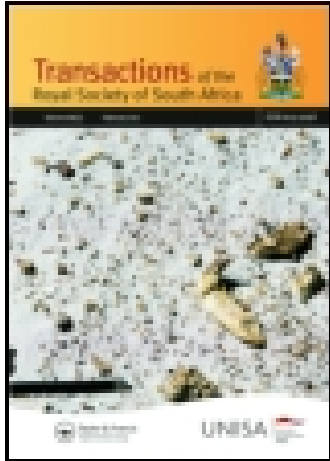


This article was downloaded by: [New York University]

On: 11 May 2015, At: 21:50

Publisher: Taylor & Francis

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office:
Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Transactions of the Royal Society of South Africa

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/ttrs20>

SOUTH AFRICAN MICROTHYRIACEAE

Ethel M. Doidge

Published online: 01 Apr 2010.

To cite this article: Ethel M. Doidge (1919) SOUTH AFRICAN MICROTHYRIACEAE, Transactions of the Royal Society of South Africa, 8:1, 235-282, DOI: [10.1080/00359191909520002](https://doi.org/10.1080/00359191909520002)

To link to this article: <http://dx.doi.org/10.1080/00359191909520002>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

SOUTH AFRICAN MICROTHYRIACEAE.

BY ETHEL M. DOIDGE.

(With Plates XIII-XIX.)

The family *Microthyriaceae* was first described by Saccardo ('Syll. Fung.' ii, p. 658, 1883) as follows: "Simplices (*i. e.*, without a stroma) Perithecia subsuperficiala, nigricantia, membranacea vel carbonacea, dimidiata, applanata, contextu plerumque eximio radiato, centro pertusa vel astoma. Asci 4-8 spori, saepe breves." In describing fungi in those early days, the morphological structure of the reproductive bodies was not minutely studied, and gradually a large number of genera and species of very varying character was assigned to the *Microthyriaceae*. The only character which these forms theoretically had in common was the flattened, shield-like form of the perithecia. In practice even this characteristic was not always taken into account. During the last ten years, however, the enormous task of revision has been carried out chiefly by von Höhnelt (1) and Theissen (2-10); a large number of genera, including all forms which are not strictly superficial, have been excluded, and the whole group completely reorganised.

In Engler's 'Die Pflanzenfamilien,' 1897, Lindau includes the *Microthyriaceae* in the group *Perisporiales* with the *Erysiphaceae* and the *Perisporiaceae*; but although they have some points in common, the *Microthyriaceae* differ widely from the other two families in the form of the fruiting body, which is not a "perithecium" in the true sense of the word, but a flattened, shield-shaped structure, usually in the form of a flattened hemisphere. Theissen classifies together all the superficial ascomycetes with hemispherical fruiting bodies (which he terms "thyriothecia") in a new group, the *Hemisphaeriales* (6, 8). Within this group he distinguishes three families: the *Microthyriaceae*, with filamentous mycelium and thyriothecial membrane formed of radiating hyphae; the *Hemisphaeriaceae*, which differ from the *Microthyriaceae* in the more or less reticulate—not radiate—structure of the thyriothecial membrane; and the *Trichopeltaceae* (9), which, instead of a network of filamentous hyphae, form a ribbon-like thallus in which the thyriothecia are developed pycnotically.

Of these three families this paper only deals with the *Microthyriaceae* as delimited by Theissen. He assigns to this family some twenty genera, of which only eight have representatives described as occurring in South Africa.

General Characteristics.

The mycelium may be persistent or evanescent; in the latter case it is poorly developed, and disappears as soon as the thyriothecia are formed.

The genus *Asterina* (2) may be taken as typical of the family; in this genus the spore germinates at one or both poles, as a general rule sending out first a small papilla of limited growth which closely resembles in form the hyphopodia on the mycelium; one or two germ tubes are subsequently developed from each pole, and these elongate, forming septate hyphae which branch alternately and produce hyphopodia at more or less regular intervals. The hyphopodia are extremely varied in form, and are of the greatest diagnostic value. Alternate branching is the rule, but in some species opposite branching is predominant. The mycelium develops centrifugally, and the mother spore can long be detected unaltered in the centre; its persistent character is often useful in determining the nature of the epispore at maturity, when the spores in the ascus are more or less immature. In a few species of *Asterina* typical hyphopodia are not developed, their place being taken by so-called "node-cells," which are spherical or hemispherical, swollen cells placed at regular intervals. These species may be regarded as intermediate forms between the genus *Asterina* and genera like *Asterinella* (3), in which no hyphopodia are developed.

The thyriothecium originates from a medial cell of a hypha, or from the terminal cell of a short lateral branch. In either case the initial cell divides rapidly and forms a group of small polyhedral cells between the hypha and the leaf surface. Each of the cells comprising this group begins to grow in a radial direction, each one forming a radiating hypha which is in close contact with its neighbour and is attached to it by the radial walls. The increase in circumference, as the disk increases in size, is provided for by the repeated bifurcation of the constituent hyphae. These are sometimes connected throughout their length, forming a compact disk with an entire or crenate margin; but more frequently they are free at the circumference, giving the thyriothecium a fimbriate appearance. The central part has meanwhile become arched to form the perithecial cavity, while the peripheral zone remains appressed to the leaf surface. Theissen regards this structure as a development of the complete spherical form found in the *Perisporiaceae*; the thyriothecium consists only of the basal half, which has been turned upside down, and hence is called "inverse." This inverse form, together with the radial-prosenchymatous structure of the membrane, is typical of the thyriothecia of the *Microthyriaceae* proper.

The thyriothecium has no typical ostiole; at maturity the initial group of cells may break away, forming a central pore, but the spores usually escape—in the genus *Asterina*—through radial or irregular fissures in the membrane. In *Lembosia* and its allied genera the thyriothecium dehisces by a longitudinal slit, and in the genus *Englerulaster* the outer membrane

breaks down from the centre, falling apart into separate cells, with abundant secretion of mucilaginous matter.

The pycnidia (*Asterostomella*) in the genus *Asterina* are usually identical in form with the thyriothecia, but they are smaller; these were often mistaken by the earlier workers for thyriothecia, and described as such, the brown, continuous conidia being taken for ascospores and described as a separate genus *Asteronia*. Of the conidia of *Asterinella* Theissen (3) says very little, but mentions conidia of the *Asterostomella* type in one species, and in his key to the genera he includes the genus in the section with one-celled conidia. Of the four South African species one has conidia of the *Asterostomella* type, one has hyaline, curved, aseptate conidia, and in a third they are hyaline, fusiform and four-celled; in each case they are borne in pycnidia resembling thyriothecia.

In the genus *Clypeolella* the conidia are four-celled, and are borne on the mycelial hyphae; more than one superficial fungus has been collected showing this type of conidium, but in every case the thyriothecia were very immature, so that it was impossible definitely to identify any one of them as a *Clypeolella*, and it is still uncertain whether this genus occurs in South Africa.

The asci may be paraphysate or aparaphysate, and in some cases the presence or absence of paraphyses is used as a generic distinction; they vary in form from elliptic or clavate to spherical. There is also considerable variety in the spore forms of the different genera, but in the majority they are two-celled, and either hyaline or brown.

THE SOUTH AFRICAN GENERA.

The genus *Asterina* Lév. has the largest number of species. In his monograph on this genus, Theissen describes 108 species, of which 55 are from South America; he only records 6 genuine species from Africa. A much larger number of fungi has been described from South Africa as belonging to the genus *Asterina*, the greater part collected by MacOwan and Medley Wood, and described by Kalchbrenner and Cooke in Grevillea; a few were described at a later date by Winter, Hennings, and Sydow, making 22 species in all. Of these 11 are excluded as not belonging to the *Microthyriaceae* as now defined; Theissen excludes a still greater number on account of the absence of thyriothecia in the type specimens, but a number of these I have fortunately been able to re-collect and re-describe.

In the present paper 30 species of *Asterina* are recorded from South Africa, and are represented in the National Herbarium, Pretoria. These are as follows:

Sub-genus *Dimerosporium*.—13 new species; 1 new variety of a Brazilian species; 4 amplified descriptions of species previously recorded but imper-

fectly described, or type not showing thyriothecia; 4 species previously described.

Sub-genus *Clypeolaster*.—1 new species; 2 new varieties; 3 species previously described, and 2 species recorded from Brazil.

The limits of the genus *Asterina* are not at all sharply defined; the typical form of the thyriothecium is the flattened hemisphere, but not infrequently elongated thyriothecia occur amongst the hemispherical ones; the round *Asterina* thyriothecia graduate into the linear *Lembosia* form, and in some species it is difficult to decide which is the predominating type. The chief distinction between these genera, apart from the shape of the thyriothecium, is that in *Lembosia* the asci are elliptical or cylindrical, and paraphysate, while in *Asterina* they are more or less spherical, and in the sub-genera *Dimerosporium* and *Clypeolaster* they are aparaphysate; but this character does not serve to distinguish the genus *Lembosia* from the genus *Parasterina*, which also has paraphysate asci.

On the other hand, the thyriothecia often approach the sub-spherical form of *Englerulaster*; in the latter genus the cells of the thyriothecial membrane fall apart from the centre outwards, with abundant formation of mucilaginous matter; in some species of *Asterina* the central cells break down in a very similar way, but the process does not extend outwards to the circumference; the dividing line between the genera *Asterina* and *Englerulaster* is, therefore, not at all sharp.

The same applies to the genera *Asterina* and *Asterinella*; the *Asterina* species with regular node-cells approach very close to the *Asterinella* species with more or less torulose mycelium. The genus *Seynesia*, which is an *Asterina* without persistent mycelium, is only represented by one species, and so also the genera *Microthyrium*, *Amazonia* and *Morenoina*. In the genus *Lembosia* three species are described, of which only one has been previously recorded; none of the four species of *Asterinella* described agree with any of the species mentioned in Theissen's monograph of the genus. *Morenoella*, which differs from *Lembosia* only in the absence of paraphyses, is represented by one species hitherto undescribed. *Englerulaster Gymnosporiae* was included in a previous paper (11) in the genus *Dimerium*; of the other two species now described, one has only been recorded from North America, and the other is apparently new to science.

GEOGRAPHICAL DISTRIBUTION, ETC.

It has been pointed out in connection with the genus *Asterina* that a large proportion of the described species are South American, and this is equally true of the other genera of the *Microthyriaceae*, but whether this indicates that there are actually a larger number of species in South America, or that more complete collections have been made there than in Africa, remains to be proved.

The distribution of the family in South Africa coincides with that of the *Perisporiaceae*, abundant material being found in all the humid, wooded districts; but the collection in the National Herbarium is necessarily still very incomplete, and no collections at all have been made in many very promising localities.

A series of permanent microscopic preparations has been made by the collodion method (11) of all the specimens mentioned, and is kept for reference in the Union Botanical Laboratory, Pretoria. For the determination of the greater part of the host plants, particularly those collected in the Transvaal, I am indebted to Miss S. M. Stent, to Dr. J. W. Bews and Mr. T. R. Sim for the identification of a number of Natal plants, and to Dr. S. Schönland and Miss Gane of the Albany Museum, for naming a large collection of plants from the Eastern Province. I am also indebted to Miss A. Pegler and others for a number of very interesting specimens.

LITERATURE CITED IN THE PREVIOUS SECTIONS.

- (1) VON HÖHNEL.—“Fragmente zur Mykologie,” ‘Sitz. Ber. k. Akad. d. Wiss. mathnat.-Klasse.’
- (2) THEISSEN.—“Die Gattung *Asterina*,” ‘Abhandl. der k. k. zool. bot. Gesellschaft, Wien,’ Band vii, Heft 3, 1913.
- (3) ——— “Le genre *Asterinella*. Broteria,” ‘Serie Botanica,’ vol. x, 1912, pp. 101–124.
- (4) ——— “Zur Revision der Gattung *Dimerosporium*,” ‘Beih. Bot. Zentralb.,’ 1912, p. 45 ff.
- (5) ——— “Fragmenta brasiliica, IV, V,” ‘Ann. Myc.,’ x, 1912.
- (6) ——— “*Hemisphaeriales*,” ‘Ann. Myc.,’ xi, 1913, pp. 468–470.
- (7) ——— “*Lembosia*-studien,” ‘Ann. Myc.,’ xi, 1913, pp. 424–467.
- (8) ——— “Über Membranstructuren bei den *Microthyriaceen* als Grundlage für den Ausbau der *Hemisphaeriales*,” ‘Myk. Centralb.,’ iii, 6, pp. 273–286.
- (9) ——— “*Trichopeltaceae*, n. fam. *Hemisphaerialium*,” ‘Centralb. für Bakt.,’ xxxix, pp. 625–640.
- (10) ——— “Die Gattung *Clypeolella* v. Höhn,” ‘Centralb. f. Bakt.,’ xxxiv, pp. 229–235.
- (11) DOIDGE.—“South African *Perisporiales*,” ‘Trans. of the Royal Soc. of S. Af.,’ v, pt. vi, 1917, pp. 713–750.

MICROTHYRIACEAE.

Mycelium persistent or evanescent, thyriothecia superficial, inverse, radiate, flattened-hemispherical or linear; asci paraphysate or aparaphysate, 2–8-spored, elliptic or clavate to sub-spherical. Spores varying in form,

hyaline or brown. Occur on living leaves and young parts of plants in humid situations.

Key to the Genera.

(After Theissen, Myk. Centralb. iii, p. 281.)

- A. Free mycelium wanting.
- I. Spores 1-celled.
- a. Spores hyaline *Myocopron*.
- b. Spores brown ? *Vizella*.
- II. Spores 2-celled.
- a. Spores hyaline *Microthyrium*.
- b. Spores brown.
- z. Thyriothecium circular *Seynesia*.
- zx. Thyriothecium linear.
- i. Asci paraphysate *Lembosina*.
- ii. Asci aparaphysate *Morenoina*.
- III. Spores 3-celled, brown, walls sub-polar *Scutellum*.
- IV. Spores 4-celled, brown *Halbania*.
- V. Spores more than 4-celled, hyaline *Phragmothyrium*.
- VI. Spores linear, filiform ? *Ophiopeltis*.
- B. Free mycelium present.
- I. Spores 1-celled, brown *Lembosiella*.
- II. Spores 2-celled.
- z. Spores hyaline.
1. Thyriothecia round.
- i. Mycelium with hyphopodia ? *Asterella*.
- ii. Mycelium without hyphopodia *Calothyrium*.
2. Thyriothecia linear *Lembosiopsis*.
- zx. Spores brown.
1. Thyriothecia round.
- i. Mycelium with hyphopodia.
- o. Thyriothecial wall 1-layered, conidia 4-celled *Clypeolella*.
- oo. Thyriothecial wall with more than one layer of cells, conidia usually 1-celled.
- / . Thyriothecial membrane secreting mucilage externally and internally, breaking down centrifugally and becoming separated into single cells *Englerulaster*.

- //. Thyriothecial membrane
not secreting mucilage
externally, at the utmost
breaking down only in
the centre.
- a. Asci paraphysate . *Parasterina*.
b. Asci aparaphysate . *Asterina*.
- ii. Mycelium without hyphopodia . *Asterinella*.
2. Thyriothecia linear.
- i. Asci paraphysate.
a. Mycelium hyphopodiate . . . *Lembosia*.
b. Mycelium non-hyphopodiate . *Echidnodes*.
- ii. Asci aparaphysate.
a. Mycelium hyphopodiate . . . *Morenoella*.
b. Mycelium non-hyphopodiate . *Echidnodella*.
- III. Spores 5-celled, brown *Amazonia*.

MICROTHYRIUM Desm.

Ann. Sc. nat. xv, p. 137 (1841); Syll. Fung. ii, p. 662.

Thyriothecia superficial, dimidiate, flattened-hemispherical, formed of radiating hyphæ. Asci aparaphysate. Spores hyaline, 2-celled. Free mycelium absent.

Microthyrium maculicolum Doidge, sp. nov.

Plate XVIII, fig. 40. Slide XLVI, 18.

Epiphyllous, forming raised, blister-like, light-brown areas up to 1 cm. diam. on the upper side of the leaf, on which the thyriothecia are visible as minute black points. Mycelium pale, effuse, evanescent. Thyriothecia dark brown, numerous, scattered or sub-gregarious, flattened hemispherical, sometimes more or less angular by contact, 150–190 μ diam.; composed of radiating hyphæ 3–4 μ thick, cells 3–10 μ long, central cells almost cubical, the more elongated ones near the circumference, margin entire. Asci 8-spored, not numerous, usually 3–7 in each thyriothecium, aparaphysate, elliptical with broadly-rounded apex, 70 \times 27 μ , or obovate, 50–57 \times 30–43 μ , apedicellate, uniformly thinly tunicated, wall barely 1 μ thick. Spores conglobate or sub-parallel, hyaline, 1-septate, upper loculus decidedly broader, 21–23.5 \times 6.5–10 μ .

On leaves of *Capparis*? sp., Durban, 11/4/18, Bottomley, 11668.

SEYNESIA Sacc.

Syll. Fung. ii, p. 668.

Similar to *Microthyrium*, but spores brown.

Seynesia orbiculata Syd.

Ann. Myc. x (1912), p. 39.

Thyriothecia epiphyllous, gregarious, always forming orbicular groups 4–8 mm. diam., very closely packed, opaque, formed of radiating hyphæ, mostly hemispherical, 90–175 μ diam., less frequently somewhat elongated or irregular, in which case they are longer. No free mycelium. Asci ovate to clavate, thickened at the apex, 35–60 \times 16–25 μ , 8-spored. Spores distichous or conglobate, ellipsoid, rounded at both ends, 1-septate, constricted, smooth, brown, 13–18 \times 6–8 μ , cells equal.

On leaves of *Euclea* sp., Letaba Drift, Zoutpansberg Dist., 6/8/11, Doidge, 1808.

MORENOINA Th.

Ann. Myc. xi (1913), p. 434.

Free mycelium wanting; thyriothecia linear to oblong, inverse, radial-prosenchymatous in structure, asci aparaphysate, spores 2-celled, brown.

Morenoina africana Doidge sp. nov.

Plate XVIII, fig. 41. Slides XLIV, 15, 16.

Epiphyllous; mycelium none, or represented by a few pale, poorly developed hyphæ. Thyriothecia scattered or confluent in small groups, linear-ellipsoid, 120–400 \times 65–100 μ , straight or slightly curved, less frequently somewhat sinuous or forked, dehiscing by a longitudinal slit almost the length of thyriothecium; radiating hyphæ 2.5–3 μ thick, cells almost cubical; margin fimbriate. Asci (immature) aparaphysate, ellipsoid-clavate, briefly pedicellate, 23–27 \times 10–12 μ , not staining blue with iodine. Mature spores only seen outside the ascus, fuscous, 2-celled, scarcely constricted, smooth, 12–14 \times 5–6.5 μ , cells equal.

On pinnules of *Dryopteris inaequalis*, Zwartkop, Natal, 19/7/18, Doidge, 11605.

ENGLERULASTER von Höhn.

Fragm. z. Myk., Bd. x, Nr. 520.

Mycelium superficial, branched, septate, with regular hyphopodia. Thyriothecia hemispherical or almost spherical, inverse, radial-prosenchymatous; at maturity the thyriothecial membrane breaks down from the centre, falling apart into separate cells, with abundant formation of mucilaginous matter. Ascospores brown, 2-celled.

Key to the Species.

- | | | | | | |
|----|-------------------------------------|----------------------------------|---|---|----------------------------|
| a. | Spores not more than 30 μ long. | | | | |
| | a. | Thyriothecia 90–110 μ diam. | . | . | 1. <i>E. Gymnosporiae.</i> |
| | b. | Thyriothecia 160–190 μ diam. | . | . | 2. <i>E. Popowiae.</i> |
| b. | Spores 33–36 μ long | . | . | . | 3. <i>E. orbicularis.</i> |

1. *Englerulaster Gymnosporiae* (P. Henn.), Th.

Slide I, 16.

Beih. Bot. Centralb. 1912, pp. 51-54; Myk. Centralb. iii, p. 277.

Dimerium Gymnosporiae (P. Henn.), Syd. Ann. Myc. vii (1909), p. 546; Trans. Roy. Soc. of S. Af. v, Part vi, p. 719, Pl. lviii, f. 7.

Dimerosporium Gymnosporiae P. Henn. Syll. Fung. xvi, p. 408.

Epiphyllous or amphigenous, sub-crustaceous; mycelium pale fuscous, radiating, effuse, hyphae 7-11 μ thick, sinuous, septate, with a few small hyphopodia; hyphopodia sessile, 1-celled, hemispherical. Thyriothecia gregarious, hemispherical, black, opaque, 90-110 μ diam. Asci ovoid, rounded at the apex, sub-tunicated, attenuated at the base, sometimes very briefly pedicellate, 35-50 \times 30-45 μ , 8-spored, paraphysate. Spores conglobate, ovoid, 1-septate, constricted, fuscous, 18-24 \times 10-13 μ .

On leaves of *Gymnosporia* sp., Umbelusi, Portuguese East Africa, Howard, 523; Empangeni, Natal, 11/7/17, v. d. Bijl, 11367.

