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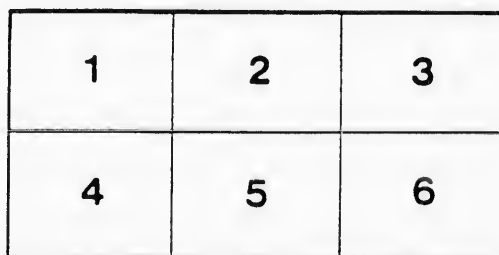
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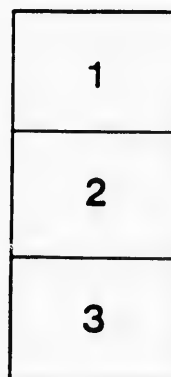
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FROM THE TRANSACTIONS OF THE ROYAL SOCIETY OF CANADA

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VOLUME V

SECTION IV

GEOLOGICAL AND BIOLOGICAL SCIENCES

RECENT ADDITIONS

TO THE LIST OF

INJURIOUS INSECTS OF CANADA

By JAMES FLETCHER, LL.D., F.L.S.

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1899



IX.—Recent Additions to the List of Injurious Insects of Canada.

By JAMES FLETCHER, LL.D., F.L.S.

(Read May 25, 1899.)

Hardly a year passes but some new name is added to the list of those insects which attack to a noticeable extent our various cultivated crops.

In 1869, the late Dr. C. V. Riley began to publish his remarkable series of Reports on the Noxious Insects of Missouri, and for many years, as indeed to a large extent it is to-day, this was the most reliable and important source of reference for all who required information upon injurious insects and the best way to control their ravages.

In 1883, Dr. William Saunders published his most useful book on *Insects Injurious to Fruits*—a work which has been of enormous value to the fruit growers of Canada and the United States in preventing loss in their fruit crops.

In 1870, one year later than Riley began to publish his Missouri reports, through the energy of Dr. Wm. Saunders, the Rev. C. J. S. Bethune and Mr. E. Baynes-Reed, the first *Report of the Entomological Society of Ontario* appeared. This series then begun has been issued regularly ever since and is a compendium of most useful information concerning the injurious insects of Canada, but particularly of the Province of Ontario. *The Canadian Entomologist*, a monthly magazine, also published by the Entomological Society of Ontario, contains many articles of interest to the practical agriculturist and horticulturist; but this publication is more scientific in character than the Reports of the society.

From various causes it would appear that injurious insects are more numerous now than was formerly the case, not only in the number of kinds which occasionally attack crops to a serious extent, but actually in the number of the individuals which appear. The increase in the numbers of different species is affected to a large measure by the destruction of the native food supply incident upon the clearing up of the forest lands and in the draining of bogs, swamps and marshes. In addition to those indigenous insects which develop into crop pests, owing to their natural food-supply being reduced in quantity, there are introduced from time to time, foreign insects from other countries. These, too, in the past have proved to be by far the worst enemies of the farmer and gardener.

The general rule which controls the amount of insect occurrence is the extent of the food-supply: consequently, those insects which are very exclusive in their diet—and there are many such,—or those which feed upon rare plants or upon little grown crops, are correspondingly less abundant than those which have a large range of food plants or which find suitable food in the crops most widely cultivated.

In a state of nature, we find that there are few insects which are not held back from disproportionate increase by special enemies. These latter are naturally, when only normally abundant, far fewer than the hosts at whose expense they live; but with the undue increase of their hosts the parasitic species very soon multiply rapidly and restore again the balance of the ratio of occurrence.

When an insect is introduced accidentally into a distant country, the chances are very remote of the special parasites which attack it in its native land, being also introduced with it, and, as a result, these foreign species are liable to become serious enemies. In rare instances this has been remedied by the subsequent artificial introduction of parasites.

During the fifteen years which have elapsed since the publication of Saunders's *Insects Injurious to Fruits*, many species of insects have occurred in Canada as enemies of fruits and other crops, and records have appeared in various publications.

It has been thought that an annotated list of these might be of interest: the present paper has therefore been prepared and is submitted herewith. With the mention of each injurious insect will be found notes as to the time of the first recorded appearance of the insect, and the best remedies that the experience of many workers has enabled us to devise. These notes are grouped under the heads of the different classes of crops attacked. It may further be noticed that some of these insects are not actually new additions to the list of injurious crop pests, but new facts of importance having been discovered concerning them it seems advisable to include them here.

CEREALS.

The enemies of small grains have received few accessions, but there have been remarkable changes in the amount of injury in various years from the well known pests of these crops. The Hessian Fly, the Joint-worms and the Wheat-stem Maggot have not been for some years, except in very restricted areas, sources of serious loss to the grain crops. The Wheat Midge, at one time a terrible pest throughout the Dominion, is now restricted to a narrow strip in the Niagara peninsula, where it

broke out in 1898, and to a few places where it occurs sparsely in the Maritime Provinces.

Two important new enemies of cereals have appeared and require mention here, viz., the American Frit-fly and the Wheat-stem Sawfly. The American Frit-fly (*Oscinis carbonaria*, Loew.), a native insect, is described and the life history given in the report of the Dominion Experimental Farms for 1890 (under the name of *Oscinis variabilis*). Remedies: These are the same as those for the Hessian fly, the life history of the two insects being similar, viz., (1) Late sowing of fall wheat; (2) Harrowing of stubbles (or in the West the burning over or ploughing down deeply of stubbles); (3) Applications of special fertilizers in spring.



Fig. 1.—The American Frit-fly—enlarged.

The Wheat-stem Sawfly (*Cephus pygmaeus*, L.).—A remarkable Canadian outbreak was that of the Wheat-stem Sawfly. In 1889, Prof.



Fig. 2.—Base of straw infested by *Cephus pygmaeus*: (a) cocoon; (b) plug of borings; (c) circular exit; (d) scattered borings.

(Figure kindly lent by Prof. J. H. Comstock.)

Comstock published a bulletin from Cornell University describing an occurrence of this insect on the College farm at Ithaca, N.Y., in which nearly 5 per cent of the wheat in a field was infested. In 1887, Mr. W. H. Harrington took a specimen of the fly at Ottawa, Canada, and received specimens from Buffalo, N.Y., in June, 1888 and 1889. In July 1895, the writer collected specimens of the perfect insect at Indian Head, N.W.T., but, with the exception of the injury at Ithaca, N.Y., no record was made of injury to grain crops until 1896, when Mr. Wenman, of Souris, Manitoba, found larvæ injuring wheat in his own fields and those of some of his neighbours, from which the sawflies were bred the following summer. (Rep. Exp. Farms, 1896, p. 229.) Remedies: As nearly all the larvæ pass the winter in the bases of the straw, the most practical remedy is found in the treatment of infested stubble by burning it over before the flies emerge in the following spring.

