

THE COCCIDAE OF SOUTH AFRICA—II.*

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(PLATES III–VII).

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Four Gall Coccids.

Although a large variety of plant-galls are known in South Africa, only four have so far been determined to be caused by Coccids. These are of particular interest because no two of them are similar, and more remarkable still is the fact that no two of the insects belong to the same genus, nor apparently to the same sub-family. Under these circumstances it has been thought advisable to group them together without reference to their systematic position in this paper. The characters of the galls and insects may be seen from Plates iii and iv.

The four genera are *Grewiacoccus*, g.n., *Cissococcus*, Ckll., *Calycicoccus*, g.n., and *Amorphococcus*, Green. The first of these belongs undoubtedly to the PSEUDOCOCCINAE; the last undoubtedly to the ASTEROLECANININAE. The remaining two, *Cissococcus* and *Calycicoccus*, are so unusual that I am unable to place them in any existing sub-family. I therefore propose sub-family names with the characters of the type genera. Cockerell in his description of the genus *Cissococcus* prefaces it by saying:—“belongs to the ERIOCOCCINI. Larva typically Eriococcine with rows of dorsal spines and prominent caudal tubercles.” With this I cannot agree, as the larva has a distinct marginal series of stout conical spines but no dorsal ones.

* The numbers applied to species and to the figures on the Plates follow on from those of Part I in Trans. Roy. Soc. S. Africa, v, 2, pp. 65–194, 1915.

In *Calycicoccus* the body of the adult ♀ terminates in a distinct cone with numerous very stout conical spines. The galls of the four species may be distinguished as follows :—

Gall on stem, flatly rounded and blister-like, about 3 mm. in diameter (fig. 75)

Amorphococcus.

Gall on leaf, normally flatly conical, about 3 mm. in diameter (fig. 73)

Calycicoccus.

Gall on margin of leaf, pitcher-shaped, about 6 mm. long (fig. 76) . . *Grewiacoccus.*

Gall on stems, large, about 10–12 mm. long, broad, truncate pear-shaped (fig. 74)

Cissococcus.

Sub-family PSEUDOCOCCINÆ.

Genus *Grewiacoccus*, g.n.

A Pseudococcine genus in which the adult ♀ is enclosed in a blunt leaf-gall (fig. 76). Two or three adult females may be found in the same gall.

Adult ♀ with legs and antennae of normal form but small, and an anal ring with six hairs which surround a short, stout, hollow cone. Anal tubercles not produced, but represented by single setae. Scattered over the body are small gland pores, many of which are furnished with spear-head-shaped spines; on the posterior portion of the body these are extremely numerous; the anterior part has comparatively few.

Type, *G. gregalis*, sp.n.

64. *Grewiacoccus gregalis*, sp. n. (Plate iv, figs. 76–76d).

Adult ♀ causing a gall on the leaf of the host-plant, in which one, two or three insects may be present. The galls may be solitary, or, as is often the case, five to twelve may be found clustered around the edge of a single leaf. The mature gall is about 6 mm. in length, broadly inflated, with the sides tapering slightly to the neck, of a scrotal shape or one very much like a pitcher (fig. 76). The galls stand nearly erect from the distorted edge, and are of the same green colour and texture as the leaf. There is no hole at the distal end, but below, on the under-side of the leaf, is a circular opening through which project two dense white filaments accompanied by a small amount of fine white cottony matter. When obtained in January numerous young were found clustered around the necks of some of the galls. All the available space in the gall is occupied by the female—or females if there are two or three—and on the inner walls there is a slight layer of white wax, which is more plentiful near the base, or where the posterior part of the insect is. On some leaves small slender galls (fig. 76) were observed, but these were always empty in cases examined.

Adult ♀, when alive, yellowish or slightly pink, about 3·2 mm. long, broadly rounded in front and tapering behind; segmentation distinct. When stained and mounted the ♀ is long, with nearly parallel sides and has the two extremities almost equally rounded. The integument is almost clear, except that of the posterior segments; these are richly supplied with gland-pores, from the majority of which spear-shaped and slightly pigmented spines arise (fig. 76b). On the anterior parts of the body the gland-pores are few in number and scattered. They are all small; some have trilocular orifices, whilst others are simple with a slender spine or hair. The eyes

are small and are situated at a distance from the bases of the antennae about equal to the length of the latter.

The antennae are 6-jointed, occasionally appearing 7-jointed owing to a pseudarticulation in segment 3. The average lengths of the segments are approximately, in μ : (1) 24, (2) 17, (3) 40, (4) 15, (5) 20, (6) 46 (fig. 76*d*).

The legs are small, the approximate measurements in μ being: femur 68, tibia 44, tarsus 34, claw 16 (fig. 76*c*).

The anal ring is recessed in a deep groove and has six stout bristles, from between which projects a short, stout, hollow cone.

Habitat: On leaves of "kruisbesje" (*Grewia occidentalis*, Linn.—Tiliaceae), Pienaar's River, Transvaal; collected by the writer and Claude Fuller, 23rd January 1917.

Collection No.: 305.

Sub-family CISSOCOCCINAE, nov.

(Characters of the type genus.)

Genus **Cissococcus**, Ckll.

Cissococcus, Ckll., Ann. Mag. N. H. (7) ix, p. 23, 1902.

Adult ♀ causing large truncate-pear-shaped galls on the stems, tendrils or leaf-stalks of the host-plant. Galls often solitary, but sometimes clustered in masses of six or eight. Gall broad; usually 10–12 mm. long; tapering to top, where there is a circular depression and perforation. Adult ♀ with small rudimentary legs and without conspicuous antennae. Anal ring with six stout bristles enclosed in a delicate fluted tube beneath a series of densely chitinised plates. Anal plates four in number, two large outer ones with outer edges fringed with dagger-like spines (fig. 78*a*); two inner ones with rounded outer edges and with rows of spines on disc. Integument with simple, scattered glands and a few long bristles.

Larva with long legs and 6-jointed antennae. Margin of body with complete series of short conical spines, about 32 on each side. Anal tubercles produced, each with one very long seta and several shorter ones. Anal ring with six hairs.

Type, *C. fulleri*, Ckll.

65. **Cissococcus fulleri**, Ckll. (Plates iii & iv, figs. 74 & 78).

Cissococcus fulleri, Ckll., Ann. Mag. N.H. (7) ix, p. 23, 1902; Fernald, Catal. Coccidae, p. 84, 1903.

Insect causing large galls on the stems, tendrils or leaf-stalks of the host-plant. The galls are normally solitary, but in many cases six to eight are clustered together and are then distorted. The normal gall averages 12 mm. long, is broad pear-shaped, almost as broad as long, broadly rounded at the base and slightly tapering to the end (fig. 74) where the orifice is situated. The galls are usually fixed by one side, so that the long axis of the gall is parallel with the stem or tendril to which it is attached. The galls apparently grow very rapidly from June to August, for in material just received (8th August 1916) Mr. Fuller writes that the galls have all developed in the last six weeks. The twigs and leaves are green, but the galls brown, and where a number are clustered together the intermediate stem is

decidedly reddish. The stem beneath the normal galls remains green, but the broad attachment is half green and half brown. The outside of the gall is not smooth, but is much wrinkled and appears bark-like. The orifice of the gall is conical, the thin outer edge being brown and hard in texture, the inside appearing softer and green. At the base of the wide opening there is a minute circular pore. When opened in the fresh state the walls of the gall are hard and woody, from 1 mm. to 1.5 mm. in thickness, with the outer bark loosely attached.

Male puparium about 1.4 mm. long and 0.7 mm. broad, almost parallel-sided, with rounded extremities; margin with a fine fringe of glassy filaments about one-fourth of the width of the body in length, and the dorsum with two submarginal rows of very long white glassy filaments many times the length of the body (fig. 74c). The puparium itself is delicate, glass-like, not divided into definite plates as in the ♂ LECANINAE. The posterior extremity is broadly and roundly excavated. Body of the immature male, as seen through the puparium, pinkish.

The adult female at the time the eggs are developing fills approximately half the space of the gall, being very convex, with the blunt caudal extremity fitting tightly into the conical portion near the aperture. The dorsal surface is distinctly segmented and is flat with prominent ridges, as shown in fig. 74a.

The colour of the body is delicate flesh-pink, slightly obscured by a thin layer of white powdery secretion. In boiling KOH the body becomes purplish red, and the liquid is deeply stained with the same colour.

Anal ring in a delicate tube beneath the two anal plates. The chitin of this tube is very delicate, but bears a few scattered hairs and simple glands and is pleated longitudinally, so that it looks like a large number of long bristles when seen in optical section. The anal ring bears 6 very stout bristles.

Legs small, rudimentary (fig. 78b, c).

Spiracles very large. Mouth-parts comparatively very small. Integument clear, with scattered simple glands and numerous long bristles. Antennae apparently entirely absent.

Larva with marginal series of short blunt, very stout spines, about 32 on each side, but no dorsal spines. Anal lobes and armature of larva reminding one of those of *Cerococcus*. Eyes darkly pigmented.

Remarks: A number of the galls of this species which contain healthy females also harbour a large coleopterous larva. I imagine that this species feeds upon the wax and other secretions of the insect. In other cases comparatively large galls were opened which showed no trace of the Coccid, but contained a small dipterous larva. In a few instances living galls were opened that contained a large body of the Coccid in which the integument was dry and brown, and this on being opened exhibited a number of maggots (8-10), also Dipterous. Dead galls, apparently of last year's growth, harboured a multitude of specimens in great variety. These include a small centipede, several species of mites, a mealy bug, and a minute honey-coloured ant, the entire nest of which seems to be in a single gall.

Habitat: On native vine (*Cissus cuneifolia*); collected by C. Fuller on Natal Coast, near Durban.

Collection No.: 40.

Sub-family CALYCIPOCCINAE, nov.

(Characters of the type genus.)

Genus **Calycicoccus**, g.n.

Adult ♀ inhabiting small conical or calyx-like galls in the leaves of the host-plant. Typical galls flat on upper surface of leaf and flatly conical on lower side. The apex of the cone is perforate, and through the aperture protrude numerous strong filaments secreted from the caudal spine glands of the ♀. Inverted galls, formed from the upper tissues of the leaf, are larger and bluntly pointed.

Body of adult ♀ peg-top-shaped, wine-red in colour; anterior end broadly rounded and the abdominal segments produced into a conspicuously annular cone, all segments bearing very stout spines. In the type species ten segments are visible, on which the stout spines decrease in size away from the posterior extremity.

Antennae and legs present. Antennae small, consisting of 4 segments. Terminal segment with several hairs.

Legs small, all three pairs usually about equally developed. Claw long; upper and lower digitules apparently simple hairs.

Mouth-parts comparatively small. Integument of greater portion of body without glands. Posterior segment, margins and around the spiracles with long setae. Anal ring with 6 hairs.

Type, *C. merwei*, sp. n.

66. **Calycicoccus merwei**, sp. n. (Plates iii & iv, figs. 73 & 77).

Adult ♀ enclosed in galls on the leaves of host-plant. The galls are of two distinct types: one small, flat, and inconspicuous, except for the coloration of the plant tissues above them; the other stout, blunt, horn-like.

Gall, type A (fig. 73a). About 3 mm. in diameter, flatly conical, only about twice the thickness of the leaf. On the upper surface of the leaf there is a flatly rounded, circular indication, the centre of which is pale yellow in colour. This is surrounded by a darker area, outside which a paler tint fades into the general grey-green of the leaf; this is the top of the gall. On the under-side the gall is regularly raised into a flat cone, the centre of which is drawn out into a small tube, from which a tuft of glassy filaments protrudes. On dissection of the hard woody tissues it is found that the filaments are produced from the conical posterior extremity of the adult ♀.

Gall, type B (fig. 73). About 4.5 mm. in diameter and about 5 mm. long, tapering to a pointed tip, which is always curved to one side. This gall is hard and woody, and represents, I think, the inverted form of "type A" which is normal. In every case the large gall is found on the upper surface of the leaf, with a thickened edge or rounded mound on the lower side, and is often found on a leaf with as many as 30 of the normal galls, which open on the lower surface. The insects contained in the two forms are identical, but vary somewhat in size, those in the abnormal galls being usually the larger. The different types of galls appear to depend upon whether they are formed from the upper or lower tissues of the leaf, as the large type B are only produced on the upper surface.

Adult ♀ about 1.5 mm. in diameter, peg-top-shaped with the conical posterior extremity extending downward with the gall (fig. 77). The body colour is deep

wine-red, with the posterior segments rendered conspicuous by the accumulation of white powdery secretion. Strong glassy filaments are produced from the pointed tip and extend through the opening of the normal gall. These have never been observed protruding from galls of type B. When cleared and mounted the insect is seen to possess both legs and antennae. The body is hyaline, except the mouth-parts, legs, antennae, and posterior extremity with the stout spines, which are more heavily chitinised.

Male puparia clustered on the lower sides of the leaves, generally around the conical parts of the galls. Male puparium about 1 mm. long and rather more than half as broad, with the dorsum densely matted with white waxy filaments. Before forming puparia the males are first of all yellow, and bright pink when older.

Habitat: Causing galls in the leaves of a native tree (*Apodytes dimidiata*, L. Mey.), Durban; collected by C. P. v. d. Merwe, 10th July 1916. Also on the stunted beach form of this plant at Illovo River, Natal; collected by Claude Fuller, 5th August 1916.

Remarks: I have pleasure in associating the collector's name with this interesting species. The insects were in the adult stage and contained well-developed embryos when collected in July.

Mr. T. R. Sim in his "Forest Flora of Cape Colony" mentions and figures "calyx-like galls" on the leaves of this tree. Since describing this species I have received galls similar to Mr. Sim's description and figure on smaller leaves said to be of the same species of host-plant, but these did not contain insects in suitable condition to determine whether they belong to this same species. They do, however, undoubtedly belong to the same genus. In reply to a query concerning the insect Mr. Sim writes (2nd February 1917) "I am under the impression that the insect gall appears wherever the tree grows, from the coast to the Drakensberg, though as the subject is not quite in my line, I made no special observations. I remember it on the East London, Durban-Coast, Mid-Natal and Amatola Ranges, but am not sure in regard to the Drakensberg, where the tree is frequent."

