Deer Master* investigations into reproductive efficiency of hinds

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Abstract

The South Canterbury/North Otago Branch of the NZ Deer Farmers Association carried out extensive on farm investigations and trials over a period of three years, examining production and reproduction parameters on 16 member deer farms.

Key measures of deer farm reproductive performance are pregnancy rate and weaning rate, both directly reflecting the number of fawns weaned and therefore the efficiency of breeding herds.

Pregnancy status immediately post mating (June/July), pregnancy status again immediately prior to set stocking (November), lactation status at weaning (March/April) and the number of fawns tagged at weaning, were all parameters used to determine the reproductive performance of these 16 farms.

The average pregnancy rate established for Deer Master farms for mixed age hinds (MA Hinds) was 95%, and for 2 year hinds (2Y Hinds) was 83 %.

Ensuing average weaning percentage (No. scanned pregnant/No. calves weaned) was 94% for mixed age hinds and 82% for two year hinds.

Importantly the weaning percentage reflected considerable fawn loss during the peri-natal/lactation period.

Combining weaning rate with the initial pregnancy rate and allowing for all losses it became evident that significant reproductive wastage is occurring. That is, between 13 and 29% of all hinds in any one year were non productive.

Additional investigations were undertaken in an attempt to reduce the fawn losses recorded during the peri-natal/lactation period. Results from fawn-proofed paddocks, Vitamin E supplementation, paddock variables and conception date effect were all analysed.

Clear trends, with practical application for the Deer Industry did appear from the fawn proofed paddocks. Paddock variable studies showed however, that fawn-proof fences were positively related to weaning percentage. Vitamin E supplementation did not increase weaning percentage.

Part A. Recording and establishing Reproductive Efficiency.

Introduction

The background to the Deer Master Project has been described previously (Campbell, 1998). The initial investigations were aimed at establishing actual reproduction levels for the 16 member farms. This is commonly referred to as "bench marking".

One of the founding reasons for the Deer Master project was the relatively poor weaning percentage and the apparent absence of fawn carcasses in the paddocks.

The aim of the Deer Master work also included therefore investigations into the so called "losses during pregnancy" as well as any other losses such as during the peri-natal/lactation period.

Further work focussed on factors affecting weaning percentage.

- the effect of Vitamin E supplementation.
- fawning behind a fawn-proof fence.
- measuring fawning paddock environmental factors.
- fawning date effects.

Definition of Terms

Pregnancy Rate represents the number of hinds that conceive to the stag within a defined mating period.

Weaning Rate represents the number of fawns weaned as a proportion of hinds set stocked and reconfirmed pregnant in November.

Reproductive Efficiency combines both the pregnancy rate and the weaning rate and includes any losses that may occur during pregnancy or in the perinatal/lactational period up to the weaning date. This is often termed the "true weaning percentage" (No. calves weaned/No. hinds put to the stag).

Data source and collection

Deer Master captured data from 16 properties over a three year period with a total of 15,654 individual hind records.

Hinds were rectal ultrasound scanned for pregnancy in June/July and the pregnancy rate for each herd was established.

Losses attributable to the pregnancy period were measured by confirming continued pregnancy at the time of set stocking (November). Pregnancy was confirmed on the evidence of a developing udder and the balloted technique described by Audige (1995). Apparently non-pregnant hinds at set stocking were re-scanned to confirm pregnancy status.

Weaning included the counting of hinds with evidence of an udder (still milking) and the number of fawns weaned. Where possible paddocks were searched carefully at weaning time for evidence of dead fawn carcasses.

Results

The pregnancy rate, *in-utero* loss, weaning rate and reproductive efficiency for MA and R2YO hinds for 1997 to 1999 are presented in Tables 1 and 2.

Table 1 Pregnancy rate, *in utero* loss, weaning rate and reproductive efficiency of MA hinds for each year.