On *Putterlickia*, sp. Isipingo, Natal, 21/5/15, Doidge, 10154.

2. *Englerulaster Popowiae* Doidge, sp. nov.

Plate XIII, fig. 1. Slide XLV, 6.

Epiphyllous, forming thin black spots up to 5 mm. diam.; mycelium brown, radiating; hyphae 5-6 μ thick, frequently septate; branching opposite or irregular; hyphopodia sessile, alternate or unilateral, occasionally opposite, capitate to ellipsoid, some at right angles to the hyphae, others bent or curved inwards, broadening at the base, 10-13.5 \times 6-8 μ , sometimes up to 16 μ in length. Thyriothecia dark brown but seldom quite opaque, 160-190 μ diam., radiating hyphae 5-6 μ thick, margin coarsely fimbriate, dehiscence by an irregular central fissure which extends outwards to the margin and leaves the ripening asci exposed. Asci spherical to ovate, 8-spored, apedicellate, not tunicated, often slightly angular by compression, 40-47 \times 30-40 μ , paraphysate. Spores brown, 2-celled, constricted, cells equal or upper loculus slightly larger, each loculus almost spherical, minutely scabrous when mature, 21-27 \times 10-13.5 μ .

On leaves of *Popowia caffra*, Buccleuch, Natal, 24/3/16, Doidge, 9714; East London, 24/11/17, Doidge, 10917.

3. *Englerulaster orbicularis* (B. & C.) v. Höhn.

Fragmente z. Myk. 520, Sitz. Ber. k. Akad. d. Wiss. math.-nat. Klasse.

Asterina orbicularis B. & C., Grevillea, iv, p. 8; Syll. Fung. i, p. 46; on living leaves of *Ilex coriacea*, Florida, Rabh.-Wint. Fung. Eur. 3439.

Dimerosporium orbiculare Mart., Journ. of Myc. i, p. 146; Ell. & Ev. North American Pyrenomycetes, p. 32.

Plate XIII, fig. 2. Slides XVI, 1, 2; XXIII, 13-16; XXIV, 1, 10; XLII, 11-13.

Amphigenous, forming black, crustaceous spots, 3–5 mm. diam.; when numerous they become confluent and produce irregular, black blotches covering large areas of the leaf surface. Mycelium radiating, branching and anastomosing freely; hyphae brown, straight, 5–6 μ thick, branching opposite or alternate; cells 10–15 μ long; hyphopodia alternate or opposite, sessile, hemispherical, flattened or shortly cylindrical, 5–8 \times 5–6 μ . Thyriothecia scattered, hemispherical, opaque, 150–170 μ diam., radiating cells 3–3.5 μ thick, cells cubical, margin not fimbriate, but the thyriothecia are surrounded by a dense network of hyphae. Asci aparaphysate, 8-spored, broadly ovate or sub-spherical, 54–57 \times 44–50 μ , much thickened round the apex. Spores conglobate, 2-celled, brown, slightly constricted, 33–36 \times 15–18 μ , cells equal or subequal, epispore minutely verrucose at maturity. Pycnidia similar to the thyriothecia but smaller, 60–120 μ diam.; conidia brown with a hyaline band, oval or ovate, 15–25 \times 8–14 μ .

On leaves of *Ilex capensis*, Woodbush, Zoutpansberg, 4/8/11, Doidge, 1753; Brander's High Forest, Victoria East, 14/8/15, v. d. Bijl, 9461; Zwartkop, Natal, 15/8/17, T. R. Sim, 10574; Van Staden's Pass, 13/11/17, Doidge, 10884; Woodville Forest, George, 11/11/17, Doidge, 10943; Buccleuch, Natal, 17/7/18, Doidge, 11563.

PARASTERINA Theiss. et Syd.

Ann. Myc. xvii (1915), p. 246.

Like *Asterina*, but asci paraphysate.

Hyphopodia sessile.

- | | |
|---|----------------------------|
| a. Spores 35–40 μ long | 1. <i>P. implicata</i> . |
| b. Spores not more than 35 μ long. | |
| x. Hyphopodia never opposite | 2. <i>P. Brachystoma</i> . |
| xx. Hyphopodia usually opposite | 3. <i>P. rigida</i> . |

1. *Parasterina implicata* Doidge, sp. nov.

Plate XIII, fig. 3. Slide XXXIII, 2.

Epiphyllous, forming round-irregular, black, crustaceous spots 3–5 μ diam. Hyphae brown, 6–7 μ thick, torulose, branching irregularly and anastomosing freely to form a network of entangled hyphae, tips of branches often club-shaped; cells 14–25 μ long; hyphopodia sessile, not very numerous, alternate or unilateral, hemispherical, ovate or obliquely flattened, 6–10 \times 10–6 μ . Thyriothecia gregarious, flattened-hemispherical, 300–400 μ diam., composed of radiating hyphae 3.5–5 μ thick, dehiscence irregular or stellate. Asci ovate to spherical, 8-spored, paraphysate, slightly thickened round the apex, 57–73 \times 50–57 μ ; paraphyses numerous, filiform. Spores conglobate, 2-celled, fuscous, smooth, constricted, 35–40 \times 13–15 μ , upper cell broader.

On leaves of *Sideroxylon inerme*, East London, 24/11/17, Doidge, 10922.

2. *Parasterina brachystoma* (Rehm.) Th.

Die Gattung *Asterina*, p. 49.

Seynesia brachystoma Rehm., Hedwigia, 1898, p. 325; Syll. Fung. xvi, p. 641, on leaves of a tree, Serra do mar, Central Brazil; Ule 569 Herb. Pazschke and Berlin, on Myrtaceae leaves, Ule 1238; Herb. Berlin sub *Seynesia colliculosa* Rehm.

Asterina multiplex Rehm., Ascom. 1706. On living leaves of *Styrax leprosum*, São Leopoldo, Rio Grande do Sul, South Brazil; Theissen, Decades F. Bras. 59.

Asterina megalosperma Speg. in herb; on leaves of *Styrax*?, Ipiranga. no. 16.

Also Ule 1143, Herbar. Pazschke, on an Anonaceae sub *Asterina paraguayensis*.

Plate XIII, fig. 4. Slides XXVI, 16; III, 7-9: XXXV, 11.

Epiphyllous, forming black, carbonaceous spots, round to irregular, up to 10 mm. diam. Mycelium radiating, branching alternately and anastomosing to form a network; hyphae straight, brown, 6-8 μ thick, frequently septate, cells 10-16 μ long, walls often oblique; hyphopodia alternate, sessile, continuous, very briefly cylindrical or subglobose, 7-11 \times 6-10 μ . Thyriothecia hemispherical, gregarious, 280-400 μ diam., consisting of straight, brown hyphae about 3 μ thick, cells almost cubical; dehiscence stellate; margin dentato-crenulate, certain stout hyphae running out into the mycelium. Asci paraphysate, broadly ovate, sessile, thickened at the apex, about 55 \times 45 μ , 8-spored; paraphyses filiform, swollen at the tips, which become conglutinate. Spores conglobate, brown, smooth, oblong, 2-celled, slightly constricted, rounded at both ends, 30-35 \times 14-17 μ (Thiessen makes the spores 33-37 μ long), cells equal in length, but the upper loculus somewhat broader.

On leaves of *Eugenia Zeyheri*, Woodbush, Zoutpansberg, 3/8/11, Doidge, 1759; March, 1910, Gray, 888.

On *Eugenia Gerrardi*, Buccleuch, Natal, 23/3/16, Doidge, 9723; 20/4/16, J. M. Sim, 10141.

On shrub undetermined (*Myrtaceae*?), Zwartkop, Natal, 19/7/18, Doidge, 11597.

var. **Laxa** Doidge, var nov.

Slides XXVI, 17, 18; XXXIX, 7.

Mycelium more slender and more opaque than in the type; hyphopodia more distant and slightly smaller.

On leaves of *Grumilea capensis*, Woodbush, Zoutpansberg, 3/8/11, Doidge, 1758.

On *Oxyanthus Gerrardi*, Berea, Durban, 28/1/17, v. d. Bijl, 11017.

On *Oxyanthus natalensis*, Berea, Durban, 28/1/18, v. d. Bijl, 11366.

3. *Parasterina rigida* Doidge, sp. nov.

Slide XXXVIII, 12. Plate XIII, fig. 5.

Epiphyllous, forming black, carbonaceous spots up to 7 mm. diam., mostly on the primary veins. Hyphae brown, 5–6 μ thick, branches mostly alternate, anastomosing; cells 16–20 μ long; hyphopodia numerous, usually opposite, sessile, hemispherical to ovate, 6–8 \times 5–6 μ . Thyriothecia gregarious, flattened-hemispherical, 250–400 μ diam., formed of radiating hyphae about 5 μ thick, dehiscing by an irregular disruption of the central cells. Asci paraphysate, broadly elliptic to ovate, 60–75 \times 30–40 μ , thickened round the apex, which is traversed by a pore; paraphyses filiform, somewhat swollen at the tips and not so long as the asci. Spores conglobate, fuscous, 2-celled, constricted, 27–33 \times 13–15 μ , upper loculus larger than the lower. On leaves of *Oncinotis inandensis*, Buccleuch, Natal, 11/5/16, Doidge, 9722.

ASTERINA Lév.

Ann. d. Sc. natur., Sér. iii (Bot.), Bd. iii, 1845, p. 59.

Mycelium superficial, branched, septate, with regular hyphopodia or node-cells. Thyriothecia flat to hemispherical, inverse, radial-prosenchymatous in structure, without a regular ostiole; spores escape through fissures in the thyriothecial membrane. Asci aparaphysate. Ascospores brown, 2-celled. Pycnidia similar to the thyriothecia, pycnoconidia brown, 1-celled (*Asterostomella*); mycelial conidia 1-celled or wanting.

Key to the Sections.

- A. Thyriothecia without basal membrane. Sub-genus I—DIMEROSPORIUM.
 B. Thyriothecia with basal membrane. Sub-genus II—CLYPEOLASTER.

Sub-genus I. DIMEROSPORIUM Fckl.

1869. Sym. Myc., p. 89; (*Myxasterina*) v. Höhn. Fragm. z. Myk., no. 331 (vii, p. 58), 1909.

Thyriothecia without basal membrane, asci aparaphysate.

- A. *Nodulosae*: hyphae without true hyphopodia, but with swollen node-cells.
 a. Nodes 7–10 μ diam. 3. *A. gibbosa* var. *megathyria*.
 B. *Hyphopodiatæ*: hyphae with true hyphopodia.
 a. Hyphopodia 2-celled.
 1. Spores verrucose or ciliate.
 i. Spores 15–19 μ long, thyriothecia 120–130 μ diam. 4. *A. natalensis*.
 ii. Spores 18–23 μ long, thyriothecia 140–180 μ diam. 5. *A. Combreti*.
 iii. Spores 23–28 μ long 6. *A. Peglerae*.

2. Spores smooth.
- i. Spores 15–18 μ long 5. *A. tenuis*.
 - ii. Spores 18–24 μ long.
 - x. Thyriothechia 130–150 μ diam. 6. *A. fimbriata*.
 - xx. Thyriothechia 160–240 μ diam. 7. *A. reticulata*.
 - iii. Spores 30–34 μ long 8. *A. uncinata*.
- b. Hyphopodia 1-celled.
1. Hyphopodia entire or with slight indentations, not deeply lobed.
 - i. Hyphopodia angular or sub-lobed 9. *A. delicata*.
 - ii. Hyphopodia finger- or flask-shaped.
 - x. Spores smooth 10. *A. Grewiae*.
 - xx. Spores minutely verrucose 11. *A. Trichiliae*.
 - iii. Hyphopodia hemispherical or shortly and broadly cylindrical.
 - x. Spores 15–18 μ long 12. *A. raripoda*.
 - xx. Spores 23–26 μ long.
 - o. Thyriothechia dehiscing by a stellate fissure 13. *A. ferruginosa*.
 - oo. Thyriothechia dehiscing by an irregular spherical rupture.
 - / . Thyriothechia 225–280 μ diam., radiating hyphae straight 14. *A. rhamnocola*.
 - // . Thyriothechia 150–200 μ diam., radiating hyphae tortuous 15. *A. Hendersoni*.
 - xxx. Spores 26–28 μ long 16. *A. opaca*.
 - xxxx. Spores 35–40 μ long 17. *A. robusta*.
 2. Hyphopodia lobed.
 - i. Spores verrucose.
 - x. Spores 20–23 \times 10–12 μ 18. *A. erysiphoides*.
 - xx. Spores 17–22 \times 8–10 μ 19. *A. Balansae* var. *africana*.
 - xxx. Spores 23–27 \times 12–13.5 μ 20. *A. Eaccoecariae*.
 - ii. Spores smooth.
 - x. Spores 13–15 μ long 21. *A. undulata*.
 - xx. Spores 16–20 μ long 22. *A. polythyria*.

***Asterina gibbosa* Gaill.**

Bull. Soc. Myc. 1897, p. 180; Syll. Fung. xiv, p. 697; Die Gattung *Asterina*, p. 57, T. lv, fig. 7, v, 3–4, vii, 29–30, viii, 3, Rabh. W.P.F. eur. 4054, Tuberao, Sta. Catharina, South Brasil; Balansa, Plantae

du Paraguay 3839 (Herb. Kew) on *Randia* sp., Guarapi, Brasil; on *Basanacantha spinosa*, São Leopoldo, Rio Grande do Sul, Herb. Theissen.

var. **megathyria** Doidge, var. nov.

Plate XIII, fig. 6. Slides XI, 16–19; XIII, 10; XXXI, 15; XXXII, 16, 17; XXXIV, 4; XLI, 7.

Mostly epiphyllous, forming minute, orbicular, black, crustaceous spots, 1–3 mm. diam; when the spots are hypophyllous they frequently become confluent. Mycelium not effuse, irregularly branched; hyphae flexuous, 4–6 μ thick, radiating, olivaceous-brown; cells 10–20 μ long; nodes 7–10 μ thick, asymmetrical, more or less spherical. Thyriothecia very numerous, densely aggregated and becoming confluent, flattened-hemispherical, outline orbicular or flattened by contact, 140–200 μ diam., composed of straight, radiating hyphae 2–4 μ thick, cells 4–6 μ long; margin not fimbriate, dehiscence stellate. Asci aparaphysate, ovate to sub-clavate, 8-spored, thickly tunicated, especially round the apex, 33–34 \times 27–33 μ . Spores ellipsoid, 1-septate, slightly constricted, light olivaceous brown, smooth, 16–20 \times 8–9 μ ; upper loculus sub-spherical, 8–9 μ diam.; lower loculus ellipsoid, 9–12 \times 8 μ .

On *Tricalysia Sonderiana*, nr. Durban, 25/5/1897, Wood (Wood No. 6452 sub. *A. tenuis*).

On *Tricalysia lanceolata*, Amanzimtoti, 10/7/11, Doidge, 1576; Winters Kloof, 27/6/11, 1/6/15, Doidge, 1624, 8987; Claridge, 31/5/15, Doidge, 8992; Kentani, 16/12/14, Pegler (Pegler, 1970), 8787.

On *Randia dumetorum*, Amanzimtoti, 10/7/11, Doidge, 1682; Lemana, Zoutpansberg, 14/8/11, Doidge, 1792; Umgeni, Durban, 10/7/15, Wood, 9031.

On *Pavetta obovata*, Krantzklouf, Natal, 26/5/15, Doidge, 8985.

On *Alberta?* sp., Buccleuch, Natal, Doidge, 10151.

On *Plectronia Guienzii*, Hogg's Back, 15/1/18, J. & M. Henderson, 11347.

Differs from the type in the size of the asci and thyriothecia; the latter are much larger and the radiating hyphae composing the thyriothecial membrane narrower than in the type. The specimens from South Brazil have very small thyriothecia, 50–90 μ diam., with radiating hyphae 4–5.5 μ thick.

This species occurs very commonly on *Rubiaceae*, and has been collected a number of times, especially in Natal.

2. *Asterina natalensis* Doidge, sp. nov.

Plate XIII, fig. 7. Slide XXXI, 11.

Epiphyllous, forming thin black spots 2–4 mm. diam.; mycelium slender, branching irregularly and anastomosing; hyphae 3–5 μ thick, hyphopodia fairly numerous, alternate or occasionally opposite, stipitate, 2-celled, upper

cell slightly lobed or hooked, $8-14 \times 6-10 \mu$. Thyriothecia $120-130 \mu$ diam., flattened-hemispherical; margin fimbriate; dehiscence stellate; composed of radiating hyphae $3-3.5 \mu$ thick, cells almost cubical, about 4μ long. Asci aparaphysate, broadly cylindrical or spherical, somewhat thickened round the apex, $26-32 \times 20-24 \mu$. Spores conglobate, 2-celled, constricted, $15-19 \times 9-10 \mu$, brown, upper loculus slightly broader; epispore very minutely scabrous at maturity. Pycnidia similar to the thyriothecia but slightly smaller; conidia ovate, brown with a lighter medial band, $13-17 \times 8-10 \mu$.

On leaves of *Mikania* sp., Winkle Spruit, Natal, 28/5/15, Doidge, 9001.

3. *Asterina Combreti* Syd.

Engl. Bot. Jahrb. 1910, p. 264, on leaves of *Combretum tavatense*, Kibwezi, British East Africa; Herb. Syd. and Berlin, Die Gattung *Asterina*, p. 63, pl. iii, fig. 8; vii, 7.

Hyphaster kutuensis (P. Henn.) in H. Baum, Ber. der Kunene-Zambesi-Exped. 1902, p. 169.

Asterina (Dimerosporium) kutuensis (P. H.) v. Höhn., Fragm. z. Mykol. xii, no. 599, on *Combretum Baumii*, East Africa.

Asterina Combreti var. *kutuensis* (P. Henn.) v. Höhn., Die Gattung *Asterina*, p. 63.

Plate XIII, fig. 8. Slides XXIII, 19, 20; XXXI, 16; XXXIII, 16.

Amphigenous, mostly epiphyllous, forming orbicular or indefinite spots 2-6 mm. diam.; mycelium delicate, undulating; hyphae light brown, branching irregularly and anastomosing, $3-4.5 \mu$ thick, less frequently up to 5μ thick, cells $16-20 \mu$ long; hyphopodia alternate briefly stipitate, $8-14 \times 4-5 \mu$, upper cell slightly lobed or curved. Thyriothecia gregarious, flattened-hemispherical, $140-180 \mu$ diam., composed of radiating hyphae about 3μ thick, cells rectangular $4-7 \mu$ long, the central ones almost cubical, cells longer towards the fimbriate margin; dehiscence stellate. Asci globose-ovate, $28-40 \times 28-32 \mu$, 8-spored, aparaphysate. Spores conglobate, oblong, rounded at both ends, 1-septate, constricted, brown, $18-23 \times 8-11 \mu$, upper loculus frequently somewhat broader, epispore minutely verrucose at maturity. Pycnidia resembling the thyriothecia but smaller; conidia (*Asterostomella*) elliptical to pear-shaped, continuous, brown with a medial, hyaline band, $18-24 \times 9-13 \mu$.

On leaves of *Combretum Kraussii*, Woodbush, Zoutpansberg, 3/8/11, Doidge, 1773; Buccleuch, Natal, 20/4/16, J. M. Sim, 10152; Stella Bush, Durban, 19/4/18, Bottomley, 11378; Buccleuch, 23/3/16, Doidge, 9709.

On *Combretum*, sp., Winkle Spruit, Natal, 28/5/15, Doidge, 9004; Rikatli, Portuguese East Africa, Sept., 1918, Junod, 11731, 11732; Louis Trichardt, Transvaal, 8/4/19, Putterill, 11829.

Theissen (Die Gattung *Asterina*, p. 63) describes *A. Combreti* Syd. with hyphae $4-5 \mu$ thick, hyphopodia $8-10 \mu$ long and spores $20-24 \times 9-11 \mu$;

var. *kutuensis* (P. Henn.) v. Höhn. is distinguished from the type by its hyphae 3-3.5 μ thick, hyphopodia 10-13 μ long and spores 18-20 \times 8-9 μ . Theissen had not seen the type specimen of *A. kutuensis*, but quoted von Höhnel's original description. I am unable to distinguish between these two forms; the spores vary from 18-23 μ in length and from 8-11 μ in breadth; sometimes the mycelium is fairly stout, 4-5 μ thick, with rather short hyphopodia (8-10 μ long); in other cases the mycelium is more slender, 3-3.5 μ thick, with hyphopodia 10-13 μ long. Not infrequently all these characters can be met with on one leaf, and there is, within the limits indicated, considerable variation in the dimensions of the hyphae, hyphopodia and spores. I have therefore included all the collections examined in the species *A. Combreti* without attempting to distinguish varieties.

4. *Asterina Peglerae* Doidge, sp. nov.

Plate XIII, fig. 9. Slide XI, 20.

