

Biological Notes on  
Chauliognathus pennsylvanicus DeGeer  
(Coleoptera, Cnontharidae)

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Biological Notes on  
Chauliognathus pennsylvanicus DeGeer  
(Coleoptera, Cantharidae)

Historical Account

This insect was described by Carl DeGeer in 1768 in Volume IV of his "Memoires pour servir a l'histoire des insects" on page 78. The original description is herewith reproduced:

"Téléphore exotique

Téléphore à corcelet & étus jaunes roussâtres,  
avec une tache noire allongée sur chaque etyi,  
à antennes & pattes noires.  
Telephorus (pennsylvanicus) thorace elytrisque  
rufoflavis, macula oblong nigra in singulo elytro,  
antennis pedibusque nigris.

"M. Acrelius m'a envoyé ce Téléphore de Pensylvanie, où il se trouve dans l'herbe, mais singulièrement sur les roses. Il est de la même grandure & à peu près de la même figure que nos Téléphores les plus communs, ayant la longueur de six & la largeur de deux lignes.

"La tête, les antennes & les pattes, ainsi que le dessous de la poitrine, sont de couleur noire. Le corcelet & les étuis sont d'un jaune couleur d'ocre roussâtre; sur le milieu du premier il y a une tache noire, & chaque étui a vers le derriere une grande tache ovale également noire, qui en occupe la moitié de la longueur & presque toute la largeur, ne laissant aux côtés qu'une ligne fine jaune, & ces taches le font

très bien reconnoître. Dans la femelle le ventre est noir en dessous, mais chaque anneau est bordé de jaune obscur, au lieu que celui du male est jaune comme les étuis, avec quelques lignes transversales noires & au derriere on voit une pièce élevée allongée noire, à laquelle se trouvent les parties du sexe.

Il porte la tête baissée. Les antennes, qui sont filiformes & de grosseur égale, sont très-longues & quelquefois plus que tout le corps. La plaque du corcelet est presque quarrée, mais son bord antérieur est arrondi & ceux des côtés sont relevés."

It is not until one hundred years later, in 1868, that B. D. Walsh writing in "The American Entomologist" gave a few notes on the habits of the larva of this insect as feeding on plum curculio larvae. He states further, "but for the beneficent operations of these little creatures there can be but little doubt that not a single bushel of peaches would have been grown in Egypt for the last five years". The adults were observed to be pollen feeders on golden-rod, thistle, etc. Excellent drawings of the adult and larvae by C. V. Riley were also presented here.

In 1869 C. V. Riley recorded the insect as being very abundant in Missouri, the larvae being particularly beneficial as they fed on the larvae of the apple curculio. H. G.

Hubbard in Florida, in 1880, made a few notes on the larvae. He discovered they would eat crushed aphids and Phora aletiae. In Alabama, in the same year, E. A. Schwarz writing in "The American Entomologist" observed many of the larvae of this insect on the fences, dead from a fungus. In 1888 the larvae were found to be ferocious in their attacks on the cotton worm chrysalids. J. A. Lintner reports on the beneficial qualities of these larvae in his "Fourth Report on the Injuries and Other Insects" of the State of New York in 1888.

Some interesting notes by H. A. Morgan, in 1891, from the Louisiana Agricultural Experiment Station Bulletin, state "they pursue the sugar cane borer as well as lying in wait." It is estimated that the larvae diminished the borers very considerably. In 1893 J. A. Lintner in his "Ninth Report on the Injurious and Other Insects" of the State of New York records one instance where the adults of this insect were injurious to the grape blossoms in Bird's Nest, Virginia. He also noted that the larvae are very predaceous and have been found feeding on the larvae of the codling moth, larvae of the plum curculio and on the cotton worm. W. V. Reed in 1909 records the beneficial work of this larva in its habit of searching out the codling moth larvae in Georgia.

W. S. Blatchley in 1910 notes Chauliognathus pennsylvanicus as being abundant in Indiana from June 30 to September 30. R. I. Smith in 1911 notes that the pickle worm is a favorite food of this larva. He caught some of the velvety dark brown

or black larvae in 1909 and reared them through to maturity in 1910. They were observed to be the most predaceous enemy of the pickle worm in North Carolina. Phillips, Underhill, and Poos, in 1921, record that this larva is a predaceous enemy of the larger corn stalk-borer in Virginia.

Richard Leiber, in 1926, notes that the adult was a pest to the flowers: daisies, phlox, coreopsis, roses and lilies, in June and July.

