THE EGGPLANT LACE-BUG IN PORTO RICO.

Corythaica monacha Stal.

By R. T. Cotton, Assistant Entomologist, Insular Experiment Station.

The growing of the eggplant *Solanum melongena,* is made difficult by the ravages of a great many insect pests, the worst of which is undoubtedly the lace-bug *Corythaica monacha* Stal. This bug is widespread over the Island and attacks the eggplant wherever it is grown, causing heavy damage when not controlled by spraying. It feeds normally on the so called wild eggplant, *Solanum torvum,* and it is on this plant that it is able to survive during the intervals between crops. *Solanum torvum* is one of the most abundant of weeds on the Island, growing luxuriantly in all parts and at all times, and it is undoubtedly owing to this fact that the lace-bug is so abundant. If it were dependent solely on the cultivated eggplant for its food supply it would soon die out, but as the eggplant is seldom grown at all times of the year even in the most favorable localities.

The injury to the plant is occasioned by the feeding of the nymphs and adults, which congregating in hundreds on the undersides of the leaves, suck the vital juices from the plant. Their presence on the leaves is first indicated by the appearance of small yellowish-brown patches, which growing in size soon involve the entire leaf causing it to dry up and fall off. It is not an uncommon sight to see a whole patch of eggplant entirely denuded of its leaves. The insect has a very short life cycle and multiplies so rapidly that once introduced into a field it soon spreads to every plant.

Life-History.

This insect breeds continously through the year. The mature female lays a large number of small, flask-shaped eggs, which she inserts into the tissue of the leaves, until only a little more than the crater-like tops protrude through the epidermis. The eggs are placed singly on the undersurfaces of the leaves and are scattered over the entire area. The length of the egg stage varies from five to seven days with the majority hatching in six days. The following table is an extract from breeding notes taken at various times of the year:

Table 1.—Length of Egg-Stage of Lace-Bug.

No.	Eggs laid	Eggs hatched	Incub. period	No.	Eggs laid	Eggs hatched	Incub. period
			Days				Days
1	July 5.....	July 11.....	6	7	Dec. 2.....	Dec. 8.....	6
2	July 10.....	July 15.....	5	8	Dec. 4.....	Dec. 11.....	7
3	July 20.....	July 26.....	6	9	Dec. 10.....	Dec. 16.....	6
4	Aug. 4.....	Aug. 10.....	6	10	Jan. 3.....	Jan. 9.....	6
5	Aug. 16.....	Aug. 22.....	6	11	Jan. 7.....	Jan. 14.....	7
6	Sept. 2.....	Sept. 7.....	5	12	Jan. 8.....	Jan. 14.....	6

The young nymphs are quite active at first but soon settle down to a quiet existence, feeding together in large colonies on the undersides of the leaves. Occasionally a few may be seen feeding on the upper surface of the leaves and when feeding on the weed *Solanum torvum* they feed as much on the upper as on the lower surface of the leaves. The nymphs develop quite rapidly, passing through five successive moults before attaining adult form. The period between moults is remarkably constant being in practically all cases of two days duration. The following table is a record of the moulting periods of some of the individuals reared in the laboratory:

Table 2.—The Moulting Stage of Nymphs of Lace-Bug.

No.	Date hatched	First moult	Second moult	Third moult	Fourth moult	Fifth moult	Adult
1	July 23.....	July 25.....	July 27.....	July 28.....	July 30.....	Aug. 1.....	.....
2	July 23.....	July 25.....	July 28.....	July 30.....	Aug. 1.....	Aug. 3.....	.....
3	July 23.....	July 25.....	July 27.....	July 29.....	July 31.....	Aug. 2.....	.....
4	Aug. 2.....	Aug. 4.....	Aug. 6.....	Aug. 8.....	Aug. 9.....	Aug. 11.....	.....
5	Aug. 2.....	Aug. 4.....	Aug. 5.....	Aug. 7.....	Aug. 9.....	Aug. 11.....	.....
6	Aug. 5.....	Aug. 7.....	Aug. 9.....	Aug. 11.....	Aug. 13.....	Aug. 15.....	.....
7	Oct. 4.....	Oct. 5.....	Oct. 7.....	Oct. 9.....	Oct. 11.....	Oct. 13.....	.....
8	Oct. 4.....	Oct. 6.....	Oct. 8.....	Oct. 10.....	Oct. 12.....	Oct. 14.....	.....

The time taken from the hatching of the nymph to the appearance of the adult is thus only ten days, an extremely short time, and as the females are quite prolific in their egglaying, the increase in numbers of the insect is very rapid.

Description of Stages.

The Egg.—Length .48 mm., width .22 mm., flask-shaped with the neck bent to one side. Top of egg crater-like, having a ragged border and a circular impressed area that is cross-hatched with delicate markings. This circular top is .13 mm. in diameter and acts as a lid that is pushed aside when the young nymph hatches. Egg white in color, translucent; surface smooth and shiny.

NYMPHAL STAGES.

First Stage.—Length .65 mm., width .36 mm.; body slender, general color pale yellowish dorsally, fading to white on the ventral surface. Eyes red, antennae short, and club-like at the tip.

