NUTRITION OF RED DEER

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The work I shall quote in this talk has been carried out in the Nutrition Section of Invermay Agricultural Research Centre.

Pattern of growth

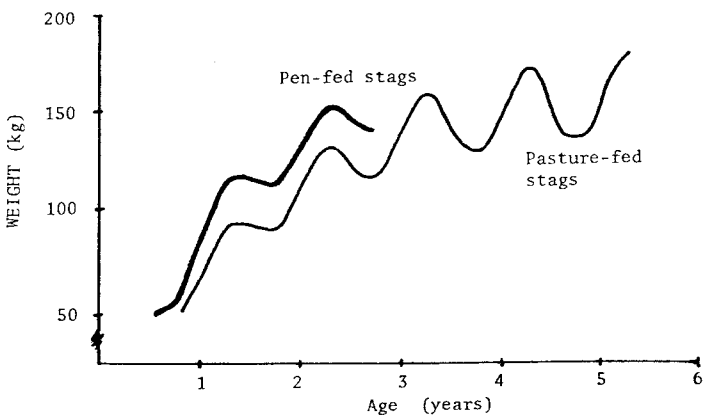
Red deer, particularly stags have a very marked annual cyclic pattern of growth even when fed *ad libitum*. During spring and early summer feed intake is high and the stag gains weight so that he is in peak condition by early March at which time his intake starts to decline. The rut takes place in April-May at which time voluntary intake is considerably reduced and the stag loses considerable weight regardless of whether or not he is used for breeding. After the rut intake increases so that with good feeding it is possible to achieve a maintenance intake over winter for most stags.

Over the years we have recorded weight losses over the rut-winter period of 10-30% of which about two-thirds occurs before the end of May. However, we now find that by increasing the amount of feed offered in June, July and August we seem to be able to prevent further weight loss during this winter period.

Figure 1 shows the liveweight patterns of two groups of stags at Invermay - one grazing pasture and receiving supplementary feed in winter and the other fed a high quality diet *ad libitum* in pens. The latter gives an indication of the growth potential of such red stags.

Fig. 1

Red Deer: Liveweight patterns of stags



From an examination of the weight records of our deer over a number of years, we can describe the approximate growth pattern of stags and hinds (Table 1).

Table 1

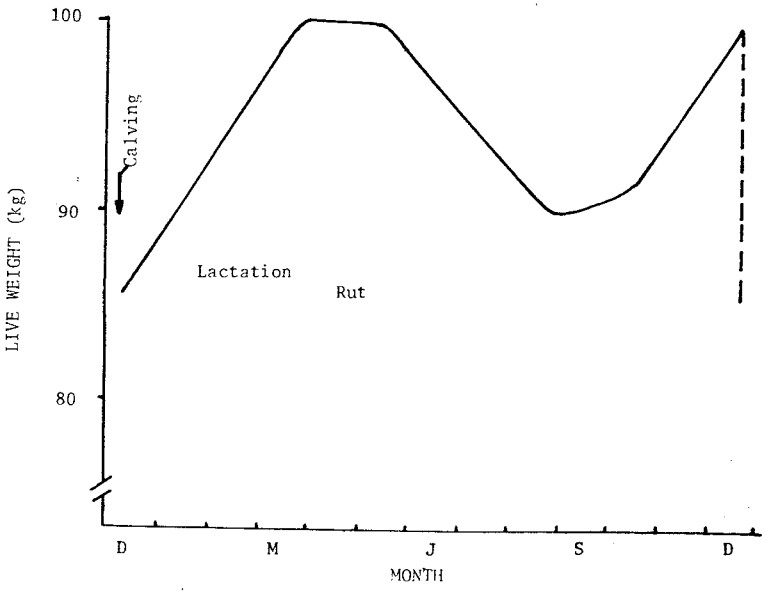
Age	*STAGS*	*HINDS*
	Weight as percentage of mature weight	
15 months	50%	70-75%
2¼	70	80-85%
3¼	90	90
4¼ - 5¼	95-100	95-100

The stags attain a mature weight of about 180-200 kg and the hinds about 90-100 kg.