T. F. Winburn and R. H. Painter have the following to say about Chauliognathus pennsylvanicus: "Females of Chauliognathus pennsylvanicus collected in the field were placed individually in salve boxes about one-half full of dirt and fed syrup. In several cases egg masses of from 150 to 200 eggs, which hatched in about ten days, were secured. Unsuccessful attempts were made to feed these small larvae and on the second day they burrowed into the ground and formed a cell in which they remained. The hot dry weather during July killed all of them and during the last of August more were secured. They acted in a similar manner and remained over the winter in their cells."

It will be noted in the above review of the literature of this insect that only twice has the adult been reported as a pest, and that to flowers. In all cases, wherever noted, the larvae were beneficial in that they were predaceous, preying on such insects as the plum curculio larvae, sugarcane borer, codling moth larvae, pickle worm and cotton worm chrysalids. As the major part of the life history of this

insect was unknown the writer attempted to work it out in detail as is herewith given.

### Technic of Rearing

The cages used for mating and egg-laying were of two types. The first type consisted of a box eighteen inches long, twelve inches wide, and six inches deep, over which was placed a wire screen top, tent-like in shape, just the two ends and one side being covered by the screen. In the other side was fitted a glass in such a way as to be easily moved to facilitate the work of examining the beetles and egg masses. The second type consisted of a flower pot, ten centimeters in diameter and an ordinary lamp chimney with a piece of cheese cloth over the top, held in place by a rubber band.

The egg containers were petri dishes eleven centimeters across the top and one and one-half centimeters deep, in which there was placed two thicknesses of filter paper. The larval containers were of five types. First, petri dishes of the same type as the egg containers; second, watch glasses with two thicknesses of filter paper; third, watch glasses without any filter paper; fourth, open glass tubes three centimeters in diameter and ten centimeters in length, with five centimeters of plaster of paris in the bottom; fifth, ordinary flower pots similar to those used in the second type of egg-laying cages. Petri dishes were used for covers.

The best type of egg-laying cage was the watch plan provided with filter paper. It allowed for minute examination and more extensive division of pairs with less expense. They were considerably smaller and more compact, taking up less space and were more easily attended. The egg containers described above proved very satisfactory. A small amount of fresh humus soil was placed in the center of the petri dish before the eggs were transferred; thus, aided by two thicknesses of filter paper, the moisture applied to the container to insure a sufficiently moist atmosphere did not evaporate so readily. The larval containers were of about equal value except for outside containers, in which case the fifth one gave the greatest satisfaction in most respects.

A pipette and camel's hair brush are very useful additions to the apparatus just described. The former is for applying the water, which they need in greater amounts than the average larvae at all times, and the latter is for making the egg and larval transfers.

### Life History

#### Description of Adult

Elongate, slender. Head and under parts black; thorax yellow with a broad black spot on basal half; elytra yellow with an oblong-oval blackish spot on apical third, this sometimes prolonged to cover two-thirds or more of the surface; ventral segments margined behind with yellow. Thorax with margin rather widely flattened and reflexed. Male plate very large, nearly twice as long as the rest of the abdomen, oval in outline, convex, and thickly covered with setae. Female ultimate ventral seg-



ment truncate and deeply incised, one and one-half times the length of the penultimate segment; ovipositor prominent and readily seen with the aid of a hand lense. Length 9-12 mm.

#### Distribution

The occurrence of this insect in the United States is over a wide range. The first specimens taken for determination were from Pennsylvania. However, the bulk of literature has been collected from Illinois, Indiana and Missouri, while the insect is known to occur throughout practically all the states east of the Rocky Mountains. So far the writer has not been able to find any specimens of this species in the extreme southern part of Texas. They are found in all of the Southern States and in the northern part of Texas. This family is represented in our fauna by ten genera and two hundred and twenty-five species.