Hypophyllous, forming thin, spreading black areas of irregular form. Hyphae fuscous, very slender, 3.5-4 μ thick, branching irregularly and anastomosing; hyphopodia alternate or unilateral, 10-15 \times 6-10 μ , stipitate, stipe usually cylindrical, equal in thickness to the hyphae, and from 3-10 μ long, but occasionally septate or gibbous (see *A. peraffinis*), terminal cell irregularly 2-3-lobed, and frequently uncinat. Thyriothecia numerous, scattered, light brown, flattened-hemispherical, 110-160 μ diam., composed of radiating hyphae 2.5-3 μ thick; these are not straight but more or less undulating; margin fimbriate; dehiscence irregular, then stellate. Asci aparaphysate, sub-spherical, 45-50 \times 43-45 μ , 8-spored. Spores conglobate, 2-celled, constricted, upper loculus larger, very opaque when mature, episporic ciliate, 23-28 \times 13-16.5 μ .

On leaves of *Rhus*? sp., Kentani, 6/9/15, Pegler (Pegler, 2354), 9130.

The determination of the host is uncertain as Miss Pegler has never found this plant in flower. It is a small shrub with trifoliate leaves.

The hyaline spores in the immature ascus of this species of *Asterina* are quite smooth, but on the spores which are just turning colour there are often bristles up to 3 μ long; the episporic is pronouncedly ciliate at maturity, but never has bristles so long as those on the ripening spore.

5. *Asterina tenuis* Wint.

Hedwigia, 1886, p. 94; Syll. Fung. ix, p. 389; Die Gattung *Asterina*, p. 116.

Plate XIV, fig. 10. Slides XVI, 17-20; XXIX, 7-8; XXXI, 20; XXXIV, 5-7; XXXVI, 2-5.

Amphigenous; mycelium effuse; hyphae light brown, very slender, anastomosing; hyphopodia alternate, mostly stipitate but some sessile

8–20 × 7–10 μ , distinctly 3–6-lobed, some almost palmate, others somewhat uncinata. Thyriothecia gregarious, often becoming angular through contact, otherwise flattened-hemispherical, fuscous, 85–130 μ diam., composed of radiating hyphae 2–3 μ thick, cells about 4 μ long; margin fimbriate, dehiscence stellate. Asci almost globose, sessile, 8-spored, 30–35 × 26–32 μ . Spores oblong, 1-septate, constricted, rounded at both ends, not infrequently asymmetrical, fuscous, 15–18 × 7–9 μ , lower loculus slightly narrower. Pycnidia similar to the thyriothecia but slightly smaller; conidia (*Asterostomella*), oval to pyriform, fuscous with a hyaline medial band, 13–18 × 6–10 μ .

On leaves of *Claozylon* sp., Natal, Wood (Wood, 6458 b), 1534 b.

On *Dalechampia capensis*, Amanzimtoti, Natal, 10/7/11, Doidge, 1638; Winkle Spruit, Natal, 25/5/15, Doidge, 9003.

On *Acalypha decumbens*, Van Stadens Pass, 13/11/17, Doidge, 10862.

The type specimen (Wood 6458), consists of two different sets of leaves. The fungus on the leaves of *Claozylon* sp. corresponds with Winter's description of *A. tenuis*; the other leaves are apparently those of a *Capparis* sp., and the fungus, which is in very poor condition, resembles *A. celtidicola* var. *microspora*.

Evidently two sets of specimens have been confused, and this accounts for the fact that Theissen (Die Gattung Asterina), failed to find a species corresponding to *A. tenuis* on Wood's no. 6458.

6. *Asterina fimbriata* Kalch. & Cke.

Grevillea, ix, p. 33 c. tab. 138, f. 46; Syll. Fung. i, p. 41.

Asterina punctiformis Lév. var. *fimbriata*, Die Gattung Asterina, p. 67, T.V., fig. 19.

Plate XIV, fig. 11. Slides V, 6; XXIV, 20; XXV, 4.

Epiphyllous, mycelium radiating, irregularly branched, but branches frequently opposite and anastomosing very irregularly; hyphae light brown, undulating, 4–6 μ thick; hyphopodia alternate, stipitate, 8–12 × 6–8 μ , stipe cell short, terminal cell capitate or club-shaped, and usually slightly indented or 2–3-lobed. Thyriothecia gregarious, round, 130–170 μ diam., or oval, 170 × 140 μ ; composed of radiating hyphae 3.5–4.5 μ thick, cells 7–10 μ long; margin fimbriate, dehiscence stellate. Asci aparaphysate, 8-spored, ovate-spherical, 28–34 μ diam., or 36–48 × 26–28 μ . Spores conglobate, 1-septate, rounded at both ends, brown, deeply constricted, 18–22 × 8–10 μ , loculi sub-equal, or the upper loculus slightly broader.

On leaves of *Sclerochiton harveyanus*, nr. Uitenhage, MacOwan (MacOwan, 1290); East London, 24/11/17, Doidge, 10910.

On *Hypoestes* sp., Wood, Natal (Wood, 608).

On *Plectronia ciliata*, East London, 24/11/17, Doidge, 10900.

7. *Asterina reticulata* Kalch. & Cke.

Grevillea, ix, p. 33; Syll. Fung. i, p. 40.

Asterostomella reticulata (K. & Cke.) v. Höhn., Fragm. z. Myk. 493.

Plate XIV, fig. 12. Slides XXVI, 7-8.

Amphigenous, forming black, carbonaceous, sub-orbicular spots; or spreading, chiefly along the veins and leaf margins. Mycelium spreading, reticulate; hyphae light brown, 5-6 μ thick, straight, cells 15-30 μ long; branches usually opposite, anastomosing; hyphopodia alternate or unilateral, briefly stipitate, club-shaped, hooked or slightly lobed, 7-13 \times 6-8 μ . Thyriothecia flattened-hemispherical, composed of radiating hyphae 3-3.5 μ thick, cells 3.5-4 μ long, cubical; margin fimbriate, dehiscence irregular-stellate. Asci ovate, sessile, aparaphysate, 45-50 \times 30-33 μ . Spores conglobate, 1-septate, constricted, brown, smooth, 20-23 \times 10 μ ; loculi sub-equal or upper loculus slightly broader, each cell almost spherical. Pycnidia similar to the thyriothecia but smaller, 100-150 μ diam.; conidia brown with a medial hyaline band, ellipsoid or pyriform, 16-20 \times 7-10 μ .

On leaves of *Olinia cymosa*, Boschberg, Cape Province, 1877, MacOwan (MacOwan, 1336, Rabh.-Wint. Fung. Eur. 3337), *Asterostomella* stage only.

On *Olinia* sp., Barberton, 18/1/91, Galpin (Galpin, 1275).

MacOwan's specimen shows only the conidial stage, and was on that account referred by v. Höhnel to the genus *Asterostomella*. I have not succeeded in collecting this fungus myself but was fortunate in finding the thyriothecia and ascospores on a specimen of *Olinia* in the Galpin herbarium.

8. *Asterina uncinata* Doidge, sp. nov.

Plate XIV, fig. 13. Slides X, 15-16.

Hypophyllous, effuse; mycelium light brown, delicate, branching irregularly and anastomosing; hyphae undulating, 5-6 μ thick, cells 26-33 μ long; hyphopodia alternate, unilateral or opposite, stipitate, 20-40 μ long, stipe 1-3-celled, 7-30 μ long, cylindrical, equal in thickness to the hyphae, straight, curved, or abruptly geniculate, occasionally bearing two terminal cells; terminal cell club-shaped or cylindrical, straight or uncinata, the curve being in the same direction as, or in the opposite direction to that of the stipe, occasionally sub-lobed. Thyriothecia large, rather pale and covered with a network of hyphae, flattened-hemispherical, 200-280 μ diam., composed of radiating hyphae 3-5 μ thick—these are straight except at the margin, where they become tortuous; cells 3.5-7 μ long; dehiscence by a central pore, which develops into a stellate fissure; margin not fimbriate. Asci aparaphysate, spherical or ovate, 42-50 \times 40-45 μ . Spores smooth, dark brown, opaque, 30-34 \times 16-20 μ , deeply constricted; each loculus ovoid; upper loculus 18-20 μ broad, lower loculus 14-16 μ broad.

On leaves of *Rhamnus prinoides*, Brander's High Forest, Victoria East, 12/8/15, v. d. Bijl, 9463; on the same leaves as *A. rhamnocola*.

12. *Asterina delicata* Doidge, sp. nov.

Plate XIV, fig. 14. Slide XXXI, 10.

Epiphyllous, effuse, forming thin blackish spots up to 8 mm. diam. Mycelium spreading, delicate; hyphae slender, light brown, 3-3.5 μ thick, cells 20-24 μ long, branching irregular; hyphopodia alternate, 1-celled, asymmetrical, usually angular or sub-lobed, 6-7 μ high by 6-10 μ broad. Thyriothecia gregarious or scattered, flattened-hemispherical, 100-130 μ diam., composed of radiating hyphae 3 μ thick, cells almost cubical, 3-3.5 μ long; margin not markedly fimbriate; dehiscence at first by a central pore, then irregular. Asci aparaphysate, sessile, ovate or spherical, 26-33 \times 33-40 μ . Spores conglobate, light brown, 1-septate, constricted, broadly rounded at both ends, 20-22 \times 10-12 μ , cells sub-equal, or upper loculus slightly broader. Pycnidia similar to the thyriothecia but smaller, 70-100 μ diam. Conidia dark brown, continuous, elliptical to ovate, 20-22 \times 12-15 μ .

On leaves of *Trimeria alnifolia*, Mayville, Durban, 22/7/15, Wood, 9062.

10. *Asterina Grewiae* Cke.

Grevillea, x, p. 130; Ann. Myc. x, p. 189; Die Gattung Asterina, p. 76.

Plate XIV, fig. 15. Slides XXVI, 13; XXIX, 13; XXXIII, 1.

Amphigenous, mostly epiphyllous; mycelium effuse, delicate, irregularly branched, and anastomosing to form a network; hyphae slender, light brown, 3.5-4 μ thick, undulating; cells 15-20 μ long; hyphopodia alternate, unilateral or occasionally opposite, 1-celled, finger or flask-shaped, sometimes sub-lobed, 8-10 \times 3.5-4 μ . Thyriothecia numerous, flattened-hemispherical, 100-130 μ diam., formed of radiating hyphae about 3 μ thick, with cells 3-5 μ long; margin not fimbriate; dehiscence by an irregular-stellate fissure. Asci aparaphysate, 8-spored, spherical, 20-24 μ diam. Spores conglobate, brown, 1-septate, smooth, constricted, 20-22 \times 10-12 μ , upper loculus broader and almost spherical. Pycnidia similar to the thyriothecia but smaller, 50-65 μ diam.; conidia continuous, ovate-elliptical, rounded at both ends, 18-20 \times 11-13 μ , brown without medial band.

On leaves of *Grewia lasiocarpa*, Inanda, Natal, 1879, Wood (Wood, 639); Kentani, 25/8/17, Pegler (Pegler, 2436), 10993; Woodville Forest, George, 11/11/17, Doidge, 11018.

11. *Asterina Trichiliae* Doidge, sp. nov.

Plate XIV, fig. 16. Slides XXXIV, 11; XLVII, 11.

Epiphyllous, forming thin, scattered, sub-circular spots up to 6 mm. diam. Hyphae brown, straight, 4-6 μ thick, branches opposite, anastomosing, often at right angles to the hyphae; hyphopodia frequently opposite,

finger- or flask-shaped, sessile, $6-10 \times 4-5 \mu$. Thyriothecia scattered, flattened-hemispherical, $190-220 \mu$ diam., formed of radiating hyphae $3-3.5 \mu$ thick, opaque in the centre, more translucent towards the fimbriate margin; dehiscence stellate. Asci aparaphysate, 8-spored, ovate or sub-spherical, $40-46 \times 43-50 \mu$, embedded in a yellowish mass of mucilaginous matter. Spores conglobate, 1-septate, constricted, $25-27 \times 12-13 \mu$, dark brown, opaque when mature and minutely scabrous, upper loculus slightly broader.

On leaves of *Trichilia dregeana*, Winkle Spruit, Natal, 28/5/16, Doidge, 9006.

On *Trichilia emetica*, Louis Trichardt, Zoutpansberg, 8/4/19, Putterill, 11833.

12. *Asterina raripoda* Doidge, sp. nov.

Plate XIV, fig. 17. Slide XXIV, 9.

Epiphyllous, forming thin black spots $3-5$ mm. diam.; mycelium poorly developed, branching irregularly and occasionally anastomosing; hyphae pale-fuscous, $3.5-5 \mu$ thick, frequently septate and somewhat sinuous, cells mostly $10-15 \mu$ long; hyphopodia rare, alternate, 1-celled, hemispherical, $4-5 \mu$ high and $6-7 \mu$ broad. Thyriothecia scattered or confluent in small groups, flattened-hemispherical, arising at the tips of secondary hyphae and at first fan-shaped, or, less frequently, medial and round from the start, $150-200 \mu$ diam., at first papillate, then dehiscing by a stellate fissure; margin irregularly crenulate, but not fimbriate. Asci aparaphysate, cylindrical-clavate to ovate, not tunicated, 8-spored, $40-52 \times 16-24 \mu$. Spores conglobate, 2-celled, brown, slightly constricted, smooth, $15-18 \times 7-10 \mu$; upper loculus broader, spherical; lower loculus ellipsoid.

On leaves of *Ansellia africana*, Zululand, April 1913, Franks, 6687.

13. *Asterina ferruginosa* Doidge, sp. nov.

Plate XIV, fig. 18. Slides XXXIV, 1-2; XXXIX, 13.

Epiphyllous, forming thin, black, carbonaceous spots up to 8 mm. diam., frequently coalescing to form irregular blotches. Hyphae brown, slender, $4-6 \mu$ thick, branches usually opposite, anastomosing, cells $23-27 \mu$ long; hyphopodia alternate or unilateral, sessile, hemispherical or sub-globose, $6-8 \mu$ high and $8-10 \mu$ broad; there are occasional stipitate hyphopodia, chiefly in the neighbourhood of the thyriothecia; they are 2-celled, $12-13 \times 6-7 \mu$, the stipe cell being about 6μ long. Thyriothecia numerous, scattered, or confluent in small groups, flattened-hemispherical, $160-190 \mu$ diam., ferruginous, formed of radiating hyphae $3-3.5 \mu$ thick; margin densely fimbriate; dehiscence stellate. Asci aparaphysate, 8-spored, sub-spherical, $33-37 \mu$ diam., embedded in a dirty yellow mass of mucilaginous matter. Spores conglobate, 1-septate, brown, slightly constricted, smooth, $23-26 \times 11-12.5 \mu$; upper loculus slightly broader.

On leaves of *Cussonia umbellifera*, Woodbush, Zoutpansberg Dist., 3/8/11, Doidge, 1774.

On *Cussonia spicata*, Sea View, Durban, 1/10/17, v. d. Bijl, 11360.

14. *Asterina rhamnicola* Doidge, sp. nov.

Plate XV, fig. 19. Slides X, 14–18; XXXIII, 3.

Epiphyllous, forming thin, carbonaceous, more or less orbicular, spots up to 5 mm. diam. Mycelium delicate, radiating; hyphae straight, brown, 6–7 μ thick; branches alternate or opposite, anastomosing; cells mostly 25–30 μ long; hyphopodia alternate or unilateral, sessile, shortly and broadly cylindrical or sub-hemispherical, 6–10 \times 6–7 μ . Thyriothecia not numerous, scattered, conico-hemispherical, paler than the mycelium, 225–280 μ diam., formed of radiating hyphae 3–5 μ thick; margin not fimbriate; dehiscence by the irregular rupture of the central cells. Asci aparaphysate, broadly elliptic to ovate, 8-spored, 45–50 \times 23–33 μ . Spores conglobate, 1-septate, fuscous, slightly constricted, 23–25 \times 9–12 μ , upper loculus larger.

On leaves of *Rhamnus prinoides*, Woodbush, Zoutpansberg, 4/8/11, Doidge, 1752; Kentani, 10/4/15, Pegler (Pegler, 2315), 9068; Brander's High Forest, Victoria East, 12/8/15, v. d. Bijl, 9463.

15. *Asterina Hendersoni* Doidge, sp. nov.

Plate XV, fig. 20. Slides XLVII, 16–17.

Amphigenous, forming black spots up to 3 mm. diam. Mycelium brown, branching irregularly and anastomosing. Hyphae 5–6 μ thick, tortuous, sub-torulose, very frequently septate, cells 6–8 μ long; hyphopodia hemispherical, or somewhat angular or flattened, alternate, 3.5–6 μ diam. Thyriothecia flattened-hemispherical, scattered, 150–200 μ diam., formed of rather tortuous, radiating hyphae about 3.5 μ thick; margin coarsely fimbriate; dehiscence by an irregular rupture of the central cells. Asci aparaphysate, 8-spored, broadly ellipsoid to ovate, sessile or very briefly pedicellate, 45–50 \times 26–33 μ , do not stain blue with iodine. Spores brown, 1-septate, constricted, 23–25 μ long; each cell sub-globose; upper loculus 13–13.5 μ broad, lower loculus 10–11 μ broad. Pycnidia similar to the thyriothecia but smaller, 120–150 μ diam.; conidia brown with a medial hyaline band, ovate to ellipsoid, 23–27 \times 10–13 μ .

On leaves of *Ilex capensis*, Hogg's Back, 15/1/18, J. & M. Henderson, 11341, 11342.

16. *Asterina opaca* Syd.

Ann. Myc. x, p. 38; Die Gattung *Asterina*, p. 113.

Plate XV, fig. 21. Slides XXIII, 12; XLII, 9.

Epiphyllous, forming black, orbicular spots 1–3 mm. diam. Hyphae

short, but very much branched and anastomosing, chestnut brown, 5–7 μ thick, very closely interwoven; hyphopodia small, sessile, 1-celled, rounded at the apex or rarely slightly attenuated, alternate or opposite, 9–11 μ long, 5–6 μ broad. Thyriothecia often 1 or 2 in each spot, in the larger spots as many as 10, hemispherical, 150–250 μ diam., dehiscing irregularly, black, opaque, somewhat fimbriate. Asci ovate to globose, slightly thickened at the apex, paraphysate, 50–70 \times 35–46 μ , 8-spored. Spores conglobate, ellipsoid, broadly rounded at both ends, septate, deeply constricted, cells equal, smooth, 26–28 \times 13–14 μ .

On leaves of *Chrysophyllum natalensis*, Amanzimtoti, Natal, 10/7/11, Doidge, 1663.

On *Chrysophyllum* sp., Buccleuch, Natal, 10/7/18, Doidge, 11555.

17. *Asterina robusta* Doidge, sp. nov.

Plate XV, fig. 22. Slides VI, 15, 19, 20.

Epiphyllous, forming black, carbonaceous spots up to 5 mm. diam.; these are often so numerous as to become confluent and form irregular black areas on the leaf surface. Mycelium dark brown, radiating; hyphae 6–7 μ thick, some of the cells swollen, 9–10 μ thick; cells about 20 μ long; branches opposite or alternate, usually somewhat narrowed at junction with main hypha; hyphopodia usually unilateral, sometimes alternate, 1-celled sub-hemispherical, 6–6.5 \times 6.5–7 μ . Thyriothecia numerous, 300–400 μ diam., crowded, flattened-hemispherical when solitary, but more frequently confluent in small groups and becoming angular by lateral compression, opaque, almost black; composed of radiating hyphae about 5 μ thick; dehiscence by an irregular fissure, the cells breaking away from the centre outwards. Asci 8-spored, obovate, 65–75 \times 45–55 μ , thickened round the apex; there are no true paraphyses, but the asci are surrounded by a spongy tissue of small greenish yellow cells, which decompose into the dirty yellow mucilaginous mass in which the asci are embedded at maturity. Spores conglobate, 35–40 \times 18–20 μ , very dark brown, 1-septate, constricted, smooth, upper loculus slightly broader, each cell sub-spherical.

On leaves of *Pittosporum viridiflorum*, Mossel Bay, 22/7/15, Pole Evans, 9066.

18. *Asterina erysiphoides* Kalch. & Cke.

Grevillea ix, p. 32, t. 137, fig. 12; Syll. Fung. i, p. 47; Ann. Myc. x, p. 16.

Plate XV, fig. 23. Slides XXIII, 17–18; XXXII, 11.

Epiphyllous, forming black, sooty spots up to 6 mm. diam. Mycelium spreading, delicate; hyphae brown, 3.5–5 μ thick, much branched and anastomosing freely; hyphopodia alternate, sessile, 1-celled, erect or hooked, irregularly 3–5-lobed, 7–13 μ high and 5–10 μ broad. Thyriothecia flattened-

hemispherical, sub-opaque, 120–130 μ diam., composed of radiating hyphae 3–3.5 μ thick, central cells almost cubical, about 4 μ long; dehiscence stellate, margin fimbriate. Asci aparaphysate, almost spherical, 30–34 μ diam. Spores brown, 1-septate, constricted, rounded at both ends, 20–23 \times 10–12 μ , upper loculus broader, epispore verrucose at maturity. Pycnidia similar to the thyriothecia but smaller, 80–100 μ diam.; conidia ovate to pyriform, continuous, brown with an ill-defined, light, medial band, 16–20 \times 10–14 μ .

