Pere David quarter-breds pack on the weight

Research has some interesting results

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THE GREATER Red deer family is notable for the degree of hybridisation possible between the various species and subspecies.

The Red deer (Cervus elaphus) has a wide distribution through Europe, while its close relatives the Wapiti are in both North America and Asia.

The Sika deer (C. nippon) are also found in Asia. Hybridisation between Red deer and Wapiti, and Red deer and Sika has often been reported (eg Harrington 1982).

Practical approaches to hybridisation in the NZ deer farming industry have involved the North American Wapiti and the larger subspecies of strains of European Red deer.

The possibility of hybridisation with tropical species like the Rusa (C. timorensis) or Sambar (C. unicolor), in order to introduce a different breeding season, has also been considered.

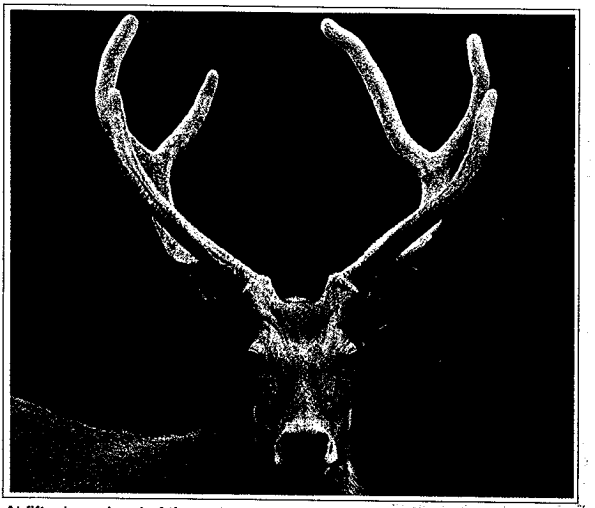
Red x Rusa hybrids have been bred in Australia but hybridisation with the Pere David deer (Elaphurus davidianus) is of special interest.

The Pere David — a native of China — has probably been extinct in its native land for nearly one hundred years. Survival of the species was ensured by the Duke of Bedford of Woburn Abbey in the years around the turn of the century when he collected surviving members of the species from European zoos.

The species, known as milu in China, is notable for being a summer breeder and for its long gestation of about 283 days — around 50 days longer than Red deer.

Natural hybridisation between Pere David and Red deer has been recorded at Woburn; the Red x Pere David hind subsequently proved fertile producing a calf to a Pere David male.

Reports of hybridisation and the interest in the possibilities for hybridisation within the New Zealand deer industry, coupled with the interest in the preservation of the species, lead to a number of introductions of Pere David deer in the mid-1980s.



At fifty days ahead of time

This rising 3-year half-bred Pere David stag was photographed in late October last year at full antler

Unfortunately, the species has not done well in New Zealand with the susceptibility of the species to malignant catarrhal fever (MCF) being the major problem. There is now only one herd of 14 pure PD deer left in New Zealand — at Mount Hutt Station.

Hybridisation

Successful hybridisation of the Pere David and Red deer was achieved by artificial insemination (AI) in 1986.

Attempts to achieve natural mating of Pere David males and Red females were unsuccessful because of the failure of the two species to integrate socially, coupled with practical difficulties in advancing oestrus in Red hinds.

Investigations of active and passive immunisation of Red deer females against Pere David leucocytes started in an attempt to improve the low pregnancy rate reported in 1988.

Of 116 laparoscopic inseminations carried out, 15 day-38 pregnancies with nine calves were the result. There was no effect of immunisation on pregnancy rate, although six of seven pregnancies in controls went to term compared with only three of eight pregnancies in immunised hinds going to term.

In all, 85 hinds were inseminated with semen from two stags resulting in 14 pregnancies and nine calves, whereas the remaining 31 inseminations contributed only one pregnancy and no calves.

This data suggest there are significant differences between stags, possibly in fertilising ability, or alternatively incompatibilities between the dam and the hybrid embryo.

The backcross hybridisation of the F1 to the Red deer has been more successful. The pregnancy rates of AI Red hinds with fresh F1 hybrid ▷

Table 1: Mean gestation length (±SD) for red (R), (PDxR)xR and PDxR calves (all calves from R dams).