Year	Mated	Pregnancy rate (%)	Hinds set stocked	*In utero* loss (%)	Number of fawns	Weaning rate (%)	Reproductive efficiency (%)
1997	4396	89.3	2586		2307	89.2	79.4
1998	3660	91.8	3185	1.0	2895	90.8	83.1
1999	5997	94.8	4605		4255	92.4	87.1

Table 2 Pregnancy rate, weaning rate and reproductive efficiency of R2YO hinds for each year

Year	Mated	Pregnancy rate (%)	Hinds set stocked	Number of fawns	Weaning rate (%)	Reproductive efficiency (%)
1997	1136	81.9			85.2	69.8
1998	1214	85.2	944	823	87.2	75.8
1999	1646	82.2	1151	987	85.8	71.0

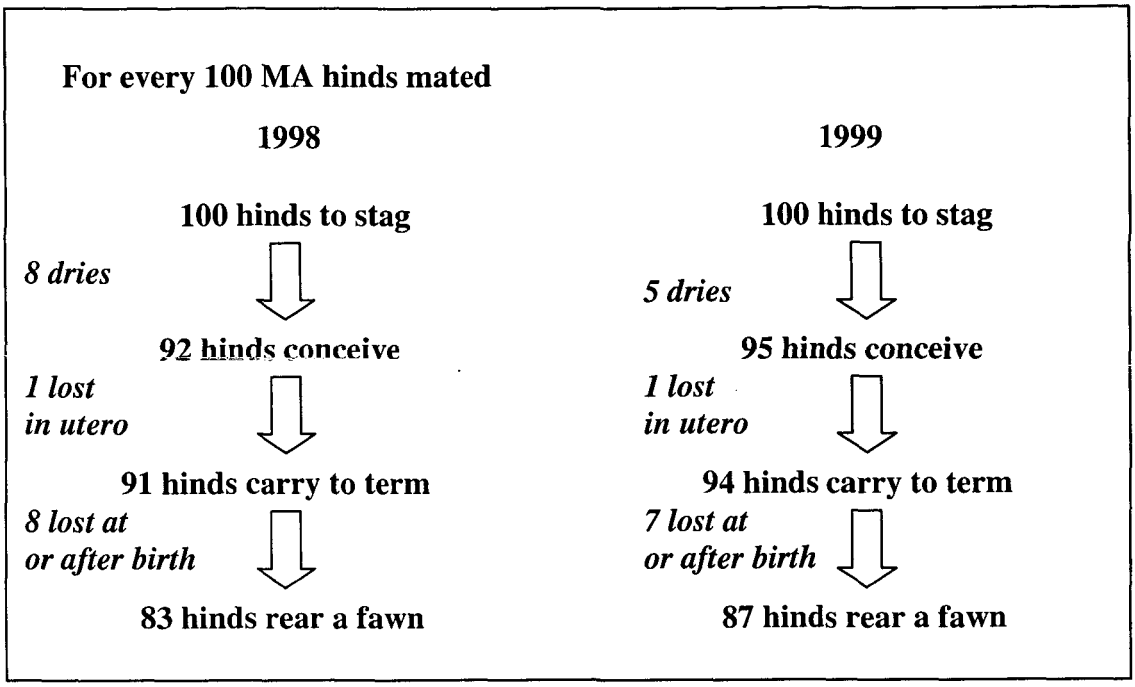

Figure 1 *Summary of reproductive efficiency for MA hinds.*

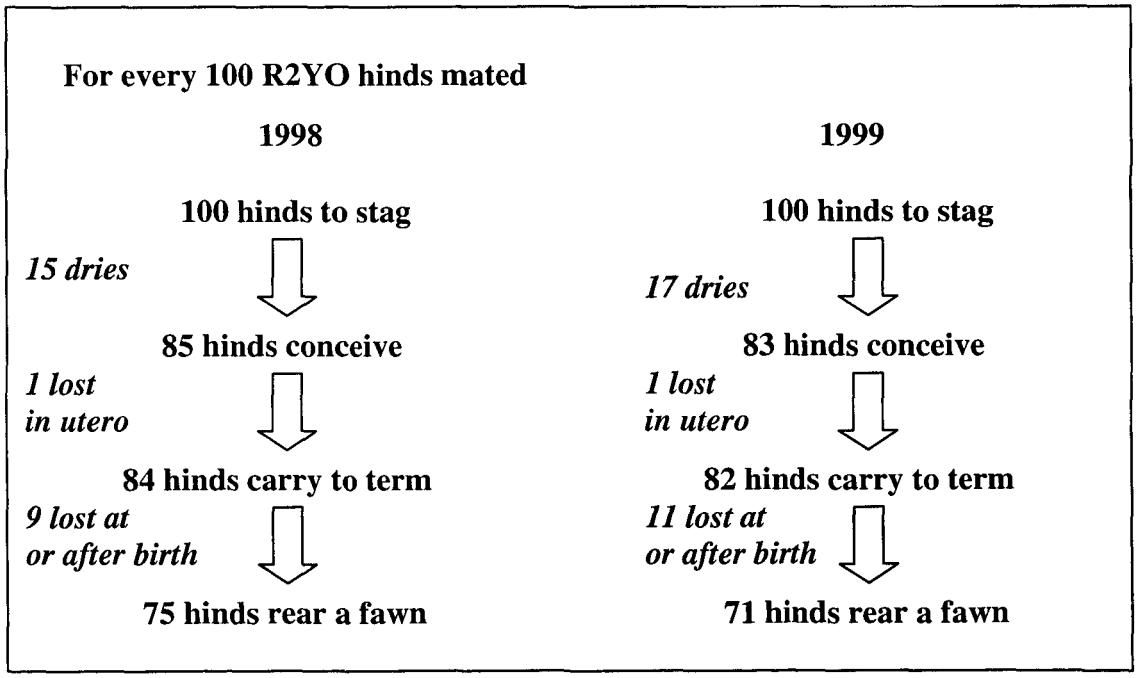

Figure 2 *Summary of reproductive efficiency for 2YO hinds.*

