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The Childers Cane Beetle



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THE CHILDERS CANE BEETLE.*

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THE Childers Cane Beetle is a native scrub-land pest, which, since the destruction of the original scrub timbers and the cultivation of sugar-cane on these lands, has found a new set of conditions which have proved almost ideal for its development and multiplication, and it now ranks as the chief sugar-cane insect pest in Southern Queensland. Its main centre of occurrence is in the Isis district, but it also does considerable damage to cane at Goodwood, Bingera, Gin Gin, Bucca, and in the Woongarra district. It has been known as a serious pest for the past forty years, but the extent and severity of its infestations has now apparently reached a state of partial equilibrium, which, in a large measure, is dependent on weather conditions and to a lesser degree on the carrying-out of certain beneficial farming practices by the growers themselves. In the Isis district, the area destroyed by this pest varies between 100 and 300 acres yearly. In all of the localities mentioned above it is confined to the chocolate, red, and lighter coloured scrub soils, which are mainly of volcanic origin.

In order to deal with this pest intelligently, it is necessary to be acquainted with all phases of its life history, and the following brief description is typical of the habits and stages entered into by this insect during its cycle. (See Plate I., Figs. 1 to 6.)

Life History of Pest.

The beetle is of a light to reddish brown glossy colour, approximately $\frac{3}{4}$ to $\frac{7}{8}$ of an inch in length, and it may frequently be found flying around lights during its flying period. The flight takes place in November or December, after the first heavy soaking rains which usually fall during those months. The beetles emerge soon after dusk, and fly around for upwards of an hour or more. Mating takes place soon after they emerge, and after the flight the beetles re-enter the soil to deposit their eggs. This they often do near to their original points of emergence, and in this way "grubby" patches persist in practically the same fields year after year. Eggs are laid a few days later at depths varying from 10 to 20 inches, the eggs being placed singly in the soil. After an interval of about three weeks, these hatch out, and the resulting grubs commence to feed on the decaying organic matter contained in the soil. As these grubs increase in size, they go through three distinct stages or periods of growth. It is rather curious that

*The scientific name of this insect is *Pseudoholophylla furfuracea* Burm.

CANE GRUB (*P. furfuracea*).

(Description of Plate I., page 3.)

Fig. 1—Egg x 4.

Fig. 2—1st stage larva x 2.

Fig. 3—2nd stage larva x 2.

Fig. 4—3rd stage larva x 2.

Fig. 5—Pupa x 2.

Fig. 6—Adult x 2.

Fig. 7—Female antenna x 6.

Fig. 8—Male antenna x 6.

