The
Florida Entomologist

Official Organ of the Florida Entomological Society

Vol. X AUTUMN NUMBER No. 3
SEPTEMBER, 1926

NOTES ON THE BIOLOGY AND IMMATURE STAGES OF GONOMYIA (LEIPONEURA) PLEURALIS (WILL.)—TIPULIDAE, DIPTERA

J. Speed Rogers
Dept. of Biology, University of Florida

Gonomyia (Leiponeura) pleuralis (Will.) is one of the several Neotropical Leiponeura that ranges well into the southern part of the United States. Originally described from St. Vincent,

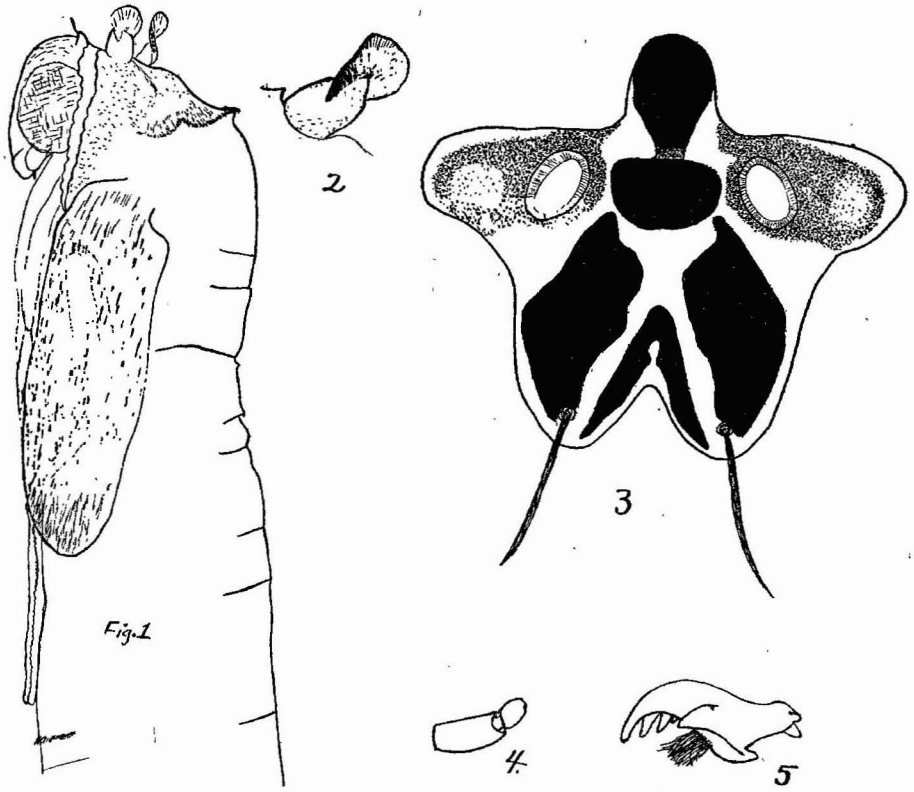

Fig. 1.—Immature stages of Gonomyia (L.) pleuralis

it is now known from Georgia and Florida as well as from Cuba, Porto Rico, Bermuda, British Guiana and Colombia.

In Florida the species is found thruout the state and is often the most abundant cranefly of the swamp margin and low hammock associations. Altho taken occasionally thruout the year, it is common in March and April and often abundant in November.

On November 7 and 8, 1925, these flies were found to be extremely abundant in a low level "hammock" of sweetgum, water oak, live oak, and iron wood near the west end of Payne's "Prairie", an extensive open marsh, near Gainesville. On these dates the floor of the hammock was quite dry, altho for most of the year the soil is damp or wet. Altho adults were to be taken with every sweep of the net from the low undergrowth and grasses, no teneral individuals were to be found. Other adult craneflies found in the same situation were: *Rhamphidia flavipes,* frequent; *Rhpipidia domestica,* few; *Pseudolimnophila luteipennis,* common; *Toxorhina magna,* few; *Erioptera parva,* few; *Gonomyia puer,* few. On the same dates another and much wetter situation was visited, a low hammock lying between Levy Lake and a series of small ponds and sedge-marshes. This low hammock approached swamp conditions, the principal trees being: red bay, magnolia, sweet gum, laurel oak, water oak, ironwood and ash, and the soil ranged from moist to saturated. Here *Gonomyia pleuralis* was very abundant again and teneral individuals were not uncommon. Towards the margins of an area of marsh teneral specimens were increasingly common and on a wide zone of bare, black muck soil bordering the water of the marsh, scores of flies were seen emerging. The zone of black muck is beneath the water of the marsh during a part of the year; its surface has a scant film of algae and the surface soil is full of spagnum stems, rootlets and other decaying vegetation.

