

TRENDS IN RED DEER (*CERVUS ELAPHUS*) POPULATIONS IN WESTLAND FORESTS

C.N. CHALLIES

*Protection Forestry Division, Forest Research Institute,
Rangiora*

INTRODUCTION

The major changes in the density and "well being" of red deer (*Cervus elaphus*) in New Zealand have been initiated either by their colonisation of new range or by subsequent intensive hunting. Deer numbers increased rapidly following their establishment in each area and usually reached "peak" densities at which food was limiting within 20 to 30 years. If they were not controlled these populations remained at high numbers for several years then declined naturally (Holloway 1950, Howard 1965). In most areas, however, deer have been extensively hunted in an effort to reduce their numbers and for a variety of other purposes, including recreation and the recovery of skins and meat (Wodzicki 1950). This has tended to keep deer populations dynamic and few if any have reached a long term balance with their habitat (see also James 1974, p.41).

Red deer populations in forested areas have proved very resilient when hunted and have been difficult to maintain at densities much below the carrying capacity of their range. Few attempts to control or exploit deer prior to 1960 were of sufficient intensity or duration to significantly reduce animal numbers over large areas. Since then, however, there has been a reorganisation of the government deer control campaign (which was initiated in 1931) and the development of a game meats industry. These operations have undoubtedly increased the intensity with which deer have been hunted and have made a large impact on many populations.

The red deer populations in Westland vary a great deal in terms of age since establishment and types, timing and intensity of the hunting to which they have been subjected. They can, however, be divided into two broad categories; those that have recently been hunted mainly for venison and those that have been hunted mainly

for animal control. These are represented respectively by the high country areas in South Westland from the Haast Valley south, and in Central Westland around the Hokitika Catchment. The densities of deer, their planes of nutrition and the recent changes in their habitat in these districts have been interpreted from the results of surveys made by the Protection Forestry Division of the New Zealand Forest Research Institute. The estimates of animal numbers are based on counts of faecal pellets transformed with contemporary pellet decay rate information into hectares per deer. The age and sex specific physical size (Challies 1973a), and fatness of animals (Riney 1955) are used to judge the relative nutrition-related "condition" of these populations.

RED DEER TRENDS IN WESTLAND

1. *South Westland Populations*

The South Westland red deer populations are part of the two West Otago herds which extended their ranges north and west across the main divide between 1910 and 1940 (Logan and Harris 1967). They were well established in the headwaters of the Haast Valley by 1920 and during the next 40 years spread through the rest of the district (Banwell 1968). In the Haast and Okuru Valleys deer reached high densities during the 1930s and 1940s, and in the Turnbull, Waiatoto and upper Arawata Valleys during the 1950s and early 1960s. As the lower Arawata and Cascade Valleys were colonised less than 15 years before commercial shooting started, it is unlikely that these areas have ever contained high densities of deer.

Apart from light culling by Acclimatisation Society staff no efforts were made to artificially control the density of these populations until government hunting started in 1932. Initially these operations were confined to the Haast

Valley, but as deer numbers increased in adjacent areas they were extended, starting in the Okuru and Turnbull Valleys during the late 1940s and early 1950s. This hunting was discontinued in 1957 when South Westland was classified as a low priority protection forest area, and no further attempts have been made to control deer numbers here. During the period of government hunting an average of 4500 deer were shot in South Westland each summer, with few years excepted. This hunting does not appear to have had any lasting effect as deer in these valleys were at high densities and in poor condition during the early 1960s.

The South Westland deer herds have been exploited for venison ever since the establishment of the commercial game meats industry. All accessible areas of valley flats have been hunted by shooters on foot since the early 1960s, and the open sub-alpine vegetation has been hunted from helicopters since 1964. The type of country involved is illustrated by Figure 1. This hunting has been unrestricted and competitive and has resulted generally in a



FIGURE 1. a general view of the lower Okuru Valley, which is typical of the South Westland high country. The commercial shooting of deer is concentrated in the valley bottoms where they are hunted on foot, and above the upper forest line where they are hunted from helicopters.