	Red (n)	(PDxR)xR (n)	PDxR (n)
Male	234.6 (52)	253.3 (32)	268.3 ± 6.73 (10)
Female	234.1 (34)	251.8 (22)	262.5 ± 4.79 (10)
SD	3.41	7.30	
SED	0.76	2.02	2.61

▷ semen over three years at Invermay were comparable with the lower end of those for AI of Red hinds with Red semen.

Natural mating with synchronised Red hinds resulted in a pregnancy rate of 75 per cent in a group of 32 hinds over 17 days. Overall the data suggest that the F1 males probably have a reasonable level of fertility.

The F1 females are also fertile. Three 2 year-old hybrids produced fawns from natural mating with an F1 hybrid stag at Invermay in 1991. These three females were subsequently treated to induce superovulation and mated with a Red stag at Invermay in 1992.

Overall, 28 embyros were transferred using a laparoscopic technique similar to that used with AI, for a total of 13 pregnancies.

The difference in pregnancy rate between the three donor hinds highlights the potential importance of individual hind factors in embryo quality.

Such factors could include the immunological response of the recipient dam to the developing embryo.

Gestation length

Gestation length data for Pere David hybrids and the Red deer are presented in Table *1*.

Pere David deer have a long gestation of 283 + 6.1 days — around 50 days longer than the Red deer, while the F1 hybrid gestation of 262 days for males is about seven days greater than the mid-point mean for the Pere David and Red deer.

The quarter-Pere David/three quarter-Red deer had a mean gestation of 252 days.

Some factor(s) regulating gestation length may be peculiar to the Pere David deer.

In the quarter-Pere David, gestation lengths ranged from 242 days — a range slightly longer than that reported by Fennessy et al (199 lb) with birth weights from 6 kg to 12.3 kg.

The 274 day gestation resulted in a very low birth weight calf (female of 6 kg). The same phenomenon has been observed where horse embryos have been transferred into donkeys. It's believed to be the result of inappropriate immunological response of the dam to the foetal placenta.

Growth

Comparative liveweight and growth data for Red and quarter-Pere David/three quarter-Red deer are presented in Table *2*. The hybrids were on average 12 per cent heavier than Red deer at birth — a small difference for the average 18 day longer gestation.

Thereafter the hybrids grew at considerably faster rates than their Red contemporaries, to be 15 per cent heavier at the end of winter and 28 per cent heavier in autumn at 15 months of age.

Compared with Red deer of the same sex, the hybrids had a particularly fast rate of growth prior to weaning (31 per cent faster than Reds), and during the spring-summer period from eight to 15 months of age (44 per cent faster for males and 63 per cent faster than Red females).

Hybrid females had a similar growth rate to Red males over this period. The relatively fast growth rates of hybrids, particularly over the spring-summer period, raise questions about the pattern of growth in Pere David hybrids and in particular the involvement of daylength cues.

In this respect, the timing of the seasonal traits of food intake and coat growth was advanced by around 8 weeks compared with Red deer.

There is little comparable data available for pure PD or F1 hybrids. However, that available and shown in Table *2*, suggests the quarter-PD hybrids are only five to 10 per cent lighter than the pure PD or F1 hybrids at the yearling stage.

Antlers and seasonality

Pere David deer exhibit a unique antler formation with the tines reversed compared with Red deer. A very long 'brow' tine is common among the F1 hybrids which have displayed a range of antler forms.

Adult Pere David deer cast their antlers in June/July and clean their hard antlers in late October/November.

The F1 hybrid data are limited but are presented in Table *3*, along with some comparative data for Red deer of the same age.

The data indicates Pere David hybrids have an advanced antler cycle compared with Red deer, with hard antler casting averaging 60 days earlier than Red deer and antler cleaning 51 days earlier. The total antler growth period is similar for F1 hybrids and Red deer.

The only data available for quarter-Pere David/three quarter-Red deer are as yearlings (Table *4*) when the hybrids initiated their pedicles 30 days later than the Red deer and at weights 22 per cent higher than Red deer. The hybrids cleaned their antlers in early February.