The Amputating Brocade Moth (*Hadena arctica*, Boisdu.)—The caterpillar of this moth is one of the well-known cutworms, and, although normally, as indicated by its pallid colour, a subterranean feeder upon the roots and lower stems of various members of the Grass Family, has also the habit of occasionally becoming a Climbing Cutworm, sallying forth at night

and attacking many plants, even having been detected as a marauder in fruit orchards. In 1895 the moths of this species were observed in enormous numbers in several parts of Western Ontario, and complaints were received of their swarming into houses, where they gave annoyance by soiling clothes and curtains, and also by dying in large numbers in shop windows. As was to be expected, the caterpillars were very numerous and destructive in the same districts during the following summer, large areas of wheat, oats and corn being so injured that they were ploughed up.

No practical remedy has yet been devised, for wide application, against insects which attack cereal crops when growing in the field; but, by studying the life history of each species and thus becoming acquainted with the exact time at which it will finish its growth and cease its injuries, much may be done to escape unnecessary loss by making the fullest use of land at the time when there is no longer any danger in planting. In some instances where fields were stripped bare by these caterpillars, the owners were advised to sow the land again with suitable crops during the second week in June, and, as a result, instead of the fields remaining unprofitable for the rest of the year, as was the case in many places, these farmers obtained good returns. A method of clearing land infested by cutworms, the value of which is now getting to be recognized more widely by farmers, is the turning in of turkeys and other poultry. A full appreciation of the value of the work done by these birds will certainly have a good effect by opening the eyes of farmers to the good services which are year by year rendered by the flocks of wild birds whose visits to fields under cultivation are too often misunderstood.

The Pea Moth (*Semasia nigricana*, Steph.).—For many years housekeepers have known that garden pease were seriously attacked by the small caterpillars of a moth, and, unless care was taken in shelling pease, some of these "worms" were sure to appear on the table. As far as I can learn, nothing was published upon the habits of this insect of which these "worms" were the caterpillars, until 1894, when the first of several articles concerning it appeared (Rep.



Fig. 3.—The Pea Moth—natural size and enlarged.

Exp. Farms, 1894). From the time of the year at which the perfect moth emerges, it would seem that the early planting of peas of an early variety, is the best way to avoid loss from this insect; but up to the present, beyond the breeding of the moth from half-grown caterpillars, little

is known of the habits of the species. Experiments are now being carried on with the view of discovering practical means of avoiding loss.

ROOT CROPS AND VEGETABLES.

The Bean Aphis or Black Dolphin (*Aphis rumicis*, L.).—The Broad or Windsor Beans and Horse Beans are not grown to any extent in Canada. A few years ago (1892), however, an effort was made to introduce Horse Beans into cultivation for use as a highly nitrogenous fodder plant. It was not long (1894) before the well-known pest of the Broad and Horse Beans, the "Black Dolphin" of English farmers, made its appearance, and was one of the causes which prevented these useful plants from being much more widely grown in this country.



Fig. 1.—Bean Aphis—natural size and enlarged.

At the same time (1894) the bean plants were severely attacked by a native leaf-hopper, the Bean Thrip (*Empoa fabae*, Harr.), which occasionally does slight injury to the field beans ordinarily cultivated.

The Bean Weevil (*Bruchus oblectus*, Say).—The latest addition to the insect enemies of the Canadian farmer is the Bean Weevil (Rep. Exp. Farms, 1898), which not only destroys the seeds while in the pod in the fields, but also propagates among the dry grain when stored. It is hardly likely that this will ever become a regularly occurring pest, but like the grain and rice weevils (*Calandra*), it will appear at intervals and then be lost sight of. The best remedy for this insect, as with the well known Pea Weevil (*Bruchus pisorum*, L.), which in many points has a similar life history, is the destruction of the weevils inside the seeds as soon as possible after the crop is harvested. Fumigation with bisulphide of carbon is the best treatment in every way. It must not be forgotten that this liquid and its vapour are very dangerous to use, owing to their extreme inflammability. The most convenient way to fumigate seed is to place it in an ordinary coal oil barrel and pour on the beans one ounce of the bisulphide of carbon for every 100 pounds of grain, then close the barrel tightly, first with a wet canvas or cloth, and, on the top of this, with boards which should be left undisturbed for two days at least.

The Turnip Aphis (*Aphis brassicae*, L.).—Of late years serious injury has been done to crops of turnips and other members of the cabbage family by the European enemy of these plants, which in this

country is now very generally known as the Turnip Aphis. Although occurring injuriously for many years, the first published reference seems to have been in 1885 (Rep. Hon. Ent. Dept. Agric. Can., 1885). The smooth-leaved varieties of turnips suffer most, and, as a rule, little is done by turnip growers to check its ravages,



Fig. 5.—Turnip Aphis—enlarged.

which are frequently considerable. Much, however, can be done by those who will consider the habits of the species. Generally, these plant-lice make their appearance in the fields in small and widely separated colonies, just about the time when turnips are being thinned out. Good results may therefore be obtained if the men when thinning will be on the lookout for these incipient colonies and destroy them by simply hoeing out the infested plants and, having pulled some earth over them with the hoe, then press it down firmly with the foot. When the plant-lice are too numerous for this simple treatment, the turnips should be promptly sprayed with a knapsack sprayer, using as an insecticide a one to nine dilution of the ordinary kerosene emulsion, or a wash of the so-called whale-oil soap, one pound in six gallons of water.

The Red Turnip Beetle (*Entomoscelis adonidis*, Fab.).—In 1885 (Rep. Exp. Farms, 1887, p. 11), a red and black chrysomelid beetle was found at Regina and other places in the Northwest Territories, eating the leaves of turnips. It is now known to be an occasional pest upon turnips, cabbages and almost all crucifers from Manitoba to British Columbia, but is rare towards the eastern and western limits of its range. A full account of the life history is given in the Report of the Experimental Farms for 1892, page 152.

The Spinach Carrion Beetle (*Silpha bituberosa*, Lec.).—In the 1893 Report of the Experimental Farms, page 174, mention was made of injuries to certain garden crops at Calgary by the larvae of this

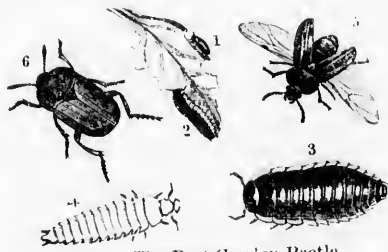


Fig. 6.—The Beet Carrion Beetle.

beetle, and since then occasional complaints of their attacks upon plants belonging to the Spinach and Gourd Families have been received. A European species, *Silpha opaca*, L., has similar bad habits and is known as the Beet Carrion Beetle. This has been treated of several times by Miss E. A. Ormerod, the eminent English economic entomologist. As a remedy against these insects, plants may be protected by spraying or dusting them with poisonous insecticides, those containing arsenic being the most useful.

