Using visual estimation of cover for rapid assessment of graminoid abundance in forest and grassland habitats in studies of animal foraging

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Abstract

Questions: To assess the feasibility of using visually-estimated vegetation cover in rapid assessment of herbivore food species abundance in the grass layer, we asked the following questions: 1) What is the relationship between total graminoid cover and biomass in forests, and does height improve the prediction of biomass from cover? 2) How does total cover relate to biomass in a grassland habitat? 3) How does elephant food species graminoid cover relate to individual species biomass? 4) How well does species diversity of forest understorey grass layer, calculated from cover data, mirror that calculated from biomass data? **Location:** Nagarahole National Park, India. **Methods:** We estimated the abundance of graminoids through visual estimation of cover and weighed harvested biomass in forest and grassland plots. In forests, two estimates of total graminoid abundance (total graminoid cover and sum of species covers) were used. In the grassland, only total graminoid abundance was measured. We examined the relationship between cover estimates and biomass, and the additional utility of height in predicting biomass, using multiple regressions and AIC-based model selection. We also assessed similarity in cover- and biomass-based Simpson's and Shannon-Wiener diversity indices using regressions. **Results:** Graminoid cover explained a large portion of variation in total graminoid biomass in forest and grassland habitats. The sum of species covers was better than total cover in estimating total graminoid biomass in the forests. The benefit of including height to estimate total biomass was moderate in forests but substantial in grasslands. Cover estimates were good proxies of food species biomass, and the addition of height did not yield better models for most species. Species diversity indices calculated from cover largely matched those based on biomass. **Conclusions:** Visual estimation of species cover is a good alternative to biomass harvesting for rapid assessment of abundance of graminoids consumed by generalist herbivores, like elephants.

Keywords: elephant food species; forage distribution; graminoids; grasslands; rapid assessment methods; species diversity; vegetation abundance; visual estimation of cover; tropical forests.

Nomenclature: Potdar et al. (2012)

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Introduction

Ecologists estimate vegetation abundance in order to study various structural and functional attributes of plant communities (e.g. Hermy 1988; Guo & Rundel 1997; Chiarucci et al. 1999; Henschel et al. 2005; Lavorel et al. 2008), the productivity of animals' habitats (e.g. Hutto 1990; Säid et al. 2005; Pettorelli et al. 2011; Iversion et al. 2014) and its effect on foraging behaviour (e.g. Wilms-

hurst et al. 1999), and the impact of animal activities on vegetation (e.g. Pekin et al. 2015). While studies of plant community structure and function may require intensive measurements of species abundance or traits (e.g. Chiarucci et al. 1999; Lavorel et al. 2008), assessment of resource availability for animals often necessitates sampling over large spatial scales (see Pettorelli et al. 2011), which would, therefore, benefit from rapid methods of estimating species abundance. Estimating forage abundance is a

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