Pupae and larvae of three sizes were obtained by washing the surface layer of black soil thru a sieve. The pupae and fully grown larvae were very common. Other cranefly larvae or pupae present, tho in much smaller numbers, were: *Pseudolimnophila luteipennis* and *Pilaria recondita.*

Exanimation of the contents of the alimentary canal of a number of larvae showed that the food was almost entirely a filamentous alga. The proventriculus and ventriculus were completely filled with pellets of matted filaments among which

were a number of diatoms of several genera. Digestion of the alga is apparently very nearly complete, only a few empty cells could be found in the intestine. The alimentary canal had very little sand in it, which would indicate that the alga strands are fed upon directly and not ingested with samples of soil.

Larvae placed in a dish with water from the pond, crept about over the bottom of the pan, protruding and opening the mouth parts with each extension of the body. One of these creeping larvae was observed to ingest a filament of alga several times longer than its head capsule. The end of the filament was grasped by one mandible, during one of the rythmic mouth movements as the larva progressed, and was pulled into the mouth, both mandibles pulling the filament in as they closed. With the retraction of the head capsule the end of the filament was pulled into the thoracic region and when the head capsule was again thrust forward the mandibles took another hold much farther along the filament. Ingestion was completed both by movements of the mouth parts and by the movement of the entire head capsule.

Larvae left for three days in the pan of water appeared perfectly normal at the end of this time and when transferred to rearing cages completed their development as rapidly and normally as larvae placed directly into rearing cages. Larvae for rearing were placed in soil from the habitat after it had been sterilized and remoistened to about the same wetness as that of the habitat. Larvae placed in sterilized earth, that had been but slightly dampened, soon died. Pupae were able to complete their development and emerge under distinctly drier conditions than were the larvae, but neither larvae nor pupae were able to survive soil as dry as that found near the surface of the hammock at the end of Payne's Prairie.

DESCRIPTIONS OF IMMATURE STAGES

The Larva (full grown)

Form, terete and elongate. Average measurements of ten larva: length, 9 mm.; diameter of 3rd abdominal segment, 1 mm.; diameter of spiracular disk, 0.8 mm. Body diameter uniform between 2nd thoracic and 8th abdominal segments. The color, in life, varies in different individuals from tawny olive to cinnamon buff. Color uniform except for a slight deepening on the thoracic segments and the markings of the spiracular disk. The integument is thin and transparent with a microscopic, very fine, brownish pubescence.

The spiracular disk (Fig. 3) resembles that of *Gonomyia (L) alexanderi* (Johns.) in general appearance (1), but differs enough in details

to easily distinguish it from that species. The plane of the disk is slightly oblique, the dorsal margin, anterior to the ventral. Of the five lobes, the ventral pair are greatest in both length and breadth and each bears, near the tip of its caudal face, a long, slightly curved bristle, directed caudad; the lateral lobes are distinctly nearer to the dorso-median lobe than to the ventral lobes and are intermediate in size; the dorso-median lobe is markedly the smallest. The faces of all of the lobes bear conspicuous markings. Each ventral lobe has two jet black stripes; the outer stripe is the broader and extends from the apex of the lobe to the level of the spiracles, the inner stripe is much narrower and fuses with that of the other lobe just above the bases of the lobes. A broken stripe, a little wider than the diameter of the spiracles, extends horizontally across the disk between the tips of the lateral lobes. The median portion of this stripe is jet black and lies between the spiracles; the outer portions extend from the tip of a lateral lobe to the inner end of the spiracle, narrowly enclosing the spiracle. The outer portions of the stripe are less intensely colored than the median. The face of the dorso-median lobe is almost entirely covered with a jet black mark whose narrow base almost reaches to the median portion of the horizontal stripe. The broadly elliptical spiracles are separated by about twice their long diameter. In life the spiracles are light yellow in color except for a very narrow, chitinized ring of black. Anal gills are small and consist of four blunt, curved lobes borne from a common base.