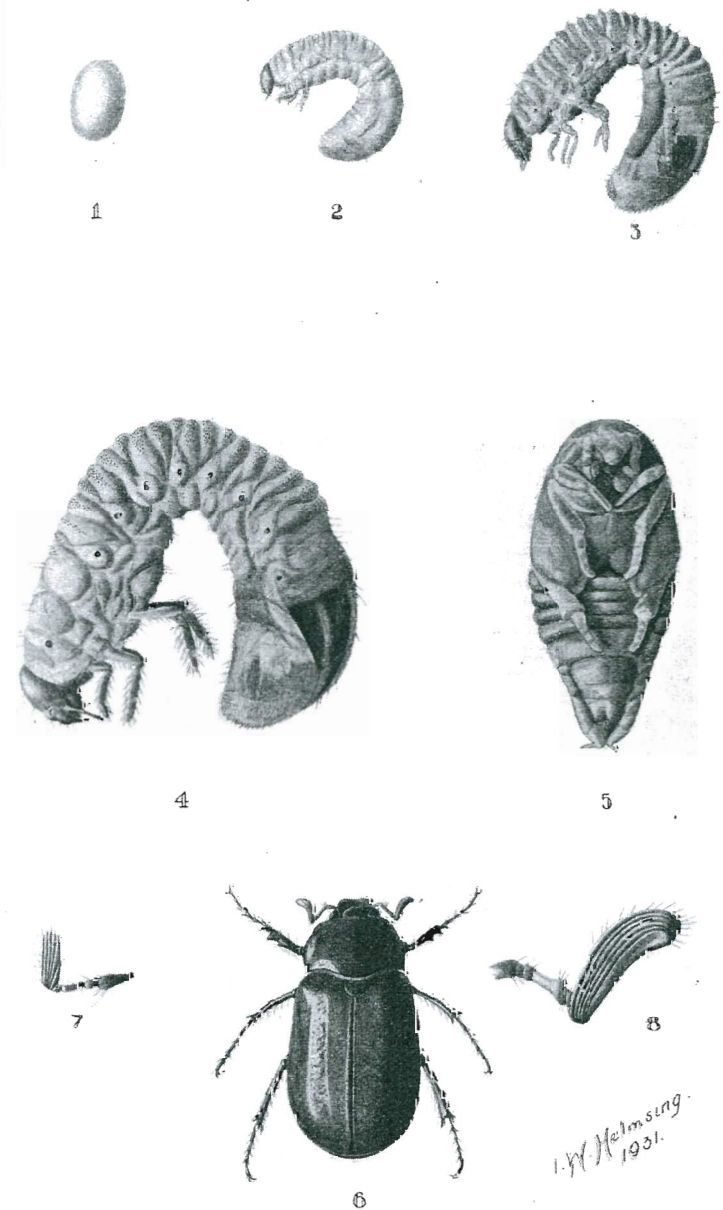


PLATE I.

(For description of Plate I. see page 2).

L. W. Helmsing
1931.

throughout each particular stage the width of the grub's head remains constant, and does not grow in proportion to the remainder of the body. After each moult, however, the head is found to have increased in size, and by measuring the size of the grub's head we are able to determine its stage of growth. For instance, the width of the head of first-stage grubs is $\frac{1}{12}$ th inch, that of second-stage grubs $\frac{1}{6}$ th inch, and that of third-stage grubs $\frac{1}{4}$ inch. The first stage occupies the period from the date of hatching (January) until March or April, when grubs moult and enter on their second stage. Soon after this moult, these second-stage grubs commence to feed again, and they continue feeding until about September, when, by a similar process of moulting, they change to the third or last grub stage. In this stage their rate of feeding increases enormously, consequently from October onwards damage to cane begins to be most noticeable. Feeding continues throughout the summer months until the grubs become full-fed in the following March or April, when they commence to retire to depths of 18 inches or more in the soil. At this depth they form earthen cells, and after a dormant period of several months the change to the pupal stage ultimately takes place in September and October. The pupal stage lasts approximately one month, and beetles are ready to fly in November and December, thus completing their life cycle in two years.

During wet weather grubs are usually found near the surface of the ground, but as the soil dries out they retire to greater depths. They also retire deeper when they are about to moult, returning later to positions near the surface when they resume feeding. As there is a considerable overlapping of the various stages (for instance, third-stage grubs being often found prior to the winter months, July and August, and second-stage grubs as late as December) the period of moulting is very protracted and irregular. Consequently for many months of the year grubs are to be found at depths varying from one to eighteen inches or more below the surface, and it is this uneven distribution of grubs in the soil that makes the control of this pest such a difficult problem.

A rather peculiar characteristic exhibited by this beetle is the fact that male specimens are strongly attracted by artificial lights, whilst little or no attraction is exhibited on the part of the female beetle. For this reason, the collecting of beetles from light traps as a control measure, has been abolished, since it was shown that the number of females caught was approximately only 1 per cent. of the total number so trapped.

Damage.

The grub stage is the only stage in which these insects cause damage to cane. This they do by eating off the roots, thus depriving the plant of its normal food supply. Stools so affected put forward little or no new growth, and at the same time turn yellow and remain in this stunted condition for months. They may even die out completely, according to the severity of the infestation. This damage usually occurs in the spring and summer months, and the grubs tend to concentrate in patches, rather than to evenly infest a field of cane. On this account, growth in the infested areas is most irregular, and a good stand of cane 5 to 6 feet high may, in the same row a few yards distant, give place to small, stunted stools yielding no millable cane. In other instances, sets may be destroyed by grubs burrowing into them from the cut ends, or ring-barking them at the nodes, necessitating the replanting of the sets so destroyed.

Control.

The measures adopted to control this pest naturally fall under three main divisions—viz., (1) Normal cultural methods, (2) Encouragement of natural enemies, and (3) The use of soil fumigants. From our experience, it appears that a sensible combination of two or three of these practices must be employed, rather than to rely solely on one method for complete control. Further, on account of the comparatively high cost of soil fumigation, and the fact that complete success by this method is more or less governed by favourable weather conditions, its use should be resorted to only in extreme cases; and growers are urged to give due attention to their cultural operations with a view to checking as much as possible the natural increase of the pest, and preventing its establishment in areas now free from attack.