Second Stage.—Length 1.09 mm., width .52 mm.; body oblong-ovate, general color a pale yellowish white; margins of abdomen and thorax and dorsal surface of head, thorax and abdomen armed with spiny tubercules, tubercules on dorsal surface dusky; tips of antennae and tarsi a light brown.

Third Stage.—Length 1.53 mm., width .8 mm.; similar in form to previous stage only larger, and has rudimentary wingpads; dorsal spines darker in color and regions round them dusky, forming a distinct color pattern.

Fourth Stage.—Length 1.75 mm., width 1 mm.; similar in form to previous stage only larger, body markings darker; wingpads much longer, their tips dusky-brown.

Fifth Stage.—Length 2.3 mm., width 1.2 mm.; body oblong-ovate, dorsal surface more or less flattened; general color a yellowish-grey, with a few dark brown markings. Last six segments of the abdomen provided on each side with a marginal tubercule armed with one long and several shorter spines, the abdomen apparently terminating in two of these spiny processes; first two pairs of marginal abdominal tubercules a dusky-brown. The *metanotum* provided with two large, dark-colored tubercules armed with spines, the abdomen provided with three median, dorsal tubercules similar to those on the *metanotum*; wingpads each armed with a marginal tubercule and several marginal spines. Head armed with three tubercules and two anterior marginal spines; head light in color except posterior margin which is dusky; pronotum light in color with two dusky bars near the anterior end arranged in the form of a V. *Metanotum* dark, abdomen light in color with dusky segmentation marks and dark-colored tubercules. Wingpads light colored with a dark spot on the disk, and with dusky tips. Antennae about one-third the length of body, clothed with a few short hairs, the tip somewhat club-shaped and dusky-brown in color. Legs fairly long and slender, terminating in chitinized claws, general color light except tarsi which are dark brown.

Adult.—This lace-bug is a delicate lace-like little insect belonging to the heteropterous family *Tingitidae*. It is one of the very few representatives of this interesting family that inhabit the Island of Porto Rico. It is about 3.5 mm. long, body dark, hood and lace-like wings grey marked with brown.

Natural Enemies.

Several predaceous insects feed on the soft-bodied nymphs of this lace-bug, among which are the Coccinelid beetles *Megilla innonata* Vauls. and *Cycloneda sanguinea* Linn., and the *Reduviid* bugs *Zelus rubidus* Lap. and Serv. and *Z. longpipes* Linn.

Control.

This insect may be effectively controlled by a soap-and-water spray, eight pounds of soap to fifty gallons of water being a good strength to use. The plants should be sprayed as soon after the appearance of the lace-bugs as possible, since it is much easier to control them then than later.

LIFE HISTORY OF HALTICA JAMAICENSIS FABR.

By R. T. Cotton, Assistant Entomologist, Insular Experiment Station.

In 1792 Fabricius described this beetle under the name of *Galleruca jamaicensis,* but a year later becoming uncertain of his species he changed the name to *G. bassiae.* In 1808 Olivier gave the name of *G. plebja* to this species, and Sturn in 1843 gave it the name of *Graptodera tarsata.* In 1875 Harold recognized *jamaicensis* as the correct name calling it *Haltica jamaicensis* Fab. and relegating the other names to synonymy.

It is recorded as occuring in Jamaica, Santo Domingo, Haiti, Porto Rico, Costa Rica, and Cuba. It apparently varies quite a little in color in different localities, but there is doubtless but one species concerned.

This beetle is the largest of the flea-beetles found in Porto Rico and at times is extremely abundant. Confining its attention chiefly to one of the common weeds, *Jussiaea leptocarpa* and two closely allied plants *J. suffruticosa* and *J. erecta,* it occasionally feeds on garden beans and conceivably might do great damage if for any reason its ordinary food supply should give out.

Both adult and larva feed very voraciously on the foliage of the *Jussiaea* plants, usually entirely stripping the plants in their immediate vicinity.

Life History.

The eggs are laid in batches of from one to thirty, sometimes side by side in a regular row, sometimes massed together one on top of the other. They are a pale buff yellow color, oblong-oval in shape

and are placed on the leaves and stems of the plant. Although sometimes concealed in folds of the buds and flower-heads they are more often in plain view, placed on the upper surface of the leaves. The adult females are very productive, one female in captivity producing eight hundred and eighty-seven eggs during a period of sixty-eight days. The average, taken from the laying record of thirty females, was five hundred and twenty eggs.

The eggs hatch in from four to six days, and the young larvae that emerge begin at once to feed upon the foliage. Growing rapidly the larva moults at the end of five days and again three days later. Growth continues rapidly for a few days, then becomes slower and slower until no further increase in size is perceptible, yet it is not until fifteen days later after the second moult that the larva descends to the soil to pupate. Five days are spent in a prepupal state and six more in the true pupal state before the adult beetle actually emerges, thus making a total of thirty-nine days from egg to adult.

Technical Description of Stages.

Adult.—A large steely blue beetle. Original description by Fabricious.

