

usually falls to the ground. The male caterpillars cease feeding and spin their cocoons earlier than the females, and produce distinctly smaller chrysalids.

There is only one brood annually in Eastern Canada, except that a partial second brood apparently occurs in southern Ontario in favorable seasons.

### THE INJURY.

The extensive defoliation by the caterpillars destroys the beauty of the trees for much of the season, and often injures them so seriously that branches either die outright after repeated attack, or become so weakened thereby that they gradually succumb to injury by other insects such as borers, and fungi.

The list of trees attacked by the White-marked Tussock includes a large number of our deciduous shade trees, and even a few conifers. In Eastern Canada the favorite food trees appear to be willow, birch, horse-chestnut, basswood, elms, maples, poplars, and fruit trees. Mr. Felt has listed the following host-tree records from the Eastern United States: "linden, horse-chestnut, buckeye, maple (specially the soft and Norway), boxelder, honey locust, apricot, garden plum, wild plum, garden cherry, chokecherry, rose, pear, apple, quince, ash, elm (several species), sycamore or buttonwood, butternut, black walnut, hickory, oak, birch, alder, willow, poplar, spruce, fir, larch, and cypress.

### NATURAL ENEMIES.

This species has a very large number of natural enemies. Minute hymenopterous parasites breed within and destroy the eggs, a large number of hymenopterous and dipterous parasites kill the caterpillars and pupae, and various predaceous insects also aid in reducing their numbers. Certain fungi and bacteria, which spread rapidly in epidemics, destroy great numbers of the caterpillars, and are sometimes a chief agent in their control.

The last outbreak of the White-marked Tussock in Eastern Canada, as already mentioned, extended from Halifax to western Ontario, and lasted, in all, from 1903 to 1911. It was not anywhere abundant throughout the whole period, however, and was brought finally and suddenly to a close by the action of parasites and fungi. The species has bred in obscurity since that time, and is just now coming again to prominence, since the scarcity of its parasites has allowed it to breed to such great numbers. Eventually they will again effect its control, in time probably to save the life of the trees, but not soon enough to prevent much injury in addition to the disfiguration of the trees during the summer.

A few of our native birds feed upon hairy caterpillars such as the White-marked Tussock, and are important factors in natural control in sections where they are still numerous. Unfortunately, man and the English sparrow have united to drive these useful birds away from the neighbourhood of our cities, towns, and larger villages, with the result that the White-marked Tussock and other destructive insects find our centres of population more acceptable to them than the open country. The protection and encouragement of our insectivorous birds is a most important method of insect control.

### CONTROL MEASURES.

The life of city shade-trees is sufficiently precarious at the best of times. The almost impossible soil conditions, and the extremely adverse atmosphere content of smoke, dust, and gasses are very serious obstacles to healthy tree growth; and the yearly attacks by ice storms, boring insects, defoliating insects, and fungi make the life of a city-grown tree one long, or short, series of adventures.

The great value of shade trees to cities and towns is everywhere recognized, and there should be no hesitation in making a reasonable expenditure to protect them from those enemies which may be successfully controlled.