The head capsule is close to that of *G. (L) alexanderi* but differs in several distinct details. The dorsal bars are long, slender and their posterior ends are unexpanded. The lateral bars are slightly longer, their posterior ends expanded into very thin, vertical, spatula-like blades; the ventral bars are longest, flattened, narrow, blade-like. Anteriorly the dorsal and lateral rods of either side are connected by a very thin, chitinous, dorsal plate, that is incised posteriorly into a rounded median and two curved, lateral lobes. The labrum-epipharynx is narrow and elongate, tapering toward the apex which curves ventral and extends as far cephalad as the tips of the maxillae. It bears on its ventral surface, toward the apex, an extensive mat of long hairs. The mandibles (Fig. 5) are curved ventro-mesad to a slender apical point. The ventral margin bears four conical teeth, the first about as large as the apical point, the 2nd, 3rd, and 4th progressively smaller. On the inner face of each mandible, near its base is a tuft of long pale hairs. The maxillae are pale, cylindrical, very little chitinized. They extend cephalad well past the tips of the mandibles and their tips protrude distinctly beyond the prothoracic margin when the head-capsule is drawn in. The hypopharyngeal region shows little structure except a mat of short hairs. The antennae (Fig. 4) have the basal segment cylindrical, twice as long as broad; the second joint is a small oval, borne on a short, slender pedicel. The whole antenna is but sparsely hairy.

The younger larvae differ only in their smaller size and in a less intense coloration on the spiracular disk, altho the characteristic pattern is evident. These younger larvae fell into two well marked size groups, the larger with a length of 6 mm.

and a diameter of 0.75; the smaller with a length of 4.5 mm. and a diameter of 0.5 mm.

The Pupa (Fig. 1)

Length, 5.5-6 mm.; breadth (dextro-sinistral) at base of wing pad 0.8-1 mm.; depth (dorso-ventral) at base of wing pads 0.9-1.1 mm. Length of pronotal breathing horn 0.25 mm. Color (in life) an ochraceous buff with the dorsum of the thorax more brownish and the eyes dark cherry red; in older pupae the eyes become black and the dorsum of the thorax, the wing pads, and the tarsal sheaths become dark brown. The cephalic crest is marked by two small tubercles, narrowly separated by the mid-dorsal line; each tubercle bears a stout seta, curved slightly cephalo-ventrad. Antennal sheaths extend to slightly below the base of the wing pads, and are marked by a series of slight but distinct angulations. Pronotal breathing horns (Fig. 2) consist of short cylindrical bases that bear, from somewhat spiral lines of insertion, thin, fan-shaped, erect membranes formed of single rows of slender tubes. The abrupt angle of the mesonotum is marked by a narrow, sinuous, transverse crest that bears a line of short, stiff, curved hairs. The mesonotal crest marks an abrupt change in the amount of chitinization of the dorsum, the region between the mesonotal and cephalic crests having the heaviset chitinization of the body. The remainder of the thoracic dorsum is smooth and thinly chitinized. The wing pads extend to the posterior margin of the second abdominal segment; the tarsal sheaths extend to the anterior third of the fourth segment; their tips are nearly level, the outer pair slightly longer. The abodmen is lightly chitinized and shows little armature. The fourth to eighth sternites bear a row of thin, stiff, pale hairs, just before their caudal margins. The lateral and caudal margins of both sternites and tergites have a sparse fringe of scattered, appressed hairs. All five lobes from the larval spiracular disk are evident on the eighth tergite; these are more distinct in male pupae.

The duration of the pupal stage is from 5 to 6 days. Of eight pupae placed in sterile earth on November 10th, the eighth adult emerged on the morning of November 14 and from larvae placed in another jar of sterile earth, the first adult appeared on the morning of November 16. In another jar, containing unsterilized earth brought from the habitat, adults emerged at irregular intervals thruout November and December, the great majority appearing between November 12 and 25.