On leaves of *Jasminum tortuosum*, MacOwan 1139. MacOwan's No. 1139 in the herbarium of the South African Museum, Capetown, is *Puccinia exhaustiens* Thüm., and I could find on the leaves no trace of an *Asterina* mycelium. Theissen (Ann. Myc. x, p. 16) writes of the specimen in the Kew Herbarium: "Das Original enthält eine unreife *Asterina* mit hellbraunlichem Myzel, dessen Hyphen 4–5 μ dick sind und abwechselnde 6–8 hohe, meist drei-lappige Hyphopodien tragen. Die unreifen Gehäuse enthalten noch keine Schläuche, nur braune, hyalin gegurtelte sog. Stylosporen von 18–20 μ Länge und 10–12 μ Breite ('sporidiis ellipticis, continuis, atrofuscis 18–20 \times 10' in der Originaldiagnose) Die Art ist zu streichen." Two more recent collections on *Jasminum* spp., however, show abundant thyriothecia and mature spores, and as the mycelium and conidia correspond with the above description I have re-described *A. erysiphoides* from these.

On *Jasminum multipartitum*, Springfield, Natal, 14/7/15, Wood, 9018.

On *Jasminum angulare*, Kentani, 8/11/15, Pegler (Pegler, 1868), 9161.

On *Jasminum* sp., Alice, C.P., 18/11/17, Doidge, 11978.

19. *Asterina Balansae* (Speg.) Th.

Die Gattung *Asterina*, p. 88.

Seynesia Balansae Speg. F. Guar. i, No. 297; ii, No. 130; Syll. Fung. ix, p. 1065.

var. *africana* Sacc.

Hedwigia, 1899, p. (133); Syll. Fung. xvi, p. 640; Die Gattung *Asterina*, p. 88.

Plate XV, fig. 24. Slide XXIII, 4.

Epiphyllous, forming opaque black spots 3–5 mm. diam.; these are often so numerous that they coalesce. Mycelium dense, irregularly branched; hyphae brown, sinuous, 4–6 μ thick, cells 12–15 μ long; hyphopodia alternate or unilateral, sessile, lobed, 4 μ high and 7–8 μ broad. Thyriothecia flattened-hemispherical, 100–150 μ diam., composed of radiating hyphae 3–3.5 μ thick, dehiscence stellate or irregular. Asci aparaphysate, 8-spored, spherical, 25–40 μ diam., or ellipsoid, 28–45 \times 18–24 μ . Spores conglobate, brown, 1-septate, constricted, 17–22 \times 8–10 μ ; the upper cell spherical and broader than the lower; epispore minutely verrucose at maturity.

On leaves of *Rubus rigidus*, Natal, Wood (Wood, 6464), 9507.

20. *Asterina Excoecariae* Doidge, sp. nov.

Plate XV, fig. 25. Slides XIII, 11; XXXIV, 3.

Amphigenous; thin, carbonaceous, not forming orbicular spots, but irregular areas up to 8 mm. diam. Mycelium effuse; hyphae delicate, rather pale, somewhat undulate, 3–3.5 μ thick, cells about 16 μ long, branches opposite, anastomosing; hyphopodia sessile, alternate, or unilateral, various in shape, usually with 2–3 broad lobes, 6–7 \times 6–8 μ . Thyriothecia scattered, flattened-hemispherical, 100–120 μ diam., composed of radiating hyphae 2.5–3 μ thick; dehiscence stellate. Asci aparaphysate, evanescent, 8-spored, sub-spherical, sessile, about 35–40 μ diam. Spores conglobate, 1-septate, brown, constricted, 23–27 \times 12–13.5 μ , the upper loculus larger; episporium scabrous at maturity. Pycnidia similar to the thyriothecia but smaller, 60–70 μ diam.: conidia ovate, brown, with or without lighter, but not hyaline, medial band, 20–24 \times 13–17 μ .

On leaves of *Excoecaria* sp., Winkle Spruit, Natal, 28/5/15, Doidge, 9009.

21. *Asterina undulata* Doidge, sp. nov.

Plate XV, fig. 26. Slide XXXI, 12.

Epiphyllous, forming minute black spots 1–3 mm. diam. Hyphae pale-fuscous, undulating in more or less regular waves, 5–6.5 μ thick, not much branched, occasionally anastomosing, cells 18–22 μ long; hyphopodia alternate, 1-celled, broader than long, 5–6.5 μ high and 7–10 μ broad, irregularly lobed and cut, many almost palmate. Thyriothecia formed at the tips of secondary hyphae, the immature thyriothecia are fan-shaped; mature thyriothecia flattened-hemispherical, gregarious, often becoming slightly angular by contact; margin not fimbriate; radiating hyphae 2.5–3 μ thick, cells 4–6 μ long. Asci aparaphysate, 8-spored, slightly thickened round the apex, ovate, 20–24 \times 17–20 μ . Spores conglobate, narrow-ovate, brown, 1-septate, constricted, 13–15 \times 6–8.5 μ , broadly rounded at both ends, upper loculus slightly broader.

On leaves of *Viola abyssinica*, Woodbush, Zoutpansberg, 4/8/11, Doidge, 1769.

Near *A. Veronicae*, from which it differs in the size and form of the hyphopodia. In *A. Veronicae* there is a fairly broad sinus between the lobes; in the present species the lobes are closely folded together, so that only one wall is visible between the two. There is also a difference in the size of the spores.

22. *Asterina polythyria* Doidge, sp. nov.

Plate XV, fig. 27. Slide XXIV, 8.

Mostly epiphyllous, colonies black, crustaceous, 1–4 mm. diam. Mycelium forming a radiating fringe round the very numerous, closely-packed thyriothecia and pycnidia. Hyphae brown, sinuous, branches numerous, frequently

opposite and anastomosing; hyphopodia sessile, broader than long, lobed, most frequently 2-3-lobed, 5-7 μ high and 6-10 μ broad. Thyriothechia opaque, densely crowded, flattened-hemispherical, 150-170 μ diam., with stellate dehiscence; or oblong, 190-200 \times 140 μ , dehiscing by a lineal fissure. Asci cylindrical-ovate, aparaphysate, 8-spored, 26-40 \times 20-24 μ , slightly thickened round the apex. Spores conglobate, 1-septate, brown, slightly constricted, 16-20 \times 67 μ , smooth, the upper loculus somewhat broader. Pycnidia similar to the thyriothechia but smaller, 65-120 μ diam.; conidia brown with a hyaline band, continuous, ovate to pyriform, 16-21 \times 6-10 μ .

On leaves of *Osyridicarpus natalensis*, Tongaat, Natal, 12/9/13, v. d. Bijl, 6949.

Sub-genus II. CLYPEOLASTER Th.

Die Gattung Asterina, p. 6.

Thyriothechia with basal membrane, asci aparaphysate. The basal membrane is a blue-grey or grey-green disk formed of radiating hyphae, and apparently reproduces the structure of the thyriothechial membrane.

a. Hyphopodia 2-celled.

a. Stipe cell gibbous 23. *A. peraffinis*.

b. Stipe cell cylindrical.

1. Hyphopodia lobed, 9-14 μ high.

i. Spores 16-18 μ long 24. *A. celtidicola*
var. *microspora*.

ii. Spores 20-23 μ long 25. *A. ? vagans*.

2. Hyphopodia not lobed, 12-20 μ high . 26. *A. sphaerasca*.

Hyphopodia 1-celled.

a. Hyphopodia not lobed 27. *A. loranthicola*.

b. Hyphopodia lobed.

1. Spores smooth 28. *A. clausenicola*.

2. Spores verrucose.

i. Spores 18-20 μ long 29. *A. diplocarpa*.

ii. Spores 15-18 μ long 30. *A. tertia* var.
africana.

23. *Asterina peraffinis* Speg.

Fung. Puig. 355; Syll. Fung. ix, p. 392.

On living leaves of an *Asclepiadaceae*, Apiaty, São Paulo; Museo Nacional, Buenos Aires. On a similar host, São Leopoldo, Rio Grande do Sul, Herb. Theissen.

Asterina pseudopelliculosa Speg. var. *peraffinis* (Speg.) Th. Die Gattung Asterina, p. 104.

Plate XVI, fig. 28. Slides VIII, 15, 20, 18, 19.

Hypophyllous; mycelium slender, undulating, densely reticulate; hyphae

brown, 3·5–5 μ thick, branches opposite or alternate, anastomosing; hyphopodia alternate or unilateral, 2-celled, occasionally sessile, 1-celled, 10–15 \times 8–12 μ , most frequently palmately 3–4-lobed and obliquely septate between the first and second lobes; thus the stipe cell is gibbous and the terminal cell has 2–3 blunt lobes. Thyriothechia 100–160 μ diam., hemispherical, dehiscing by an irregular central fissure, which later becomes stellate; composed of radiating cells, 3–3·5 μ diam., margin fimbriate. Asci aparaphysate, spherical to obovate, 30–50 \times 25–30 μ , 8-spored. Spores conglobate, brown, oblong, 18–22 \times 7–10 μ , upper loculus sub-globose, lower loculus narrower. Pycnidia similar to the thyriothechia but smaller, about 70 μ diam.; conidia continuous, brown without a hyaline band, ovate to pyriform, 17–20 \times 6–10 μ .

On leaves of *Tylophora Flanaganii*, Lemana, Zoutpansberg, 14/8/11, Doidge, 1804; Hoek-van-helbosch, Zoutpansberg, 7/1/06, Burt Davy, 1228; Brander's High Forest, Victoria East, 14/8/15, v. d. Bijl, 9458.

Theissen (Die Gattung *Asterina*) makes this a variety of *A. pseudopelliculosa*, from which it differs in the 2-celled hyphopodia, on the grounds that in the Brazilian specimens of *A. peraffinis* 1-celled hyphopodia are also found. In my specimens 1-celled hyphopodia are rare or absent, and it appears to me that the fact that the majority of the hyphopodia are 2-celled is sufficient to separate this species from *A. pseudopelliculosa*, where they are constantly 1-celled. Theissen also mentions f. *africana* = *Asterina Strophanthi* P. Henn., Engl. Bot. Jahrb. 38, p. 125, on *Strophanthus hispidus*, Togo, Africa, Rehm. Ascom. 1624, Herb. Berlin. This form, which is not represented in the National Herbarium, has some 1-celled and some 2-celled hyphopodia, and is an intermediate form between *A. peraffinis* and *A. pseudopelliculosa*.

24. *Asterina celtidicola* P. Henn.

Hedwigia, 1905, p. 64; Syll. Fung. xvii, p. 846; Die Gattung *Asterina*, p. 94, on leaves of *Celtis* sp., Rio Jurua, Amazonas; Herbar. Berlin.

Var. *microspora* Doidge, var. nov.

Plate XVI, fig. 29. Slides XXIV, 9; XXXVI, 15; XI, 6; XLII, 3, 4.

Mostly epiphyllous; hyphae brown, undulate, 3·5–5 μ thick, with cells 20–24 μ long; branching irregularly to form a network of anastomosing hyphae; hyphopodia alternate, stipitate, straight or curved, the terminal cell lobed, 9–13 μ high and 6–10 μ broad. Thyriothechia 85–100 μ diam., hemispherical, dehiscence stellate, margin fimbriate; composed of radiating hyphae 3–3·5 μ thick, cells 4–5 μ long. Asci ovate to globose, 23–30 \times 26–33 μ , aparaphysate, 8-spored, thickened round apex, not stained blue by iodine. Spores dark brown, episore strongly echinulate, rounded at both ends, 2-celled, constricted, 16–18 \times 8–9 μ , rarely 20 μ long, upper loculus

very slightly broader. Pycnidia similar to the thyriothecia but smaller, 70–100 μ diam., conidia brown with a medial hyaline band, continuous, oval to ovate, 14–20 \times 8–10 μ .

On leaves of *Maerua* sp., Stella Bush, Durban, 1/7/14, Franks, 8405; Amanzimtoti, Natal, 10/7/11, Doidge, 1683.

On leaves of *Maerua pedunculosa*, Stella Bush, Durban, 7/4/18, Bottomley, 11376.

On *Oncoba Kraussiana*, Stella Bush, Durban, 23/9/17, v. d. Bijl, 11361; 8/4/18, Bottomley, 11382.

Var. *microspora* differs from the type, and also from var. *Capparidis* (*Asterina Capparidis* Syd. et Butler, Ann. Myc. 1911, p. 390, on leaves of *Capparis*, Madras, India; Butler, 1179, Herb. Sydow.) chiefly in the size of the spores and asci. Var. *Capparidis* differs from the type in the short cubical cells composing the thyriothecium, which are not so delicate as those of the type, and in the somewhat stouter mycelium, the hyphae being 4.5–5.5 μ thick. The spores resemble those of the type. Var. *microspora* agrees very closely with the type in the form of the mycelium, but differs in the size of the asci and spores.

25. *Asterina* ? *vagans* Speg.

Fung. Guar. no. 127; Syll. Fung. ix, p. 390; Die Gattung *Asterina*, p. 95.

Pl. XVI, fig. 30. Slides XI, 10, 15; XLIV, 18.

Epiphyllous, effuse; hyphae radiating, brown, about 5 μ thick, branches distant, often opposite, cells usually 25–30 μ long; hyphopodia alternate or unilateral, 9–14 \times 8–11 μ , briefly stipitate, stipe cell 3.5–6 μ long, terminal cell asymmetrical, more or less hooked, most frequently unequally 2-lobed or 3-lobed. Thyriothecia scattered, flattened-hemispherical, 120–180 μ diam., margin fimbriate; dehiscence by a stellate fissure; composed of radiating hyphae 3–3.5 μ thick, central cells cubical, 3.5–4.5 μ long. Asci paraphysate, embedded in a dirty-yellow mass of mucilaginous matter, ovate, 33–37 \times 33–35 μ . Spores conglobate, brown, 2-celled, loculi sub-equal, slightly constricted, 20–26 \times 10–13 μ , verrucose when mature. Pycnidia 50–60 μ diam.; conidia brown with an obscure medial band, oval to pyriform, 15–18 \times 10–11 μ .

On leaves of *Rinorea ardisiaeflora*, Buccleuch, Natal, 20/5/15, Doidge, 9704; 17/7/18, Doidge, 11581.

This should perhaps be described as a variety of *A. vagans*, the hyphae composing the thyriothecium are somewhat more slender than the type, and the asci do not stain blue with iodine; but my material of this species is very scanty, and I hesitate to describe it as a distinct variety until I have examined further collections.

26. *Asterina sphaerasca* Thüm.

Fung. Austro-Afric. 119; Syll. Fung. i, p. 40; Die Gattung Asterina, p. 115. "On leaves of *Capparis Guenzii*, Olifants Hoek, Uitenhage Dist."

Plate XVI, fig. 31. Slides XXIII, 11; XXIV, 13.

Epiphyllous, effuse; mycelium brown, consisting of sinuous hyphae 5-6 μ thick, cells 24-30 μ long, branching irregular, hyphae anastomosing to form a network; hyphopodia 2-celled, not lobed, erect, straight or uncinata, opposite or alternate, 12-20 \times 5-6 μ . Thyriothecia numerous, opaque, hemispherical, 130-170 μ diam., composed of radiating hyphae 3-4 μ thick, central cells 3.5-4 μ long, peripheral cells longer, margin fimbriate. Asci aparaphysate, spherical or ovate, 35-45 μ diam., 8-spored, not stained blue by iodine. Spores conglobate, 2-celled, constricted, 20-24 \times 10-12 μ , dark brown when mature and strongly echinulate, rounded at both ends, cells sub-equal. Pycnidia similar to thyriothecia but smaller, 100-120 μ diam., conidia ovate, brown, 20-25 \times 12-15 μ .

On leaves of *Capparis citrifolia*, Winkle Spruit, Natal, 28/5/15, Doidge, 9010.

I think there can be no doubt that this is the fungus collected by von Thümen, although I have not seen the type specimen. It is the only species which agrees with his description, and the host belongs to the same genus *Capparis*. *A. celtidicola* var. *microspora* on *Maerua* differs in the size of the spores and asci, and in the form of the hyphopodia.

Theissen, judging only by the imperfect description (Syll. F. i, p. 40), and not having seen the type, places this species amongst those imperfectly known, and remarks on its similarity to *A. Capparidis*. From this species (or variety, *A. celtidicola* var. *Capparidis*), *A. sphaerasca* differs in the form of the hyphopodia, which are taller and not lobed.

27. *Asterina loranthicola* Syd.

Ann. Myc. xii, 3, p. 266.

Plate XVI, fig. 32. Slides XXV, 9, 16; XXVI, 19, 20.

Amphigenous; mycelium spreading, composed of hyphae which are straight or nearly straight, brown, 4-6 μ thick, and irregularly branched; hyphopodia not at all numerous, alternate, sessile, 1-celled, cylindrical to obovate, often uncinata, 9-11 μ long, 5-6 μ broad. Thyriothecia densely aggregated, always flattened-hemispherical, 109-160 μ diam., composed of straight, radiating hyphae 3.5-5 μ thick, cells rectangular, up to 7 μ long; margin fimbriate; thyriothecial membrane easily separating into its component parts. Asci aparaphysate, ovate to globose, 30-38 \times 24-30 μ , 8-spored. Spores ellipsoid-oblong, 1-septate, brown, rounded at both ends, 20-24 \times 8-11 μ , epispore ciliate, upper loculus often slightly broader.

Pycnidia similar to the thyriothecia but smaller; conidia elliptic-pyriform, brown, with or without a hyaline band, $15-22 \times 9-11 \mu$.

On leaves of *Loranthus* sp., Quelimane, Portuguese East Africa, 14/9/17, Pole Evans, 7385.

On leaves of *Loranthus Dregei*, 8/3/15, Pegler (Pegler, 2302), 8863.

28. *Asterina clausenicola* Doidge, sp. nov.

Plate XVI, fig. 33. Slides VI, 16, 17; XLV, 7.

Amphigenous, mostly epiphyllous, effuse, forming a thin, spreading, carbonaceous layer frequently almost covering the upper surface of the leaf. Mycelium delicate, consisting of pale-fuscous hyphae $3-3.5 \mu$ thick, undulating, frequently branching and anastomosing, hyphopodia alternate or unilateral, occasionally opposite, sessile, 1-celled, $6-7 \mu$ high and $9-10 \mu$ broad, deeply 3-5-lobed, each lobe flattened or bilobulate, narrowing suddenly into a base $3-3.5 \mu$ thick. Thyriothecia scattered, flattened-hemispherical, $110-140 \mu$ diam., formed of radiating hyphae $2.5-3 \mu$ thick, with cells $3-3.5 \mu$ long; dehiscing by a stellate fissure; margin fimbriate. Asci paraphysate, 8-spored, broadly ovate or spherical, sessile, broadly rounded and thickened at the apex, $27-30 \times 23-24 \mu$. Spores conglobate, fuscous, smooth, 1-septate, slightly constricted, $19-20 \times 6.5-8 \mu$, upper loculus usually slightly larger. Pycnidia very numerous, similar to the thyriothecia but smaller, $50-60 \mu$ diam., conidia brown with a hyaline band, continuous, ovate to ellipsoid, $15-18 \times 8.5-11.5 \mu$.

On leaves of *Clausena inaequalis*, Hilton Road, Natal, 21/7/18, Doidge, 11606.

Asterostomella stage only: on *Clausena inaequalis*, Woodbush, Zoutpansberg, 4/8/11, 1754; Buccleuch, Natal, 24/4/16, J. M. Sim, 10149.

29. *Asterina diplocarpa* Cke.

Grevillea, x (1882), p. 129; Syll. Fung. ix, p. 381; Die Gattung *Asterina*, p. 106.

On leaves of *Sida cordifolia*, Inanda, Natal, Herb. Kew, Wood, 601; on *Sida carpinifolia*, São Leopoldo, Rio Grande do Sul, Herb. Theissen; Decades F. Brasil, 54 sub *A. peraffinis*; Rick. F. austro-amer. 325; Ule 673 on *Croton*, Rio de Janeiro, Herb. Berlin and Pazschke sub *A. peraffinis*.

Asterina similis Cke., Grevillea x, p. 130; Syll. Fung. l. cit., on *Sida rhombifolia*, Inanda, Natal, Herb. Kew, Wood, 544, "socio *A. diplocarpa*."

Asterina Sidae Earle, Plants of Porto Rico, 6333, on *Sida* sp., Porto Rico.

Asterina Kwangensis P. Henn. in Herb. Berlin on an *Asclepiadaceae*, Kwango, Congo.

Asterina huallagensis P. Henn., Hedwigia 1904, p. 372; Syll. Fung. xvii, p. 879; on *Croton* sp., Peru (non *Asterina huallagensis* [P. Henn.] Theiss. *Lembosia huallagensis* P.H.).

Plate XVI, fig. 34. Slides XXIV, 11, 14; XXXI, 19; XXXIX, 6.