Collection No.: 104.

Sub-family ASTEROLECANINAE.

Genus **Amorphococcus**, Green.

Amorphococcus, Green, Ent. Mo. Mag. xxxviii, p. 261, 1902.

"Insect enclosed in galls. Adult female forming no test; naked or partially enveloped in the nymphal pellicle. Antennae rudimentary. Limbs wanting. Mentum monomerous, without stigmatic spines. Derm without cribriform plates or paired glands. Anal lobes minute or obsolescent. Anal ring setiferous.

"Larva with conspicuous 8-shaped glands giving rise to eurling glassy filaments. The characters of the larva clearly indicate the relationship of this abnormal genus to *Asterolecanium*.

"Probably allied to Maskell's genus *Frenchia*." (Green).

67. **Amorphococcus acaciae**, sp. n. (Plates iii & iv, figs. 75 & 79).

Adult ♀ causing flatly rounded, circular, blister-like galls on the stems of *Acacia* sp.

Gall of adult ♀ about 2.5 mm. in diameter, and 1 mm. high, circular, curving from stem to centre of gall, which is perforate with a circular orifice (figs. 75, 75a).

The surface of the gall may be chipped off with the point of a knife, exposing the yellow adult ♀ below (figs. 75*b*, 75*c*). The inner surface of the gall is regularly domed, and the orifice is generally closed from within by what appears to be the cast skin of the immature ♀.

Adult ♀ about 1.25 mm. in diameter, pale yellow in colour, irregular and wrinkled. When cleared and mounted the insect appears as a hyaline sac with mouth-parts and anal ring only conspicuous. The antennal tubercles are small, with 3 curved spines (fig. 79*a*). Figure-8 glands absent. Simple glands moderately numerous, chiefly in irregular transverse rows near posterior end. Anal ring small, with 6 hairs. Caudal lobes obsolete, but marked by a pair of long stout bristles, which are rather more than twice the length of those of the anal ring (fig. 79). Mouth-parts comparatively small.

Habitat: Causing flat galls in stems of *Acacia* sp.; collected by writer, Pretoria, 19th September 1914.

Collection No.: 299.

Sub-family CONCHASPINAE.

This sub-family comprises very few species, all of which belong to one of the two genera *Conchaspis* and *Fagisuga*. Only the former is represented in South Africa, and that by one species.

The characteristics of the CONCHASPINAE may be briefly stated as follows:—

Anal ring hairless; legs and antennae present; adult females beneath a separate covering scale, which is composed entirely of secretory matter without the admixture of exuviae.

Genus *Conchaspis*, Ckll.

Conchaspis, Ckll., Gard. Chron, (3) xiii, p. 548, 1893; id., Jn. Inst. Jamaica, I, p. 256, 1893; id., Bull. Bot. Dept. Jamaica, p. 101, 1895; Green, Cocc. Ceylon, i, p. 19, 1896.

Pseudinglisia, Newst., Ent. Mo. Mag., xxix, p. 153, 1893.

Scale ± circular, moderately convex, smooth or slightly ridged. Adult ♀ retaining legs and antennae. Antennae of few (3 or 4) segments. Terminal segments of the abdomen ± united into a pseudo-pygidium, which usually has long hair-like spines but no definite plates (figs. 80 *c*, 81). In the type species of the genus *Fagisuga*, *F. triloba*, Ldgr., there are several stout spines and three broad plates with saw-like margins (fig. 83).

68. *Conchaspis euphorbiae*, sp. n. (Plate v, fig. 81).

Female scale large, reaching 6.5 mm. for its greatest diameter, average size about 5 mm.; nearly circular, sometimes slightly elongate, moderately arched. Colour white, but appearing greyish owing to the presence of small dark particles incorporated in it, especially at the margins of the component lamellae. The scale is somewhat flattened on top, where it usually presents a ♯ irregular, central, yellowish projection surrounded by a concentric ring. In texture the scale is compact, the main dome being slightly roughened above and white and shiny beneath. The small ~~male~~ (?) puparia found beneath the large main scale are white, broadly oval and loose and flocculent in texture. Large numbers of scales are often aggregated into masses

which entirely surround the smaller twigs of the host-plant. In one lot of material from Namaqualand the scales are dull black in colour, owing to the collection of "sooty" fungus which covers entirely both scales and twigs.

Adult ♀, when dry, dark brown in colour, larger than *C. socialis*; the average length being 1·8–2 mm. The body, when cleared, is broadly rounded in front and tapers gradually towards the posterior end. The integument is but slightly chitinised, except the mouth-parts, legs, antennae and thickened portions of the pseudo-pygidium, which appear yellowish brown. The general body surface is finely stippled, and is not rugose, as is the case in *socialis*. The antennae are 3-jointed; the basal segment long, and often appearing divided towards the base (figs. 81*b*, 81*c*). Legs stout and moderately long, extending well beyond the margin of the body, similar to those of *socialis*, *i.e.*, without tibio-tarsal articulation. The clear spaces surrounding the eyes, which are so conspicuous in the Ceylon species already mentioned (fig. 80*a*), are not noticeable in this species, but a close examination reveals two areas, similar in shape, but closer together and situated somewhat further back from the front margin, at the level of the mouth-parts. These are of about the same, or slightly intensified, density as the surrounding integument, with the eyes noticeably denser in the centre. The characters of the pseudo-pygidium are illustrated in the accompanying figures (figs. 81, 81*a*). The compound, circular, marginal glands of *socialis* are absent, and the compressed, oval gland openings are more numerous. On the margin of the anterior part of the body, between the position of legs i. and ii., there is a rounded protuberance (fig. 74*d*), and a submarginal series of long hairs.

Habitat: On melkbosch (*Euphorbia* sp.), Concordia, Namaqualand; collected by Mr. Krapohl.

Collection Nos.: 13 and 14.

Sub-family DIASPINAE.

Anal ring hairless. Adult ♀ without legs and with rudimentary antennae. The terminal abdominal segments are \pm united into a definite pygidium. Adult ♀ beneath a separate covering scale which is composed of secretory matter *plus* the exuviae.

The insects comprising this sub-family show considerable variation in form, character of the scales, etc., and this accounts for the large number of genera and sub-genera which have been made to accommodate them. Several attempts have been made to classify them in a more or less natural or phylogenetic manner, as, for instance, the arrangement of Leonardi in 1898, and particularly that of Lindinger in 1907. As none of the schemes so far propounded seems entirely satisfactory, I refrain from making use of any one of them in dealing with South African Coccids only, as such a course would necessitate either many unavoidable gaps or the inclusion of a large amount of material which is undesirable in such a work as this. A really workable classification of the COCCIDAE must be a work of the future, when more forms have been discovered and more complete collections assembled.

The chief specific characters used for the determination of the DIASPINAE are found in the pygidium of the adult female. These may be given more or less in the order of their importance in the following way:—(1) Number and character of lobes; (2) number and character of plates; (3) number and arrangement of circumgenital

glands; (4) number and arrangement of marginal gland openings; (5) number and position of spines; and (6) number and position of dorsal glands.

To facilitate the comparison of species, particularly with reference to the above characters, a formula is included in many of the descriptions. The type of formula follows that used by Dr. L. Lindinger in his work on European COCCIDAE (Die Schildläuse, 1912), but it has been altered and adapted to the requirements of this work. All formulae read from the median line of the pygidium.

L indicates lobes; the position is indicated by figures placed below, as L_1 , L_2 , etc.

Thus L_1 indicates the median lobe, L_2 the first lateral lobe or lobe in the 2nd position, etc.

ll indicates a lobe composed of two lobules.

P indicates plates with the position indicated as for lobes.

— indicates a vacant space in the margin of the pygidium.

G indicates gland openings on the margin.

S indicates spine on the margin.

N.B.—G and S are not used unless the parts indicated form a distinctive characteristic of the pygidium, and glands or spines set within the margin are not indicated. When more than one plate is present at any point the number is indicated by a figure in front of the character: thus $2P_1$ indicates two plates before the median lobe.

For example, $L_1, P_2, ll_2, P_3, G, G, P_4, G, G, P_5, G, —, G, P_6$. (*C. natalensis*)

In using the above characters it will be found that every species does not have a distinctive formula. Thus *Chrysomphalus aurantii*, the common Red Scale has:— $P_1, L_1, 2P_2, L_2, 3P_3, L_3, 3P_4$, and this is also the formula for *C. ficus* and *C. dictyospermi*. Nevertheless, the value of such a formula as a means of comparison is great, and the tabulation of pygidial characters is facilitated and shortened.

The number and arrangement of the circumgenital glands are also given in tabular form. Thus in *Diaspis bromeliae* there are five groups of glands arranged in an anterior median group and two lateral groups on each side. This would be stated:—Circumgenital glands in 5 groups:—

7—11

13—21 13—21

12—18 12—18

indicating that the median group consists of from 7 to 11 glands, the anterior laterals of 13 to 21 each, and the posterior laterals of 12 to 18 each.

Synoptical Key to South African Genera of the Diaspinae.

A. ♂ puparium somewhat similar to the ♀ scale in general form and texture, being usually smaller and more elongate.

B. Exuviae of ♀ scale \pm central and superposed; ♀ scale circular or nearly so.

C. Adult ♀ not enclosed in the second pellicle.

(1) ♀ scale with thin margins, not recurved to make it capsular; pygidium without elongated thickenings (paraphyses); plates absent, simple or branched; circumgenital glands absent, or, when present, usually in 4 groups.

Aspidiotus series.

- (2) ♀ scale usually capsular ; pygidium with elongated paraphyses ; plates variable sometimes absent ; pygidium without embossed design on dorsum

Chrysomphalus.

- (3) Similar to *Chrysomphalus*, except that the pygidium has embossed design on dorsum ; body usually wine-red in living insect, often with deep articulation between the cephalothorax and abdomen ; plates usually simple.

Pseudaonidia.

- (4) ♀ scale with exuviae curved over to one side, giving the scale a distinct shell-like appearance ; body deep purple ; plates cleft and \pm spoon-like.

Furcaspis.

CC. Adult ♀ enclosed in second pellicle.

- (5) As in *Aspidiotus* series, except that the ♀ is enclosed in 2nd pellicle but for the pygidium, which protrudes *Cryptaspidiotus.*

- (6) ♀ scale composed almost entirely of the large second pellicle with little or no secretory covering ; pygidium with definite lobes and plates *Aonidia.*

- (7) As in *Aonidia*, except that the pygidium is without definite lobes or plates.

Gymnaspis.

BB. Exuviae of ♀ overlapping and placed near or at the anterior end of the scale ; ♀ scale broadly elliptical or elongate and narrow.

- (8) ♀ scale broadly elliptical, 2nd pellicle large with \pm secretory covering ; pygidium with a continuous marginal series of broad fimbriated plates and with wide marginal glands, whose openings are at right angles to long axis of body. *Parlatoria.*

- (9) ♀ scale long and narrow ; pygidium of ♀ without embossed design on dorsum ; plates simple ; circumgenital glands usually in 5 groups ; ♂ puparium similar to ♀ scale but smaller ; the posterior part with a hinge-like flap.

Lepidosaphes.

- (10) ♀ scale very long and very narrow, thread-like ; pygidium of ♀ with a large embossed patch on dorsum ; circumgenital glands in 3 or 5 groups.

Ischnaspis.

AA. ♂ puparium usually white and usually unlike the ♀ scale in texture ; always unlike it in form, being narrow with nearly parallel sides, in some cases uni- to tri-carinate.

B. Adult ♀ not enclosed in second pellicle.

- (11) ♀ scale \pm circular or slightly elongate ; circumgenital glands usually in 5 groups ; exuviae central or slightly to one side, but within the margin ; plates usually simple and dagger-like, rarely branched at tips.

Diaspis series.

- (12) ♀ scale usually buried beneath the outer layers of bark of host-plant ; pygidium strengthened by two clubbed thickenings which extend backward from median lobes ; plates few in number, simple, blunt . . . *Howardia.*

- (13) ♀ scale usually elongate, often broadened behind, usually white ; exuviae anterior ; circumgenital glands absent or present ; plates usually simple and dagger-like. *Chionaspis* series.

BB. Adult ♀ enclosed in second pellicle.

- (14) ♀ scale completely enclosing the adult ♀, composed of large second pellicle and with little secretory covering; plates usually absent or few in number and simple. *Fiorinia*.

Genus ASPIDIOTUS, Bouché.

Scale of adult ♀ \pm circular, flat to convex or conical. Exuviae central or sub-central, invariably occupying the highest portion of the scale; with the first exuviae superposed upon the second, and often coated with a thin secretory covering, which sometimes gives a nipple-like effect to the scale. Ventral scale usually thin and delicate, often remaining on the plant when the insect is removed.

The puparium of the male resembles the ♀ scale to a great degree, but is usually smaller, rather more elongate, and usually more coriaceous.

The pygidium of the adult ♀ has lobes and generally branched plates, but no elongate paraphyses such as those found in *Chrysomphalus*. Circumgenital glands may be present (2 to 5 groups) or absent.

The following sub-genera are represented in South Africa:—*Aspidiotus* (*s. str.*), *Selenaspidus*, *Morganella*, *Diaspidiotus* and *Hemiberlesea*.

These may be distinguished by the following key:—

A. Pygidium without incisions having thickened edges.

(a) Lobes present, all normal; plates branched, normal. *Aspidiotus, s. str.*

(b) Three pairs of lobes present, of which the 3rd are usually tusk-like; scale generally flat, circular, with central exuviae, of a brown colour; cephalothorax, with one exception, distinctly separated from the abdomen at the margin; plates broad, with outer end fringed. *Selenaspidus*.

(c) Only median pair of lobes present; these are long and slender, closely adjacent or contiguous, with anal openings at inner bases; scale convex, black; exuviae concolorous; plates very long, numerous, and fringed on sides.

Morganella.

B. Pygidium with incisions having thickened edges.

(d) ♀ scale usually dark greyish in colour, exuviae covered, often exhibiting "concentric ring and dot"; median lobes usually close together; other lobes rudimentary or at least not prominent; plates usually few in number and simple, dagger-like or but slightly branched. *Diaspidiotus*.

