DEPARTMENT OF AGRICULTURE
STRAITS SETTLEMENTS AND
FEDERATED MALAY STATES

THE IDENTIFICATION OF GRUBS FROM RUBBER ESTATES

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In this paper, certain grubs which have been received from rubber estates throughout Malaya by the Rubber Research Institute have been briefly described and figured. The writers attended these grubs and bred them to maturity and, to enable those engaged in the rubber industry who have identified the grubs to be familiar with the appearance of the beetle, photographs of the beetles by Mr. H. D. Meads of the Department of Agriculture, have been reproduced.

Xenostomus punctipennis Parry is a Lucanid beetle and, although its grubs were received from rubber areas, it is doubtful whether they were actually found in the soil. It is considered that they were obtained from a log in which decaying wood formed their principal diet. On the other hand, *Psilopholis vestita* Sharp, *Leucopholis rorida* Weber, *Leucopholis nummicudens* Newm., *Leucopholis tristis* Brnsk., *Lepidiota stigma* F., *Lachnosterna bidentata* Burm., and *Aserica* sp. are Melolonthines, "Cockchafers", and their larvae live in the soil feeding upon the roots of plants. The seven species of *Anomala* are Rutelines; the grubs in this sub-family being generally considered to feed upon decaying vegetable matter and refuse and to extract their nutritive requirements from the soil, but reports as to representatives injuring the roots of healthy plants have been received.

The grubs of the Melolonthines, whilst moderately active in the soil, are comparatively helpless on the surface, exceptions being the grub of *Leucopholis tristis* which moves with marked rapidity on its back and that of *Aserica* sp., which progresses on its ventral surface. On the other hand, the grubs of most species of Rutelines walk with comparative ease on their ventral surface on the ground, thereby differing in this character from the Melolonthines.

The grubs with which this paper deals are similar in general appearance (*see* figure below), being whitish, soft, curved in ventrally and much wrinkled. They have brown heads, three pairs of legs and a well-developed anal segment. The hairs and spines (raster) on the ventral surface of the last abdominal segment are generally sufficient for the identification of the different grubs, but where their arrangement is similar additional distinguishing characters have been mentioned. The anal

aperture is of some importance as an aid to identification; in the Melolonthids it is transverse, in the Lucanid, *Xenostomus punctipennis* Parry, it is longitudinal.

GRUB OF PSILOPHOLIS VESTITA SHARP.

DISTRIBUTION.

The grubs of *Psilopholis vestita* Sharp have been received from estates in Johore, Kedah, Malacca, Negri Sembilan, Pahang, Perak, Selangor and Singapore; of *Leucopholis rorida* Weber, from Pahang, Perak and Kedah; of *Lachnosterna bidentata* Burm., from Kedah, Perak and Selangor; of *Leucopholis tristis* Brunsk., from Kedah and Selangor; of *Leucopholis nummicudens* Newm., from Johore, Kedah and Pahang; of *Lepidiota stigma* F., from Kedah, Pahang and Perak; of *Melolontha argus* Burm., from Johore, Kedah and Perak; of *Melolontha vervex* Sharp, from Pahang and Perak; of *Anomala cupripes* Hope, from Kedah, Pahang, Perak and Selangor; of *A. pulchripes* Sharp, from Kedah, Negri Sembilan, Perak and Selangor; of *A. viridis* F., from Kedah; of *A. aureola* Hope, from Kedah; of *A. pallida* F., from Kedah and Selangor; of *Anomala chalcites* Sharp, from Kedah; of *Apogonia cribricollis* Burm., from Kedah and Selangor; of *Aserica* sp., from Perak; and of *Xenostomus punctipennis* Parry, from Kedah and Perak.

GENERAL OBSERVATIONS.

With the somewhat meagre information available regarding the distribution and habits of the beetles and grubs, it is possible to give only a bare outline of the types of country in which the grubs and beetles have been found.

