

EXPERIMENT STATION
KANSAS STATE
AGRICULTURAL COLLEGE
MANHATTAN, KANSAS
BULLETIN NO. 3

JUNE, 1888

OBSERVATIONS ON TWO INSECT PESTS

By E. A. POPENOE, Entomologist

BY ORDER OF THE COUNCIL:

E. M. SHELTON, *Director*

MANHATTAN, KANSAS
PRINTING DEPARTMENT, AGRICULTURAL COLLEGE
1888

THE APPLE TREE FLEA BEETLE.

Graptodera foliacea LEC.

In his "First Annual Report on the Injurious and other Insects of the State of New York," Prof. J. A. Lintner has given (page 327) a list of insect depredators upon the apple tree, the number of species reported reaching one hundred and seventy-

Text is taken from first Annual Report.

Content matches Bulletin 003, but is arranged differently.

six. This number included not only those seriously injurious to the apple tree or its fruit, but also all then known to subsist in part upon it, and but occasionally troublesome. About one-fifth of the entire number given may be named as species actually and noticeably injurious; and while we are solicitous to diminish rather than to increase this number, it is yet necessary that we pay due attention to all notable additions to the catalogue. One of these we have found in Kansas, in the green leaf-eating flea beetle, known to entomologists as *Graptodera foliacea*, which we may call the apple flea beetle. This beetle is generally distributed throughout the State, and from personal observation we know it to extend at least to the foot hills in Colorado.

Throughout its range, so far as noted, it usually occurs upon plants of the evening primrose family (*Onagraceae*), being especially partial to the silky gauras (*Gaura parviflora* and others), the leaves of which are often riddled by it. We have not learned the place and character of the preparatory stages of this insect, it being the adult or beetle stage in which it has proven injurious in our orchards and nurseries.*

For several years past, the beetle in question has attracted attention on the College grounds by its attacks during May and June upon the apple trees, the leaves being the portions injured. In orchard trees, the lower branches only, near the ground, have suffered, and these but slightly. The greatest injury has been done in the nursery, where the beetle has often completely defoliated the spring set root grafts and the yearling trees, and has seriously injured even two-year-old trees. The insects are most active in bright, warm weather, and are then attracted to the trees in great abundance, where they feed upon the parenchyma of the leaf (Plate I, fig. 9), avoiding the veins and

* A number of these beetles, received from Dighton, Lane county, were kept for a fortnight in a small jar, and fed with apple leaves. They fed voraciously upon the leaves, and some of the females deposited eggs upon the leaves, and also on the sides and bottom of the jar, under the fragments of the food and excreta. The eggs are orange in color, rather less than a millimeter in length, long oval in form, and, under a high magnifying power, the shells are seen to be minutely granulated.

midrib, these being sometimes all that remains after a few days' presence of the beetle. It is on the young shoots of the root grafts that their work is most injurious. In these, they keep the new growth cut so close that the graft sometimes fails to recover. While the injury to yearlings is considerable, yet the trees, though denuded, usually recover, and throw out new leaves after the season of the attack is past.

Like its near ally, the steel-blue grape beetle, this species is easily alarmed, and on being approached springs off the leaf, afterward seeking safety in flight, but only to return and again occupy its feeding ground, after the danger is past.

Upon the College grounds, we have checked the advances of this beetle without much trouble, by the timely application by spraying of the mixture of arsenical poison (Paris green or London purple) in water, as used against the codlin moth. As the beetles fly well, and as they may come in from time to time, through three weeks or more, from other localities, it may be necessary to repeat the application, the more if heavy rains have fallen. Our use of the poisons so far has been with the purpose of saving the trees, and we have not made trial to find the minimum effective strength of the mixture. In the strength employed, about six ounces of London purple to the barrel of water, we found that some injury to the tender leaf growth followed, the plants suffering less from this, however, than they would have suffered from the unchecked attacks of the flea beetle.