The Carrot Rust-fly (*Psila rosea*, Fab.).—An insect enemy very seldom mentioned in the writings of entomologists, but one which is frequently complained of by correspondents in New Brunswick and some parts of the provinces of Quebec and Ontario (in the East), is the Carrot Rust-fly of Europe. In 1885 infested carrots were found at Ottawa, Ont. (Rep. Hon. Ent. Dep. Agr. Can., 1885), and since then this insect has at different times caused rather serious losses in some other parts of the Eastern provinces. The red carrots are much more attacked than

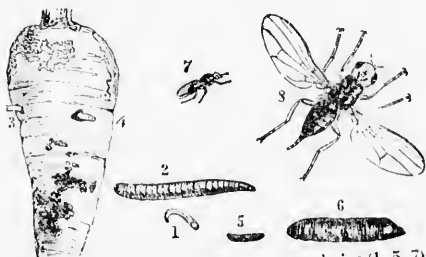


Fig. 7.—The Carrot Rust-fly—natural size (1, 5, 7), and enlarged (2, 6, 8).

the white ones, but no kinds are always exempt. Surface treatment with carbolic or other malodorous substances, have given good results in preventing the flies from laying their eggs. Late sowing has also been found very useful. As the larvæ work also in stored carrots during the winter, the soil in which the latter have been packed should be carefully treated to destroy the pupæ of those larvæ which leave the roots and enter the soil to complete their development.

The Tomato Stalk-borer (*Hydræcia cataphracta*, Grt.).—For many years all lepidopterous borers in the stems of tomatoes and potatoes in Canada have been considered to be *Hydræcia nilela*, Gn., but upon breeding during several years a great many examples from larvæ found boring in these plants in Central Canada I have never succeeded in obtaining any other species than *H. cataphracta*. I am, therefore, led to believe that this is the insect which has been referred to previously as "the Stalk-borer." Not only does the larva attack the tomato and potato, but it bores into the stems of almost every other plant while in a succulent condition if they are thick enough. Unfortunately no remedy is possible other than the cutting out of the larva when its presence is detected by the fading of the leaves.

The Black Army-worm (*Noctua fennica*, Tausch.).—Since 1884 (Rep. Ent. Soc. Ont., pp. 13 and 15), when the first outbreak of this caterpillar occurred in such numbers as to gain for it the name of the Black Army-worm, a certain amount of damage must be attributed every year to this species. In years of small occurrence the caterpillars are confined mostly to clover fields and do not attract attention, but when abundant they spread from the clover and attack almost every kind of succulent plant or shrub. When full-grown the larvæ are large, velvety black caterpillars, striped with white, two inches in length and very ravenous; as they develop early in the season, their depredations among young vegetables are sometimes serious before they are noticed. The best means of checking this and all kinds of cutworms is to use what is known as the "poisoned bran remedy," of which,—as it is so remarkably successful and the subject of a satisfactory remedy against cutworms is of such general interest,—it may be well to give here a full description of the preparation. It consists of a mixture of bran and Paris green in the proportion of 50 of the former and 1 of the latter. In making this mixture (which may be applied either wet or dry), it is best to dampen the bran slightly with water containing a little sugar. After mixing thoroughly, so that the whole mass may be permeated very slightly with moisture, add the Paris green by shaking on a very little at a time and stirring it in. If the Paris green were added to the bran when it is perfectly dry, it would, owing to its weight, sink at once to the bottom when stirred. If it is desired to use this mixture as a wet application, more sugar and water must be added until it is of about the same consistency as porridge; but, if it is to be used dry, a little more dry bran may be added until the mixture will run through the fingers easily.

The Red-backed Cutworm (*Carneades ochrogaster*, Gn.).—Many different kinds of cutworms have at various times been described by writers in agricultural and entomological papers, but the one which I am convinced is the worst culprit of all has been generally overlooked. This is the large dull-brown caterpillar above named, which may be easily recognized by its large size, and the broad reddish stripe down the back. The moth, which lays the eggs from which these caterpillars hatch, varies much in colour, from bright brick red in the form named *turris* to a grayish ochre-yellow in the typical form. The caterpillars are particularly troublesome in gardens, attacking all early vegetables and annual flowering plants. The remedy for the last species is of course applicable to this, and, as the caterpillars are specially destructive to newly set out cabbages, tomatoes, etc., it is well to protect these by

wrapping loosely round their stems a strip of paper about two inches wide by three long, placing it so that about an inch and a half of the band is above the ground. Strips of tin answer the same purpose, the heavy-bodied caterpillars not being able to crawl up the smooth surface.

The Clover Cutworm (*Mamestra trifolii*, Rott.).—Although named after the clover plant, upon which certainly this insect does feed, the caterpillars attack very many other crop plants and many weeds. Perhaps the worst injuries which have been reported in Canada, were upon field peas, mangels, cabbages and turnips (Rep. Exp. Farms, 1888, p. 57). Spinach and the "Lamb's Quarters" (*Chenopodium album*) are common food plants of green caterpillars much less marked with dark lines than those which are usually found on peas, mangels and turnips; but, for the meantime, all are included in the species *M. trifolii*. The last serious outbreak of the Clover Cutworm was in 1896 upon turnips and peas in the townships around Rice Lake, Ont.

The Corn Worm (*Heliothis armiger*, Hbn.).—This insect, which is common in the United States and is so well known in the South as the notorious Boll Worm of the cotton fields, is by no means a frequent crop pest in Canada, but is probably the cause of some loss in fields of late corn every year, and occasionally, as last autumn (Rep. Ent. Soc. Ont., 1898, p. 82), becomes a pest of some importance, no less than 95 per cent of the ears of both sweet corn and yellow field corn having been injured near Orillia, Ont., by the caterpillars eating into and much disfiguring the soft grains beneath the inclosing husks.

The Spotted Blister-beetle (*Epicauta maculata*, Say).—The injuries to potatoes by the Gray and the Black Blister-beetles are sometimes considerable in the old provinces of Canada, but they are intermittent in occurrence. In the West another species, the Spotted Blister-beetle, of about the same size but spotted all over with minute black points, frequently appears suddenly in large numbers. As the Colorado Potato Beetle does not occur as a pest of the potato west of Manitoba, no regular treatment of potato fields with poisonous applications is practised and consequently much damage is sometimes wrought before anything can be done to prevent it. In the larval state the blister-beetles are parasitic upon the eggs of locusts, but in the perfect form they are ravenous vegetable-feeders. When these insects occur, the crops attacked should at once be freely dusted or sprayed with Paris green or a solution of whale-oil soap.

