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OF THE

ROYAL BOTANIC GARDENS,

PERADENIYA.

EDITED BY

T. PETCH, B.A., B.Sc.

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The Pseudo-sclerotia of Lentinus similis and Lentinus infundibuliformis.

BY

T. PETCH, B.A., B.Sc.

IN 1906, when visiting a rubber plantation (*Hevea brasiliensis*) in which several hundred trees had been felled about two years previously, my attention was arrested by a *Lentinus* which grew under somewhat peculiar conditions on the tops of very many of the decaying stumps. Although the wood of *Hevea brasiliensis* is comparatively soft, stumps of trees which were healthy when felled do not decay rapidly, but produce new shoots, which keep the roots, &c., alive for several years. The continual destruction of these new shoots, either by grazing animals or by man, is ultimately followed by the death of the stump, but the process is a lengthy one.

In the present case the felled trees had been twelve years old, and their stumps, about a foot high, were about ten inches in diameter. The older wood in the centre of each stump was decayed, but the cortical tissues were healthy, practically to the original level, so that each stump top formed a basin which, in the wet weather then prevailing, was filled with a semi-liquid mud consisting chiefly of the residue of the decayed wood. In these basins, either floating or partly embedded in the mud, were masses of wood, from which arose the sporophores of the *Lentinus*.

As will be seen from Plate I., these masses of wood are very variable in size and shape. Some are only about 2·5 cm. long, 2·5 cm. high, and 1 cm. thick; others measure up to 16 × 9 × 8 cms. Some are definitely lenticular, with regular faces and a rounded edge; others are quite irregular. In general, a vertical face follows the vertical grain of the wood, though it does not necessarily follow one tangential plane.

The specimens figured on Plate I. were all taken from stumps of trees *in situ.* The one in figure A shows the vertical grain of the wood, though somewhat obscurely. It is viewed from the inner face, which is irregular, owing to the decay of the matrix to different depths. The ridges which project laterally inwards towards the centre of the figure indicate the different annual rings of the tree, the two which approximate to each other from right and left, respectively, being parts of the same annual ring.

The faces shown in the more regular specimens of figure B exhibit the radial longitudinal section of the original wood, and are slightly vertically grooved owing to the somewhat greater decay of the wood along the zones which contain the large vessels. The top and bottom surfaces of these, which correspond with the cross section of the original tree, also show these grooves, and, in addition, minute parallel grooves at right angles to these, indicating a slightly greater disintegration along the medullary rays.

Figure C of the same plate shows a larger specimen viewed from above. It shows well-marked zones which correspond with the annual rings of the wood, and faint radial grooves corresponding with the medullary rays. Figure D shows the outer face, *i.e.*, the upper in figure C of the same specimen.

The exterior of these masses is always red-brown. The largest I have seen weighed 380 grams when dry (air-dry). When split open they split along the grain of the wood, and at first sight appear to consist of normal unchanged wood, but a microscopic examination reveals the fact that all the elements of the wood are filled with mycelium.

These masses have since been observed on many occasions, and it would appear that they are a normal production in the case of this *Lentinus*, *Lentinus similis* B. & Br., which is usually found on decaying stumps *in situ.* Their formation may be explained as follows. The mycelium of the *Lentinus* attacks and destroys the dead wood, but several portions are left more or less unchanged. When the decayed tissue weathers away, these portions are left embedded in the soil or are washed out by the rain and lie free on the surface. They are filled with a storage form of mycelium, and subsequently give rise to the *Lentinus* sporophore. They are thus analogous to sclerotia, but their framework consists of wood. It does not appear, therefore, to be unduly extending the idea of the term if we style them pseudo-sclerotia. The sporophore, apparently, always arises from such a pseudo-sclerotium; when it has seemed to grow from a stump, it has been found on examination to spring from one of these bodies which lies practically free in the surrounding decayed tissue.

Figure C shows that the selective action of the fungus in forming these pseudo-sclerotia is not correlated with any particular region of the wood. In that particular example the body of the mass is composed of the outer wood of the stem, but the radially projecting limb penetrated almost to the centre of the tree. On the other hand, the markings on the surface of the pseudo-sclerotia indicate a slightly more advanced destruction along the medullary rays and the annular zones which contain the large vessels.

von Schrenck (11), in describing the destruction of the wood of *Prosopis glandulosa* by *Polyporus texanus* (Murrill) Sacc. & Trott., states that the fungus does not destroy the wood as a whole, but attacks only the heavily lignified groups of wood fibres. Although the wood parenchyma and the vessels are filled with hyphæ, they resist destruction almost completely. This he attributes to the high tannin content of both these tissues. The finding that tannin exerts a retarding influence on the development of certain fungi was published by the present writer (7) in dealing with *Thielaviopsis paradoxa* in 1909, and it has since been extended to other species by other investigators. But it is evident that this cannot be invoked to explain the formation of the pseudo-sclerotia of *Lentinus similis*, since the latter may include elements of all the regions of the stem.

Rough determinations of specific gravity, made from determinations of gross volume and weight, gave the following results. In normal *Hevea* wood from a tree twelve years old, taken midway between centre and circumference, the specific gravity was 0·66. A pseudo-sclerotium from *Hevea* wood, which had apparently not yet produced a sporophore, had a specific gravity of 0·65. A small pseudo-sclerotium which had borne three sporophores had a specific gravity of 0·41.

When cut with a razor, the tissue of the pseudo-sclerotium is found to be softer than normal *Hevea* wood. As a general rule, all the elements of the wood are present, but the walls of the fibres and of the cells of the medullary rays are reduced in thickness. The wall of the fibre in normal *Hevea* wood attains a thickness of 6 μ; walls of this thickness may be found in the pseudo-sclerotia, but most of them are considerably reduced, in some cases to a thickness of about 1 μ, and here and there one finds a "pocket" where the fibres have disappeared, though the latter occurrence is comparatively infrequent. In some cases some of the cells of a medullary ray have been destroyed.

In chlor-zinc-iodine the tissue stains yellow-brown. Closer examination of longitudinal sections reveals a thin violet layer lining most of the fibres. This layer is frequently dragged out of the cell in cutting free-hand sections, and is then conspicuous, but it is so thin that it is not discernible in cross section. The vessels of the wood and the cells of the medullary rays do not show any blue lining.

It may be noted that in the sap wood of a healthy *Hevea* the fibres show a thick cellulose lining, which stains violet with chlor-zinc-iodine. This swells up in the stain, separates from the yellow-brown wall, and lies irregularly distorted (in cross section) within the lumen of the fibre. The appearance is then exactly that figured by Marshall Ward in his paper on *Stereum hirsutum* (13). Ward states that he used the sap wood of *Æsculus*, and he attributes the inner cellulose layer to the action of the fungus, while he gives a complete account of the difference in growth of the fungus on the sap wood, on which it was luxuriant, and on the heart wood, on which the growth was scanty. It would appear possible that the better development of the fungus on the sap wood was due to the presence of a lining of cellulose in the fibres, suitable for the nourishment of the fungus, prior to infection, not to a more rapid delignification of the wood by the fungus.

In the case of a pseudo-sclerotium, the wood of which extends from sap wood to heart wood, such as that shown in figures C and D, Plate I., there is a noticeable difference between the heart and sap wood when stained with chlor-zinc-iodine. The violet colouration occurs here and there in the heart wood, but to a much less extent than in the fibres in the sap wood. Even in the heart wood, however, the thickness of the walls of the fibres is reduced, though to a less degree than in the sap wood.

The conclusion would appear to be justified that the fungus has partly destroyed the walls, more in the sap wood than in the heart wood, and that the cellulose lining which stains violet is due to the action of the fungus and is not a residue of the original cellulose lining of the sound fibres.

In aniline chloride all the walls stain yellow, the colouration being most intense in the medullary rays and the vessels. There is marked difference, macroscopically, between the colour of the sap wood and that of the heart wood in the pseudo-sclerotium when stained with aniline chloride, the colouration being much more intense in the heart wood.

With phloroglucin, the vessels and the medullary rays stain pink, whether the pseudo-sclerotium is formed from sap wood or heart wood. The colouration of the fibres varies. If the wood is sap wood, the fibres stain here and there, often in short isolated lengths of the wall of a fibre, the remainder being unstained; but in general the fibres do not stain, and the contrast between the vessels, medullary rays, and fibres is exceptionally well marked. In the heart wood region of the same pseudo-sclerotium the fibres in general are stained by phloroglucin, but the colouration is paler than in normal *Hevea* wood; in the thicker walls the colouration is deep rose-red along the middle lamella, the next layers being paler, with sometimes a very thin colourless layer lining the cell; the thinner walls are uniformly coloured pale pink, often with a deep rose-red patch at the junction of the middle lamellæ of the walls of adjacent cells, but some may be quite colourless.

The débris of the wood surrounding the sclerotium consists of fragments of the medullary rays and the vessels. In some cases the walls of the cells of the medullary rays are reduced to the middle lamella only, but the majority retain some of the thickening layers, though much reduced, and show the usual pitted structure. In normal *Hevea* wood these walls range from 4 μ to 8 μ in thickness; in the fragments of the decayed wood they may be 2 μ to 4 μ in thickness, and these may be continuous with the remains of the walls of adjacent cells which have been reduced to the middle lamella only. The débris stains yellow with chlor-zinc-iodine, but gives no colouration with phloroglucin and hydrochloric acid, nor with aniline chloride.