To assist in the identification of the insect, the following brief description is given: The apple flea beetle (Plate I, fig. 10) measures from 4 mm. to 5 mm. (.15 to .19 inch) in length, is ovate in general outline, and, except as noted below, is in all parts highly polished, and brassy green in color. The antenna are usually dull brownish black, the color obscured by a short gray pubescence, except that the first three joints are of the same color as the body, and are but sparsely pubescent. The feet are dull brownish, or reddish brown, and, with the legs and under parts generally, are thinly clothed with short gray

pubescence. In other details, the species is well represented in the figure.

Since the foregoing account was published, our knowledge of the early stages of this insect has been extended by a notice of the larva and its habits, from the pen of Miss Mary E. Murtfeldt, in *Insect Life*, for September, 1888.

From that paper, the following statements are taken, as of great interest to many Kansas nurserymen, who may not have access to the original.

Eggs were found July 9 upon the apple leaves, placed in a breeding jar as food for the beetles. These eggs measured about 1 mm. in length, and were usually in clusters of two and three, side by side, attached to the stems and bases of the mid-rib of the leaves. From the eggs, the larvae appeared on July 17. The following account of their appearance and habits is quoted from the paper above cited:

"They are nearly cylindrical, of a dull black color, and rather more elongated in proportion to their diameter than the larvae of *G. chalybea*.

"When grown, they feed on the parenchyma of the leaf, indifferently on either surface but later, they gnaw holes in it similar to those made by the perfect insects.

"The first moult took place in eight days, and two or three of the small larvae perished in the process, being unable to entirely withdraw themselves from the outgrown skins. The second moult occurred one week later, and in this, also, one larva perished. During these periods, there are no changes of color or maculation. August 2, one larva had completed its growth, and as it was making its way to the earth, I put a stop to its further development by transferring it to the alcohol bottle. The following characters were noticed: Length of mature larva, from 6 to 7 millimeters; diameter, 1½ mm.; form, cylindrical, tapering somewhat posteriorly; general color, varying from dull black to dark fuscous: piliferous plates inconspicuous, of the same shape, number and arrangement as those of *G. chalybea*, black in color and slightly polished; each giving rise to from

one to three minute hairs; head rounded, cordate, deep black, but not brilliantly polished; prolegs well developed, faintly annulate at the points with dingy white.

"The larvae move about considerably, but in a slow and rather clumsy fashion, with the tip of the abdomen appressed to the surface of the leaf or stem, to assist in keeping them in position.

"The pupa is inclosed in a frail earthen cocoon, or cell, just beneath the surface of the ground.

"None of the beetles from this brood have emerged, and it is possible that they may hibernate. Several of the parent beetles were, August 14, still alive and as voracious as ever, while eggs and young larvae were still to be found on the leaves.

"August 14, two larva entered the ground, and the beetles emerged on the 28th of the same month — the duration of the pupal stage of life being less than two weeks.

"September 1. The last beetles of the spring brood have just died, possibly from a lack of fresh food more than from old age, as I was absent from home and could not give them personal attention. The probabilities are that the second brood of these beetles hibernates, and lays its eggs early in the season for the production of the beetles that are so destructive throughout the summer.

"It will be seen from this account that *G. foliacea* is an all-summer pest, and capable of inflicting a vast amount of injury in the nursery and young orchard."

THE APPLE-TWIG BORER.

Amphicerus bicaudatus SAY.

Boring in twigs of the apple, pear, peach, sumac and grape. A cylindric, dark-brown beetle, about three-eighths inch long, the head concealed from above by the projecting prothorax, which is more or less roughened in front; the wing covers, at tip, sloping downward, and, in the males, beset with a pair of short, blunt spines, inclined inward. The larvae and pupae, as found in dead stems of tamarix, and in dead grape vines, are figured and described below.