The Western Blister-beetle (*Cantharis Nuttallii*, Say).—Another of the blister-beetles and one of the handsomest creatures we have in our insect fauna is the Western Blister-beetle, a species an inch in length,

with its plum-coloured wing-cases, glossed with gold, head, thorax and body metallic green with the same golden sheen as the wing-cases, the antennae dull black and the legs dark purple. Although so beautiful to look at, the beetles are extremely destructive when, as is frequently the case in the West, they appear suddenly in fields of beans and vetches; moreover, they emit an abominable odour, and, if crushed, the juices of the body have such a vesicating power that they will readily blister the skin which may come in contact with them. In a state of nature these beetles feed upon the *Astragali*, or Milk-vetches, and other Leguminosae growing wild on the western prairies. The species is credited with being one of the most inveterate enemies of the Rocky Mountain Locust, vast numbers of the eggs of which are destroyed by its larvæ. (Rep. Exp. Farms, 1892, p. 155.)

FODDER CROPS.

The Cottony Grass Scale (*Eriopeltis festuæ*, Fonse.).—In the Report of the Experimental Farms for 1895 (p. 145), is an account with



Fig. 8.—The Cottony Grass Scale: egg-sacs on grass—natural size.

an illustration of a curious scale-insect which has occasionally done harm to pastures and meadows in Nova Scotia. It was first sent in by Prof. A. H. Mackay, who stated that it occurred in large numbers over an extensive marshy flat in Cumberland County, N.S., every blade of dead grass having one or more egg-sacs attached. The young insects hatch in spring, and feed on the leaves and stems of grasses, the females becoming full-grown in July and soon after the middle of the month laying their eggs in conspicuous elongated oval sacs of closely-felted, white, downy threads. As the eggs do not hatch until the following spring after they are laid, burning over the "old fog" or dead grass either late in the autumn or

before growth begins in spring is an easy means of preventing the increase of this insect.

The Punctured Clover Weevil (*Phytonomus punctatus*, Fab.).—The first record of the occurrence of this clover weevil in Canada was in 1881 (Rep. Hon. Ent. Dept. Agr. Can., 1884). It is not, however, a pest which regularly occurs, and in almost every instance when there has been an outbreak it has been attended by a parasitic fungous disease (*Entomophthora phytonomi*, Arthur), which has so reduced it that in no case have reports been received of its reappearance the following year.

In Canada a much more frequent enemy of the clover plant and one which sometimes makes serious but unnoticed diminution in the weight of crops of that important fodder is the native Green Clover Weevil (*P. nigrirostris*, Fab.), a much smaller insect, the larvæ of which eat the young flower heads and budding shoots inside the sheathing stipules of the leaves. With both of these weevils, early cutting of the first crop of clover hay, or feeding it off with stock, as is done for the clover-seed midge, are useful.

The Clover Root-borer (*Hylesinus trifolii*, Müller) is only once recorded as having attracted notice by its injuries in Canada (Rep. Exp. Farms, 1891, p. 200). The remedy most relied on is the ploughing down deeply of an infested crop, and refraining from sowing clover again for some time.



Fig. 9.—Clover Root-borer.

FRUITS.

Owing to the fact that a large amount of capital has been invested in fruit farms and that these plantations are of a more permanent nature than those of any of the ordinary crops which occupy the land for only one or two years or less, more attention has been devoted to the enemies of fruit crops than to other injurious insects. The consequence is that the habits of most of those which trouble the fruit grower are now pretty well understood, and practical standard remedies have been discovered for most of them. One of the most important developments of economic entomology during the past decade has been the introduction into horticulture of what is known distinctively as "spraying,"—an effective method of distributing arsenical and other poisonous sprays over growing crops by means of specially prepared

force-pumps and nozzles, which will allow of the use of a minimum quantity of a suitable insecticide, so that no injury may be done by it to the foliage treated, while at the same time the marauding insects are destroyed.

The San José Scale (*Aspidiotus perniciosus*, Comstk.).—Probably no insect which has claimed the attention of entomologists has caused

more excitement or proved more difficult to control than this minute scale-insect, which was given its popular name by fruit shippers in 1873, from the place in California where it was first noticed. It was not till 1880 that Prof. Comstock pointed out the great loss which it was causing and gave it the specific name of *perniciosus* on account of the extent of its injuries. Up to 1892 the San José Scale was thought to be confined in North America to the Pacific Coast, but during the summer of 1893 it appeared in injurious numbers in the Eastern States, and in 1894 the first Canadian specimens were received from near Kelowna, on Lake Okanagan, British Columbia. (*Farmer's Advocate*, London,



Fig. 10.—The San José Scale: apple branch with scales; large scales above at left.

Ont., Dec., 1894). The infested trees were destroyed, and it was not until 1896 that the insect was again found injuring fruit trees, this time in two localities on Vancouver Island. By the destruction of the trees this importation was again entirely wiped out, and no further appearance of the San José Scale in British Columbia has so far occurred. The history of the San José Scale as an injurious fruit pest in Canada begins with the spring of 1897, when in the month of January, undoubted specimens were found at Chatham, Kent Co., Ontario, and soon afterwards near Niagara, in Lincoln County. Since that time its injuries and the efforts which have been made by the Federal and Provincial Governments have been a subject of absorbing interest and will, I fear, continue to be so for some time to come. As yet, no practical remedy suitable for general application by the ordinary fruit grower has been discovered, although fumigation with hydrocyanic acid gas, a dangerous operation with most poisonous materials, has proved effective in the hands of specialists when performed with great care. The best simple remedy is the spraying of the infested trees after close

pruning with a strong solution (2 lbs. in 1 gallon of water) of "whale-oil" soap, a concentrated fish oil soap emulsified with caustic potash.

During the San José Scale investigations it became known that three other dangerous scales were present and wide-spread upon Canadian fruit trees, viz., two native species, the Forbes Scale (*Aspidiotus Forbesi*, Jasn.) and the Putnam Scale (*A. ancyllus*, Putn.), and besides these a European scale known as *Aspidiotus ostreaformis*, Curtis, the last named first found in America near Chilliwack in British Columbia, but now known to occur in many parts of Western Ontario, as well as in many of the Eastern United States.

New York Plum Scale (*Lecanium cerasifer*, Fitch).—The first appearance of this scale as a noxious insect in Canada was in 1891. (Rep. Exp. Farms, 1895, p. 157.) This is not nearly so difficult to treat successfully as the last species. Spraying the trees during the winter with the well known kerosene emulsion (Riley-Hubbard formula) diluted with four parts of water has been found to be the most satisfactory treatment.

