

mentioned in this paper in safeguarding the agricultural interests of the Province by their sound judgments and sane measures, embodied in the regulations of the Board of Horticulture, against the introduction of dangerous insect pests—pests which are causing considerable annoyance and expense to fruit-growers and farmers in other portions of the Dominion of Canada, and which might with ease be introduced through the medium of trade into this Province, which in the early 90's was only just beginning to develop its wonderful agricultural and horticultural resources. To-day this Province stands, in comparison to its fruit-growing areas, the cleanest of any fruit-growing country in the world. There is little codling-moth, no San Jose scale, no very serious insect pest in the orchard or on the farm, and we look back to the few men, whose names have been incorporated in this paper, through whose wise judgment and who through the exercise of proper precaution made this condition possible.

If it had not been for the Horticultural Regulations, for it has been on the basis of these regulations that our economic entomology has been built so far, and about which mention has been made, our history of British Columbian entomology up to the present would have been very different. Instead of applying quarantine and preventive measures as have been done and as we are in the main doing now, we should have been studying and controlling insect pests of the farmer, of more serious intent than any we have with us under present conditions. As such the published record of entomology in British Columbia would have been much different.

No praise, therefore, is too great for those whose energies have placed this Province on an independent pedestal in the field of economic or applied entomology, causing her to stand an example to all of the practical and elementary principles of entomology, which other Provinces and States failed to follow until too late.

Our work for the future will be to retain this standard of immunity at all costs of labour and expense, and we will endeavour at the same time to supplement our knowledge on those insects of economic importance in our midst and indigenous to the Province. There are few countries with such an interesting entomological fauna. There are few studies that offer such scope for individual research as a study of this same entomological fauna; consequently the field lies open, in systematic or economic investigation, in popular or scientific research, for those that may wish to place their energies and the products of their brains towards a furtherance of our knowledge on British Columbia insects, their lives and their characteristics.

MITES: THEIR CLASSIFICATION AND HABITS, WITH SOME OBSERVATIONS ON THEIR OCCURRENCE IN THE OKANAGAN.

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The work of mites has been brought so much before us in this Province throughout the past season (we need only mention here the discovery by Güssow of a species of *Eriophyes* associated with a kind of "silver-leaf," and also by Brittain of a species of the same genus causing apple-blotch on the fruit) that the writer, when asked to make a few remarks at this meeting, thought it would not be out of place to treat briefly on this class of minute animals, so that a more exact idea of the nature, classification, and importance of the class may be obtained.

The animal kingdom, as you are probably aware, is divided into a number of branches or phyla, each phylum having its own peculiar characteristics. The phylum with which we have to deal is the *Arthropoda*, a group of animals having jointed bodies and jointed legs. In this phylum are the following classes:—

1. *Crustacea*.—These are water-breathing animals. They possess many legs and hard outer or exoskeletons; head and thorax are united. Example: Crabs, lobsters, crayfish.

2. *Arachnida*.—These are land forms, possessing eight legs, head and thorax united. Example: Scorpions, spiders, mites, and ticks.

3. *Malacopoda*.—These are also land forms, body worm-like and possessing numerous legs. The *Peripatus*, an animal rarely met with, is an example of this class.

4. *Diplopoda*.—Also land animals. They possess long, cylindrical, and many-segmented bodies. Two pairs of short legs are found on each segment; short antennae are also present. Example: Thousand-legged worms (*Spirobolus*).

5. *Chilopoda*.—Another class of land animal. The bodies are long, flat, and many-segmented. One pair of rather long legs is found on each segment; long antennae are present. Example: Centipedes (*Scolopendra*).

6. *Insecta* or *Hierapoda*.—Either aquatic or terrestrial, but chiefly the latter. The body of the adults is divided into three distinct regions—head, thorax, and abdomen. Adult forms possess six legs and many are winged. Metamorphoses occur in all but the two lowest orders. Example: Insects (butterflies, moths, beetles, etc.).

From the above classification we gather that mites, although closely related to insects, are not placed in the same class; hence it is a mistake to call a mite an insect. The main differences, as have been noted, are that in the mites head and thorax are united and eight legs are present; while in insects the body of adults is divided into three distinct regions—head, thorax, and abdomen, and six legs are present. Some species, however, notably the blister-mites, have only four legs, while young red spiders have six legs before the first moult.

GENERAL HABITS.

The mode of life of the different members of this class varies greatly; some are parasitic on higher animals, others infest living plants, and many feed upon dead animal or vegetable matter, thus acting as scavengers. Of the mites that are parasitic on higher animals, we have only to mention the various ticks that are so common in many parts. An exception to this is the so-called sheep-tick, which is a true insect belonging to the order Diptera (flies). Man himself is subject to the attacks of a well-known parasitic mite, the itch-mite. It burrows into the skin, causing the itching sensation so characteristic of the disease. Parasitic mites sometimes occur on insects; a common species is found beneath the wings of locusts. Many mites also infest food products; they are sometimes found in cheese, in sugar, and in preserved meats.

