



Cotinus Nitida; the work of larvae on lawn of experimental station grounds at Norfolk, Va.

Battle with June Beetle— Foe of Fine Turf

By B. R. LEACH

IN THE territory lying south of a line drawn from New York City due west to the Mississippi River the June beetle is the one insect pest which has a pronounced tendency to cause gray-headedness among the greenkeeping fraternity. This area is the home of the June beetle and it causes as much damage to golf courses in the southeast as any other two turf pests combined. Inasmuch as the annual period of turf injury by this grub is rapidly approaching and but little margin of time remains for the application of remedial measures it would seem advisable at this time to discuss the habits and life-history of the insect, turf conditions which affect it favorably and adversely, and lastly, but not least, methods of control in fine turf.

The adult beetle measures a little less than an inch in length and approximately one-half inch in width. The head of the beetle is metallic green, the back a velvety green and the under portion of the body a brownish green. It makes its appearance above ground about the first week of July in the latitude of Louisville, Ky., and as early as the last week of June at Columbia, S. C. South of these locations

their appearance is proportionately earlier and toward the North the date of emergence of the adults is proportionately later.

Shortly after emergence the beetles mate and the females begin laying eggs in the soil, these hatching ordinarily in two or three weeks. The young grubs grow rapidly and continue to feed until cold weather sets in, by which time they are at least two-thirds grown. During the cold portion of the year they remain dormant at the bottom of their burrows which may be as much as two feet below the surface, although in the South they may come up to feed during warm spells in the winter. Active feeding begins again in the spring and continues for a short time, at the end of which the grub undergoes certain changes and transforms to a beetle. The life-history of the June beetle is shown diagrammatically in Fig. I. (All plates and photographs in this article were obtained from the U. S. Bureau of Entomology.)

Grub Is Greedy

When the grub of the June beetle hatches from the egg it feeds on the organic matter of the soil in the immediate vicinity for a short time and soon comes

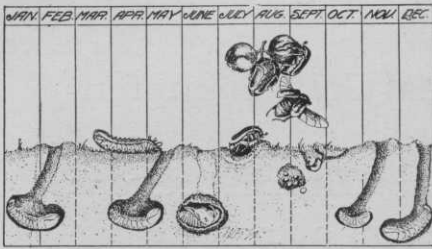


Fig. 1—Diagrammatic picture showing life history of green June beetle. (Walton del.)

up near the surface as shown in the diagram. Here it constructs a small burrow which gradually becomes deeper as the grub increases in size and strength. The purpose of this burrow is undoubtedly that of securing protection from birds and other enemies which loiter on the surface of the soil during the day time for during that period of the 24 hours the grub usually stays at the bottom of the burrow and comes up at night to feed and to void the contents of its lower intestine.

Contrary to the opinion of many, the grub of the June beetle does not feed on grass roots. Rather it feeds on the organic matter of the soil in which the grass roots are growing and injury to the turf is caused by the burrowing and tunneling which the grub continually does in its pursuit of food. This tunneling, and especially the tunneling of the young grub just under the surface of the soil, is its one weak trait in an otherwise pretty sound scheme of existence, and the trait which I have capitalized in using arsenate of lead as a measure for its control. This phase of the problem will be discussed at greater length under the discussion of control measures.

Inasmuch as the food of the grub of the June beetle consists of organic matter,



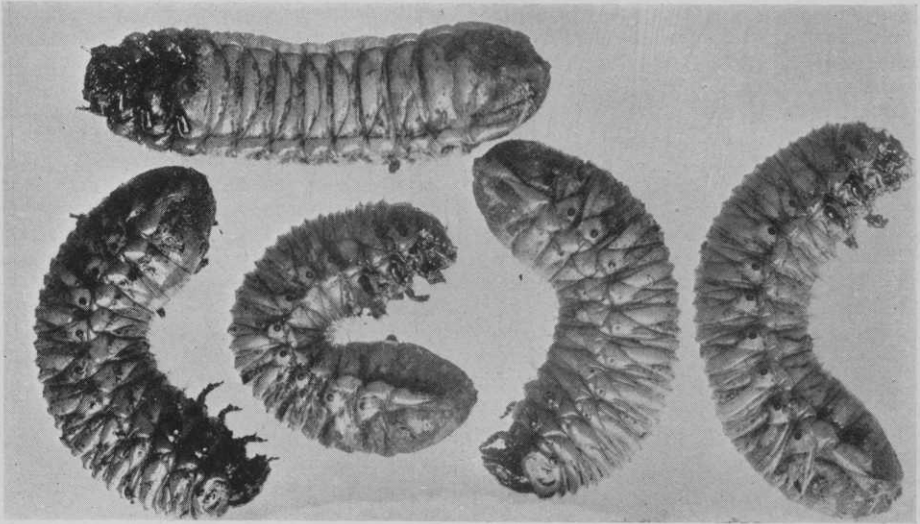
Fig. 2.—Distribution of green June beetle in the United States

with a special fondness for rotted manure, it follows that the beetle, in laying its eggs, is naturally drawn to soil situations where organic matter of this nature is present in the soil in ample amounts. Greenkeepers in the South, and especially the seasoned members of the brotherhood, are fully aware that the heavy manuring of the turf of a golf course invariably results in the subsequent heavy infestation of the manured turf by the June beetle. Consequently, in past years, they have been between the devil and the deep blue sea. If they manured the turf they had good grass and it stayed good until the June beetle got busy and ruined it. If they didn't manure the turf the grass was poor.

