NOTES ON OREGON COCCINELLIDÆ

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For almost two years the writer has taken field notes on the more common species of Coccinellidæ found in Oregon. Several experiments also have been made with them in the laboratory in order to test their fecundity, the stability of varieties, and the economic value of the different forms. From these field notes and laboratory records the following account has been prepared.

Relative Economic Importance of Different Species Found in Oregon

The most abundant and the most important species of Coccinellidæ found in Oregon is *Hippodamia convergens* Guérin. It is found everywhere in the lower altitudes of western Oregon in the spring and summer, and in the higher altitudes during the fall and winter. It is found in eastern Oregon, but may not have a general distribution there.

The next most abundant and most important species found here is *Hippodamia spuria* Leconte. During the month of September, 1912, I collected a hibernating mass of this species, found in company with *H. convergens* Guérin, from the top of Mt. Chintimini (about 4000 ft.). Out of 256 individuals obtained, 64 were *H. spuria* Leconte and 192 were *H. convergens* Guérin. This is about the average ratio of the two species as found during the summer time feeding in the valley. Next in abundance, but probably not in importance is *Coccinella novemnotata* Herbst. Then comes perhaps *Chilocorus bivulnerus* Muls. and *Cycloneda sanguinea* Linn. While these two latter species are not so abundant as *Coccinella novemnotata* Herbst., their activities are directed against more serious pests. *Psyllobora tædata* Leconte appears to be the most abundant species found among the foothills and mountains in the summer. It is not of special economic importance as yet as it seldom is found in the valleys on cultivated plants. *Smilia misella* Leconte is present in the Willamette Valley, and does good work against the San Jose Scale. *Adalia bipunctata* Linn., *Hippodamia parenthesis* Say, and *Coccinella transversoguttata* Fald. are present in considerable numbers, but never are of prime importance.

Migration and Hibernation Habits

Late in July or early in August many of our most common coccinellids run short of aphid food, and for a while will be found in great

numbers feeding upon the pollen of various plants. In searching for such food, there frequently is a tendency for large numbers to move in certain directions or to collect upon certain very much desired flowers. However, there does not appear to be any fixed migration accompanied by such gregarious habits as are found for example in the case of some of the species of blister beetles, Meloidæ.

By the middle of August (which here is the hottest and dryest part of the year) the coccinellids begin a definite migration. They, almost of one accord, quit the hot dry valleys and move upward, many of them never stopping until the highest point for miles around is attained. Thus, last September I found thousands of them on the very summit of Mt. Chintimini, the highest point in the Coast Range Mountains. Here in these higher altitudes the coccinellids move about and swarm many times. As soon as winter has set in they have settled in their permanent hibernating quarters. These consist of pockets under large stones, rubbish, or under leaves or logs. There is a strong tendency for the different species and varieties to segregate themselves in their winter quarters. Thus in many pockets of *Hippodamia convergens* Guérin will be found all or over 90 per cent of the typical form, *i. e.*, the form with thirteen spots on the elytra. Other pockets will contain individuals all or the most of which are spotless forms of *H. convergens* Guérin. I have found that there is sometimes a mixing of species in the hibernating quarters, thus frequently a few individuals of *H. spuria* Leconte will be found with *H. convergens* Guérin and vice versa.

The coccinellids pass the winter without food, and are, for long periods at least, perfectly quiescent. That some of our species can pass the winter hibernating at the lower levels I have proved by experments, the mortality, however, is very great unless they are kept in artificially cooled quarters.

Emergence of Adults in Spring

There is some variation among the different species in regard to the time of emergence in the spring. At Corvallis, a valley town 230 feet above sea level, I have the following records for the spring of 1913. The dates given represent the first recorded observation of an active individual out of doors:

Chilocorus bivulnerus Muls.....February 10.
Hippodamia convergens Guérin (spotless form).....April 11.
Adalia bipunctata Linn.....April 14.
Hippodamia convergens Guérin (typically marked).....April 16.
Hippodamia convergens Guérin (with some spots).....April 17.

Hippodamia spuria Leconte.....April 21.
Coccinella novemnotata Hbst.....April 21.
Coccinella transversoguttata Fald.....April 21.