(e) ♀ scale usually convex, light in colour, buff or yellowish, median lobes large and close together, others suppressed; plates conspicuous, crowded towards median lobes; anal ring large, set far back near median lobes *Hemiberlesea*.

Key to South African Species of Aspidiotus s. str.

A. Pygidium with three pairs of lobes.

a. L_1 projecting beyond L_2 .

(1) ♀ scale brownish, ♂ puparium white, L_1 with straight sides, L_2 and L_3 smaller; \pm pointed (fig. 84) *A. hederæ* (Vall.)

(2) ♀ scale circular, white, with brown exuviae; L_1 with straight sides, L_2 and L_3 normal (fig. 91) *A. fimbriatus capensis*, Newst.

- (3) ♀ scale somewhat elongate, brown; L_1 rounded; P_4 very long (fig. 90)
A. regius, sp. n.
- (4) ♀ scale very small, conical; L_1 broad, rounded (fig. 87) .. *A. gowdeyi*, Newst.
- (5) ♀ scale white with radial striae, exuviae yellow; L_1 chitinous, L_2 and L_3 similar in shape but \pm colourless (fig. 89). .. *A. transparentis*, Green.
- aa. L_1 not extended so far back as L_2 .
- (6) ♀ scale transparent, yellowish; L_1 almost as long as L_2 (fig. 88)
A. destructor, Sign.
- (7) ♀ scale buff; L_1 deeply recessed and much smaller than L_2 (fig. 86)
A. kellyi, sp. n.
- B. Pygidium with four pairs of lobes.
- (8) L_2 , L_3 and L_4 rudimentary; P long, forked (fig. 85) .. *A. furcillae*, sp. n.

69. **Aspidiotus hederæ** (Vall.) Sign. (Plate vi, fig. 84).

The synonymy of this species is extensive. The following list includes, perhaps, most of the different specific names which have been applied to it:—

Aspidiotus affinis, Targ., 1869; *A. aloes*, Sign., 1869; *A. bouchéi*, Bar., 1849; *A. capparis*, Sign., 1876; *A. ceratoniae*, Sign., 1869; *A. chamaeropsis*, Sign., 1869; *A. denticulatus*, Sign., 1869; *A. epidendri*, Bouché, 1844; *A. ericae*, Sign., 1869; *A. genistae*, Westw., 1840; *A. gnidii*, Sign., 1869; *A. ilicis*, Sign., 1869; *A. lentisci*, Sign., 1876; *A. limonii*, Sign., 1869; *A. nerii*, Burm., 1835; *A. oleastri*, Colv., 1882; *A. osmanthi*, Sign., 1869; *A. transvaalensis*, Leon., 1914; *A. villosus*, Sign., 1869.

Chermes aloes, Boisd., 1867; *C. cycadicola*, Boisd., 1867; *C. hederæ*, Vall., 1829; *G. osmanthi*, Vall., 1829.

Diaspis obliquus, Costa, 1835.

This may be accounted for, to some extent, by the large variety of plants upon which the insect thrives, and by the variability of the insect itself. As a general rule the scale of the adult ♀ is approximately circular, moderately robust, varying from flat to roundly arched. It is yellowish to pale brown in colour, with yellow exuviae. When young the ♀ scale is white, as is also the ♂ puparium. In some cases the ♂ and ♀ scales are intermingled, but it is commonly noticed that the majority of the ♀ scales are on the upper surfaces of the leaves and the ♂ puparia on the lower. The size of the scales varies considerably on different host-plants. Thus on oleander the ♀ scale is often 2.5 mm. in diameter; on *Melia azedarach* the average size is probably 1.75 mm.

The living insect (♀) is \pm circular to broad pear-shaped, its broadest part being at about the middle. It is yellow in colour, with the pygidial margin darker. The free abdominal segments are distinct in young forms, but obscured when the body becomes distended with ova.

When cleared and mounted the body is hyaline, and the mouth-parts and pygidium yellowish. There are three pairs of lobes, which are variable. The median lobes are typically strong, with their inner faces straight but sloping backwards, so that the space between them is slightly broader at the base than at the outer end. The

length on the middle face is about equal to the width of the lobe. When not worn down, L_1 are notched on both outer and inner sides and the median extremity is rounded. The outer margins of these lobes curve slightly outward, and from each lobe a dense band of chitin extends into the pygidium for about the length of the lobes. L_2 are about as long as L_1 but narrower, and usually notched on the outer side; L_3 smaller, often \pm conical. The plates are longer than the lobes (fig. 84) and are finely divided at their extremities, the longest branches being nearest the lobes. Circumgenital glands present, in four groups:—

7—13 7—13
4—10 4—10

Formula :— $P_1, L_1, 2P_2, L_2, 3P_3, L_3, 7-8P_4$.

Habitat:—It is commonly found on *Acacia* (Australian species), asparagus, *Grevillea*, *Hakea*, English ivy, *Melia*, mulberry, oleander and palms; and has been received on *Agave americana*, aloe, *Aralia*, *Arbutus*, *Aucuba*, *Bauhinia*, box, broom, *Callitris*, Cape gooseberry, carnation, *Ceratonia siliqua*, *Citrus* (lemon), convolvulus, *Coprosma*, croton, *Cupressus sempervirens*, *Dracaena*, *Elaeagnus*, ferns, fig, *Genista*, grape, honeysuckle, jasmine, Kei apple, lilac, mango, moonflower, New Zealand flax, oak, orchids, *Osmanthus*, *Pandanus*, pepper, *Penstemon*, pine (*P. excelsa*, *P. canariensis*), plum, poplar, privet, *Prunus pissardi*, rose, *Spiraea*, *Tecoma*, *Thuja*, *Veronica* and *Yucca*.

Collection Nos. : 192, 195, 206.

70. ***Aspidiotus furcillae***, sp. n. (Plate vi, fig. 85).

Female scale small, about 1 mm. diameter, \pm circular, roundly arched, sordid white in fresh material, but when older appearing dark brown to blackish brown with rich red brown exuviae. The true colour of the scale is rarely seen, as nearly all specimens are partly or wholly covered with the outer layers of bark of the host-plant. The exuviae are central or nearly so.

The adult ♀ is apparently viviparous, as mounted specimens contain many larvae. Its body is broad pear-shaped, widest a little before the middle. The body wall is thin. Antennal tubercle with one long hair and two short spurs. Extending into the pygidium are two interrupted bands of chitin, the anterior portion being a little outward from the posterior bands (fig. 85). L_1 large, strongly chitinous, with the dense portion extending into the pygidium for a distance of a little more than the length of the lobes. The median space is narrow, parallel-sided, apparently without plates or spines. The median lobes are strongly indented on the outer margin and faintly notched on the inner side; outer margin of lobes rounded, with the outer edge longer than the inner. L_2 and L_3 \pm rudimentary, with a broad base from which arises a long stout spine, and the lobe proper, which is delicate and pointed. L_4 similar but generally shorter and more rudimentary. P long, broad, almost parallel-sided, with the apex drawn out into two, or occasionally three, very long prongs. The plates are apparently easily broken away, as many specimens have few left when mounted. Parastigmatic glands 0. Circumgenital glands in four groups:—

2—4 2—4
1—3 1—3

Formula :— $L_1, 1-2P_2, L_2, 2P_3, L_3, 2-3P_4, L_4, 3P_5, —, S$.

Habitat: On *Acacia horrida*, Pretoria; collected by the writer, 20th September 1914.

Collection Nos.: 193 and 209.

71. ***Aspidiotus transparens***, Green (Plate vi, fig. 89).

Aspidiotus transparens Green, Ind. Mus. Notes, iv, p. 4, 1896; Green, Cocc. Ceylon, i, p. 49, 1896 (*A. lataniae*, Sign., part); Green, Jl. Bomb. N. H. Soc. xiii, p. 69, 1900; Lindinger, Der Pflanze, iii, p. 358, 1907; Lindinger, Berl. Ent. Zeits. lii, p. 105, 1908.

Scale of adult ♀ + circular to somewhat elongate, about 3 mm. in largest diameter, dense white, occasionally slightly translucent, so that the deep orange ♀ may be indicated below. Scale usually with distinct radial striae. Occasionally the ♀ scales are faintly tinged with yellow, but as a rule they are pure white with orange yellow exuviae.

Adult ♀ elongate, bright orange yellow, with pygidial margin somewhat darker. Body (when mounted) hyaline, pyriform, with the abdominal segments well indicated. Pygidium long, roundly tapering, with the median lobes dense and deeply coloured, and L_2 and L_3 much more delicate and almost colourless (cf. *A. destructor*). Antennal tubercles with a long curved spine and apparently two or three small spurs. Parastigmatic glands 0. Pygidial margin as illustrated (fig. 89). Circumgenital glands in 4 groups:—

5—12 5—12
9—18 9—18

Formula:— $P_1, L_1, 2P_2, L_2, 2P_3, L_3, 8P_4$.

Habitat: On "umkavoti" (*Chaetachme aristata*, Planch.), Durban; collected by C. Fuller. On avocado (*Persea gratissima*, Gaerm.), Durban; collected by A. Kelly, May 1916. On reed, Simondium; collected by J. W. Hodgson, 30th January 1915.

Collection Nos.: 159, 159a.

72. ***Aspidiotus destructor***, Sign. (Plate vi, fig. 88).

Aspidiotus destructor, Sign., Ann. Soc. Ent. France, ix, p. 120, 1869; Green, Jl. Bomb. Nat. Hist. Soc. xiii, p. 70, 1900.

Scale of adult ♀ about 2 mm. in diameter, circular or nearly so, thin, transparent, yellowish, without radial striations. Exuviae pale to moderately deep yellow.

Adult ♀ similar to *A. transparens*, but often with the abdominal segments somewhat withdrawn, and when mounted readily distinguished by the following characters:

A. destructor, Sign.

L_1 shorter than L_2 and appearing slightly recessed, narrow, with the inner margin somewhat concave, outer margin notched near apex (fig. 88).

A. transparens, Green.

L_1 longer and broader than L_2 , not appearing recessed, deeply coloured, with thickened chitin extending into pygidium, ± symmetrical; notched on inner as well as outer side (fig. 89).

Circumgenital glands in 4 groups (occasionally in 5) :

(0—5)
 9—14 9—14
 5—7 5—7

Habitat : On banana, Capetown ; on sugar cane, Durban.

Collection No. : 160.

73. ***Aspidiotus fimbriatus capensis***, Newst. (Plate vi, fig. 91).

Aspidiotus fimbriatus capensis, Newst., Bull. Ent. Res. vii, p. 373, 1917.

Scale of adult ♀ circular, about 2·5 to 3 mm. in diameter, moderately convex, pure opaque white. The exuviae are central and normally covered with a thin layer of secretion, through which they appear slightly brownish. When rubbed the second exuviae are dark brown or bronze in old specimens, yellow when younger, with a terminal yellow spot which represents the pygidium.

Puparium of ♂ similar in shape, but small, semi-transparent, with yellow exuviae.

The body of the adult ♀ is broad pear-shaped or almost circular, with the small pygidium protruding from the one margin. All the anterior part of the body, which is broadly and uniformly rounded, is rather densely chitinised. The free abdominal segments are hyaline. The pygidial margin is almost as dense as the anterior part of the body. The segmentation is very obscure and the segments are hardly indicated at the margin. There are three pairs of well-developed lobes. L_1 notched on both margins, the other two being notched on the outer side only. L_1 moderately long and broad, with parallel sides and slightly denser than L_2 and L_3 . The dense chitin of the median lobes extends into the pygidium for a distance about equal to the length of the lobes. The space between the median lobes is broad U-shaped and contains two plates almost as wide as P_2 . L_2 and L_3 are of about equal width and are slightly narrower and shorter than L_1 . The plates are of about the same length as the lobes and form a distinct fringe reminding one of *Parlatoria*. They are broad and \pm parallel-sided, with their outer margins comb-like. Pygidium as illustrated (fig. 91). Tubular glands present. Circumgenital glands in 4 groups, occasionally in 6 :—

(0—2) 6—10 6—10 (0—2)
 6—10 6—10

Formula :— $P_1, L_1, 2P_2, L_2, 3P_3, L_3, 8-10P_4$.

Remarks : This species is more or less similar to *A. lauretorum*, Lindinger, but is readily distinguished by the pure white opaque scale of the mature ♀ and the more numerous circumgenital glands.

Habitat : On *Encephalartos* sp., Port Elizabeth, C.P., Cape No. 1268. Also collected by A. Kelly at St. George's Park, Port Elizabeth, C.P., April 1915. Mr. Butters of St. George's Park, Port Elizabeth, assures me that this is a native scale brought in with *Encephalartos* years ago.

Collection No. : 200.

74. ***Aspidiotus regius***, sp. n. (Plate vi, fig. 90).

Scale of adult ♀ small, elongate, about 1·4 mm. long and 0·7 mm. broad, usually widest about the middle and narrowed to each end ; buff in colour, with brownish

exuviae showing through the thin layer of secretion. The scale is somewhat translucent.

Adult ♀ small, about 1 mm. long, considerably longer than broad, evenly rounded in front, hyaline, except the pygidium, which is slightly yellow. The segmentation is indistinct and the margin of the body \pm regular. The antennal tubercles are small, with one very long seta, which is five times the diameter of the tubercle in length. There are three pairs of well-developed lobes, the median pair as broad as long, symmetrical, with the sides rounded and narrowing towards the pygidial margin. There is a distinct notch on each side and the apex is evenly rounded. The apical half of all the lobes is striate. L_2 somewhat similar, smaller, with the notch on the outer side more prominent than that on the inner. L_3 about half the size of L_2 , similar in shape. The plates are broad, with a long terminal fringe, except P_4 , which are broad at the base with a long narrow projection, which is \pm toothed on its outer margin. The first two plates of P_4 are almost four times as long as L_3 . Pygidium as illustrated (fig. 90). Circumgenital glands in 4 groups:—

2—5 2—5
3—4 3—4

Formula:— $P_1, L_1, 2P_2, L_2, 3P_3, L_3, 3-4P_4$.