The presence of grubs of *Psilopholis vestita* Sharp was first reported in 1930 on a comparatively small clean-weeded area of rubber which was, however, surrounded on three sides by jungle. This species, it is considered, may be placed in the first rank as regards its importance as a pest of the rubber tree, and records show that the principal habitat favoured is land planted with rubber adjoining extensive areas of jungle. The configuration of such land, however, does not appear to influence the distribution of the grubs. Although there is no doubt that the roots of rubber are frequently attacked, the most favoured food of the grub of this beetle has still to be discovered, but from the reports which have been received from time to time from managers of rubber estates covers of various kinds would appear to have been attacked in preference to the roots of rubber. In

support of this statement, the following extracts from letters are quoted—"in loose muddy earth under earth scrap, and the roots (rubber) appeared untouched"; "from what I could see of the damage, the grubs appear to be more selective than those in the Federated Malay States, bestowing their attention on the roots of rubber trees rather than on those of the various other growths which cover the soil"; "grub which I believe to be cockchafer has attacked an area of one acre near the jungle boundary. The rubber was planted in 1920 and carries a mixed cover of natural covers and grass. The grass is dead or dying and the roots of natural covers have been severed just below the surface"; "there is no sign yet that the grub has in any way damaged the growing rubber, but the growths between the terraces are being rapidly destroyed; the area is 6 acres in extent, is bounded on one side by jungle and on two others by small swamps; the ground cover consists of a mixture of rubber seedlings and forestry growths and is now being killed off by the activities of the grubs".

The adults of *P. vestita*, as well as the adults of the other species of Melolonthinae, are frequently found on various plants, but that does not necessarily indicate that the leaves of those plants form their habitual food, consequently considerably more information than is available at present will need to be forthcoming before control measures directed against the adults can be devised. Of the other species referred to, adults of *L. bidentata* have been reported eating the shoots of young rubber trees. *M. vervex* adults have also damaged leaves of rubber, our informant stating that they were "eating leaf of rubber tree about 6 feet from the ground, the noise of the eating having called my attention to them". *A. cupripes* grubs have been reported feeding on grass roots.

Psilopholis vestita Sharp is the only beetle that has been studied in any detail. Its life-cycle occupies a year, the emergence period commencing towards the end and continuing during the first few months of a year. Other beetles mentioned appear to have a maximum emergence at about the same time, but some, for instance *Leucopholis rorida* Weber, *Lachnosterna bidentata* Burm., and *Anomala cupripes* Hope, have also been received during the middle months of the year, suggesting that either there is considerable over-lapping of emergences or there are two generations a year.

The importance of these grubs to rubber has therefore not been established, their principal damage undoubtedly being to the roots of indigenous covers and to the soil by tunnelling, thereby promoting its erosion. It is considered that, in the days of clean cultivation, grubs of *P. vestita* may have been present on rubber estates but confined to the vicinity of the jungle, and that the spread of this beetle on estates was regulated by the absence of suitable conditions for feeding and/or oviposition. With the introduction of indigenous and other covers, however, conditions so resembling those near the jungle fringe have been created that the beetles have not of necessity to return to their original habitat.

DESCRIPTIONS OF GRUBS.

Fam.—*Lucanidae.*

Xenostomus punctipennis Parry. (Plate *II*, Fig. 13, Plate *IV*, Fig. 15).

Full-grown grub about 2.5 cm.

Apex of abdomen distinctly ovately bilobate. Anal aperture straight, longitudinal, *not transverse.*

Raster. Median spines (moderately long and acute) arranged in two undulate rows, and close together. The area on each side of the median rows with a few similar spines.

Fam.—*Scarabaeidae.*

Sub-Fam.—*Melolonthinae.*

Lachnosterna bidentata Burm. (Plate *II*, Fig. 8, Plate *III*, Fig. 5).

Full-grown grub about 3.0 cm.

Anal aperture v-shaped, rather broad.

Raster. Median parallel rows of spines absent. Area anterior to anal slit with numerous robust, flattened, hooked spines irregularly disposed.

Around the margin of the anal slit are short acute and long slender spines.

Lepidiota stigma F. (Plate *I*, Fig. 2, Plate *III*, Fig. 6).

Full-grown grub about 7.5 cm.

Anal aperture angulate; anal flap broadly triangular with the apex rounded: lateral areas with short, acute spines.