The Cigar Case-bearer (*Colcophora fletcherella*, Fernald).—This destructive orchard pest which occasionally increases rapidly, and the caterpillar of which does so much harm to apple trees early in the season, was abundant in many parts of Canada in 1891. (Rep. Exp. Farms, 1891, p. 196.) The young caterpillars hibernate on the twigs in their small curved cases, and as soon as the warm weather begins they revive and attack the buds and unfolding leaves. Soon after they form new and larger cases, shaped like miniature cigars, one quarter of an inch in length, inside which they live, moving about and feeding for some time on the leaves, through the surface of which they eat a small hole and then consume the parenchymatous tissues only, by extending the body for some distance around this hole between the epidermal layers of the upper and lower surfaces. In these cases also they complete their transformations, and the minute silky-gray moths emerge through the upper end of the cases at the end of July. Persistent spraying of the trees with Bordeaux mixture containing Paris green, or with kerosene emulsion early in the season, are necessary to control this pest.

The Apple Fruit-miner (*Argyresthia conjugella*, Zell.).—During 1896 (Rep. Exp. Farms, p. 258) a new pest of the apple appeared in alarming numbers in the Fraser valley and in Vancouver Island in British Columbia. The infested fruit was much gnarled and rendered unfit for the market by the work of the small caterpillars of a very small tineid moth not previously noticed in North America, but which in Europe was known to breed in the fruit of mountain ash (*Sorbus*

Aucuparia, L.). In British Columbia, in addition to cultivated apples, it was found that the larvæ also fed inside the fruit of the wild crab apple (*Pirus rivularis*, Dougl.), which has fruit of about the same size as the European mountain ash.

The Lesser Apple-worm [*Grapholitha (Semasia) prunivora*, Walsh].—For many years British Columbian apple growers have referred to a small caterpillar which in everything but size answered to the caterpillar of the Codling Moth, but it was not until 1898 when the perfect moths were reared, that the exact identity of the species was determined. In 1897 the caterpillars were very numerous and destructive in British Columbia, and also occurred in several places in Eastern Canada. (Rep. Exp. Farms, 1898, p. 199.) In the East as the caterpillars attacked the apple chiefly at the calyx end and did not burrow deeply into the flesh, the injury was less important than on the Pacific Coast, where they burrowed all through the fruit in a very similar way to those of the well known Codling Moth. The species was treated of by Benjamin Walsh many years ago in his first report as Entomologist of Illinois (1868), under the name of the Plum Moth. He bred specimens from plums, the fungous growth known as "the Black Knot," the Cock's-comb Gall of the elm, which is caused and inhabited by plant-lice, and also from a hollow gall on the leaves of red oak. Dr. C. V. Riley also bred it from galls on oak, from haws, from crab apples, and abundantly from cultivated apples.

The Mottled Umber Moth (*Hibernia defoliaria*, L.).—This moth, the caterpillar of which is one of the *Geometridæ*, is a European species which has secured a foothold in British Columbia, and every year does some harm to plum and cherry trees in Vancouver Island. In the Report of the Experimental Farms for 1893, page 178, it is treated of and figured in all its stages.

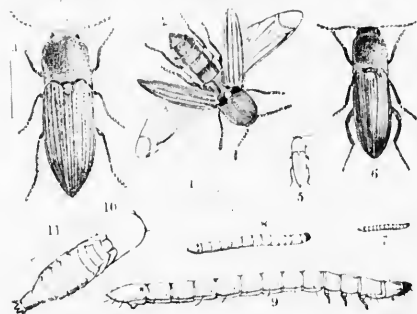


Fig. 11.—Click-beetles and Wireworms—2, 3, 6, 9, 11, magnified.

Click beetles (*Corymbites caricinus*, Germ., and *C. tarsatus*, Lec).—Injuries to the flowers of apple trees by the two click-beetles above named have sometimes been rather serious. (Rep. Exp. Farms, 1892, p. 146.) The grubs of these beetles belong to the large class of very injurious crop pests known as Wireworms, which attack the roots of many plants, and are among the most

troublesome insects the practical entomologist has to deal with; all efforts to control them with poisonous substances and most agricultural methods adopted with the same purpose have failed. Late ploughing of infested land and sowing fields with rye or barley are the only experiments which have given any degree of success.

The Bronze Apple Weevil (*Magdalis ænesceus*, Lec.).—Considerable damage in Vancouver Island orchards is every year attributable to the attacks of this beetle. The fully developed beetle is deep bronze-black, narrow in shape and about a quarter of an inch in length. The female lays her eggs in minute holes which she bores with her slender elongated snout into the bark of apple trees. There are as a rule several of these holes in a group. As soon as the grubs hatch, they eat burrows through the tender bark and in the surface of the wood. Sometimes they occur in large numbers and the attacked trees soon die. Apparently healthy young trees are frequently attacked. Although the grubs have not yet been detected as enemies of the cherry, the perfect beetles swarm on the foliage of that tree and devour it to a serious extent. The regular treatment of orchards with alkaline washes to prevent the attacks of borers, and regular spraying of foliage for leaf-feeding insects, will control this enemy.

The Peach Bark-borer (*Phænotribus liminaris*, Harris).—One of the most serious enemies of the peach grower in the Niagara Peninsula, although frequently overlooked, is this minute scolytid, which, although only one-twelfth of an inch in length, by reason of its attacks and those of its larvæ, causes such an enormously disproportionate outflow of gum from the trees that they are soon weakened and killed. As soon as this pest is noticed in an orchard, the trees should be washed as early as possible in the spring and again subsequently with a combined alkaline and carbolic acid wash. (Rep. Exp. Farms, 1893, p. 176, and 1894, p. 212.) Of somewhat similar habits to the Peach Bark-borer is the Fruit Bark-beetle (*Scolytus rugulosus*, Ratz.), which although for some years a destructive enemy of the fruit grower in the United States close to our borders, only appeared in our Canadian orchards in 1898. (*Farmer's Advocate*, 1898, p. 262.) As a general thing this insect confines its depredations to unhealthy trees; its injuries, therefore, are not of so much importance as those of the Peach Bark-borer. In the case of both, however, all moribund trees should be cut down and promptly burned.

The Gray Peach Weevil (*Anametis grisea*, Lec.).—An unusual but sometimes serious attack upon peach and apple trees is by the Gray Peach Weevil, a beetle belonging to the *Oliorhynchidae*, which crawls up

the trees in early spring and eats out the young buds, showing apparently a preference for those of newly set scions. (Rep. Exp. Farms, 1893, p. 177.) As these beetles have not true wings, they can only gain access to the buds by crawling up the trees; therefore, banding the trees in spring with some material which cannot be crossed over by the beetles will prevent them from attacking the buds.

The Black Grape-vine Weevil (*Oliorhynchus sulcatus*, Fab.).—This is supposed to be a European insect which has been introduced into Canada. It is common in Nova Scotia, but no injury to crops has been reported from that province. In British Columbia (Rep. Exp. Farms, 1893, p. 182) it has caused injury as a greenhouse pest, the grubs eating the roots of gloxinias and cyclamens as well as the foliage of various other plants.

