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Tatsuo Udagawa
Government Forest Experiment Station, Meguro, Tokyo, Japan

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TATSUO UDAGAWA, Government Forest Experiment Station, Meguro, Tokyo, Japan

ABSTRACT; The wildlife in Japan does more damage in outbreaks in forestry than in agriculture. Hares annually damage in excess of 250 thousand acres. Voles annually damage 50 to 100 thousand acres; in some areas great damage may occur suddenly. The giant flying squirrel damages areas of replanted trees in southern areas of Japan. The Himalayan black bear strips the bark on tree trunks. In agriculture, the sparrow and the duck do an excessive amount of damage in rice fields, and the boar does conspicuous harm in the plowed fields of mountain villages. In Okinawa, sugar cane is attacked by Rattus rattus, and in some years the loss is severe. Of even greater concern is the damage done by introduced vertebrates. The gem-faced civet was imported from Taiwan. Similarly introduced from Taiwan, the tree squirrel increased on Izu-Oshima. The nutria was introduced in 1940; they escaped from cages in Southern Honshu and have increased.

The wildlife in Japan does more damage in outbreaks in forestry than in agriculture. Hares (Lepus timidus and L. brachyurus) annually damage in excess of 250,000 acres of young trees. So far, there is no effective control for this damage, and therefore this is a big obstacle to reforestation. Now, nooses set in plantations are the only good method for limiting hare activity. Cydoheximide is the only good repellent I know about. A coating of 0.1 percent solution on the branches will prevent damage for six months, from autumn to spring. This is the only method for protecting young coniferous trees. Also, voles (Microtus and Clethrionomys) annually damage 50 to 100 thousand acres; in some areas great damage may occur suddenly. In cases where forest areas are adjacent to orchards, there is the same damage. When the bamboo grass, Sasa, bears seed, damage is extensive. Voles become extremely abundant at this time. Under normal conditions there are two or three voles per acre, but in the years that Sasa bears seed, there may be 50 to 100 per acre. In times of vole abundance, trees 40 years old may be damaged. Also, there are years of few Sasa seeds when voles increase in numbers; at such times there are from 25 to 50 voles per acre. We are now studying the causes of this situation. Now there are more than 1000 survey centers in the entire country. The population density is determined three times (in June, August, and October). If damage is expected in the winter, poison is distributed in the autumn. For control, zinc phosphide is distributed by helicopter, at the rate of 500 grams per acre.

The giant flying squirrel (Petaurista leucogenys) does damage in areas of replanted trees in southern areas of Japan, and especially in Kyushu is very prolific. There is flying squirrel damage on trees 30-100 years old, and this damage (of three to six feet of bark stripping) can be seen anywhere from 30 to 50 feet from the ground. In most cases the trees are dead; and when not dead, the wood is spoiled, and the damage permits the entrance of wood destroying fungi. The most effective control is by gun, but recently I have been able to trap them with live traps baited with chestnuts. These traps are placed on platforms 10 or 15 feet from the ground; I have found it easy to trap giant flying squirrels by this method. There are great losses in forests due to these squirrels.

Also, in restricted areas in central Honshu, the Himalayan black bear (Euarctos thibetanus) damages the bark on tree trunks. In some confined areas the damage is intense. There is in Japan damage to conifers similar to that done to redwoods in California. In Japan cage traps are baited with wasp nests. Such traps are 5 feet wide and 5 feet high, and 9 feet long. Many bears are captured in this way. Even when the trap is baited only with honey smeared on the inside, bears will enter. Bears, as is the case with hares, avoid cycloheximide. For bears a spray solution of 0.05 percent is sufficient to prevent damage to tree trunks.

In agriculture, the sparrow (Passer montanus) does an excessive amount of damage in rice fields. In northern Honshu, the eastern spot-billed duck (Anas poecllorhyncha) commits the same attacks. There is no good control by shooting. If there is some effective method for protecting rice fields in California, I should very much like to learn about it.

In the plowed fields of mountain villages the white-moustached boar (Sus leucomystax) does conspicuous harm. It is not especially harmful in the forest, but, depending upon the area, every year damage occurs. Damage commences in the spring and continues until autumn. They damage many kinds of vegetables, but the greatest harm is done to rice fields in the autumn. Live traps are the best means of control; these traps are 30 feet wide and 30 feet long, and 15 feet high, built of wood. Potatoes are used for bait in the springtime. When

the boars enter to eat the potatoes, a sliding door is lowered. Because these traps are very expensive to construct, half of the cost is borne by the government. Boars are also effectively repelled by cycloheximide, in a 0.1 percent solution sprayed on cotton next to surrounding rice fields.

There are various sorts of attacks by Microtus montebelli, but recently the brown rat (Rattus norvegicus) is dominant in the rice fields, and accounts for a great loss. Recently the brown rat has become very abundant in Japan, For example, in Tokyo in 1950, brown rats constituted 58 percent of all the rats captured; but in 1956 this figure had risen to 80 percent, and in 1967 brown rats were 95 percent of the rats in Tokyo. There are numerous large poultry farms in the suburbs of Tokyo, some keeping ten thousand birds. These are open farms, with many sources of food for rats. From these poultry farms, rats spread to rice fields and residential areas.

In Okinawa, sugar cane is attacked by Rattus rattus, and in some years the loss is severe; it may reach to from 20 to 60 percent of the total annual production. Also, in these areas, the white-moustached boar's depredations are excessive.

Of even greater concern is the damage done by introduced vertebrates. Namely, thirty years or so previously, the gem-faced civet (Paguma larvata taiwana) was imported from Taiwan as a fur bearer, and has increased in central and southern Honshu - it damages mandarin oranges and other local fruits. Under those circumstances, vegetables are also damaged. Similarly introduced from Taiwan, the tree squirrel (Callosciurus erythraeus) increased on Izu-shima, one of the Seven Islands of Isu, and damages the nut crops of the trees.

The nutria or coypu (Myocastor coypus) was introduced in 1940; they escaped from cages in Southern Honshu and have increased in Okayama Prefecture, where they damage rice fields and vegetables. The range is extending.