. Even if we only apply the definition to organisms that do require sexual reproduction, we have to acknowledge that there are lots of exceptions to the definition. Dogs, wolves, coyotes, and some other canids are all defined as different species, yet they can all interbreed to produce hybrids with various degrees of fertility, for example. Darwin recognized what has come to be known as "the species problem" in the 1850's, when he wrote "No one definition has satisfied all naturalists; yet every naturalist knows vaguely what he means when he speaks of a species."

Kinda sounds like Supreme Court Justice Potter Stewart when he, in 1964, was trying to define what was and was not obscene pornography. The best he could do was "I know it when I see it."

Despite its limitations, our definition of a species has served science quite well for generations, and advances in DNA science have generally validated it – until now. A recent discovery makes the definition of a species more elusive than ever, and it was discovered in a species (2 species?) of ant. Many species of ants capture larvae of other ant species and raise them as a slave caste, either augmenting or completely replacing the worker caste within the colony. Some species have gone a step farther and integrated the DNA of the slave species into their own society to produce a hybrid slave caste, accomplishing this by matings between the lone queen of the master species and males of the slave species. In studying one such amazing interspecies relationship, scientists discovered that at least one master species, *Messor ibericus*, was way ahead of humans in figuring out how to clone another species, *Messor structor*. In studying the DNA of *M. ibericus* populations occurring hundreds of miles away from the nearest population of *M. structor*, they first thought they had a problem with sample contamination because DNA unique to *M. structor* was turning up in their sequences. Good ol' careful observation of the *M. ibericus* queen laying eggs and then following the development of the larvae into adulthood led to an astonishing discovery: not only was the *M. ibericus* queen able to produce *M. ibericus-structor* hybrids, she was able to produce pure-strain *M. structor* males. Ants have been around for about 150 million years, and it appears that *M. ibericus* has used all that time to evolve a system transcending the need to steal *M. structor* larvae through warfare. Instead, an *M. ibericus* queen only has to mate with an *M. structor* male once. She then can manipulate the DNA within her body to produce fertile females of her own species (future queens of new colonies), *M. structor-ibericus* hybrids to fill the slave/worker caste, or pure-strain *M. ibericus* males to mate with new prospective queens so that they, too will possess the genetic blueprint to carry on the cloning in future generations. *M. structor* exists on *M. ibericus* turf only as clones produced by *M. ibericus*. In other areas, geographically separated for perhaps millions of years, *M. structor* exists as a "regular," free ant species, so it appears that *M. ibericus* stole *M. structor* DNA a very long time ago. The discovery turns many of our assumptions about the definition of a species on its head, so much so that a new biological term was coined to describe the process, xenoparity (Greek for "foreign birth").

Where speciation is concerned, the more we learn, sometimes the less we fully understand.