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QUEENSLAND.

BUREAU OF SUGAR EXPERIMENT STATIONS.

DIVISION OF ENTOMOLOGY.
BULLETIN No. 5.

Notes on the Habits and Metamorphosis
of *Lepidiota frenchi*, Black.,

BY

EDMUND JARVIS,
Entomologist.



1917.

BRISBANE:

By Authority: Anthony James Cumming, Government Printer.

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Bureau of Sugar Experiment Stations,

Brisbane, 28th September, 1917.

The Under Secretary, Department of Agriculture and Stock, Brisbane.

SIR,—I have the honour to recommend for publication, as Bulletin No. 5 of the Bureau of Sugar Experiment Stations, “Notes on the Habits and Metamorphosis of *Lepidiota frenchi*, Black.,” by Mr. Edmund Jarvis.

I have, &c.,

HARRY T. EASTERBY,
General Superintendent.

Approved: E. G. E. SCRIVEN, Under Secretary.

Notes on the Habits and Metamorphosis of *Lepidiota frenchi*, Black.

INTRODUCTION.

THIS interesting insect, although less harmful to cane than our grey-back cockchafer, is perhaps equally well known to growers in the Cairns district; and may, indeed, be considered as ranking second in economic importance among the Scarabacidae affecting sugar-cane in Northern Queensland.

As mentioned in a previous report, *Lepidiota frenchi* feeds habitually on the roots of native cereals and other herbaceous plants, but has already acquired a liking for cane.

A decided outbreak of this pest occurred at Meringa during April, 1917, when 186 second-stage grubs were collected in a few hours from 50 chains of furrow whilst ploughing red volcanic land; representing about 2,418 grubs per acre, or 0.85 to each stool of cane.

In view of its near relationship to our notorious grey-back cockchafer (*Lepidiota albohirta*, Water.), its excessive abundance, the varied nature of its dietary, its common occurrence in canefields, and evident liking for cane roots, the Bureau of Sugar Experiment Stations has thought it advisable to issue a Special Bulletin dealing with the life-history and economy of this insect.

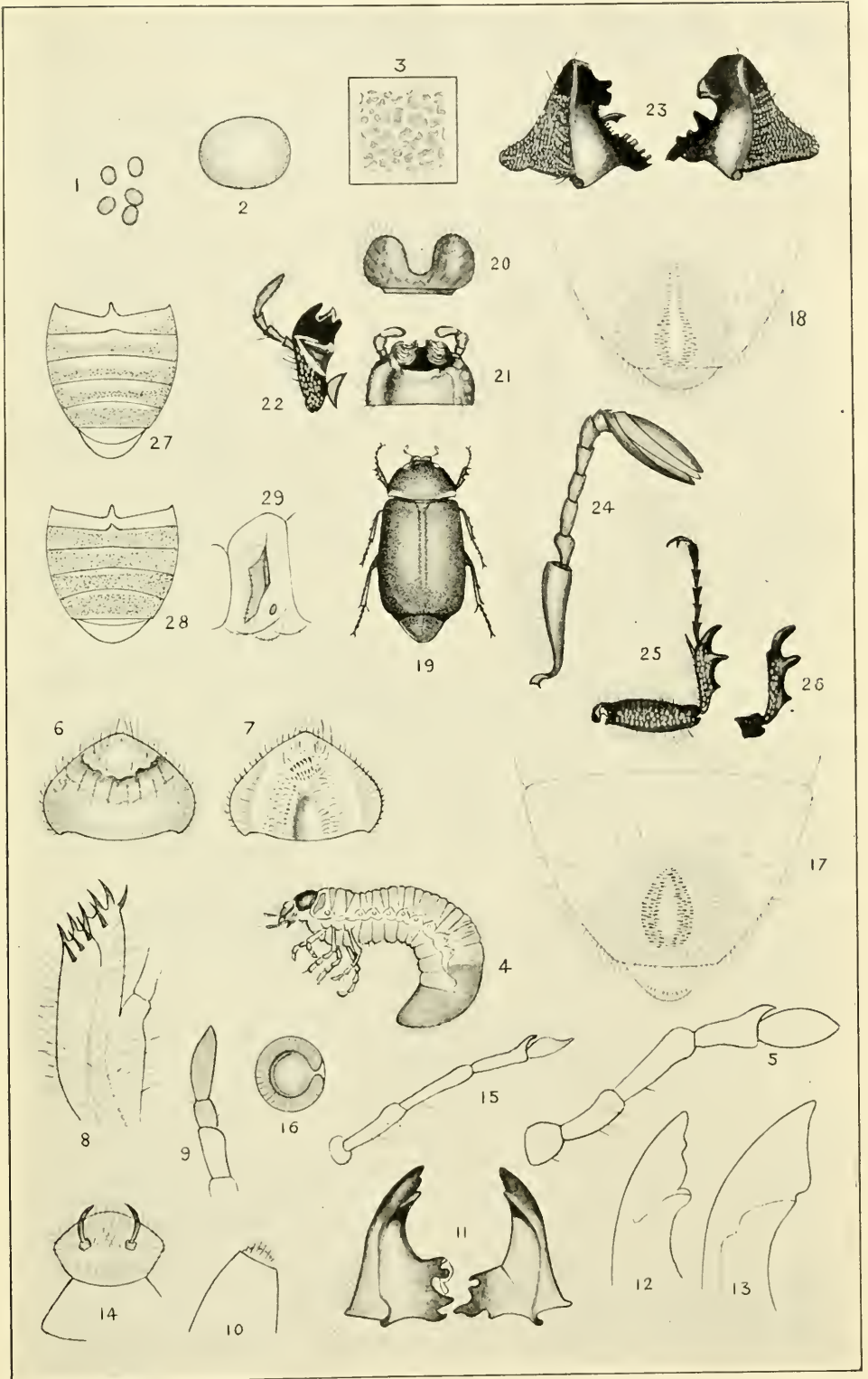
The author's illustrations are designed to admit of the beetle in question being readily identified, and, at the same time, will enable entomologists to separate it from a closely allied scarabaeid figured in Bulletin No. 3 of this Office (*Lepidiota*, No. 683 in our collection) which some coleopterists consider to be identical with *frenchi*, but, in the writer's opinion, presents slight structural and other differences sufficiently marked to entitle it to rank perhaps as a separate species.