Photograph by B.R. Manson

decrease in the availability of deer. The annual tallies obtained by shooters on foot have decreased by about 60 percent during the last 10 years, and helicopter crews now fly further for fewer animals than previously.

During the mid 1960s commercial hunters obtained large kills of red deer from all of the South Westland valleys except those which had been recently colonised. The densities of deer present at this time are not known, but a survey made in the Arawata Valley in February 1969 showed that there was still one deer to 4.5 ha (Challies 1973b). As this estimate was made four years after hunting from helicopters started in that valley, earlier densities were probably higher — perhaps as high as one deer to two hectares in some localised areas. Remeasurement of these Arawata Valley pellet lines in 1971 showed that animal density had decreased by 70 percent during the two years to one deer to 14.5 ha (Challies 1973b). This density is similar to the average estimate of one deer to 16.5 ha obtained from a survey of the area between the Haast and Cascade Valleys during the summer 1970/71. The estimates obtained for the individual valleys ranged between one deer to 11.5 and 20.5 ha (Tustin 1972). As intensive commercial hunting has continued deer numbers may now be even lower in some parts of South Westland.

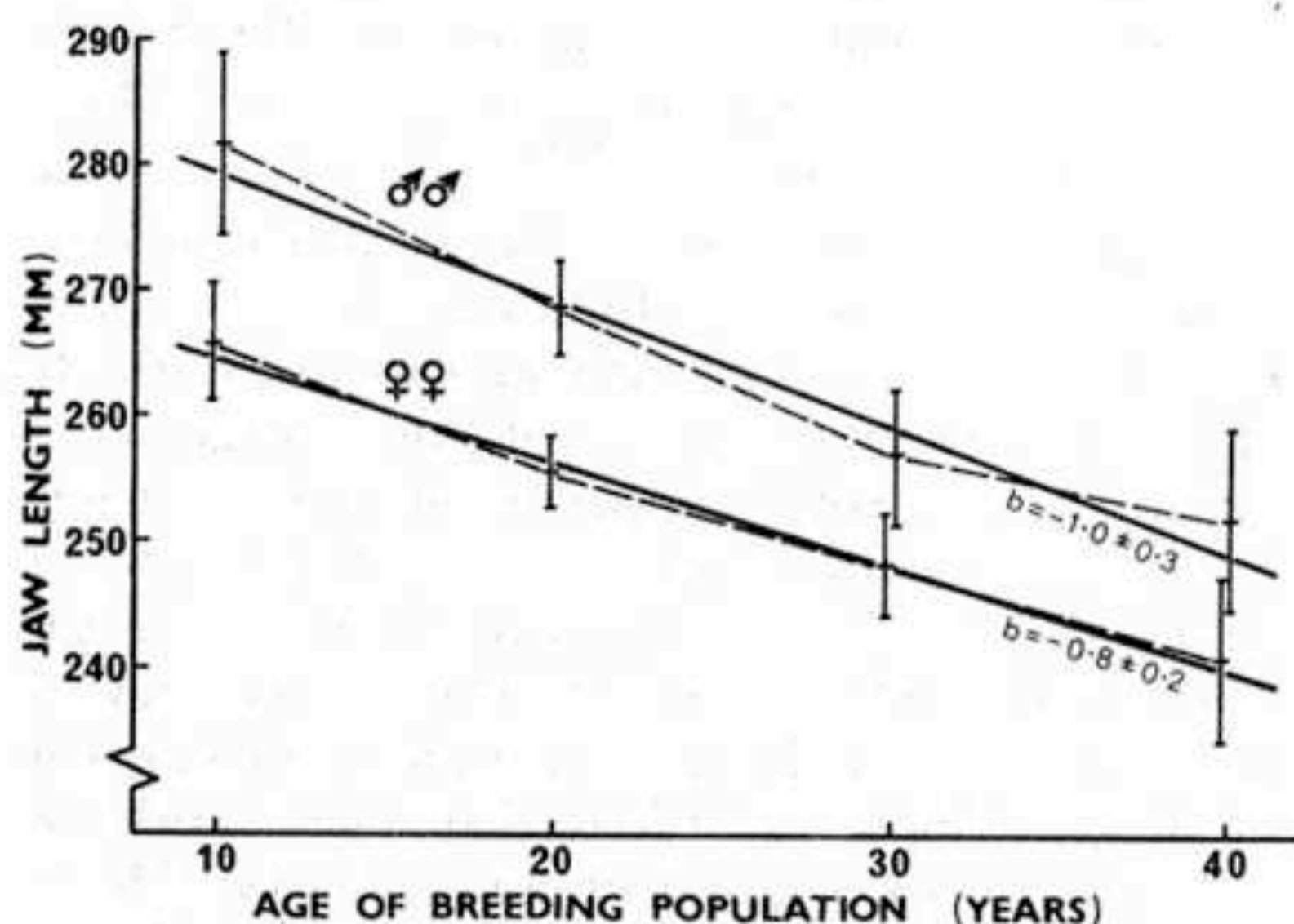


FIGURE 2. Mean jaw lengths with 95% C.L. of 2-year-old red deer collected during the summer 1967/68 from areas of South Westland that were colonised at different times. These differences in physical size are consistent with a decline in the planes of nutrition of these populations since their establishment.

When commercial hunting started in South Westland a wide variation in the planes of nutrition of the deer in the respective valleys was apparent. These differences followed a gradient,

with the animals in lowest condition in the areas that were colonised first and those in the highest condition in the areas colonised recently. This pattern comprises populations at different stages in their initial eruptive fluctuations (Holloway 1950, Howard 1965). A sample of animals collected during the summer 1967/68 confirmed this trend, and Figure 2 shows the difference in the physical size of animals in these populations. Fatness and adult fecundity were also found to decrease with the length of time that deer had been established in each area. Similar samples made in subsequent years have shown changes in these indices consistent with a significant improvement in the planes of nutrition of these deer, especially in the valleys where they have been established longest. Here deer have steadily increased their rate of physical growth since the onset of commercial hunting, as shown in Figure 3, and are now nearly as fat as the recently established populations. In 1972, similar proportions of animals in each valley were fecund, and around 60 percent of two year-olds, and 90 percent of older hinds produced fawns.