Oblonga cyanea antennis pedibusque nigris affinis C. alni at alia et minor, thorax et elytra cyanea, nitida, immaculata, abdomen obscurum. Pedis niger.

Egg.—The egg is pale yellow in color, oblong-oval in shape, and provided with an exterior covering that is usually broken in places, showing the inner shell. This exterior covering is finally reticulated and dull in appearance. The inner covering is slightly shining and is sculptured with hexagonal-shaped markings. Length 1.2–1.3 mm. Width .45–.5 mm.

Larva.—Robust, tapering gradually from the fourth abdominal segment both cepheled and caudad; general color yellowish-brown, with numerous black tubercules on each segment; head black, thoracic and anal plates black and strongly chitinized; legs black, head and body well supplied with numerous spine-like hairs. Length 14 mm., greatest width 3 mm.

The immature stages of the larva are smaller, and the tubercules closer together, giving the first-stage larva the appearance of being almost black.

Bibliography.

1792. Fabricius, J. C.—Entomologia Systematica Emendata et Aucta secundum, classes, ordines, genera, species, adjectis, synonimis, locis, observationibus, descriptionibus. Tom. 1, 2, p. 16.

1796. ——— ———.—Index alphabeticus in Entomologium, systematicam emendatum et auctaum, ordines, genera et species continem. P. 69.

1801. ——— ———.—Systema Eleutheratorum secundum ordines genera, species, adjectis, synonymis, locis, observationibus, descriptionibus. Kilac, Biblopol, acad. 1, p. 484.

1808. OLIVIER.—Entomologie ou historie naturelle des insectes, avec leurs caracteres generiques et specifiques, leurs description; leurs synonymie et leur figure enluminée Coleopteres, Paris, Baudenin VI, p. 626, t. 2. f. 27.

1843. STURM.—Catalog seines Kafer, Saunlong Nurnb. p. 281.

1868. SUFFRAIN, E.—Verzeichniss der von Dr. Canalach auf del Insel Cuba gesamelton chrysomelinen. Wiegm. Arch. 1, p. 196.

1875. HEROLD, E. V.—Ueber einige amencanische Haltica—(graptodera)—Arten, p. 66–67.

1880–1892. JACOBY, M.—Biologia Centrali Americana, Coleop. VI, part 1, p. 295.

SCALE-FEEDING HABITS OF A PORTO RICAN MILIPEDE.

Rhinocricus arboreus (Saussure).

By R. T. COTTON, Assistant Entomologist, Insular Experiment Station.

While investigating the feeding-habits of some of the common millipedes of the Island, to ascertain whether or not they were injurious to truck crops, I was surprised to find that one of the species had the very interesting habit of feeding on the purple scale of citrus, *Lepidosaphes beckii*.

This millipede is a large, dark reddish-brown form about 80 mm. long. Dr. R. V. Chamberlin of the Museum of Comparative Zoology, Cambridge, Mass., has very kindly identified it for me as *Rhinocricus arboreus* (*Saussure*) and says that it is known from several other West Indian Islands, St. Thomas, St. Croix, Antigua, etc.

It was while walking through a citrus grove at Río Piedras, P. R., that my attention was attracted by seeing several specimens of this millipede, among the branches of the grape-fruit tree that was heavily infested with the purple scale. Pausing to watch them for a few minutes, I noticed that they were feeding voraciously on the scale, and smooth, clean patches on the scale-infested branches indicated where they had been at work. Transferring them to the laboratory I placed them on grape-fruit twigs that were completely covered with

scales, and in a very short time the twigs were cleaned off. Some idea of the voracity of this millipede may be gained from the fact that one specimen, by actual count, consumed two thousand scales in a period of three hours, and after a short rest continued feeding.

This species of millipede is quite abundant in this locality, and in order to satisfy my curiosity as to whether or not I could entirely clear a tree of scales by them, I captured a number of them and placed about a dozen, in each of several small grape-fruit trees that were badly infested with the purple scale. They seemed perfectly contended with their new surroundings and commenced at once to feed on the scales. At the end of two weeks the trees were perfectly clean and free from scales and the bark took on a fresh green color. At this time most of the millipedes left the trees in search of more food although one or two remained and are still in the trees, four or five months after they were introduced. Singularly enough these trees are still perfectly clean although they have had no other treatment, while other trees in the block that were sprayed with an oil emulsion, but did not have any millipedes, are again very heavily infested with scale. Although they are never likely to be of any great importance in controlling scale insects in the grove, it is interesting to note this habit of a supposedly vegetable feeding myriapod.

Although preferring the purple scale, this millipede will feed on other scales, as I have found by experiment with specimens in the laboratory. I have not observed them in the field feeding on any but the purple scale. I do not wish to leave the impression from these notes that the millipede in question feeds entirely on scales, because it does not, the scales being but a part of its diet.

In dissecting out the alimentary canals of some specimens of this millipede, I was interested to find that they were all very heavily infested with worms, which according to Dr. B. H. Ransom, "represent four different species of nematodes, none of which appear to have been described. The largest and most numerous form agree very well with the genus *Isakis* Lespés, 1856, the type species of which occurs in termites." The other three species have not as yet been placed generically.