Remarks: This species is similar to *A. britannicus* and *orientalis*, Newst., in some respects, but is easily distinguished by the slight difference in the size of the scale, the shape of the body, and the character of the glands and plates, especially P_4 .

Habitat: On aloe, King Williamstown, C.P.; collected by A. Kelly, March 1913.

Collection No.: B200.

75. **Aspidiotus kellyi**, sp. n. (Plate vi, fig. 86).

The scale of the adult ♀ is about 2 mm. in diameter, \pm circular or slightly elongate, flat to slightly convex, rather robust, faintly buff or brownish in colour, with almost central exuviae, which are covered; but in rubbed specimens they appear metallic yellow to bronze in colour. Seen from below the second exuviae are yellow. The ventral scale is extremely delicate and remains attached to the leaf. The tissues below, and around the scales, are of a rich purple tint.

The ♂ puparium is flat, about 1 mm. long, somewhat elongate, often with the ends slightly pointed, dull light brown in colour with paler margins. Exuviae covered yellowish.

Adult ♀ bright yellow, long, pear-shaped; when dry, dull deep brown to blackish. When boiled and cleared the insect is small, almost 1 mm. long (containing young), regularly pyriform, with margin regular, *i.e.*, without prominent margins to the abdominal segments. The posterior extremity is rather abruptly narrowed to the pygidium. The mouth-parts are comparatively large and broad; the antennae, situated near the anterior margin, small, each composed of a \pm elongate tubercle and one long curved bristle. Parastigmatic and circumgenital glands absent. The pygidium appears truncate from the fact that the median lobes and the six adjacent plates are deeply recessed in a \pm rectangular depression between the large second lobes. There is a large strong spine at the outer margin of each lobe. Beyond the third lobes the margin is \pm fringed with broad, short plates, of which there are probably four or five, but the plates in this species are so delicate that out of eight

insects mounted no single specimen shows them all in position. L_1 small, deeply recessed, \pm parallel-sided and notched on each side. L_2 large, rounded, outer portion not conspicuously notched, but striate. L_3 smaller than L_2 , roundly pointed, with the apex pointing slightly outward. P comparatively short. P_1 and P_2 not so long as L_2 . P_3 fringed on the outer margins. Pygidium as illustrated (fig. 86).

Formula : $P_1, L_1, 2P_2, L_2, 2P_3, L_3$.

Adult ♂ not observed.

This insect is most like *Aspidiotus excisus*, Green, in the peculiar type of pygidium. It is readily distinguished from that species however by (a) the difference in the scale, (b) the fact that the median lobes are smaller than the second pair, and (c) the entire absence of circumgenital glands.

The material studied consists of a small collection of dry material from which 8 adult females were mounted.

Habitat : On grass (*Andropogon amplexans*, Nees), Meintjes Kop, Pretoria ; collected by A. Kelly, October 1913 ; also in same place by Carl Rudolf, 8th April 1916.

I have much pleasure in associating the collector's name with this species as a token of appreciation for much assistance rendered in a multitude of ways.

Collection No. : B188.

76. **Aspidiotus gowdeyi**, Newstead (Plate vi, fig. 87).

Aspidiotus gowdeyi, Newst., Bull. Ent. Res. iv, p. 77, 1913.

Scale of adult ♀ "very small, obconical and suddenly truncate at the margin of the larval pellicle ; margin circular. Colour dark brown, outer margin paler, upper margin orange-brown to pale castaneous. Larval pellicle completely hidden beneath a glistening white secretion, which is perfectly flat, quite circular in outline, and not raised above the upper truncate margin of the secretory covering of the puparium. Ventral pellicle thin. Diameter, 0.4–0.5 mm.

"Female, adult. Broadly ovate, narrowed posteriorly ; integument very thin and transparent ; presence of rudimentary antennae and parastigmatic glands doubtful. Pygidium with six lobes ; median lobes much the largest, distal margin broadly rounded ; second and third pair small and somewhat triangular, with the distal margins more or less pointed. Squamae very finely and closely fringed ; those between the median and third pair of lobes and the three succeeding ones, on either side, unusually broad, the two proximal ones small and branched. Only two spines are traceable and these are placed on opposite sides beyond the squamae. There is a very small bilateral incision near the second pair of lobes and a rather long thickening of the integument near each of the third lobes. Anal orifice large and submarginal. Position of the vaginal orifice rendered obscure by a large and somewhat tongue-shaped thickening of the integument occupying the middle area of the pygidium. Circumgenital glands absent." (Newstead).

Pygidium as illustrated (fig. 87).

Formula : $P_1, L_1, 2P_2, L_2, 3P_3, L_3, 6-8P_4$.

Habitat : On "umkavoti" (*Chaetachme aristata*, Planch.) and other native shrubs in Natal and S.E. Cape Province.

Collection No. : 213.

Key to South African Species of Sub-Genus Diaspidiotus.

A. Pygidium of ♀ without distinct plates.

a. L_2 rudimentary.

(1) L_1 short, not touching on inner margins; circumgenital glands 0 (fig. 99) *africanus*, Marlatt.

aa. L_2 normal, smaller than L_1 .

(2) L_1 sloping inwards and touching or nearly so; circumgenital glands present (fig. 92) *forbesi*, Johnson.

(3) Chitinous thickening to second incision reniform, L_1 not touching on inner margin; circumgenital glands 0 (fig. 98) *ehretiae*, sp. n.

B. Pygidium of ♀ with distinct plates.

b. L_2 normal, smaller than L_1 .

(4) Plates short; circumgenital glands 0 (fig. 97)- .. *perniciosus*, Comst.

bb. L_2 rudimentary or apparently absent.

(5) Plates short; circumgenital glands present (fig. 94) .. *pectinatus*, Ldgr.

77. **Aspidiotus (Diaspidiotus) forbesi**, Johnson (Plate vi, fig. 92).

Aspidiotus forbesi, Johnson, Ent. News, vii, p. 151, 1896.

A. (Diaspidiotus) forbesi, Ckll., Bull. 6, U.S. Dept. Agr. pp. 5 & 21, 1897.

A. (Aspidella) forbesi, Leon., Gen. Spec. Dias. Asp. p. 49, 1900.

Aspidiotus forbesi, Fernald, Catalogue, p. 259, 1903.

Common Name: Cherry Scale.

Scale of adult ♀ ± circular, about 2 mm. in diameter, greenish or brownish grey, with the exuviae orange-red to dark red-brown and slightly covered.

Male puparium similar in colour, smaller and more elongate. In both cases the margins of the scales are often much paler than the median portions.

Adult ♀ yellow, long, pear-shaped, with the pygidial end sharply pointed. Abdominal segments distinctly rounded at the margins. L_1 rounded at apex and notched midway on lateral margin, converging and almost meeting, giving this species a decided pigeon-toed appearance. L_2 narrower, about one-half the width of L_1 , obscurely pointed, and with an indefinite notch on the the outer edge. The first incision is edged by chitinous thickenings of unequal size, the mesal one being long and club-shaped, the outer one usually minute. There is a small pair of thickenings between the median lobes and the pair bounding the second incision are often of about equal size and fused at the top. Plates absent or inconspicuous. Pygidium as illustrated (fig. 92). Circumgenital glands in 5 groups:

1—4
4—7 4—7
3—5 3—5

Formula:— L_1 , S, L_2 , S, —, S, (1-2P?), —, S.

This species was probably introduced prior to 1900 on consignments of apple trees from the Southern States of America.

Habitat: On plum, Bethlehem, O.F.S., 6th April 1912; on plum, Potchefstroom, Transvaal, May 1912; Cradock, Cape Province; Pietermaritzburg, Natal.

Collection No.: 190.

78. **Aspidiotus (Diaspidiotus) africanus** (Marlatt) Brain (Plate vi, fig. 99).

Aspidiotus (Diaspidiotus) africanus, Marlatt (*ex parte*), Bull. U.S. Bur. Ent., T.S. 16, p. 15, 1908.

Scales of young circular, yellowish or buff, with a distinct white cap formed of the secretory covering of the first exuviae. This white layer sometimes exhibits a faint nipple effect, owing to a depressed ring near its outer margin.

Scale of adult ♀ sometimes circular, often slightly irregular and elongate, about 1·8 mm. in diameter, creamy-, yellowish-, brownish- or greenish-buff in colour, with yellow exuviae. The scale is often roundly arched or bluntly conical. The first exuviae are small, yellow, covered with an opaque layer of white secretion as observed in the young scales. The white caps are undoubtedly one of the chief distinguishing characters of the scales of this species. Male puparia about 1 mm. long and 0·6 mm. broad, almost parallel-sided, with rounded ends and the exuviae placed just within the margin at the anterior end. Colours as in the ♀ scale. The material described by Marlatt in 1908 was undoubtedly a mixture of two species, *africanus* and *pectinatus*, q.v. These were separated and the latter described by Lindinger in 1909.

Specimens mounted in glycerine are readily distinguished, for in *pectinatus* the plates are numerous and normally branched, while in *africanus* there are very few plates and these are simple and dagger-shaped, and very short.

The adult ♀ of *A. africanus* is broad pear-shaped, and hyaline, with the pygidial margin slightly denser. There are three pairs of lobes, the median pair alone being well developed. L_2 and L_3 are rudimentary. L_1 short, with their outer edges sloping and once notched. There are no chitinous thickenings between the median lobes. Those bounding the first incision are equal and usually \pm fused. Those at the second incision somewhat unequal, the inner being the larger of the two.

The formulae for the two species would be :

africanus :— $2P_1, L_1, 2P_2, L_2, P_3, L_3$.

pectinatus :— $2P_1, L_1, 2P_2, L_2, 1-3P_3, L_3, 2-3P_4$.

Pygidium as illustrated (fig. 99). Circumgenital glands 0.

Habitat : On bezemboom, Lady Grey ; collected by J. C. Faure, May 1916. On *Robinia pseudacacia* and on pepper, Bloemfontein ; on native bush, Meintjes Kop, Pretoria ; collected by the writer, July 1915.

Collection Nos. : 188, 191, and 196.

79. **Aspidiotus (Diaspidiotus) perniciosus**, Comstock (Plate vi, fig. 97).

Aspidiotus perniciosus, Comst., Rep. U.S. Dept. Agr., p. 304, 1811.

A. (Diaspidiotus) perniciosus, Ckll., Bull. 6, U.S. Dept. Agr., p. 30, 1897.

Aonidiella perniciosus, Berl. & Leon., Annali di Agr., p. 55, 1898 ; Leonard, Gen. Spec. Dias. Asp., p. 129, 1900.

Aspidiotus perniciosus, Fernald, Catalogue, p. 271, 1903.

Common Names : San José Scale, Pernicious Scale.

Scale of young flat, small, very dark blackish grey or black, with a central greyish dot surrounded by a black ring bordered on the outside again by a distinct greyish ring.

Scale of adult ♀ to 2 mm. in diameter, yellowish or buff-grey, but often obscured by fragments of bark. The yellow exuviae are covered and exhibit the greyish ring and dot of the young stages.

Male puparium smaller, narrower and darker in colour.

The nearest South African species is *A. pectinatus*, so far as the scale itself is concerned, but in this latter the ochraceous or blue-grey colour is pronounced, the exuviae show through the secretory layer as a red-brown pellicle, and the ♀ scale is usually more conical.

Adult ♀ (mounted) about 1.2 mm. long, broad pear-shaped, but often with the abdominal segments somewhat retracted, hyaline, except the mouth-parts and median area of the pygidial margin, which are yellow. Antennal tubercle slightly shorter and broader than in *pectinatus*. Pygidium (fig. 97) pointed, with two pairs of lobes. L_1 about as long as broad, rounded at apex, notched on the outer margin as in *pectinatus*. L_2 smaller, usually rounded at apex and notched near the middle of the outer margin. P short, slightly branched. Circumgenital glands 0. Formula: $P_1, L_1, 2P_2, L_2, 3P_3, L_3, 3P_4, —, S$.

It is practically impossible to state with any degree of certainty when this species was introduced into the Union. From its distribution at the time of discovery here it seems to me quite possible that there were two separate introductions, the one into Natal and the other to the Transvaal, possibly from Australia about 1906.

Habitat: It has been found on apple, almond, apricot, ash, chestnut, elm, hawthorn, loquat, oak, peach, pear, plum, poplar, quince, rose, pepper, walnut, and willow, and has been found at about a dozen places in the Transvaal, about an equal number in Natal, and three in the Orange Free State. It is not yet reported from the Cape Province.

Collection No.: 197.

80. **Aspidiotus (Diaspidiotus) pectinatus**, Lindinger (Plate vi, fig. 94).

Aspidiotus (Diaspidiotus) africanus, Marlatt (*ex parte*), Bull. U.S. Bur. Ent., T.S. 16, p. 15, 1908.

Aspidiotus pectinatus, Lindinger, Jahrb. Hamb. Wiss. Anst. xxvi, p. 43, 1909.

Common Name in South Africa: Grey Scale.

Scale of young circular, dark greyish, with a distinct white ring and dot. Scale of adult ♀ about 1.5 mm. in diameter, moderately convex to flattish, dark greenish grey, olivaceous, or bluish grey in colour, with the yellowish brown to reddish brown exuviae covered. The exuviae usually show distinctly through the thin secretory layer and are surmounted by the conspicuous white ring and dot as observed in the young scales.

On oleander the scales often contain an admixture of powdery material from the bark of the plant and are light in colour, but the greenish colour is generally apparent on the under-side of the scale. The white caps which are so conspicuous in *africanus* are never found in this species. Male puparia narrow, with exuviae near the anterior rounded margins; colour as in the ♀ scale.

♀ viviparous.

Body of adult ♀ (mounted) small, about 0·75 to 1 mm. long, broad pear-shaped, hyaline, except the mouth-parts and tip of the pygidium, which are yellow. Antennal tubercle small, narrow, comparatively longer than usual, with one long spine, which is almost straight and about twice the length of the tubercle. Parastigmatic glands absent. The pygidium (fig. 94) is pointed; it has one well developed pair of lobes and two other pairs which are rudimentary. L_1 large, normally about as long as broad, median space short, parallel-sided, but the lobes appearing to converge owing to the outer margins curving slightly outward. There is always a deep outer notch at almost half their length and occasionally an obscure inner one. L_2 and L_3 rudimentary, sometimes represented by a small conical, hyaline, projection from the broad base; but most commonly this is apparently absent or lost to view in the process of mounting.

