

UNIVERSITY OF SOUTHAMPTON

ABSTRACT

FACULTY OF SCIENCE

BIOLOGY

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EFFECTS OF DENSITY AND AGE ON BODY CONDITION, REPRODUCTIVE
PERFORMANCE, BEHAVIOUR AND SURVIVAL OF FALLOW DEER

by

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This thesis investigates the effects of various population parameters, together with other factors such as climate and management intervention, on performance and behaviour of fallow deer, Dama dama. British deer parks were chosen for study as they provide a wide range of accurately measurable population densities, and animals within them can be observed and caught relatively easily in comparison to wild deer. The populations present fully mixed-sex herds which are entirely free-ranging within the boundaries of each park throughout the year, and thus offer a model system where population processes may be studied.

Live capture of fallow deer in 15 parks enabled collection of data on body weights and skeletal size in relation to age and sex on 3740 individuals, many of these being recaptured in a number of years. Intensive field observations focused on marked individuals in 9 populations, to determine fawning success, birth dates and weights, and variation in maternal and mating behaviour. Additional data on natural mortalities, culled carcasses, food availability, climate and habitat characteristics were collected over the extended set of parks.

Wide variation occurred between parks in winter live weights, population means ranging from, for example 19.5 to 32.3 kg for male fawns, and 32.1 to 42.6 kg for yearling females. In contrast, such variation within sites between years rarely exceeded 10%. Within some populations changes in mean body weights between years could be explained directly by changes in stocking density, associations being strongest with density measured in the year of birth. Variation in body weights and skeletal sizes between populations showed density-independent associations with summer pasture productivity and winter climate; after accounting for these factors, density-dependent effects, acting through forage availability and supplementary feed obtained per deer in winter, were also apparent.

Reproductive rates of adult does (≥ 2 years old at rut) were very high in all the sites where age-specific data were collected. The fecundity of younger does (< 2 years at rut) was consistently lower than that of adults, with differences greatest in parks offering most restricted resources. The winter body-weight threshold for yearlings, at which 50% produced fawns the next summer, was determined as 32 kg. Yearlings produced lighter offspring than adults, and mated and fawned an average of 11 days later. Near maximum reproduction was attained even in parks holding up to 6 deer/ha, as long as at high densities adequate supplementary feeding and shelter were offered.

Marked differences in mating behaviour occurred during the rut. Highly territorial systems ranging from single rutting stands to leks occurred in some parks, while non-territorial systems based on defense of mobile female groups by dominant males were observed in others. Variation in the systems observed is fully described and was found to relate in particular to buck density, total number of bucks, and doe density. Individual male mating success was highly skewed in all systems. Costs and benefits of variation and timing of mating behaviour are discussed.

Juvenile mortality in summer, as well as other natural mortality was very low in the most parks and years. Higher mortality was associated with low body weights in years of cold late winter temperatures. Survival rates were highest where supplementary winter feeding was extensive and commenced before December.