

V. DAMAGE TO FORESTS.

When I began this investigation I believed that considerable damage was caused to forest by opossums when they were numerous. This point has been to me the most interesting of all, and I have paid the closest attention to it in the places that I have visited. There are several places where opossums are found that I have not had time to visit. I have chosen what seemed to me to be typical localities and have studied them carefully.

Although, for reasons stated above, I think opossums should be entirely excluded from all sanctuaries for New Zealand plants and animals, yet I do not think they are doing serious damage in forests. The damage usually attributed to opossums is caused mainly by cattle, deer, and pigs—often by rabbits. Cattle eat and trample the undergrowth, preventing the regeneration of the forest, allowing the forest-floor to dry and cake, letting the wind have unhindered sweep. They destroy the protective fringe so essential to all our forests except beech. Thus, to admit cattle and to permit them to remain is really to pass a death sentence upon the forest. Deer do similar damage, and in addition often bark trees. Pigs destroy the undergrowth. Rabbits consume the undergrowth and bark trees of almost all kinds. Opossums consume a comparatively small amount of the undergrowth, so small that close examination generally fails to discover the damage. I have found no evidence of their eating ferns or moss, although in some cases, as in Mr. John Galder's bush in the Catlin's district, they appear to trample the growth of filmy ferns on specially favoured logs, leaving the logs bare. I have found no instances of trees barked by opossums, although the evidence of the South Australian Forestry Department, referred to in Section III of this report, shows clearly that plantation trees are barked and killed. Where, in the New Zealand bush, bark is bitten by opossum there is nothing like ringing, such as rabbits, and hares, and deer achieve. There is usually a single bite and a tear, stripping a piece of bark sometimes for a few inches up and down. I have once seen the bark of the makomako, or wineberry (*Aristotelia racemosa*), torn for 20 in. in a strip from 1 in. to 2 in. wide. The bark seems to be bitten in playfulness rather than for food, although transverse grooves are sometimes bitten 1 in. or more in length on bark of various kinds of matipo and of tawa, and of some other trees.

In the Hadfield bush at Paraparaumu, referred to elsewhere, I have found a young tawa-tree that had been bitten much as a rabbit bites, at a height of 4 ft. from the ground. I suppose that this was done by an opossum, but could not be sure, as the teeth-marks do not show. This is, within my experience, an isolated example of comparatively extensive injury, but one which in this case would not prove fatal.

The opossum eats leaves and young shoots of makomako (*Aristotelia racemosa*), of karaka (*Corynocarpus laevigata*), of houhou (*Schefflera digitata*), of mahoe (*Melicope ramiflora*), of broad-leaf (*Griselinia lucida*), of konini (*Fuchsia excorticata*), of matipo (*Pittosporum eugenoides* and other species), of kohekohe (*Dysoxylum spectabile*), the soft parts of miro-fruit and of the nikau-fruit (*Rhopalostylis sapida*), the fruit of the konini, and many others. By his weight he breaks young shoots, causing them to wither. I have examined the upper branches of many favourite food trees, but have never found that greater damage has been done than I have here described, and the trees branch freely below the wound.

I have found no native tree that has, in my opinion, been killed by an opossum. The favourite plants of the opossum are damaged by constant climbing and playing, but this generally happens near houses or at the edge of a clearing, but I have never seen serious damage of this kind in the forest. I think it necessary to refer specially to the case of the big New Zealand fuchsia. On Kapiti Island I was shown trees that had died in the forest, presumably killed by opossums, although I did not regard the evidence of cause as being convincing (see "Transactions of the New Zealand Institute," Vol. 51, 1919, p. 469), seeing that the trees still bore abundance of small twigs and that the bark was unharmed. Moreover, the fuchsia is a very hard tree to kill. I was told that in the scenic reserve on Lake Kanieri the fuchsia had been killed by opossums. Mr. Anderson, the Crown Lands Ranger, kindly accompanied me to this place. We found that although the fuchsias of the forest fringe were undamaged and healthy, those in the bush itself were rarely healthy and many were dead. These trees were of all sizes, and in various positions with regard to the drainage of the soil and with regard to shade. Many of them still bore their smaller twigs uninjured, and the bark was in all cases intact. They presented all the appearance of having died from a bacterial or fungoid disease. Some had been heavily attacked by scale insects.

In the Wellington Waterworks Reserve at Wainuiomata a similar state of things exists. The fuchsias in the bush itself, in one gully at all events, stand dead or dying, many with all their twigs upon them, while those on the forest fringe are in a thoroughly perfect condition. Behind the assistant caretaker's house is a small fuchsia-tree which has been freely bitten by opossums, but has branched again below the wounds. Such examples are of importance, because they negative the only theory that occurs to me to explain how the fuchsia-tree, having most of its twigs still upon it, could be supposed to have been killed by opossums—the theory that the opossum-bite sets up in the fuchsia a poisonous action that it does not set up in other plants. But healthy fuchsias occur abundantly in bushes heavily stocked with opossums. In Mr. Telford's bush at Otanomomo, referred to later in this section, large fuchsia-trees are numerous and healthy, and I could find no dead trees. The same is true of all the bushes I examined in the Catlin's district, and of bush at the Orari Gorge, Peel Forest, and at Geraldine. It is true of the Wellington Botanical Gardens, where there are a few opossums.

Paraparaumu.—In the scenic reserve of 1,300 acres in the Maungatukutuku Valley opossums are numerous, and the marks of their claws are to be found on many of the trees. Trees that here show indications of serving as food plants for opossums are quite common, but I found no trees that showed very serious damage. Irreparable damage is being done here by cattle, and to a less extent by deer. These animals clear the undergrowth, letting the wind sweep among the trees and allowing the forest-floor to dry—two conditions that New Zealand forests of the mixed kind cannot endure. It is not too much to say that a limit is being set to the life of the forest through damage compared with which all damage that opossums do is negligible.