Notes on the relative abundance of adults, made thru four years of collecting in Florida, indicate that there are two generations a year, the adults usually appearing in November and in March or April. This seasonal appearance, however, is much less clear cut than that of crane-flies in the northern United

States. The apparent, tho untested, explanation for the lack of clear cut periods of adult abundance, that is characteristic of most Florida craneflies, lies in the absence of marked yearly seasons, and altho favorable conditions are more restricted at certain times, individuals that mature early or late are frequently able to reproduce a generation that will emerge out of season.

Collecting at times of greatest number of adults indicates that *Gonomyia pleuralis* travel considerable distances away from the place of emergence. This ranging is much more marked in damp weather when adults may be swept from vegetation from 300 to 500 yards from the nearest possible larval habitat. At night the adults range for even greater distances and apparently they are mainly nocturnal in habit. Oviposition occurs at night, copulating pairs occasionally come to light several hours after dark and females have been taken feeding on flowers (mango) from 8:30 P. M. until 12:30 A. M.

(1). Alexander, C. P. Craneflies of New York, Part II, Memoir 36, Cornell Univ. Agr. Exp. Sta., June 1920.

Fig. 1.—Pupa.
Fig. 2.—Pronotal Breathing Horn.
Fig. 3.—Spiracular Disk of Larva.
Fig. 4.—Antenna of Larva.
Fig. 5.—Mandible, dorsal view.

PERSONALS

Prof. John Gray is spending the summer in New York and Chicago.

Prof. T. H. Hubbell is enjoying himself immensely this summer studying and collecting the Orthoptera of Oklahoma.

Mr. T. E. Holloway, of the U. S. Entomological Laboratory in New Orleans, spent some time in Florida during June in connection with attempts to establish a Tachinid parasite of the cane borer which is being imported from Cuba. The Experiment Station is also attempting to establish these parasites in Florida in cooperation with County Agent Leo Wilson of Manatee County.

Mr. Saffro of the California Cyanide Company spent a few days in Florida. His company has inaugurated some fumigation experiments here. Mr. Roseling is in charge of these experiments.

Mr. Homer Bratley, the Secretary of our Society and Laboratory Assistant in Entomology in the Experiment Station, is asking for a year's leave-of-absence. He will take up graduate work in entomology in Cornell University.

The

FLORIDA ENTOMOLOGIST

Official Organ of The Florida Entomological Society, Gainesville, Florida.

J. R. WATSON ..... *Editor*
WILMON NEWELL ..... *Associate Editor*
A. N. TISSOT ..... *Business Manager*

Issued once every three months. Free to all members of the Society.

Subscription price to non-members is $1.00 per year in advance; 35 cents per copy.

CITRUS INSECTS OF THE SUMMER

The summer of 1926 has been a very unusual one in respect to the prevalence of rust mites *(Phyllocoptes oleivorus* Ashmead). It is very unusual for these mites to cause any trouble after early July unless there occurs a considerable period during which the usual summer rains fail. But this year, altho the rainfall in most sections has been about normal, the entomogenous fungus that normally controls rust mites during the rainy season has failed to do so. Growers have had to spray or dust their trees more or less thruout July and August.

The early summer brood of whiteflies was also the heaviest for several years. The entomogeneous fungi, both the Brown Fungus and the Red Aschersonia are becoming very abundant in groves and may reduce the numbers of the fall brood to the small numbers which have prevailed during the past few years. It will be well, however, to be particularly careful to apply a thoro clean-up spray this fall. In this connection we may call attention to the undesirability of spraying early fruit with an oil emulsion. Evidence has been accumulating for many years that the oil emulsions delay the ripening of fruit, but the most significant evidence is that presented by Mr. W. W. Yothers during Farmers' Week at the University. Tho based on only a single season's work the results seem, in agreement with previous experience, quite conclusive. Unless absolutely necessary Parson Brown orange trees and other early citrus fruit trees should not be sprayed with an oil emulsion until after the fruit is picked.