The annual pattern of liveweight change in adult hinds is dependent on their management. At Invermay we take weight off our hinds over winter and then permit the hinds to gain weight in late pregnancy. This is shown in Figure 2. This weight pattern probably assists in preventing hinds from becoming overfat before calving which may cause birth difficulties.

Fig. 2

Annual Liveweight pattern of hinds (red deer)



It is important that hinds be well-fed during lactation and at this time feed quality is very important. This is illustrated by an experience at Invermay where we were very conscious of the need for cover and had allowed the pasture to get away in the spring to provide good cover for the newborn calves in December. Consequently this rank feed was of poor quality and the weaning weights of the calves in late March were poor. We now fence off a small portion of the paddock (away from the fences) and allow the pasture within this area to get away while the rest of the paddock can be well controlled to maintain feed quality. At calving time the fence is raised so that the calves can go to cover while the hinds are denied access. Alternatively, branches may be propped up around the paddock to provide similar cover. This change in management has greatly improved our weaning weights.

Weight and performance

These data for the mating weight of young hinds and calving as 2 year olds have been derived from the paper of Kelly and Moore (1977).

Table 2: Calving performance of 2 year olds related to mating weight

Weight range (kg)	*% Hinds calving*
≤ 55	0
56 - 60	0
61 - 65	50
66 - 70	90
≥ 71	91

In practical terms for groups of 16 month old hinds the following calving performance could be expected.

Table 3: Calving performance and group mean mating weight

At a mean weight of	*% of hinds over 65 kg*	*expected calving %*
65 kg	47	56
70	74	75
75	91	86
80	98	90

Intake and feed requirements

At this stage we have some data on the actual feed intake and feed requirements of red deer. However, this will be updated and published next year (Fennessy and Moore 1981, Proc. N.Z. Soc. Anim. Prod.). Based on our data we have compared liveweight change - metabolisable energy (ME) intake relationships in stags pen-fed indoors and stags wintered outdoors on diets of hay, grain and feed nuts. The relationships are shown in Fig. 3. The maintenance requirement for stags outdoors is about 0.82 MJ ME/kg $^{.75}$/day compared with about 0.57 MJ ME/kg $^{.75}$/day for stags indoors, an increase of about 40%. Based on these data it would appear that the metabolic rate of red deer is very high; this is supported by metabolic studies in the U.K.

Fig. 3

Feed intake and weight change in stags, indoors and outdoors

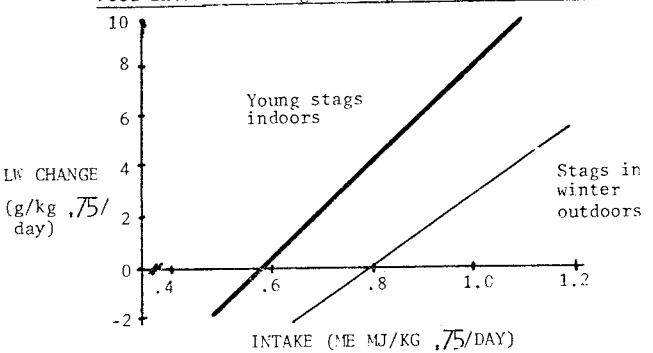


Fig. 4 is an outline of our current estimates of the annual intake cycle of a typical mature red stag. It illustrates the depressed intake during the rut and the increasing intake in the spring.