The whole of the tissue of the pseudo-sclerotium is filled with the hyphæ of the fungus. These hyphæ, when regular, vary from about 6 to 8 μ in diameter. They form a tangled mass in the medullary rays and the vessels, but run longitudinally along the fibres. If the hyphæ in the fibres are regular, several occur crowded in the lumen of a single fibre, and these intertwine in a long spiral. But in general the hyphæ in the fibres are irregular, swelling out to a diameter of 12 μ or so, in lengths up to 50 μ long, or producing a succession of irregular inflations. Frequently a hyphæ swells out into a globular mass which completely blocks the cells. The walls of these hyphæ are strongly thickened (except at the periphery of the pseudo-sclerotium), and the lumen in cross section appears as a mere point. In their irregular character and thickened walls the hyphæ strongly resemble those of a sclerotium. In the cells of the periphery of the tissue the hyphæ are, as a rule, thin-walled and collapsed.

In general shape the various parts of the hyphæ resemble those of the sclerotium of *Lentinus Woermanni* Cohn et Schroet. as figured by Bommer (I. Pl. I., figs. 10–26), or the simpler forms from *Pachyma cocos* figured by the same author (I. Pl. IV., figs. 5, 6). They resemble these, too, in being very strongly refringent, but differ in that, in general, it has not been possible to observe the existence of a central cavity through the tubercular parts of the hyphæ by external examination. Cases in which the lumen appears as a darker line do occur, but they are not common.

The hyphæ do not swell in caustic potash; in that respect they differ from the tubercular thickened hyphæ of *Pachyma cocos* as described by Fischer (3). They are not stained by chlor-zinc-iodine, nor by iodine in potassium iodide. The following stains have been tried without effect: Congo red, eosin, Delafeld's hæmatoxylin, methyl green, picric aniline blue, safranin, sudan III., methylene blue.

Fischer found that in the sclerotium known as *Pachyma cocos* three forms of hyphæ were present. The first were of normal shape, 2–4 μ diameter, but with a strongly thickened wall, so thick that the lumen was reduced to a minimum. These swelled slightly in caustic potash, and were not stained by safranin, methyl green, methylene blue, or Congo red.

The second form, which constituted the chief constituent of the sclerotium, consisted of irregular coralloid bodies, which were determined by Fischer to be hyphæ modified by the deposition of reserve substances in their walls. These dissolved in caustic potash, with the exception of the outer layer of the hypha. These bodies were not stained by chlor-zinc-iodine nor iodine. They stained strongly with methylene blue, or Congo red, or methyl violet, but not with methyl green or safranin.

The third constituent of *Pachyma cocos* consisted of larger oval refractive bodies, in which an evident lamination could be observed. These gave the same reactions as the second.

Judged by their shape the hyphæ in the pseudo-sclerotia of *Lentinus similis* correspond with the first two constituents of *Pachyma cocos*, but it will be seen that the reactions of the hyphæ of *Lentinus similis* correspond with those of the normally-shaped hyphæ of *Pachyma cocos*, not with the abnormally thickened constituents of the latter. I have not been able to consult Cohn and Schroeter's paper on *Lentinus Woermanni*, but, according to Bommer (1), the thickened elements of its sclerotium dissolve in caustic potash.

The red external colour of the pseudo-sclerotium is due to an amorphous deposit in the lumina of the fibres, &c., which open to the exterior. It is apparently homologous with the deposit frequently found, usually in black sheets, in wood attacked by various species of Pyrenomycetæ. von Schrenck (12) describes a brown substance found limiting the decayed wood of lilac attacked by *Polyporus versicolor*, which he states results from the drying up of a yellow-brown liquid which fills the cells, and probably consists of decomposition products which are infiltrated into the sound wood immediately in advance of the fungus.

The action of the mycelium of *Lentinus similis* on the wood appears to be identical with that of *Stereum hirsutum* as described by Ward (13). The wood is attacked from the interior of the cell towards the middle lamella, being first delignified and then consumed. The most notable difference lies in the selective action of the fungus, the fibres being delignified earlier than the medullary rays or the vessels.

One fact already recorded appears to conflict with the finding that the fibres are first destroyed, *i.e.*, the formation of furrows on the pseudo-sclerotium, in some cases, along the zones which contain the larger vessels. This apparent contradiction is explained when the furrows are examined carefully. It is then seen that the ends of the vessels project slightly above the general level at the base of the furrow (which is about 0·25 mm. deep), and that the furrow is due to the more advanced destruction of the fibres surrounding the vessels.

But the special feature which appears to make the case of *Lentinus similis* worthy of record is the reservation of certain regions of the wood which is attacked by the fungus as storage tissue and base for the development of sporophores. Nearly the whole of the wood is quite destroyed, only the delignified remains of the medullary rays and vessels being left. But in some regions the wood is only lightly attacked, some layers of the walls being removed, but more than sufficient left to maintain the appearance, structure, and solidity of ordinary wood. These parts are filled with the hyphæ already described, and from them the sporophore subsequently arises.

I have not been able to determine that any further change occurs in the woody skeleton of the pseudo-sclerotium when the fructification develops. It would seem probable that the fructification is developed solely at the expense of the storage hyphæ, and that the latter do not further attack the wood. The question is somewhat indeterminable, as the isolated pseudo-sclerotia are attacked by other fungi, as well as by bacteria and insects, in the field.

As has already been noted, the red limiting layer of the pseudo-sclerotium resembles the black layers found so frequently in wood attacked by Pyrenomycetæ. The opinion seems to be current that in the latter instances the black layer indicates the limit to which the mycelium of the fungus has advanced. That view would appear to be untenable in the present case ; the enormous development of thick-walled mycelium and the comparatively slight destruction of the wood preclude the suggestion that the remainder of the tissues have been destroyed by some other agency.

Some features in the supposed course of development of *Pachyma cocos* would appear to bring it into relationship with the pseudo-sclerotium of *Lentinus similis*. *Pachyma cocos* is a subterranean sclerotium which is frequently found united to the roots of trees. The relationship between the root and the fungus has been described by Fischer (3), from whose account the following details are taken. In an example in the Herbarium of the British Museum, the strongly developed *Pachyma* sclerotium was seated on a fairly thick root and surrounded by a dark rind. In a cross section the wood of the root appeared intact. There was no *Pachyma* mass within the wood, but it was situated between the wood and the cortex, the latter forming the outer dark rind. In a specimen at Kew the white *Pachyma* mass was not limited to the space between the wood and the cortex, but had attained a fair development within the wood ; the greater part of the wood had been replaced by hyphæ, but in cross section it was seen that wedges of wood remained, projecting inwards from the periphery. In a third specimen a cross section showed that nearly the whole mass consisted of fungus hyphæ, and only traces of wood remained ; the latter consisted of scattered groups of cells towards the periphery, and a great number of isolated discoloured fibres in the central parts.

Microscopic examination showed that the *Pachyma* constituents were not confined to the white masses which to the naked eye were obviously of fungus origin, but that these were present also within the cells of the apparently sound wood. They occurred in all the elements of the wood ; in the majority of the sections hardly a single cell could be found in which they were lacking. In the larger remnants of the wood it was not possible to detect any action of the fungus on the cells, and as far as could be decided without a comparison with sound wood of the same species, the wood filled with *Pachyma* hyphæ was quite normal. But where small wedges of wood remained between large masses of *Pachyma*, a destruction of the cell wall had evidently taken place; these walls were quite thin, the discoloured thickened membrane having almost quite disappeared. The fungus destroyed the inner thickening layer of the cell wall, and only the middle lamella remained.

Fischer describes the action of *Pachyma cocos* on the wood as follows. The hyphæ enter the root tissue as normal hyphæ, and spread through the wood and the cortex. There they are modified, being changed by the deposition of reserve food into highly refractive, irregular, coralloid bodies, whose shape is determined by the size of the cells in which they happen to lie. The walls of the cells are attacked by the fungus, the thickening layers being first consumed, and finally the middle lamella, so that ultimately a mass of almost, or quite, pure fungus tissue is left in the place of the wood.

It would appear that in the case of *Lentinus similis* we have a process similar to that described above, but the action does not proceed so far. The cells of the wood are filled with thickened coralloid hyphæ, and the walls of the cells are partly consumed, but the destruction does not proceed to such an extent that the whole of the wood is replaced by fungus hyphæ.

Lentinus infundibuliformis B. & Br.

A somewhat similar pseudo-sclerotium is formed by another common Ceylon *Lentinus*, *L. infundibuliformis* B. & Br. In this case the decayed wood *may* weather away leaving a compact body, but more usually there is a considerable mass of partly decayed wood outside the reddish limiting layer of the pseudo-sclerotium. In general, therefore, it is not so definite as that of *L. similis*, but often has the appearance of merely a piece of decayed wood. These pieces, however, persist, after the bulk of the log attacked has decayed, and subsequently produce the fructification. But the formation of such masses is apparently not constant in the case of *Lentinus infundibuliformis*; the sporophore frequently, perhaps the more usually, develops directly from the decaying log or stump.

The two examples described below were formed from the trunk of a mango tree which was felled in December, 1904. The log remained recognizable until 1914, and during the ten years it produced successive crops of this *Lentinus* and other fungi.