My thanks are due to Mr. A. M. Lee, Entomologist at Adelaide National Museum, who in 1915 very kindly examined several specimens of this common melolonthid infesting our canefields, which he at once identified as being *Lepidiota frenchi*, Blackburn. I may say that Mr. Lee is inclined to think that possibly our *Lepidiota* No. 683 may belong to a large "race" of *L. frenchi*, Black.

DESCRIPTION OF PLATE.

All Drawings Original.

- Fig. 1.—Eggs of *Lepidiota frenchi*, Black., natural size.
 Fig. 2.—Eggs of same, magnified about 5 times.
 Fig. 3.—Portion of sculptured surface of egg, highly magnified.
 Fig. 4.—Grub of *Lepidiota frenchi*, Black., Stage III., nearly full size.
 Fig. 5.—Antenna of Stage I. grub of same, $\times 25$ times.
 Fig. 6.—Outer surface of labrum (upper lip) of Stage III. grub of same, $\times 25$ times.
 Fig. 7.—Inner surface of labrum of same, $\times 25$ times.
 Fig. 8.—Portion of maxilla of same, $\times 16$ times.
 Fig. 9.—Maxillary palpus of same, $\times 26$ times.
 Fig. 10.—Extremity of maxillary palpus showing apical tuft of papiliform setæ, highly magnified.
 Fig. 11.—Mandibles (jaws) of Stage III. grub of *L. frenchi*, $\times 5$ times.
 Fig. 12.—Terminal teeth of mandible of same, $\times 12$ times.
 Fig. 13.—Terminal teeth of mandible of *Lepidiota* No. 683, $\times 12$ times.
 Fig. 14.—Labium (lower lip) of Stage III. grub of *L. frenchi*, $\times 8$ times.
 Fig. 15.—Antenna of same, $\times 8$ times.
 Fig. 16.—Spiracle and peritreme of same, $\times 35$ times.
 Fig. 17.—Venter of anal segment of same, showing disposition of bristles by which grubs of this beetle may be distinguished from those of related *Scarabaeidae*, \times about 5 times.
 Fig. 18.—Arrangement of bristles on the anal segment of *Lepidiota* No. 683, $\times 5$ times.
 Fig. 19.—Adult male of *Lepidiota frenchi*, Black., natural size.
 Fig. 20.—Labrum of same, $\times 8$ times.
 Fig. 21.—Labium of same, $\times 8$ times.
 Fig. 22.—Maxilla of same, $\times 8$ times.
 Fig. 23.—Mandibles of same, dorsal view, $\times 8$ times.
 Fig. 24.—Antenna of same, $\times 16$ times.
 Fig. 25.—Front leg of same (excluding coxa), $\times 2$ times.
 Fig. 26.—Front tibia of leg of *Lepidiota* No. 683; differing from that of *frenchi* in the structure and position of teeth, $\times 2$ times.
 Fig. 27.—Venter of abdomen of *L. frenchi*, showing arrangement of the transverse bands of scales, $\times 1\frac{1}{2}$ times.
 Fig. 28.—Venter of abdomen of *Lepidiota* No. 683, indicating bands of scales narrower than those of *frenchi* and arranged differently, $\times 1\frac{1}{2}$ times.
 Fig. 29.—Latero-cervical shield of Stage II. grub of *L. frenchi*, $\times 4$ times.