Mostly epiphyllous, effuse; mycelium undulate, reticulate; hyphae brown or pale fuscous, 3·5–5 μ thick, forming more or less regular zigzag lines; hyphopodia alternate or unilateral, continuous, sessile, 6–7 μ high and 5–10 μ broad, lobed, the majority with three flattened or rounded lobes, erect or hooked. Thyriothecia numerous, crowded, flattened-hemispherical, 100–150 μ diam., composed of radiating hyphae 3–3·5 μ thick, with cells 3–5 μ long; dehiscing by a stellate fissure; margin not fimbriate. Asci 8-spored, aparaphysate, with a short foot, globose or ovate-pyriform, 27–35 μ diam., or 46 \times 22 μ , not stained blue by iodine. Spores conglobate, 2-celled, very slightly constricted, dark brown, 17–22 \times 8–10 μ ; epispore verrucose, upper cell slightly broader. Pycnidia smaller than the thyriothecia, 70–85 μ diam.; conidia continuous, brown, elliptic or pyriform, 18–23 \times 12–14 μ .

On leaves of *Sida rhombifolia*, Inanda, 1877, Wood (Wood, 544), 10192.

On leaves of *Sida cordifolia*, Inanda, Wood (Wood, 601), 10194, 9506; Van Staden's Drift, 13/11/17, Doidge, 10858.

On *Hibiscus pedunculatus*, Maritzberg, 21/3/18, Doidge, 9710; East London, 11/11/17, Doidge, 10927.

30. *Asterina tertia* Rac.

On the leaves of different *Acanthaceae* (*Adhatoda*, *Crossandra*, etc.), Buitenzorg, Java, Herb. Raciborsky; Die Gattung *Asterina*, p. 103.

var. *africana* Doidge, var. nov.

Plate XVI, fig. 35. Slides XXVI, 9, 10; XXIV, 12, 15; XXXI, 18; XXXIII, 15.

Epiphyllous; mycelium radiating, consisting of fuscous, undulating hyphae, 3–3·5 μ thick, irregularly branched and anastomosing; hyphopodia 1-celled, alternate or unilateral, 6–7 μ high and 7–10 μ broad, irregularly lobed, the majority either more or less symmetrical, with 2–3 flattened, rounded or bilobulate lobes, or hooked, with 2–4 rounded lobes on the convex side. Thyriothecia crowded, flattened-hemispherical, 120–130 μ diam., formed of radiating hyphae about 3 μ thick, cells about 3·5 μ long; margin not pronouncedly fimbriate; dehiscence stellate. Asci aparaphysate, 8-spored, broadly ovate to spherical, sessile, thickened round the apex, 30–40 \times 23–27 μ . Spores conglobate. 1-septate, fuscous, constricted, 15–18 \times 6·5–8 μ ; upper cell often slightly broader, epispore minutely verrucose at maturity. Pycnidia smaller than the thyriothecia, 50–70 μ diam.; conidia brown, continuous, ovate to pyriform, 13–17 \times 11–13 μ .

On leaves of *Hypoestes aristata* (sub *A. fimbriata*), Inanda, Wood (Wood, 608), 9512.

On *Hypoestes verticillaris*, Kentani, 6/5/15, Pegler (Pegler, 2317), 9074; van Staden's Drift, 12/11/17, Doidge, 10856.

On *Isoglossa Woodii*, Lemana, Zoutpansberg, 14/8/11, Doidge, 1791; East London, 24/11/17, Doidge, 10923.

On *Dicliptera heterostegia*, Mayville, Durban, 22/7/15, Wood, 9028.

On *Peristrophe* sp., Claridge, Natal, 31/5/15, Doidge, 8998.

Theissen ('Die Gattung Asterina,' p. 103) remarks: "Die Art ist kaum mehr als eine Form von *A. diplocarpa*." The species is certainly very closely related to *A. diplocarpa*, but there is a constant if rather slight difference in the form of the hyphopodia. The variety differs from the type in the narrower spores.

SPECIES EXCLUDENDAE.

Asterina capensis Kalch. et Cke., Grevillea, ix, p. 32; Syll. Fung. ii, p. 41 = *Meliola capensis* (K. et Cke.) Th., Ann. Myc. x, 1912, p. 19; Trans. Roy. Soc. of S. Af. v, 1917, p. 731.

Asterina confluens K. et Cke., Grevillea, ix, p. 33; Syll. Fung. i, p. 49, is the conidial stage of some undetermined fungus; Theissen, Die Gattung Asterina, p. 4.

Asterina ditricha K. et Cke., Grevillea, ix, p. 32 = *Meliola ditricha* (K. et Cke.) Doidge, Trans. Roy. Soc. of S. Af. v, 1917, p. 728.

Asterina interrupta Wint., Flora, 1884, p. 6; Syll. Fung. ix, p. 381 = *Entopeltis interrupta* (Wint.) v. Höhnel, Fragmente z. Myk. 489.

Asterina Macowaniana K. et Cke., Grevillea, ix, p. 33; Syll. Fung. i, p. 41 = *Parenglerula Macowaniana* (K. et Cke.) v. Höhn., l. cit., 525.

Asterina myriadea Cke., Grevillea, x, p. 130; Syll. Fung. ix, p. 389 = *Dimerium myriadeum* (Cke.) Theissen, Ann. Myc. x, p. 193.

Asterina phaeostroma (Cke.), Grevillea, x, p. 130; Syll. Fung. ix, p. 396 = *Balladyna velutina* (Cke.) v. Höhn., Ann. Myc. x, p. 16; Trans. Roy. Soc. of S. Af. v, 1917, p. 716.

Asterina similis Cke., Grevillea, x, p. 130 = *Asterina diplocarpa* Cke., Ann. Myc. x, p. 14.

Asterina solaris K. et Cke., Grevillea, ix, p. 33; Syll. Fung. i, p. 42 = *Asterodothis solaris* (K. et Cke.) Theissen, Ann. Myc. x, p. 179.

Asterina stylospora Cke., Grevillea, x, p. 129, does not belong to the Microthyriaceae, Ann. Myc. x, p. 13.

Asterina toruligena Cke., Grevillea, x, p. 129, is not an Asterina, Ann. Myc. x, p. 19.

ASTERINELLA, Th.

Fragmenta brasiliica, v, no. 123; Ann. Myc. x, 1912.

Mycelium superficial, creeping, branching, without hyphopodia. Thyrio-

thecia dimidiate, scutate, inverse, radiate in structure, dehiscing from the centre. Asci globose-ovate or elliptical-cylindrical. Spores brown, 2-celled.

Key to the Species.

- A. Asci aparaphysate.
 a. Spores 13–17 μ long.
 i. Hyphae 3–3.5 μ diam. 1. *A. Acokantherae*.
 ii. Hyphae 3.5–5 μ diam., torulose 2. *A. Burchelliae*.
 b. Spores 20–23 μ long 3. *A. Woodiana*.
 B. Asci paraphysate 4. *A. lembosoides*.

1. *Asterinella Acokantherae* Doidge, sp. nov.

Plate XVII, fig. 36. Slides XXIX, 16; XXXI, 13, 14, 17; XLVII, 4, 5.

Hypophyllous, forming thin, black carbonaceous spots up to 5 mm. diam. Mycelium rather scanty; hyphae pale, fuscous, 3–3.5 μ thick, branching irregularly and anastomosing. Thyriothecia very numerous, brown, gregarious, frequently confluent in small groups, flattened-hemispherical 90–115 μ diam., composed of radiating hyphae about 3 μ thick; margin fimbriate. Asci elliptical-cylindrical, sessile, thickened round the apex, aparaphysate, 8-spored, 26–35 \times 13–17 μ . Spores distichous or conglobate, fuscous, ellipsoid or sub-clavate, slightly constricted, 13–17 \times 3.5–5 μ , Pycnidia similar to the thyriothecia; conidia hyaline, fusiform, 3-septate, 20–24 \times 3–3.5 μ .

On leaves of *Acokanthera spectabilis*, Durban, Natal, 15/5/97, Wood (Wood, 6450 and 6451), 9510 and 9521.

On *Acokanthera venenata*, Tongaat, Natal, 12/9/13, v. d. Bijl, 6951.

Conidial stage only: on *Carissa arduina*, Louis Trichardt, Zoutpansberg, 8/4/19, Putterill, 11849.

Medley Wood's specimens are labelled *Dimerosporium Acokantherae*, but the fungus does not correspond with Henning's description (Fung. Africani, p. 4, Engl. Bot. Jahrb., vol. 17).

2. *Asterinella Woodiana* Doidge, sp. nov.

Plate XVII, fig. 38. Slides XXXIV, 9; XL, 4.

Hypophyllous; mycelium thin, effuse, reticulate; hyphae slender, fuscous, 2.5–3 μ thick, tortuous and interwoven, abundantly branched and anastomosing. Thyriothecia fairly numerous, scattered, light brown, 150–160 μ diam., flattened-hemispherical, formed of radiating hyphae 2–3 μ thick, margin crenulate, or irregularly lobed at maturity. Asci ovate to elliptical, 8-spored, aparaphysate, 33–37 \times 27–30 μ . Spores conglobate, 2-celled, fuscous, smooth, constricted, 20–23 \times 10 μ , cells sub-equal. Pycnidia similar to the thyriothecia but smaller; conidia (*Asterostomella*) ellipsoid, brown, continuous, 14–16 \times 8–10 μ .

Associated with *Meliola Cryptocaryae*, on leaves of *Cryptocarya Woodii*, Mayville, Natal, 22/7/15, Wood, 9025.

On *Cryptocarya Woodii*, Berea, Durban, 29/1/17, v. d. Bijl, 11362.

3. *Asterinella Burchelliae* Doidge, sp. nov.

Plate XVII, fig. 37. Slides IV, 20; XXXIV, 9; XL, 4.

Epiphyllous, forming minute, black spots about 1 mm. diam. Mycelium poorly developed; hyphae brown, 3.5–5 μ thick, frequently septate, undulating, somewhat torulose, cells 10–13 μ long. Thyriothecia 100–120 μ diam., brown, flattened hemispherical, formed of radiating hyphae about 3 μ thick, margin somewhat fimbriate. Asci ellipsoid to cylindrical, thickly tunicated round the apex, sessile, paraphysate, 27–37 \times 16–20 μ . Spores 13–17 \times 5–6.5 μ , oblong to clavate, rounded at both ends, upper cell shorter.

On leaves of *Burchellia capensis*, Woodville Forest, George, 11/11/17, Doidge, 10940.

Closely related to *Asterina gibbosa*, from which it differs in the poorly developed mycelium and in the absence of regular nodular swellings.

4. *Asterinella lembosioides* Doidge, sp. nov.

Plate XVII, fig. 39. Slides XLIII, 4–6.

Mycelium slender, arachnoid; hyphae fuscous, 1.5–3 μ thick, tortuous, frequently branched and anastomosing. Thyriothecia scattered, hemispherical, 200–240 μ diam., or broadly ellipsoid, 280–320 \times 160–240 μ ; formed of radiating hyphae about 2 μ thick, dehiscing by an irregular central fissure. Asci very numerous, paraphysate, ellipsoid to cylindrical, 33–43 \times 17–20 μ , somewhat thickened round the apex, which is traversed by a terminal pore; paraphyses numerous, hyaline, exceeding the asci, filiform, swollen, club-shaped at the tips. Spores conglobate or sub-distichous, 15–17 \times 8.5–10 μ , 2-celled, fuscous, scarcely constricted cells sub-equal. Pycnidia similar to the thyriothecia; conidia hyaline, continuous, lunate, 17–18 \times 1.5–2 μ .

Parasitic on the mycelium of *Balladyna velutina* and *Meliola amphitricha*, on leaves of *Plectronia Guienzii*, Buccleuch, Natal, 17/7/11, Doidge, 11574.

LEMBOSIA Lev.

Syll. Fung. ii, p. 741; Theissen, Lembosia-studien, Ann. Myc. xi (1913).

Mycelium superficial, hyphae branched, septate, with hyphopodia. Thyriothecia dimidiate, inverse, formed of radiating hyphae, typically oblong-linear, dehiscing by an irregular longitudinal fissure. Asci paraphysate, 8-spored. Spores 2-celled, brown.

Key to the Species.

- a. Spores 15–16 μ long 1. *L. natalensis*.
 b. Spores 17–20 μ long.
 i. Thyriothecia up to 800 μ long 2. *L. congesta*.
 ii. Thyriothecia not more than 300 μ long 3. *L. radiata*.

1. *Lembosia natalensis* Doidge, sp. nov.

Plate XIX, fig. 44. Slide XXV, 13.

Hypophyllous, effuse; hyphae fuscous, 3–3.5 μ thick, branching and anastomosing; hyphopodia very rare, cylindrical or slightly curved, 6 \times 3 μ . Thyriothecia scattered, elliptic, sometimes forked, 300–500 \times 140–160 μ , dehiscing by a narrow longitudinal slit. Asci paraphysate, 8-spored, ellipsoid to obovate, 30–34 \times 20–24 μ . Spores conglobate, 2-celled, fuscous, ellipsoid, scarcely constricted, 15–16 \times 6–7 μ . Pycnidia flattened-hemispherical, Asterina-like, 200–250 μ diam., composed of radiating hyphae about 2 μ thick, dehiscence stellate; conidia hyaline, fusoid, 18–20 \times 3.5 μ .

On leaves of an undetermined shrub (*Myrtaceae?*), Krantzklouf, Natal, 1/6/15, Doidge, 8984.

2. *Lembosia congesta* Wint.

Exot. Pilze in Flora, 1884, p. 9; Syll. Fung. ix, p. 1105; Hab. ad ramulcs juniores *Carissae arduinae* in Promontorio Bonae Spei, Afr. austr. (MacOwan).

Plate XIX, fig. 45. Slides XXVIII, 11–13, 16.

On the younger branches, or less frequently on the leaves; thyriothecia closely packed, forming black, opaque, round irregular spots up to 4 mm. diam. Thyriothecia black, opaque, elongated linear, straight, curved or flexuous, 500–800 \times 180–220 μ ; oval, attenuated to both ends, 280–340 \times 160–175 μ , or rarely almost hemispherical, 160–190 μ diam; dehiscing by a longitudinal slit. Asci oblong to clavate, attenuated into a short foot, 8-spored, paraphysate 60–70 \times 21–26 μ ; paraphyses filiform, often forked at the apex, tips more or less conglutinate. Spores conglobate or sub-distichous, oblong, 1-septate, constricted, fuscous when mature, 17–18 \times 7–9 μ . Mycelium on the leaves well developed, fuscous, undulating, abundantly branched, and anastomosing, with a few sessile, dark brown, hemispherical hyphopodia 6.5–8 \times 6.5 μ , on the primary hyphae. Mycelium on the branches not so well developed; hyphae straighter, more slender, 3.5–5 μ thick, branches parallel, with occasional elongated reticulations.

On *Carissa arduina*, Lemana, Zoutpansberg, 14/8/11, Doidge, 1786; Isipingo, Natal, 21/5/17, Doidge, 10155; Grahamstown, 15/8/17, Gane, 11369; Cango Valley, Oudtshoorn, 9/11/17, Doidge, 10898; Woodville Forest, George, 11/11/17, Doidge, 10929; Howieson's Poort, Grahamstown,

17/11/17, Doidge, 10960; Lovedale, Alice, 18/11/17, Doidge, 10979; Hogg's Back, 15/1/18, J. & M. Henderson, 11345.

On *Carissa acuminata*, Stella Bush, Durban, 7/4/18, Bottomley, 11381.

On *Carissa grandiflora*, Krantzkloof, Natal, 26/5/15, Doidge, 8983; Isipingo, Natal, 27/3/18, Bottomley, 11380.

3. *Lembosia radiata* Doidge, sp. nov.

Plate XIX, fig. 46. Slide XLVI, 8.

Epiphyllous, rarely hypophyllous, forming dense, opaque, black spots 1.5–2.5 mm. diam. Mycelium delicate, radiating; hyphae slender, fuscous, 3–4 μ thick; branches irregular, interwoven and anastomosing; hyphopodia sub-globose, 6–7 μ diam. Primary thyriothecia densely crowded and confluent in the centre of the spot, so that the boundaries of the individual thyriothecia are often indistinguishable; confluent in a stellate manner; secondary thyriothecia often forming a concentric ring, oriented with the long axis on a radius from the centre; 240–300 \times 60–160 μ , formed of radiating hyphae about 3 μ thick; dehiscing by a longitudinal slit almost the length of the thyriothecium. Asci ellipsoid-clavate, 42–45 \times 18–23 μ , 8-spored, somewhat thickened round the apex; paraphyses numerous, hyaline, slender, filiform, slightly exceeding the asci, simple or branched, not swollen at the tips; asci do not stain blue with iodine. Spores sub-distichous, 1-septate, scarcely constricted, fuscous, smooth, 17–20 \times 8–10 μ ; cells sub-equal, but upper loculus very slightly broader and rather more broadly rounded.

On leaves of an undetermined shrub (Leguminosae), Rikatli, Portuguese East Africa, 15/9/18, Junod, 11729.

ECHIDNODES Theiss. et Syd.

Ann. Myc. xvii (1915), p. 422.

Like *Lembosia*, but mycelium non-hyphopodiate.

Echidnodes rhoina Doidge, sp. nov.

Plate XVIII, fig. 43. Slides XXVIII, 7–10.

Amphigenous, mostly epiphyllous, forming minute black spots 1–1.5 mm. diam., often very numerous and confluent. Hyphae septate, brown, 2.5–3.5 μ thick, alternately branched, anastomosing; no hyphopodia. Thyriothecia irregularly scattered, occasionally confluent, not very numerous, black, oblong-ellipsoid, straight or curved, or occasionally forked, 300–500 \times 90–150 μ , dehiscing by a longitudinal slit almost the length of the thyriothecium. Asci 8-spored, paraphysate, broadly elliptic-ovate, somewhat thickened at the apex, 35–40 \times 20–24 μ ; paraphyses fairly numerous, filiform, exceeding the asci. Spores distichous or con-

globose, 1-septate, constricted, brown, 13–16 μ long; upper loculus longer and broader, almost globular, 6.5–8 μ broad; lower loculus 5–6.5 μ broad; epispore minutely verrucose at maturity.

On leaves of *Rhus lucida*, Van Staden's Pass, 13/11/17, Doidge, 10887; Howieson's Poort, Grahamstown, 10957.

MORENOELLA Speg.

F. Guaran. i, p. 258; Theissen, Lembosia-studien, Ann. Myc. xi, p. 425.

Mycelium superficial, hyphae branched, septate, with hyphopodia. Thyriothecia dimidiate, inverse, formed of radiating hyphae, typically oblong-linear, dehiscing by an irregular longitudinal fissure, asci aparaphysate, 8-spored. Spores 2-celled, brown.

Morenoella Oxyanthæ Doidge, sp. nov.

Slides IV, 17; XXV, 18; XXVI, 17.

Hypophyllous; thyriothecia very densely crowded, forming black or rusty brown opaque spots, which are round-irregular, and up to 5 mm. diam. Thyriothecia elongated, attenuated towards each end, often curved, 400–600 \times 250–300 μ , dehiscing by an irregular, longitudinal slit. Hyphae not distinct in the centre of the spot, but radiating from the thyriothecial mass; these are more or less densely interwoven, pale, fuscous, slender, branched and anastomosing hyphae, 3–3.5 μ thick, with small, globular, alternate hyphopodia. Asci aparaphysate, 8-spored, elliptic-ovate, sessile, or very briefly pedicellate, very much thickened round the apex, 23–30 \times 13–16 μ . Spores distichous or conglobate, ellipsoid or sub-clavate, unevenly 1-septate, the upper cell being shorter and broader, slightly constricted, fuscous when mature, 12–16 \times 3.5–5 μ .

On leaves of *Oxyanthus Gerrardi*, Kentani, Pegler (Pegler, 2321), 9073; Town Bush Valley, Maritzberg, 21/3/16, Doidge, 9719.

On *Grumilea capensis*, Woodbush, Zoutpansberg, 7/8/11, Doidge, 1758.

ECHIDNODELLA Theiss. et Syd.

Ann. Myc. xvii (1915), p. 422.

Like *Morenoella*, but mycelium non-hyphopodiate.

Echidnodella Hypolepidis Doidge, sp. nov.

Slides XXVIII, 14, 15.

Epiphyllous, effuse, usually along the midrib of the pinnule, spots small and often confluent. Hyphae septate, pale-fuscous, slender, 2–3 μ thick, tortuous, abundantly branched and anastomosing; no hyphopodia. Thyriothecia gregarious, often confluent, straight or curved, and not infrequently forked, oblong-ellipsoid, 120–240 \times 50–100 μ , dehiscing by a n edial, longitudinal slit almost the length of the thyriothecium; composed

of hyphae 3-3.5 μ thick, with cells 3.5-5 μ long. Asci (immature) 8-spored, paraphysate, elliptic-ovate, sessile, rounded at the apex, 20-25 \times 7-10 μ . Mature spores only seen outside the ascus, 1-septate, fuscous, 10-14 \times 3.5-5 μ , upper cell broader and more broadly rounded.

On pinnules of *Hypolepis sparsisora*, Woodville Forest, George, 11/11/17, Doidge, 10930.

AMAZONIA Theiss.

Ann. Myc. ii (1913), 499.

Thyriothecia superficial, dimidiate, scutate, formed of radiating hyphae. Asci paraphysate. Spores 4-septate, brown. Mycelium hyphopodiate.

Amazonia asterinoides (Wint.) Th.

Ann. Myc. ii (1913), 499; and 15 (1917), 421.