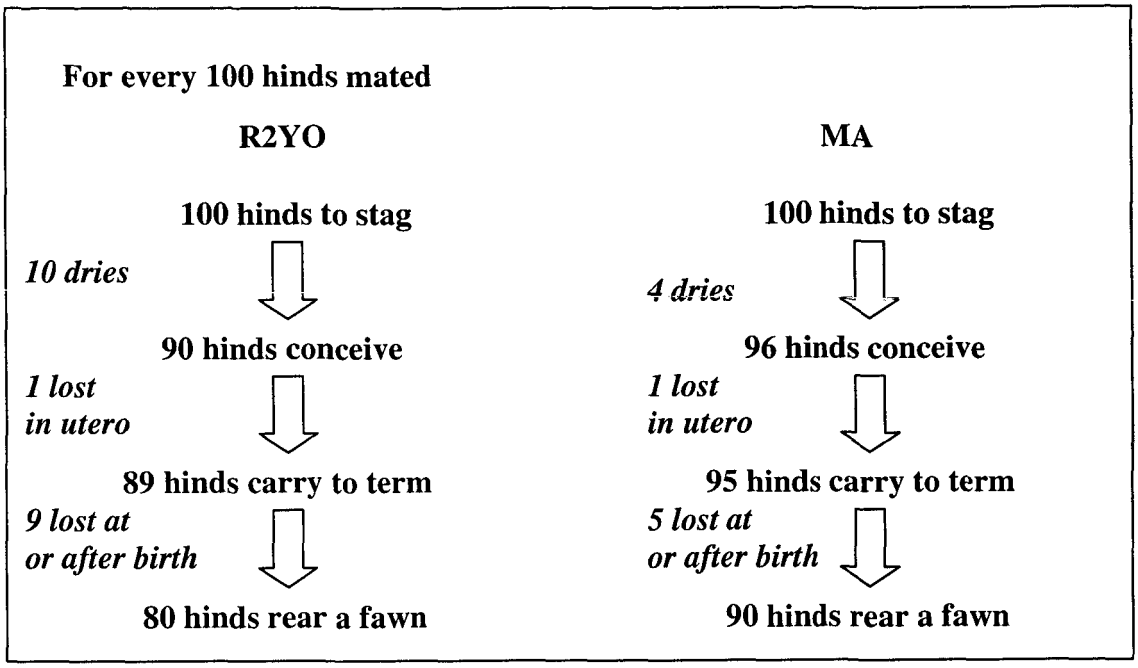

Figure 3 *A suggested realistic reproductive goal for commercial farms.*

Discussion

The success of a hind to rear a fawn to weaning is substantially less than 100%. Despite anecdotal evidence of 100% reproductive efficiency herds, the authors of this paper believe that the percentages described in this study are typical of this geographic region and possibly the rest of the NZ Deer Industry, as demonstrated by data from Massey University and the RWDPP (See Walker *et al* these proceedings).

This project recorded only a small percentage (1%) of hinds loosing fawns during pregnancy. This figure is consistent with studies in other parts of NZ (Audige *et al.*1999).