A pseudo-sclerotium was gathered in 1912,* lying free on the soil by the side of the decaying log. It bore two pilei of *Lentinus infundibuliformis*, one-half expanded and the other just expanding. In shape it is irregularly fusoid, 19 cm. long and 4 cm. diameter at the thickest part. It is more or less irregularly longitudinally furrowed, and has the general appearance of a piece of wood. Externally it shows the grain of the wood, and is coloured a reddish-purple. On handling the air-dry specimen one is immediately struck by its weight; its specific gravity is 0·87.

On splitting it longitudinally with a chisel, the fracture does not follow the grain of the wood. The surface of the fracture is granular or powdery, with lines here and there showing the remains of the wood fibres. In cross section (sawn) the surface appears waxy or resinous, and composed of closely-packed circular elements, but when smoothed with a razor it is uniformly continuous, the position of the medullary rays and vessels being indicated by whiter lines and dots, which are only apparent under a lens. This pseudo-sclerotium differs from that of *Lentinus similis* in that it is solid, all the cavities of the wood elements being completely filled by the mycelium.

Examination of a cross section shows that much of the wood persists. The medullary rays have disappeared. Many of the vessels have also been consumed, but a number of them remain; their walls are much reduced, and they often lie isolated in the mass of mycelium. The bulk of the woody

* Another pseudo-sclerotium of this type was obtained at the same spot in March, 1915.

skeleton, however, consists of the remains of the fibres ; these occur in extensive patches, on the whole fairly continuous, but often broken up and forming zigzag lines, composed of single walls of adjacent fibres. In some places all the fibres have been consumed and the cavity is filled with mycelium ; in others the thickened angles of the fibres remain isolated and embedded in the mass of mycelium. Where the fibres form a continuous network, their walls are much reduced, sometimes to the middle lamella, but in general the remains of the walls are about 4 μ thick.

With chlor-zinc-iodine the remains of the vessels and fibres stain yellow-brown ; no trace of blue was observed. With phloroglucin and hydrochloric acid all the remains of the wood stain rose-pink, even in the places where only the corners of the fibres persist, and there is no evident increase in intensity of colouration from the exterior to the middle lamella. Thus, the remains of the fibres are not delignified.

The action of *Lentinus infundibuliformis* on the wood thus agrees with that of *L. similis*, in that the wall is attacked and consumed from the lumen of the cell inward towards the middle lamella, but it differs in that the medullary rays and vessels are the first elements to disappear.

In longitudinal section the walls of the fibres are found to be discontinuous ; this accounts for the irregular fracture in that direction.

As already stated, the mycelium completely fills all the elements of the wood, or the spaces where these have been consumed, and forms with the remains of the wood one solid mass. Where the wood elements have disappeared, the mycelium which originally filled the lumina retains the outlines of the latter to a great extent. This is specially noticeable in the case of the vessels. Three elements may be distinguished in the mycelium. The least numerous are thin-walled, normally-shaped hyphæ, 2–3 μ diameter, with evident protoplasmic contents. More abundant than these are other normally-shaped hyphæ of the same uniform diameter, but refringent, rigid, with thickened walls. These latter predominate along the sites of the medullary rays ; they frequently bear small globose bodies, resembling conidia in appearance, about 2 μ diameter, on short lateral pedicels about 2 μ long, perpendicular to the hypha. The remainder of the mycelium is composed of inflated, irregularly nodular, "coralloid" hyphæ, up to 12 μ diameter, which bear short, thick branches often inflated above, and subglobose swellings. In cross section it is seen that the walls of these hyphæ are laminated and thickened, the cavity varying from about 4 μ in diameter to a mere point. The "coralloid" hyphæ apparently adhere to one another, but separate on heating with dilute caustic potash.

The whole of the mycelium swells in caustic potash, but the swelling is most marked in the case of the irregular coralloid hyphæ; the walls of the latter, however, do not dissolve. Iodine in potassium iodide gives a faint yellow colouration, as does also chlor-zinc-iodine. Watery methylene blue stains the regular hyphæ slightly, but the irregular hyphæ more deeply. All stain with Congo red, but not with eosin. With picric aniline blue, or cotton blue, the thin-walled regular hyphæ stain deeply, but the remainder takes a very slight, or no, tinge.

A second pseudo-sclerotium was obtained from the same spot in 1914. This consisted of a subfusoid piece 23 cm. long and 7 cm. diameter, originally wood, to which was attached a piece of bark 16 cm. by 13 cm. It bore twenty-three pilei of the *Lentinus* in different stages of development, arising chiefly from the bark or at the junction of the bark and the wood. The surface of the wood is weathered and irregularly split, and has almost completely lost its red colour. It is very friable when sawn, and splits irregularly. Its weight is in marked contrast to that of the previous specimen, its specific gravity being only 0·28. In the absence of any previous knowledge of these structures, it would appear to be merely a piece of semi-decayed wood.

Microscopic examination shows that the cells of the medullary rays have in some places disappeared, while in others they persist with their walls much reduced in thickness, or corroded and fragmentary. The vessels, as a rule, remain, but their walls are reduced in thickness. The fibres on the whole persist, in some cases with walls reduced to the middle lamella, elsewhere with walls 4 μ or more thick. The greatest reduction of the fibres occurs in the "spring wood"; in the autumn wood they often appear quite sound. Where considerable reduction has occurred, the walls of the fibres are perforated with large irregular openings.

Chlor-zinc-iodine stains all the remains of the wood brown to yellow-brown; no blue was observed. With phloroglucin and hydrochloric acid the fibres and vessels stain, but the medullary rays do not; the contrast in the stained cross section is most striking. Occasionally, where a rather thick wall of a cell in a medullary ray has been left, this stains with phloroglucin. In the autumn wood the walls of the fibres stain uniformly with phloroglucin, but in the spring wood they exhibit differential staining, the colour becoming more intense towards the middle lamella.

The action of the fungus on the wood thus agrees with that found in the previous case; the medullary rays are attacked, or at least destroyed, first, and then the vessels and fibres. But the destruction of the wood has not proceeded so far as in the case of the pseudo-sclerotium of this species first described.

With regard to the amount of the fungus tissue present, however, this example differs widely from the former. The vessels and the medullary rays (or the sites of the latter) contain numerous interlacing hyphæ, but there are comparatively few in the fibres. In no case do the hyphæ completely fill the lumina of the cells. The first sclerotium was a solid mass of mycelium in which the remains of the wood were embedded; the second, in the condition as gathered, is a piece of decayed wood containing comparatively little mycelium.

The mycelium consists of two elements only. One of these consists of the thin-walled hyphæ previously noted, the other of the rigid thick-walled, regular hyphæ, about 2 μ diameter, bearing the globose conidia-like bodies described above. No coralloid hyphæ have been found, but the cells contain amorphous masses, in comparatively small quantity, which, like the globose conidia-like bodies, stain yellow-brown with iodine in potassium iodide. The reactions of the two elements of the mycelium to various stains are identical with those previously described for these two in the case of the former example. The conclusion would appear to be justified, that these amorphous masses are the remains of the coralloid hyphæ which have been exhausted of their reserve food by the growth of the pilei. This second example is an exhausted pseudo-sclerotium. It would also appear probable that the coralloid hyphæ are produced by the transformation of the thick-walled normal hyphæ, and that the conidia-like bodies are a first stage in the formation of the short side branches.

The pseudo-sclerotium of *Lentinus infundibuliformis* bears a much closer resemblance than that of *L. similis* to *Pachyma cocos*. Its " coralloid " hyphæ are more highly and more abundantly developed, and form with the remains of the wood a solid mass; whereas in the case of *L. similis*, the hyphæ, in general, lie free in the lumina of the wood elements. But in neither case has it been possible to demonstrate that the thickened hyphæ dissolve in caustic potash.

General.

The existence of sclerotia in the genus *Lentinus* has long been known. One of the sections into which Fries divided the genus *Lentinus*, *Scleroma*, contained those species which arose from a sclerotium or from a mass of mycelium in the soil. F. S. Earle (2) narrows Fries' *Scleroma* by including only those species which have a true sclerotium, and limits the genus *Lentinus* to these, with the type specimen *Lentinus tuber-regium.*

There seems to be considerable doubt as to the identity of *Lentinus tuber-regium.* It was originally described and figured by Rumphius (10) from the Moluccas. Rumphius associated it with the sclerotium *Pachyma tuber-regium*, but Fries states that its mycelium merely binds the soil together, and is clearly different from the *Pachyma.* In " Epicrisis Systematis Mycologici " (1836–38) Fries stated that he had not seen it, but in " Novæ Symbolæ Mycologicæ " he wrote that it occurred " *Ad terram in insulis Archipelagi indici, sat frequens.*"

Hennings (5) stated *Lentinus tuber-regium* occurred in the Moluccas, Madagascar, and the Cameroons, and formed a large sclerotium, which was eaten by the natives as a medicine. His figure much resembles *L. infundibuliformis.*

Recent records of *Lentinus tuber-regium* appear to refer chiefly to Africa. Eichelbaum (2A) recorded it from East Africa, and stated that it did not form a true sclerotium, but merely bound the earth together into a ball; it was not the sclerotium, but the pileus, which was eaten by the natives.