210 *REPORT OF HORTICULTURAL DEPARTMENT.*

Among the numerous insects concerning which information has been asked during the season past, none, seemingly, has attracted more general attention than the apple-twig borer. Specimens of the insect, and its work in grape vines and apple twigs, have reached us from various points in eastern and central Kansas, Norton and Lane being the westernmost counties from which complaints are noted. The following extracts from letters indicate the nature and extent of the injury caused by this beetle in our orchards and vineyards, and give some hint as to its distribution in our State: Mr. R. Robertson, under date of May 26th, 1888, writes from Nemaha county: "I send you, for name, some grape-vine destroyers. In a lot of fifty old Concord vines, they have destroyed about ten per cent. of the young or bearing wood. The vines were trimmed last fall; I did not notice the insect or its work then. In large numbers it would be very destructive." Mr. J. R. Bell writes from Rice county, May 19th: "I mail you to-day, a box containing specimens of a fly, or borer, that is working in our apple trees, and doing some damage. I find them working in grape vines as well, and hear much complaint of vines being entirely killed. I have lost a few large ones myself The sumac bush seems to be particularly their choice, as I found them very numerous in it this spring." Mr. M. A. Carleton, Mitchell county, May 28th, sending specimens in grape canes, writes: "It is a most destructive pest in this country, having so far as I have obtained information, destroyed almost all vines nearly to the roots, and all hopes of any grapes this year. I found the specimens in the heart of the vine. They have bored their way there, feeding on the soft tissue, and have, seemingly, in all cases entered at the joint." Mr. H. C. Davis, Norton county, May 21st: "Enclosed find cuttings of apple branches infested by a borer new to this country; also others showing the deposit of the larvae on the branches. * They (the borers) kill every branch that shows a burrow. I have lost fifteen

* This "deposit of the larvae" proves to be the cases of the "rascal leaf crumpler," (*Phycis indignella* ZELLER).

four-year-old trees this spring, and have had many more damaged.”

Others of the same tenor, from intermediate points, leave no doubt that the presence of this beetle was general, and that its work was unusually evident and noteworthy the past spring.* In the vicinity of the College, for instance, vines were very commonly infested, often several insects being found to a small vine, and two or more in the same cane.

In examining accessible literature for recorded observations upon this insect, it was found that little is known of its life-history, and nothing certainly known of its preparatory stages. As a partial index to published matter in this connection, and as a basis for comparison, the following references, with abstracts and quotations, will have value:

Apate bicaudatus SAY: “Found above the mouth of the Ohio.” - Jour. Acad. Nat. Sci. Phila., Vol. III, p. 320, 1824. Coll. writings, ed. Le Conte, Vol. II, p. 180, No. 2. Referred (l. c.) to *Bostrichus* by Le Conte.

Bostrichus bicaudatus SAY: Asa Fitch, Third Report upon the Injurious Insects of New York, (1856.) p. 12: “This insect occurs from Pennsylvania to Mississippi, and has been common of late years in the orchards of Michigan and Illinois, but has never been met with as yet in New York or New England.”

Bostrichus bicaudatus SAY: P. R. Uhler, U. S. Agl. Rep. for 1860 [1861], p. 321. Following a popular description of the beetle, evidently quoted, with slight modification, from Fitch, as above cited, Mr. Uhler says: “*Remedies.*—The best plan which can probably be adopted to exterminate these insects will be to saw off every infested limb beyond the point where the larvae [sic] penetrate, and burn it in the fire. Some of the mixtures before noticed [soft soap, or other alkaline wash] may prove efficient in deterring the insect from alighting and depositing its eggs in the tree.”

Bostrichus bicaudatus SAY: Cyrus Thomas, in Trans. III. State Agl. Soc., Vol. V, 1865, p. 424. Description and reference to destructive habits. He says: “I have frequently traced them out of hickory limbs, which, I think, is their favorite native tree. I am inclined, also, to think their usual habit is to attack it when deadened, cut down or damaged, before becoming perfectly dry.” He describes larvae, which, he surmises, may belong to this species, and their burrows in hickory. Recommends capture of beetles in their spring flights, and the destruction of prunings of trees attacked.

Bostrichus bicaudatus SAY: B. D. Walsh, Practical Entomologist, Vol. I, 1866, p. 27. Popular description of beetle, and its habits. Regarding its dis-

* Messrs. Holsinger and Espenlaub, of Rosedale, state that this insect has attracted no attention in their vicinity, and that they have not seen a case of its work.