Fig. 4

Intake of red stags

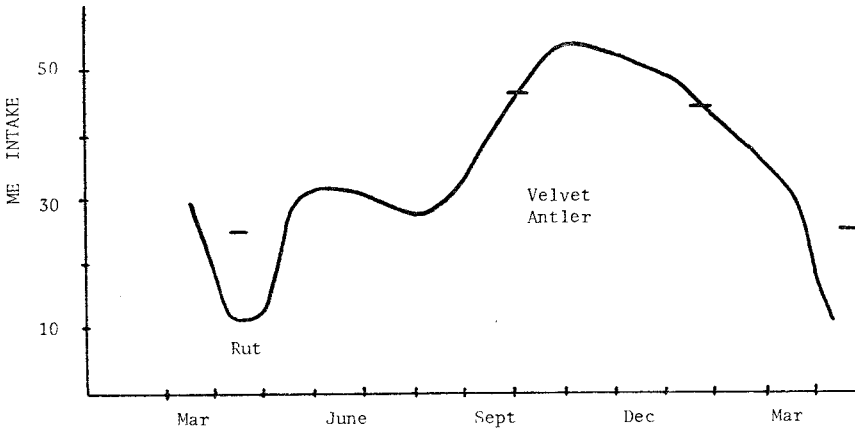


Table 4 presents our estimates of daily feed requirements of the different classes of red deer by season.

Table 4: Estimates of daily feed requirements by season

(MJ ME/day)

	Autumn	*Winter*	*Spring*	*Summer*
Hind	25	20*	27-32	50
Stag	27	32*	50	50
Calf	16-20	16-20	30	30
Yearling	25	25	38	38

* Some weight loss

The points of note are the relatively high requirements for stags in winter and lactating hinds (with their young) in the summer. These high requirements are at a time of the year when pasture production is limited by climate in most parts of New Zealand. This clearly may have important farm management implications.

The estimated winter feed requirements for *maintenance* are set out in Table 5. They are expressed in relation to average pasture or lucerne hay (good quality nuts would be about the same as pasture). The maintenance requirement for a 55 kg ewe is given for comparison.

Table 5: Estimated maintenance requirements

	ME	kg DM per day	
	(MJ/day)	Pasture	Lucerne hay
Hind	26	2.4	2.9
Stag	36	3.3	4.0
Calf	17	1.5	1.9
Yearling	26	2.4	2.9
Ewe	11	1.0	1.2

The estimated stock unit conversions for red deer are given in Table 6.

Table 6: Estimated stock units

Young (first year)	1.5
(second year)	2.0
Hind	2.0
Stag	2.5

A reasonable estimate for fallow deer would seem to be a ratio of about two fallow to one red.

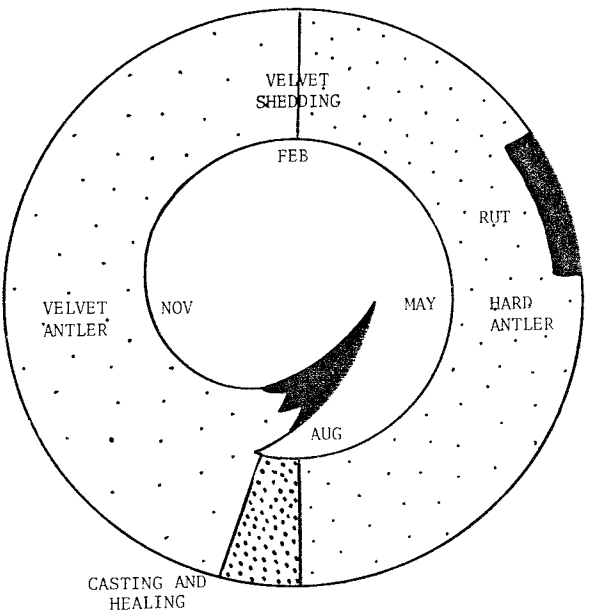
Antler growth

Antlers are bony outgrowths from the skull of the deer - they are not horns. The antler is actually an appendage of the pedicle which is a permanent bony projection of the frontal bone of the skull.

The antler growth cycle is shown in Fig 5. The pedicle usually first becomes prominent in the stag at about 6-10 months of age. The growth of the pedicle and the first (spike) antler is essentially a continuous process. The antler hardens and the velvet is shed about February so that the stag is in the hard antler for the rut. In the following spring the tissue around the pedicle swells, the old antlers are cast and the pedicle heals over initiating the new antler growth.