The question has recently been discussed by Ramsbottam (9), who identified eight specimens brought from Nigeria by Mr. and Mrs. P. A. Talbot as this species. Only in one case was there a perfect sclerotium, and that bore nine fruit bodies. The microscopic structure of the sclerotium was exactly similar to that described by Schroeter and Bommer for *L. Woermanni.* Ramsbottam states that *Lentinus flavidus* Massee, from Old Calabar, which also grows from a sclerotium, is identical with the species from Nigeria examined by him. He concludes that " the plant which was described by Rumphius, and so long lost sight of, is fairly common in West Africa, and it is probable that *L. Woermanni* Cohn and Schroet., and certainly that *L. flavidus* Massee, are merely stages of the same fungus." One would, however, prefer to have specimens from the East Indies, where it was said to be common, before accepting this decision.

However, no doubt exists in the case of the other species. *Lentinus Woermanni* Cohn and Schroet., which has frequently been found in West Africa, arises from a true sclerotium which has been adequately described and figured by Cohn and Schroeter and Bommer (1). *Lentinus scleroticola* from Samoa was described by Murray (6), who considered that it was parasitic on the sclerotium, an opinion which has not been shared by others who have examined the specimen. *Lentinus cyathus* Berk. and Broome, from Queensland, also arises from a sclerotium. Ramsbottam states that *L. scleroticola* and *L. cyathus* are quite distinct from one another and from *L. tuber-regium.*

In addition to species which possess a true sclerotium there would appear to exist others whose mycelium merely binds together earth in a large compact mass. This is vouched for in recent times by Eichelbaum, but detailed accounts of the structure of any such mass connected with a *Lentinus* have not, so far as I am aware, been published.

Lentinus similis and *Lentinus infundibuliformis* provide a third type in which the skeleton of the pseudo-sclerotium consists of the wood of the host plant.

Whether these three types are definitely associated with different species of *Lentinus*, or whether they are merely stages which may be assumed by the sclerotium of any one species, must remain an open question on the available evidence.

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Description of Plate I.

FIG. A.—Pseudo-sclerotium of *Lentinus similis*, with *Lentinus* growing from it : irregular.

FIG. B.—Three pseudo-sclerotia of *Lentinus similis*, subangular or rounded.

FIG. C.—Pseudo-sclerotium of *Lentinus similis* viewed from above. Considered in relation to the tree, this upper surface corresponds with the cross section of the stem. The projecting portion on the right is directed radially. The furrows from left to right are the result of a greater decomposition along the zones which contain the vessels.

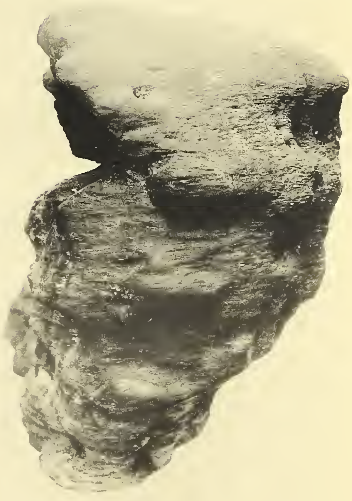
FIG. D.—The same pseudo-sclerotium as in C, viewed from the outer side.

A

B

C

D



PSEUDOSCLEROTIA OF LENTINUS SIMILIS X 2/5

Further Corrections and Additions to Trimen's "Flora of Ceylon," 1893–1911.

BY

J. C. WILLIS, Sc.D., F.L.S.

IN a paper in this journal, Vol. V., Pt. III., Dec., 1911, p. 175, was published a list of corrections and additions to the Flora of Ceylon. In going over my botanical notes I have come upon a few sheets on this subject which escaped incorporation in that paper, and give them now in alphabetical order of genera :—

Achyranthes bidentata (III. 404). Fl. Feb.

Aganosma cymosa (III. 139). To 4,500 feet.

Alternanthera triandra (III. 405). Haputale, 4,500 ft.

Amomum involucratum (IV. 250). Heads sometimes on leafy stems.

Aneilema zeylanicum (IV. 305), *for* var. longiscapa *read* longicapsa.

Arisæma Leschenaultii (IV. 352). The spathe may be only 3 in. long. Fl. Jan.

Asystasia chelonioides (III. 324). Leaves sometimes much narrower than described.

Carex filicina (V. 110). Epiphytic on Pedurutalagala at 7,500 ft.

Casearia coriacea (II. 237). Leaves sometimes 1–1¾ in.

Cassia Kleinii (II. 110). Leaves sometimes only ¼ in. long.

Celosia pulchella (III. 393). Fort Macdonald valley, 4,600 ft.

Coleus barbatus (III. 373). Bandarawela specimens have the venation very prominent beneath and impressed above.

Crepis japonica (III. 51). The leaves may be slightly hairy.

Crotalaria albida (II. 12). Hakgala, 5,500 ft.

Cyanotis zeylanica (IV. 313). Hakgala, Ambawela.

Dædalacanthus montanus (III. 297). Top of Ritigala.

Desmodium heterophyllum (II. 55). Leaflets sometimes not more than $\frac{1}{4}$ in.

D. Scalpe (II. 50). Terminal leaflets sometimes $1\frac{1}{4}$ in., lateral 1 in. or less.

Dimeria fuscescens (V. 198). Nodes very commonly hairy.

Euphorbia thymifolia (IV. 8). Talawakele, 4,000 ft.

Ficus glomerata (IV. 96). Hakgala, 5,200 ft.

Freycinetia Walkeri (IV. 342). Fl. Apr.

Leucas biflora (III. 386). Ritigala.

L. marrubioides (III. 385). Hairs sometimes ascending.

Lippia nodiflora (III. 347). Craig, Bandarawela, 4,500 ft.; a smaller plant with smaller leaves.

Loranthus tomentosus (III. 465). Corolla tube $\frac{3}{8}$–$\frac{5}{8}$ in.

Macaranga indica (IV. 70). Adam's Peak, with leaves glabrous below.

Mallotus albus (IV. 64). Diyatalawa, 4,000 ft.

M. Walkeræ (IV. 66). Fort Macdonald valley, 5,000 ft.

Ophiopogon intermedius (IV. 266). Fl. Jan.

Phaseolus trinervius (II. 72). Leaflets sometimes $1\frac{1}{2}$ in.

Pogonatherum crinitum (V. 222). Peduncles often to 3 in. long. Glume III. usually absent.

Polycarpæa spicata W. & A., *cf.* Willis in Ann. Perad., V., 167. A species new to the Ceylon flora.

Polystachya zeylanica (IV. 182). Hakgala, 5,500 ft.

Rubus lasiocarpus (II. 138). Rachis sometimes up to $6\frac{1}{2}$ in.; leaflets sometimes almost glabrous beneath; fruit sometimes blue.

Spermacoce hispida (II. 371). Patana, Fort Macdonald valley, 4,700 ft.

Smilax prolifera (IV. 283). Ditto.

Stenosiphonium Russellianum (III. 298). Top of Ritigala.

Strobilanthes Nockii (III. 301). Ambawela road, 5,500 ft.

S. pulcherrimus (III. 315). Sita Eliya.

S. vestitus (III. 310). Hakgala.

Zornia diphylla (II. 35). Pods on the same plant may be spiny or not spiny.

Some Abnormalities of the Coconut Palm.

BY

T. PETCH, B.A., B.Sc.

IN the following notes are described some abnormalities of the coconut palm which have come under the writer's notice during the last few years. In general, the phenomena described have been recorded before, but it is possible that the present account may contain additional details which may be of some service.

Yellow Coconuts.

In the "Tropical Agriculturist," Vol. IX., page 102, there appears the following paragraph, entitled "A Curious Coconut Tree":—

A gentleman who was down at Matara the other day tells us of a curious coconut tree he observed on the roadside a few miles beyond Galle, which bore ordinary coconuts on one side and king coconuts on the other. Though he has been travelling about the Island for a good many years he does not remember either seeing or hearing of a similar case before. Neither do we, and we should be glad to hear more about the history of this curious tree.

The editor's evident scepticism was dispelled by the receipt of a bunch of coconuts from the same (?) correspondent, together with the following letter ("Tropical Agriculturist," Vol. X., page 650):—

Herewith a bunch of coconuts with three fruits, two of which you will find are like the king coconuts, while the other is quite green, all in the same cluster, and from a tree about forty years old, which hitherto never had anything but green-coloured nuts, and has about four clusters at present all green-coloured. One nut you will note is small; this is, I believe, attributable to rats making an attempt when the fruit was tender to eat it. There were two other green-coloured nuts on the same cluster, which unfortunately were destroyed by rats in their early stage.

It will be noted that this specimen bunch differs from those first described, in having green and yellow coconuts on the same inflorescence; whereas the tree referred to in the former paragraph was said to have ordinary (*i.e.*, green) coconuts on one side and king coconuts (*i.e.*, yellow) on the other, that is, on different inflorescences.

In 1913 a similar instance was brought to our notice by Mr. L. G. O. Woodhouse. Great interest had been excited among the inhabitants of the village of Dambadeniya, North-Western Province, by the occurrence on the same coconut palm of green and yellow nuts. They declared that it bore two different kinds of coconuts, yellow or *gon-tembili* and green or *pol*. Some bunches bore green fruit only, others yellow fruit only, while others bore the two kinds intermingled. No information is available as to the colouration of the leaves.

