

## BEECH REGENERATION AND DEER IN THE NORTH-EASTERN RUAHINE RANGE

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During an ecological survey of the forests of the north-eastern Ruahine range during the summer of 1959-60, an age-class distribution study of the beech regeneration was undertaken to ascertain the effect on forest regeneration of known fluctuations in deer numbers.

The forest surveyed covers an area of 39,000 acres, extending from near the Ngaruroro River in the north to the Makaroro River in the south, and having an altitudinal range from 1,300 ft on the eastern bush edge to 4,400 ft at the top of the range. The sampling was carried out in the mountain beech and red beech—mountain beech types, these being the two most broadly represented in the area. Ages of red and mountain beech up to pole size were determined by ring counts taken over an area of one acre on 21 sites, each site coinciding with an ecological survey plot. These were positioned across the grain of the country for line-plot sampling and covered a wide aspect and altitudinal range. Three to four ring counts were taken near ground level from the most broadly represented size classes on each plot and an average age was recorded for each size class. Stocking per acre of the various size classes was obtained from plot data. Then an age-frequency graph was plotted which showed two distinct missing age classes. These represented periods in which, through some inhibiting factor, little or no regeneration persisted.

The larger of these gaps occurs from 1930, where there is a steep decline in stocking per acre, to 1940. From here the stocking rises steeply to 1945, with a second, minor, gap occurring between 1948 and 1953. An attempt has been made to interpret these missing age classes in the beech forests by examining their history in relation to deer populations and control measures. Past observations of several men who have had long and close contact with the area (L. Masters, B. D. Mills, A. Douglas, N. L. Elder) reveal a definite correlation between peak deer populations and these missing age classes.

Deer were first liberated in this range north of the Ngaruroro River in 1883, spreading down the eastern flank, and were quite common by 1918 (N. L. Elder 1957). There was a slow initial build-up and the population reached a peak about 1930. This could account for the large missing age class. An examination of the age-frequency graphs drawn for individual catchments reveals that re-

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generation was inhibited a little later in the more southerly Makaroro catchment, which supports the theory of the deer spreading southwards down the range with successive peak populations. Later observations revealed a decline in population after 1940 (N. L. Elder 1957) which would account for the sharp increase in the stocking per acre of stems originating from this period. Deer culling began in 1937, and this would have further reduced the deer herds. A second, smaller age gap occurs between 1948 and 1953, which would indicate a corresponding peak deer population lower than the first. There are no records of observations on deer to substantiate this theory, although deer cullers' tallies were consistently high for this period. At the present time there appears to be a reasonably good coverage of beech seedlings throughout the forested area. This release from browsing pressure, as well as being a result of a natural decline in deer numbers after the last peak population, could be due in part to shooting pressure from cullers.

It is fully realised that mast seed years, drought, and other animal populations could influence the age-class distribution of these forests, but owing to the lack of early records or observations these factors have not been considered. Nevertheless, it appears that the absence of these age classes has been caused in part at least by browsing pressure at the time of peak deer populations.

Although these correlations are not conclusive there is a fairly good agreement, which would seem to indicate that this approach, which aims at tracing the past effects of deer on the forest through study of the vegetation, shows promise.

#### REFERENCE

Elder, N. L., 1957 (unpublished) Ecological Report of the Northern Ruahines.

Persistent beech regeneration only occurs as a result of mast years, and the spacing of these years can be very irregular. Any analysis of age-class distribution in beech forest therefore must take account of seeding. Even a gap of as long as ten years between regeneration establishment could readily occur as a result of absence of mast years. It is suspected that successful regeneration is sometimes even less frequent at higher elevations in a forest.—Ed.