Future prospects

The relatively rapid growth rates of quarter-Pere David hybrids indicate ▷

Table 2: Comparative birth date, live weights (± SD) and relative live weight gains for red deer and ¼-PDx¾-R deer hybrids up to 15 months of age (born 1990).

	Red deer		¼-Pere David's x ¾-red deer	
	Males	Females	Males	Females
Number	12	6	5	10
Mean birth date	Dec 3 ± 2.6	Dec 2 ± 2.0	Dec 14 ± 2.6	Dec 12 ± 7.2
Mean live weights by date				
Birth	9.2 ± 0.73	8.8 ± 0.81	10.0 ± 1.50	10.2 ± 1.40
Mar 11	43.9 ± 2.95	41.8 ± 1.47	50.4 ± 4.34	49.5 ± 3.89
Aug 14	64.6 ± 5.64	57.8 ± 1.33	72.6 ± 6.95	68.1 ± 4.14
Mar 3	105.3 ± 7.61	82.5 ± 3.62	131.2 ± 10.83	108.5 ± 7.38
Relative live weight gain (compared with red females at 100)				
Birth to weaning	105	100	139	132
Weaning to end winter	129	100	139	117
End winter to autumn	164	100	237	163

See the difference

The three-quarter Elk quarter Red rising 3-year stag is at the same stage in antler growth though obviously not the same stage of antler development

▷ they may provide another alternative approach to producing larger deer.

The advanced seasonality indicated by earlier antler casting and cleaning in F1 hybrids also suggest hybrids may have something to offer in terms of an earlier breeding season.

The longer gestation of the hybrid compared with Red deer may, however, limit the usefulness of the earlier breeding.

The low success rates in producing F1 hybrids will limit their practical application in the deer industry.

There are six male and five female F1 hybrids aged more than one year in New Zealand, with up to 10 yearlings — mostly females.

Unfortunately F1 semen has not been frozen successfully, limiting AI to fresh semen. The success of embryo transfer means there may be some future in producing an F2 hybrid with subsequent selection for desired traits like an advanced breeding season.

However, in the practical situation, the future of the hybrid will likely rest on the quarter-Pere David/three quarter-Red backcross as a sire or the development of an interbred quarter-Pere David.

Both these alternatives would likely require considerable selection and a long term breeding programme for the desired traits, if any real impact is to be made in the deer farming scene.

The usefulness of animals with high spring-summer growth rates is a possible exception to this generalisation. There are a number of unknowns — including the pattern of inheritance of the traits associated with the seasonal cycle.

The susceptibility of hybrids to MCF is also an issue. The annual death rate for F1 hybrids from MCF at Invermay, while based on only 16 animal years of exposure, is nearly 20 per cent.

The mortality rate for quarter-Pere David hybrids based on 50 animal years of exposure to date, is nearly 1 per cent.

This is similar to the death rate in Red deer. Antler growth and the potential for velvet production in hybrids are also largely unknown at this stage.

Currently, the greatest value of the hybrids is their contribution to basic research in molecular genetics and the possibility of using them to locate genetic markers for productive traits. □

Table 3. Comparative data for hard antler casting and antler cleaning for two PDxR F1 hybrids and red deer.

	Stags	Age	Casting date	Cleaning date	Antler growth period (days)
PD x R	GW899	2	9 Sept	25 Dec	107
	GW903	2	21 Aug	15 Dec	116
	GW899	3	12 Aug	19 Dec	129
Red	Group of 16	2	26 Oct ± 9.6	10 Feb ± 4.1	106 ± 7.2
	Group of 16	3+	8 Oct ± 14.1	9 Feb ± 6.1	124 ± 11.2

Table 4. Comparative data (mean ± SD) for pedicle initiation and antler cleaning for the red stags and ¾-PD/¾-R stags.

	Red	¼-PDx¾-R
Number	12	5
Mean date of pedicle initiation	24 Aug ± 30	23 Sep ± 28
Mean weight at pedicle initiation	66.1 ± 4.6	80.6 ± 4.6
Mean date for antler cleaning	NA	3 Feb ± 13

NA = not available

Peter Fennessy

Says susceptibility of hybrids to MCF is an issue