Habitat use by Himalayan Snowcocks

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This note compares results from four different methods used to study microhabitat use by Himalayan Snowcocks *Tetraogallus himalayensis,* including those developed by Mayers (1985) and by Bland and Temple (1990).

Himalayan Snowcocks are common in the high alpine zone of the Karakoram mountains of northern Pakistan (Roberts 1991). In summer 1992, we studied habitat utilization by 150-300 snowcocks in a 250 ha meadow called Dhee Sar (36 81'N, 74 95'E) in Khunjerab National Park, Pakistan, at 4000-4400 m ASL. Snowcocks used four main habitats: flats, slopes, moraines, and high meadows.

Methods

Between 1 May - 31 August 1992, three observers noted snowcocks from hides in mornings (generally 0530-0900) and throughout the day while walking around Dhee Sar. A total of 1250 h were spent looking for snowcocks (x = 1.4 individuals seen/hr). We recorded group size and habitat where the birds were seen. We tried not to count the same group or individual twice during an observation period.

Between 20 - 25 August 1992, one observer (J.L.) counted snowcock faecal droppings in 1200 70 x 70 cm quadrants located randomly throughout each habitat.

For both the observational and faecal results, we calculated a Use Index (UI) for each habitat:

$$UI_i = (O_i/E_i) \cdot \left(\sum_{i=1}^{4} O_i/E_i\right)^{-1}$$

Where O_i is the observed number of snowcocks seen or scats counted in habitat i and E_i is the expected number of snowcocks or scats seen in habitat i. The E_i for observations was calculated by assuming that snowcocks would be observed in proportion to the time a habitat was watched, and in proportion to the size of the habitat. The E_i for faecal droppings was calculated by assuming that scats would be found in proportion to the number of quadrats sampled in the habitat. UI values reflect the magnitude of deviation from the expected value; a large UI suggests that a habitat was used more than expected while a small UI suggests that a habitat was used less than expected. Also, since UI values are standardized unitless measures of habitat use, they permit a comparison of methods.

The first data set used to calculate UI values was the combination of observations of individual snowcocks collected using both observational methods (from hides, and while walking). There, are two potential independence problems. First, the observations were not statistically independent: individuals may have been observed on more than one occasion, and treating observations as independent may artificially increase the sample size (Hurlbert 1984, Machlis et al. 1985). Second, since Himalayan Snowcocks often occurred in groups, the location of an individual may have been influenced by other snowcocks. To address the first problem, individual snowcocks must be individually identified, something we were unable to do in this study. To address the second problem, we used group sightings as the unit of analysis (see also Bland and Temple 1990).

The second data set used to calculate UI values was a combination of all observations of groups of snowcocks. The problem with this analysis is that the two sets of observations (from hides and while walking) derive from different methods of data collection. Strictly, results from two different data collection methods should not be combined.

The third data set used to calculate UI values was the set of observations made while walking around Dhee Sar. Hides were not used in high meadows. Therefore, we were unable to calculate group UI values for all habitat types using only observations from hides.

Results

All methods yielded qualitatively consistent results for the flats and high meadows (Fig. 1). Flats were used consistently less than expected and had consistently small UI values as calculated from both observations and faeces. The reverse was true for the high meadows. Slopes and moraines had intermediate UI values and had inconsistent results in terms of whether a method suggested they were used more or less than expected (Fig. 1). Nevertheless, the magnitudes of the UI values seem fairly consistent between methods (Fig. 1).

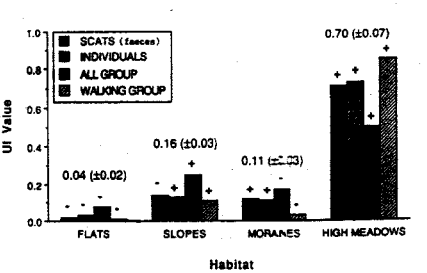

Figure 1. Comparison of four methods of studying habitat utilization by Himalayan Snowcock.

Methods included: faeces samples (SCATS); observations of individual snowcocks (INDIVIDUALS); observations of groups of snowcocks regardless of sampling regime (ALL GROUPS); and observations of groups made while walking around the study site (WALKING GROUP). Histograms illustrate UI values (see equation 1). Plus or minus signs seen above the histograms show whether the particular value is greater or less than expected by chance. The mean (±SE) of the four values is found above the histograms.

Discussion

All methods demonstrate unambiguous habitat use: high meadows were used more than expected, while flats were used less. This is in contrast to another study of Himalayan Snowcock which obtained different results depending upon the "census" method used (Bland and Temple 1990). In our study, less clear patterns of use are more difficult to resolve. Whether slopes and moraines were used more or less than expected varied according to the method employed. One source of this variation is that group size in Himalayan Snowcocks varies seasonally, as does habitat use. Thus, equivocal patterns of habitat use might be influenced by short term variations in habitat use.

Our results suggest that if the goal of a study is simply to determine the level of habitat use, and sample sizes are large, observational protocol and statistical concerns may not be very important in influencing the results. Our results were generally consistent despite the method employed.

Management implications

A busy manager interested in protecting or enhancing Himalayan Snowcock habitat could distinguish those habitats much used from those rarely used by comparing scat densities in different habitats. It is difficult to see wild Himalayan Snowcocks and observing them takes time. Counting snowcock scats requires a fraction of the time required to observe the bird throughout the season. While differential habitat use may be identified from direct observations these seem not to add additional information on actual patterns of use.

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