Raster. Median rows of spines somewhat narrowly separated and converging anteriorly and produced beyond crease (*cf.* Plate *III*, Fig. 4); spines moderately long, acute, overlapping apically; rows somewhat irregular; spines on areas adjacent to median rows, abundant, flattened and only slightly hooked apically.

At the margins of the anal aperture and on the area adjacent to the area covered with flattened spines are some short, acute, and long slender spines.

Leucopholis nummicudens Newm. (Plate *I*, Fig. 5, Plate *III*, Fig. 2).

Full-grown grub about 5.0 cm.

Raster. Median rows of spines parallel, but irregularly arranged; 18 to 19 in each row. (*cf.* Plate *III*, Figs. 1 and 3). On the areas adjacent to median rows are long, flattened, hooked spines, less in number than in *L. rorida.*

The grub of this species closely resembles that of *Melolontha vervex*, but it has more spines in the median rows and the rows do not reach the crease.

Leucopholis tristis Brnsk. (Plate *I*, Fig. 1, Plate *III*, Fig. 7).

Full-grown grub about 6.0 cm.

Anal aperture triangular.

Raster. Median rows of spines almost parallel; spines moderately long, acute, regularly arranged. Areas adjacent to median rows with moderately long, and short, flattened, hooked spines more numerous than in *Psilopholis vestita* Sharp, (*cf.* Plate *III*, Fig. 8). Long slender spines are also present near the outer margin, which has a few acute spines of varied lengths, mostly very short.

The flattened spines are concave on one side. A markedly active grub on its back.

Leucopholis rorida Weber. (Plate *I*, Fig. 4, Plate *III*, Fig. 1).

Full-grown grub about 5.0 cm.

Anal aperture curved.

Raster. Median rows of spines almost parallel, and irregularly arranged; spines long, acute, 14 to 15 in each row (*cf.* Plate *III*, Figs. 2 and 3). On the areas adjacent to median rows are abundant flattened, hooked spines more in number than in *L. nummicudens* Newm. Above the anal aperture are very short acute spines.

Melolontha vervex Sharp. (Plate *II*, Fig. 7, Plate *III*, Fig. 3).

Full-grown grub about 4.5 cm.

Anal aperture rounded.

Raster. Median rows of spines parallel almost reaching crease, (*cf.* Plate *III*, Figs. 1 and 2), spines irregularly arranged, 13 to 14 in each row. Spines anterior to median row absent, but flattened spines, 8 to 10 in number, placed laterally in two divergent rows are present . On area adjacent to median rows are moderately abundant long, flattened, hooked spines. Near the anal aperture is a row of short, acute spines.

Melolontha argus Burm. (Plate *II*, Fig. 6, Plate *III*, Fig. 4).

Full-grown grub about 3.5 cm.

Anal aperture angulate.

Raster. Median rows of spines slightly staggered and produced beyond crease (*cf.* Plate *III*, Fig. 6); spines of various lengths, but mostly longest in the middle of rows. Areas adjacent to median rows with abundant flattened, hooked spines,

Psilopholis vestita Sharp. (Plate *I*, Fig. 3, Plate *III*, Fig. 8).

Full-grown grub about 5.75 cm.

Anal aperture curved.

Raster. Median rows of spines parallel converging somewhat at each end; spines acute, moderately long, longer near anal aperture. Areas adjacent to median rows with long, flattened, hooked spines less in number than in *Leucopholis tristis* Brnsk. (*cf.* Plate *III*, Fig. 7). Anal flap with short, acute spines, interspersed with a few longer spines.

Sub-Fam.—*Rutelinae.*

Anomala cupripes Hope. (Plate *II*, Fig. 10, Plate *IV*, Fig. 10).

Full-grown grub about 4.5 cm.

Anal aperture curved.

Raster. Median rows of spines parallel, diverging somewhat near anal aperture; spines long and short, in almost equal numbers, longer spines occupy two-thirds of rows (*cf.* Plate *IV*, Figs. 9 and 12). Areas adjacent to median rows with flattened, hooked spines of varied length and thickness.