The Department of Entomology has recently received from Prof. Harry S. Smith of the California Citrus Experiment Station at Riverside a shipment of an oriental parasite *(Comperiella bifasciata)* of the Florida Red Scale. The shipment arrived in fine condition and the parasites were liberated on a scale-infested tree at Lake Alfred. If this parasite can be established in Florida it should be of much value as the Florida Red Scale is a difficult one to control by spraying. The hymenopteron is apparently a parasite of all species of *Chrysomphalus.*

A LIFE HISTORY STUDY OF IMPORTANT LADY-BEETLE PREDATORS OF THE CITRUS APHID

W. L. THOMPSON *

In connection with the Citrus Aphid Investigations a study of the life history of the different predators is being made. Among the most common of the predators are the lady-beetles. The

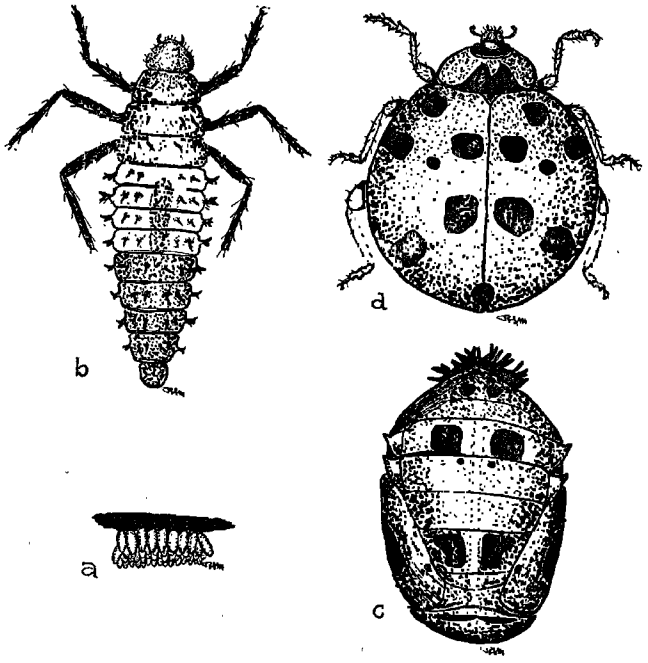

Fig. 2.—The Chinese Lady-beetle: a, eggs; b, larva; c, pupa; d, adult. From Bull. 183, Fla. Agri. Expt. Station.)

Blood Red *(Cycloneda sanguinea immaculata* Fab.), *Hippodamia convergens* Guer., *Olla abdominalis* and *Scymnus bineratus* are the four most common lady-beetles feeding on the Cit-

*Contribution from Florida State Plant Board and Agri. Experiment Station cooperating.

The Department of Entomology has recently received from Prof. Harry S. Smith of the California Citrus Experiment Station at Riverside a shipment of an oriental parasite *(Comperiella bifasciata)* of the Florida Red Scale. The shipment arrived in fine condition and the parasites were liberated on a scale-infested tree at Lake Alfred. If this parasite can be established in Florida it should be of much value as the Florida Red Scale is a difficult one to control by spraying. The hymenopteron is apparently a parasite of all species of *Chrysomphalus.*

A LIFE HISTORY STUDY OF IMPORTANT LADY-BEETLE PREDATORS OF THE CITRUS APHID

W. L. THOMPSON *

In connection with the Citrus Aphid Investigations a study of the life history of the different predators is being made. Among the most common of the predators are the lady-beetles. The