(1) Normal Cultural Methods.

Normal Cultural Methods and arrangement of cropping programme to be used in areas subject to grub attack:—

Try to carry out all ploughing or the greater part of such work in the spring and summer months when grubs are located near the surface. Where grubs are plentiful, ploughing should be done with a single-furrow plough, and boys should be employed to hand-pick any grubs that may be exposed in the furrows. When it is necessary to plough out old ratoons on account of grub damage, it is often more advantageous to cut the stools up first with a rotary cultivator, and then to follow up this operation by ploughing out with a single-furrow plough. The rotary cultivator kills about 50 per cent. of the grubs that are present in the top 3 inches of soil, and at the same time divides the stool up into small pieces, whereas if a plough be used in the first instance, the stools are turned over in huge pieces, and the grubs, being found well up underneath the stools, can only be collected with difficulty. In the final ploughing, the number of grubs collected should amount to less than 4 quarts per acre, and then the land may be considered reasonably clean and safe to plant.

Avoid spring planting in areas that have been grub-infested a year or two previously, for it is under such conditions that "ringbarking" of the sets takes place. It is a better plan to make sure that the land is thoroughly clean, and to plant in late summer or autumn.

In the presence of grub infestation, ratooning should not be carried on beyond the second ratoon crop. Old ratoons often show severe grub damage, and they act as centres from which infestation spreads to surrounding fields of cane.

Avoid ploughing out and replanting immediately afterwards. This practice imposes a very small check on the pest, and invariably the young plants are killed soon after they "strike." Hence "misses" have to be supplied later, and this results in a very poor plant crop. In addition the ratoons usually yield light crops, and at the same time conditions have been made most favourable for an increase of the pest. It is a better plan either to allow the land to fallow with ploughings every two months, or to plant a crop of quick-growing cowpeas, which should be ploughed under before the beetle flight in November. In addition to benefiting the following crop by supplying nitrogen to the soil, the ploughing in of green manure crops makes the soil moister and warmer. As a result the grubs will be found nearer the surface, and

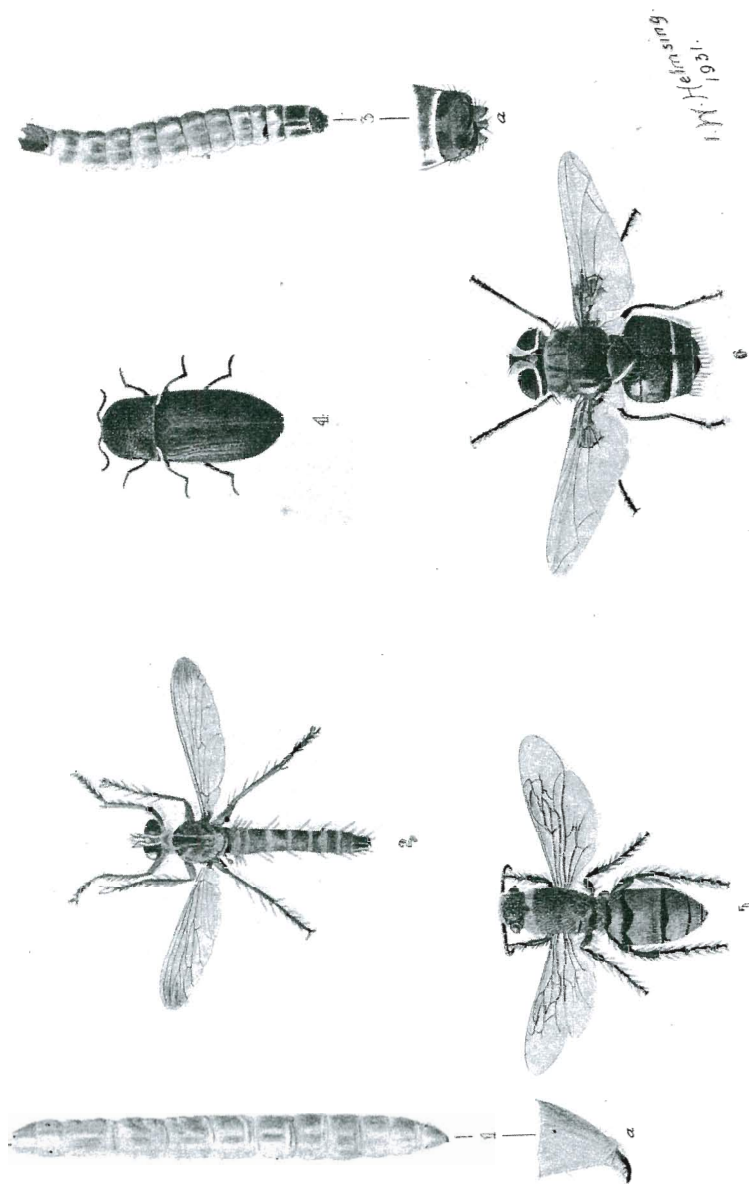


PLATE II.

