

Imaginary populations

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A few years ago, Camus & Lima (2002) wrote an essay to stimulate ecologists to think about how we define and use a fundamental concept in ecology: the population. They concluded, concurring with Berryman (2002), that a population is "a group of individuals of the same species that live together in an area of sufficient size to permit normal dispersal and/or migration behaviour and in which population changes are largely the results of birth and death processes". They pointed out that ecologists often forget "to acknowledge that many study units are neither natural nor even units in terms of constituting a population system", and hence claimed that we "require much more accuracy than in past decades in order to be more effective to characterize populations and predict their behaviour". They stated that this is especially necessary "in disciplines such as conservation biology or resource pest management, to avoid reaching wrong conclusions or making inappropriate decisions".

As a population ecologist and conservation biologist I totally agree with these authors and, like them, I believe that greater precision and care is needed in the use and definition of ecological terms. The point I wish to stress here is that we ecologists tend to forget that when we use statistical tools to infer results from our sample to a population we work with what statisticians term "imaginary", "hypothetical" or "potential" populations. As Zar (1999) states, if our sample data consist of 40 measurements of growth rate in guinea pigs "the population about which conclusions might be drawn is the growth rates of all the guinea pigs that conceivably might have been administered the same food supplement under identical conditions". Such a population does not really exist, and hence it is considered a hypothetical or imaginary population. Compare that definition with the population concept that would be in our minds when performing such measurements. We would probably assume that our study population consisted of pigs (not the growth rates of pigs!) and probably all the pigs at the farm we were sampling, rather than the all the growth rates of the pigs that might conceivably have been administered the same food.

We overlook the fact that we are using the statistical tools to try to estimate ecological population parameters (and test specific hypotheses on the values of these population parameters) but that the ecological population which is in our minds and the statistical (imaginary) population of our tests need not necessarily be the same (and most often are not). So, to avoid wrong inferences (with wide-ranging consequences if we are dealing with decision-making processes) we should do all we possibly can to ensure that our natural populations are as similar as possible to the imaginary populations of statisticians, or at least we should discuss our results within the framework in which our inference was developed. Statistics is not an ad hoc tool invented for us, but rather a tool that we have borrowed from statisticians for our purposes. We should always keep this in mind.

References

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