The Importance of Patch Size in Estimating Steady-State Bite Rate in Grazing Cattle

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Introduction Since the pioneering work of Black and Kenney (1984), various intake studies have been conducted at the spatial scale of a single feeding station ("patch") to elucidate the processes that determine instantaneous intake rate (e.g. Laca *et al.*, 1994). While these are well-suited for patch depletion studies, it is less clear how well they represent non-patchy and relatively homogeneous environments (Ungar & Griffiths, 2002). Clearly, grazing should be restricted to the upper grazing horizon (i.e. layer of bites), but sample duration may be insufficient to characterize steady-state behaviour, especially when grazing commences on an empty mouth. We examined the impact of feeding station size on bite rate and jaw movement allocation between bites and chews.

Materials and methods Six Israeli-Holstein dairy heifers were used. Treatments were three sizes of feeding station (0.16, 0.30 and 0.53 m^2) and two initial sward heights (10 and 20 cm; mean herbage mass per unit area: 105 g/m^2 and 149 g/m^2, respectively), in a full factorial design. Animals were allowed to deplete the patch without interference. Grazing sessions were recorded on video with acoustic monitoring, using a microphone on the forehead of the animal. Analysis was from the first bite until depletion of the upper grazing horizon of the patch, or until the animal first paused, raised its head or moved its head away from the patch. The acoustic signal was sequenced aurally; each sound burst produced by a jaw movement was classified as a pure chew, pure bite or chew-bite. Factors in the ANOVA were animal, patch size, sward height and the size x height interaction.

Results The allocation of jaw movements and bite rate responded strongly to the duration of the grazing session, expressed here as the total number of jaw movements (Figure 1). The allocation of jaw movements was initially to pure bites, which we attribute to the mouth being empty. On the smallest patches, this initial run of pure bites depleted much of the upper grazing horizon of the patch and hence constituted a high proportion of the total number of events in the sequence. As the size of the feeding station increased, more jaw movements were performed ($P < 0.001$) and the proportion of jaw movements allocated to pure chews increased ($P = 0.01$). Bite rate was higher on the shorter sward (62.9 vs. 57.4/min; $P = 0.02$), as was the rate of jaw movement (77.8 vs. 74.2/min; $P = 0.03$) and the proportion of pure bites (0.47 vs. 0.33/min; $P = 0.02$), however the interaction between patch size and initial sward height was not significant in any analysis. It is possible that representative values for the sward type were not reached at even the largest patch size. For comparison, mean bite rate of a group of 9 heifers (including 5 from above) grazing continuous expanses of the same herbage was 47.5/min.

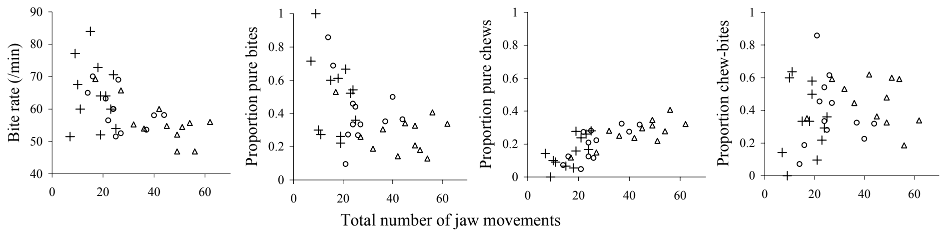

Figure 1 Response of bite rate and the allocation of jaw movements between the three types to total number of jaw movements in the sequence (Patch size: + = small, O = medium, Δ = large).

Conclusions Small patches do not permit the estimation of steady-state jaw allocation, and hence bite rate, on homogeneous, continuous swards. For such purposes, patch size should be closer to the potential area that can be reached by a stationary animal.

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