Meliola asterinoides Wint., Gaill. Le Genre *Meliola*, p. 58.

Meliolaster Mackenzii Doidge, Trans. Roy. Soc. of S. Af. viii (1918), p. 122.

Plate XVIII, fig. 42. Slides XLIII, 8-10.

Mostly hypophyllous, less frequently epiphyllous or on the stems, forming minute round spots 1.5-2.5 mm. diam. Mycelium brown, radiating, hyphae flexuous or almost straight, 6-7 μ thick; branches alternate, cells 15-6 μ long; capitate hyphopodia alternate or unilateral, briefly stipitate, curved, 10-15 \times 6-7 μ , terminal cell sub-globose, convex; mucronate hyphopodia ampulliform, scattered amongst the capitate hyphopodia, neck sometimes sub-uncinate, 12-15 \times 6-7 μ . Thyriothecia gregarious in small groups, flattened-hemispherical or angular by compression, 250-350 μ diam., radiating hyphae straight, 4-6 μ thick, cells about 10 μ long, margin densely fimbriate. Asci paraphysate, evanescent, ellipsoid, 2-spored, 50-57 \times 20-23 μ . Spores cylindrical-compressed or sub-clavate, 4-septate, rounded at both ends, slightly constricted, 33-37 \times 10-13.5 μ .

On *Piper capensis*, Buccleuch, Natal, 17/8/18, Doidge, 11570.

HOST INDEX

(According to Genera and Families).

Abbreviations:—*A.* = *Asterina*; *Ala.* = *Asterinella*; *E.* = *Englerulaster*; *L.* = *Lembosia*; *M.* = *Morenoella*; *Mna.* = *Morenoina*; *Am.* = *Amazonia*; *Mic.* = *Microthyrium*; *S.* = *Seynesia*; *P.* = *Parasterina*; *Ech.* = *Echidnodes*; *Echla.* = *Echidnodella*.

Acanthaceae	<i>A. fimbriata.</i>	Acokanthera	<i>Ala. Acokantherae.</i>
<i>cfr.</i> Diclptera.	<i>A. tertia</i> var.	Alberta	<i>A. gibbosa</i> var.
Hypoestes.	<i>africana.</i>		<i>megathyria</i>
Isoglossa.		Anacardiaceae	<i>A. Peglerae.</i>
Peristrophe.		<i>cfr.</i> Rhus.	<i>Ech. Rhoïna.</i>
Sclerochiton.		Anonaceae	<i>E. Popowiae.</i>
Acalypha	<i>A. tenuis.</i>	<i>cfr.</i> Popowia.	

- Ansellia . . . *A. raripoda*.
 Apocynaceae . . . *P. rigida*.
 cfr. Acokanthera. *Ala. Acokantherae*.
 Carissa. *L. congesta*.
 Oncinotis.
 Aquifoliaceae . . . *E. orbicularis*.
 cfr. Ilex. *A. Hendersoni*.
 Araliaceae . . . *A. ferruginosa*.
 cfr. Cussonia.
 Asclepiadaceae . . . *A. peraffinis*.
 cfr. Tylophora.
 Burchellia . . . *Ala. Burchelliae*.
 Capparidaceae . . . *A. celtidicola* var.
 microspora.
 cfr. Capparis. *A. sphaerasca*.
 Maerua.
 Capparis . . . *A. sphaerasca*.
 Carissa . . . *Ala. Acokantherae*.
 L. congesta.
 Celastraceae . . . *E. Gymnosporiae*.
 cfr. Gymnosporia.
 Putterlickia.
 Chrysophyllum . . . *A. opaca*.
 Claoxylon . . . *A. tenuis*.
 Clausena . . . *A. clausenicola*.
 Combretaceae . . . *A. Combreti*.
 cfr. Combretum.
 Combretum . . . *A. Combreti*.
 Compositae . . . *A. natalensis*.
 cfr. Mikania.
 Cryptocarya . . . *Ala. Woodiana*.
 Cussonia . . . *A. ferruginosa*.
 Dalechampia . . . *A. tenuis*.
 Diclptera . . . *A. tertia*, var.
 africana.
 Dryopteris . . . *Mna. africana*.
 Ebenaceae . . . *S. orbiculata*.
 cfr. Euclea.
 Euclea . . . *S. orbiculata*.
 Eugenia . . . *A. brachystoma*.
 Euphorbiaceae . . . *A. Excoecariae*.
 cfr. Acalypha. *A. tenuis*.
 Claoxylon.
 Dalechampia.
 Excoecaria.
 Excoecaria . . . *A. Excoecariae*.
 Flacourtiaceae . . . *A. delicata*.
 cfr. Oncoba. *A. celtidicola* var.
 Trimeria. *microspora*.
 Grewia . . . *A. Grewiae*.
- Grumilea . . . *P. brachystoma*
 var. *laxa*.
 M. Oxyanthae.
 Gymnosporia . . . *E. Gymnosporiae*.
 Hibiscus . . . *A. diplocarpa*.
 Hypoestes . . . *A. fimbriata*.
 A. tertia var.
 africana.
 Hypolepis . . . *Echlo. Hypolepidis*.
 Ilex . . . *A. Hendersoni*.
 E. orbicularis.
 Isoglossa . . . *A. tertia* var.
 africana.
 Jasminum . . . *A. erysiphoides*.
 Kraussia . . . *A. gibbosa* var.
 megathyria.
 Lauraceae . . . *Ala. Woodiana*.
 cfr. Cryptocarpa.
 Leguminosae . . . *L. radiata*.
 Loranthaceae . . . *A. loranthicola*.
 cfr. Loranthus.
 Loranthus . . . *A. loranthicola*.
 Maerua . . . *A. celtidicola* var.
 microspora.
 Malvaceae . . . *A. diplocarpa*.
 cfr. Hibiscus.
 Sida.
 Meliaceae . . . *A. Trichiliae*.
 cfr. Trichilia.
 Mikania . . . *A. natalensis*.
 Myrtaceae . . . *P. brachystoma*.
 cfr. Eugenia. *L. natalensis*.
 Oleaceae . . . *A. erysiphoides*.
 cfr. Jasminum.
 Olinia . . . *A. reticulata*.
 Oliniaceae . . . *A. reticulata*.
 cfr. Olinia.
 Oncinotis . . . *P. rigida*.
 Oncoba . . . *A. celtidicola* var.
 microspora.
 Orchidaceae . . . *A. raripoda*.
 cfr. Ansellia.
 Osyridicarpus . . . *A. polythyria*.
 Oxyanthus . . . *P. brachystoma*
 var. *laxa*.
 M. Oxyanthae.
 Pavetta . . . *A. gibbosa* var.
 megathyria.
 Peristrophe . . . *A. tertia* var.
 africana.

Piper	<i>Am. asterinoides.</i>	Kraussia.	<i>megathyria.</i>
Piperaceae	<i>Am. asterinoides.</i>	Oxyanthus.	<i>Ala. Burchelliae.</i>
<i>cfr. Piper.</i>		Pavetta.	<i>Ala. lembosoides.</i>
Pittosporaceae	<i>A. robusta.</i>	Plectronia.	<i>M. Oxyanthae.</i>
<i>cfr. Pittosporum.</i>		Randia.	
Pittosporum	<i>A. robusta.</i>	Tricalysia.	
Plectronia	<i>A. gibbosa</i> var.	Rubus	<i>A. Balansae</i> var.
<i>megathyria.</i>		<i>africana.</i>	
<i>A. fimbriata.</i>		Rutaceae	<i>A. clausenicola.</i>
<i>Ala. lembosoides.</i>		<i>cfr. Clausena.</i>	
Polypodiaceae	<i>Echla. Hypolepidis.</i>	Santalaceae	<i>A. polythyria.</i>
<i>cfr. Dryopteris.</i>	<i>Mna. africana.</i>	<i>cfr. Osyridicarpus.</i>	
Hypolepis.		Sapotaceae	<i>P. implicata.</i>
Popowia	<i>E. Popowiae.</i>	<i>cfr. Chryso-</i>	<i>A. opaca.</i>
Putterlickia	<i>E. Gymnosporiae.</i>	phyllum.	
Randia	<i>A. gibbosa</i> var.	Sideroxylon.	
<i>megathyria.</i>		Sclerochiton	<i>A. fimbriata.</i>
Rhamnaceae	<i>A. rhamnicola.</i>	Sida	<i>A. diplocarpa.</i>
<i>cfr. Rhamnus.</i>	<i>A. uncinata.</i>	Sideroxylon	<i>P. implicata.</i>
Rhamnus	<i>A. rhamnicola.</i>	Tiliaceae	<i>A. Grewiae.</i>
<i>A. uncinata.</i>		<i>cfr. Grewia.</i>	
Rhus	<i>A. Peglerae.</i>	Tricalysia	<i>A. gibbosa</i> var.
<i>Ech. Rhoina.</i>		<i>megathyria.</i>	
Rinorea	<i>A. ? vagans.</i>	Trichilia	<i>A. Trichiliae.</i>
Rosaceae	<i>A. Balansae</i> var.	Trimeria	<i>A. delicata.</i>
<i>cfr. Rubus.</i>	<i>africana.</i>	Tylophora	<i>A. peraffinis.</i>
Rubiaceae	<i>A. brachystoma</i>	Viola	<i>A. undulata.</i>
<i>cfr. Alberta.</i>	var. <i>laxa.</i>	Violaceae	<i>A. vagans.</i>
Burchellia.	<i>A. fimbriata.</i>	<i>cfr. Rinorea.</i>	<i>A. undulata.</i>
Grumilea.	<i>A. gibbosa</i> var.	Viola.	

DESCRIPTIONS OF NEW SPECIES, ETC.

Asterina brachystoma (Rehm.) Th.

var. *laxa* Doidge, var. nov.

A typo differt mycelio laxo, tenuiore; hyphopodiis minoribus et paucioribus.

Asterina (Clypeolaster) clausenicola Doidge, sp. nov.

Mycelium amphigenum, plerumque epiphyllum; hyphis irregulariter ramosis, undulatis, gracilibus, 3-3.5 μ crassis, fuligineo-brunneis; hyphopodiis alternis, sessilibus, profunde trilobatis vel quinquelobatis, 6-7 μ altis, 9-10 μ latis, a base 3-3.5 μ cr. abrupte attenuatis. Thyriothechia sparsa, hemisphaerica, 110-140 μ diam., ex hyphis angustis 2.5-3 μ crassis contexta, margine fimbriata, stellatim dehiscentia. Asci aparaphysati, octospori, sub-globosi vel ovati, 27-30 \times 23-24 μ . Sporae fuligineo-brunneae, laeves, uniseptatae, leviter constrictae, 19-20 \times 6.5-8 μ , loculo supero parum latiore, utrinque rotundatae.

Hab. in foliis *Clausenae inaequalis*, Hilton Road, Natal, 21/7/18, leg. Doidge, 11606.

Asterina celtidicola P. Henn.

var. *microspora* Doidge, var. nov.

A typo differt sporis minoribus, 14–20 × 8–10 μ .

Asterina delicata Doidge, sp. nov.

Mycelium epiphyllum, tenuissimum; hyphis alterne ramosis, 3–3.5 μ crassis, fuscis, cellulis 20–24 μ longis; hyphopodiis alternis, sessilibus, aut angularibus, aut sublobatis, 6–7 μ altis, 6–10 μ latis. Thyriothecia gregaria vel sparsa, applanato-hemisphaerica, 100–130 μ diam., ex hyphis rectis 3 μ crassis contexta, centro irregulariter aperta. Asci aparaphysati, ovati vel sub-globosi, 26–33 × 33–40 μ . Sporae brunneae, 1-septatae, constrictae, 20–22 × 10–12 μ , laeves, utrinque rotundatae, loculis fere aequalibus.

Hab. in foliis *Trimeriae alnifoliae*, prope Durban, Natal, 22/7/15, leg. Medley Wood, 9062.

Asterina erysiphoides Kalch. et Cke. Char. emend.

Mycelium effusum, epiphyllum, tenue; hyphis brunneis, 3.5–5 μ crassis, ramosis, anastomosantibusque; hyphopodiis alternis, sessilibus, continuis, erectis v. uncinatis, irregulariter 3–5 lobatis, 7–13 μ altis, 5–10 μ latis. Thyriothecia applanato-hemisphaerica, sub-opaca, fimbriata, 120–130 μ diam., ex hyphis 3–3.5 μ crassis contexta, stellatim dehiscentia. Asci aparaphysati, sub-globosi, 30–34 μ diam. Sporae brunneae, a maturitate verrucosae, 1-septatae, constrictae, utrinque rotundatae, 20–23 × 10–12 μ , loculo superiore latiore.

Hab. in foliis *Jasmini multipartiti*, Natal, 14/7/15, leg. Medley Wood, 9018.

Asterina Excoecariae Doidge, sp. nov.

Mycelium amphigenum, effusum, hyphis tenuibus, undulatis, 3–3.5 μ crassis, alterne ramosis, cellulis circ. 16 μ longis; hyphopodiis sessilibus, alternis vel unilateralibus, varie lobatis, 6–7 μ altis, 6–8 μ latis. Thyriothecia sparsa, applanato-hemisphaerica, 100–120 μ diam., ex hyphis angustis, 2.5–3 μ cr. contexta, stellatim dehiscentia. Asci aparaphysati, octospori, sub-globosi, 35–40 μ diam. Sporae brunneae, uniseptatae, constrictae, 23–27 × 12–13.5 μ ; episporio a maturitate verrucoso; loculo superiore latiore.

Hab. in foliis *Excoecariae* sp., Winkle Spruit, Natal, leg. Doidge, 9009.

Asterina ferruginosa Doidge, sp. nov.

Mycelium epiphyllum; hyphis brunneis, tenuibus, 4–6 μ crassis, alterne ramosis, cellulis 23–27 μ longis; hyphopodiis continuis, alterne vel unilateralibus, hemisphaericis vel sub-globosis, 6–8 μ altis, 8–10 μ latis, rare stipitatis, 12–13 μ altis. Thyriothecia numerosa, sparsa vel gregaria,

applanato-hemisphaerica, ferruginea, 160–190 μ diam., ex hyphis rectis, 3–3.5 μ cr. contexta, margine copiose fimbriato, stellatim dehiscentia. Asci aparaphysati, octospori sub-globosi, 33–37 μ diam. Sporae brunneae, leniter constrictae, laeves, 23–26 \times 11–12.5 μ , loculo superiore parum latiore.

Hab. in foliis *Cussoniae umbelliferae*, Woodbush, 3/8/11, leg. Doidge, 1774.

Asterina gibbosa Gaill.

var. *megathyria* Doidge, var. nov.

A typo differt thyriotheciis gregariis, majoribus, 140–200 μ diam. ex hyphis 2–4 μ cr., rectis, contextis; ascis 33–34 \times 27–33 μ .

Asterina Hendersoni Doidge, sp. nov.

Mycelium amphigenum, undulatum; hyphis brunneis, flexuosis, 5–6 μ crassis, sub-torulosis, alterne ramosis, cellulis 6–8 μ longis; hyphopodiis alternis, hemisphaericis v. sub-angulatis, 3.5–6 μ diam. Thyriothecia sparsa, applanato-hemisphaerica, 150–200 μ diam., ex hyphis brunneis, undulatis, 3.5 μ crassis contexta, irregulariter dehiscentia. Asci aparaphysati, octospori, ovati, 45–50 \times 26–33 μ . Sporae laeves, brunneae, 23–25 μ longae, constrictae, loculo supero sub-globoso, 13–13.5 μ lato, infero 10–11 μ lato.

Hab. in foliis *Ilicis capensis*, Hogg's Back, 15/1/18, leg. J. et M. Henderson, 11341, 11342.

Parasterina implicata Doidge, sp. nov.

Mycelium epiphyllum, implicatum; hyphis brunneis, torulosis, 6–7 μ crassis, irregulariter ramosis, reticulatis, cellulis 15–25 μ long.; hyphopodiis sessilibus, alternis, paucis, hemisphaericis, ovatis vel oblique compressis, 6–10 μ altis, 10–6 μ latis. Thyriothecia gregaria, applanato-hemisphaerica, 300–400 μ diam., ex hyphis 3.5–5 μ crassis contexta, irregulariter v. stellatim dehiscentia. Asci ovati v. globosi, octospori, paraphysati, 57–73 \times 50–70 μ ; paraphysibus numerosis, filiformis. Sporae fuscae, uniseptatae, constrictae, 35–40 \times 10–13 μ , loculo supero parum latiore.

Hab. in foliis *Sideroxylon inermis*, East London, 24/11/17, leg. Doidge, 10922.

Asterina natalensis Doidge, sp. nov.

Mycelium epiphyllum, tenue; hyphis brunneis, 3–5 μ crassis, irregulariter ramosis; hyphopodiis plerumque alternis, rare oppositis; breviter pedicellatis, 8–14 μ altis, 6–10 μ latis, supra sublobatis vel curvatis. Thyriothecia applanato-hemisphaerica, 120–130 μ diam., ex hyphis 3–3.5 μ cr. contexta, margine fimbriata, stellatim dehiscentia. Asci aparaphysati, lati cylindranei v. globosi, octospori 26–32 \times 20–24 μ . Sporae brunneae, uniseptatae, constrictae, 15–19 \times 9–10 μ , loculo supero parum latiore, episporio tenuiter verrucoso.

Hab. in foliis *Mikaniae* sp., Winkle Spruit, Natal, 28/5/15, leg. Doidge, 9001.

Asterina Peglerae Doidge, sp. nov.

Mycelium hypophyllum; hyphis fuscis, tenuibus, 3·5–4 μ crassis, alterne ramosis; hyphopodiis alternis, pedicellatis, 10–15 μ altis, 6–10 μ latis, supra bi- v. trilobatis, rectis vel recurvatis. Thyriothecia sparsa, ex hyphis undulatis, 2·5–3 μ cr. contexta; stellatim dehiscentia; ambitu fimbriata. Asci aparaphysati, sub-globosi, octospori, 45–50 \times 43–45 μ . Sporae atro-brunneae, opacae, uniseptatae, constrictae, 23–28 \times 13–16·5 μ , loculo supero majore, episporio ciliata.

Hab. in foliis *Rhois*? sp., Kentani, 16/9/15, leg. Pegler (Pegler, 2354), 9130.

Asterina polythyria Doidge, sp. nov.

Mycelium epiphyllum; hyphis brunneis, sinuosis, 3·5–6·5 μ crassis, cellulis 10–20 μ longis, ramis plerumque oppositis; hyphopodiis continuis, 2–3 lobatis, 5–7 μ altis, 6–10 μ latis. Thyriothecia numerosa, densiuscule disposita, aut applanato-hemisphaerica, 150–170 μ diam., stellatim dehiscentia, aut oblonga, 190–200 \times 140 μ , rima longitudine dehiscentia. Asci cylindracei v. ovati, aparaphysati, octospori, 26–40 \times 20–24 μ . Sporae brunneae, sub-constrictae, laeves, 16–20 \times 6–7 μ , loculo supero paulo majore.

Hab. in foliis *Osyridicarpus natalensis*, Tongaat, Natal, 12/9/13, leg. v. d. Bijl, 6949.

Asterina raripoda Doidge, sp. nov.

Mycelium epiphyllum, parce evolutum, alterne ramosum; hyphis fuscis 3·5–5 μ crassis, undulatis, cellulis 10–15 μ longis; hyphopodis raris, alternis, continuis, hemisphaericis, 4–5 μ altis, 6–7 μ latis. Thyriothecia sparsa, applanato-hemisphaerica, alia in summis hyphis secundariis, alia in mediis hyphis primariis oriunda, 150–200 μ diam., centro umbilicato et irregulariter stellatim dehiscentia, margine crenulata. Asci aparaphysati, cylindracei v. ovati, octospori, 40–52 \times 16–24 μ . Sporae brunneae, vix constrictae, laeves, 15–18 \times 7–10 μ , loculo supero latiore, globose; infere ellipsoideo.

Hab. in foliis *Anselliae africanae*, Zululand, April 1913, leg. M. Franks, 6687.

Asterina reticulata K. et Cke., char. emend.

Mycelium amphigenum, effusum, reticulatum; hyphis brunneis, rectis, 5–6 μ crassis, cellulis 15–30 μ longis; ramis plerumque oppositis, anastomosantibus; hyphopodiis alternis, breviter pedicellatis, clavatis, recurvatis v. sub-lobatis, 7–13 \times 6–8 μ . Thyriothecia applanato-hemisphaerica, 160–240 μ diam., ex hyphis rectis, 3–3·5 μ cr. contexta, margine fimbriato, poro irregulari centrali et demum stellatim dehiscentia. Asci aparaphysati, sessiles, ovati, 45–50 \times 30–33 μ . Sporae brunneae, uniseptatae, constrictae, laeves, 20–23 \times 10 μ , loculis sub-aequalibus, vel supero parum latiore.

Hab. in foliis *Oliniae* sp., Barberton, 18/1/91, leg. Galpin (Galpin, 1275).

Asterina rhamnicola Doidge, sp. nov.