The specimen bunch sent bore five nuts, three green and two yellow. The main stalk of the inflorescence was longitudinally striped green and yellow. The side branches which arose from the green areas were green and bore green fruit, while those which sprang from yellow areas were yellow and bore yellow fruit.

Two nuts of each colour were planted. Only two of the four germinated, but fortunately one of each kind. The first leaves produced by the yellow nut were decidedly yellowish, but subsequent leaves became greener, and the plant now, at the age of one year, bears leaves which are green with a yellow or bronze midrib. Its leaves, however, are a paler green than those of the sister plant. At first it was notably smaller than the other, but the difference has decreased as the plants have grown older. It is now not quite as tall, and still produces smaller leaves.

The fruits were narrow and elongated, with well-marked angles. The classification of coconuts is in an unsatisfactory state, and the native classification depends chiefly on colour and shape. Other factors are sometimes recognized, for example, the thickness of the shell—a specially thick-shelled nut being valued for its use in a native game, in which one player attempts to break the other's nut, as English boys play with horse chestnuts. But to what extent these characters are heritable and constitute distinct varieties has never been determined.

The occurrence may, perhaps, be included under the assemblage of phenomena known as chlorosis, which is now gradually yielding to analysis. As the main stalk of the inflorescence bears the yellow colour, it is not due to any effect of fertilization on that particular bunch. It is hoped to grow the two palms to maturity, and it may be possible that they will ultimately throw some light on the origin of yellow varieties of coconuts.

Double Coconuts.

As is generally known, the ovary of the coconut is initially trilocular, but only one loculus develops ; the other two are, as a rule, suppressed at an early stage, the process usually being evident when the young fruit is about an inch or an inch and a half in length. Evidence of its trilocular origin is, however, always present in the three micropylar orifices of the nut.

All coconut planters are well acquainted with "double" coconuts, *i.e.*, fruits in which two loculi have developed, and some state that trilocular nuts are sometimes found. I have not seen an example of the latter, but the former are fairly common. When the husk is removed, the bilocular nut, in the cases I have seen, betrays its abnormal internal structure by its shape, it appearing laterally compressed.

One example in my possession measures $4\frac{1}{2}$ inches in length, 4 inches in breadth in one direction, and $3\frac{1}{4}$ inches in breadth in the direction perpendicular to the former. Of the three external longitudinal ridges, one runs down the middle of one of the flatter sides, while the other two diverge more or less symmetrically from this median ridge at angles of about 120°. The median cross section of the nut is an ellipse, with its major axis 4 inches and its minor axis $3\frac{1}{4}$ inches.

The nut is completely divided into two by a longitudinal partition perpendicular to the flatter sides, and forming the minor axis of the ellipse of cross section. The partition is even, except for a slight bulge to one side in the lower half. It is composed of the same elements as the external shell, but is much thinner. The external shell is from 3 to 4 millimetres in thickness, while the partition is only 0·75 to 1 mm. It becomes thicker as it meets the outer shell, and rounds off into the latter. On the one side it arises along a line which corresponds in position with the external ridge, and meets the other side midway between the positions of the other two ridges. Where it meets the latter side there is a small cavity in the outer shell of the nut, which apparently indicates the third loculus. In cross section this cavity is one centimetre in length (measured along the outer shell) and one and a half millimetres broad ; it is almost filled with a comparatively soft, brownish-white tissue.

The endosperm of both loculi was normal. The usual three micropylar orifices are present, two of them normal and symmetrically situated, one on either side of the partition, while the other is situated over the partition and is blocked by it.

A second specimen is almost identical with that already described. Its shape, the position of the external ridges, the nature of the micropylar orifices, the line of origin of the partition, and the indication of the third loculus are all exactly the same as in the previous example. Its median cross section is an ellipse, whose major axis is $4\frac{1}{2}$ inches and minor axis $3\frac{3}{4}$ inches. The partition, however, does not coincide with the direction of the minor axis, but curves strongly to one side, so that the cross section of one loculus is a circle, a little more than 3 inches in diameter, while that of the other is a lune, about an inch broad in the middle. Both loculi contained normal endosperm.

A different kind of " doubleness " was brought to my notice in 1914 by a specimen, which the finder had considered sufficiently strange to be worthy of exhibition at the Matara Agricultural Show. It consists of two nuts developed within the same husk.

The specimen is $5\frac{1}{2}$ inches in length. The two nuts are unequally developed, and neither is normally shaped. In median cross section the larger shows a segment of a circle rather greater than a semicircle, its flat side being 4·9 inches long and its breadth, in the perpendicular direction, 3 inches ; while the smaller is approximately a semicircle, 3·8 inches along the flat side and 2·6 inches broad in the perpendicular direction. The two nuts lie with their flat faces opposed to one another, and separated by a layer of coir (tissue of the husk) from 2 to 6 mm. in thickness. Their angles are rounded off, so that a broad fissure runs down each side of the double nut. The curved parts of the walls of the two nuts are of normal thickness, but the flat opposed faces become very thin in the middle, where the hard dark brown tissue vanishes, and the wall consists of the inner pale brown layer only.

In the larger nut two of the external ridges form the edges of the flat side, while the third divides the hemisphere unequally at about one quarter of its breadth. The micropyle on the larger segment is normal ; that on the smaller segment is about the normal size, but is oblique and blocked ; the third, which is also oblique and blocked, is very small, and is situated just below the ridge on the flat side. In the smaller nut only one micropyle is present ; that is normal and symmetrically placed.

Prolification.

Leafy prolification of the inflorescence is said by Masters ("Vegetable Teratology," page 165) to occur in Cocos, but no description nor reference is given. Whether the examples described below really fall under that head is doubtful.

The inflorescence of the coconut is contained in a clavate spathe which is at first completely closed and bears no resemblance to a leaf. The spathe splits open, usually down the outer face, but sometimes down one side, and the flowering branches fall out. At first most of them bend towards the lower side of the main axis, but they subsequently become more rigid and assume a symmetrical position with regard to the latter, falling again to the lower side as the fruits develop, and their weight drags the branches down. The asymmetrical appearance of the inflorescence as usually depicted is due, therefore, in the one case to the immaturity of its branches, and in the other to the weight of the fruit, not to an asymmetrical arrangement of the branches on the main axis of the inflorescence. In general, the branches of the inflorescence are simple. Within the spathe there may be one or two small triangular bracts on the lower part of the main axis of the inflorescence, while below each flowering branch is a very small ridge-like bract, usually not exceeding one-eighth of an inch in height.

In 1908 an abnormal inflorescence was forwarded to me from Minuwangoda from a tree forty years old, which had, according to its owner, never borne any other kind. The spathe terminated in a solid stalk-like tip about 5 inches long, which bore a leaf 9 inches long. This leaf was fan-shaped and undivided, like the first leaves of a seedling coconut plant.

Within the spathe the main axis of the inflorescence bore a large number of long bracts and small flowering branches symmetrically arranged, the whole resembling a bouquet. Owing to the longitudinal compression produced by the closed spathe during their expansion, nearly all the bracts were strongly tranversely wrinkled at the base, and most of the flowering branches, and in some cases the bracts also, were repeatedly bent from side to side in permanent zigzags.

The first bract, counting from the base, almost sheathed the main axis completely ; its shape was elongated, triangular, 5 inches broad at the base, and 23 inches long.

The second bract was the same general shape, but only 2 inches broad at the base. Its length was 22 inches. In its axil was an aborted shoot, 4 inches long, tapering to a sharp point ; it was winged on either side, the wings being folded over and meeting down the centre of the adaxial face, so that it had rather the appearance of a leaf stalk. Further examples show that this is to be regarded as an aborted spathe.

The third bract was 3 inches across the base and 21 inches long. In its axil was the first flowering branch of the inflorescence. This was only 11 inches high, and was again abnormal. Instead of being simple, it bore eighteen (tertiary) flowering branches. The lower half of the shoot bore five successive triangular bracts diminishing in length upwards from 2 inches to half an inch; these were followed by the eighteen flowering shoots, each with its own bract. The bracts of the lowest flowering shoots were longer than the empty bracts below and reached a length of 3 inches, but those situated higher up the axis diminished until the uppermost did not exceed a quarter of an inch. Thus, the secondary axes of the inflorescence repeat the abnormal features of the whole inflorescence.

The fourth bract was 22 inches long, and was split down to the base. It was apparently a fusion of two bracts, as there were in its axil an aborted spathe almost identical with that in the axil of the second bract, and a branched, bracteate, flowering shoot, similar to that in the axil of the third bract, but smaller.

Bracts Nos. five to twenty-six were similar to No. three, but were progressively shorter, with smaller and less branched flowering branches in their axils. Bracts Nos. twenty-seven to thirty-two had no flowering shoot in their axils, but aborted spathes, similar to that of bract No. two, but only about half an inch long.

Flowering branches re-appeared with bract No. thirty-three. In that instance the branch bore three tertiary branches, but the flowering branches which accompanied bracts thirty-four to thirty-six were simple. Bract thirty-seven bore a flowering shoot with two branches in its axil, but that of bract thirty-eight was again simple. In the latter case the bract was 5 inches long and the flowering shoot 4 inches. Subsequent bracts did not exceed in length the flowering branches they subtended. The remaining flowering branches, which were all simple, numbered sixteen, and their bracts diminished progressively upwards, until those of the last eight did not exceed one-eighth of an inch in length, *i.e.*, were normal.

