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Deer herd health and production profiling in New Zealand. 2. Preliminary results

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Summary — A 2 yr observational study of 15 commercial red deer farms is being conducted in New Zealand and statistical analysis initiated. Preliminary results for weaner deer growth, reproduction and deer mortality data are presented. Multivariable statistical analyses are used to identify risk factors for these various outcomes. Factors associated with yearling hind conception status were included in a putative path diagram and logistic regression was used to identify important factors.

epidemiology / observational study / farmed deer / New Zealand / risk factors

Résumé — Profil de santé et de production dans les élevages de cerfs élaphes en Nouvelle-Zélande. 2. Résultats préliminaires. *Une enquête d'observation de 2 ans est en cours dans 15 élevages de cerfs élaphes en Nouvelle-Zélande et les analyses statistiques des données ont débuté. Des résultats préliminaires sont présentés au sujet de la croissance des jeunes cerfs sevrés, de la reproduction et de la mortalité des cerfs en élevage. Les facteurs de risques associés au succès de reproduction des jeunes biches sont en cours d'étude par diverses méthodes d'analyse statistique, dont la régression logistique multiple.*

épidémiologie / enquête d'observation / Cervidés/ Nouvelle-Zélande / facteurs de risque

INTRODUCTION

The background to this paper and the methods used for this deer herd health and production profiling study are presented in another paper in this proceedings (Audigé *et al,* 1994). The amount of data that was collected at the time of writing was substantial and most still required validation before statistical analysis, and so the results in this paper are preliminary. More detailed analyses and results will be published in due course. Other preliminary results have been published elsewhere (Audigé *et al,* 1993).

THE GROWTH OF WEANER DEER

Weaner deer bodyweights were computed at defined dates for each sex and are presented in table I. Data from 1992 and 1993 were combined when available before calculations.

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From April 1 to March 1 of the next year, the range of bodyweights widens. Mean bodyweights of weaner stags and hinds, respectively, were statistically significantly different between farms ($p < 0.01$), thus providing variability for further investigations. The relative importance of multiple potential risk factors will be analyzed with particular interest in grazing and health management, blood strains and environmental factors.

DEER MORTALITY

The monthly distributions of deer losses show seasonal variation. The highest death rate for weaners was between the ages of 3 and 6 months (March–June) whereas the highest death rates for adults was between June and October. Unfortunately, a large number of deer could not be examined *post mortem* because they were found too late after death, but this highlights the reality of research on commercial deer farms.

Between March 1992 and September 1993, the most common diagnoses associated with hind deaths were fading (loss of body condition) (14.5% of total deaths), malignant catarrhal fever (MCF) (10.5%) and dystocia (7.9%). MCF was the most common cause of stag death (17.4%) followed by injuries, either self-inflicted or caused by other stags (13.0%). Confirmed losses of weaners were mainly associated with broken bones (13.8%), yersiniosis (6.1%) and osteochondrosis lesions (7.8%), although the latter were all from one property only. Calf losses resulted mainly from dystocia (22.8%) and stillbirth (12.3%). Overall incidence mortality rates of weaners, hinds and stags during this period were 5.7, 2.3 and 2.8 losses per 100 deer-years, respectively.

REPRODUCTION

Overall pregnancy rates of yearling and adult hinds assessed by ultrasound are presented in table II. There were highly statistically significant variations ($p < 0.01$) between farms with pregnancy rates of yearling and adult

Table I Bodyweights (kg) of weaner stags and hinds 1992–1993.

	April 1	*June 1*	*Sept 1*	*Dec 1*	*March 1*
Stags					
Number of deer	1 379	1 334	914	308	222
Mean	50.0	56.4	63.8	77.3	95.8
Minimum	22.5	26.6	34.8	48.9	66.0
Maximum	69.1	82.0	90.5	106.8	131.0
SD[a]	7.6	8.6	10.1	11.1	12.5
Weaner hinds					
Number of deer	1 338	1 228	742	385	389
Mean	45.9	51.8	56.7	68.0	80.2
Minimum	19.9	19.6	27.4	34.6	42.9
Maximum	64.5	73.7	79.8	93.5	113.0
SD[a]	7.0	7.6	7.9	8.4	9.4

[a] SD: standard deviation

Table II. Pregnancy rates of yearling and adult hinds 1992–1993.

	N° of deer	*% conceiving before May 1*	*% conceiving after May 1*	*% not pregnant*
Adults				
1992	1 759	89.3	7.7	3.1
1993	1 728	92.8	3.5	3.6
Yearlings				
1992	370	55.1	27.3	17.6
1993	417	72.9	12.2	14.9
1992 and 1993 combined				
Adults	3 487	91.0	5.6	3.4
Yearlings	787	64.5	19.3	16.1

hinds ranging from 50 to 100% and from 84.4 to 100%, respectively.

Pre-mating bodyweights for yearling and adult hinds ranged from 56 to 114.3 kg (mean 83.2 kg) and from 68 to 144.5 kg mean 99.3 kg), respectively. Almost all hinds were over the threshold weight of 65 kg under which they were reported to be at risk of not conceiving (Hamilton and Blaxter, 1980). However, mean weights were similar between pregnancy status groups. Mean growth rates of yearling and adult hinds during the rut (April 1–June 1) were 33.5 and –8.2 g per d, respectively.

The overall pregnancy rate of adult hinds was satisfactory, although improvement was possible for herds having less than 90% of hinds conceiving before May 1. Data also suggest that 3–4% of nonpregnant adult hinds is normal. As pregnancy test results were available in 1992, most farmers culled nonpregnant or late-conceived hinds in winter. Whether this practice had a positive effect on pregnancy rates in 1993 will be analyzed. Pregnancy rates of yearling hinds were low and represent a considerable waste factor for the industry.