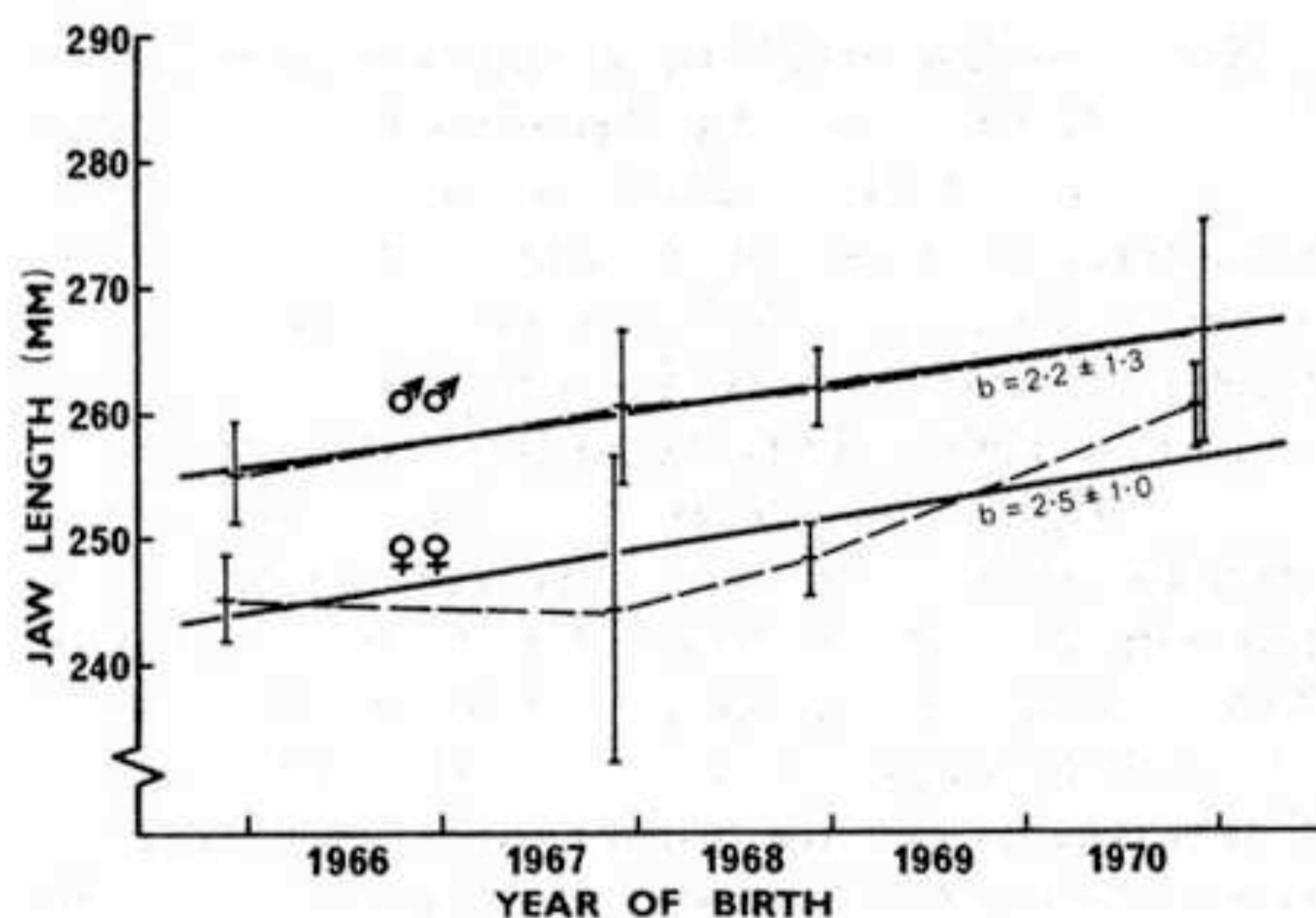


FIGURE 3. Mean jaw lengths and 95% C.L. of 2 year-old red deer collected between 1967 and 1973 from areas of South Westland that were colonised before 1940. This increase in physical size is consistent with an increase in the amount of food available per capita since the onset of commercial hunting.

These changes in deer density and condition have undoubtedly been associated with a lower proportion of the available browse being utilised. A reconnaissance survey made of this area during the summer 1970/71 showed that the

vegetation in a few localised areas had responded to lower deer use. A spectacular change had occurred in some of the lower slope and terrace forests, especially those which had been intensively hunted on foot since the early 1960s. At higher altitudes, however, it is unlikely that the time interval between the onset of hunting with helicopters and the survey was sufficient to give a measurable change in the vegetation (Wardle *et al.* 1973).

2. Central Westland Populations

The red deer in Central Westland originate from several local liberations, and the two West Canterbury herds which extended their ranges across the main divide between 1910 and 1925 (Logan and Harris 1967). They became established in most of the high country between the Whitcombe and Taramakau Valleys during the 1920s and had reached high numbers throughout this area by the late 1940s. From here deer have spread through the remainder of the Central Westland high country and have recently colonised the Wanganui Valley to the south.

The first serious attempts to control deer densities in this area were made in 1949 and 1950 with government hunting in all of the valleys that contained high deer numbers. These extensive shooting operations continued for the next 10 years and large numbers of animals were killed in most areas. In the Hokitika Catchment alone an average tally of 2200 deer were destroyed each year (N.Z.F.S. 1966). These operations may have reduced deer numbers in a few localities, but there was little evidence in 1957 that this had significantly reduced the browsing pressure on the forests (Holloway 1966).

The survey of the Hokitika Catchment during the summer 1957/58 showed that this area should have high priority for animal control and that a more intensive hunting effort was required. Immediate steps were taken to improve access and other facilities in these valleys and to investigate more efficient methods for killing deer. Most of the animal control effort in Westland has since been concentrated in the Hokitika Catchment and at lower intensity in adjacent areas. The Taramakau Catchment has been hunted mainly as a "buffer zone" for the

high priority Waimakariri Catchment in Canterbury. These operations have included the use of hunters on improved incentive schemes, large scale aerial poisoning and hunting from helicopters (N.Z.F.S. 1966). The intensity of this campaign declined during the late 1960s and has now given way to commercial hunting as the main agency controlling deer numbers.