#### Feeding Habits

While all beetles have chewing mouth parts the beetles of this genus are remarkable for having an extensible, fleshy filament attached to each maxilla. These filaments are probably used in collecting pollen and nectar from flowers. It has been observed by the writer and others that the adults are pollen and nectar feeders. The adult flies or crawls from one flower to another feeding on the nectar or pollen of each individual flower. On being disturbed the insect loosens its hold and falls to a lower level or more often to the ground. The adult seems to prefer certain species of flowers such as the yellow

and white sweet clovers and golden-rod in Douglas County, Kansas; however, they were found feeding on the flowers of thistles, daisies, alfalfa, and many other kinds of wild or cultivated flowers;

#### Number of Broods

The writer observed (Douglas County, Kansas) two distinct broods of Chauliognathus pennsylvanicus, one appearing from the middle of June to the fore part of July, and the other appearing from the middle of September to the first week in October. The former has been designated as the June brood and the latter as the September brood. While both broods feed on all types of flowers the June brood was in greatest abundance on sweet clover and the September brood was most numerous on golden-rod. Approximately two hundred adults of the June brood were caged and the larvae from their eggs reared through to the first week in September. The larvae at this time were a velvety black in color, with distinct dorsal markings, and were very active.

#### LONGEVITY

The longevity of the adults has not been accurately determined. However, the females lived from two days to a week longer in the cages than did the males.

The work of definitely compiling the data necessary for a complete life history of this insect was begun on Sept. 22, 1930. At this time the golden-rod flowers were literally covered with the adults. They were gathered in quart fruit jars and taken

into the laboratory. The mating and egg-laying cages were then filled with fresh humus soil and a few golden-rod stems. Both types of cages were used. Fresh stems of golden-rod were added each day and the ground moistened. A duplication of field conditions was attempted at all times. The last appearance of the adults in this vicinity was October 13. There had been a gradual decrease from the first of October up to the final disappearance. Throughout the season they were in greatest abundance on the warm sunny days and less in evidence on the cool cloudy days. In fact the temperature had a decided effect on both the adults and the larvae as regards their activity.

During the year 1930 there was an abundance of adults during the June and September periods. However, the same periods for the year 1931 showed them to be less numerous.

#### Oviposition

On Sept. 22nd many of the adults were observed to be copulating but it was two days later before the writer noticed a female in the act of ovipositing. She pushed the tip of her abdomen down about five millimeters into the loose humus soil, preferably under the fallen leaves or flowers of golden-rod and deposited a mass of white eggs. The males died from two to three days after copulation but the females lived from two to seven days afterward. At no time did the female oviposit more than once, as checked by several individual cages with but a single pair in each.

#### Eggs

The eggs were pearl white in color; the average length

being three-fourths of a millimeter and the average width being one-half of a millimeter, the general shape being oval. The eggs were deposited in masses varying from sixty-four to one hundred twenty-four, an average of ten masses giving a count of ninety-four. These egg masses were transferred to the egg containers as described above. The eggs were held together by a sticky substance. Sufficient moisture was supplied at all times so the eggs would not dry out. In from twelve to thirteen days the eggs were quite yellowish in appearance and on the fourteenth day time white alligator-like larvae emerged. From notes taken on the June brood the egg stage was exactly eleven days. Not all the eggs hatched at the same time, the period usually extending over twenty-four hours. In some of the masses only a small percentage of the eggs hatched but that was the exception rather than the rule.

### Larvae

The first instar larvae were delicately white and alligator-shaped in appearance. The length was one and thirteen-sixteenths of a millimeter; width at the widest portion of the body, which was the prothorax, was six-sixteenths of a millimeter, the head being four-sixteenths of a millimeter wide and the last segment of the abdomen two-sixteenths of a millimeter side. The following description is given for the rest of the instars. Head shining rufous, with two black patches behind, transversely arranged, labrum retractile, dark colored, horny

and deeply emarginate with a central tooth, maxillary palpi four-jointed; labial palpi two-jointed, antennae three-jointed, the last joint very small; body rather flattened, of an opaque velvety brown color above, with a somewhat darker subdorsal line which is widened on the three thoracic segments; a very distinct lateral spiracle to every segment of the body except the anal one, making altogether eleven pairs of spiracles. Body beneath very pale brown, the dividing line between the darker and the paler shade of brown upon each segment being a semi-circular curve, with its concavity upwards; a moderate anal proleg.

#### Hibernation

When all the eggs of one mass were hatched the larvae were transferred, by means of the camel's hair brush, to the five types of larval containers which were now supplied with a small amount of fresh humus soil. Knowing that the larvae were predaceous, both from the literature and from actual observation on the June brood, the writer was much concerned as to what would happen with so many larvae in one container. It was a great surprise that the larvae, on being transferred, disappeared immediately beneath the surface of the dampened soil. On further examination, a few hours later, the larvae were found contentedly curled up in individual cells which they had made. Even though they were disturbed many times during the fall the larvae refused to eat and always disappeared again into some part of the soil and hollowed out another cell.