The Strawberry Bud-weevil (*Anthonomus signatus*, Say).—An intermittently occurring but serious enemy of the strawberry is the small beetle above named, which sometimes (Rep. Exp. Farms, 1887, p. 32, under the name *A. musculus*, Say) does much harm by laying its eggs in the buds of strawberries



Fig. 12.—The Strawberry Bud-weevil—enlarged.

and then cutting them off. The remedy first suggested in the above article, of covering plants with paper or gauze until the flowers open, is

the only one which has given up to the present time any useful results.

The Currant Weevil (*A. rubidus*, Lec.), another small beetle of the same family as the above, is an occasional enemy of white and red currants, the larvæ feeding in the fruit, causing it to ripen prematurely and fall from the bushes. This insect has never occurred in sufficient numbers to cause any noticeable diminution of the crop. (Rep. Hon. Ent. Dept. Agr. Can., 1885, p. 27; Rep. Exp. Farms, 1887, p. 31.)

The Black Gooseberry Borer (*Nylocerius Agassizii*, Lec.).—A mere mention may be made of rather extensive injuries to the stems of some young gooseberry bushes imported into British Columbia from Oregon, by the larvæ of a very rare longicorn beetle, to which the above name has

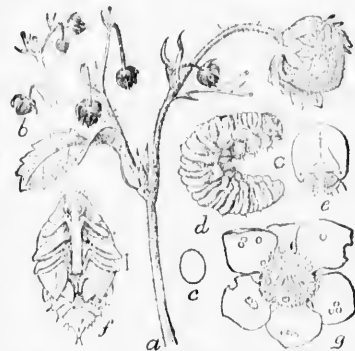


Fig. 13.—The Strawberry Bud-weevil; a, strawberry stem attacked; c, egg; d, larva; f, pupa—c, d, f, enlarged.

been given. (Rep. Exp. Farms, 1898, p. 207.) Although the larvæ were abundant in the consignment of bushes in which it was imported, this is still an extremely rare insect; therefore, as it has not been observed attacking gooseberry bushes in its native State, where they are extensively grown, its apparent abundant presence in the above instance must be considered as accidental, and, further, as all the infested bushes were destroyed, it is hardly likely that it will ever become an important enemy of the fruit grower in British Columbia.

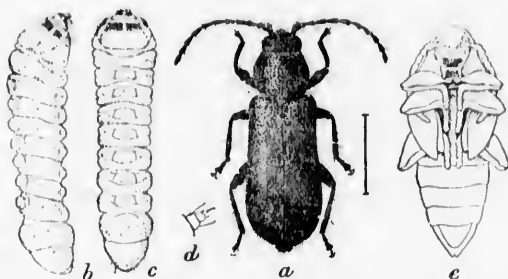


Fig. 14.—The Black Gooseberry Borer; *a*, beetle; *b*, *c*, *d*, larvæ; *e*, pupa—enlarged.

The Western Strawberry Crown-borer (*Tygloderma foveolatum*, Say).—Injuries by a crown-borer which attacks strawberries in British Columbia in a perfectly similar way to the eastern species *Tygloderma fragariae*, Riley, have proved to be by the above named species. (Rep. Exp. Farms, 1897, p. 201.)

The Apple Maggot (*Trypeta pomonella*, Walsh).—A most destructive enemy of the apple fruit is the Apple Maggot, which has appeared in Canada in one or two places only (Rep. Exp. Farms, 1896, p. 256), although for many years it has caused great loss to fruit growers in the States of Vermont and Maine, and also in New York, Massachusetts and Connecticut. The life history is well known, having been worked out very completely by Prof. Harvey, of the Maine State Agricultural College. The remedy is comparatively simple but requires great persistence. The one that is most relied on by those who have had most experience, is the prompt destruction of windfalls, so as to prevent the maggots going into the ground when they leave the fruit to complete their transformations. This can be done by keeping pigs, sheep or other stock in the orchard. Prof. Harvey says emphatically "the gathering of windfalls for the checking of *Trypeta* has been tried and found effectual." Deep spading or ploughing of the ground under the trees and the keeping of poultry in the orchards are very useful, because when the larvæ leave the apples to pupate they always remain near the surface of the ground.

The Currant Maggot (*Epochra Canadensis*, Loew.).—The injuries by the Currant Maggot in many places on Vancouver Island are so

serious every year as to have deterred many from growing black currants. Although specifically named after Canada, this fly must be regarded as rare and extremely local in the Dominion. With the exception of parts of British Columbia, it is certainly nowhere common in Canada, although like the Apple Maggot it is abundant in some seasons in the State of Maine close to our borders. (Rep. Exp. Farms, 1897, p. 204.)

The Plum Web-worm (*Lydella rufipes*, Marlatt).—When travelling through the Mennonite country in Southern Manitoba in the summer of 1896, I observed much damage was being done to plum trees by the gregarious caterpillars of a sawfly, which webbed together the leaves of whole branches, and soon stripped them of all green cellular portions, in a very similar manner to the larvæ of the Cherry-tree Tortrix (*Cacacia cerasivorana*, Fitch). This sawfly has also been found in South Dakota and has been treated of by Prof. Williams. (Bull. 33, S. Dak. Exp. Stn.) No specimens of the perfect insect have come into my hands, and it is just possible that it may be the European *Lydella piri*, of Schrank, which could easily have been imported in the cocoons among the roots of the plum trees brought out by the Mennonites from Southern Russia.

The Pear-tree Flea-louse (*Psylla piricola*, Förster).—This insect has only in one or two instances caused much loss in Canada, the first record being in 1891. (Rep. Exp. Farms, p. 210.) It may, however, be found in small numbers in almost all pear orchards in Western Ontario, and its injuries are often probably unnoticed even when they are of considerable extent. The presence of this flea-louse may generally be detected by the copious secretion of honey dew with which the leaves, limbs and trunks of the trees soon become covered and upon which a dirty looking black fungus, *Pumago salicina*, develops. The mature insects are like minute *Cicada* and belong to the same section of the Homoptera as the aphides or plant-lice. The Pear-tree Flea-louse passes the winter in the perfect state, chiefly beneath the flakes of bark on the trunks of the trees, beginning to move about and mate early in the spring. At that time they are not very active, and, when it is known that trees are infested, much good may be done by placing sheets on the ground beneath these trees and scraping off with hoes all the rough scales of bark. This debris should then be burnt at once, and the trees sprayed with kerosene emulsion.

The Black Peach Aphis (*Aphis persicae-niger*, E. F. Smith).—The first record of this very fatal enemy of the peach tree was at Leamington, Essex Co., Ontario. (Rep. Exp. Farms, 1895, p. 196.) But it is hardly to be doubted that it might have been found in Canadian peach

orchards previous to that date. Like all the dark-coloured plant-lice, it is harder to kill than those which are of a green colour. The form of the Black Peach Aphis which lives above ground, may be successfully and easily treated by spraying with a whale-oil soap solution (1 lb. in 6 gallons of water), but the destructive form which lives upon the roots is much more difficult to reach. An horticultural method which has given good results is a liberal periodic application of kainit, as much as 10 pounds being broadcasted on the ground as far as the branches extend, beneath trees of about six inches in diameter, and then lightly spudded or cultivated in. This not only invigorates the trees but also destroys the insects.