HABITS OF THE BEETLE PRIOR TO OVIPOSITION.

Lepidiota frenchi occurs both in our so-called forest country and densely timbered scrub lands, its range of flight extending practically throughout North East Queensland.

It usually appears in December, a week or so later than our grey-back cane-beetle, and may confidently be expected to emerge immediately after the occurrence of rain sufficiently heavy to thoroughly moisten the subsoil.

Unlike *albohirta*, the species in question has a two-years' life-cycle, so that although in evidence each season it is only excessively abundant every second year, when the beetles, emerging as they do in countless thousands from grass lands, roadways, &c., generally attract considerable notice.

Some idea of their numbers at such times may be gathered from the fact that in 1915 four beetle-collectors in half an hour picked off 23 lb. of these cockchafers from the wire fence of Gordonvale Recreation Reserve, in the centre of the township. It takes on an average 475 specimens to weigh 1 lb.; so that the above quantity represented no less than 10,925 beetles.

In the event of abnormally dry conditions prevailing during December, two emergences of *frenchi* may take place.

In 1915, for instance, when the rainfall for December was 4.90 inches below the average, a small primary brood appeared about Christmas time; but, owing to the registration for the following month being 15.63 inches below the average, the main body constituting the rest of the brood were unable to escape from the soil until about the end of January.

During December, 1916, however, when the rainfall happened to be 16.14 inches in excess of the average for that month, the beetles made their normal appearance *en masse* on the 15th instant, and no secondary emergence was recorded.

The aerial movements of *Lepidiota frenchi* were briefly described by the writer in a previous monthly report. Virginal flight commences on the first approach of twilight (about 6.45 p.m.), when suddenly and without warning of any kind myriads of these insects start up simultaneously from every quarter and wildly dash to and fro as though determined to make the most of the brief period afforded them for exercising their wings. Such animation strikes one as being decidedly novel, and, apart from its scientific significance, well worth witnessing.

Standing among the cane stools, one seems to be literally encompassed by an immense whirling swarm of beetles—thousands being in view at the same time—which in their erratic ill-directed flight keep knocking themselves against the stiff leaves, the clapping noise produced by the

sudden impact being plainly audible at a distance of several yards. In addition to this oft-repeated sound, the air, so still a few moments before, vibrates loudly with a continuous hum, due to the accumulated buzzing of the vast multitude. It may be of passing interest to mention that the writer, upon testing this humming sound with a tuning-fork, found the note to be B natural—8 tones below the middle C of a piano at concert pitch—and very different from the deep tremulous drone that characterises the flight of our grey-back cane-beetle.

The turmoil depicted above lasts for 10 to 15 minutes, when copulation immediately takes place and silence again prevails. At this stage the beetles may be observed on all sides clinging in couples to the cane leaves at a height of 3 or 4 feet above ground level, and, if picked off from the foliage, will lie quietly in the hand without making the least effort to escape.

The attitude assumed whilst mating is rather curious, as the male alone clings to the leaf blade, the female hanging motionless head downwards supported in mid-air with the ventral surface of body exposed to view.

Connection does not apparently continue for more than about half an hour, and is followed by a period of feeding, during which the beetles display little or no activity.