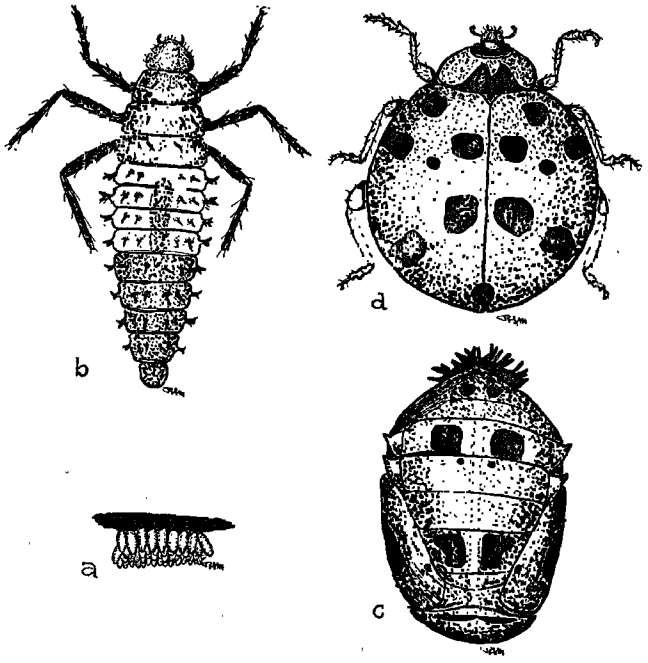

Fig. 2.—The Chinese Lady-beetle: a, eggs; b, larva; c, pupa; d, adult. From Bull. 183, Fla. Agri. Expt. Station.)

Blood Red *(Cycloneda sanguinea immaculata* Fab.), *Hippodamia convergens* Guer., *Olla abdominalis* and *Scymnus bineratus* are the four most common lady-beetles feeding on the Cit-

*Contribution from Florida State Plant Board and Agri. Experiment Station cooperating.

rus Aphid. Other species of lady-beetles have been found feeding on the Citrus Aphids as *Exochomus marginipennis childreni,* Twice-stabbed *(Chilocorus bivulnerus* Muls.), Vedalia *(Rodolia cardinalis* Muls.) and several of the smaller species of *Scymnus.*

In May 1925 the Experiment Station received a few Chinese Lady-beetles *(Leis* sp.) from Professor Harry Smith of the California Experiment Station, Riverside, California. It is hoped that these beetles will aid in the control of the Citrus Aphid.

In the following article are recorded the results of a study of the life history of the Chinese Lady-beetle, Blood Red, *Hippodamia convergens* and *Olla abdominalis;* these being the only species that completed a life cycle under observations. A description and a more detailed account of the Chinese Lady-beetles is given because this is a new species in this state.

Due appreciation is expressed to Professor J. R. Watson, Entomologist of the Florida Agricultural Experiment Station, and to Ralph L. Miller, Assistant Entomologist of the State Plant Board of Florida.

LIFE HISTORY OF CHINESE LADY-BEETLE, LEIS SP.

Descriptions.—The adult is oval and very convex. Color: head yellow with eyes and posterior margin black. Thorax yellow with angular two-lobed black spots in center of posterior margin. Wings dark red with thirteen black spots, six on each wing and one common. When the adult emerges the wings are yellow and very soft. About one and one-half hours after emergence all of the spots have appeared. The color of the wings gradually deepens to a brownish and then to a bright red. In warm weather it takes from one to two weeks for the wings to become a bright red and in cool weather or winter, a much longer period, from four to six weeks. Beetles that emerged in December did not color to a bright red until the last of February, when the weather became warmer. The legs and abdomen are yellow when the beetles emerge but darken with age. The center of the ventral side of abdomen is almost black and the outer margin brown in beetles several months old. The length is 6 to 9 mm. The male beetles are generally smaller than the females.

The length of the life of these beetles has not been determined in Florida. Some of the beetles that emerged in the period from

TABLE I.—NUMBER OF APHIDS EATEN EACH DAY BY THREE ADULT CHINESE LADY-BEETLES.

		A		B		C	
Date	Hours	Eaten Aphids	Instar of Aphids	Aphids Eaten	Instar of Aphids	Aphids Eaten	Instar of Aphids
1926							
4-15	23	134	1-2-3-4	108	1-2-3-4	19	1-2-3-4
4-16	21½	153	1-2-3-4	151	1-2-3-4	45	1-2-3-4
4-17	22	146	2-3-4	160	1-2-3-4	43	1-2-3-4
4-18	24	124	2-3-4	139	1-2-3-4	63	1-2-3-4
4-19	27½	107	2-3-4	166	1-2-3-4	109	1-2-3-4
4-20	24	182	2-3-4	121	1-2-3-4	77	1-2-3-4
4-21	26½	160	1-2-3-4	184	1-2-3-4	117	1-2-3-4
4-22	21½	106	1-2-3-4	193	1-2-3-4	132	1-2-3-4
4-23	23½	122	1-2-3-4	.....	1-2-3-4	133	1-2-3-4
4-24	....	.....	.....	.....	.....	.....	.....
and	43	201	1-2-3	Dead	.....	180	1-2-3
4-25	....	.....	.....	.....	.....	.....	.....
4-26	29	134	2-3-4	.....	.....	149	1-2-3-4

Note:—A and B beetles emerged in fall of 1925.
C beetles emerged 4-14-26.