Mycelium epiphyllum, tenue; hyphis rectis, brunneis, 6–7 μ crassis, alterne ramosis, cellulis 25–30 μ long.; hyphopodiis alternis, continuis, cylindraceis v. hemisphaericis, 6–10 μ altis, 6–7 μ latis. Thyriothecia pauca, sparsa, conico-hemisphaerica, quam mycelium pallidiores, 225–280 μ diam., ex hyphis rectis, 3–5 μ cr. contexta, margine haud fimbriata, medio irregulariter dehiscentia. Asci aparaphysati, late ellipsoidei vel ovati, octospori, 45–50 \times 23–33 μ . Sporae fuscae, obsolete constrictae, laeves, 23–25 \times 9–10 μ , loculo supero majore.

Hab. in foliis *Rhamni prinoides*, Woodbush, Transvaal, 4/8/11, leg. Doidge, 1752.

Parasterina rigida Doidge, sp. nov.

Mycelium epiphyllum, hyphis brunneis, 5–6 μ crassis, alterne ramosis, anastomosantibus, cellulis 16–20 μ long.; hyphopodiis numerosis, plerumque oppositis, continuis, hemisphaericis vel ovatis, 6–8 μ altis, 5–6 μ latis. Thyriothecia congregata, applanato-hemisphaerica, 250–400 μ diam., ex hyphis rectis, 5 μ crassis contexta, medio irregulariter dehiscentia. Asci paraphysati, late ellipsoidei vel ovati, 60–75 \times 30–40 μ , tunicati, apice poro pertusi; paraphysibus filiformis, apicibus incrassatis. Sporae fuscae, uniseptatae, constrictae, laeves, 27–33 \times 13–15 μ , loculo supero majore.

Hab. in foliis *Ouncinotis inandensis*, Buccleuch, Natal, 11/5/16, leg. Doidge, 9722.

Asterina robusta Doidge, sp. nov.

Mycelium epiphyllum, atro-brunneum; hyphis torulosis, 6–7 μ cr., cellulis circ. 20 μ long., alterne vel opposite ramosis; hyphopodiis unilateralibus vel alternis, continuis, sub-hemisphaericis, 6–6.5 \times 6.5–7 μ . Thyriothecia applanato-hemisphaerica, opaca, atro-brunnea, ex hyphis rectis circ. 5 μ cr. contexta, medio irregulariter dehiscentia. Asci aparaphysati, octospori, 65–75 \times 45–55 μ , muco viridulo involuti. Sporae atro-brunneae, uniseptatae, constrictae, 35–40 \times 18–20 μ , loculis globosis, supero parum latiore.

Hab. in foliis *Pittospori viridiflori*, Mossel Bay, 22/7/15, leg. Pole Evans, 9066.

Asterina tertia Rac.

var. *africana* Doidge, var. nov.

A typo differt sporis angustioribus; sporis 15–18 \times 6.5–8 μ . Hab. in foliis *Isoglossae Woodii*, Zoutpansberg, 14/8/11, leg. Doidge, 1791.

Asterina Trichiliae Doidge, sp. nov.

Mycelium epiphyllum; hyphis brunneis, rectis, 4–6 μ crassis, opposite ramosis; hyphopodiis oppositis, rare alternis, cylindraceis v. pyriformis, continuis, 6–10 μ altis, 4–5 μ latis. Thyriothecia sparsa, applanato-hemisphaerica, opaca, ex hyphis rectis, 3–3.5 μ crassis contexta, margine fimbriata,

stellatim dehiscencia. Asci aparaphysati, octospori, ovati vel sub-globosi, $40-46 \times 43-50 \mu$, muco viridulo involuti. Sporae atro-brunneae, uniseptatae, constrictae, $25-27 \times 12-13 \mu$, episporio verrucoso, loculo supero parum latiore.

Hab. in foliis *Trichiliae Dregeanae*, Winkle Spruit, Natal, 28/5/16, leg. Doidge, 9006.

Asterina uncinata Doidge, sp. nov.

Mycelium epiphyllum, effusum, tenue, irregulariter ramosum; hyphis undulatis, $5-6 \mu$ crassis, cellulis $26-33 \mu$ long.; hyphopodiis alternis, uncinatis, rare oppositis, pedicellatis, $20-40 \mu$ altis; cellula basali, 1-2 septata, $7-30 \mu$ longa, cylindrica, recta, curvata vel abrupte geniculata; cellula superiore clavata, v. cylindrica, recta vel uncinata, rare sub-lobata. Thyriothecia applanato-hemisphaerica, $200-280 \mu$ diam., ex hyphis medio rectis, margine undulatis, $3-5 \mu$ crassis contexta; poro centrali et stellatim dehiscencia, margine haud fimbriata. Asci aparaphysati, sub-globosi, $42-50 \times 40-45 \mu$. Sporae atro-brunneae, opacae, $30-40 \times 16-20 \mu$, uniseptatae, valde constrictae; loculis ovatis, supero $18-20 \mu$ lato, infero $14-16 \mu$ lato.

Hab. in foliis *Rhamni prinoides*, Brander's High Forest, Victoria East, 12/8/15, leg. v. d. Bijl, 9463. *A. rhamnicola* consocia.

Asterina undulata Doidge, sp. nov.

Mycelium epiphyllum, laxum, tenue; hyphis pallide fuscis, undulatis, gracilibus, $5-6 \mu$ crassis, laxe ramosis, cellulis $18-20 \mu$ long., hyphopodiis alternis, continuis $5-6.5 \mu$ altis, $7-10 \mu$ latis, varie lobatis. Thyriothecia applanato-hemisphaerica, in summis hyphis secundariis oriunda, congregata, margine haud fimbriata, ex hyphis angustis, rectis, $2.5-3 \mu$ cr. contexta, stellatim dehiscencia. Asci aparaphysati, octospori, ovati, $20-24 \times 17-20 \mu$. Sporae brunneae, anguste ovatae, uniseptatae, constrictae, $13-15 \times 6-8.5 \mu$, loculo supero parum latiore.

Hab. in foliis *Violae abyssinicae*, Woodbush, Zoutpansberg, 4/8/11, leg. Doidge, 1769.

Asterinella Acokantherae Doidge, sp. nov.

Mycelium parvum, epiphyllum; hyphis pallide fuscis, $3-3.5 \mu$ diam., irregulariter ramosis. Thyriothecia congregata, applanato-hemisphaerica, $90-115 \mu$ diam., ex hyphis rectis, 3μ cr. contexta, margine fimbriata. Asci ellipsoidei v. cylindraceuti, sessiles, apice tunicati, aparaphysati, octospori, $26-35 \times 13-17 \mu$. Sporae fuscae, distichae vel conglobatae, ellipticae v. sub-clavatae, uniseptatae, obsolete constrictae, $13-17 \times 3.5-5 \mu$.

Hab. in foliis *Acokantherae venenatae*, Tongaat, Natal, 12/9/13, leg. v. d. Bijl, 6951.

Asterinella Burchelliae Doidge, sp. nov.

Mycelium epiphyllum, parce evolutum; hyphis brunneis, sub-torulosis

3·5–5 μ crassis, cellulis 10–13 μ longis, undulatis. Thyriothecia applanato-hemisphaerica, 100–120 μ diam., ex hyphis rectis, 3 μ cr. contexta, margine sub-fimbriata. Asci aparaphysati, elliptici v. cylindranei, apice crasse tunicati, 27–37 \times 16–20 μ . Sporae oblongae v. clavatae, 13–17 \times 5–6·5 μ , utrinque rotundatae, loculo supero brevior.

Hab. in foliis *Burchelliae capensis*, Woodville Forest, George, 11/11/17, leg. Doidge, 10940.

Asterinella lembosoides Doidge, sp. nov.

Mycelium tenue, arachnoideum; hyphis fuscis, tortuosis, 1·5–3 μ crassis, dense ramosis, anastomosantibus. Thyriothecia sparsa; hemisphaerica, 200–240 μ diam., vel late elliptica, lembosoides, 280–320 \times 160–240 μ ; ex hyphis rectis circ. 2 μ cr. contexta, medio irregulariter dehiscentia. Asci numerosi, paraphysati, elliptici v. cylindranei, 33–43 \times 17–20 μ , apice incrassati et poro pertusi; paraphysibus numerosis, hyalinis, ascos superantibus, apice leniter incrassatis. Sporae conglobatae v. sub-distichae, 15–17 \times 8·5–10 μ , uniseptatae, obsolete constrictae, loculis sub-aequalibus.

Parasitica in mycelio *Balladynae velutinae* et *Meliolae amphitrichae* in foliis *Plectroniae Guienzii*, Buccleuch, Natal, 17/7/18, leg. Doidge, 11574.

Asterinella Woodiana Doidge, sp. nov.

Mycelium hypophyllum, effusum, tenue, reticulatum; hyphis tenuibus, fuscis, 2·5–3 μ crassis, tortuosis et intertextis, valde ramosis, anastomosantibus. Thyriothecia sparsa, brunnea, ex hyphis rectis, 2–3 μ cr. contexta, marginem crenulato v. a maturitate irregulariter lobato. Asci ovati v. elliptici, octospori, aparaphysati, 33–37 \times 27–30 μ . Sporae conglobatae, fuscae, laeves, uniseptatae, constrictae, 20–23 \times 10 μ , loculis sub-aequalibus.

Meliola Cryptocarya consocia, in foliis *Cryptocaryae Woodii*, Mayville, Natal, 22/7/15, leg. Medley Wood, 9025.

Englerulaster Popowiae Doidge, sp. nov.

Mycelium epiphyllum, brunneum, radiatum; hyphis 5–6 μ crassis, crebre septatis, ramis oppositis v. alternis, anastomosantibus; hyphopodiis sessilibus, alternis, nonnunquam oppositis, capitatis v. ellipsoideis, rectis v. recurvatis, 10–13·5 \times 6–8 μ , rare 16 μ altis. Thyriothecia atro-brunnea, 160–190 μ diam., ex hyphis 5–6 μ cr. contexta, ex centro demum latius aperta, margine fimbriata. Asci globosi v. ovati, apedicellati, octospori, aparaphysati, 40–47 \times 30–40 μ . Sporae brunneae, constrictae, uniseptatae, 21–27 \times 10–13·5 μ , loculis sub-globosis, aequalibus, v. supero parum latiore; episporio minute verrucoso.

Hab. in foliis *Popowiae caffrae*, Buccleuch, Natal, 24/3/16, leg. Doidge, 9714.

Lembosia natalensis Doidge, sp. nov.

Mycelium hypophyllum, effusum; hyphis fuscis, 3–3·5 μ crassis, ramosis-anastomosantibus; hyphopodiis paucis, cylindraneis v. subcurvatis, 6 \times 3 μ .

Thyriothecia sparsa, elliptica, nonnunquam bifurcata, 300–500 × 140–160 μ, rima anguste longitudinale dehiscentia. Asci paraphysati, octospori, ellipsoidei v. obovati, 30–34 × 20–24 μ. Sporae conglobatae, fuscae, uniseptatae, ellipsoideae, obsolete constrictae, 15–16 × 6–7 μ. Pycnidia applanato-hemisphaerica. Asterinoidea, 200–250 μ diam., ex hyphis circ. 2 μ cr. contexta, stellatim dehiscentia. Conidia hyalina, fusoidea, 18–20 × 3·5 μ.

Hab. in foliis fruticis ignotis (? *Myrtacearum*), Krantzklouf, Natal, 1/6/15, leg. Doidge, 8984.

Lembosia radiata Doidge, sp. nov.

Mycelium epiphyllum rare hypophyllum, plagulas opacas 1·5–2·5 mm. diam., efficiens; hyphis tenuibus fuscis, 3–5 μ crassis, ramis intertextis, anastomosantibus; hyphopodiis sub-globosis, 6–7 μ diam. *Thyriothecia* primaria centro stellatim congregata, secundaria in circulo concentrico radiatim disposita; ellipsoidea, 240–300 × 60–160 μ, ex hyphis circ. 3 μ cr. contexta, rima longitudinale dehiscentia. Asci paraphysati, octospori, ellipsoidei v. clavati, 42–45 × 18–23 μ; paraphysibus tenuibus, filiformis, vix ascos superantibus, simplicibus v. bifurcis, apice haud incrassatis. Sporae sub-distichae, uniseptatae, obsolete constrictae, fuscae, laeves, 17–20 × 8–10 μ, loculis subaequalibus vel supero parum latiore.

Hab. in foliis *Leguminosae* indet., Rikatli, Portuguese East Africa, Sept., 1918, leg. Junod, 11729.

Echidnodes rhoïna Doidge, sp. nov.

Mycelium amphigenum, plerumque epiphyllum; hyphis septatis, brunneis, 2·5–3·5 μ crassis, alterne ramosis; hyphopodiis nullis. *Thyriothecia* sparsa, haud numerosa, atra, oblonga vel ellipsoidea, recta v. curvata, rare bifurca, 300–500 × 90–150 μ, rima longitudinale dehiscentia. Asci paraphysati, octospori, late ellipsoidei v. ovati, apice obsolete incrassati, 35–40 × 20–24 μ; paraphysibus filiformis, ascos superantibus. Sporae distichae v. conglobatae, brunneae, uniseptatae constrictae, 13–16 μ longae; episporio minute verrucoso.

Hab. in foliis *Rhois lucidae*, van Staden's Pass, 13/11/17, leg. Doidge, 10887.

Microthyrium maculicolum Doidge, sp. nov.

Thyriothecia epiphylla in maculas fuscas sparsa, atro-brunnea, applanato-hemisphaerica, 150–190 μ diam., ex hyphis fuscis 3–4 μ crassis contexta, margine haud fimbriata. Asci octospori, paraphysati elliptici, apice late rotundati, 70 × 27 μ vel ovati, 50–57 × 30–43 μ, apedicellati, tenuiter tunicati. Sporae conglobatae v. sub-parallelae, hyalinae, 1-septatae, haud v. obsolete constrictae, 21–23·5 × 6·5–10 μ, loculo supero latiore.

Hab. in foliis fruticis indet. (*Capparis*?), Durban, 11/4/18, leg. Bottomley, 11668.

Echidnodella Hypolepidis Doidge, sp. nov.

Epiphyllum, effusum; hyphis fuscis, pallidioribus, tenuibus, 2–3 μ crassis, tortuosis, dense ramosis, anastomosantibus; hyphopodiis nullis. Thyriothecia congregata, recta v. curvata, nonnunquam bifurca, oblonga v. elliptica, 120–240 \times 50–100 μ , rima longitudinale dehiscentia, ex hyphis 3–3.5 μ cr. contexta. Asci (immaturi) octospori, aparaphysati, elliptici vel ovati, apice rotundati, 20–25 \times 7–10 μ . Sporae (maturae ex ascos visae) fuscae, haud v. obsolete constrictae, 10–14 \times 3.5–4 μ , loculo supero latiore.

Hab. in pinnulis *Hypolepidis sparsisorae*, George, 11/11/17, leg. Doidge, 10930.

Morenoella Oxyanthae Doidge, sp. nov.

Hypophylla; thyriothecia crustose denseque congregata, elongata, utrinque attenuata, saepe curvata, 400–600 \times 250–300 μ , rima longitudinale irregulare dehiscentia. Mycelium radiatum, hyphis tenuibus, intertextis, ramosis, anastomosantibus, 3–3.5 μ cr., hyphopodiis minutis, alternis, globosis. Asci aparaphysati, octospori, elliptici vel ovati, sessiles v. breviter pedicellati, apice valde incrassati. Sporae distichae v. conglobatae, ellipticae v. subclavatae, vix constrictae, uniseptatae, fuscae, 12–16 \times 3.5–5 μ , loculo supero brevior et latiore.

Hab. in foliis *Oxyanthi Gerrardi*, Kentani, leg. Pegler (Pegler, 2321), 9073.

Morenoina africana Doidge, sp. nov.

Epiphyllum, mycelium evanescens. Thyriothecia sparsa, anguste elliptica, 120–400 \times 65–100 μ , recta v. subcurvata, nonnunquam bifurca v. aliquantum sinuosa, rima longitudinale dehiscentia, ex hyphis 2.5–3 μ crassis contexta, margine breviter fimbriata. Asci (immaturi) aparaphysati, ellipsoidei v. clavati, breviter pedicellati, 23–27 \times 10–12 μ , jodo non caerulescentes. Sporae (extra ascos visae), fuscae, obsolete constrictae, laeves, 12–14 \times 5–6.5 μ , loculis aequalibus.

Hab. in pinnulis *Dryopteridis inaequalis*, Zwartkop, Natal, 19/7/18, leg. Doidge, 11605.

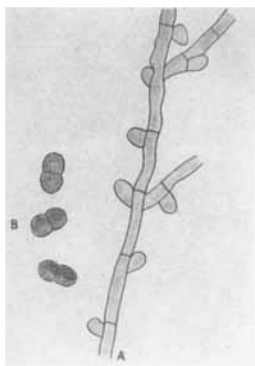
EXPLANATION OF PLATES XIII—XIX.

[All drawings were made with the camera lucida, and with the same magnification (Zeiss obj. D, No. 5 ocular).]

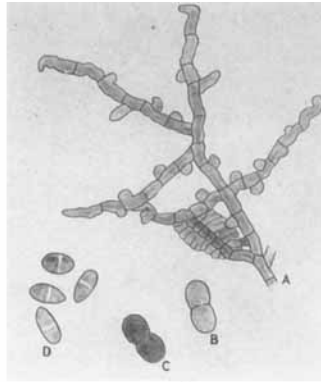
FIG.

1. *Englerulaster Popowiae* Doidge, n. sp. (a) Mycelium showing hyphopodia; (b) spores.
2. *Englerulaster orbicularis* (B. & C.) v. Höhn. (a) Mycelium showing hyphopodia and incipient thyriothecium; (b) immature and (c) mature spores; (d) conidia.
3. *Parasterina implicata* Doidge, n. sp. (a) Mycelium; (b) spores.
4. *Parasterina brachystoma* (Rehm.) Th. (a) Mycelium; (b) spores.
5. *Parasterina rigida* Doidge, n. sp. (a) Mycelium; (b) spores.
6. *Asterina gibbosa* Gaill. var. *megathyria*, n. var. (a) Mycelium with "node cells"; (b) ascus; (c) spores.

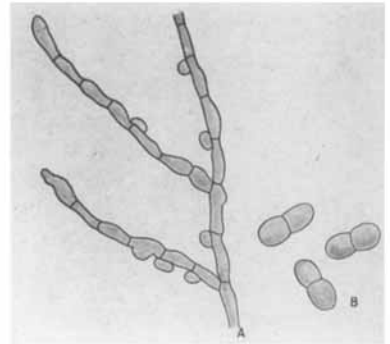
7. *Asterina natalensis* Doidge, n. sp. (a) Mycelium; (b) spores; (c) conidia.
8. *Asterina Combreti* Syd. (a) Mycelium and pycnidium; (b) immature and (c) mature spores; (d) conidia.
9. *Asterina Peglerae* Doidge, n. sp. (a) Mycelium; (b) spores.
10. *Asterina tenuis* Wint. (a) Mycelium; (b) spores; (c) conidia.
11. *Asterina fimbriata* Kalch. & Cke. (a) Mycelium; (b) spores.
12. *Asterina reticulata* Kalch. & Cke. (a) Mycelium; (b) spores; (c) conidia.
13. *Asterina uncinata* Doidge, n. sp. (a) Mycelium showing two- and three-celled hyphopodia; (b) spores.
14. *Asterina delicata* Doidge, n. sp. (a) Mycelium; (b) spores; (c) conidia.
15. *Asterina Grewiae* Cke. (a) Mycelium; (b) spores; (c) conidia.
16. *Asterina Trichiliae* Doidge, n. sp. (a) Mycelium; (b) spores.
17. *Asterina raripoda* Doidge, n. sp. (a) Mycelium; (b) spores.
18. *Asterina ferruginosa* Doidge, n. sp. (a) Mycelium; (b) spores.
19. *Asterina rhamnicola* Doidge, n. sp. (a) Mycelium; (b) spores.
20. *Asterina Hendersoni* Doidge, n. sp. (a) Mycelium; (b) spores; (c) conidia.
21. *Asterina opaca* Syd. (a) Mycelium; (b) spores.
22. *Asterina robusta* Doidge, n. sp. (a) Mycelium; (b) spores; (c) conidia.
23. *Asterina erysiphoides* Kalch. & Cke. (a) Mycelium; (b) spores; (c) conidia.
24. *Asterina Balansae* (Speg.) Th., var. *africana* Sacc. (a) Mycelium; (b) spores; (c) conidia.
25. *Asterina Excoecariae* Doidge, n. sp. (a) Mycelium; (b) spores; (c) conidia.
26. *Asterina undulata* Doidge, n. sp. (a) Mycelium, showing hyphopodia and two incipient thyriothecia; (b) mature and (c) immature spores.
27. *Asterina polythyria* Doidge, n. sp. (a) Mycelium; (b) spores; (c) conidia.
28. *Asterina peraffinis* Speg. (a) Mycelium; (b) spores.
29. *Asterina cellidicola* P. Henn., var. *microspora* var. nov. (a) Mycelium; (b) spores; (c) conidia.
30. *Asterina* ? *vagans* Speg. (a) Mycelium; (b) spores.
31. *Asterina sphaerascasca* Thüm. (a) Mycelium; (b) spores; (c) conidia.
32. *Asterina loranthicola* Syd. (a) Mycelium; (b) spores; (c) conidia.
33. *Asterina clausenicola* Doidge, n. sp. (a) Mycelium; (b) spores; (c) conidia.
34. *Asterina diplocarpa* Cke. (a) Mycelium; (b) spores; (c) conidia.
35. *Asterina tertia* Rac., var. *africana* n. var. (a) Mycelium; (b) spores; (c) conidia.
36. *Asterinella Acokantherae* Doidge, n. sp.
37. *Asterinella Burchelliae* Doidge, n. sp.
38. *Asterinella Woodiana* Doidge, n. sp.
39. *Asterinella lembosoides* Doidge, n. sp. The finer mycelium of the *Asterinella* can be seen investing the stouter hyphae of *Balladyna velutina*.
40. *Microthyrium maculicolum* Doidge, n. sp.
41. *Morenoina africana* Doidge, n. sp. Shows the elongated thyriothecia and the orbicular pycnidia.
42. *Amazonia asterinoides* Th.
43. *Echidnodes rhoïna* Doidge, n. sp.
44. *Lembosia natalensis* Doidge, n. sp. Showing elongated thyriothecia and a round pycnidium.
45. *Lembosia congesta* Wint.; from the leaf of *Carissa* sp. On the stem the mycelium is not so well developed, and the hyphae are inclined to run parallel, following the striations in the bark.
46. *Lembosia radiatu* Doidge, n. sp. Showing the orientation of the thyriothecia.



