

every kind of flower—viz., aster, dahlias, chrysanthemums, daisies, roses, and many others. The damage caused by them is often lost sight of, but in the order we have several economic pests, the most important, in our connection, being the greenhouse thrip, which is credited as being one of the most injurious of all greenhouse insects in these parts. As yet we have had no one to study these insects under our local conditions; consequently there is some excellent work ready at hand for those interested.

#### SLUGS.

Slugs in the soil in this part of the world frequently are met with, and their slimy nature make them very disagreeable. Their presence is largely accounted for by somewhat sour conditions of soil, such as we have in the city. Applications of lime will give relief.

#### MOLES.

According to Mr. E. M. Anderson, Museum, Victoria, we have two species in the immediate vicinity of Vancouver—viz., Townsend's mole (*Scapanus townsendi* Bach.) and Gibb's mole (*Neurotrichus gibbsi* Baird). The former is 6 inches in length, while the latter is only 3. They are both beneficial, though at times a nuisance.

Mr. Day: I shall now ask Mr. Tom Wilson to read his papers on: (a.) "The Oyster-shell Scale" (published in Bulletin 5). (b.) "The Remarkable Outbreak of Locusts of 1914."

### THE OUTBREAK OF LOCUSTS OF 1914.

BY TOM WILSON, F.R.H.S., DOMINION INSPECTOR OF INDIAN ORCHARDS.

This past summer has been remarkable for an outbreak of locusts which occurred. The immense range areas of the Interior and the fruit lands of the Okanagan have suffered equally from the attack, each in its own respective manner.

True locusts, or short-horned grasshoppers, belong to the entomological family Acridiidae. Some of the most numerous and destructive insects belong to this family. They are widely dispersed throughout many different parts of the world, and do periodical damage in those different parts of the world. They are mentioned in many ancient writings; for instance, we read of a plague of locusts in ancient Egypt, a country which still is subject to occasional infestations. They are found in both the Old and New Worlds: Southern Europe, Algeria, India, South Africa, in the Eastern Hemisphere, and in the Argentine, Mexico, and some of the Western United States, as also on the Canadian great plains, and now, owing to several different trains of circumstance, in British Columbia.

The insects of this family have antennæ short, much more so than the body; the ovipositor of the female also short and composed of four separate plates; the tarsi are three-jointed. The hind legs are the longest and usually have stout femora, especially near the base.

Amongst those species of this family that did most damage during the past season, for there were several species involved, were *Melanoplus affinis* and *M. femur-rubrum*, the red-legged locust. The first district in which they came under the writer's notice was in the Similkameen Valley, near Princeton, about the middle of July. They were so numerous that the flight resembled a snow-storm. We found that crops of clover, alfalfa, and the ordinary hay-crops had been much injured, so much so as to bring about an appreciable shortage in weight per acre, while the ranges or cattle-grazing grounds had been rendered bare.

A little later in the season we were in the Okanagan country near Kelowna, and the same conditions were found to exist. In one young orchard which we visited, where that most reprehensible practice "clean cultivation" was being carried on, we found the locusts, after having eaten off the surrounding "range," were tackling

the young orchard trees. These trees seemed to have been planted about two years. Every tree would have a dozen or more locusts busily eating off the foliage, and even the young branches being stripped bare of leaves, petioles, and bark. Where the wood was too hard to cut off we found that in many cases the bark of the trunk had been girdled. I may say that it appeared that only on clean-cultivated orchards was this extreme injury found to be the case. Where there was a crop between the trees or where there were a few weeds along the roadside or by the fences, the trees were more or less untouched.

In the Spallumcheen country I found the locusts again very numerous, but doing no great amount of harm to farm or garden crops, owing, I suppose, to there being a goodly supply of their natural food. They had, however, denuded such shrubs as the saskatoon, wild roses, willows, buck-brush, etc.

The grazing-grounds in the vicinity of Nicola Lake were also severely attacked and many thousands of acres were rendered useless. Our Secretary, Mr. Treherne, made a special trip to the Nicola country to investigate the conditions of the outbreak. Possibly we may persuade him to tell us more of the exact conditions as they appeared to him. I will, however, leave that to him, as the work was done at the special request of the Dominion Entomologist in Ottawa, to whom the report was forwarded.

For the benefit of those of our members who may not be acquainted with the life-habits of this family of insects, I shall describe briefly the life-history of these creatures.

The eggs are laid underneath the surface of the soil in an egg-pod in shape something like a bent flask. Each of these pods contains from twenty-four to thirty-six eggs. Each female in her lifetime usually deposits two of these, though sometimes three or four may be laid by the same female. The insects pass the winter in the egg stage, and the young locusts hatch out in the spring. The period between hatching and maturity is from eighty to ninety days, and the grasshopper passes through several moults, usually four or five. Only after the last moult does the young grasshopper get its full wings. In about a week after reaching maturity the adults pair and oviposition commences.