(For description of Plate II. see page 7.)

are more readily accounted for, either by hand-picking, or by fumigation later should this latter method become necessary.

When steam ploughing and subsoiling is to be carried out in grub-infested areas, this operation is best conducted during August and September of the year when the pest is due to change to the beetle stage. During these months, many grubs and pupæ are in a helpless condition in their earthen cells, and they will be either destroyed or they will emerge as cripples if the cells are damaged by large tines of these implements as they pass through the soil.

The practice of allowing cane to stand over (unless it be the last crop previous to ploughing out the cane) should not be encouraged on account of the tendency on the part of the female beetles to fly to these fields to deposit their eggs. It is also inadvisable to have dense standing crops of legumes or weedy fields during the fighting period of the beetle, since this mass of vegetation attracts the female beetle to it for the purpose of egg-laying. Every effort should therefore be made to have all cowpea crops, &c., ploughed under before mid-November.

(2) The Encouragement of Natural Enemies.

This pest, both in its grub and beetle stages, is the prey of a large number of natural enemies, but despite the check received from their combined activities, it is still present in sufficient numbers to cause damage. In certain restricted localities, however, beneficial insects keep it in complete control, and as the preservation of these insects is of the utmost importance, a few brief notes are here appended with a view to familiarising growers with some of their insect friends.

Robber Flies (See Plate II., Figs. 1, 1A, and 2).—Perhaps the most important natural enemies of the grubs are the maggots of the Robber flies, several species of which occur locally. They are long cylindrical milky white maggots, and they measure about $1\frac{1}{2}$ inches in length when full grown. At one extremity there is a sharp beak-like process with which the maggot attaches itself to a grub and quickly sucks its body fluids. Having killed a grub in this manner, it leaves it and soon seeks another victim, and in this way dozens of grubs are killed before the Robber fly maggot becomes full grown. These insects have been a big factor in keeping grubs under control in the Woongarra district during the past few years.

Digger Wasps (See Plate II., Fig. 5).—In certain years, digger wasps contribute greatly towards the control of the grub pest, and they

PARASITES AND PREDATORS.

(Description of Plate II., page 6.)

- Fig. 1—Larva *Neoaratus* sp. x 2.
- Fig. 1A—Head of larva *Neoaratus* sp. x 5.
- Fig. 2—Adult *Neoaratus* sp. x 2.
- Fig. 3—Larva *Lacon assus* Cand. x 2.
- Fig. 3A—Head of larva *L. assus* Cand. x 5.
- Fig. 4—Adult *Lacon assus* Cand. x 2.
- Fig. 5—*Campsomeris tasmaniensis* Sauss. x 2.
- Fig. 6—*Rufilia* sp. x 2.

are considered as being another highly important natural enemy. These wasps are often seen visiting nectar-bearing flowers or flying low over grub-infested soil. Having located a grub in the ground, the female wasp stings it, thus causing the grub to become paralysed, and it then lays an egg on the grub's body. The wasp maggot which hatches out from this egg soon proceeds to consume the grub. One Digger wasp is capable of killing about sixty grubs, but unfortunately these wasps are kept in check by enemies of their own, and therefore their efficiency as grub parasites is greatly reduced.

Wireworms (See Plate II., Figs. 3 and 4).—The species of wireworm found in the red soils in conjunction with cane grubs actually kills grubs, and must not be confused with another harmful species found in wetter land, where it enjoys the evil reputation of injuring the buds and shoots of newly planted sets. The former wireworm is about one inch in length, cream coloured, with a hard, dark reddish-brown head and tail plate. It disposes of grubs in a manner somewhat similar to that of robber fly maggots.