The significant area of fawn loss was during the peri-natal/lactation period, prior to weaning. Losses were substantial with individual farms ranging between 4 and 15% and 7 and 25% for MA and R2YO hinds, respectively.

There exists significant differences in both the pregnancy rate and the weaning rate between mixed age hinds and two year hinds. In this study two-year-old hinds substantially under performed in comparison to their older herd mates.

Deer Master placed considerable emphasis on the collection and post-mortem diagnosis of fawns dying during the perinatal/lactation period. However the understandable unwillingness of farmers to disturb hinds during fawning and the apparent 'vaporisation' of dead fawn carcasses (see reasons below) resulted in a very small percentage of dead fawns being examined. Previous studies have experienced similar difficulty in getting accurate data for this problem. (Audige, 1995).

High summer pasture masses, rapid decomposition rates and scavengers are all likely contributors to poor carcass recovery.

The Deer Master project was stimulated by these perinatal/lactation losses to investigate possible ways to reduce this loss as follows.

Part B Attempts at reducing reproductive losses

Fawn proof fencing

Introduction

Fawn loss as demonstrated in this study primarily occurs during the peri-natal/lactation period.

The reasons for this fawn loss are not well understood. Some studies (Audige 1995) indicate fawn loss may occur as a result of paddock escape, mis-mothering, mis-adventure, savaging, stillborn, disease or dystocia.

Anecdotal evidence suggests fawn movement between paddocks occurs frequently. This study aimed to increasing weaning percentage by reducing the opportunity for fawns to move through fences by ensuring that the fawn paddock perimeter fence was "fawn proof".

Trial Design

Weaning rate from MA hinds set stocked in fawn-proof paddocks (FP) was compared with weaning rate of MA hinds set stocked in paddocks with conventional deer fences (CDF). Fawn-proofing involved either lining existing fences (ground to 110mm) with chicken netting (10mm mesh) or overlaying netting on existing fences so to reduce the gap to approximately 1/3.

The study was conducted over 2 years with 617 and 2271 hinds set stocked in FP and CDF paddocks respectively in 1998 and 703 and 1681 hinds set stocked in FP and CDF paddocks in 1999.

Results

The mean weaning rate of each FP paddock compared with the mean of all other CDF paddocks is presented in Fig 4. Solid bars indicate the mean fawning percentage of CDF paddocks on each farm and the grey bar the higher mean weaning percentage recorded from FP paddocks. Where FP paddocks were lower than the mean for CDF paddocks the solid bar represents the FP weaning rate and the open bar the CDF weaning. The 95% confidence interval for weaning rate from CDF paddocks for each farm is given.

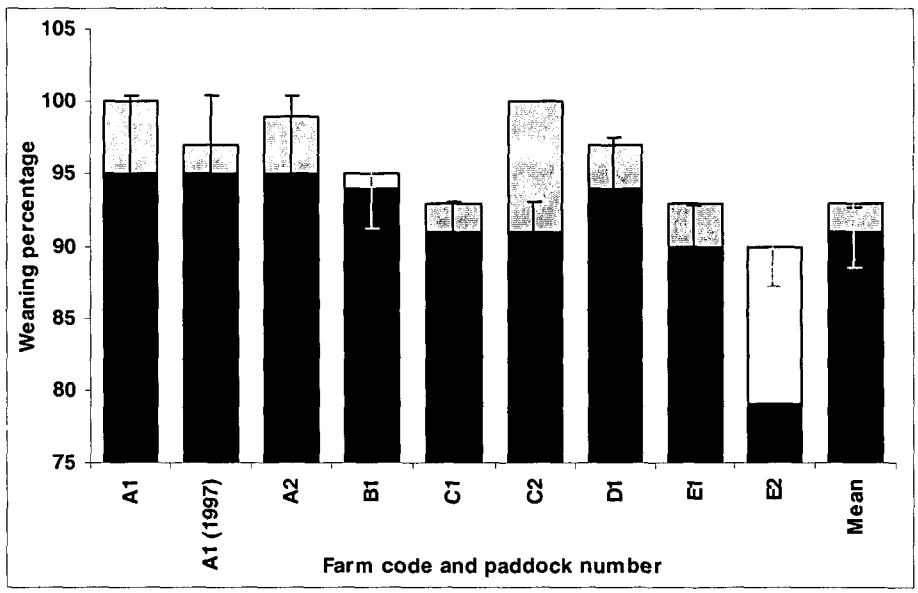

Figure 4. The 1998 weaning percentage of MA hinds in CDF paddocks (solid bars) and FP paddocks presented with the 95% confidence interval of the CDF weaning rate for 10 trials.