As the length of the main axis from the point of insertion of the first bract to the tip was only 15 inches, it will be seen that the degree of condensation was extreme. All the bracts and secondary inflorescences were wedged together, and formed a moderately conical head, from which the long tips of the bracts of the main axis projected.

The bracts are thin, but rigid ; in texture they resemble the sheath at the base of the leafstalk in *Euterpe*, *Oreodoxa*, &c. In the case of the coconut leaf, this tissue forms the interwoven fibrous sheath known as the strainer.

All the flowers on this inflorescence were male, and as it is stated that the tree has never borne any fruit, it is probable that no female flowers are produced.

Abnormal inflorescences, in some respects similar to the foregoing, were obtained from Chilaw in 1914. The tree in this case is about seventeen years old, and, as in the previous instance, it is said that it has never borne other than these abnormal inflorescences.

One of the examples forwarded was still unexpanded. Apparently the spathe had been removed ; at least there was no true spathe on the specimen. The whole structure resembled an elongated cylindrical bud, and was about 50 inches in length, with a maximum diameter (at the base) of only an inch and a half. The main axis of the inflorescence bore sixteen " leaves " enclosed within one another. Each of these consisted of a bract-like structure, from 30 to 40 inches long, usually furnished with a leafy tip. Their bases were somewhat inflated and resembled in texture the bracts of the previous inflorescence, but higher up they became thicker and more nearly resembled the tissue of a spathe. They thinned out on either side into incurved wings, which overlapped on the opposite side of the bud for the greater part of its length. Towards the apex, however, the wings ceased to meet, and that part of it was merely channeled. The longest leafy tip was 20 inches in length, but only one inch in breadth ; it was simple, not pinnate. The majority of the bracts bore similar tips, but in few cases they were wanting. The main axis of the inflorescence terminated in a small simple leaf about a foot in length.

There was no sign of any flowering branch in the axils of these reduced leaves. The phenomenon might, perhaps, be classed as a case of chloranthy were it not for the evidence of other inflorescences from the same tree.

Examination of a second, older, expanded specimen gave the following details. The main axis of the inflorescence bore thin bract-like structures, twenty in all, similar to those of the Minuwangoda tree. These were inflated at the base and strongly transversely wrinkled, and measured up to 4 inches in breadth at the base and 8 inches in length. But each bract terminated in a fairly well-developed pinnate leafy tip up to 5 inches in length. The main axis bore at the apex four small normally pinnate leaves up to 24 inches in length, and furnished with sheaths at the base of the leaf stalk. In this example each bract bore an aborted spathe in its axil ; these were up to 6 inches in length, and differed from the structures found in the corresponding position in the inflorescence of the Minuwangoda tree in being completely closed and therefore hollow. There can be no doubt that these represent aborted spathes.

The main axis of this inflorescence also was remarkably short, measuring only 5 inches from the point of insertion of the first bract to the base of the terminal leaf stalk.

It would appear that in these examples the bracts are an excessive development of normal bracts, and that their production is attended by the entire or partial suppression of the flowering branches. In the Minuwangoda example the female flowers are wanting, and in one region of the inflorescence the flowering branches are represented by aborted spathes. In the Chilaw examples the flowering branches are replaced by aborted spathes in one case, while in the other they are completely wanting.

Hypertrophy of the Perianth.

A possible example of the abnormality figured by Masters on page 428 of his book was obtained at Matara in 1914. Unfortunately the specimen had been collected a long time previously, and nothing could be ascertained regarding its history.

Of the six segments of the perianth which are normally found beneath the coconut, four are present. These are quite normal. The perianth had been detached, and it is impossible to state whether two segments have been lost, or whether these are to be regarded as represented in or by the abnormal structures above.

The place of the ordinary drupaceous fruit is occupied by two opposed structures. On the one side is a broad curved piece with some approach to the appearance of a flexed hand. It is evidently composed of five segments fused together laterally ; these are indicated by strong ridges and furrows on the convex outer surface, and by five triangular teeth into which it divides at its upper edge. The five segments arise side by side from the base and are practically all of the same size. Measuring round the curve this piece is 7 inches high and 6 inches broad ; its maximum thickness was one inch. The lobes at the upper margin are half an inch long, and owing to the curve are directed almost horizontally.

Opposed to this is an erect, more or less oval structure, 6 inches high and 2 inches in diameter. It is strongly longitudinally fluted, but it is not possible to correlate these ridges with the original structure of the flower. It arises partly from the edge of the main axis (like the other piece already described), and partly in continuation of the main axis.

This oval structure contains in the centre a small cavity which is triangular below, and about eight millimetres broad there, but becomes V-shaped above owing to the ingrowth of one side. The length of its side at the broadest is twelve millimetres. The other piece is solid, except for fortuitous cracks caused by drying. The whole of the tissue in both pieces is that of the husk; there is no indication of nut or shell.

Masters regarded the presence of similar structures as due to "an hypertrophied condition of the segments of the perianth, which have not only increased in length as the central nut has ripened, but have developed in their tissues that fibrous tissue which ordinarily is found in the pericarp only. This view of the structure of these nuts is borne out by the fact that under normal circumstances the base of the perianth contains a considerable amount of fibrous material. In the present case this has increased to such an extent that the fruit appears surrounded by a double husk, by an inner one as usual and by an outer six-parted one." The illustration shows a fruit, apparently normally formed, with two of the additional claw-like segments. It is not stated whether a normal nut was found in the main fruit.

One would scarcely say that under normal conditions the base of the perianth contains any considerable amount of fibrous material. Moreover, there is apparently no evidence whether the normal perianth was or was not present when the nut was growing. Unless the specimen were carefully gathered with part of the branch, and equally carefully preserved, the perianth would soon drop off. Its absence, therefore, from a dried specimen cannot be taken to indicate anything.*

But whether Masters' explanation is correct or not, it is clear that it does not apply to the recent Ceylon specimen, in which the fruit is replaced by a six-partite husk in two sections. It would seem probable that this latter example owes its origin to some abnormal division of the ovary.

* While the above was in the Press I have received two more examples of this abnormality, in each of which the normal six-partite perianth is present.

The Effect of Lightning on Coconut Palms.

BY

T. PETCH, B.A., B.Sc.

IN a recent publication, entitled "Die Blitzgefährdung der verschiedenen Baumarten," Dr. Ernst Stahl has collected and discussed all that is known of the effect of lightning on trees, and has described new experiments, which afford further explanation of the natural phenomena recorded. It is remarkable that practically the whole of the information available refers to temperate climates; indeed, that which relates to the tropics is so brief that it may be quoted in full :—

According to Hann (Handbuch der Klimatologie, Bd. II., page 20), the lightning which accompanies the violent thunderstorms of the tropics has the most remarkable peculiarity that it very seldom sets things on fire or proves fatal. Moreover, injury to trees is relatively much less frequent than in temperate climates. During a stay of four months at Buitenzorg, which happened to coincide with the rainy season, when severe thunderstorms occurred almost every day, I only remember hearing of two cases, the one a palm, and the other a large *Ficus elastica*.

Seeman (Journal of Botany, V., page 378) has noted that "no observations seem to be on record of coconut palms being injured by lightning, though, as Tennent in his well-known work on 'Ceylon' states, they are known to be excellent lightning conductors."

A short communication from Herr Z. Kamerling records that injury by lightning occurs from time to time in Java and Sumatra, for example, in the case of the coconut palms, but somewhat rarely. He is of opinion that the numerous trees bring about a slow equalization between the earth and the clouds, and that discharges, in general, take place from one cloud to another, but only rarely between the clouds and the earth.

Dr. C. Bernard states that at Buitenzorg *Albizzia* and *Ficus* are often struck by lightning, and coconut palms are killed. But he notes that *Oreodoxa* and other palms, which often stand in isolated positions, are not struck, and suggests that the vertical shoot formed by the young unfolded leaves acts as a lightning conductor. None of the palms which form the *Oreodoxa* and *Areca* avenues in the Botanic Gardens have up to the present been struck by lightning.

Annals of the Royal Botanic Gardens, Peradeniya, Vol. VI., Part I., Aug., 1915.

Pechuel-Loesche (Über Blitze und Blitzschlage, page 93) has recorded that in spite of careful search he was not able to find trees injured by lightning in the regions of the Loango Coast, though at various times he had observed the lightning fall on isolated giant trees so near at hand that he heard only a short, sharp, clap of thunder.

The natives display no fear of lightning ; they take shelter under trees without hesitation if they are caught in the open by thunderstorms. The view that very few flashes reach the ground might, therefore, appear to be justified. But I cannot agree with that opinion ; and I would venture the explanation that the enormous volume of rain water which saturates the porous soil, or, while running off, constitutes a mantle over the thick thatch of the huts probably, being a good conductor, affords protection to the latter at least. Pechuel-Loesche's observations can no doubt be explained by the fact that the tropical rainstorms soon wet the bark, which is generally smooth, and so furnish a practical protection.