Anomala pulchripes Sharp. (Plate *II*, Fig. 11, Plate *IV*, Fig. 12).

Full-grown grub about 3.5 cm.

Anal aperture curved, with two or three irregular rows of moderately long, acute spines above, and longer and more slender spines below.

Raster. Median rows of spines parallel diverging at anal end; two-thirds of the spines very short, remainder long. (*cf.* Plate *IV*, Figs. 9 and 10). Area adjacent to median rows with long and short, hooked, flattened spines.

Anomala viridis F. (Plate *II*, Fig. 9, Plate *IV*, Fig. 9).

Full-grown grub about 4.5 cm.

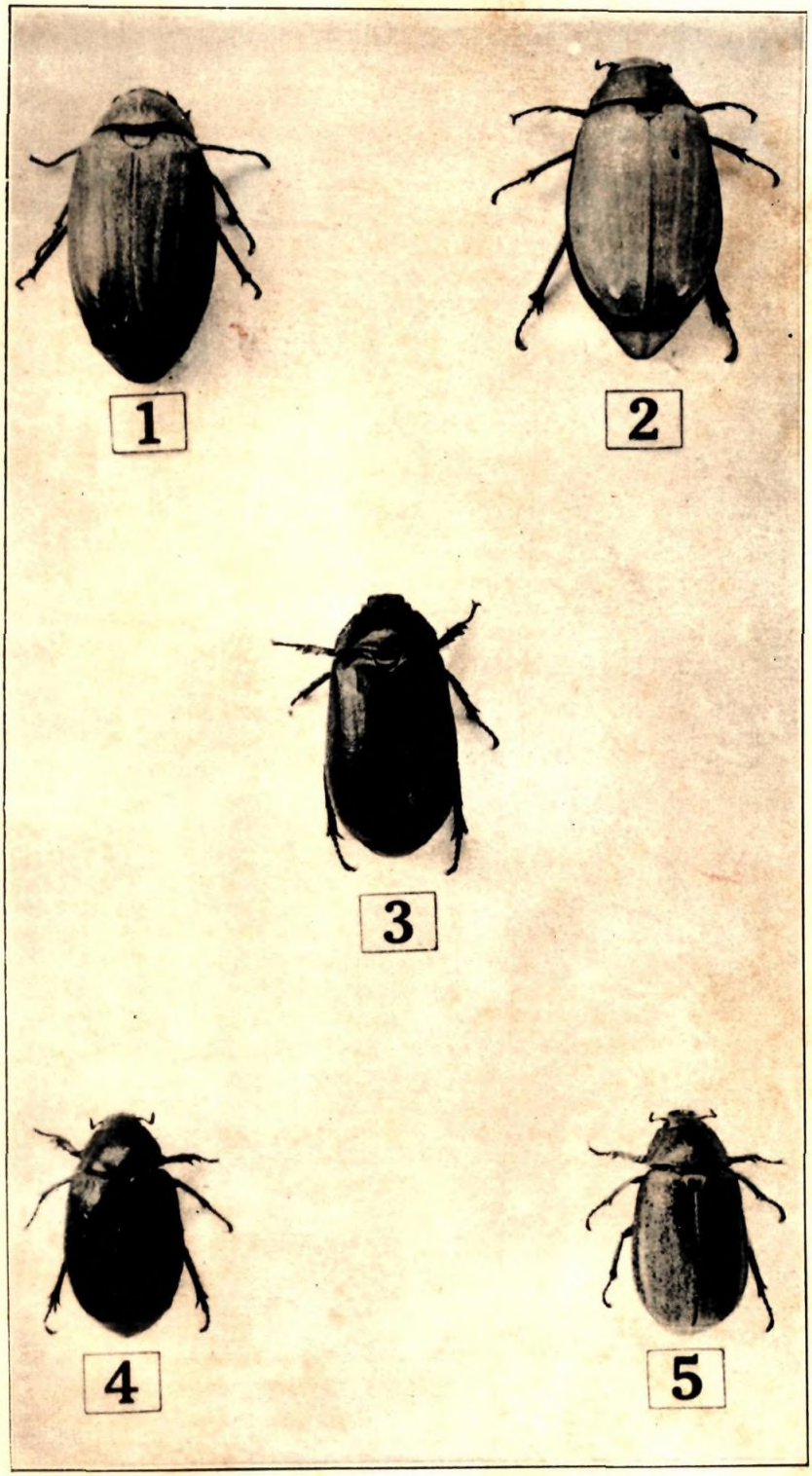
Raster. Median rows of spines sinuate, near anal aperture long and slender, about 20 in number; remaining spines short, acute. (*cf.* Plate *IV*, Figs. 10 and 12). Areas adjacent to median rows with flattened and slightly hooked spines of varied lengths.