IDENTIFICATION OF RISK FACTORS

At the time of writing, multivariable statistical analyses were initiated but not completed, so only the principles are presented. Early conception results of yearling hinds (reproductive success was identified as conception before May 1) are used in this example.

In a preliminary analysis, the association of potential risk factors with hind conception status was tested for statistical significance. Continuous and ordinal variables were analyzed without transformation using the Mann–Whitney *U* test. Categorical variables were analyzed using the Chi-square test of independence. Variables not showing statistically significant association ($P > 0.20$) were rejected from the multivariable analysis unless they were recognized as potentially important factors biologically. A putative path diagram was drawn using the remaining factors to investigate the potential causal pathways between important risk factors (Chesterton *et al,* 1989) (fig 1). Statistical software used included Statistix (Analytical Software, St Paul, MN USA)

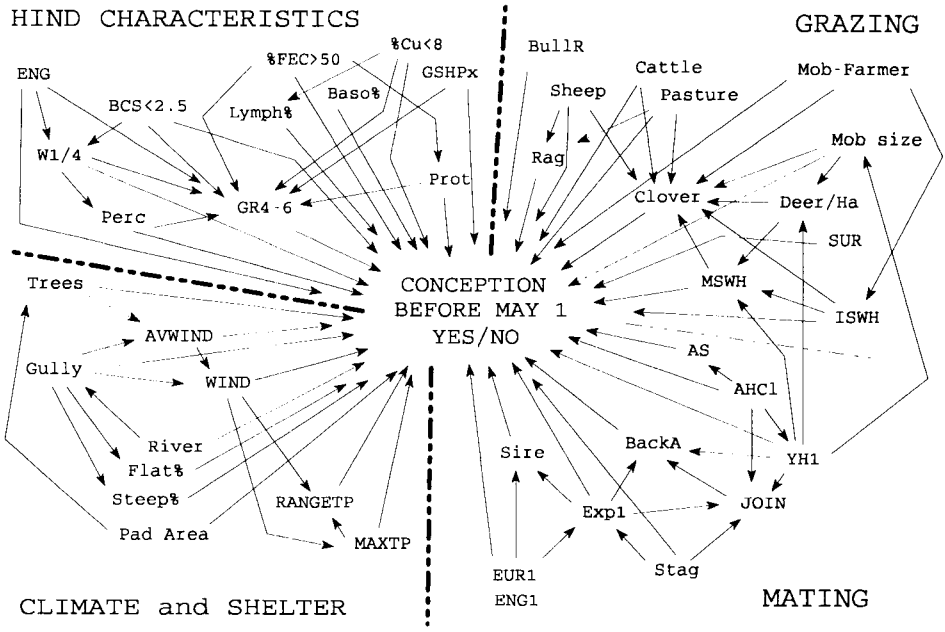

Fig 1. Putative null path model for yearling hind early conception status (Yes = hind conceived before May 1; No = hind conceived after May 1 or nonpregnant). **Pasture**: average pasture score; **ISWH**: mean initial sward height; **MSWH**: mean sward height; **Clover**: pasture clover score; **Rag**: average ragwort score; **Mob-Farmer**: average time between 2 contacts between deer and farmer; **Mob Size**: average deer mob size; **AHCl**: contact with mature hinds; **Deer/Ha**: No of deer per ha in paddocks; **AS**: average number of stags with hinds; **Sheep**: deer grazing with sheep; **Cattle**: deer grazing with cattle; **SUR**: percentage of time spent in paddocks next to signs of human activity such as houses, roads, farm buildings, *etc*; **BullR**: average bull rushes score; **PadArea**: paddock area; **Flat %**: average of the percentage of flat paddock area; **Steep%**: average of the percentage of steep paddock area; **Gully**: average gully score; **Trees**: average tree score; **River**: percentage of time spent in paddocks with a river; **MaxTP**: average of maximum temperatures; **RangeTP**: average of daily temperature ranges (maximum–minimum); **AVWIND**: paddock average wind exposure score; **WIND**: wind stress indicator; **Stag**: date of first contact with at least one stag; **JOIN**: date of joining for mating; **Sire:** No of sires; **YH1**: No of yearling hinds in the first mating mob; **EXP1**: use of at least one experienced sire stag; **EN1** presence of one or more English stags but no European stags; **EU1**: presence of one or more European stags; **BackA**: use of one or more back-up stags before May 1; **ENG**: hind having some English blood; **BCS < 2.5**: hind having a body condition score below 2.5; **W1/4**: live weight on April 1; **Perc**: percentile of W1/4 within the first mating mob; **GR4-6**: growth rate between April 1 and June 1; **L%**: percentages of lymphocytes; **B%:** percentages of polynuclear basophils; **TP**: serum total protein; **%CU < 8**: percentage of sampling hinds with serum copper below 8 μmol/l; **%FLC > 0**: percentage of sampling hinds with positive faecal larvae count; **GSHPX**: mean value of glutathione peroxidase from 3 sampling hinds.

and Stastistica (Statsoft Inc, Tulsa, OK USA).

Multiple logistic regression among other statistical techniques will be used to identify the most important risk factors, using a forward inclusion method (Kleinbaum *et al*, 1982).

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Prevention of metritis–mastitis–agalaxia syndrome in sows

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Summary — Data collection related to farrowing performances and health parameters was performed in 20 intensive pig farms in Portugal (100–800 sows each) over 7 yr (1985–1992). At-risk profiles were obtained regarding the metritis–mastitis–agalaxia (MMA) syndrome. Using prospective surveys and subsequent preventive veterinary medicine programs in pig farms, the

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