A typical experience with the June beetle, and all the misery it is capable of causing, occurred at the Pine Valley Golf club some years ago. This course, located on the edge of the pine barrens in New Jersey, is built on an almost pure sand. When the course was built and for some time after, large amounts of manure were used in order to enrich the weak, sandy soil, the motive of course being a good one. Everything went well for a year or two and then the June beetle began to become decidedly numerous until it ultimately almost ruined the course. In other words, here was a combination of circumstances and conditions, which through nobody's fault in particular, gave the June beetle an ideal set of soil conditions in which to increase and multiply, for there is no condition more desired by this grub than a light, well drained soil, well supplied with organic matter and particularly if the latter is of an animal origin.

Grub Baffled Them

Some cryptic comment on the situation at Pine Valley during those years, from the pen of Mr. Alan Wilson, can be found in some of the back numbers of the Bulletin of the Green Section (1921 or 1922). They tried all known methods of controlling the grub but with little success. They simply had to stand by, abstain from the use of animal manure, and wait for the grub infestation to work itself out. This gradually took place as the organic content of the soil burned itself out. For a year or two prior to 1928 the grub had not been seriously bad at Pine Valley although there were plenty of them present on the course. In 1928 they began the use of arsenate of lead on the greens and



June beetle grubs full grown

fairways for the control of both the June and Japanese beetles, and if this treatment is maintained it is very improbable that grubs will ever again be a problem with them. This in spite of the fact that they are again using adequate amounts of manure for the top dressing of greens and fairways. In the absence of the arsenate of lead method of control of the June beetle grub it would have been interesting to see how long a course such as Pine Valley, built on nothing but sand, could have endured without the liberal employment of animal manure.

As stated above, the grub of the June beetle is not a feeder on the roots of turf. The injury is caused, first by the tunneling of the grub just under the surface of the soil during which operation it loosens the individual grass plants of the shallow-rooted, closely cropped turf causing the ground to become unduly loose and porous to such an extent that the upper soil layer has a pronounced tendency to dry out thereby killing the turf. The second type of injury results from the mounds of soil which they are constantly throwing up at the mouths of their burrows. These mounds may be best described as comparable to greatly enlarged anthills. In addition to roughing up the turf beyond almost all hope of redemption these mounds smother the grass immediately beneath unless they are promptly leveled.

There have been many suggestions for

the control of the June beetle advanced from time to time, but they have never really furnished an answer, at least from the standpoint of golf course maintenance. It is all very well to advise the discontinuing of applications of manure to turf in those sections of the country where the June beetle is present in large numbers, but this is not really an answer because manure is necessary for the growth of fine turf grasses.

The injection of liquid carbon disulfide



The June beetle

into the mouths of the burrows is frequently found recommended for the June beetle and it is effective within the limitations imposed by squirting the liquid into the thousands of burrows present when there is a real infestation of the June beetle to contend with. Furthermore the carbon disulfide has a tendency to burn the turf in the immediate vicinity of the spot where it is injected into the soil.

Many clubs in the South have made a practice of hiring the caddies and other individuals to collect the beetles and grubs on the course during the June beetle season in an effort to decrease the injury to the turf. For several reasons it is rare for value to be received for the money expended in a campaign of this sort. The vast majority of the adult JUNE BEETLES collected on the course during the daytime are *males* and there is nothing gained by collecting them because they have not as yet learned to lay eggs. The female beetles hug the ground as soon as the sun rises or shortly after and go about their business of egg-laying. Gathering grubs is also of rather doubtful value as far as insuring smooth, unpitted turf is concerned because a considerable bulk of the damage to the turf is already accomplished before the grubs are large enough and conspicuous enough to be readily detected and captured. Furthermore no matter how assiduous a collector of grubs you may be you never get more than a certain proportion of them in a given area of turf.

Arsenate of Lead for June Beetle Control.

When I was carrying out the experimental work on the control of the Japanese beetle grub by means of experimental plats at the Riverton (N. J.) Country club it was interesting to watch what happened when a June beetle grub wandered into the plats treated with arsenate of lead. It never made but one burrow and one mound when it hit the arsenated soil. The next day if one explored the burrow the grub would be found at the bottom either sick and flabby or in the first stages of decomposition. In other words, in making its burrow it got a dose of the poison and succumbed. Please bear in mind that these were large, well-grown grubs which are much more difficult to poison than are the newly hatched grubs.