Anomala pallida F. (Plate *II*, Fig. 14, Plate *IV*, Fig. 14).

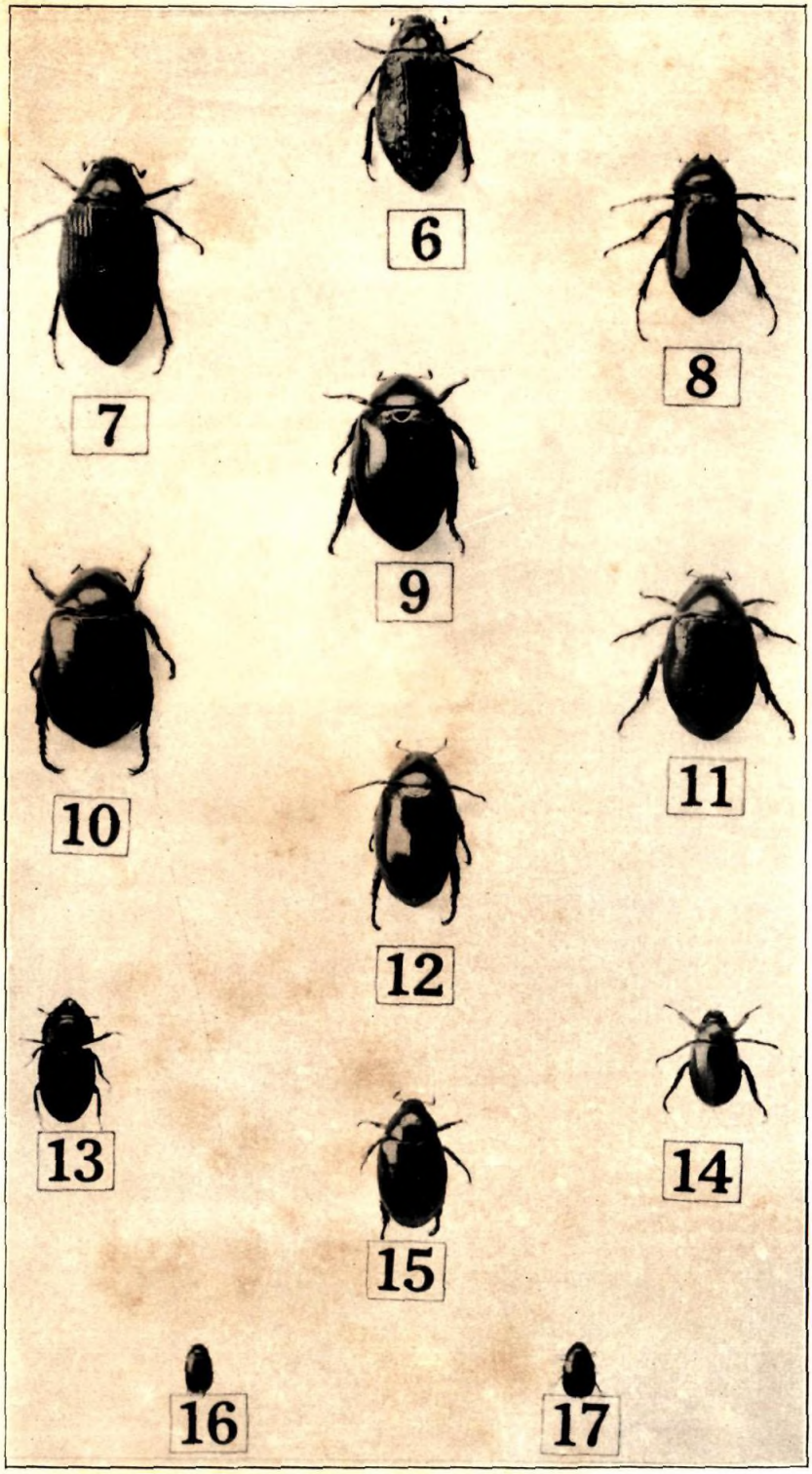
Full-grown grub about 2.0 cm.