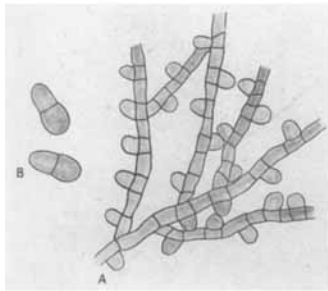
1



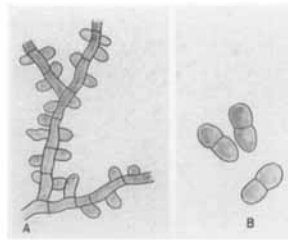
2



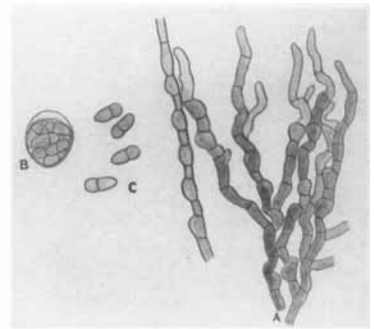
3



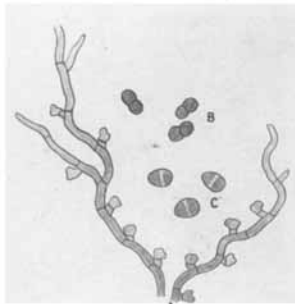
4



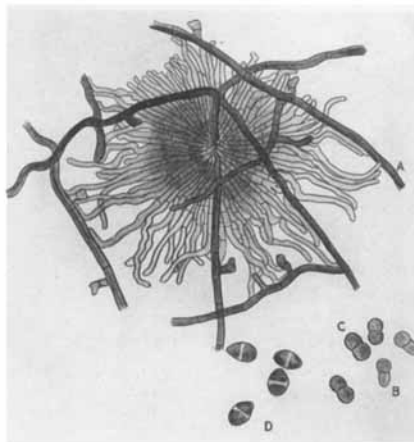
5



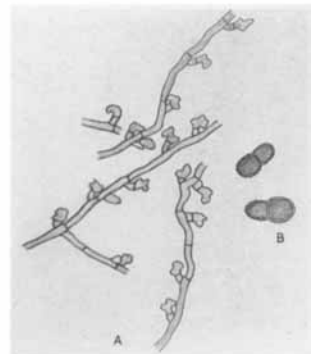
6



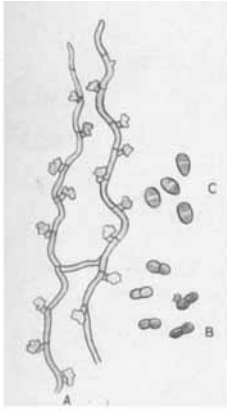
7



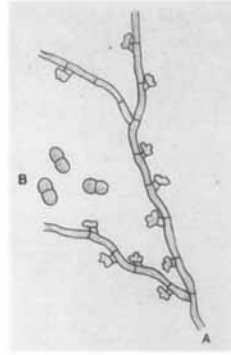
8



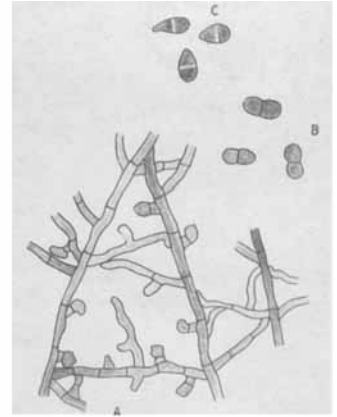
9



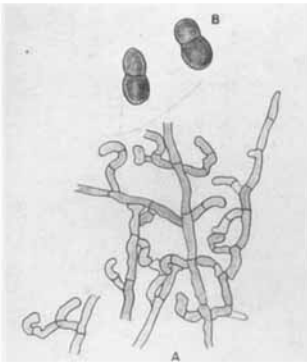
10



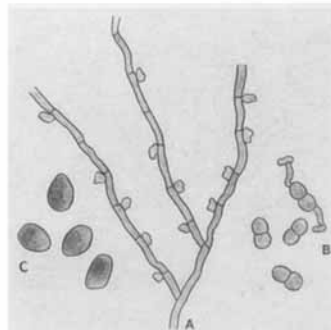
11



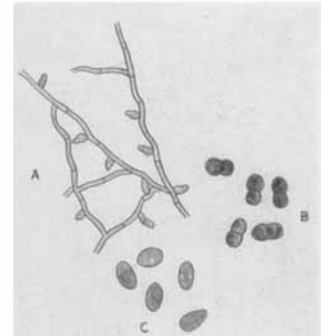
12



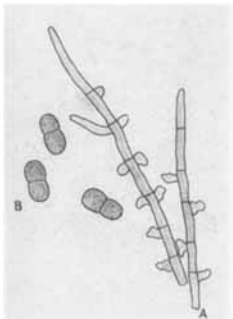
13



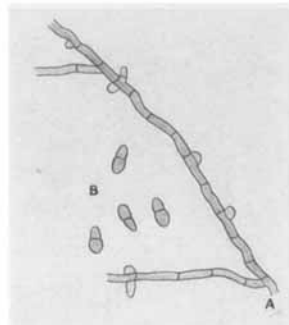
14



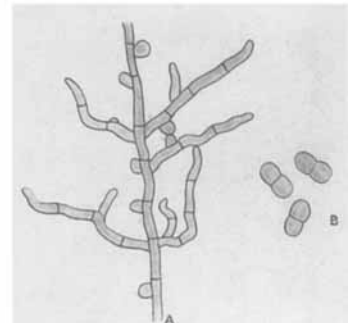
15



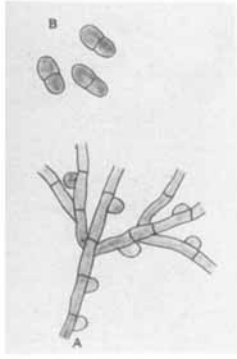
16



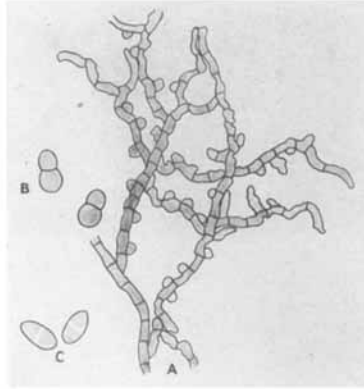
17



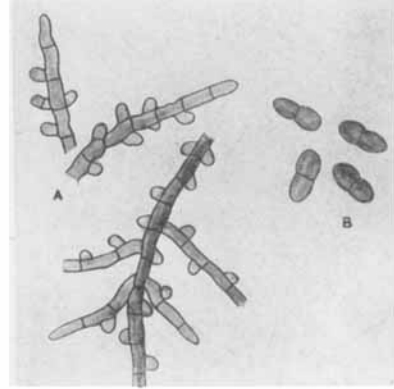
18



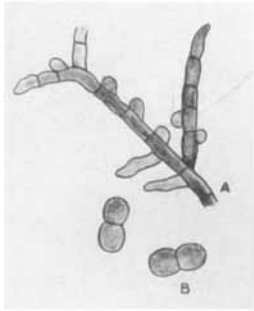
19



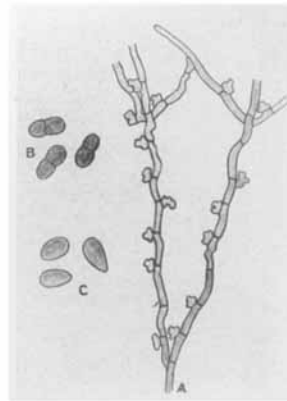
20



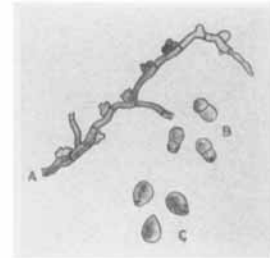
21



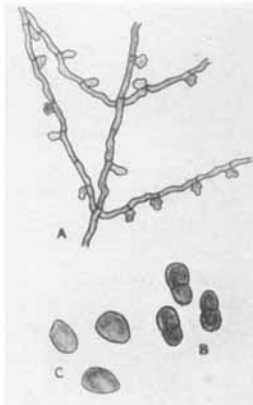
22



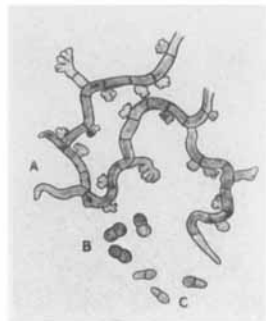
23



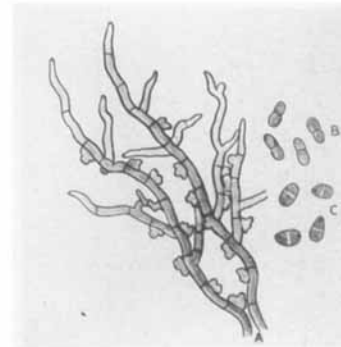
24



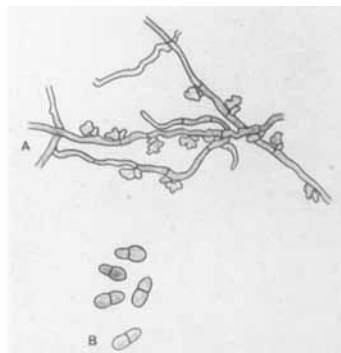
25



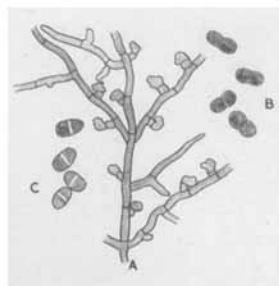
26



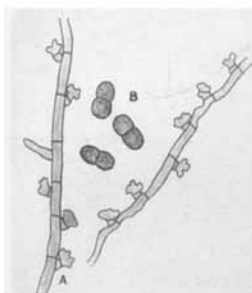
27



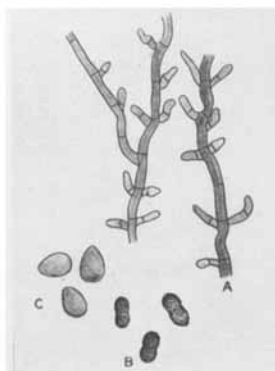
28



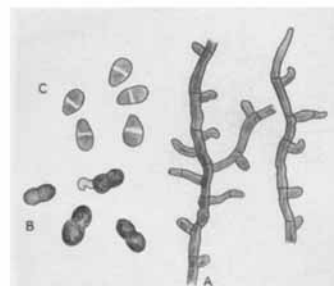
29



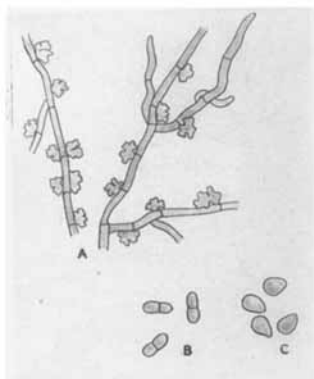
30



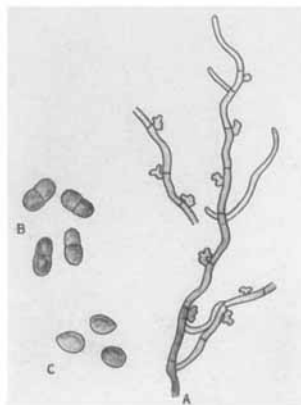
31



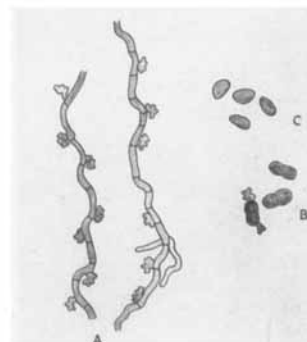
32



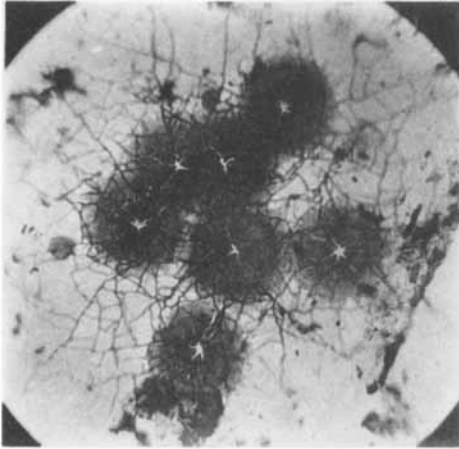
33



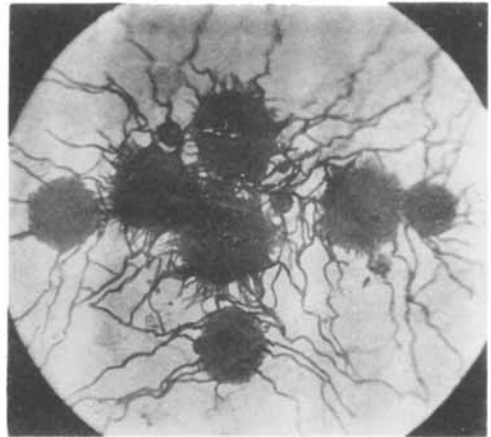
34



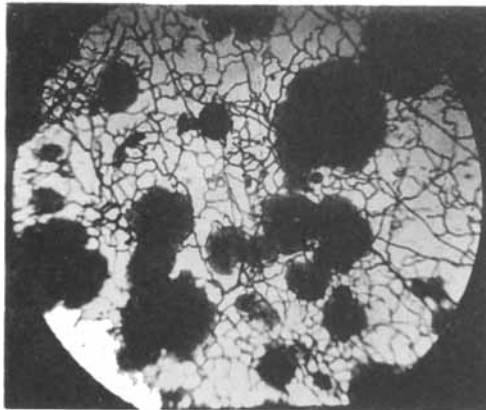
35



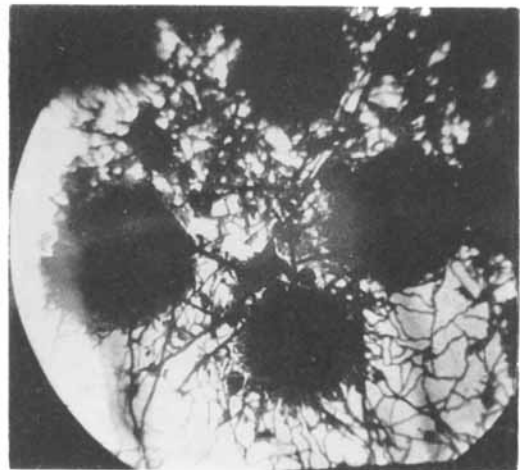
36



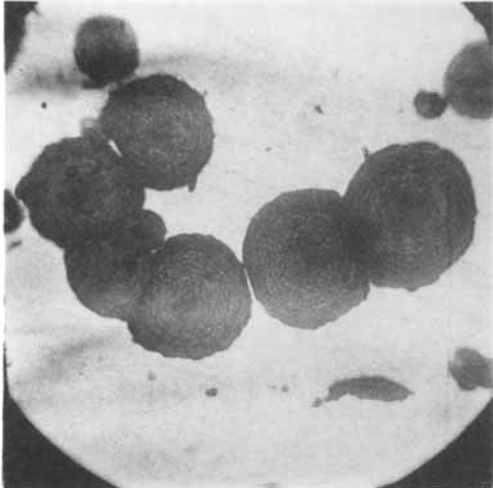
37



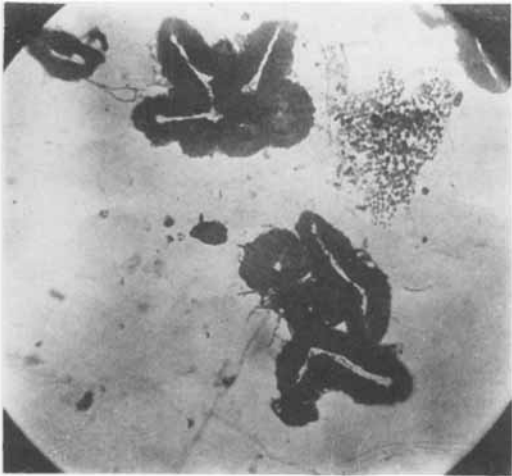
38



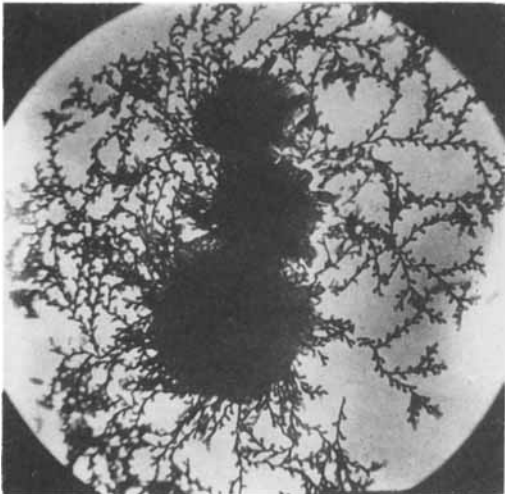
39



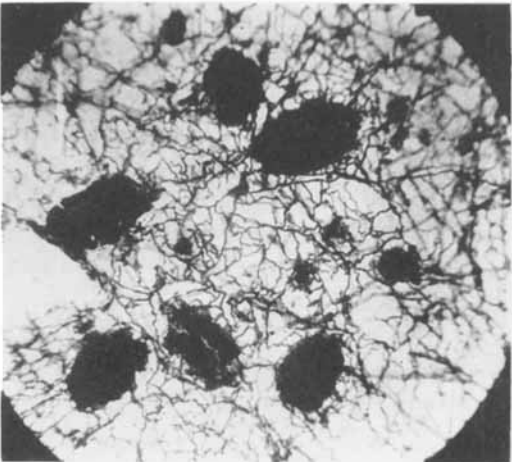
40



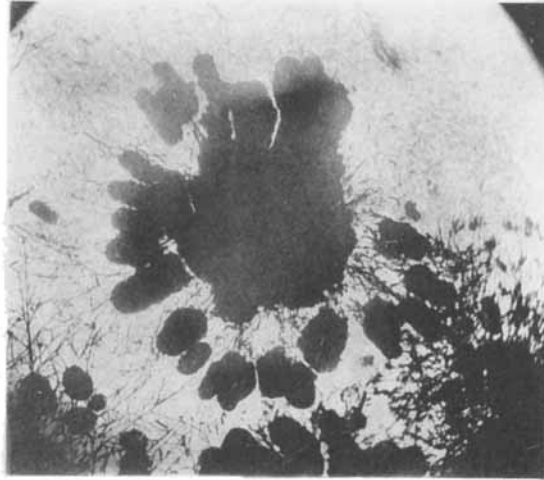
41



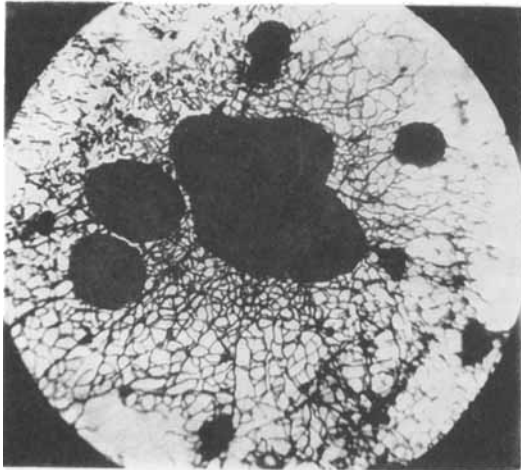
42



43



46



45



44