212 *REPORT OF HORTICULTURAL DEPARTMENT*

tribution: "This insect occurs in Pennsylvania and in the valley of the Mississippi, but not in New York or New England."

Bostrichus bicaudatus SAY: Walsh & Riley, American Entomologist, Vol. I, 1869 [1869], p. 80. Figure and brief descriptions. Specimens from Iowa (in apple), Missouri, and, doubtfully, from New York. Same work, Vol. I, p. 206, specimens from Illinois (in apple). Same work, Vol. II, 1870, p. 212, Kansas (pear): p. 245, Iowa, Kansas (grape); p. 246, Wisconsin.

◦ *Amphicerus bicaudatus* SAY: Dr. Henry Shimer, in Trans. Am. Ent. Soc., II, 1869, p. viii. Describes work of beetles in dead vines of Clinton and Isabella grapes. Notes presence of larvae, which, however, are not certainly referable to *Amphicerus*.

Amphicerus bicaudatus SAY: C. V. Riley, Fourth Report of State Entomologist of Missouri, 1872, p. 51. Figures beetle and its burrows; gives an account of what is known of its history, with inferences as to the preparatory stages. "The beetles seem to prefer some varieties, such as Benoni and Red June, to other varieties of the apple, and, though they likewise occur in grape, pear and peach stems, I have never found them in those of the crab apple. Both male and female beetles bore these holes, and may always be found in them, head downward, during the winter and spring months. The holes are made for food and protection, and not for breeding purposes. Indeed, common as this insect is, its preparatory stages are entirely unknown." Fifth Report, p. 54: Records the beetle from New Jersey, in pear twigs, and notes statement of Dr. Henry Shimer, who bred the beetle from grape canes.

Bostrichus (Amphicerus) bicaudatus SAY: Cyrus Thomas, Trans. III. State Hort. Soc., Vol. IX, 1876, p. 194. "It is thought they prefer certain varieties of apples, such as Benoni and Red June, and will not attack the crab, but this has not yet been satisfactorily determined. The preparatory stages are yet unknown, although they are doubtless similar to those of the following species (*Sinoxylon basilare*). There is reason to believe it sometimes, at least, passes its larval state in the grape vine. I am incline to think that the larva works in hickory; that it is a borer cannot be doubted." . . . Cyrus Thomas, Sixth Report of the State Entomologist of Illinois, pt. II (1877), page 123. Description of beetle and work; cites the beetle as depredating upon the apple, "especially the young trees," the peach and hickory, "and even upon the grape vines." Other statements, essentially the same as the preceding extract from Trans. III. State Hort. Society.

Amphicerus bicaudatus LE CONTE: In list of Coleoptera collected in Northern New Mexico and Southern Colorado, in 1875, by Wheeler's Expedition.

Amphicerus bicaudatus SAY: Prof. A. J. Cook, in Fifth Annual Report of Michigan Pomological Society, 1875, p. 138. Brief notice.

Bostrichus bicaudatus SAY: Dr. S. H. Kridelbaugh, in Trans. Iowa Hort. Soc., Vol. II, 1876. Reports this beetle as, in some cases, totally killing the grape vine for a length of five or six feet; and, as "making sad havoc" in a nursery, killing the young trees.

Amphicerus bicaudatus SAY: Townend Glover, Manuscript Notes from my

Journal, or Entomological Index, etc., 1877, p. 4. "Apple-twig borer: Insect bores into the twigs of apple, grape, hickory, pear, cherry, etc."

Amphicerus bicaudatus SAY: E. A. Popenoe, List of Kansas Coleoptera, in Transactions of Kansas Academy of Science for 1876, Vol. V, p. 32. "Abundant and troublesome in vineyards, boring in the twigs."

Amphicerus bicaudatus SAY: Dr. G. H. Horn, Revision of the Bostrichidae, Proc. Am. Phil. Soc., Vol. XVII, (1878,) p. 547. "occurs everywhere east of the Rocky Mountains."