Anal aperture curved; margins with an indentation at the middle.

Raster. Median rows of spines parallel; spines short, acute 15 to 16 in number; on the area adjacent to median rows are 7 to 8 long curved, flattened spines in two rows parallel to median rows; near these spines and below anal aperture are similar spines.



1. *Leucopholis tristis* Brunsk; 2. *Lepidiota stigma* F.; 3. *Psilopholis vestita* Sharp; 4. *Leucopholis rorida* Weber; 5. *Leucopholis nummicudens* Newm.



6. *Melolontha argus* Burm.; 7. *Melolontha vervex* Sharp; 8. *Lachnosterna bidentata* Burm.; 9. *Anomala viridis* F.; 10. *Anomala cupripes* Hope; 11. *Anomala pulchripes* Sharp; 12. *Anomala aureola* Hope; 13. *Xenostomus punctipennis* Parry; 14. *Anomala pallida* F.; 15. *Anomala chalcites* Sharp.; 16. *Aserica* sp.; 17. *Apogonia cribricollis* Burm.

On the anal flap the spines are few, short and acute, interspersed with long slender spines.

Anomala aureola Sharp. (Plate *II*, Fig. 12, Plate *IV*, Fig. 13).

Full-grown grub about 3.0 cm.

Raster. Median rows of spines almost parallel, a little more widely separated near anal aperture. Spines regularly arranged, long, slender and somewhat curved.

Anal flap with short, acute spines, arranged in a semicircular area close to aperture. Area between aperture and median row of spines with long, acute spines near aperture, then long, flattened, hooked spines.

Area adjacent to median rows with flattened, hooked spines of varied lengths, mostly long.

Anomala chalcites Sharp. (Plate *II*, Fig. 15, Plate *IV*, Fig. 11).

Full-grown grub about 2.75 cm.

Anal aperture curved.

Raster. Median spines in two rows, close together, and converging anteriorly. Spines near anal aperture long and about 20 in number, others in median rows very short. Areas adjacent to median spines with abundant flattened, hooked spines.

This species closely resembles *A. pulchripes* (Plate *IV*, Fig. 12), but differs from it in the median spines being closer together, more slender and shorter.

Aserica sp. (Plate *II*, Fig. 16, Plate *IV*, Fig. 16).

Full-grown grub about 1.25 cm.

Apex of abdomen rounded; anal aperture situated more dorsally than ventrally. The characteristic double longitudinal row of spines present in other Melolonthinae is absent, there being only one row of about 27 spines arranged in a transverse curve. Below and above these spines are abundant short, acute spines.

Apogonia cribricollis Burm. (Plate *II*, Fig. 17, Plate *IV*, Fig. 17).

Full-grown grub about 1.50 cm.

Very similar to *Aserica* sp. (Plate *IV*, Fig. 16) but has fewer spines, about 16, in the transverse row. These spines also are relatively much longer in the middle of the row.