In 7 of the 9 FP paddocks mean weaning rate was greater than the mean weaning rate of CDF paddocks for that farm. However, only 3 FP paddocks had a mean weaning percentage that was statistically greater than the CDF paddock mean weaning percentage on the corresponding farm. Across farm there was no difference in mean weaning rate between CDF paddocks and FP paddocks.

Four additional FP paddocks were included in 1999. The outcome is presented in Figure 5.

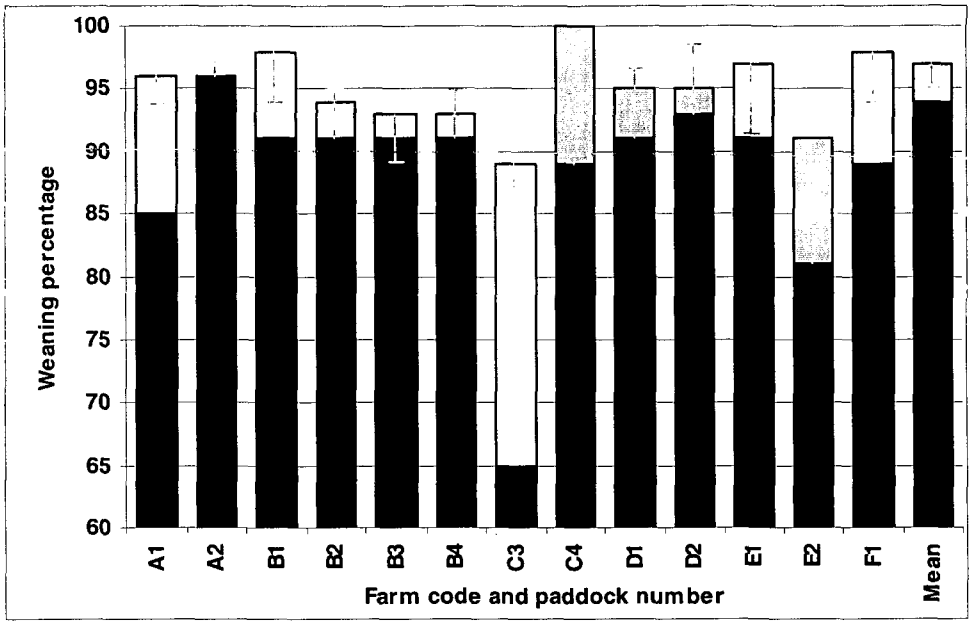

Figure 5. The 1999 weaning rate of MA hinds in CDF paddocks (solid bars) and FP paddocks presented with the 95% confidence interval of the CDF weaning rate.

In 1999 only 6 of 13 FP paddocks recorded weaning rates above the mean for CDF paddocks. On average FP paddocks and CDF paddocks recorded similar weaning rates (91%).

Discussion

Results from this study suggest there is no consistent benefit in weaning rate from fawning mixed age hinds in fawn-proof paddocks compared with normal deer fences.

In 1998 there was a trend for weaning rate to be higher in FP paddocks compared with CDF paddocks. There was no such trend in 1999 and no difference between FP and CDF.

For some FP paddocks weaning percentage were higher than CDF paddocks by between 2-9% which in some cases represented 100% of the possible improvement. For other paddocks CDF paddocks were up to 25 percentage units higher than FP paddocks.

As highlighted previously, many factors affect the survival of fawns to weaning and fawn escape is not the only reason for fawn loss. These other factors may have a greater or lesser influence in any one year on fawn loss and may be the reason for the inconsistent results between years. Thus, the use of FP fences should not be dismissed.

Summary

- There was a strong trend for fawn proof paddocks to have a higher weaning rate than conventionally fenced paddocks in year 1 but not year 2.

Vitamin E supplementation

Introduction

The work of Wagner (1998) indicated that supplementation of hinds with vitamin E immediately prior to set stocking was associated with an increase in weaning rate. A single dose of 300 IU of vitamin E administered orally to the hinds in this trial. This reduced the dry rate from 9.3 to 5.5% and from 7.6 to 2.0% on the same group of animals in two consecutive years. It was unclear whether this effect was specific to that herd or whether the same effect could be measured in a wider group of animals.