In dealing with the Mediterranean region, Dr. Stahl cites Dr. Trabut as stating that in Algeria thunderstorms and injury by lightning are rare, but in the oases the date palm is frequently struck. In the case of one palm which had been struck a short time previously, Dr. Trabut found the crown dead and in course of decay, and a long split in the stem. The author accounts for this excessive injury to the date palm by the facts that it is taller than the surrounding vegetation, that in consequence of the structure of its crown and stem it is not readily wetted by the rain, and, not least, by its position in a damp situation in a dry region.

It will be noted, no doubt with some astonishment by residents in the tropics, that the records which Dr. Stahl has been able to discover of injury by lightning to tropical trees in general and palms in particular are remarkably few. This is no doubt to be explained in great measure by the fact that the daily commonplaces of tropical life pass unrecorded, though it would appear to be correct that, comparatively speaking, the frequent thunderstorms of the tropics cause less injury than those of temperate climates.

This latter view is fairly widely held. Von Danckelmann, writing in " Nature," December 11, 1884 (Vol. 31, page 127), stated :—

> It is a remarkable fact that in all the publications relating to Africa we so seldom come across accounts of injuries caused by

lightning. Some travellers—those of the German Loango Expedition of 1873–76 for example—even distinctly report that, notwithstanding the extreme frequency of lightning in Africa, cases of damage inflicted by it are almost unheard of. During my own stay on the Congo, though I was eagerly on the lookout for instances of this kind, I did not succeed in authenticating a single case of injury due to the electric fluid. There was, indeed, a vague rumour among the natives of a man in some village having been struck dead and a "tshimbek" burnt down by lightning, but I could find no eyewitnesses of the fact; and all the time I was in Africa I never saw a tree or other object which showed signs of having been struck by lightning. The only case of which I obtained any authentic report was that the coal magazine of the French factory at Banana was burnt down in consequence of a lightning stroke in March, 1882. I have been recently informed, however, that just a year after the destruction of the French coal magazine, the large gin store of the Dutch factory at Banana was similarly destroyed, a flash of lightning having kindled a great fire there, which lasted four days. As a result of these two accidents following so close on one another in the same locality, lightning conductors are now being set up at Banana, and the International Association of the Congo has had conductors fixed on all the magazines at Vivi. I find in Dr. Pogge's journals, which I am now preparing for publication, an instance, witnessed by that traveller himself, of a man being killed by lightning. As far as my own researches go I find scarcely any literature concerning the use of lightning rods, or the frequency of accidents from lightning in the tropics," &c.

The foregoing communication elicited a letter from J. J. Meyrick (" Nature," Vol. 31, page 194), who wrote as follows:—

My experience confirms the remarks of Dr. Von Danckelmann in "Nature" (page 127) respecting the little damage done by lightning in tropical countries. In the plains of India, at the commencement of the monsoon, storms occur, in which the lightning runs like snakes all over the sky at the rate of three or four flashes in a second, and thunder roars without a break for frequently one or two hours at a time. During twelve years' residence in India I heard of only two human beings, and, I think, three buildings, being struck, although in parts of Lower Bengal the population amounts to more than 600 to the square mile. I always attributed the scarcity of accidents to the great depth of the stratum of heated air next the ground keeping the clouds at such a height that most of the flashes pass from cloud to cloud and very few reach the earth. This idea is supported by the fact that in the Himalayas, at 6,000 feet or more above the sea, buildings and trees are frequently struck. I have seen more than a dozen pine trees which had been injured by the lightning on the top of one mountain between 8,000 and 9,000 feet high. In the British Islands thunderstorms are said to be more dangerous in winter than in summer, and such a fact if true can be explained by the very thin stratum of air then intervening between the clouds and earth.

On the other hand, Dr. A. Ernst wrote from Venezuela, where he had resided for twenty-two years :—

Thunderstorms are very frequent during the rainy season. They break out generally in the afternoon, about the time of the daily maximum of heat, whilst they are extremely rare in the morning (I only witnessed one case) and during the night. Statistics of accidents do not exist, nor are there many lightning rods in use (in Caracas about half a dozen). But there are certain regions where the former are far from being uncommon, as, for instance, the country round the Lake of Valencia and the plains or *llanos* to the north of the Orinoco. In these a considerable number of cattle are killed by lightning every year, and I know also of several cases where houses were destroyed and people killed. The herds of cattle crowd together as soon as a thunderstorm begins, and the animals remain during the whole time with their heads down to the ground, thus avoiding instinctively that their pointed horns should act as lightning conductors (*sic*). In the neighbourhood of Maracay, at the eastern end of the Lake of Valencia, accidents occur almost every year .... Near Caracas accidents are comparatively rare. During all the years of my residence here no more than six have come to my knowledge; in three of them some damage was done to buildings, in two cases large trees were split, and in one (October, 1882) a ploughman was killed while at work in the field, together with his two oxen, his driving stick (about four yards long and shod with an iron point) having acted as a lightning conductor.

To the above may be added the following extract from a recent number of the same Journal ("Nature," Vol. 94, page 261) :—

In Symons's Meteorological Magazine for July last (1914), Mr. L. C. W. Bonacina asked readers who had been in India whether lightning casualties, notwithstanding the severity of tropical storms, are not much rarer there than with us. He pointed out that many persons agree that thunderstorms in England are much more dangerous than in India. In the issue for October a correspondent (G. G.) states that in the course of his travels in various parts of India during a period of several years he had only known, or heard of, one case of death by lightning, though a few high buildings, notably near Delhi, and tall trees in mountain districts had been struck. He, therefore, answers Mr. Bonacina's question in the affirmative, the reason being given that thunderstorms occur higher up in the air. He states that he has never seen lightning in India so near the earth as in England.

It will be seen that the information elicited in 1914 is practically the same as that of thirty years earlier, and is based on general opinions, not on detailed and continuous observation. It would appear, therefore, that there is still need of careful records of the effects of lightning in the tropics.

The records of the Registrar-General of Ceylon give the average number of deaths by lightning in this country as ten per annum from 1891 to 1898, and eleven per annum from 1898 to 1910. The actual numbers for each year from 1899 are given in the following table :—

1899	16	1906	7
1900	18	1907	15
1901	17	1908	15
1902	13	1909	11
1903	2	1910	10
1904	9	1911	2
1905	4		

The population of Ceylon in the year 1911 was 4,106,350.

That coconut palms are killed by lightning is well known to all coconut planters. The editor of the "Tropical Agriculturist" wrote in 1886 (Vol. VI., page 73): "Those connected with coconut estates are aware that, besides the destruction of young trees by the grubs or beetles, they must lay to their account a varying but appreciable percentage of loss of trees at all stages of growth from the effects of lightning;" and the well-known Ceylon coconut planter, Mr. W. H. Wright, stated in "All about Coconut Planting" (3rd edition, 1914, Appendix, page iv): "The ills a coconut property is heir to are drought, white ants, beetles, and lightning." The statement of Sir Emerson Tennent, referred to by Seeman (*loc. cit.*), is: "One pre-eminent use of the coconut palm is omitted in all these popular enumerations, it acts as a conductor in protecting their houses from lightning. As many as 500 of these trees were struck in a single pattu near Puttalam during a succession of thunderstorms in 1859."

But though the destruction of coconut palms by lightning is an undoubted fact, it is necessary to exercise considerable caution in accepting that as an explanation of the death of trees in any particular case. As a general rule, the native always assigns the death of a coconut palm to lightning, or, in the rare event of the absence of thunderstorms for any considerable period, to a "falling star" or a "meteorite." Until quite recently deaths from budrot were always so explained, and probably cases of root disease also, while I have been offered the same theory in the case of a tree which was obviously killed by "red beetle" (*Rhynchophorus signaticollis* Chevr.). When the observer is not the owner of the trees in question, but merely after the storm examines the locality to find out "what the lightning struck," the possibility of error is still greater, for he is apparently content to accept headless stems as evidence of the lightning stroke, without pausing to consider what has become of the crowns, and in many cases he relies on the evidence of trees, which the pathologist could inform him had been headless for months previously.

The damage inflicted on coconut palms by lightning may take any one, or any combination, of the following three forms :—

(1) The crown may be set on fire.

(2) The tree may be mechanically injured, either by splitting of the stem or by defoliation.

(3) The tree may exude a liquid which dries in red-brown streaks and patches on the stem.

Combustion of the Crown.

This has been recorded by Frank (Krankheiten der Pflanzen, 2nd ed., I., page 241), who states that the dry branches and leaf stalks of palms are sometimes set on fire by lightning.

In 1895 considerable interest was aroused in the Ceylon daily press by the report that a coconut palm had been seen with its crown on fire at Pondicherry. The subsequent correspondence has been recorded in the "Tropical Agriculturist" (Vol. XV.), and from the opinions expressed it would appear that lightning was generally considered a normal explanation. One correspondent recalled that a similar occurrence had been observed in 1893 or 1894 near Christ Church, Colombo, during a severe storm ("Tropical Agriculturist," Vol. XV., page 351), while Mr. W. H. Wright stated that some time ago he had witnessed a coconut tree taking fire from a flash of lightning just before the rain came down, but he had never seen any tree on fire during the rain, a fact which he thought might be explained by supposing that the tree could not take fire when wet. On the other hand, another well-known coconut planter, Mr. Jardine, wrote that he had never seen a coconut tree set on fire by lightning or a meteorite, though he had seen hundreds struck by lightning (" Tropical Agriculturist," Vol. XV., page 345).

