We simulated real populations in R (Version 3.4.0, R Core Team 2017). We did this through several custom-made functions which are fully documented in the supplementary material and can be used by anyone. We generated 20 different populations who’s starting population comes from a normal distribution centered on 1000 individuals. These populations were allowed vary over time for 110 years, and then the first ten years were removed. For each simulation, we generated a new set of populations under the same constraints.

We were interested in seeing what the ‘real’ trend was, as well as what kinds of trends would be found via different kinds of population sampling/measurement. For the ‘real trend’ we sampled two sets of two populations. For the first set, we took the two populations who had the most individuals at year 1. For the second we took two populations at random.

We also looked at the influence of sampling on a population in two ways. First, by varying the number of years between sampling occasions, and second, by varying the length of the sampling period. We also introduced sampling error, since in almost no circumstance are we able to produce a true population census. For sampled datasets, we once again looked at two sets of two populations. The first set contained the two highest pops in year 1, and the second two random populations.   
  
For both the real and sampled datasets we looked for trends in each population separately through linear regression using the lm() function in R. We ran a variety of combinations of sampling frequency and length of sampling period 10,000 times; these combinations are detailed in Table 1. Then we graphically compared the proportion of negative trends among the sampled datasets with the real dataset.

Table 1 - Simulation Scenarios

|  |  |
| --- | --- |
| **Sampling Frequency** | **Length of Sampling Period** |
| Every year | 2 years |
| Every 2 years | 2 years |
| Every Year | 5 years |
| Every 2 Years | 5 years |
| Every 5 Years | 5 years |
| Every Year | 10 years |
| Every 2 Years | 10 years |
| Every 5 Years | 10 years |
| Every Year | 20 years |
| Every 2 Years | 20 years |
| Every 5 Years | 20 years |
| Every Year | 50 years |
| Every 2 Years | 50 years |
| Every 5 Years | 50 years |
| Every Year | 100 years |
| Every 2 Years | 100 years |
| Every 5 Years | 100 years |

**References**

R Core Team (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.