Amphicerus bicaudatus SAY: Hubbard & Schwarz, Coleoptera of Michigan, Proc. Am. Phil. Soc., Vol. XVII, p. 638, (Marquette.)

Amphicerus bicaudatus SAY: E. A. Schwarz, Coleoptera of Florida. Proc. Am. Phil. Soc., Vol. XVII, p. 455, (1878,) (Haulover, rare.)

Amphicerus bicaudatus SAY: Zesch & Reinecke, Catalogue of Coleoptera collected in vicinity of Buffalo, N. Y.

Bostrichus bicaudatus: Herbert Osborn, in Trans. Iowa State Hort. Soc., Vol. XIV, 1879, p. 94. Brief description.

Amphicerus bicaudatus SAY: C. V. Riley, in *American Entomologist*, Vol. III, (1880,) in answer to correspondent reporting great damage to Concord grape vineyard in Nebraska, says: "It is extremely common throughout the Western States, and more often received for identification during the winter and spring months than any other beetle." Referring again to Shimer's note on the food plant of the larva: "While Dr. Henry Shimer found certain larvae in grape canes which he conjectured to be of this species, . . . yet they were doubtless those of an allied beetle (*Sinoxylon basilare* SAY) which I subsequently reared from larvae thus inhabiting grape canes." Same work, p. 108: Reported by T. V. M., Denison, Texas, boring in February in twigs of apple trees.

Bostrichus bicaudatus: G. C. Brackett, Trans. Kas. State Hort. Soc., 14th Annual Meeting, 1880, (1881,) p. 171. Account quoted and figures borrowed from Riley's Fourth Report on Insects of Missouri.

Amphicerus bicaudatus SAY: Mary Treat, Injurious Insects of the Farm and Garden, Orange Judd Co., 1882, p. 145. Account and figures copied from Riley's Fourth Report.

Amphicerus bicaudatus SAY: Wm. Saunders, Insects Injurious to Fruits, Lippincott, 1883, p. 33, (No. 13.) General account of habits of beetle. Figures from Riley's Fourth Report.

Amphicerus bicaudatus SAY: Prof. J. A. Lintner, Second Report of the Injurious and Other Insects of the State of New York, 1885, p. 125. Gives partial bibliography, description, and figures of the beetle and its work, and an account of the habits of the insect so far as known, with inferences as to the life history and breeding habits.

Bostrichus bicaudatus: A. N. Godfrey, Insect Enemies of the Apple, in Trans. Kas. State Hort. Soc., Vol. XV, (1886,) p. 163. Short note on habits, with figure from *American Entomologist*, after Riley. Says that "it is never seriously injurious."

HABITS.*

September 8, 1887, an examination of dead stems of *tamarix*, a flowering shrub of strong growth, but in this locality killing to the ground in severe winters, revealed the work of two beetle larvae unknown to us. The burrows extended lengthwise through the stems, for the most part through the center, following the line of the slender pith. The larger of the two larvae proved to be the young of the twig borer under consideration.