September 1925 to January first, 1926 are living at this time, June 21, 1926. Out of 1000 beetles January 1, there were 34 beetles living June 21, 1926.

Feeding Habits.—The beetles feed mostly on aphids of different species. While caged they have been observed to eat the Citrus Aphid *(Aphis spiraecola)*, Melon Aphid *(Aphis gossypii)*, Turnip Louse *(Aphis pseudobrassicae)*, Cabbage Plant Louse *(Aphis brassicae)*, Grapefruit Aphid *(Toxoptera aurantiae)* and the Pepper Aphid. The Citrus Aphid and Turnip Louse are the only species that have been fed to them to any great extent. They seem to thrive equally well on either. The adults also eat their own eggs or the eggs of other species of lady-beetles when the aphis are not abundant in the cages. They will eat also the pupae of their own species when in the same cage. Syrphus fly larvae are also eaten by the beetles.

In warm weather they have been observed to eat from 100 to 200 or more Citrus Aphids per day, but in cool weather the amount is decreased to few or none. The younger adults eat more than the older ones in cool weather, that is, when the days are slightly warm the young beetles become active and search for food but the older ones remain more inactive.

Immediately after an adult emerges, it eats very little but its appetite gradually increases. One young beetle, No. C of Table I, started with 19 aphids per day and increased to 180 in ten days. See Table I for feeding records of young and old beetles.

Hibernation.—The adults go into a more or less inactive stage during winter. The older adults remained dormant during the latter half of November, December 1925, January and up to the middle of February 1926. It appears that the temperature has a great deal to do with their activities in winter. One cage was kept in a small green house in cold weather so that the temperature was much higher than the temperature in the insectary. These beetles in the green house deposited eggs up to December 15, 1925 but very few and the egg masses were small, eight to ten eggs to the mass. The beetles in the insectary deposited no eggs after the middle of November.

When hibernating the adults gathered in masses along the edge of the cage and in curled leaves. For some unknown reason at certain times in the warm weather they gathered in clusters as though in hibernation. Beetles that emerged from April 1st to about April 12 started to gather in clusters at the top of

the cage April 24. These beetles went down through the leaves apparently feeding again. From May 10th to 14th they again clustered at the top of the cage and remained until June 21st (time of writing). They are now becoming active again. At the time when they seem to be in this dormant state, there are always a few active beetles working through the leaves. It was also observed that there is very little copulation or egg laying during this period of dormancy.

Deposition of Eggs.—The length of time between the emergence of the beetles and the time they mate has not been exactly observed. Beetles that emerged in the period of July 21 to 31 deposited fertile eggs August 13. One female that was in an individual cage deposited non-fertile eggs 35 days after she had emerged. Beetles that emerged from April 5 to April 29 deposited eggs about May 7. February 17 the beetles that hibernated were moved from Lake Alfred, Florida to Davie, Florida. The beetles were seemingly dormant when moved but the weather being warmer at Davie, they became active at once and started eating. Fertile eggs were deposited one week after they had become active. Beetles that are depositing eggs regularly seem to be in copulation a greater part of the time.

The beetles deposit from one to sixty eggs in one egg mass. The average number of eggs in an egg mass was, for one individual female, 24. The maximum was 54 and the minimum 8. This average was from 37 egg masses deposited over a period of 106 days, June 17 to November 10, 1925. The total number of eggs deposited was 904 or an average of 85 eggs per day.