The aim of this trial was to measure the response in weaning rate to supplementing a large group of hinds from different farms with vitamin E.

Trial Design

The trial was run on 4 farms and involved a total of 2216 hinds. Hinds in each mob were randomly allocated to a supplemented (a single oral dose of 800IU vitamin E in 10ml) or non-supplemented treatment. The weaning rate for supplemented and non-supplemented hinds were compared using a Chi-square test.

It must be noted that this trial did not consider the prior Vitamin E status of the hinds, nor did it consider that the type of doses given was in any way a supplementary regime required for elevating Vitamin E in hinds. This trial attempted only to reproduce the effect seen by Wagner (1998).

Results

A total of 1029 hinds were treated with Vitamin E and 1190 counterparts remained untreated. Results for each property are given in Table 3.

There was no significant difference ($P > 0.05$) in weaning rate between supplemented and non-supplemented hinds across all farms or on any one property.

Table 3 Viitamin E Supplementation Trial Results

Farm	Non-supplemented hinds			Supplemented hinds		
	Fawns	Hinds	Weaning rate (%)	Fawns	Hinds	Weaning rate (%)
1	394	442	89.1	417	462	90.3
2	284	341	83.3	247	311	79.4
3	348	351	99.1	205	210	97.6
4	49	56	87.5	36	43	83.7
Total	**1075**	**1190**	**90.3**	**905**	**1026**	**88.2**

Paddock variables

Introduction

The aim of this study was to record and measure fawning paddock environment factors which may influence the successfully rearing of a fawn.

Methods

Fawning paddocks (85) were scored for a range of features (Table 4) prior to set stocking in November based on the recording system of Audige, (1995). Data was analysed to determine if any of these factors significantly influenced weaning percentage.

Table 4 Paddock variable data collected prior to weaning

Variable	Assessment System	Interpretation
Paddock size	Area in hectares	Measured or in some cases taken from accurate farm maps
Paddock disturbance distance	Meters	Approx. distance in m from source
Paddock disturbance severity	Scored 1-3	1=constantly on an hourly basis, 2= daily, 3=less than daily
Topography	Proportion of paddock flat (no obvious inclines) or steep (need support when climbing)	% flat and % steep with the difference being neither (rolling)
Hill	Score 0-3	0=no hill, 1=less than 5m high, 2=5-10m high, 3=over 10m high
Tree	Score 0-2	0=no trees, 1=one or more isolated trees, 2=one or more groups of tress),
Stump	Score 0-2	0=no or few stumps, 3=many stumps.
Gorse	Score 0-3	0=no gorse, 1=few plants,. 2=groups of plants in some areas, 3=large area
Shelter belt	Score 0-2	0=no shelter belt or less than 0.5, 1=shelter1-5m high, 2= over 5m high.
Stones	Score 0-1	0=no or few stones, 1=many.
Shade	Score 0-1	0=limited shade at most times during the day, 1= shade at all times.
Area of shade	Percentage of paddock shaded	Estimated as per mid-afternoon
Thistles	Score 0-3	0=no or few thistles, 1=many single plants, 2=small areas, 3=covering 10% or more of paddock
Fences type	Netting/wire description	Identify 12 and 6 inch netting, additional wires, sheep top-ups and fawn-proofing.
Dam	Present or not	Dam or ponding of any description
River	Present or not	River, stream, drain or water race
Trough	Present or not	Drinking trough
Pasture type	Pasture species	
Estimated clover content	Percentage	
Pasture height at set stocking	Average height in cm	Measured using a pasture stick
Number of hinds set stocked		Does not include any which died

Summary

For this data set and using logistic regression analysis, only shade score and fawn proof fencing were significant factors.

- Hinds with access to shade in the form of trees, scrub or gorse cover throughout the paddocks were 2.5 times more likely to wean a fawn than those in more exposed paddocks. This would be equivalent to increasing weaning percentage from 90 to 95%
- Using this method of analysis, fawn proof fencing was associated with higher weaning percentage with hinds 1.8 times more likely to wean a fawn behind fawn proof fencing than behind

conventional deer fencing. This would be equivalent to increasing weaning percentage from 90 to 94%

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