With most clubs in the June beetle

area the maintaining of the greens free from injury by this pest is all that is desired and only the ultra de luxe golf clubs are desirous of protecting both the greens and fairways. Under the circumstances the methods of grubproofing turf as described in my previous articles in GOLF-DOM should be followed for the control of this grub, namely, five pounds of arsenate of lead per 1,000 square feet of turf, the powder to be mixed with a quantity of soil or sand scattered over the turf. This dosage has given adequate control of the June beetle at the Riverton club where in past years it frequently played hob with several of the greens each year.

The soil on this course is of a sandy nature and the arsenate of lead readily penetrates into the soil for a short distance. In soils of a clay nature it may prove advisable to use 10 pounds of arsenate of lead per 1,000 square feet of turf, applying the poison in two separate applications of five pounds each about a month apart. This will undoubtedly give the greater tendency for the arsenate to work into the more dense clay soil and insure a better mixture in the upper half inch or inch soil layer. If you are not already applying arsenate of lead with the topdressing as a regular part of the treatment of the greens the arsenate should be applied, in the case of the 5 pound dose, as soon as the June beetle's adults are observed flying about the course. If you plan to use the 10 pound dosage apply the first five pounds a month before the appearance of the beetles as near as you can estimate from the experience of former years and the second five pounds as soon as the beetles make their appearance. The above dosage applies also to fairways in case you wish to render them proof against the ravages of this grub.

In arsenating greens for the control of this grub it is absolutely useless to limit the arsenating to the green proper, since the grubs will be plentiful in the soil just outside the closely mown green and as soon as they attain any size they will begin to migrate into the green and throw up mounds until they begin to get the poison and these mounds are enough to ruin the green for the balance of the season.

In order to protect the green from all danger of tunneling and burrowing it is absolutely necessary to grub proof the least a distance of 25 feet while 35, and even 50 feet, is better. Remember that

these grubs are capable of traveling relatively long distances on their backs and the idea is to have sufficient poisoned soil around the grub so that a grub traveling toward the green is poisoned long before it ever attains its goal. If there are any steep banks around the greens watch them closely as the arsenate has a tendency to wash off these steep slopes and more frequent applications of the arsenate are necessary on these slopes.

In next month's article I propose to begin the discussion of weed control in fine turf.

A Correction

Since the publication of my article in June GOLFDOM dealing with the control of earthworms in turf it has been drawn to my attention that the dosages of Mowrah meal and bichloride of mercury as recommended in that article are incorrect.

Further investigation into the matter would indicate that the dosages of these two materials as recommended in the article are not so much incorrect as they are out of date.

The present recommendations for bichloride of mercury for worm control when applied in the liquid form consist of two to three ounces of the bichloride dissolved in 50 gallons of water and applied to 1,000 square feet of turf. When applied in the dry form two to three ounces of the chemical are mixed with sand or soil and applied evenly to 1,000 square feet of turf.

As regards Mowrah meal the present dosage consists of 15 to 20 pounds of the meal applied to 1,000 square feet of turf, which in view of the present low prices of this material is far from being expensive as a worm control agent.

Another fact which I neglected to mention in the June article in connection with the use of bichloride; avoid the use of the material during the hot season. It is better to do the job of worm eradication with this compound in the spring or fall.

Some Tips from MacKenzie

DR. A. MACKENZIE, noted golf architect, makes the following suggestions and comments on design and maintenance of courses:

"Remember that golf is a game and that no player ever gets any fun in searching for lost balls."

"Cut the fairways and greens in the

irregular curves of nature, and not in straight lines."

The cost of the best advice is infinitesimal compared with the amount of money frequently wasted without it.

"Never follow the advice of a golfer, however good a player he may be, unless he is broad minded enough to disregard his own game and recognize that not only has the beginner to be considered, but also that a very high standard of golf architecture improves everyone's play."

Golf course construction is a difficult art (like sculpture) and still in its infancy. Endeavor to make every feature indistinguishable from a natural one.

Most courses have too many bunkers. They should be constructed mainly from a strategical and not from a penal point of view.

Fiercely criticized holes often improve the standard of play and ultimately become most popular.

Never destroy undulations, hazards, or other features because at first sight they may appear to be unfair. Their destruction may detract appreciably from the strategy, interest and excitement of the game.

Never alter a hole unless you are convinced that the change will increase the joy and the thrills of overcoming difficulties.

"The best golf courses are those, the holes of which have been designed and constructed to conform to the character of the ground at one's disposal."

To attempt to copy a famous hole where conditions are dissimilar is usually fatal.

HAVE you noticed that along about now the stores are featuring cut prices on golf goods? Why not check up on some of the stock that you have carried over for a season or two and mention to some of your members that these clubs may be had at reduced prices? Be frank about it; Say you don't know why the clubs don't sell, they're good quality, etc., and to move them you are putting a bargain price on them to members who have been good customers of yours.

IT SEEMS to us that the department stores sell far more high priced bags in the proportion to the pro shops than they sell high priced clubs. The stores are not embarrassed about asking "fancy" prices for fancy bags.