Towards dawn, however, they again take wing for a few minutes, and resettle on the gum trees and bushes from which they suddenly circle erratically to the ground as daylight appears, burrowing as deeply as possible among grass tufts or under creeping vegetation, leaf-mould, &c., in order to avoid sunlight and escape notice from birds and other enemies.

Beetles that after copulation were placed at once in breeding cages, and not allowed to feed, laid no eggs, and died after about 16 days without the ovary having developed.

The period of emergence occupies from three to four weeks, the pest being first noticed swarming over cultivated areas, and finally issuing from unbroken forest land consisting of stiff volcanic and clay loam soils.

They were observed to fly in greatest numbers during warm evenings when the temperature was between 75 and 80 degrees F.

THE EGG.

Mode of Deposition.—The egg stage of *frenchi* has not hitherto been described or figured, and happens to differ very noticeably from that of our grey-back cane-beetle.

On 16th December, 1916, two adult females of this species which had copulated the previous evening were placed by the writer in special breeding cages containing young growing cane plants, and when examined eleven days later 28 eggs were found in one cage and 33 in the other.

Concluding from appearances that they had been laid some little time, a similar experiment was conducted on 22nd December, with three females in separate cages. These were examined on the 27th without success, but next day (just a week after copulation) ova were taken from each cage, the numbers being—26, 32, and 39. No additional eggs were deposited, although the beetles lived about a week longer.

The depth at which oviposition takes place appears to vary from 3 to 5 inches, according to the percentage of moisture present; but, unlike the eggs of *albohirta*—which are massed together in one chamber—those of *frenchi* are deposited separately, each egg being isolated in a small cavity measuring about 5 mm. in diameter with compacted sides, the entire batch occupying a space of not more than a couple of cubic inches.

Size and Appearance.—The egg immediately after deposition is 2.83×2.19 mm. but quickly increases in size, and twenty-four hours later has swollen to 3.66×2.83 mm. When about to hatch out, it is 4.50×3.50 mm., 12 placed end to end in a straight line measuring 54 mm. ($2\frac{1}{8}$ inches). Although at first obtusely ovate (Figs. 1 and 2), it gradually in the course of swelling assumes an almost spherical form. The chorion is tough and coriaceous, silvery-white, with granulated surface not unlike crystallised sugar in appearance (Fig. 3).

About a fortnight elapses between the acts of oviposition and emergence of the larvæ.

THE LARVA.

Stage III.—In general structure the fully-grown grub of this species resembles that of *Lepidiota albohirta*, Water., which has already been minutely described by Girault in "Societas Entomologica," Germany, 1913, a translated reprint of which has been issued in the form of Contribution No. 21 of our Bureau (Ent. Lab. Sugar Exp. Stat. Bundaberg). Girault and Dodd subsequently published the following brief description of the grub of *Lepidiota frenchi*, Black. (Stage III.), based on the former author's full description of *albohirta* alluded to above:—

"Greatest length at stretch, 41 mm.; greatest width (at base of anal segment), 10 mm.; length in natural curved position, 18 mm.; thickness, 8 mm.; greatest width of head, 6 mm.; length to apex of labrum, 5.5 mm. Very similar to *albohirta*, but will differ as follows:—Stigmata much larger in comparison to the peritremes, the widest portion of the peritremes not half as wide as the stigmata (nearly as wide in *albohirta*), the peritremes distinctly open, the opening slit wider than long (peritremes scarcely open in *albohirta*, the opening slit very narrow, many times longer than wide); apex of abdomen ventrad with a naked longitudinal path, with convexed margins, delimited by about four rows of rather short, stout setæ, these overlapping; the scattered setæ being all round this path."*

* Bull. No. 2, Div. Ent. Qld. Bureau Sug. Expt. Stations, 1915.

In addition to the foregoing description, I may state that the larva of *frenchi* is of a dull opaque cream colour; and when first unearthed and exposed to daylight usually lies on its side in the position indicated in Fig. 4, and does not, like *albohirta*, keep convulsively doubling its head against the base of the anal segment.

The disposition of the rows of setae just mentioned is illustrated in the present Bulletin (Fig. 17), and may, if desired, be compared with the arrangement of those occurring on the anal segment of *albohirta* figured by the writer in Bulletin No. 4 of this Office.