MITES INJURIOUS TO PLANTS AND THEIR CONTROL.

As these interest us more particularly to-day, we shall now briefly consider some of their important features. They all feed by puncturing the tissues and extracting plant-juices. Eggs are laid singly on the outside or inside of plant-tissues or in clusters upon the bark. The young develop rapidly and soon new broods are produced; consequently a great deal of damage is often done. They continue to breed throughout the summer, hot, dry weather being especially favourable. Cold, wet weather checks their activities. The common mites known to us in this Province are the red spider (*Tetranychus bimaculatus*), which frequents all sorts of vegetation; the brown mite (*Bryobia pratensis*), also a general feeder; and the pear-leaf blister-mite (*Eriophyes pyri*), producing blister-like galls on pear-leaves. To these may now be added the two forms mentioned in the earlier part of this paper. In warmer countries mites are responsible for a great deal of harm. The red spider is very common, one form being especially bad on citrus trees. We may also mention the silver-mite of lemon (*E. oleivorus*) and the cotton-leaf blister-mite (*E. gossypii*). Reference will only be made in this discussion to the forms found in the Province.

It is generally believed that mites winter over in the adult stage under buds and bark-scales. At any rate, this seems true in the case of the pear-mite. According to Weldon, of Colorado, who has published a paper in the *Journal of Economic Entomology*, October, 1910, on his observations of orchard mites, the adult

red spider (*T. bimaculatus*) passes the winter at a depth of $1\frac{1}{4}$ to 2 inches in the soil. In a very interesting manner he describes the migration of this species from the tree to the soil. His observations are remarkably convincing. The brown mite (*B. pratensis*) is closely associated with *T. bimaculatus*, but in the case of the former, webs are usually absent. The injury from this mite takes place early. Weldon states that *B. pratensis* winters over in the egg stage, the winter eggs being deposited on the trees before August 1st in Colorado.

The problem of mite-control is a difficult one, but good work has been done by many stations with satisfactory results. They can usually be controlled by the summer application of flowers of sulphur alone, powdered lime and flowers of sulphur, or lime-sulphur spray. Weldon found that summer spraying with lime-sulphur was remarkably effective against red spider (*T. bimaculatus*), while for brown mite (*Bryobia pratensis*), which winters over in the egg stage, a dormant spray of lime-sulphur early in the spring gave much better results. With this dormant spray he states that the mites die a short time after hatching from the eggs.

OBSERVATIONS MADE LAST OCTOBER.

The writer last season had a great deal to do with nursery-stock inspection in different parts of the Province. In one of the nurseries curious disfigurements or incrustations of the bark were observed on Northern Spies. Freehand sections were made of the affected parts, and on examination a large number of mites of the genus *Eriophyes* were found. The matter was referred to the Dominion Entomologist for his report. He corroborated my statement that a species of *Eriophyes* was present under the incrustations, but suggested that from the way in which they were found they were probably wintering over in these rough places on the bark and not causing any harm. On the bark of the same trees, egg-blisters of the apple-leaf hopper (*Empoasca mali*) were also found, and it appears that these disfigurements and incrustations are due to the breaking of the egg-blisters when the young hoppers emerge. If mites were present on the leaves in the summer, they would easily crawl to these hiding-places in the bark on the approach of cold weather in the fall. The writer also took the matter up with Mr. Brittain, former Plant Pathologist of the Province, to find out his experience, if any, with this occurrence. He stated that several examinations of affected trees had been made by him during the summer and no trace of mites had he found. Now, however, he had no difficulty in isolating them from the trees sent him, and expressed the belief that they were of the same species as the one associated with "silver-leaf," to which reference has already been made. The problem is an interesting one, for if the mite in question is responsible for some of the silver-leaf appearance in nurseries and it winters over in the places referred to, the life-history will be complete, and a means of control, by spraying with lime-sulphur when the leaves are appearing, suggests itself. Observations of the summer habits of the mite on the leaves have been made by Mr. Brittain, and a further batch of trees with bark incrustations have been sent him, so that he may study and compare the characters of both more thoroughly and be able to state definitely whether or not the mite found under the incrustations is the same species as that working on the leaves during the summer. It may be of interest to note that the disfigurements on Northern Spy, I am informed, are of common occurrence all over the Province.

It is my regret that I shall not be in the Province next summer to investigate this problem more thoroughly, as no doubt some more light on the subject is greatly needed. It is to be hoped, however, that it will be taken up by some student in entomology.

RESOLUTIONS.

Moved by Mr. Taylor, Kelowna, "That this Society, owing to representation having been made at their annual meeting in January, 1914, by fruit-growers from the Okanagan District, in relation to the possibility of the 'carrying-over' of fire-blight (*Bacillus amylovorus*) by bees in their hives during winter, and thus spreading