Circumgenital glands few in number, in 4 groups :

0—4 0—4 usually 1—2 1—2
0—3 0—3 ,, 1—2 1—2

Formula : $P_1, L_1, 2P_2, L_2, 1-3P_3, L_3, 1-3P_4$.

Habitat : This scale is now recorded from all four Provinces of the Union. It was first described from specimens on pear, but is more commonly a privet scale. It is known to infest *Acacia horrida*, *Acer*, alder, almond, apple, apricot, ash, *Berberis*, *Ceratonia*, *Cotoneaster*, *Crataegus*, fig, *Gleditschia*, grape vine, hibiscus, ilex, lilac, pear, persimmon, plum, poplar, privet, quince, *Rhus*, pepper, and willow.

Collection No. : B.191.

81. *Aspidiotus (Diaspidiotus) ehretiae*, sp. nov. (Plate vi, fig. 98).

Scale of adult ♀ about 2 mm. in diameter, almost circular, greyish buff to brownish grey in colour, but often obscured by fragments of bark from the host-plant. The margins are depressed and the central portion raised, almost conical, with the highest portion occupied by the covered exuviae. The portion of the scale covering the second exuviae is smoother than the remainder of the secreted scale and the pale brown exuviae are slightly visible. In the centre is a small greyish or slate-coloured area, with a central white dot surrounded by a distinct shining ring of opaque white. This ring is particularly prominent in the young and male scales. Ventral scale white, extremely delicate, remaining attached to the host-plant.

Male puparium about 1 mm. long, and 0·6 mm. broad, of similar colour to that of the the ♀ scale.

Adult ♀ (from dry material) resinous brown, chitinous; when mature (mounted) large, 1·7 mm. long and 1·4 mm. broad, becoming highly chitinised from the anterior end backwards. Old females, after the eggs are laid, are entirely chitinous, of a deep yellow-brown colour. In young specimens the body is hyaline, except the mouth-parts, chitin bands of the pygidium, and the lobes and median part of the pygidium immediately behind them. Antennal tubercle with one moderately long spine. Pygidium with a basal row of transverse chitinous bands and two lateral ones, one on each side. Abdominal segments not prominently produced but broadly rounded; margin with a few hairs. Anus small, set well back from the lobes. The pygidium (fig. 98) is pointed. There are two pairs of lobes; but in specimens which have not

become too generally chitinised there is an indication of a small third lobe immediately anterior to the second incision. Later, when the surrounding chitin is denser, this appears as part of the pygidial margin. L_1 large \pm triangular, once notched on the outer side. L_2 similar but less than half the size. P absent. The chitinous thickenings to the first incision are large, unequal, the mesal one being the larger. The thickening to the second incision is large and reniform. Circumgenital and parastigmatic glands 0.

Formula : $L_1, S, L_2, S, —, S, —, S$.

The character of the lobes and the apparent absence of plates places this species very close to *A. forbesi*, but it is readily separated from this species by the characters of the scale, the median lobes being less convergent and slightly wider apart, the reniform thickenings to the second incisions and the absence of circumgenital glands.

Habitat : Apparently killing a tree of *Ehretia hottentottica*, Burch., Cookhouse, C.P. ; collected by A. Kelly, 13th March 1915.

Collection No. : 189.

82. ***Aspidiotus (Hemiberlesea) rapax***, Comst. (Plate vi, fig. 96).

Aspidiotus rapax, Comst., Rep. U.S. Dept. Agr., p. 307, 1881.

„ *camelliae*, Morg., Ent. Mo. Mag. xxiv, pp. 68 & 79, 1887.

„ *flavescens*, Green, Ceylon Independent, 1889.

„ *camelliae*, Lounsbury, Rep. Ent. C.G.H., p. 63, 1896.

Scale of adult ♀ strongly convex or almost conical, almost circular to elongate and one-sided, often appearing resinous, yellowish brown, with the exuviae towards one end brownish or blackish.

Professor Comstock's original description of the ♀ is as follows :—

“Female.—The body of the female is nearly circular in outline, bright yellow in color with more or less translucent blotches. The last segment presents the following characters : The group of spinnerets are wanting.

“Only one pair of well-developed lobes, the median, present. These are prominent. Each one is furnished with a notch on each side, the notch on the mesal margin is distad of that on the lateral margin. The second and third pairs of lobes are represented by the minute pointed projections of the margin of the body.

“The margin of the ventral surface of the segment is deeply incised twice on each side of the meson ; once laterad of the first lobe, and again between the rudimentary second and third lobes. The parts of the body wall forming the margin of these incisions are conspicuously thickened.

“There are two simple tapering plates between the median lobes, two deeply and irregularly toothed or branched plates extending caudad of each incision, one usually simple and tapering plate between incisions of each side, and two or three of the same character laterad of the second incision.

“The first, second, and third pairs of spines of each surface are situated near the lateral bases of the first, second, and third lobes respectively ; the fourth pair are situated at a little more than one-half the distance from the median lobes to the penultimate segment. In each case the spine on the ventral surface is but little laterad of the one on the dorsal surface.”

Pygidium as illustrated (fig. 96). Circumgenital glands 0. Formula: $2P_1, L_1, 2P_2, L_2, 3P_3, L_3, 2-3P_4$.

Habitat: This scale has been recorded on a large variety of plants, but an examination of the material reveals the fact that most of the records refer to *A. lataniae* and not *A. rapax*. It is known on *Euonymus*, *Acacia melanoxylon*, and a native tree from Johannesburg.

Collection No.: 198.

83. **Aspidiotus (Hemiberlesea) lataniae** (Sign.) Green (Plate vi, fig. 93).

Aspidiotus lataniae, Sign., Ann. Soc. Ent. Fr. (4) ix, p. 124, 1869; Green, Ent. Mo. Mag. (2) x, p. 181, 1899.

Scale of adult ♀ arched, circular to one-sided to elongate, with exuviae near one side. Whitish or greyish brown, about 2 mm. diameter, exuviae blackish. This scale is very much like that of *A. rapax*, but is usually flatter and the exuviae strike one as darker in looking over a lot of material. Pygidium as illustrated (fig. 93).

Circumgenital glands in 4 groups:

3—6	3—6
5—10	5—10

Lobes and plates as in *Aspidiotus rapax*, from which it is readily separated by the presence of circumgenital glands.

Habitat: On a large variety of plants throughout the Union, including vines, rose, box, palm, camellia, etc.

Collection Nos.: B.198, 199.

84. **Aspidiotus (Hemiberlesea) mitchelli**, Marlatt.

Aspidiotus (Hemiberlesea) mitchelli, Marlatt, Bull. U.S. Dept. Agr., T.S. 16, part 2, p. 22, 1908.

Professor Marlatt's description is as follows:—

“Scale of female: Length 1·5 mm; subcircular to broad oval, strongly convex, and of the general *camelliae* (*rapax*) type; secretory matter rather dense, color dull yellowish, due chiefly to the extraneous matter taken up from the surface; exuviae yellowish-brown, near the anterior and usually covered. Ventral scale a distinct white flocculent patch, thinnest at the centre.

“Scale of male: Similar in general appearance to that of the female, but of the normal elongate shape.

“Adult female: Normal top-shaped, 0·75 mm. in diameter; in balsam hyaline; anal plate a little more yellowed than body, broad, not produced; three pairs of lobes; median lobes truncate, not converging, with two lateral shoulders, separated by a lobe's width, relatively much smaller than the lobes of *camelliae* (*rapax*); second lobe minute, spear-shaped, often with outer lateral shoulder; third lobe narrow, spiniform; thickenings of first and second incisions present, subequal, and together with lobes a little more yellow than the pygidium, but not strongly chitinised; plates numerous, long, filiform, central ones simply branched; spines short, inconspicuous; basal dorsal thickenings not strongly developed or chitinized; anal opening much larger than median lobes, broad oval, about one lobe's length from tip; paragenital

pores wanting; dorsal pores not numerous or conspicuous, but with very long (one-half width of pygidium) internal tubes; ventral thickenings of integument extending from median lobes practically wanting."

This species was recorded "on thick, narrow, slightly oblanceolate leaves about $1\frac{1}{2}$ inches long, collected by Mr. C. P. Lounsbury, at Mitchell's Pass, S.A., Jan. 29, 1897." This species has not been observed again nor has any of the original material been found in the collection. I have left this species in the sub-genus *Hemiberlesea*, as described, for the present, but I think, from the illustration, that it should be in *Aspidiotus s. str.*

Sub-genus **Selenaspidus**, Ckll.

The chief distinguishing characters of this sub-genus may be tabulated as follows:—

Scale of adult ♀ generally large, flat, \pm circular, with central exuviae, most commonly brown in colour.

Puparium of ♂ elongate, brown, with exuviae placed towards one end.

Adult ♀ in all species (except *S. silvaticus*, Lindinger) with the cephalothorax distinctly separated at the margins from the abdomen. Pygidium with three pairs of lobes and numerous comb-like plates. The median two pairs of lobes are usually large and \pm tri-lobed. The outer (3rd) pair of lobes are normal and nearly as large as the others in *S. lounsburyi*; normal but smaller in *S. schultzei*; reduced to a small pointed projection in *S. euphorbiae*, Newst., and strong, \pm tusk-like and pointed in the other South African species. The scales of *S. lounsburyi* and *S. griqua*, sp. n., are unusual for this sub-genus. In the former it is \pm buff-coloured at first, moderately convex, and usually bleached in old specimens. In *S. griqua* the scale is very convex and the hardened, chitinous body of the female is also highly convex.

The position of the scales on the host-plant, the age of the specimens, and the condition of humidity and sunlight probably influence the scales of the species of *Selenaspidus* in a more marked manner than in any other known Diaspine Coccids.

Circumgenital glands are absent in the majority of species known, but there are two groups present in *S. articulatus* and *pertusus*, sp. n., and four groups in *S. celsatri*. At maturity the chitin becomes very dense, and the characters of the pygidium are often more or less obscured, and in some cases the body-wall has the appearance of being perforated by large, more or less rounded holes. These perforations are often arranged in definite order, but could never be mistaken for the tessellated designs found in *Pseudaomidia* spp.

The species known to occur in South Africa may be distinguished as follows:—

A. Cephalothorax distinctly separated at the margins from the abdomen.

I. Circumgenital glands absent.

- (1) 3rd lobes normal, not much smaller than 1 and 2 (fig. 100) *lounsburyi* (Marlatt).
- (2) 3rd lobes normal but much smaller than 1 and 2 (fig. 101) .. *schultzei*, Newst.
- (3) 3rd lobe obsolete, not represented by lobe or definite tusk (fig. 102)
euphorbiae, Newst.
- (4) 3rd lobe strong, tusk-like; insect small, flat, highly chitinous (fig. 107)
pumilus, sp. n.
- (5) 3rd lobe strong, tusk-like; insect convex, conical (fig. 105) *griqua*, sp. n.

II. Circumgenital glands in two groups.

(6) Posterior lateral margins of cephalothorax rounded ; integument not perforate (fig. 104) *articulatus* (Morgan).

(7) Posterior lateral margins of cephalothorax \pm acute ; integument appearing perforate (fig. 103) *pertusus*, sp. n.

III. Circumgenital glands in four groups.

(8) Anterior margin with tubercles (fig. 108) *celastris*, Mask.

B. Cephalothorax not distinctly separated at the margins from the abdomen.

(9) Circumgenital glands absent (fig. 106) *silvaticus*, Lindgr.

85. **Aspidiotus (Selenaspidus) lounsburyi** (Marlatt) (Plate vii, fig. 100).

Pseudaonidia (Selenaspidus) lounsburyi, Marlatt, Pr. Ent. Soc. Wash. ix, p. 139, 1908.

Professor Marlatt's description is as follows :—

"Female scale. Scale of adult female flat, subcircular, 2-2.5 mm. in longest diameter ; yellowish white but dense and opaque ; exuviae resinous to brown, covered with a slight excretion ; supplement usually three times diameter of second exuvium ; thin but distinct ventral scale present which adheres to the leaf.

"Male scale similar, oval, 1.5 mm. long ; exuvium near anterior end, brown.

"Adult female. Form oval, nearly 1.5 mm. long, strongly chitinized and brown in the case of old spent specimens ; body divided into two subequal parts by a deep cephalothoracic suture ; segments of abdomen indicated by distinct sutures but not marked by lateral incisions except in case of anal plate ; a short, stout lateral spine, distinctly annulated in the more hardened specimens, a little anterior to cephalothoracic suture.

"Anal plate. Similar in general characteristics to *articulatus* but exhibiting important differences ; lobes in three pairs, not very large, oval in shape, and often distinctly striate ; the two median subequal, the third smaller ; lateral teeth wanting or represented by the broad plates laterad of the third lobe ; incisions shallow, scarcely falling below the edge of the segment ; paraphyses indistinct or wanting ; interlobular plates narrow, two forked at tip—two median, two in first lateral and three in second lateral incision ; two obliquely truncated broad plates laterad of third lobe, with rudimentary third plate ; spines minute and inconspicuous ; anal opening narrow, oval, a little more than one third from tip ; vaginal opening very broad, more than one-third width of segment ; dorsal pores numerous in radiating rows from tip, but smaller and less abundant than in *celastris* ; basal thickenings a narrow line in four sections ; ventral thickenings not marked."

Habitat : On *Mesembryanthemum edule*, Capetown ; collected by C. P. Lounsbury, 29th June 1897 (Cape Nos. : 1263 and 1313).

Collection No. : 221.

85a. **Aspidiotus (Selenaspidus) lounsburyi**, var.

Scale of adult ♀ greenish grey, with uniform rusty-brown margins. Exuviae covered, central, appearing \pm grey.

The chitin in the adult ♀ of this variety is much more dense, dark in colour and often appears perforate. The third lobe is normal as in *lounsburyi* and the other characters are similar.

In old specimens which have dried out the scales become uniformly greyish white, and the covering of the second exuviae with the first exuviae attached is generally flaked off so that the scales appear greyish white with brown centres.