Eggs.—The eggs are yellow, shaped somewhat like a short and thick cigar and deposited on end in more or less irregular rows. The hatching period varies with the temperature. In warm weather they hatch in three days but in cool weather it takes eight to twelve days. See Table IV. Just before hatching the eggs darken in color. The young larvae crawl out from the top of the eggs. Immediately after hatching the larvae collect around the old egg mass and if some of the eggs have not hatched they will be eaten. Sometimes there are several hours difference in the hatching of the eggs in the same egg mass.

Larvae.—The young larvae are black in color until the first molt which, in summer, occurs about two days after hatching. The markings at this time are similar to that of the full grown larva but not as distinct. After the second molt, which occurs

about two days later, the distinct markings of a full grown larvae appear. There are three molts in the larva stage.

TABLE II

Date Eggs Deposited	Date Eggs Hatch	1 Molt	2 Molt	3 Molt	Date Larva Pupated	Date Adult Emerged
6-13	6-16	6-18	6-20	6-23	6-27	7-2
6-17	6-20	6-22	6-24	6-28	7-4	7-9
6-26	6-29	7-1	7-3	7-6	7-9	7-15
6-29	7-2	7-4	7-6	7-9	7-13	7-20
7-1	7-4	7-6	7-8	7-12	7-20	7-26
7-18	7-21	7-23	7-25	7-28	8-1	8-6

The larva has 12 plainly visible segments, 3 in the thorax and 9 in the abdomen. The head and thorax are dark gray to almost black. The first four segments of the abdomen are yellow, with a black median line beginning at the center of the first segment and extending to the fifth. The last six segments of the abdomen are a dark gray or black. Six branched spines occur on each segment except the last. The legs and under part of the body are a dark gray. The length of the full grown larva is from 12 to 15 mm.

The larvae start eating soon after hatching, attacking aphids that are as large or larger than themselves. They catch the aphids with their mandibles and suck out the body fluids, then eat the hull. A larva has been observed to suck the body fluids from a winged female, then eat wings and all. A three-fourths grown larva ate an adult aphid in two minutes but it takes up to nine minutes sometimes, much depending on its appetite.

The larva have a fairly wide range of food altho aphids are their main diet. The Citrus Aphid and Turnip Louse are the only species that have bee [illegible] in any quantity but they have eaten all the species previously named as eaten by the adult. The larvae have been observed to eat several kinds of soft-bodied insects such as the syrphus-fly larvae, mealy bugs, small Cabbage Loopers and larvae of their own species or other lady beetles. Counts were made to determine the number of Citrus Aphids individual larvae would eat per day. All adults and dead aphids were removed from the leaves before the material was put into the cage. See Table III.

TABLE III

BEETLE No. 1						BEETLE No. 2			
Date	Hours	Aphids on Leaf	Aphids Left	Aphids Eaten	Instar of Aphids	Aphids on Leaf	Aphids Left	Aphids Eaten	Instar of Aphids
7-7	23½	41	0	41	1-2-3	56	4	522	1-2-3
7-8	24½	82	5	77	1-2-3	92	17	75	1-2-3
7-9	22½	141	0	141	1-2-3-4	166	85	81	1-2-3-4
*7-10	22½	0	0	0	0	114	20	94	1-2-3-4
7-11	25	150	6	144	1-2-3-4	140	22	118	1-2-3-4
7-12	22	188	60	128	1-2-3-4	180	23	157	1-2-3-4
7-13	26	205	12	193	1-2-3-4	210	0	210	1-2-3-4
7-14	23	290	20	270	1-2-3	300	40	260	
7-15	26½	312	50	262	1-2-3	320	90	230	
7-16		316	70	246	1-2-3-4	325	60	265	1-2-3-4
7-17	27	300	41	259	1-2-3-4	.....	.....	.....	Pupat'd
7-18	24	315	46	269	1-2-3-4	.....	.....	.....	.....
7-19	24	310	165	145	.....	.....	.....	.....	.....
7-20	.....	.....	.....	.....	Pupated	.....	.....	.....	.....
7-25	.....	.....	.....	.....	Emerg'd	.....	.....	.....	Emerg.
			Total 2175				Total 1542		

*Note.—Box overlooked and no food added 7-9-25.

(To be continued)

Thru an oversight the writer neglected to sign the article in the last number of the Entomologist describing Haplothrips Abyssianae.—J. R. Watson.