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POPILIA JAPONICA NEWM., A RECENTLY INTRODUCED JAPANESE PEST.

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While inspecting a nursery in Southern New Jersey during the middle of August, 1916, the attention of the writers was attracted by a scarabæid feeding on the tips of *Cratægus*. Specimens were collected, and inasmuch as it was assumed to be a southern species, no particular attention was paid to it at that time. Recognizing, however, that it was new to New Jersey, specimens were recently sent to Mr. H. S. Barber and identified by him as *Popilia japonica* Newm. Mr. Barber stated that our specimens seemed to agree satisfactorily, even in the female genitalia, with the series of Japanese specimens in the collection of the United States National Museum. He also stated that this was the first record of the genus from America, and further that species in allied genera have caused considerable trouble in the Old World and when introduced into various of the Pacific Islands.

On July 31, soon after receiving this information, the nursery was visited and the beetles found to be present. They were especially abundant on weeds in one corner of the nursery, and to a lesser extent on adjoining nursery stock. On August 8, 1917, the nursery was again visited for the purpose of determining the exact status of the insect. At this time a considerable area was scouted and the following conditions observed. The beetles were found to be extremely abundant on weeds growing along one side of the nursery and extending at one point for a few feet into an adjoining orchard and along one side of the orchard away from the nursery and for a couple of hundred yards beyond. The infested area was small but the beetles numerous, and the line of spread appeared to have followed the weeds. At several places the insects were found on nursery stock, in most cases not far from the heavily infested weeds.

The feeding appears to be somewhat like that of the rose chafer and other scarabæids, but the destruction of the foliage is much more complete. Smartweed (*Polygonum virginianum*), tear-thumb (*Tiniaria arifolium*) both belonging to the *Polygonaceæ*, evening primrose (*Oenothera biennis*), Virginia creeper (*Ampelopsis quinquefolia*), a member of the *Vitaceæ*, were the principal food plants among the weeds, and in some cases the leaves of these plants were completely riddled. Other weeds infested to a less extent were ragweed (*Ambrosia* sp.), velvet leaf or Indian mallow

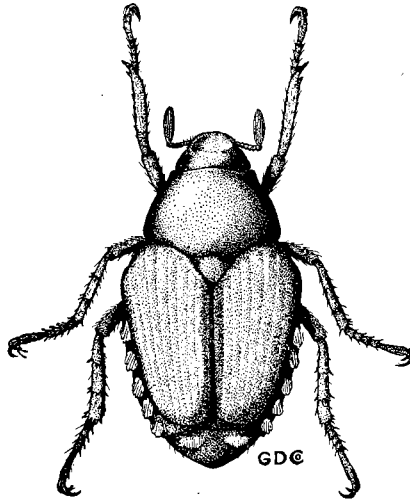


Fig. 9.—*Popillia japonica* Newm.

(*Abutilon avicennæ*), jewel weed (*Impatiens* sp.) and the blossoms of milkweed (*Asclepias syriaca*). In the nursery the beetles were found feeding on the foliage of *Ampelopsis quinquefolia*, flowering cherry, grape, elder, *Crataegus*, button bush, and in or on the flowers of double *Althea*, *Spiraea* and *Vitex agnus-castus*. They were especially abundant on the foliage of the first three plants, and sometimes four or five were found buried in the double *Althea* flowers. On the smartweed as many as a dozen were found on single leaves. It was interesting to note that in the nursery, the beetles had apparently passed over the flowers and foliage of hydrangia and the foliage of *Deutzia*, peony and some other

plants and infested Althea blossoms and *Ampelopsis* foliage further away. Alfalfa, corn, tomatoes, pears in adjoining fields and cowpeas and pole beans in the nursery were uninfested, although the beans were close to the infested weeds. Smartweed in the midst of the cowpeas and tomatoes was badly eaten. The insects were found occasionally resting on other plants such as *Tamarix africana* in the nursery and corn silk in the field, but no feeding could be detected.

When disturbed during the heat of the day, the beetles would partly fall and fly off in a clumsy manner with a slight buzzing sound. On the whole they were quite active. Late in the day they were less active and would fall to the ground when disturbed. A number were noted in the attitude of copulation, but very few were found in copulo.

