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RASPBERRY GOUTY-GALL BEETLE.

—BY—

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THE RASPBERRY GOUTY-GALL BEETLE.

OR

RED NECKED AGRILUS.

(Agrilus ruficollis, Fabri.)

The larva or grub of this beetle is injurious to cultivated raspberries, blackberries, and dewberries, killing the canes by girdling the main stems and branches, checking the natural flow of sap, and forming thick, rough places called gouty-galls.

The beetle (Fig. 4., natural size, and Fig. 7., enlarged) has blue black wing covers and beautiful copper colored neck or thorax. They appear from June until August; but usually during and after the blossom falls from the raspberry, depositing their eggs on the young cane at first near the root, later, at different points on the main stem and branches. The eggs hatch into minute worms or larvæ, which, guided by a wonderful instinct, at once commence feeding on the sap just beneath the bark; proceeding spirally upward around the cane, as shown at Fig 1., causing it to die.

When the larva has attained a certain size, it enters the woody part of the cane to the pith, through which it proceeds upwards, frequently eating through the wood to feed on the sap, (as shown at d. and e.), which is evidently its natural food. When it has proceeded in this manner from 4 to 8 inches in the cane, it excavates a cavity, or pupa case, in the pith near the woody part, in which it passes the winter in the position as shown at f. In March, it sheds its skin, and changes into a form much shorter, and is found in the position as shown at Fig. 2. During April, it sheds its skin again, changing into the pupa state as shown at Figs. 3 and 6, remaining thus until late in May, when it changes to the perfect beetle, and soon emerges from the cane, as shown at Fig. 4.

The time in which the eggs are deposited probably extends from June to August, that being the habit of other species belonging to the same family. It is evident that eggs are deposited late in the summer, from the fact that occasionally young larvæ are yet found in the galls late in March and April, and late in May I have taken a few larvæ in the pith not having formed their pupa case. It is,

EXPLANATION OF PLATE.

Fig. 1. Raspberry cane infested by *Agrilus ruficollis*, showing at a, the young larva in mine; 2, cocoons of parasites; c, where larva enters wood to pith.; d and e, where larva comes out to feed on sap, and at f, the position of the larva during winter months.

Fig. 2. Larva after shedding skin in March.

Fig. 3. Pupa in April.

Fig. 4. Perfect insect emerged.

Fig. 5. Larva; Fig. 2. enlarged.

Fig. 6. Pupa; Fig. 4. enlarged.

Fig. 7. Beetle; Fig. 4. enlarged.

Fig. 8. Parasite larva (enlarged) from cocoons at b, and Fig. 1.

Fig. 9. Parasite (enlarged) bred from cocoon found in mine as shown at b, Fig. 1.

Lines at the right of the enlarged figures, and the small insect at right of Fig. 9. represent the natural size.

RASPBERRY GOUTY-GALL BEETLE.

(ORIGINAL.)

therefore probable, that some of the beetles emerge late in the summer. By far the larger portion of the larvæ, however, are found early in the winter in the position shown at fig. 1, the beetle emerging in June.

The infested canes may be easily detected by an uneven swelling 1 to 4 inches long found at different points on the main stem and branches; but usually near the ground. Careful search must be made for the infested canes, which should be cut out and burned before the period of flowering, thus preventing the beetles from emerging to deposit their eggs on the young canes. All wild blackberry and dewberry briars in the neighborhood of cultivated ones should also be cut out and burned before the beetles emerge, provided in both cases, the beetles have not been attacked by parasites.

PARASITES.

When a plant or special crop is produced in one locality for a succession of years, the insects feeding upon it become abundant from the increase supply of their natural food.

Every species of insect has one or more special parasites, or other natural enemies. These also increase from the same cause, reducing the destructive insects in proportion to their own prevalence. The original parasite, are in turn attacked by other secondary parasites and natural enemies, the injurious insect being allowed again to increase, which may be claimed to be a provision of nature to preserve an equal balance of animal and vegetable life. How to best protect and foster the natural enemies of injurious insects is therefore a problem of the greatest importance in entomological work. Often by gaining a thorough knowledge of an injurious insect and its natural enemies, we may with very little effort on our part so assist nature as to prevent it from becoming a pest.

True insect parasites are minute gnats or flies called Ichneumons Chalcids and Tachinæ flies. They deposit their eggs in and on the eggs and larvæ of other species; the eggs hatching into grubs or larvæ which live within their host, "feeding upon the fatty portion of its victim, which dies from exhaustion" after the parasite larvæ have matured and emerged from its body. The parasite larva either changes to a pupa within the body of its victim, or emerges and spins a cocoon from which the perfect insect emerges in due time.

The cocoons of two species of parasites were found in raspberry and blackberry canes where the larvæ of the *Agrilus* have perished.

On March 11th, cocoons like those represented in Fig. 1 at b were found plentiful in the galls of the Black Cap Raspberry, scarcely a living larva of the raspberry beetle being found, although the galls were quite plentiful. On April 7th, two parasites emerged from the cocoons. Sending cocoons, larva, and a specimen of the insect to the Division of Entomology at Washington, Mr. L. O. Howard, First Assistant Entomologist who has made a special study

of parasites, kindly replied to my letter of inquiry. (Insect Life Vol. 3. Page 20) saying that "the parasite which you have reared from the *Agrilus ruficollis* is a new species of the genus *Bracon*. It is in all probability a primary parasite, as the species of this genus are reared from Coleoptera larvae." These parasites emerge from the cocoon at the side, near the end. They continued to emerge from the cocoons until June 25th, when my supply gave out. The larva of this parasite taken from a cocoon is figured at 8, very much enlarged and the perfect insect at 9.

On May 13th, I discovered another parasite cocoon in the pupa case formed by the *Agrilus* larva. Quite a number of these were found later, all of them in the pupa case of *Agrilus*, in blackberry and dewberry briars. On June 25th, the perfect insect, or (imago) emerged from one of these cocoons; the others which are being kept in a bottle are yet (Oct. 24th), in the larva state within the cocoons, the natural time for them to emerge being probably late in the season after the *Agrilus* larvae have formed their pupa case. This was also determined by Mr. Howard as *Charitopus Magnus*.

Out of 109 infested and dead blackberry canes examined on May 20th, five were found to contain the cocoons of parasite No. 1, 15 to contain cocoons of No. 2; and 26 containing living larvae and pupa of *Agrilus*, as follows: 13 pupa as in Fig. 3; 1 larva in the condition as in Fig. 2; 9 larvae in the condition as at *f*. in Fig. 1; 1 larva feeding in the pith; 2 larva in the galls; 67 having perished either from the sting of parasites or some other cause.

I would therefore suggest that when pruning cultivated raspberries and blackberries that the infested cane should be thoroughly examined and if a majority of the beetle larvae have been destroyed by parasites or other causes that it would perhaps be best to not burn the infested cane; but leave them that the parasites may again emerge to attack the *Agrilus*. These canes containing parasites could also be introduced into patches or localities where the beetles are not infested by them, and thus be made to assist in destroying the pest.

In localities where berries are not cultivated and "borers" are a pest, it would be well perhaps to reverse the operation, protect the beetles and destroy the parasites.