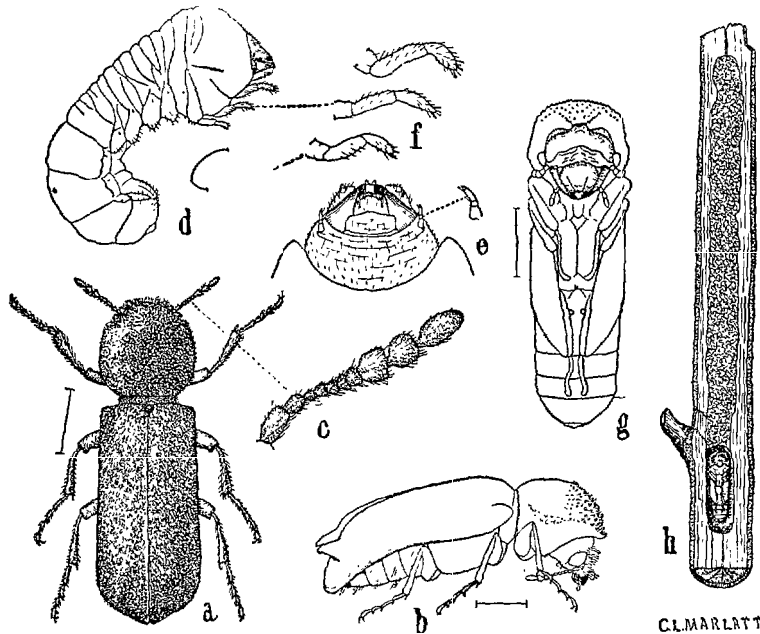


FIG. 1. TRANSFORMATIONS OF THE APPLE-TWIG BORER.
Amphicerus bicaudatus SAY.

The figures, excepting *h*, which is natural size, are enlarged, the hair lines at the side, in *a*, *b*, *d* and *g*, showing the actual size; *a*, the female beetle from above; *b*, outline side view of male beetle; *c*, antenna, showing structure; *d*, full-grown larvae; *e*, head and antenna, and *f*, the right legs of the larva; *g*, front view of pupa, in outline; *h*, twig, showing, above, the larval burrow packed with castings, and below, the pupa in its cell.

* See, also, *Entomologica Americana*, August, 1888, p. 95, where H. G. Hubbard notes the breeding of the larva of *Amphicerus* in dead underground stems of smilax.

Those burrows in which the larvae remained, or in which the pupae were found, were, as is shown in our Fig. 1, *h*, nearly of the same diameter throughout, packed closely with the sawdust-like castings of the larvae, and usually about three and one-half or four inches in extent. The pupa was found in a cell at one end of the burrow; and in one case the adult, alive, was found in the same situation, before the outward passage had been made. Many of the burrows had been already deserted by the beetles, and, in such cases, an opening had been made outward, near the upper end of the pupal cell. This must have been done by the beetle itself, and not by the larva, as the cells containing pupae had no such openings. The usual relation of this opening to the empty pupal cell is indicated by the dotted lines just above the base of the side shoot (Fig. 1, *h*). These openings may be found on any part of the infested stem, and the position in the figured burrow, at the base of the twig, is, of course, accidental.

In the twigs examined at this time, the place of the egg and the beginning of the larval burrow were not made out to a certainty. Indeed, the larval track, to all appearance, had doubled upon itself, and the whole length had been traversed anew by the nearly full-grown larva, the width of the burrow being thus left nearly uniform. This interpretation is strengthened by the finding, in one case, of a partial overlapping of earlier and later made portions of the same burrow.

Certain old vines in the College vineyard, nearly dead from the effects of the summer and winter of 1886-7, were allowed to remain through the summer of 1887, but in most cases failed to recover. On pruning the vineyard, these vines were found, January 26, 1888, to be literally riddled by beetle larvae of several kinds. An examination showed among them three specimens of the larva of *Amphicerus*. The beetles themselves were found alive in numbers in the same vines. Later, during the warm and bright days in early spring, beetles of this species were frequently taken flying. During April and

216 *REPORT OF HORTICULTURAL DEPARTMENT.*

May many specimens were brought in by neighboring grape growers whose vines they were attacking. As late as the 21st of June they were found, alive, in grape canes.