Whilst referring the reader to Contribution No. 21 of our Bureau for a general description of the larva (modified, of course, by the points of difference mentioned above), the author has thought fit to describe and figure its trophi, in order to emphasise certain structural differences between this species (*frenchi*) and *Lepidiota* No. 683:—

Head, including mouth parts, light golden yellow.

Labrum, above, supporting a few long almost vertical brown hairs; the sides fringed with short curved spines, longer near apex; anterior edge not obtusely rounded as in *albohirta*, but somewhat acute, surface distinctly convex, much roughened, and with a curved, shallow, channel-like depression across middle (Fig. 6). Under-surface of same lighter in colour, side margins flattened and formed of a number (about 12) of short parallel comb-like ridges; central area raised slightly above marginal, and with a clear, somewhat conical, depression in middle of posterior portion thickly edged with dark-brown spines directed towards the centre of this hollow, those nearest apex of labrum being elevated above its central area, much stouter, and forming a sort of brush. Greatest width of labrum, 2.90 mm.; length from base to apex, 2 mm. (Fig. 7).

Maxillary stipes with a row of tiny teeth along dorsal edge and lobe armed distally with about 15 stout black spine-like teeth (Fig. 8). Maxillary palpi four-jointed, 4th joint longest, its extremity furnished with a few short papiliform setae (Figs. 9 and 10); 2nd joint about twice length of 3rd, the latter reaching as far as apex of lobe: cardo and stipes supporting numerous reddish bristles, those on lobes of the latter longer than elsewhere.

Labium rather obtusely rounded on anterior edge, and abruptly turned down at right angles towards base of mandibles, forming a flattish face about 1 mm. in depth clothed with red bristles; palpi short, two-jointed, 2nd slightly longer than 1st and with a few papiliform setae at apex.

Mandibles projecting well in front of labrum, with distal portion, mesal edge, and lateral ridges black (Figs. 11 and 12).

Antenna, 5 mm. in length; 3rd joint longest; 2nd and 4th about equal, the latter more slender and with ventral edge of distal end produced into a short spur; 5th, little more than half length of 4th (of equal

length in Stage I. larva; compare Figs. 5 and 15), and terminating in a blunt point tipped with a few papiliform setae.

Stage II.—Body cream colour, or pale bluish-white; and much the same in general structure as Stage III.

Greatest length and width when fully extended and just prior to moulting 31×7 mm.: length of natural curved position, 16 mm.; width of head 4.10 mm. On 30th April, 1917, 83 specimens (Stage II.) collected at Meringa averaged in length and width, fully extended, 27.60×7 mm.

During winter months (May-August) these larvæ cease feeding, and lie dormant in resting cells of ovate form about an inch long with compacted walls, and situated in firm soil 8 inches or more below the surface.

Stage I.—The young grub when just hatched and in natural curved position is 6 mm. long ($\frac{1}{4}$ inch); its greatest length and width when fully extended being 9 mm. \times 1.90 mm.

Body dull whitish, with peritremes and latero-cervical shield pale yellow, the latter of lighter tint.

Head 2.20 mm. wide, darker yellow than peritremes; mandibles acute, reddish, with teeth and internal edges blackish.

Antenna, light yellow; 3rd joint, longest; 2nd, 4th, and 5th, about equal length (Fig. 5).

The interval from first to second instars occupies on an average 61 days, the duration of this stadium having been determined from the moulting of about 50 larvæ reared from eggs laid at the laboratory (1917).

A little data respecting the larval instars of *frenchi* has appeared in Bulletin No. 2 of this Office by Girault and Dodd, who noticed that Stage I. was procurable from the end of January to June, and Stages II. and III. throughout the year.

As regards the duration of life of the grub, from hatching of the egg to its assumption of the pupal form, we may, I think, conclude this period to be in all probability not less than a year and a-half, which would allow six months for the pupal, egg, and imago stages.

THE PUPA.

In general form resembles that of *albohirta*, described by Girault in Contribution No. 21 of this Bureau, but differs in being much smaller, of a uniform dull ochreous-yellow instead of yellowish-brown, and in the absence of transverse slit-like depressions on the venter of abdomen.

The two spines on cremaster are far less noticeable and divergent than in *albohirta*, and the ridges of abdominal segment, dorsally, less acute.

Length of pupa, 28 mm.; greatest width, 12 mm.

THE BEETLE.

(*Lepidiota frenchi*, Black.)