The Clover Mite (*Bryobia pratensis*, Garman).—There are doubtless many mites which are classed under the general name of "Red Spider" and which do much harm to many crops. Among these, certainly in British Columbia and Ontario, and probably in every other province of Canada, is the species which has been called the Clover Mite on account of its particular liking for that plant. The conspicuous ruby-red eggs seem to be laid by preference upon plum and apple trees, and are sometimes so numerous as to give a distinct ruddy tinge to the twigs in winter. Nevertheless, strangely, the abundance of eggs is not necessarily, it would seem, followed by noticeable injury to the trees on which the eggs are found. In California and in British Columbia some injury has been complained of from time to time and the usual remedy for Red Spiders—spraying with kerosene emulsion containing some flowers of sulphur in suspension—has been found quite satisfactory.

Besides the above pests of the farm and the fruit garden, the following may be briefly mentioned here as late additions to the list of Canadian noxious insects, which have been the cause of considerable loss.

FOREST AND SHADE TREES.

The Birch Bucculatrix (*Bucculatrix Canadensisella*, Chamb.), is an enemy of unusual occurrence, which was very abundant in Eastern North America in 1892. (Rep. Exp. Farms, 1892, p. 56.)

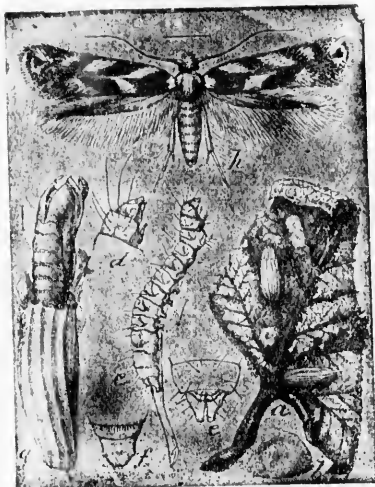


Fig. 15. The Birch Bucculatrix—enlarged.

The Vancouver Island Oak Looper (*Ellopiia somnulara*, Hulst).

—The caterpillars of this moth are measuring worms, and at intervals of about four or five years appear in incredible numbers and entirely defoliate the oak trees over miles of country around Victoria, Vancouver Island. (Rep. Exp. Farms, 1890, p. 175.)

The Spruce Gall-louse (*Chermes abietis*, L.).—Much anxiety has been caused during the last year or two since the value of spruce timber has been enhanced by its extensive use in the manufacture of paper, by the injuries and spread of this insect. (Ont. Forestry Rep., 1897, p. 39.)

The Spruce Bark-borer (*Dendroctonus rufipennis*, Kirby).—As soon as the spruce forests of eastern Canada are cut into, this bark-beetle appears and does much damage by attacking the bark of the trees standing nearest the openings. The same species occurs in Northwestern Canada and injures spruce timber in the same way as it does in New Brunswick and Quebec. (Rep. Exp. Farms, 1887, p. 35.)

The Larch Sawfly (*Nematus Erichsonii*, Hartig).—In 1883, this sawfly, a European species which had been observed in small numbers in the Eastern Townships of Quebec during the previous year (Rep. Ent. Soc. Ont., 1883, p. 17), attracted general attention by its abundance and the rapidity with which it was spreading through the country. It has since that time destroyed millions of feet of valuable larch timber and has now spread to the shores of Hudson Bay and through Labrador. Fortunately in many places where it was formerly abundant it has now almost entirely disappeared.

The Spruce Sawfly (*Lophyrus abietis*, Harr.).—Through Northwestern Ontario and Manitoba the spruce trees are frequently stripped of their leaves by the larvæ of the Spruce Sawfly. Where, as is fre-

quently the case in the West, these trees have been grown for ornamental purposes, the disfigurement is of considerable importance. The injury to the timber is also great, and many trees after being defoliated for two or three years running are destroyed.

The Negundo Plant-louse (*Chailophorus negundinis*, Thomas).—One of the worst pests of shade trees in Manitoba and the Northwest Territories, is this native plant-louse, which renders the trees, and everything around them, filthy, by reason of the copious deposits of honey dew which it emits. Trees have been cleared of this pest by spraying them with the ordinary washes of kerosene emulsion and whale-oil soap which are used against other plant-lice. (Rep. Exp. Farms, 1893, p. 181.)

The Maple Shield-maker (*Iucurvaria acerifoliella*, Fitch).—Occasionally the leaves of the sugar maple, particularly when growing in forests or groves, are damaged by the caterpillars of a small moth, which cut out circular disks, over a quarter of an inch in diameter, and make curious little flat cases of them, inside which they live while they are devouring the foliage and inside which also they pass the winter among the fallen leaves. (Rep. Hon. Ent. Dept. Agr. Can., 1885, p. 31.)

The Striped Cottonwood Beetle (*Liua scripta*, Fab.).—Poplars and willows in the prairie provinces are frequently disfigured and much injured by the fetid larvæ of this beetle, which eat away the green portions of the foliage, leaving only the browned skeletons of the leaves.

The Pallid Aspen Beetle (*Gonioctena pallida*, L.).—Throughout Manitoba and the Northwest Territories during the past two years, the groves of aspen poplars, which are of so much importance in that country, have been devastated by the larvæ of this insect, which in every way closely resemble those of the last. Plantations have been protected by spraying them as soon as the beetles appear in spring, with a Paris green wash.

The Ten-striped June Beetle (*Polyphylla decemlineata*, Say).—The grubs of this handsome western beetle do much harm to the roots of many shrubs and young trees in nurseries, as well as to the roots of almost every plant grown in gardens on Vancouver Island. (Rep. Hon. Ent. Dept. Agric. Can., 1885, p. 15.) These larvæ are very similar in appearance to, but are larger than the well known white grubs of the east.

FLOWERING PLANTS.

The Violet Sawfly (*Emphytus Canadensis*, Kirby).—Sometimes the growers of those garden favourites, pansies and violets, find that their plants have been eaten during the night by some unknown enemy. By looking beneath the surface of the soil, or under the lowest leaves, they may find some bluish-black smooth false-caterpillars. These are the larvæ of the above named insect which often occurs upon members of the Violet Family in gardens, and on one occasion did much harm in the glass houses of a large florist in Toronto. (Rep. Exp. Farms, 1898, p. 169.)