Habitat: On *Mesembryanthemum edule*, Bloemfontein; collected by J. C. Faure, 3rd June 1915.

Collection No.: B.221.

86. ***Aspidiotus (Selenaspidus) schultzei***, Newst. (Plate vii, fig. 101).

Aspidiotus (Selenaspidus) schultzei, Newst., Zool. Anthr. Ergeb. Westl. Zentr. Sudaf., p. 18, 1912.

Professor Newstead's description is as follows:—

“Puparium of female. Circular, smooth and rather thin; pellicles central, yellow to yellowish-brown; secretionary portion straw-coloured to ochreous white.

“Diameter, 1.50–2 mm.

“Female, adult. Strongly chitinised; thoracic articulation very distinct, constriction at sides deep; abdominal segments clearly defined by broad deep grooves terminating before reaching the margin; there are also several similar grooves on the thoracic region, but they are very short and irregular, taking the form rather of gland-tracts than true articulations. Pygidium (fig. 101) with three pairs of lobes; the second pair similar to the median pair, the third the smallest; all are distinctly striate, longitudinally. Squamae broad and rather coarsely divided. Spines very short. Tubular spinnerets long and slender, some of them reaching almost to the base of the pygidium.

“Resembles *Aspidiotus articulatus*, Morgan, but may be readily distinguished by the absence of the long serrated squamae at the margin of the pygidium.

“*Habitat*: Sudwestafrika, Klein Namaland, Kamaggas, L. Schultze. On a succulent plant.” (R.N.).

87. ***Aspidiotus (Selenaspidus) euphorbiae***, Newstead (Plate vii, fig. 102).

Aspidiotus (Selenaspidus) euphorbiae, Newst., Zool. Anthr. Ergeb. Westl. Zentr. Sudaf., p. 18, 1912.

Professor Newstead's description is as follows:—

“Puparium of female. Circular, thick, and opaque; exuviae central or sub-central; larval pellicle golden brown to dark golden yellow, covered with a white secretion, generally; second pellicle red-brown, covered with secretion similar to that of the larva; secretionary portion in two equal zones of pale ochreous and white, the latter marginal. Diameter, 1.75 to 2 mm.

“Female adult. With a well-marked thoracic articulation, constriction at sides great. Integument not highly chitinised. Antennae represented by an extremely minute tubercle furnished with a long spinose hair at the base. Stigmata without parastigmatic glands. Pygidium with a clearly defined lingula-shaped body of

chitin on the central surface, the apex of which points towards the hind margin. Circumgenital glands obsolete. Dorsal pores small, numerous, scattered over the whole of the pygidium. Anal orifice placed a little posterior to the lingula-shaped body. Fringe of pygidium [fig. 102] with two pairs of large lobes, the third pair obsolete. Squamae broad and digitate; these organs are not, however, very clearly defined.

“Length, 1.50 mm.

“Easily distinguished by the singular tongue-shaped mass of chitin on the pygidium. It is nearly related to *Selenaspidus magnus*, Lindgr., but this species has the integument much more highly chitinised, is slightly larger, has a very wide vaginal orifice and the tongue-shaped body is entirely absent.

“*Habitat*: Sudafrika bei Riet Tinkas (sudlich von Salem am Swakop), Sept. 1903, L. Schultze. Auf *Euphorbia* aff. *virosa*, Willd.”

This species is not represented in the Division collection.

88. ***Aspidiotus (Selenaspidus) pumilus***, sp. n. (Plate vii, fig. 107).

Scale of adult ♀ about 1.6 mm. in diameter, almost circular, margins flat, depressed, centre roundly and flatly conical, dull, grey brown, with yellow exuviae.

Puparium of ♂ smaller, narrower and elongate, of same colour and texture as the ♀ scale.

♀ viviparous.

Adult ♀ (mounted) small, largest specimen seen measuring 1.2 mm. long and 1.1 mm. broad across the angles of the cephalothorax. The body is entirely chitinous and is chitin brown in colour. The cephalothorax is flatly rounded, more than twice as wide as long, and the V-shaped sides of the articulation extend inwards for about one-tenth the width of the body. The segmentation of the body is distinct on the middle part, but does not extend to the margins. The antennal tubercles are large, disc-like, with one long hair. Before the chitinisation of the body is quite complete there are two well-defined series of hyaline patches, one in a curve in the region of the vulva (in optical section) comprising six long oval spaces, and another in the region of the mouth-parts. Parastigmatic glands 0. The vulva is wide, 180 μ , and is situated anterior to the anal opening. The pygidium as illustrated (fig. 107).

Circumgenital glands 0. Formula: $P_1, L_1, 2P_2, L_2, 3P_3, L_3, 2-3P_5$.

Habitat: On New Zealand flax (*Phormium tenax*, Linn.), Stanger, Natal; collected by C. Fuller, 11th December 1903.

Collection No.: 224.

89. ***Aspidiotus (Selenaspidus) griqua***, sp. n. (Plate vii, fig. 105).

Scale of adult ♀ about 1.5 mm. long, almost circular, but appearing elongate in the direction of the length of the twigs because it is so much arched, buff to brownish, matt, \pm smooth, shell-like, with exuviae covered. The first exuviae are central and are usually covered with a small circular area of secretion which is paler, or almost white. In rubbed specimens the first exuviae are brown. The second exuviae are covered with a layer of secretion similar to that of the scale, but their outer margin is often indicated by a line of paler colour.

Puparium of ♂ similar, but smaller and more elongate, with the first exuviae near one end, covered, yellow to orange when rubbed.

Adult ♀ with body very highly chitinised when mature, and highly conical, retaining this character when boiled in KOH, so that it is impossible to mount specimens flat without splitting them. When mounted the body is highly chitinous, with the segmentation intensified by thickened ridges of chitin at the edges of the segments. In shape the body is very short in comparison with its width, being broader than long. The cephalothoracic area is larger than the abdominal region, and the pygidium is short and flat, not pointed as in *articulatus*. The articulation is distinct, but not deep at the margins, and there is no process on the lateral margin. The lobes and plates are small and comparatively delicate, as shown in the illustration (fig. 105). Circumgenital glands 0.

Habitat: On *Arthrosolen polycephalus* (*Thymeleaceae*), a small native veld bush with numerous slender branches and narrow leaves, Belmont, Griqualand East; collected by F. Thomsen, 2nd April 1915; and on the same plant at Middelburg, Cape, by the writer, November 1916.

Collection No.: 227.

90. **Aspidiotus (Selenaspis) silvaticus** (Lindinger) (Plate vii, fig. 106).

Selenaspis silvaticus, Lindinger, Jahrb. Hamb. Wiss. Anst., xxvi, p. 10, 1908.

The illustration shows the pygidium from a specimen collected on *Aberia caffra*.

The scales of this species vary considerably in size and colour on different host-plants. The following variations may be noted for South African material:—

(a) On stemfruit (Transvaal, Collection No. 246).

Scale of ♀ circular or nearly so, brown, or in old specimens pale buff or almost white, flat, to 2 mm. in diameter. First exuviae naked, metallic, brassy or bronze; second exuviae covered, brownish. Puparium of ♂ smaller, horn-brown, with yellowish or brassy exuviae.

(b) On *Dracaena australis* (East London, C.P., Collection No. 231).

Scale of adult ♀ large, may reach 2·7 mm. for longest diameter, ± circular or elongate oval according to position on leaf, flat, thin, dull brown with paler margins. Exuviae central, flat, greenish, yellowish or metallic and brassy. Puparium of ♂ smaller, brown.

(c) On *Euonymus* (Natal, Collection No. 232).

Scale of adult ♀ to 2·5 mm. in long diameter, almost circular when not against midrib or margin of leaf, flat, dull, thin, dirty brown in colour, with ± metallic, yellowish exuviae. Puparium of ♂ flat, small, brown, with yellowish exuviae.

Habitat: On *Aberia caffra*, Uitenhage, C.P.; collected by C.P. Lounsbury, 2nd August 1906. On palms, tea and citrus, Natal; collected by C. Fuller. On *Euonymus*, Natal; collected by C. Fuller. On stem-fruit (*Chrysophyllum magaliesmontana*), Nelspruit; collected by T. R. Sim, January 1908. On native tree, Kei Valley, C.P. On *Berberis*, Irene, Pretoria, July 1913, and on ivy.

Collection Nos.: 203, 222, 228, 228a, 231, 232, 245, 246, 247 and 248.

91. **Aspidiotus (Selenaspis) articulatus**, Morgan (Plate vii, fig. 104).

Aspidiotus articulatus, Morgan, Ent. Mo. Mag. xxv, p. 352, 1889.

Selenaspis articulatus var. *simplex*, d'Emmerez, Pr. Soc. Amer. Scien. p. 20, 1889.

Aspidiotus articulatus, Newst., Mon. Brit. Coccidae, I, p. 127, 1901.

Selenaspis articulatus, Fernald, Catalogue, p. 284, 1903; Lindinger, Jahrb. Hamb. Wiss. Anst. xxvi, p. 10, 1908.

Scale of adult ♀ about 2 mm. in diameter, circular, flat, semi-transparent, pale brown or yellowish brown or dirty smoky brown when old, sometimes with margins very pale, often shiny, with central exuviae golden yellow.

Puparia of ♂ smaller, more elongate, brownish, with lighter exuviae.

♀ second stage non-articulate.

Adult ♀ viviparous, with the cephalothorax distinctly separated from the abdomen. Body-wall yellow-brown, densely chitinised; front margin flatly rounded, very finely crenulated, but without tubercles; posterior lateral angles of cephalothorax each with one spiny process, which is usually longer than its breadth at the base. The integument is finely stippled, and there is a sub-marginal series of small hairs at wide intervals. The antennae are small, with one long curved seta and a stump which may represent a second seta which has broken away. Parastigmatic glands 0.

Circumgenital glands in two groups :

6—12 6—12

The pygidium is rapidly narrowed but rounded, the ends of the four normal lobes being almost level. Lobes and plates as illustrated (fig. 104).

Habitat : On *Carissa grandiflora*, Durban; collected by A. Kelly, 7th June 1908. On variegated ornamental plant (*Euryea* ?), Pietermaritzburg; collected by C. Fuller.

Collection Nos. : 223 and 225.

92. **Aspidiotus (Selenaspis) pertusus**, sp. n. (Plate vii, fig. 103).

Scale of adult ♀ may reach 2.6 mm. in diameter, circular, flat, dull rusty brown in colour, with margins slightly paler. Exuviae yellowish or reddish brown. Second exuviae usually somewhat sunken. In old specimens exposed to the sun the scale often becomes ± bleached.

Puparium of ♂ smaller, more elongate and paler in colour, yellowish brown.

Body of adult ♀ narrower than in *articulatus*, longer than broad (1.5 × 1mm.) with deep articulation. Posterior lateral margin of abdominal region with distinct process. The integument is very highly chitinised, appearing dark brown in mature specimens, but with distinct, transparent, hyaline perforations. These are in three series : (a) a loop of about 10 spaces below the position of the mouth-parts, across the cephalothorax; (b) an interrupted series across the abdominal segments; (c) the pygidial series, which comprises a band across the base, four posterior to these lying longitudinally in two pairs, and a few elongate, narrow ones between these and the margin of the pygidium. Antennal tubercles small, each with two moderately long, curved setae. Dorsal glands and tubular glands numerous.

Circumgenital glands in 2 groups :

7—10 7—10

usually 8. Occasionally 1-2 glands are separated and might indicate that 4 groups may be present. Pygidial characters as illustrated (fig. 103).

Formula : $P_1, L_1, 2P_2, L_2, 3P_3, L_3, 6-7P_4$.

Habitat : On *Euphorbia* (tree form), East London ; collected by Mr. King, 19th October 1914. On *Mimusoops* sp., East London ; collected by Miss Impey, 30th May 1915. On laurel, Komgha, C.P. ; collected by C. P. Lounsbury, September 1909 (Cape No. 1709).

Collection Nos. : 212, 229 and 229a.

93. ***Aspidiotus (Selenaspidus) celastri***, Maskell (Plate vii, fig. 108).

Aspidiotus articulatus var. *celastri*, Maskell, N.Z. Trans. xxix, p. 297, 1897.

Selenaspidus articulatus celastri, Fernald, Catalogue, p. 285, 1903.

Selenaspidus celastri (Mask.) Lindinger, l.c., p. 8.

Scale of adult ♀ to 3 mm. in diameter, almost circular, ochreous fawn to straw-colour, often paler towards the margin, semi-glassy and smooth, with a dark brown to black blotch in the centre of the second exuviae. Exuviae central, flat. First exuviae thin, pale, almost colourless and transparent. Second exuviae brown, bright coloured, central, with a black blotch in centre.

Puparium of ♂ smaller, somewhat elongate, pale buff, semi-transparent, thin and delicate, with exuviae slightly darker.

The body of the adult ♀ resembles that of *articulatus* to some extent, but when under a low power the following differences are noticeable : The sides of the articulation are less acute and form a broad V. The anterior margin usually has a series of about twenty rough chitinous tubercles. The finger-like process on the lateral margins of the cephalothorax of *articulatus* is replaced by a process which is most often irregularly forked at the extremity. Pygidium as illustrated (fig. 108).

Circumgenital glands in 4 groups :

5—9 5—9
5—12 5—12

Habitat : On *Celastrus laurinus*, Thb., Ceres, C.P. ; collected by C. P. Lounsbury (Cape No. 1261).

Collection No. : 226.

94. ***Aspidiotus (Morganella) maskelli***, Cockerell (Plate vii, fig. 109).

Aspidiotus longispina, Mask. (non Morgan), N.Z. Trans. xxviii, p. 38, 1894.

Aspidiotus (Morganella) maskelli, Ckll., Bull. U.S. Dept. Agr., P.T. 6, p. 22, 1897.

Scale of ♀ small, about 1 mm. diameter, roundly arched, pitchy black, with exuviae of the same colour. Exuviae usually situated towards one side of the scale.

