Guana and Necker Island Population Assessments 2002

Gad Perry and Numi Mitchell
The Conservation Agency

Only rarely is a population so thoroughly known that every member is individually recognized and a full census possible. Because of this, a variety of statistical methods, some of them extremely sophisticated, are normally employed to estimate population sizes. As with all statistical methods, population estimates have limitations. The amount of available data is one crucial factor: the more, the better. In addition, certain assumptions, some of them unique to one set of estimators or another, apply.

Unfortunately, studies on critically endangered species tend to run afoul of one or both issues, making reliable population estimates difficult. This is the case with Stout Iguanas. Not only are the populations small, they are unreliable subjects (a captured adult iguana may retreat into its burrow for up to three weeks in response to the stress), hard to spot in the field (the terrain is rough and the animals are cryptically colored), and often not accessible (work on Guana normally can be conducted only during the month of October). These limitations render any estimate of population size less reliable than one would like and therefore much less satisfying to a wildlife manager. Nonetheless, work with endangered species requires that their population sizes be estimated, so that one can determine if the population is stable, growing, or — in a worst-case scenario — declining. A preliminary estimate, known to be imperfect, is better than none, as long as the limitations of the estimate are kept firmly in mind when management decisions are being made.

Several attempts to monitor the Guana iguana population were made over the years. Combined with the evidently growing numbers of hatchlings every year, they suggested that the population was doing well and growing at a steady pace. In October 2002, a more concerted effort was made by marking several individuals with water-based, white, exterior latex paint (which quickly dries and is waterproof) squirted from a two-ounce (60 cc) syringe barrel. Marking began on 4 October and continued until 13 October. Twenty-three individuals were marked, but on most days some sighted iguanas escaped unmarked. Beginning on 15 October, we did six "round-up" counts of marked and unmarked individuals, finishing on 29 October. These provided six population estimates, based on the Petersen Index: 69, 115, 138, 138, 138, and 207. The numbers are relatively close to one another, suggesting that they probably represent a fairly robust estimate. A calculated mean (134) is probably not too far from the real number. A calculated standard deviation (45 in this case) allows us to say that we are 95% confident that the true population size is between 44 and 224: two standard deviations from the mean in each direction. Unfortunately, this method does not meet all of the assumptions of the test, which renders the numbers uncertain.

A second method for calculating population sizes was proposed by Z.E. Schnabel in 1938. Using this method, we can add to the six Petersen Index tallies the data from 4–13 October. This method generates remarkably similar numbers, estimating the population size at 95 individuals and the 95% confidence interval at 58–185. Once again, not all of the assumptions are met, but the fact that two very different methods with different assumptions led to similar estimates gives us more confidence that the population size really is about 100 individuals.

We arrived on Necker Island on the afternoon of 14 October 2002 and quickly marked five Stout Iguanas. The next day before our departure, we saw six iguanas, only one of which was marked. The implication is that one-sixth of the population was marked; so five times six is 30. No statistics can be done on a single estimate, but this observation conforms remarkably well with the opinion of resident naturalist and caretaker, Brian Andrews, who believes that about 20 individuals are present, not counting the current year's hatchlings.

References

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Schnabel, Z.E. 1938. The estimation of the total fish population of a lake. *American Mathematical Monthly* 45:348–352.