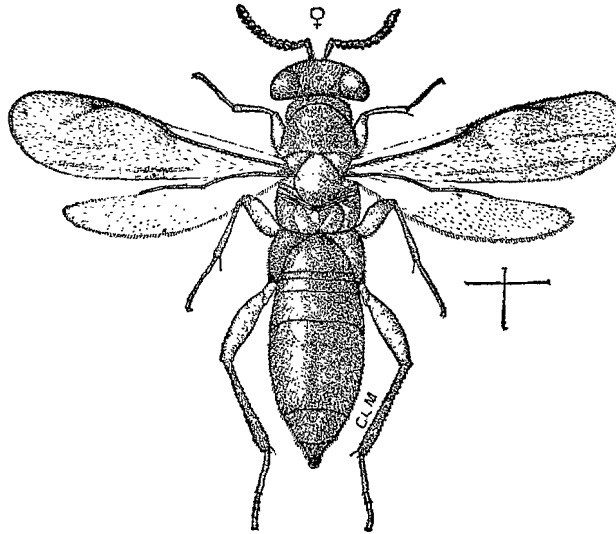


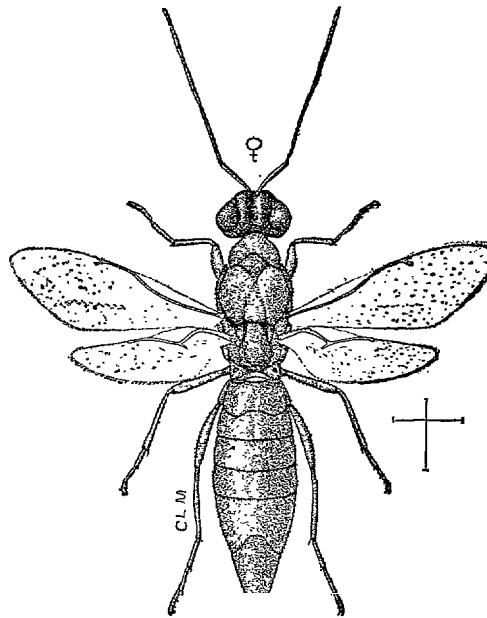
FIG. 2. *Charitopus magnificus* ASHMEAD.

On the 23d of June, examination of the dead stem of tamarix showed the larva, about one-fifth grown, in narrow burrows, some of which had reached the pith, but others being still in the outer layers of the wood. These burrows could be traced backward to their initial point in the bark, but nothing could be discovered as to the probable situation of the egg. From the size and position of these larvae, it is probable that the eggs from which they hatched were deposited early the past spring.

DESCRIPTION OF LARVA AND PUPA.

The larvae, found in connection with pupae and numerous living beetles in the dead stems of tamarix, may be described as follows: Fleshy, curved, whitish grubs (Fig. 1, *d*), measuring, in length, about ten millimeters (.4 inch); head, 1.5 mm. in width. Thoracic region much thickened. Lateral

breathing pores minute, and with difficulty seen. Mandibles black, other mouth parts reddish brown; labrum, labium and maxillæ thickly set with brownish hairs; maxillary and labial palpi apparently three jointed (basal tubercle + two joints?). Antenna reddish brown, four-jointed, basal joint (or basal tubercle?) stout, second joint small, and when (as in Fig. 1, e) not fully extended,



projecting about one-half the length of the third joint, which is darker colored, and furnished at tip with a long bristle; last joint short, one-half the diameter of the third.

FIG. 3. *Ratzburgia ampicorovora* ASHMEAD.

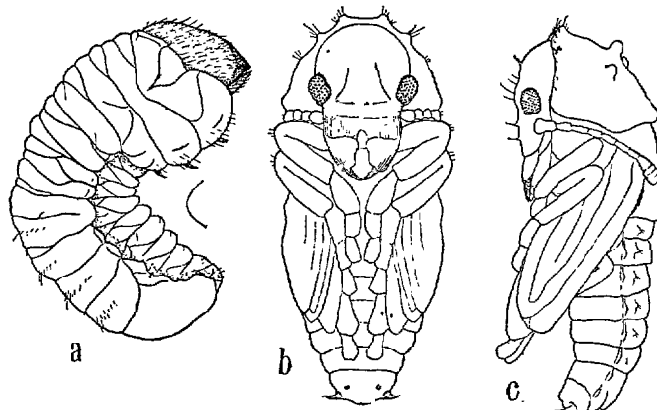


FIG. 4. Larva and pupa of *Anthribus cornutus* SAY.

The pupae (Fig. 1, *g*), of which three perfect and several parasitized specimens were found, all unmistakably referable by form and details of structure to the present species, measure in length 9 mm., in width 2.3 mm. In general color they are reddish brown, the eyes and mandibles black, the tubercles on the projecting front and sides of prothorax dark brown.

PARASITES.