Fig. 5

Cycle of antler growth in the red deer stag



The antler cycle is associated with the sexual cycle of the stag in that velvet stripping occurs as the testosterone concentration rises and the casting of the antler in the spring is generally associated with a low concentration of testosterone. Much of the understanding of the antler cycle has come from studies of the effects of castration and the administration of high rates of testosterone which are outlined below.

Castration of stags

Before puberty	-	prevents pedicle development and subsequent antler growth.
In velvet antler	-	antler remains in velvet and continues growth.
In hard antler	-	antlers are cast - new antlers grow and remain in velvet.

High rates of testosterone given to entire stags

In velvet antler	-	inhibit antler growth and promote velvet shedding.
In hard antler	-	inhibit casting of the old antlers.
After antler casting	-	inhibit pedicle healing and regrowth of the antlers.

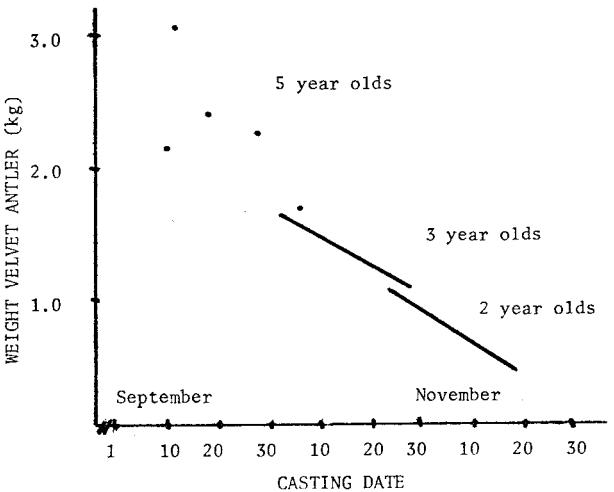
These are two possible approaches to increasing velvet antler growth and yields:

a) to increase the length of the growing season and so to increase the likelihood of a good second cut (although there are questions as to the "quality" of the second cut).

b) to increase the daily rate of antler growth.

The absolute limits of the antler growth season are set by the dates of hard antler casting and velvet shedding. It seems unlikely that we can influence the date of velvet shedding except by lighting or hormonal manipulation (including castration). At this stage we are concentrating our efforts on casting date. We know that as well as producing more second cut velvet, older stags cast their old antlers earlier and have higher yields at the first cut (cut at the A grade stage). There is also some evidence that within an age group stags which cast their old antlers earlier tend to have higher antler yields (Fig 6). We are now doing some work on the effects of winter nutrition on casting date and subsequent velvet antler yield.

Figure 6



A summary of yields of velvet antler for stags at Invermay is given in Table 7.

Table 7: Velvet antler yields of stags at Invermay

Age	*Casting date*	*Days to harvest*	*Weight (kg, first cut, A grade)*
2	31 Oct	53	0.83
2	2 Nov	55	0.82
3	16 Oct	59	1.29
Mature	20 Sept	59	2.33

We are also carrying out some work to investigate the factors which might be important in determining the daily rate of antler growth. At this stage our only recommendation that stags be well fed during the antler growth period.

INVERMAY FALLOW DEER WEIGHTS (G.H. Moore)

Weaned fawns	(3½ months)	20 kg
Yearling does	(18 months, June)	40 kg
Adult does	(June)	43 kg
Yearling bucks	(18 months, June)	51 kg
Adult bucks	(March)	75 kg

QUESTIONS and ANSWERS

Do only males possess antlers?

No, but female Reindeer produce antlers which are shed a few days after calving.

Is the female Reindeer velvet also an aphrodisiac?

It is not used mainly as an aphrodisiac but as an ingredient of many medicinal treatments.

What is the active ingredient?

It is unlikely that there is just one active ingredient as it is known to promote cell division and to treat certain anaemias.