General appearance pale red, of silvery lustre, due to the body being closely dotted with white scales. Average length and width, about 24×11 mm.

Head and trophi dark reddish-brown, the former 6 mm. wide by 5.40 mm. from edge of hind margin to anterior border of clypeus. Eyes nearly circular, shining black, a short acute ridge fringed with hairs on frontal portion of cornea formed by the continuation of base of clypeus. Dorsal surface of epicranium deeply and closely punctulate, each puncture containing a single, white, flattened, waxy-looking scale, of nearly circular outline, but becoming gradually ovate near edge of prothorax. Length of *antenna* of female (excluding capitulum), 2.60 mm.; club, 1.20 mm.; scapus, about length of the 4 succeeding joints, its distal end much broader than pedicellus; clavola, 8-jointed; club in both sexes consisting of three laminae, which—together with third joint of antenna—are slightly longer in the male; inner edge of scapus fringed with long red hairs (Fig. 24).

Labrum bilobed, greatest width 2 mm.; the exposed outer surface with numerous scattered long red hairs, and inner edges of lobes densely fringed with short hairs (Fig. 20). Apex of maxillary lobe black, with four stout obtusely pointed teeth; 4th joint of palpus, about length of remaining three taken together (Fig. 22).

Mandibles short, stout, triangular in general outline, greatest width at base 2 mm., outer exposed surface mostly covered with ovate scales (Fig. 23).

Labium rounded on sides, anterior margin hollowed in middle, central area noticeably depressed, edge of rounded sides fringed with about 8 long red hairs; labial palpi short, 3rd joint longest and about length of other two; 2nd scarcely longer than broad, with 6 or 7 stout hairs near distal end; area between palpi containing two curious brush-like pads of hairs, not meeting on centre of labium, the individual hairs being disposed symmetrically side by side, flattened, in semi-circular outline, with points directed to the front and reaching just beyond frontal edge of lip (Fig. 21).

Pronotum about 9 mm. wide, rather closely punctulate, the punctures smaller than on head, more numerous close to hind margin and sides, and each filled with a circular scale; sides of same angular, edge darker, turned up and scalloped. Surface of pleural sclerites, except a small portion against outer end of coxal cavities, almost covered with scales, including circular, ovate, pear-shaped, and hair-like forms.

Mesonotum light red, punctured on dorsal surface and clothed with yellow hairs. Scutellum triangular, sides regularly curved and shorter than base, apex sub-acute, scales circular, more numerous on basal area.

Epimeron densely covered by large ovate scales. Central area of mesosternum covered with yellow hairs, sides of same near epimeron with a few pear-shaped scales. Centre of posterior edge of *metasternum* close to hind coxae channelled, and with a patch of elongate pear-shaped scales, the rest of surface thickly covered with silvery-yellow hairs. *Episternum* mostly covered by elongate oval scales and anterior portion by hairs.

Elytra nearly oblong in form, length about twice the width, outer angle of caudal extremity acutely pointed; closely sprinkled with circular white scales, smaller near edges of margins and more numerous along suture. Each elytron with 5, narrow, equi-distant longitudinal ridges, scarcely distinguishable without a pocket lens, that bordering edge of suture being distinctly broader and more elevated than the other 4. These parallel ridges are characterised by having fewer scales, and their course may also be traced on the inner surface of elytron as fine lines of lighter hue than the lining membrane.

Wings clouded with light greyish-yellow, nervures dark-brown; length of wing (female), about 30 mm.; greatest width of same, 10 mm.

Legs dark reddish-brown, sprinkled more or less freely with scales, and fringed with yellow hairs; anterior coxa longer than femur, tibia with three teeth (Fig. 25). Hind coxae the width of femora, but shorter and densely clothed with scales and hairs.

Tergum of abdomen yellowish-brown, hairy.

Pygidium clothed on frontal area with yellow hairs, hind margin dark-reddish, slightly concave, thickly dotted with tiny scales and becoming declivous—nearly vertical close to caudal edge, which is more widely emarginate in middle, and furnished with larger scales.

Note.—This declivity near caudal edge appears to be far more strongly marked in the specimens of *Lepidiota* No. 683 examined by me than in *L. frenchi*.