The commercial hunting of deer from helicopters started in this area in 1967 but these early attempts were relatively unproductive. Successful operations were conducted in the Taramakau Catchment in 1969 and in the Hokitika Catchment in 1971, and these areas have been hunted intensively with helicopters ever since. Most of the suitable areas of valley flats, such as those in the Taramakau Valley, have been hunted commercially by shooters on foot since the early 1960s (N.Z.F.S. 1966).

There are few quantitative estimates of deer densities in Central Westland from which the differences and recent changes in these populations can be judged. Two surveys made in different parts of the Taramakau Catchment in 1968 and 1969 showed that animal numbers were relatively high at one deer to five and to seven hectares respectively. This contrasts with the low average density of one deer to 15 ha, and the range between valleys of one deer to seven and to 20 ha found in the Hokitika Catchment during the summer 1971/72 (Pekelharing 1973). The difference between the estimates for these two catchments is undoubtedly related to the relative intensity of the animal control effort that they had sustained during the 1960s. Commercial hunting since has probably reduced deer numbers in the Taramakau Catchment but there are no recent estimates of their densities to confirm this.

This difference in density was reflected in the relative condition of the deer in these two populations. Animals collected from both areas during 1969 showed that those in the Hokitika Catchment were fatter and significantly larger in size than deer in the Taramakau Catchment. Deer sampled from the Hokitika Catchment since 1969 have confirmed that this population is on a high plane of nutrition. They were similar in size to those recently established in the adjacent

Wanganui Catchment, and, as shown in Figure 4, to the youngest populations in South Westland. They also appeared to be very fecund as 69 percent of the two year-olds, and 83 percent of the older hinds were lactating during the latter half of the summer 1971/72 (Pekelharing 1973).