Adult ♀ (mounted) elliptical, broader than long (0.9 × 0.8 mm.), with the small, pointed pygidium somewhat recessed. Antennal tubercle with one very long curved spine. The pygidium (fig. 109) is acutely pointed. The median lobes are very long and narrow, with their inner faces close together and their outer margins very deeply notched. The extremity is round. There are chitinous thickenings extending back from the lobes. The plates are extremely long, ± parallel-sided, with long terminal branches, and the two edges ± plumose, the outer side being more branched than the inner. Circumgenital glands 0. Formula : $L_1 + 12-13$ long plates with outer edges fringed and 3 pairs of very long spines.

Habitat: On camellia, Botanic Gardens, Durban; collected by C. Fuller. On "Coffin tree" imported from China; collected by A. Kelly, February 1910. On *Michelia champeca*, Botanic Gardens, Pietermaritzburg; collected by A. Kelly, September 1910. On plant cuttings, Botanic Gardens, Durban; collected by A. Kelly, July 1914. On *Lagerströmia* sp., mango and orange, collected by A. Kelly in Durban, 1915. On citrus, Hillary, Natal. On papaw, Durban.

Collection No.: 210.

Genus **Furcaspis**, Lindinger.

This genus was erected by Lindinger in 1907 to accommodate the species "*biformis*" and *capensis*. The following is a translation of his diagnosis:—

"Scale of the ♀ round or elongate, thick, of differing brown colour, arched. Exuviae central or subcentral.

"Scale of the ♂ similar in colour and texture but different in shape being narrow and linear with the exuviae at the anterior end.

"Body wine-red in colour.

"Pygidium yellow, broadly rounded. Lobes, more than 3 pairs, the innermost 3 pairs almost similarly formed, those more removed differing to a greater or less degree, often toothed. Plates branched only at the end, apparently 2 to 3 toothed, the teeth united by a membrane which disappears on the dorsal side, so that the plates are really spoon-like. Design on dorsal side absent (such as found in the genus *Pseudoaonidia*)."

It should be mentioned that the scale of the two South African species is more or less shell-like, with the exuviae curved over to one side, and with \pm distinct concentric ridges on the upper surface of the scale.

95. **Furcaspis capensis** (Walker) Green (Plate vii, fig. 110).

Lecanium capense, Walker, Cat. Br. Mus. Homopt. p. 1079, 1852; Signoret, Essai, p. 612, 1876.

Aspidiotus cladii, Maskell (*ex parte*), N.Z. Trans. xxviii, p. 385, 1895.

Aspidiotus (Aonidiella) capensis, Green, Ann. Mag. N.H. xiv, p. 375, 1904.

Aspidiotus reticulatus, Newst., Zool. Anthr. Ergeb. Westl. Zentr. Sudafr. p. 17, 1912.

Common Name: Aloe Red Scale.

Scale of adult ♀ sub-circular or oval, moderately convex, very dense and tough, with the highest point towards one side, from which, as a centre, concentric ridges or corrugations extend to the margin. The first exuviae are laterad again of the highest point and appear as a rounded prominence, thus giving the whole scale the exact appearance of a minute shell. The colour of the scale varies with age. When young it is a rich pale brown, but becomes more reddish later. The most common colour in dry material is dry-blood colour. In living specimens the adult ♀ scale is sometimes very beautiful, with the margins and first exuviae orange brown, the second exuviae covered with deep red and the concentric ridges very dark, almost black. The average size of the adult ♀ scale is 2.5 mm. in largest diameter, but occasional specimens reach 3.5 mm. Ventral scale very dense and tough, yellowish white.

The ♂ puparium is small, linear, tapering slightly to the posterior extremity, brown, with the exuviae at the front end and the hind end paler. Length about 1.2 mm.

Body of adult ♀ dark purple, almost black when alive, deep purple brown when dry. When cleared and mounted the body is broadly oval, hyaline, except the mouth-parts and pygidium, which are yellow. The abdominal segments are not produced, and are merely indicated, being \pm rounded at the margins. The antennae are represented by a low tubercle and about 5 curved spines. The anterior part of the body is supplied with a sub-marginal series of long hairs, and there is a ventral series of four to six stout conical spines on each side, each of which arises from a conspicuous circular disc. These extend at intervals from the level of the mouth-parts to the region of the pygidium, those of the thoracic area being the smaller. Circumgenital glands 0. Pygidium as illustrated (fig. 110).

Remarks: This species was first described—in a few words—as *Lecanium capense* by Walker. This description was copied by Signoret in his *Essai*. Nothing further was done until Mr. Green worked over the material and published his description in 1904. The bark mentioned in these descriptions must be the dry withered aloe leaf, which could be easily so mistaken.

In the New Zealand Transactions, 1890, p. 75, Mr. Maskell described a Coccid on *Cladium* from Australia under the name of *Aspidiotus cladii*. This species has a stout circular scale with central exuviae. It is rich dark brown with paler reddish margins and red exuviae. In this respect it resembles the scale of *capensis*, but here the similarity ends, for *cladii* is more like a *Chrysomphalus* from its pygidial characters (fig. 112), although the shape of the lobes and the thickened margin of the pygidium remind one slightly of *capensis*. In 1895 (Trans. N.Z. p. 385) Mr. Maskell writes as follows:—

“I have lately received from Mr. A. Cooper, of Richmond, Natal, some pieces of aloe having on them several specimens of an *Aspidiotus* which is very clearly *A. cladii*. I have never before seen this insect from any place outside Australia, in which country it seems to be widely spread, as I have had specimens from nearly every portion of the continent. The species must have been taken to South Africa (I suppose) in some ship, perhaps on decorative plants for the saloon, or in a Wardian case. Mr. Cooper tells me that the aloe in question seems to be not seriously damaged; and I have not heard that *A. cladii* is injurious in Australia, although common enough.”

In 1899, d'Emmerez de Charmoy recorded *Aspidiotus cladii* on palms from Mauritius (Proc. Soc. Amic. Scien. p. 22, 1899). This insect forms a yellow-brown to dark brown scale, often tinged with a greenish colour. It is quite distinct from *cladii* and *capensis* and is usually somewhat elongate, with exuviae curved over to one side. Its pygidial characters may be seen from fig. 111 and I suggest that this insect should now be known as *Furcaspis charmoyi*, sp. n.

Habitat: On aloe (leaves) Eastern Province, Cape, common. On aloe, Rosebank, Cape; collected by the writer, July 1914. On aloe, Pretoria, Transvaal. On *Aloe rupestris*, Namaqualand, sent by I. B. Pole Evans, Chief of Division of Plant Pathology.

Collection Nos.: 194 and 235.

96. **Furcaspis proteae**, sp. n. (Plate vii, fig. 113).

Scale in large numbers on the leaves of different species of Proteaceae.

Scale of adult ♀ similar to that of *capensis*, but smaller and more brown than red. Average size 1·6 mm. in diameter.

Male puparium comparatively larger and wider than in *capensis*. In dry material the exuviae often appear whitish owing to the secretory layer becoming detached from the pellicle.

On casual observation the insect itself is extremely like *capensis*, but differs in the following important particulars:—

- (a) There are *four* pairs of striate lobes instead of three (Fig. 113); (b) the posterior four thick conical spines are larger and more conspicuous; (c) the lobes are longer, more parallel-sided, and narrower than in *capensis*; (d) the marginal lobular thickenings beyond the four pairs of lobes usually take the form of four lobules of which the second is generally the largest.

Habitat: On leaves of *Protea* sp., Henops River, Pretoria; collected by Mr. Mogg, July 1915. On leaves of "beukenhout" (*Faurea saligna*, Han.), Buffelspoort, Rustenburg District, Transvaal; collected by F. Thomsen, September 1909.

Collection Nos.: 241 and 241a.

EXPLANATION OF PLATE III.

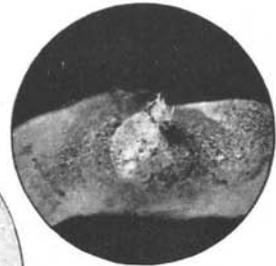
73. *Calycicoccus merwei*, sp.n., adult ♀, inverted gall ;
(a) normal gall.
74. *Cissococcus fulleri*, Ckll., galls of adult ♀ ; (a) gall of
adult ♀ in section, showing ♀ ; (b) massed galls ;
(c) ♂ puparium ; (d) adult ♀ in gall.
75. *Amorphococcus acaciae*, sp.n., adult ♀ galls ; (a) adult ♀
galls further enlarged, showing openings ; (b) adult
♀ galls with cover removed to expose ♀ ; (c) ♀ with
eggs.
-



73



74



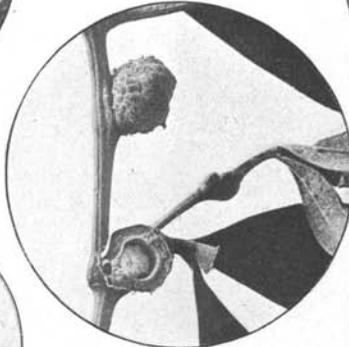
73 a



74 c



74 d



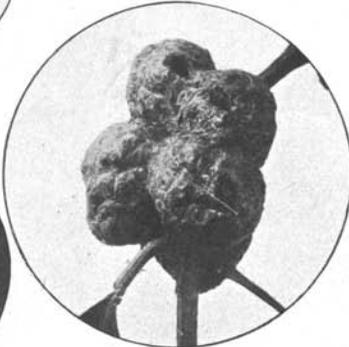
74 a



75



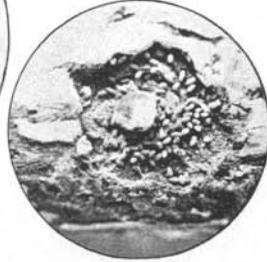
75 b



74 b



75 a

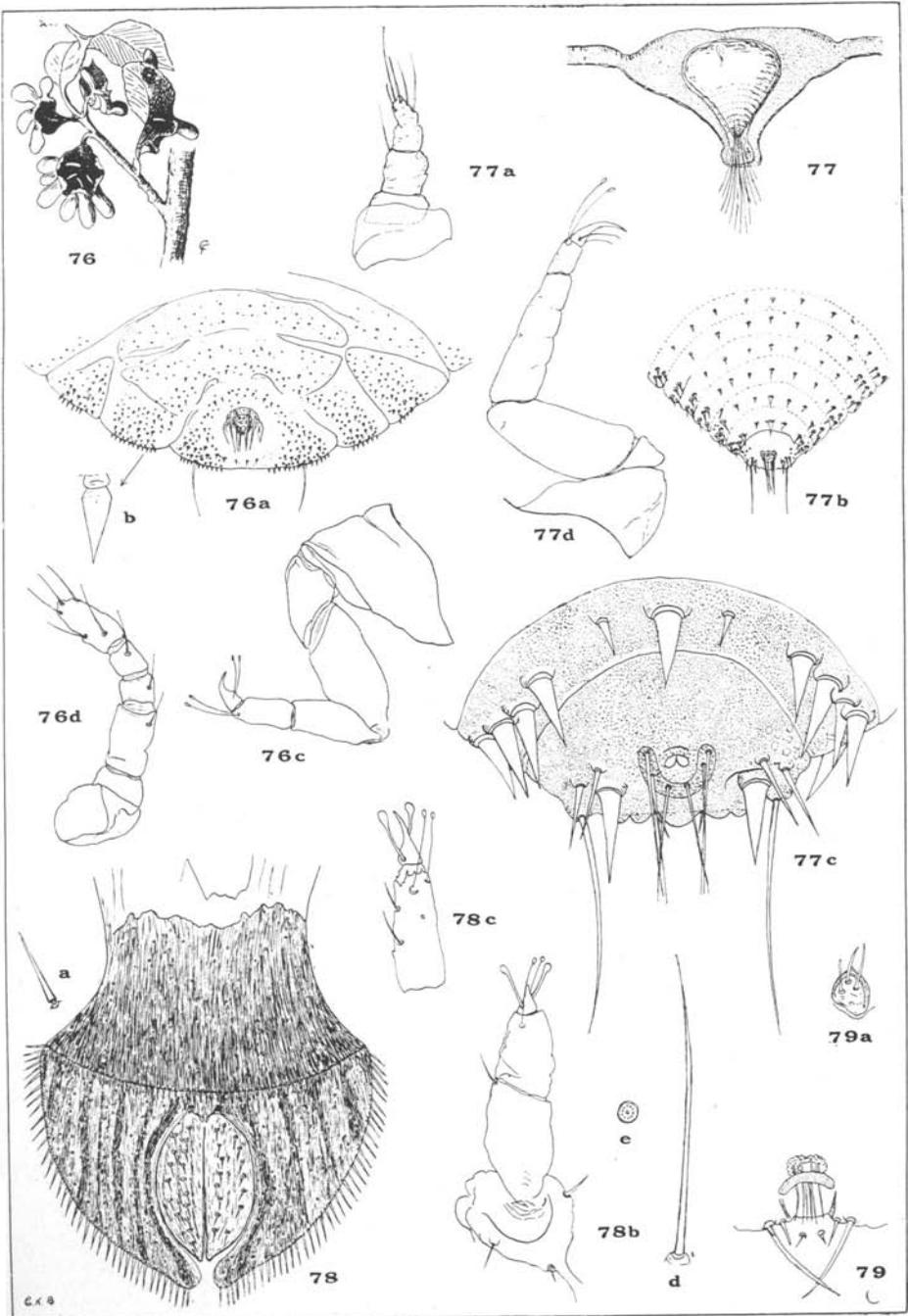


75 c

SOUTH AFRICAN COCCIDÆ.

EXPLANATION OF PLATE IV.