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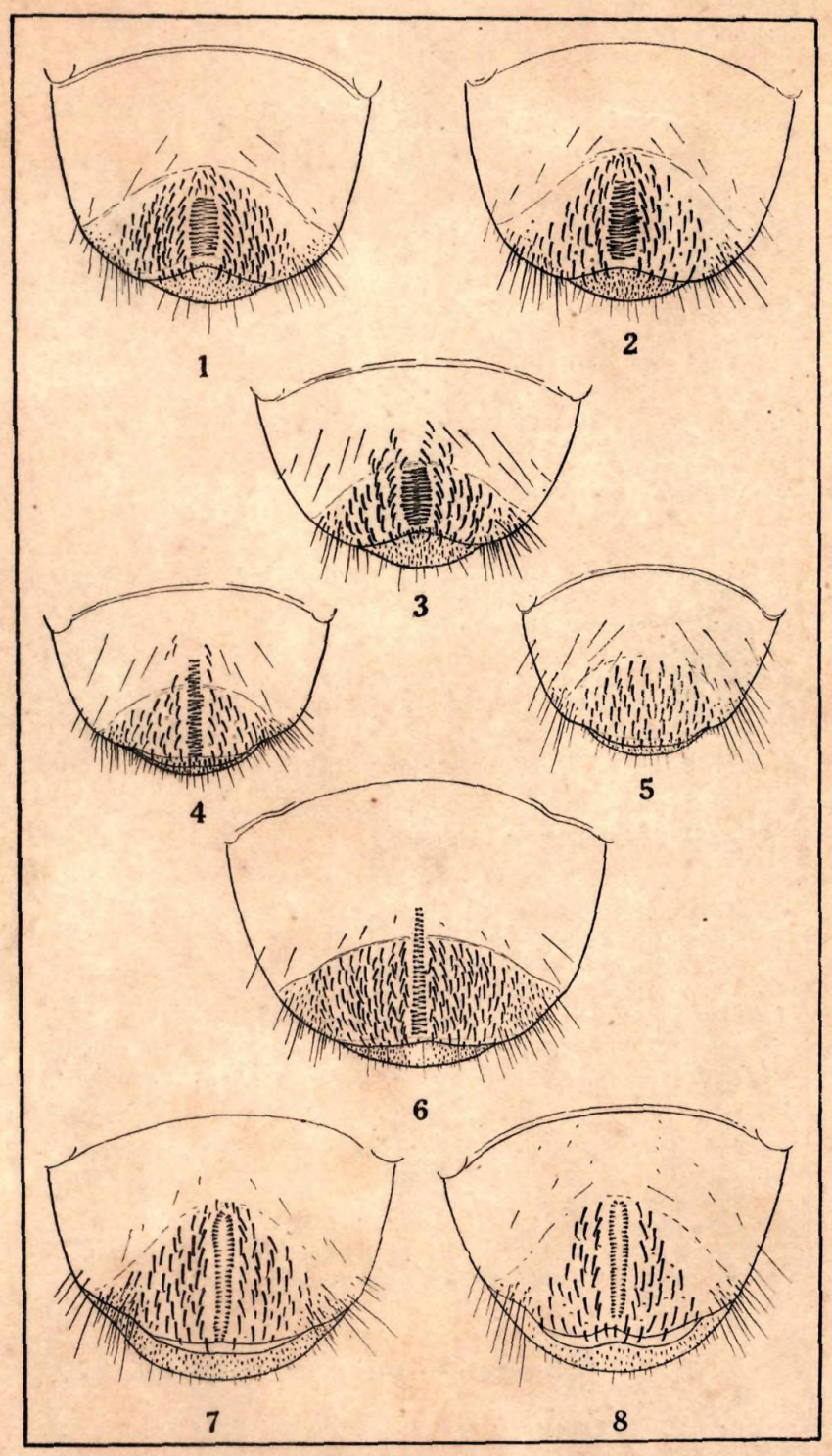

Fig. 1. *Leucopholis rorida* Weber. Fig. 2. *Leucopholis nummicudens* Newm. Fig. 3. *Melolontha vervex* Sharp. Fig. 4. *Melolontha argus* Burm. Fig. 5. *Lachnosterna bidentata* Burm. Fig. 6. *Lepidiota stigma* F. Fig. 7. *Leucopholis tristis* Brnsk. Fig. 8. *Psilopholis vestita* Sharp.