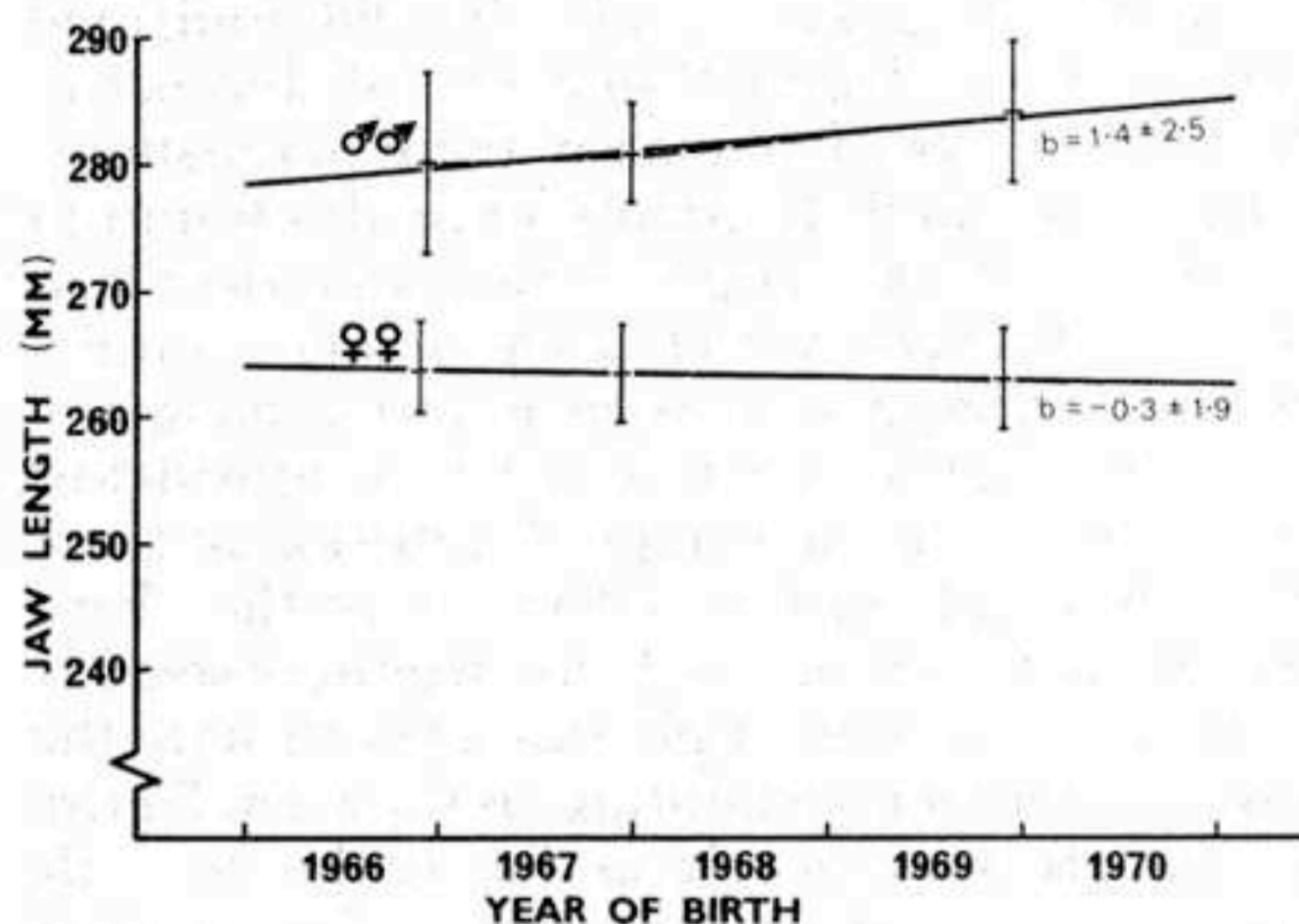


FIGURE 4. Mean jaw lengths and 95% C.L. of 2 year-old red deer collected between 1969 and 1972 from the Hokitika Catchment. These animals are nearly as large in physical size as the most recently established and best conditioned populations in South Westland.

Since the late 1950s there has been a response in the forests of the Hokitika Catchment consistent with a large reduction in deer numbers. Some recovery was evident in many areas as early as 1966, especially where aerial poisoning had been used to supplement hunting (N.Z.F.S. 1966). This trend has continued, and now, judging by the prevalence of preferred species within the deer browse range, these animals are having little effect in most areas of forest. Although opossums (*Trichosurus vulpecula*) are still a major problem causing damage to forest trees, deer are not seriously inhibiting the regeneration of these species (James *et al.* 1973, James 1974, p.43).

DISCUSSION

Prior to 1960 most red deer populations in Westland were at high density and on a poor or declining plane of nutrition, and they were adversely affecting their range. The main exceptions were the recently established populations which had not yet reached high densities. Large numbers of deer were shot in control operations during this period, but it is

doubtful whether this alone significantly reduced their numbers in many areas.

Since then the intensity of hunting has been greatly increased by the reorganisation of animal control in some areas and by the game meats industry in others. These operations have decreased deer numbers where they were previously at high densities and maintained low numbers elsewhere. This has resulted in a corresponding improvement in the planes of nutrition of these populations and generally has reduced their browsing pressure on the vegetation.

This situation appears to be widespread in many of the forests and high country of the South Island, especially those where animal control has been given priority. There were large decreases in red deer pellet densities in the headwaters of the Waimakariri Catchment between 1956 and 1971 (Manson 1972) and the Wairau Catchment between 1960 and 1973. The average decrease in the Wairau Catchment was estimated to be 92 percent (Bathgate 1973). In these and other "priority" areas, such as the Eyre Mountains, there has been a recent response in the vegetation consistent with lower deer use (Hayward 1969). Similar changes have undoubtedly occurred in many areas that have been hunted mainly for venison, but apart from South Westland this has not been documented.