Pygidium darker and noticeably more closely and uniformly punctured than the elytra, the scales slightly smaller, circular to ovate; edges turned up, especially those of lateral and hind margins. Caudal extremity obtusely rounded, fringed with short hairs, and usually furnished in the female with a small medio-apical tooth, more or less developed.

Venter of abdomen between wing-cases densely punctured, the scales larger than on elytra, circular to ovate, more numerous laterally, and arranged as shown in Fig. 28.

NATURE OF INJURY.

Identical with that occasioned by *Lepidiota albohirta*, Water. Stage II. larvæ reared at the laboratory entirely consumed the roots of cane plants growing in their breeding cages, and in many cases gnawed holes in the ‘sets.’

**POINTS OF DISTINCTION BETWEEN LEPIDIOTA FRENCHI
(BLACK.) AND LEPIDIOTA No. 683.**

THE LARVA.

- (1) Setae on venter of anal segment of *frenchi* arranged as in Fig. 17; but those of *L.* No. 683 disposed as shown in Fig. 18.
- (2) Width of head in *frenchi*, 5 mm.; in No. 683, 7.20 mm.

THE BEETLE.

- (3) Average length of adult *frenchi*, 24 mm. (nearly 1 inch); but of No. 683, 28.50 mm. ($1\frac{1}{8}$ inches).
- (4) Colour of dorsal surface of prothorax and basal area of elytra in No. 683 very dark-brown, nearly black, shading into reddish-brown just beyond scutellum; the entire upper surface of body in *frenchi* is uniform reddish-brown.
- (5) Antennal joints Nos. 6 and 7 in male of No. 683 stouter than in female; and club of same distinctly longer, in proportion to that of female of this species, than in *frenchi*.
- (6) Teeth on outer edge of front tibiae of *frenchi* sub-acute with the points about equi-distant (Fig. 25); in No. 683 the points are decidedly obtuse and not equi-distant (Fig. 26).
- (7) Spur near distal end of front tibia in *frenchi* usually tapering gradually from the base to a sharp point; in No. 683 this spur is proportionately thicker and not slender near the point.
- (8) The ventral transverse bands of white scales on abdominal segments 1 to 4 in No. 683 (Fig. 27) are much narrower on central area than in *frenchi*, which, although a smaller insect, has them nearly the width of these segments (compare Figs. 27 and 28).

CONTROL MEASURES.

Up to the present no experimentation in this connection has been attempted at Gordonvale, although from time to time the writer has emphasised the advisability of preventing as far as possible the infestation of plantations bordering virgin forest land.

As already stated, the life-cycle of *frenchi* (from egg to perfect insect) occupies a period of two years; whilst that of *albohirta* is completed in twelve months.

Although both beetles oviposit during December or January, the grubs of the latter species attain full growth in a space of about six months (January to June), pupating, as a rule, from July to September; whereas those of *frenchi*, which mature very slowly, remain in the larval

stage for fully a year longer, thus accounting for the biennial occurrence during April and May of large and comparatively small grubs in the same furrow, the former larvæ being, of course, those of Stage III, *albohirta*, and the small ones Stage II, *frenchi*. Fully grown grubs of *frenchi*, on the other hand, are often mistaken by growers for those of our grey-back cockchafer.

The former insect generally oviposits in unbroken soil densely covered by grass, weeds, &c.; and this being so, growers would do well to maintain throughout December and January a system of clean culture on areas devoted to cane, and more particularly on fallow land reserved for the planting of an early crop.

Both *frenchi* and *albohirta* lay their eggs during these months, and are strongly attracted by a luxuriant growth of vegetation between the rows, so that weedy canefields are almost sure to become badly infested.

Frenchi usually oviposits freely in such situations, with the result that in April or May, when the ground is planted with an early crop, the grubs from these eggs, being then about five months old and still small, are very liable to be overlooked and allowed to remain in the soil. As a matter of fact, however, these Stage II. larvæ have still about a year to pass before pupating, during which period they are capable of working considerable injury; moreover, after such infested land has been planted and the weeds destroyed they are necessarily obliged to subsist almost entirely on the roots of the cane.

Unlike *albohirta*, this species does not appear to be strongly attracted by artificial light, although, whilst experimenting in a canefield last December (1916), no less than 20 specimens of *frenchi* flew into a trap lit by an acetylene lamp between the hours of 7.35 and 8.30 p.m., the temperature at the time being 76 degrees F.

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