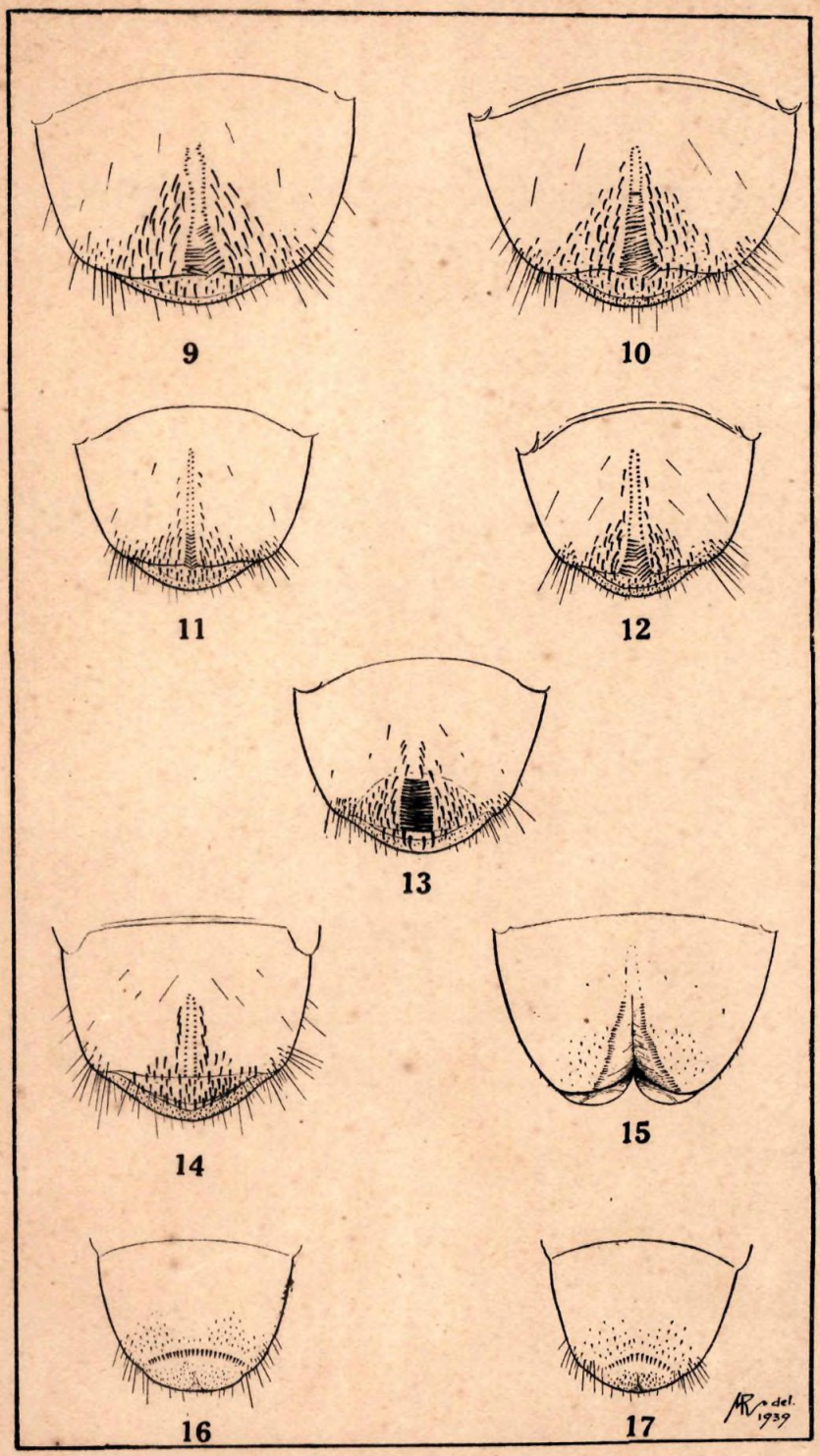

Fig. 9. *Anomala viridis* F. Fig. 10. *Anomala cupripes* Hope. Fig. 11. *Anomala chalcites* Sharp. Fig. 12. *Anomala pulchripes* Sharp. Fig. 13. *Anomala aureola* Sharp. Fig. 14. *Anomala pallida* F. Fig. 15. *Xenostomus punctipennis* Parry. Fig. 16. Aserica sp. Fig. 17. *Apogonia cribricollis* Burm.