THE USE OF ANATOMICAL FEATURES OF THE STOMACH TO INVESTIGATE THE NUTRITIONAL STATUS OF DEER POPULATIONS

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ABSTRACT

A feasibility study is undertaken for the development of indices recording interaction of individual ruminant herbivores with their nutritional environment with a view to their use as an individual based game management method. A current need for individual based methods having short response times is highlighted by a review contrasting population based and individual based methods of game management. Features desirable in a short time based individual method are discussed. Techniques which quantify the response of inbuilt mechanisms of nutritional thrift that operate in ruminants in response to declining quality of diet, (which I term" intrinsic nutritional optimisation") are reviewed from a viewpoint of their potential as tools for game management.

Methods which record change in response to diet of rumen volume, papillary and omasal anatomical characteristics, are examined. Techniques that utilise simple anatomical parameters i.e. papillary length, papillary width, papillary site, omasal weight, omasal volume, omasal laminar area and omasal laminar number are favoured.

A study of the extent of rumen wall shrinkage during preservation in formalin at various sites in wild red deer (Cervus elaphus), was undertaken. This demonstrated a degree of unpredictable variability sufficient to cast doubt on the accuracy of papillary density measurements such as are incorporated into FISA values.

In these studies the effect of differing diet was evaluated using wild red deer as representative of an 'intermediate feeder' browsing and grazing habit, farmed red deer as representative of an obligate 'bulk feeder' grazing habit and wild fallow deer (Cervus dama)as representative of voluntary "bulk feeder grazing habit.

A multivariate analysis of rumen papillary size at six objectively defined

sample sites in wild and farmed red deer and in wild fallow deer was undertaken. Three significant axes were generated, overall papillary size, overall papillary shape and site specific papillation. These responded differently to changes in age, sex, diet and species. The results supported previous descriptive work demonstrating that papillation at certain sites varied with diet and that overall papillary size increased with age. However the rate of increase of papillary size was shown to vary according to the sex in concordance with known differences in bionomic strategy. Overall papillary shape was influenced solely by species.

A multivariate analysis of omasal anatomical characteristics including laminar number and area, from wild and farmed red deer and from wild fallow deer was undertaken. Two axes were generated, overall size and overall leafiness. The latter axis showed significantly more variance in "intermediate feeder" wild red deer than in farmed red deer or in "roughage feeder" wild fallow deer.

Rumen content analysis was carried out concurrent with other studies. As with the papillary analysis, there was no significant seasonal variation in wild deer samples, further supporting a hypothesis of little seasonal variation of dietary quality at population densities well below carrying capacity.

A jaw length condition index was derived using Weibull curves derived from population samples obtained two years prior to the current study. Whilst these curves were shown to give a good description of the jaw length condition index distribution of the current population, there was no significant correlation of the index values with results from the papillary or omasal study. Possible explanations for this were considered. Firstly that the methods recorded different aspects of nutrition. Secondly that the jaw length index exhibited a cumulative damping of sensitivity as a consequence of progressive accumulation of non demarcated annual growth increments, a problem that did not occur in indices such as the site specific papillation factor, where there was no age related

increase.

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