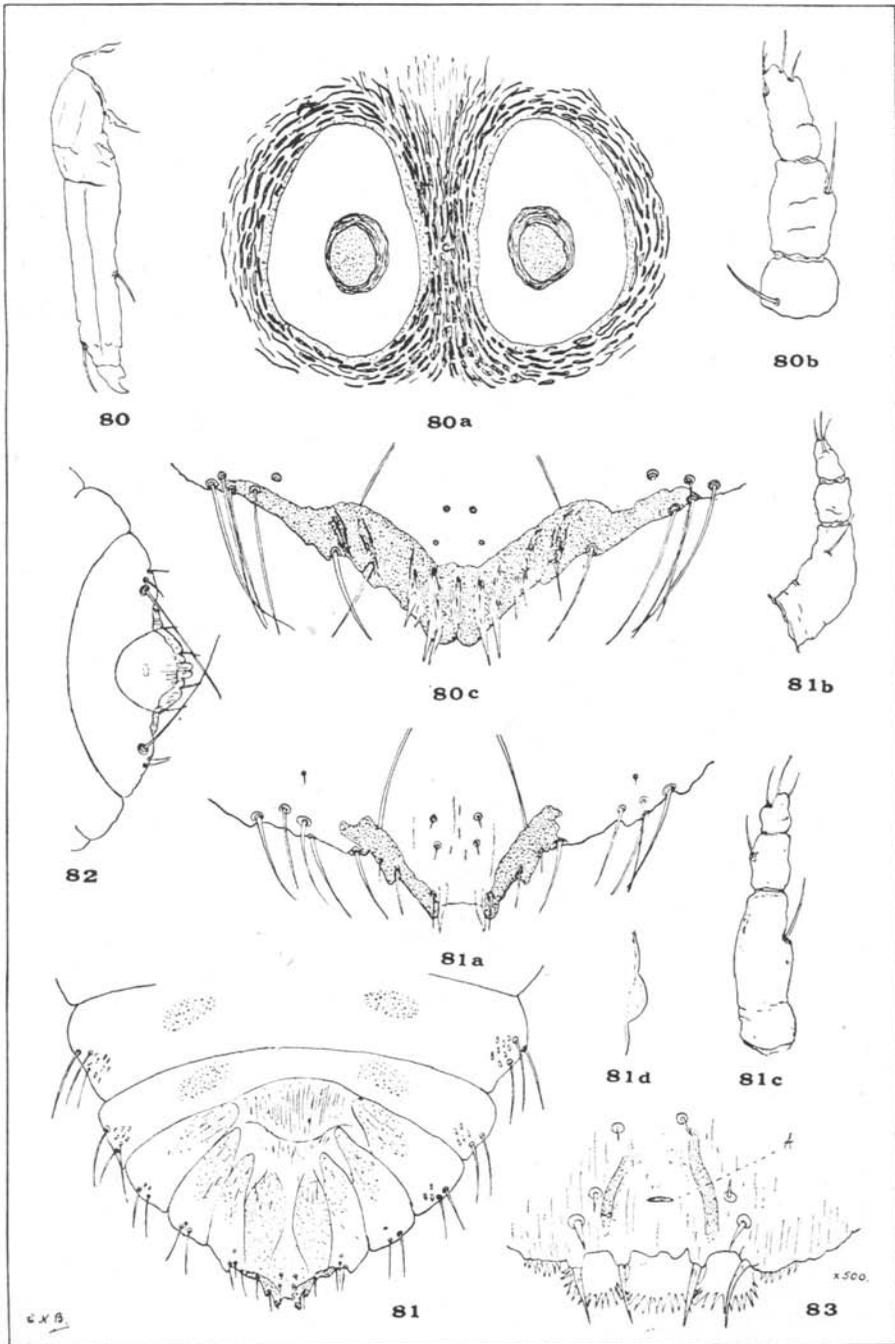
76. *Grewiacoccus gregalis*, sp. n., galls ; (a) caudal extremity of adult ♀ ; (b) spine of adult ♀ ; (c) leg of adult ♀ ; (d) antenna.
77. *Calyciococcus merwei*, sp. n., adult ♀ in gall ; (a) adult ♀ antenna ; (b) adult ♀, caudal extremity ; (c) adult ♀, caudal extremity further enlarged ; (d) leg.
78. *Cissococcus fulleri*, Ckll., adult ♀, anal plates ; (a) spine from margin of plates ; (b) rudimentary leg ; (c) normal tarsus ; (d) spine from integument ; (e) dermal gland.
79. *Amorphococcus acaciae* sp. n., adult ♀, anal armature ; (a) antenna.
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SOUTH AFRICAN COCCIDÆ.

EXPLANATION OF PLATE V.

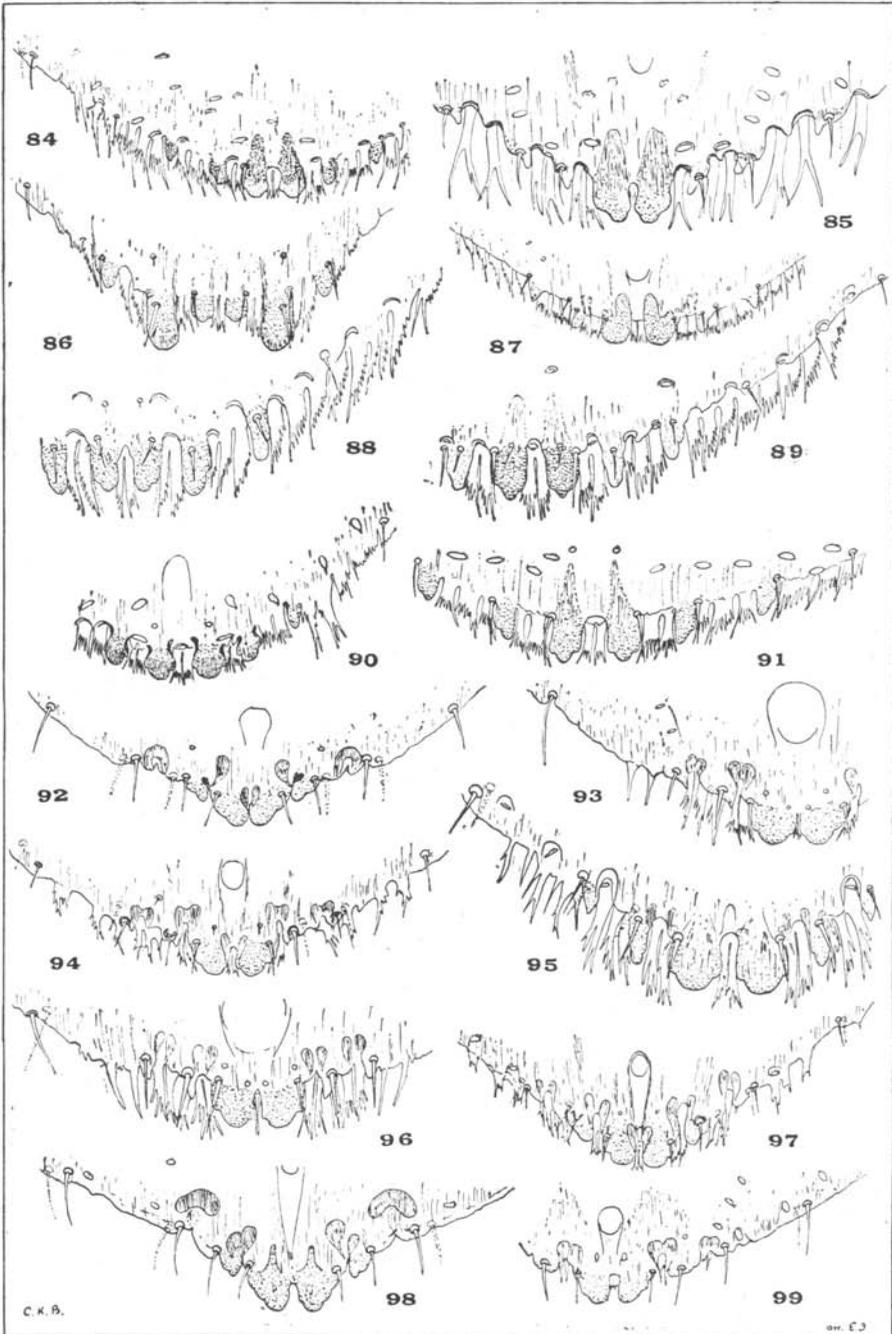
80. *Conchaspis socialis*, Green, leg of adult ♀; (a) eye-spot ;
(b) antenna ; (c) pseudopygidium.
81. *Conchaspis euphorbiae*, sp. n., adult ♀, pseudopygidium ;
(a) ditto, further enlarged ; (b, c) antenna; (d) lateral
tubercle.
82. *Conchaspis angraeci hibisci*, Ckll., larva, caudal
extremity.
83. *Fagisuga triloba* Ldgr., ♀, caudal extremity (after
Lindinger).



SOUTH AFRICAN COCCIDÆ.

EXPLANATION OF PLATE VI.

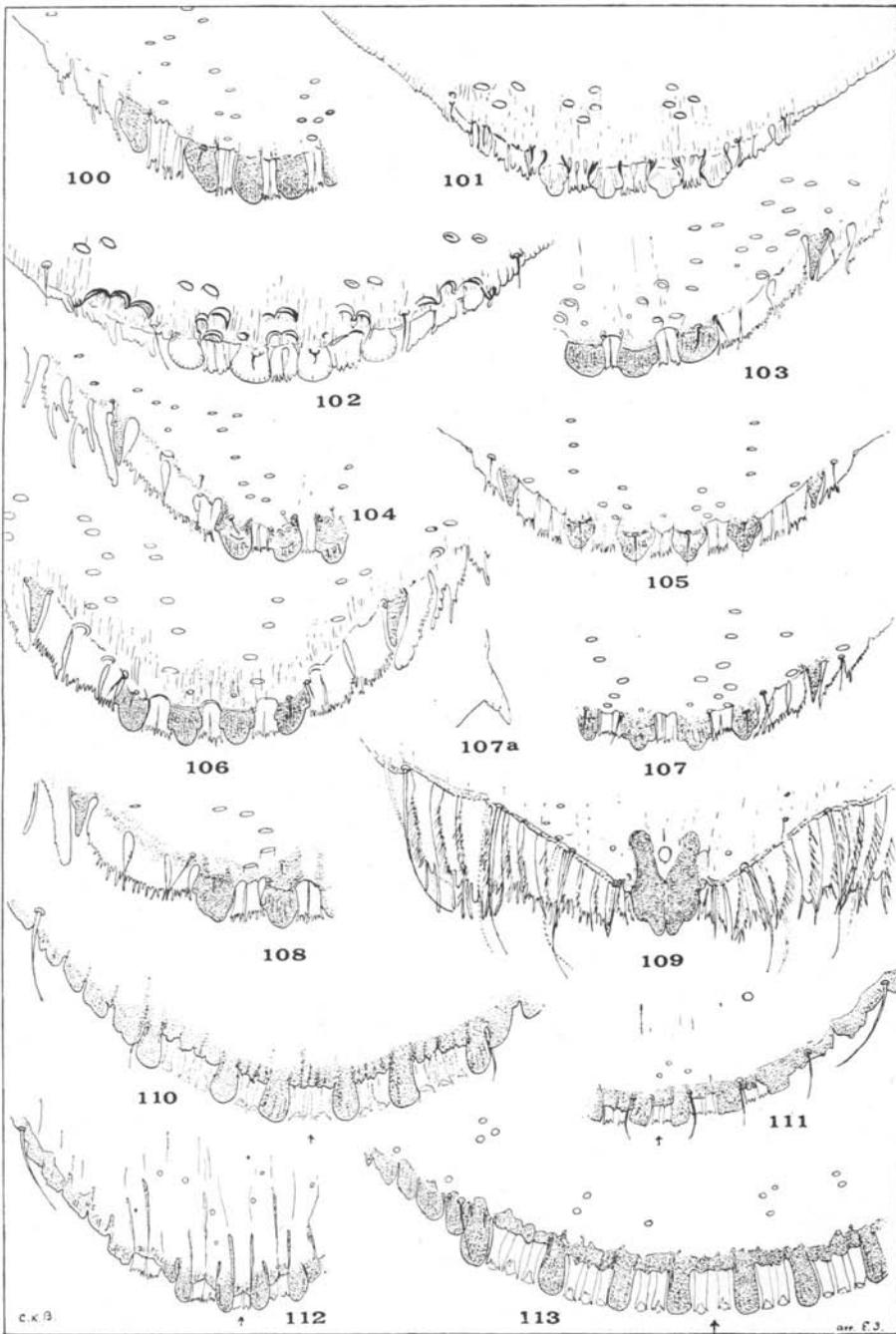
84. *Aspidiotus hederæ* (Vall.) Sign.
85. „ *furcillæ*, sp. n.
86. „ *kellyi*, sp. n.
87. „ *gowdeyi*, Newst.
88. „ *destructor*, Sign. (after Lindinger).
89. „ *transparens*, Green.
90. „ *regius*, sp. n.
91. „ *imbriatus capensis*, Newst.
92. „ (*Diaspidiotus*) *forbesi*, Johnson.
93. „ (*Hemiberlesea*) *lataniæ* (Sign.) Green.
94. „ (*Diaspidiotus*) *pectinatus*, Ldgr.
95. „ *cyanophylli*, Sign. (after Lindinger).
96. „ (*Hemiberlesea*) *rapax*, Comst.
97. „ (*Diaspidiotus*) *perniciosus*, Comst.
98. „ (*Diaspidiotus*) *ehretiae*, sp. n.
99. „ (*Diaspidiotus*) *africanus*, Marlatt.
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SOUTH AFRICAN COCCIDÆ.

EXPLANATION OF PLATE VII.

100. *Aspidiotus (Selenaspidus) lounsburyi* (Marlatt).
101. *Aspidiotus (Selenaspidus) schultzei*, Newst. (after Newstead).
102. *Aspidiotus (Selenaspidus) euphorbiae*, Newst. (after Newstead).
103. *Aspidiotus (Selenaspidus) pertusus*, sp. n.
104. *Aspidiotus (Selenaspidus) articulatus*, Morgan.
105. *Aspidiotus (Selenaspidus) grigua*, sp. n.
106. *Aspidiotus (Selenaspidus) silvaticus*, Ldgr.
107. *Aspidiotus (Selenaspidus) pumilus*, sp. n.
108. *Aspidiotus (Selenaspidus) celastri*, Mask.
109. *Aspidiotus (Morganella) maskelli*, Ckll.
110. *Furcaspis capensis* (Walker) Green.
111. *Furcaspis charmoyi*, n. n.
112. *Chrysomphalus cladii* (Mask.).
113. *Furcaspis proteae*, sp. n.



SOUTH AFRICAN COCCIDÆ.