There was one egg mass that proved to be an exception to the rule. It was oviposited in the ground on September 26; and the eggs hatched on October 8. These went into hibernating quarters the same as the others but on being disturbed were much more active. They were observed to feed on soil water but refused to eat crushed aphids or crushed fruit flies. The larvae were observed to be rather lethargic in the afternoon of the twenty-third of October. On the morning of the twenty-fourth, while in the process of examining the various larval containers, this particular group was observed to be in the process of molting. This molt took place in the bottom of the watch glass underneath the soil. Fourteen of these second instar larvae were put in the fifth type of larval container and placed out of doors. The hole in the bottom of the container was plugged with blotting paper and the container filled about three-fourths full of fresh humus soil, a petri dish being placed over the top.

This container was buried out of doors to the top of the container. It was examined at various intervals throughout the winter and it was found that these larvae had made larval cells similar to those made by the first instars. They were never active except for a few warm days during March. At this time they appeared considerably larger than the first instar, though they maintained their delicate white appearance and alligator-like form. However, in all other groups the second instar larvae were always dark as given in the description. They fed

on soil water and organisms therein but refused to display any of their reputed ferocity on pieces of earthworm or crushed fruit flies which were presented to them. They completely ignored the meat. A few days later the weather turned cold and they curled up in the soil and remained inactive until April 14th. The following morning the larvae were a grayish color with two parallel rows of dark spots on the dorsum. On digging around in the soil molted skins were found. Even the second instar larvae had that peculiar habit of curling up when disturbed.

#### Feeding Habits

The feeding habits of these larvae varied to a greater or lesser extent. At the beginning of this work the literature gave the impression that these larvae were predaceous and ferocious in their manner of attack. Following these suggestions some plump curculio larvae were placed in with some first instar larvae. There was no predaceous reaction; rather one of extreme timidity.

Desiring to solve the problem several experiments were run. In a set of four containers vegetable coloring was added to the dampened soil as follows: red for container number one, yellow for container number two, blue for container number three, and green for container number four. In each were placed six larvae. The following day a careful check of the digestive systems of each of the larvae in these containers showed definitely that they had been taking in soil water in sufficient quantities to color their digestive tracts. Still, in another

set of containers six first instar larvae were placed on pieces of fresh beefsteak. At first the larvae were very timid but within a few minutes became very busy. They were observed for twenty minutes under a compound microscope in the process of feeding. They would place their mandibles in the juices of the meat and withdraw them as though in the process of taking material. At no time were the first instar larvae observed to feed on anything but liquid or crushed foods. They seemingly derive their sustenance from minute organisms in the soil or soil water. However, an instance has been recorded where the first instar larvae fed on the crushed bodies of young cotton aphids.

With the second instar larvae as well as the rest of the larval instars it was quite a different thing. The older the larvae the more vicious were they in their attacks. A second instar larva was observed to attack very viciously and feed for twenty minutes on a plum curculio larva. Even though its victim rolled and squirmed it did not loosen its hold. Apparently the larva only sucked the juice out of its victim.

The second and third instar larvae fed on such things as crushed aphids, cut-open earthworms, freshly killed syrphid larvae, crushed flies, and beetle pupae, particularly curculios. These larvae were not observed to attack anything which was wiggling. However, when they attacked a pupa or a larva they hung on tenaciously. The fourth and fifth instar larvae were observed to feed on aphids, syrphid larvae, flies which had



been killed, plum curculio larvae and pupae, cottonwood curculio larvae and pupae, cut-open earthworms, cutworm larvae and pupae, larvae and pupae of a pea moth, a dead coreid, and on dead nymphs of grasshoppers. The literature records such foods as: pickle worms and pupae, larvae of Phora aletiae, larger corn stalk borer, sugar cane borer, melon worms, plum curculio larvae and pupae, apple worms and pupae, aphids, cotton worms and their chrysalids.

In the fourth and fifth instars the larvae had ~~a~~ very definite burrows through the ground. They would ~~lie~~ in wait with their mandibles protruding a little or even with the burrow opening. When the prey was within striking distance the larva would fasten its mandibles into its victim. By holding the prey close to the hole a leverage could be maintained which assisted in the work of getting a meal. When the larvae were roaming over the ground, as they sometimes did, and found a victim the anal proleg was always used to an advantage. This was stuck to the side of the cage or some other solid object and used as a pivot in the handling of the victim.