Mr. C. H. Uchida was kind enough to translate accounts of this insect as given in two Japanese text books. The first one is that given by S. Matsumura in his "Japanese Insect Pests," part 2, p. 247. He states that the beetles do considerable damage to string beans, grapes and certain wild beans; that the adults emerge in June and remain until September; that they are attracted by lights and controlled by hand picking and spring and fall plowing. The other account is that given by A. Fukatani in "Practical Methods of Destroying Insects on Horticultural Plants," p. 325. Mr. Fukatani gives the following account: The species feeds on string beans, peas, grapes and peanuts, the larvæ being found in the soil on the roots. The eggs are milky white, elliptical and about one-sixteenth of an inch in length. The larva is a characteristic white grub about three-fourths of an inch long, milky white, with a yellowish brown head. The pupa is about one-half inch in length, yellowish, covered with short hairs. The larva winters in the soil and pupates in May or June, the beetles emerging in July. Eggs are deposited singly in the soil and the larvæ moult several times before winter, the complete life cycle requiring one year. He also states that control is effected by jarring the beetles off the plants into a dish of oil and water; by jarring them from trees to a cloth spread below; by spraying with Paris green, lime and water; Paris green and Bordeaux mixture and by the use of Vaporite

in the soil, also that the use of organic manure and especially compost should be avoided.

From these two accounts it is evident that *Popilia japonica* is regarded as a pest in Japan. It was probably introduced into New Jersey in the larval stage in the soil around iris roots imported from that country. Japanese iris roots were first planted in the nursery where the infestation occurred about six years ago, and there have been two or three plantings of similar stock since that time. Azaleas imported from Japan have also been planted in this block but not previous to two years ago. Judging from the number of beetles observed, the insects must have been present more than two years. That it was not noticed sooner is due to the fact that its feeding is largely confined to weeds as has been stated. Its rate of dispersal is apparently very slow, as at the present time its feeding in the nursery is confined largely to that part where it apparently originated, and in the weeds outside of the nursery along the road it has not extended more than a few hundred yards. The fact that its rate of dispersal is slow is fortunate since if it became widely distributed it might become a serious pest on plants of the family *Polygonaceæ* such as buckwheat, and of the family *Vitaceæ*, such as grapes and perhaps on plants of other families such as cherry, etc.

While the Japanese account states that this insect infests leguminous plants, it is interesting to note that these plants remained uninfested although other plants in their midst were badly eaten, as has been mentioned above. The infestation in New Jersey is under careful observation: infested weeds and nursery plants are being treated with arsenic supplemented by hand picking. In this connection, it is interesting to note that where *Ampelopsis* was sprayed with arsenate of lead, the plants were practically free from the beetles, although previous to the spraying they were badly infested. No dead beetles were observed on the ground under the sprayed plants, but after careful observation it was found that some of both sexes had burrowed several inches into the soil under the infested plants. These beetles were very sluggish and had apparently been affected by the poison.

The beetle can be recognized from the following brief description: It measures a little less than one-half inch in length

and is similar in shape to species of *Euphoria*. The body and legs are metallic, bronze green in colour, save for the elytra which are reddish brown with dark margins. The lateral margins of the abdomen bear single tufts of conspicuous yellowish white hairs on each segment and a pair of these tufts on the exposed dorsal surface of the last segment. Each tuft extends downward forming a transverse line on the ventral surface, which becomes obsolete in the central portion. The ventral surface of the thorax and the basal segments of the legs are conspicuously hairy.

NOTES ON COCCIDÆ (HEMIPTERA).

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It is the belief of the present author that more may now be accomplished by the redescription of many of our named species of Coccidæ than by the addition of new forms. Especially is it desirable that the types of many of the non-Diaspine genera be elucidated for the existing descriptions are, in certain cases, so inadequate that only the most vague and unsatisfying conception can be formed from them of the real character of the genera which they typify. Nor will the mere redescription of these forms in terms of the methods heretofore so generally employed by certain authors be sufficient. There must be an accompanying search for characters of real significance. Confidence in the all-sufficiency of the number of antennal segments and the character of the secretions as taxonomic criteria can no longer be maintained.

The present paper, therefore, is the first of a proposed series in which redescriptions of and notes upon the more interesting and more significant species available for study will be presented. Throughout these papers no references other than to the Fernald Catalogue and its supplements will be given, except in the case of some which may not be found therein.

Genus *CRYPTOKERMES* Hempel.

1903. Fernald, Catalogue of the Coccidæ, p. 88.

Monophleboid Coccidæ in which the adult female is entirely without legs or antennæ (and possibly without mouth-parts), remaining enclosed within the derm of the penultimate stage; penult-
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