This general decrease in animal numbers has also resulted in a change in the local distribution of deer which are now in highest densities in the parts of their range that are hunted least. The greatest reduction in deer use has occurred in the areas of scrub and grassland where they are most accessible to hunters both on foot and in helicopters. In areas where hunting from helicopters has predominated, the present distribution of deer follows an altitudinal gradient with the highest densities on the forested lower valley slopes (Challies 1973b, Tustin 1972). This contrasts with the situation in some areas hunted mainly on foot where deer now, although using all parts of the forest, tend to favour the upper valley slopes (Pekelharing 1973).

There is little doubt that the red deer situation in New Zealand is now much better, from a

"protection forestry" viewpoint, that it has been for several decades. Whether the present low densities of deer will be reduced much further however is open to speculation. Most populations now appear to have maximised their fecundity and have probably minimised their mortality from natural causes, so they have a high potential rate of increase. They will therefore need to be hunted intensively by either commercial interests or by substitute control measures just to maintain the *status quo*.

REFERENCES

- BANWELL, D.B. 1968. *The highland stags of Otago*. Reed. 170 pp.
- BATHGATE, J.L. 1973. Report on a resurvey of the introduced mammals of the Wairau Catchment. *New Zealand Forest Research Institute, Protection Forestry Report No. 126* (Unpublished).
- CHALLIES, C.N. 1973a. The use of physical size and growth rate for deer management. *New Zealand Forest Research Institute, Symposium No. 14*: 44-53.
- CHALLIES, C.N. 1973b. The effect of the commercial venison industry on deer populations. *New Zealand Forest Research Institute, Symposium No. 14*: 164-171.
- HAYWARD, J.D. 1969. Report on the conditions of the forests of the Eyre Mountains. *New Zealand Forest Research Institute, Protection Forestry Report No. 70* (Unpublished).
- HOLLOWAY, J.T. 1950. Deer and the forests of Western Southland. *New Zealand Journal of Forestry* 6: 123-37.
- HOLLOWAY, J.T. (Compiler), 1966. Report on the Hokitika River catchment 1957/58. *New Zealand Forest Research Institute, Protection Forestry Report No. 30* (Unpublished).
- HOWARD, W.E. 1965. Control of introduced mammals in New Zealand. *New Zealand Department of Scientific and Industrial Research, Information series No. 45*.
- JAMES, I.L.; JANE, G.; BARR, C. 1973. The forests and sub-alpine scrublands of the Hokitika Catchment. *New Zealand Forest Research Institute, Protection Forestry Report No. 116* (Unpublished).
- JAMES, I.L. 1974. Mammals and beech (*Nothofagus*) forests. *Proceedings of the New Zealand Ecological Society* 21:41-4
- LOGAN, P.C.; HARRIS, L.H. 1967. Introduction and establishment of red deer in New Zealand. *New Zealand Forest Service, Information Series No. 55*.

- MANSON, B.R. 1972. 1971/72 resurvey of the forest plots in the Waimakariri Catchment. *New Zealand Forest Research Institute, Protection Forestry Report No. 114* (Unpublished).
- NEW ZEALAND FOREST SERVICE, 1966. Preliminary report and plan for control of noxious animals in the Hokitika River catchment. (Unpublished).
- PEKELHARING, C.J. 1973. Status of introduced mammals in the Hokitika Catchment, Westland; (A) Distribution and density, (B) Growth rate and condition of red deer. *New Zealand Forest Research Institute, Protection Forestry Report No. 122* (Unpublished).
- RINEY, T. 1955. Evaluating condition of free-ranging red deer (*Cervus elaphus*), with special reference to New Zealand. *New Zealand Journal of Science and Technology*, Section B, 36: 429-63.
- TUSTIN, K.G. 1972. Distribution and density of introduced animals in South Westland. *New Zealand Forest Research Institute, Protection Forestry Report No. 115* (Unpublished).
- WARDLE, J.; HAYWARD, J.; HERBERT, J. 1973. Influence of ungulates on the forests and scrublands of South Westland. *New Zealand Journal of Forestry Science* 3: 3-36.
- WODZICKI, K.A. 1950. Introduced mammals of New Zealand. *Department of Scientific and Industrial Research Bulletin No. 98*, 255 pp.