By the time that most of these coccinellids reach the valleys, *i. e.*, by the middle of April, an abundance of aphid food is present. Our most common aphids hatch in early March, and by the middle of April most of these individuals are mature.

However, this supply of food is cut short by about the middle of May, due not only to the voracious appetites of the lately emerged coccinellids, but to other enemies also, the most important of which are syrphis fly larvæ and a lampyrid beetle, *Podabrus prinosus* Leconte.

Again the coccinellids must rely upon plants for most of their food. By the first of June, thousands of individuals will be found in vetch fields and among wild flowers along the road sides or in turning rows. Around Corvallis, nearly all of the common species go to the vetch fields. Here they feed upon a cell sap or nectar secreted by special glands, one of which is located on each stipule situated at the base of a compound leaf.

Miscellaneous Notes and Observations

There is a distinct preference shown by our most common coccinellids for certain species of *Aphididæ*. Among those most sought are: The Black Cherry Aphis (*Myzus cerasi* Fab.), Snow-ball Aphis (*Aphis viburni* Scopoli), Rosy Apple Aphis (*Aphis sorbi* Kalt.), and European Grain Aphis (*Aphis avenæ* Fab.).

On the other hand, such aphids as the Green Apple Aphis (*Aphis pomi* DeGeer) and the Woolly Apple Aphis (*Eriosoma lanigera* Haus.) are not relished with nearly as much zest as the former mentioned plant lice. In fact some of our common coccinellids will not live alone upon a diet of *Aphis pomi* DeGeer. This I have demonstrated in the laboratory.

Among the records of some of the rarer species of coccinellids, I have to report a single observation of *Anisocalvia duodecimmaculata* Gebl., a female, and of *Anisocalvia quatuordecimguttata* Linn., a male. These two were found in copulation, on leaves of vine maple, at Corvallis, May 2, 1913, by G. Moznette.

Before closing I will add a single synonymical note. I am of the opinion that the typically marked form of *Hippodamia convergens* Guérin and the spotless form should be regarded as distinct species, as they were once, for the following reasons:

1. I find the spotless form breeds true to type.
2. The two forms have a tendency to segregate themselves in their

hibernating quarters and during their breeding season early in the spring. Thus, out of a hibernating mass collected March 9, 1913, at Sulphur Springs, Benton Co., by F. D. Bailey, containing 367 individuals, 344 were typically marked while only two were spotless. Out of 552 individuals collected at Carlton, during March, 1913, 500 were typically marked; only 5 were spotless. Out of 33 individuals found under bands on seven year old cherry trees May 15, 1913, 30 were spotless, 1 was typically marked.

3. The fact that the two are found intergenerating should not affect their specific status, for frequently intergeneration takes place in nature between different species of Coccinellidæ.

NOTES ON THE NEGATIVE GEOTROPISM OF CORYTHUCA CILIATA SAY, ADALIA BIPUNCTATA LINN, COCCINELLA 9-NOTATA HBST AND MEGILLA FUSCILABRIS MULS.

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Corythuca ciliata Say: Upon placing hibernating specimens of this "lace bug" in a glass cage in a warm room, their re-actions to gravity were manifested in a rather curious way. When the temperature in the cage rose sufficiently, all became active and possessed of a desire to climb vertical surfaces. Small sticks placed vertically in the cage were soon covered with individuals going up and those unable to gain a foothold on the sticks, climbed upon the backs of others and made their ascent in this manner, until the sticks were covered with one seething mass of insects.

Those on the bottom of the jar re-acted somewhat differently. One individual meeting another, would climb upon its back and a third happening along would climb upon the back of the second and a fourth and fifth would do the same, until a regular tower of "lace bugs" was formed. As a rule, when the sixth attempted to climb up, the tower would sway, finally topple and all would come down. If the first happened to be resting at an angle on the edge of a piece of bark, the tower would extend out over the edge in an extremely perilous position and usually collapsed when the fourth attempted to climb out.

In most of the cases, the last one up, would fly off in the same manner that a "lady bird" walks upward on a twig, until the top is reached and then flies off, provided it finds no plant lice.

In the bottom of the cage were several pieces of bark and the insects always preferred walking on edges or ridges that pointed upward.

This negative geotropic response took place in the dark as well as in the light, provided the temperature was high enough. Rays of