Bandicoots.—These animals have very keen powers of locating grubs under cane stools, but they do a great amount of damage in gnawing off the roots when they are trying to reach their prey, and their burrows tend to dry out the stools very quickly. In this way the damage they occasion more than offsets the good they do in killing grubs. However, their burrows are usually a good indication that grubs are present, and once the grower is possessed of this knowledge he can take suitable precautions to get rid of the pest.

Birds.—Crows and ibises follow ploughs and eat any grubs that are exposed in the furrows, and they perform a great service in ridding a field of these pests. Mynah birds and peewits similarly eat grubs, but in addition they eat a large number of valuable parasites, and it is doubtful whether they are of any real value against this pest.

Diseases, &c.—Fungous and bacterial diseases often kill large numbers of grubs, and grubs killed by these agencies should be allowed to decompose in the soil, so as to promote the further spread of these diseases when conditions again become suitable.

Frogs, toads, trap-door spiders, hunting beetles, fly parasites, and ants all prey on the beetle stage, but their combined control is only small.

(3) The Use of Soil Fumigants.

The principle of soil fumigation against cane grubs involves the liberation in the soil of toxic fumes, which quickly overpower and kill all grubs within a certain radius and depth from where the fumigant is injected. Soil fumigation against this pest is intended chiefly as a means of checking small outbreaks of grubs in otherwise clean fields of plant and first-ratoon cane. Where larger areas become infested in older fields of cane, these grubs are best dealt with by ploughing out and hand-picking the grubs. Since both soil fumigants (i.e., carbon bisulphide and paradichlorbenzene) which we commonly use have a decided check on plant growth, it is not recommended to treat young plant cane less than 3 feet high with these fumigants, and provided the precautions previously mentioned under cultural methods have been taken to ensure the land being free from pests in the first place, it should be unnecessary to fumigate plant cane in its early stages of growth.

The chief fumigant used is a mixture of paradichlorbenzene and carbon bisulphide, 30 lb. of the former crystals being dissolved in enough carbon bisulphide to fill a 5-gallon drum. Lately another fumigant called liquid dichlorbenzene has come into use. This fumigant contains a large percentage of orthodichlorbenzene, and it is mixed in the proportion of 1 gallon of liquid dichlorbenzene to 2 gallons of carbon bisulphide. It is cheaper and easier to handle than paradichlorbenzene, but it appears to be slightly more toxic to plant growth.

The mixed fumigants are injected into the soil by means of a Dank's or a Vermorel Excelsior Injector, the dosage being applied to each side of the cane stool, at a depth of approximately 4 inches. The depth is variable and depends on the depth at which the grubs are feeding, the object being to deliver the dose in line with or just above the position where the majority of the grubs are located. This depth is usually ascertained by trial diggings before commencing the work of fumigating. When treating large stools it is necessary to make three injections triangulantly around the stool, and in certain cases four injections will be required. The usual dosage is about one-eighth to one-sixth of a fluid ounce, or No. 7 and No. 8 dose on the Dank's injector, according as plant or ratoon cane is to be fumigated, and depending also on the condition of the soil.

The main grub damage begins in October and extends onwards into January and February: and to prevent grub damage it is necessary to fumigate before or, at the latest, just after the first signs of the attack are noticeable. To get the best results from fumigating, the soil should be in a nice moist, loose condition, so that the fumes will penetrate easily, and the grubs should preferably be within the top 10 inches of soil. If the soil is too wet, the spaces between the soil particles become filled with water, thereby preventing the ready passage of fumes, and resulting in a low percentage of deaths. If too dry, some grubs are located at depths beyond reach of the fumigant, and they also escape.

When storing and using carbon bisulphide, care should be taken not to smoke or bring a lighted match near the fumigant on account of the danger of explosion and fire. For this reason the shipping and railway freights are high on this product, and under these circumstances it is preferable that a large consignment should be purchased by some growers' organisation or other responsible body. In addition to their benefiting by the reduced price, individual growers then have the advantage of being able to purchase the fumigant when it is actually required by them. In this way carbon bisulphide can be obtained at approximately £2 4s. per 5-gallon drum, and liquid dichlorbenzene at £2 8s. per cwt. This makes the cost of fumigants approximately £3 12s. per acre, to which must be added the cost of labour for injecting.

Acknowledgment.

The illustrations depicting the various stages of the grub pest and its parasites are the work of Mr. I. W. Helmsing, and the writer wishes to thank Mr. R. Veitch, Chief Entomologist of the Department of Agriculture, for his ready co-operation in making available Mr. Helmsing's services for the preparation of these excellent plates.