

Burrow Cluster as a Sampling Unit: An Approach to Estimate Marmot Activity in the Eastern Steppe of Mongolia

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Abstract

In order to describe current marmot distribution and establish a baseline density for the Eastern Steppe of Mongolia (Dornod, Sukhbaatar, and Khenti aimags), we conducted line transects during pup emergence from June through July 2005. For these distance sampling surveys, we counted and measured active and inactive marmot burrow clusters. We define a sampling unit (= burrow cluster) as a surrogate for active and inactive colonies to estimate marmot density. We measured different characteristics of burrows and burrow clusters in order to estimate the probability of occupancy for future research. We also present various measures such as area (size) and average burrow number for active and inactive burrow clusters.

Key words: burrows, distance sampling, *Marmota sibirica*, Mongolia, sampling unit

Introduction

We conducted a survey in the Eastern Steppe in the summer of 2005 to establish baseline estimates of marmot distribution and abundance. Due to perceived recent dramatic declines in marmot abundance (Reading *et al.*, 1998; Zahler *et al.*, 2004; Wingard & Zahler, 2006), a 2-year marmot hunting ban was established throughout Mongolia (2005 and 2006).

Generally, steppe marmots (*Marmota sibirica*) are found in family groups (clans) or colonies (multiple clans; Barash, 1989; Adiya, 2000). Marmots are diurnal but spend a considerable time underground. We therefore needed to determine presence or absence even if no marmots were observed. We identified burrows as an indirect measure of marmot presence but did not want to overestimate marmot abundance by using burrows alone as a surrogate for marmot presence. Indeed, marmot burrows can persist long after marmots have been removed or are no longer present. Therefore, we were faced with 1) accurately determining marmot presence, and 2) defining a unit of measure while conducting transects in a timely fashion.

Burrows and burrow activity for semi-fossorial mammals have been used to determine relative density and presence (Lord *et al.*, 1970; Schmutz & Hungle 1989; Boonstra *et al.*, 1992; Hubbs *et al.*, 2000). In addition, using animal sign (scat,

tracks, for example) along transects are often used to determine species presence and relative abundance (Thompson *et al.*, 1989; Ballard *et al.*, 1995; Becker *et al.*, 2004). We could detect burrows from a slowly moving vehicle, and we identified characteristics associated with active and inactive burrow clusters, that are parameters that could potentially indicate presence or absence. We also developed a way to rapidly assess these parameters.

Methods

Surveys were conducted from 10 June to 31 July 2005 in the ~250,000 km² study area of the Eastern Steppe (the three eastern aimags of Khentii, Dornod and Sukhbaatar in Mongolia). North-south line transects were located randomly at ~50 km apart.

Distance sampling along line transects was conducted to sample active and inactive burrow clusters, marmots and other wildlife (Buckland *et al.*, 2001, see Townsend and Zahler, this volume, for full explanation of methods). We detected marmot burrows from our slowly moving vehicle and noted burrows tended to occur in clusters. The "burrow cluster" (burrows within 15 m) was our sampling unit; we made a determination of "active" based on the presence of 1) fresh scat and/or 2) a marmot. Burrow clusters were defined as a group of burrows >10.2 to 30.5 cm in diameter that