From the parasitized pupae were bred specimens of two hymenopterous parasites which, being not heretofore known, are described as new by Mr. Wm. H. Ashmead, a specialist in this group. The larger of these two flies is a somewhat stout form,* (Fig. 2,) measuring about .3 inch in length, metallic green in color, changing into rich golden green and peacock blue along the sides and base of the thorax, the abdomen blackish toward the tip; the wings, except two smoky bands on each fore wing, perfectly clear and transparent; the legs, excepting their bases,

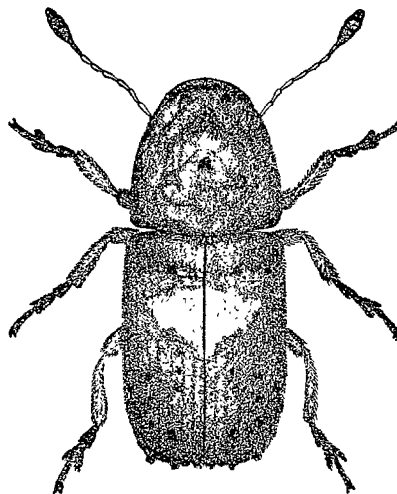


FIG. 5. Adult, *Anthribus cornutus* SAY the sides of the thorax, the abdomen above suffused with wine purple, the legs yellow. These two species are nearly allied, and belong to the family

* *Charitopus magnificus* ASHMEAD.

† *Ratzburgia amphicerovora* ASHMEAD.

yellowish red. This species merits the specific name applied to it by Mr. Ashmead, for greater magnificence in coloration in so small an insect would be difficult to find. The second form † (Fig. 3) is more slender, but slightly longer, if the short ovipositor be included in the length of the body. This insect is also brightly colored, being generally metallic green, this color shaded with purplish blue across the face, and along

Chalcididae, a most important group, including a great number of beneficial parasitic insects.

Associated in the tamarix stems with the larvae of the twig borer, were more numerous larvae of a smaller size, and with different characteristics features. These were reared in quantity, and proved to be the larvae of a beetle* quite different from the *Amphicerus*, belonging indeed to a family widely separated from that of the grape vine pest. These smaller larvae (Fig. 4, *a*) are less thickened in the anterior part of the body, have larger heads and shorter legs, and are otherwise readily distinguishable from their less numerous but more important associates, the larvae of the twig borer. The pupa is also quite distinct, (Fig. 4, *b*, front, and *c* side view,) though occupying a cell at the end of a burrow very much like that of the *Amphicerus* pupa. The perfect beetle (Fig 5) measures rather less than one-fourth inch in length, is grayish brown in color, with a broad blotch of cream white upon the middle of the back. This insect is not yet known to be injurious, but its association with the twig borer in this instance makes its history worth noting, as of possible economic interest.

CONCLUSIONS.

It seems to us safe to conclude from the above, that the beetle is single brooded, most of the individuals reaching maturity in the fall and winter, remaining through the latter season in the vines where they were bred, emerging in the spring, and soon after depositing eggs in unhealthy or dead wood in the vineyard and elsewhere, at least two shrubs being known as its food plants. It may also breed in the prunings of the grape which remain unburned over summer, as we have taken the adults in such material under conditions which render this explanation of their presence a most probable one.

The recommendation of Professor Uhler, as before cited, is inapplicable in the light of our observations on the habits of this insect, and seems, indeed, to have been based upon a mis-

* *Anthribus cornutus* SAY.

220 ***REPORT OF HORTICULTURAL DEPARTMENT.***

apprehension of the real method of injury. The usual recommendation, to collect and burn those twigs whose dying points out the insect at work, is good, but by no means sufficient; and while we may not be able to compass the complete suppression of this pest by the careful collection and destruction of all prunings, diseased or dead vines, or their stumps, yet this practice, it seems reasonable, will assist us materially in the attainment of our object.

As the beetle is found on the vines, pairing, in warm, bright spring weather (as observed by Mr. J. C. Van Everen of this place.) the grape-grower may then find it profitable to attempt the collection and destruction of the insects, knowing that the destruction of a single pair at this time means the reduction of the summer's brood by many.