The egg-masses during winter are largely preyed upon by the larvæ of blister-beetles, which devour the eggs readily. In connection with this, I may say that I found several species of blister-beetles in different parts of the interior of British Columbia during the past summer, notably *Cantharis cyanipennis*, which I found in large numbers in the Similkameen country usually congregated on the wild vetch. I found them both singly and in copula. They were also noticed in the Boundary country on vetches and alfalfa.

I mentioned in the beginning of this sketch that there were several circumstances which might have bearing on the present infestation and the reasons it should have reached the dimensions it did, because, like many other insects, we have the grasshoppers always with us, but not in such overpowering numbers.

The first reason I advance was the abnormally hot and dry season we have experienced, even for the Dry Belt. This condition was most conducive to the spread of these sun-loving dry-country insects. Second, the influx of settlers and the consequent diminution of the natural food of the locusts. Thirdly too heavy grazing on the range, or perhaps, more correctly stated, injudicious grazing on the range, has done away with the food-plants and forced the locusts to places where they could obtain the requisite amount of nutrition.

Mr. Treherne: Mr. Wilson has correctly stated that I made a short stay in the Nicola and Quilchena country investigating the outbreak of locusts that occurred the past summer. This was done at the request in the first place by the Forestry Branch of the Department of Lands, Victoria, and later by authorization from the Division of Entomology in Ottawa. A full report of my trip was forwarded in the usual manner to Ottawa, where a memorandum will no doubt be made out for the

benefit of the Forestry Branch and the ranchers of the Nicola Valley. Without trespassing on the grounds of this memorandum, I may say that I found that the spread of these locusts commenced from the Minnie and Courtenay Lake Districts, and that they travelled north at least as far as Kamloops, and extended west as far as Merritt and east as far as Kelowna. These areas are merely arbitrary as representing the probable centre of the infestation. The investigation into the Nicola country was begun in the first week of November, 1914, a very unpropitious time to study the adults, for very few could be found, and those adults found were dead and mutilated in the stacks of hay. The eggs were easily found, and in some instances in extreme numbers, indicating clearly that no disease of the adults had destroyed the females before their eggs had been laid. Where eggs were found in concentrated area, blister-beetle larvæ were also numerous enough, no doubt, to effect a fair means of control by next spring. Eggs on the range were normal and apparently healthy; consequently there is every indication that we shall again be bothered by the adults next summer unless one of the usual periodical diseases intervenes. I gathered that the outbreaks occur every seven years or so, and that the years when the locusts were most numerous and did most damage were 1889, 1898, 1907, and 1914, and that great damage was effected for about three years surrounding these dates. It is interesting to note that in one of Dr. Fletcher's old reports for 1898 (late Dominion Entomologist), on the authority of Dr. Scudder, the following species were involved: "The great mass of material was *Trimerotropis*, probably *cineta*." Out of the balance he made out the following species: *Camnilla pellucida*, *Cercotettix verruculatus*, and *Melanoplus atlantis*. These species were named from specimens from the Nicola District.

The next paper is one written by Mr. Lionel E. Taylor on "Notes on Birds likely to be of Service in the Destruction of Locusts in the Nicola Valley," and will ask Mr. Anderson to read this paper.

#### NOTES ON BIRDS LIKELY TO BE OF SERVICE IN THE DESTRUCTION OF GRASSHOPPERS IN THE NICOLA VALLEY.

BY LIONEL E. TAYLOR, F.Z.S., M.B.O.U., ASSOC.MEM.A.O.U.

The following notes are based on the reports on economic ornithology issued by the United States Department of Agriculture and from other sources; they do not pretend to be in any way complete, as the literature at my disposal is limited. The species of birds mentioned are those which may with some certainty be presumed to occur in the Nicola Valley in considerable numbers. There are many other species which occur in small numbers or at infrequent intervals, but these have been omitted, as it is not thought that they could be of economic importance.

It must be pointed out that almost all birds will eat grasshoppers at certain times, and especially when they are feeding their young. It is also important to note all investigation points to the fact that grasshoppers are exceedingly palatable to birds, and that when an incursion of these insects occurs a great many species of birds will depart from their usual diet and live almost entirely on grasshoppers.

Unfortunately there are no birds in this country which exist in such numbers as to be able to seriously cope with a large outbreak of grasshoppers as is the case in many other countries, and notably in Africa, where such birds as storks, pratincoles, kestrels, and others are capable of destroying entirely enormous swarms of locusts by their own efforts. In case, however, any doubt may exist on this point, I may mention that these flocks of birds frequently contain tens of thousands of individuals, and that they follow the swarms of locusts sometimes for weeks on end.

It must not be presumed from this that because we have no such enormous flocks of birds very little good can result. In California, where grasshoppers are annually a plague in one part or another, often numbering twenty-five to the square yard, it is conceded that the birds are not able to cause an appreciable decrease in