In order to test the cannibalistic tendencies of the larvae ten of them were placed in a container. At the end of two weeks there were only three larvae left. As no food had been placed in with them and the remaining larvae were very active it is safe to assume that it was a case of the survival of the fittest. Being predaceous on the whole as they are, there is nothing to hinder them from being suspected of cannibalistic tendencies in

such cases.

A peculiarity observed in all the instars, excepting the first, was the habit of resting between feeding periods for a period of from a few hours to two days. The second instar larvae took the least time while the fifth instar larvae took as much as two days. During this period they would remain in their burrows or cells hollowed out just beneath the surface of the ground.

#### Number of Instars

The number of instars as far as this project went were five. The first instar was passed in hibernation. However, one group passed the winter in the second stadium. These larvae emerged October eighth and molted on the twenty-fourth. Thus giving a period of sixteen days in this stadium. In other cases the larvae were in this stadium only four days. Ecological factors, to a great extent, determined the length of each stadium. The extremes are several months during the hibernation period to only four days with mid-summer temperatures. However, no temperature records were run with this project.

The second instar larvae were much more active than the preceding one. The length of this stadium varied from one to two weeks. The larvae always hollowed out a cell in which to molt. They remained here from twenty-four to forty-eight hours before completing the molt. On emerging they were more distinctly marked and very active. The third stadium varied from three to four weeks. The larvae hollowed out cells as deep as

one and one-half inches below the surface of the ground and remained there from two to four days before emerging into the fourth instar. This stadium also varied from three to four weeks. With each molt the larvae became larger and the color markings more distinctive.

In the fourth instar there was a period of from eight to twelve days in which these larvae remained in their cells before emerging into the fifth instar. A week after emerging these larvae averaged twenty-two millimeters in length and were very active. The active stadium varied from two to three weeks but the inactive part lasted as long as four weeks. This stadium was not completed due to a moving of the larvae which resulted in their death.

There were some very noticeable differences between the larvae just previous to molting and immediately after molting. This one particular difference occurred from the second stadium through the fifth stadium. When the larvae emerged from their molting cells they were dark and very distinctly marked. As the skin became old and especially a few days before molting took place the markings became indistinct and the skin became very light in color.

Biological Notes on  
Chauliognathus marginatus Fabricius  
(Coleoptera, Cantharidae)

On March 7, 1933 two females and three males were collected in a field in Hidalgo County, Texas. They were placed in a quart jar half filled with moist sandy loam soil. Sunflowers were placed in there for them to feed on. In the afternoon of March 8 two pearl white egg masses were found. One mass contained one hundred and thirty eggs and the other contained one hundred and ten eggs. On March 18 tiny white alligator-like larvae emerged. They were not very active and soon curled up in cells made in the ground. Three days later they molted into grayish larvae. They were fairly active in the second instar and fed on partly decayed caterpillars, flies and earthworms. This instar lasted for seven days. On the fifth day the larvae curled up in cells again. Their second molt took place on March 28. In the third instar they were larger, velvety-black, and more active. However, they continued to feed on partly decayed caterpillars and grubs. On April 3 they molted again. In the fourth instar they attacked live prey and were very active. They had burrows throughout the cages in which they stayed. Eight days later, on April 11, the fourth molt took place. It was in the fifth instar that a larva was observed to be feeding on another of its own kind, thus proving they also have cannibalistic tendencies. On April 21 another molt took place. The larvae in the sixth instar were very active and vicious in their attacks on wood-borer larvae. On May 9 several of the larvae curled up in the burrows and on May 12 they

they pupated. Thus making a total of fifty-five days for the larval period.

#### Description of Pupa

Exarate pupa twelve millimeters long; light ivory color; eyes dark brown and prominent.

Four days later the pupae had changed to a light brown color. On May 17, five days after pupation, the adults emerged. Several of these were placed in a cage in which fresh flowers were added every day but they only lived ten days. They were never observed in the act of mating and never laid any eggs.

In working with both Chauliognathus pennsylvanicus and Chauliognathus marginatus the writer has observed that the life history of one runs parallel to the other. According to Winburn, T. F. and Painter, R. H., the larvae of Chauliognathus marginatus over-winter in small runways in the soil of their glass containers without food. At no time did the writer observe either Chauliognathus pennsylvanicus or Chauliognathus marginatus mating while in captivity, unless they were in the act when captured.

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