The Black Violet Aphis (*Rhopalosiphum viola*, Perg.).—Another insect pest which has caused much damage to violets during the past year or so is the Black Violet Aphis, which made its first appearance in Canada about 1897. Up to the present time this insect is not widespread, and, as it has been treated very successfully in the United States with hydrocyanic acid gas, a substance which although dangerous to apply can be used quite satisfactorily by careful people, there is no reason why it should be the cause of frequent losses. The ordinary method of destroying insects in greenhouses by fumigation with tobacco may also be used, or even dusting the plants with powdered tobacco.

The Greenhouse Leaf-tyer (*Phylctania ferrugalis*, Hbn.).—A late addition to the injurious insects of Canada which, like the last named, has so far only appeared in a single establishment, is this small moth, the caterpillars of which feed upon the leaves of roses in greenhouses. The damage done by the caterpillars of this insect were very serious about three years ago, necessitating the entire cleaning out of a large house of choice roses. The only reference in American literature to injuries by this insect up to the present, which I have been able to find, is in Bulletin No. 102 of the Michigan Agricultural Experiment Station, where under the head of "The Celery Borer," the species is treated of as an out-door pest, the larvæ of which had been found boring into the stems of celery. In the Canadian greenhouses referred to above, the caterpillars are stated to feed and the moths to appear throughout the winter.

Fuller's Rose Beetle (*Aranigus Fulleri*, Horn).—At long intervals florists suffer from this beetle which in Canada and the Eastern States only increases and becomes a serious enemy under glass. (Rep. Exp. Farms, 1889, p. 88.)



Fig. 16. Fuller's Rose Beetle.

The Black Blister-beetle (*Epicauta Pennsylvanica*, De G.).—Garden flowers of various kinds, but particularly of China and German asters, as well as potatoes and leguminous plants and shrubs, are some-

times injured by this black Blister-beetle which like all the other *Cantharida*, has a habit of appearing suddenly in large numbers and attacking ravenously any plants they feed upon.

LIVE STOCK.

The Cattle Horn-fly (*Hematobia serrata*, Rob.-Desv.).—One of the most remarkable importations of an injurious insect into America was that of the Cattle Horn-fly, which first appeared in Canada in July, 1892. (Exp. Farm Bull. 11, 1892.) Since then it has spread rapidly through the whole of Canada and has been the cause of enormous loss to dairy farmers. Fortunately through the abundance of its parasitic enemies, this pest has been reduced to almost the same limits as the ordinary Cattle Fly, *Stomoxys calcitrans*, L. The simplest remedy is the treatment of stock at the time they are liable to attack, with a mixture of one pound of pine tar in ten pounds of lard.

STORED GRAIN.

The Mediterranean Flour Moth (*Ephestia kuehniella*, Zell.).—This terrible pest of the miller is an importation from the south of Europe, which first came prominently before the public in Canada on account of its injuries, in 1889. (Rep. Exp. Farms, p. 73.) Owing to their habit

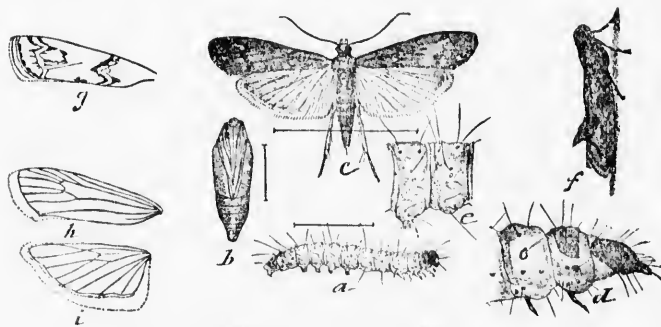


Fig. 17.—The Mediterranean Flour Moth—enlarged.

of attaching themselves by means of a silky web to any object upon which they rest, the caterpillars are easily and frequently carried from infested mills to other similar establishments, where they soon make their presence known by covering everything with silken webs, thus putting mil-

lers to great expense in cleaning their bolting reels, with which the flour is separated. Infested mills may be rendered free from their troublesome presence, only with great difficulty and at considerable expense. Fumigating with bisulphide of carbon is the method which has been most widely adopted. In Canada, throwing mills open to the intense cold of winter has also proved of great value in controlling this insect.

HOUSEHOLD PESTS.

The Carpet Beetle or "Buffalo Moth" (*Anthrenus scrophularia*, L.).—One of the most destructive and annoying enemies of the housekeeper is the Carpet Beetle, frequently miscalled the "Buffalo Moth."

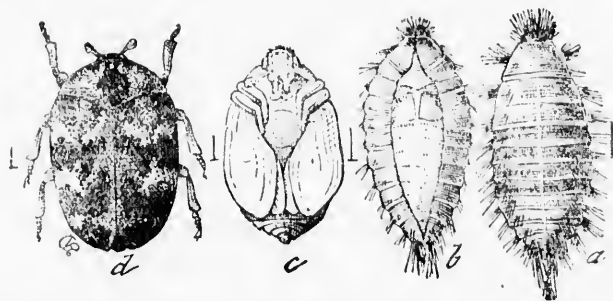


Fig. 18.—The Carpet Beetle: *a*, larva, dorsal view; *b*, do., ventral view; *c*, pupa; *d*, adult—all enlarged.

Although this insect has been well known to collectors of Canadian insects for many years it was not until 1895 that it was complained of in Canada as attacking household goods. The perfect beetles may be found on the blossoms of many shrubs, especially on the different kinds of Spiræas, in many parts of the Dominion, and although these beetles differ in no way from those found in Western Ontario it is only in the last named district that injury to carpets and other woollen fabrics has been reported. This is an extremely difficult insect to control. Spraying carpets with benzine or gasoline, ironing them with hot irons after previously wetting them, and constant sweeping out of rooms accompanied by a copious use, while the carpets are up, of scalding hot water which will penetrate between the cracks of the floors, are all that can be recommended in the way of remedies.

The Real Stink-bug (*Nomius pygmaeus*, Dej.).—There are several malodorons insects known, to many of which the name of "stink-bug" has been applied. Instances of these are the various true bugs

(*Hemiptera*), the scavenger beetles (*Staphylinidae*), the carrion beetles (*Silphidae*), and ground beetles (*Carabidae*), but I feel sure that no one who has been unfortunate enough to accidentally disturb or lay hold of a specimen of the small insect which is known to entomologists as *Nomius pygmaeus* will ever dispute its right to be called for all time the REAL Stink-bug. Fortunately, in most places this is an extremely rare insect; but on two or three occasions it has appeared in small numbers about dwelling houses and has been an intolerable affliction to the inhabitants, who were actually driven away until the plague ceased. This formidable disturber of man's comfort is a small modest-looking brown beetle no longer than one-quarter of an inch, but, when crushed or excited, as by being caught in a spider's web, can and does give out a most far-reaching and repulsive fetor which is besides of a very lasting nature, articles which have been in contact with the beetles retaining the characteristic odour for several weeks. Most of the complaints of the unpleasant presence of this beetle have been sent to me from Vancouver Island, B.C.