In 1907 it was reported in the local press that a coconut palm in Colombo had been set on fire by lightning during a storm.

This effect would appear to occur in the case of coconut palms in town gardens, where many old trees, hemmed in by buildings, are barely able to exist, and so may bear more dead and dry fronds than their more fortunate relatives on cultivated estates. But it is certainly not the most usual effect of lightning. That it should occur before the rain and not during the storm is only to be expected, as the coconut stem is rapidly wetted by the stream of rain water which descends from the crown, and under such conditions it forms an efficient conductor.

Mechanical Injury.

H. H. Thiele, writing in the Fiji Planters' Journal " (see " Tropical Agriculturist," December, 1913, page 462), states : " Lightning will, as a rule, shatter one or two trees badly, and those standing close by will be damaged by the heat to such an extent that they get diseased, their tops rot, and they die, their stems being marked with a number of brown spots." How far this is based on actual observation is not apparent.

In the " Tropical Agriculturist," Vol. VI., page 73, the editor wrote : " During the last monsoon storms twelve fine palms, a little to the south of the Kollupitiya station, were struck. Five of these were practically decapitated and others were badly burnt, but some were only affected so that a slight brown colour showed on a few of the branches."

Shattering of the stem or immediate decapitation of the coconut palm would appear to be rare. I have never seen any case of decapitation as a direct and *immediate* consequence of lightning. Of course, when a palm dies after having been struck by lightning, its crown ultimately decays, and only the headless stem remains after a few months. In the only case of mechanical injury which I have observed, the stem bore two short vertical wounds, one at 12 feet and the other at 18 feet from the ground, from each of which the fibres were protruding in loose bundles.

Exudation of Liquid.

This is by far the commonest effect of lightning on coconut palms. As a rule, no sign of injury to the stem, or scorching of the crown, is observable, but the stem exudes, at numerous points, a liquid which dries in red-brown streaks and patches on its surface. The earliest stage of this which I have seen was two or three days after the tree had been struck. The plantation was fourteen years old and the palms were 22 feet apart; all were about the same height, but only one was affected. It did not appear to differ in any respect from the surrounding trees, and there was no apparent reason why it should have been struck rather than any other. Its stem was about 10 feet high, and the central spike about 10 feet more; in consequence of its small stature, the tips of the decumbent outer leaves nearly touched the ground.

The stem was not split or marked by the lightning in any way. Owing to the collapse of the inner tissues of the bud, the central spike had fallen over, but it was still green and not charred. The outer leaves, *i.e.*, those which bent over towards the ground, were charred along the midrib; and round the tree, at distances of 8 or 10 feet from the trunk, the grass and weeds were burnt in small patches, each patch being situated below the point of a leaf. But the most striking phenomenon was the exudation of sap from the stem. Liquid was oozing out from the innumerable cracks which are always to be found in the "rind" of the coconut stem, forming white frothy masses and then running down in long red streaks. The appearance gave one the impression that the whole of the internal tissues were undergoing rapid fermentation. On cutting into the stem the internal tissues were found to be slightly pale brown, uniformly coloured, and full of sap. It is to be regretted that, as the tree was situated in a district at least three days' journey from a laboratory, no further investigation could be made.

Another case was examined about a month after the occurrence. A breadfruit tree (*Artocarpus incisa*) was said to have been actually struck, and this was dead and leafless, though its trunk was not split. Close to it was a coconut palm about 12 feet shorter. This was not quite dead; it showed long red streaks of sap, particularly in the lower half of the stem, and had two short vertical wounds, one at 12 feet and the other at 18 feet from the ground, from which the vascular bundles were protruding in loose masses. Westward from these two the palms, only 15 feet away, showed no sign of injury, but to the east twenty trees, which were taller than the breadfruit tree, were affected. Their trunks bore red bleeding spots, and their crowns were scorched, the outer leaves being generally withered and drooping, though the youngest leaves were still erect and green. None of these showed any injury to the stem, except the exudation of sap. Two palms had been felled, as being beyond recovery, and four others appeared to be dying. The tree with the worst crown was about 20 yards from the breadfruit tree, and the affected area formed, roughly, an ellipse, with the breadfruit tree at one focus.

In general, the effects of lightning on coconut palms may be summarized as follows. A group of trees, not differing in any obvious respect from the surrounding trees, is affected; sap exudes from the trunks of all these trees; their crowns are slightly scorched; one tree is more severely affected than the others, and this is regarded as the tree actually struck. In some cases longitudinal wounds are made in the stem; and if the crown is surrounded by dead leaves these may be set on fire. But apparently these last two effects are rare. The occurrence of injured trees in groups is especially remarkable.

As regards the ultimate fate of coconut palms struck by lightning, there would appear to be a considerable difference of opinion. To quote again from the "Tropical Agriculturist" (Vol. VI., page 73): "On one occasion, when a crash gave rise to the impression that 'the sky had fallen,' we felt certain that something had been struck, and on going to the seashore we found seven coconut trees affected, some killed outright, and others with only the edges of their branches (*i.e.*, leaves) singed. But ultimately every tree, however faintly affected, died. During the late monsoon storms twelve fine palms, a little to the south of the Kollupitiya station, were struck. Five of these were practically decapitated, and others were badly burnt. But some were only affected so that a slight brown colour showed on a few of the branches. Amongst the latter is a tree with a magnificent head of fruit, and this morning we expressed our fears, based on our experience, to a good native authority, that this valuable tree was as much doomed as those whose vitality had been at once destroyed. He fully confirmed our opinion : the tree must die." It would have been of greater value if the fate of this tree had been recorded. With regard to the first of these occurrences, the statement that several trees were immediately " killed outright " makes the record somewhat doubtful.

The general opinion, however, inclines to the belief that coconut palms which have been struck by lightning may recover if properly treated. The treatment adopted by the native is apparently based on the observation that a liquid exudes from the stem ; he merely cuts a hole in the stem " to let out the excess of sap." W. H. Wright, in " All about Coconut Planting " (3rd edition, Appendix, page iv), stated : " When a tree has been partially struck by lightning, steps should at once be taken to bleed it and the surrounding trees by boring holes at their bases with an auger, by which means a large percentage can be saved. Any tree, however, which has been irretrievably struck by lightning should at once be cut down and burnt."

The distinction between " partially struck " and " irretrievably struck " would appear to afford a convenient explanation in case the treatment failed. It does, however, appear to be correct that when a group of coconut palms is struck, some are more lightly affected than others. The former are not regarded as actually struck, but as " affected by the heat." Their case may be analogous to that of the tea bushes which die round a rock which has been struck by lightning on a tea estate. It would appear to be open to question whether the trees which recover after the treatment described would not have recovered without treatment of any kind.

No explanation of this "fermentation effect" can at present be offered, and the facts have been placed on record here in the hope that the subject will be taken up by others more favourably situated for detailed investigation. It may, however, be pointed out that the same effect may be produced on a small scale by making a fire near the base of a coconut palm, but not near enough to char the stem. The red-brown patches subsequently appear on the parts which have been heated. A number of red-brown spots and streaks at the base of the tree, usually on one side only, indicates that it has been injured by fire. This appearance is very common, more so in native gardens or on trees near a native hut than on estates. If a fire is made quite close to the base of a coconut palm, the outer stem tissues are, of course, burnt and charred ; but when it is too far away to admit of this, the stem is heated, especially if the wind blows the flames in that direction, and it afterwards exudes a red-brown liquid from dozens of the pre-existing cracks. It is notable that in some cases, not, however, universally, when the lower part of the stem is severely charred, the parts immediately above this do not bleed ; on the other hand, if the stem shows no blackening whatever, it bleeds vigorously. Probably in the first case the supply of sap to the upper parts of the cortex is cut off altogether.

I have seen an area of several acres affected in this way, where the grass had evidently been burnt off a long time before. All the trees were marked with red-brown spots to a height of about 3 feet on one side only. Apparently a quickly advancing fire had not been strong enough to char the stems, or to heat them sufficiently on the leeward side to cause them to bleed.

A good example of this was furnished by a group of old coconut palms over sixty years old on the Experiment Station, Gangaruwa. The plot being more or less waste ground, it was used for storing the thinnings of the cacao plots in 1907, and these were set on fire in February, 1908, without any regard for the coconut palms. When examined in April, 1908, the lower parts of the stems, sometimes to a height of 25 feet, were covered with small red-brown patches. The liquid had issued from the cracks and had dried round them ; it had not run down the stem, as in the case of a severe lightning stroke. The cortex under each patch was slightly decayed and brown, but it afterwards dried up. Four trees were marked above the highest red-brown patch. On three of these the bleeding had not extended further up the stem by March, 1909, but on the fourth there were fresh spots higher up the stem at the end of July, 1908. As a rule, on trees which have been injured by fire the bleeding occurs immediately afterwards, and the spots do not subsequently increase in number or size. Only the cortex is affected, and the amount of sap which exudes is small. But when trees are severely struck by lightning, the exuding sap is derived from the whole of the inner tissues, and issues in such quantity that it runs down the stem in long streaks.

Horse-hair Blights.

BY

T. PETCH, B.A., B.Sc.

AMONG the many tropical mycelia which are abnormal, either in habit or structure, none is more striking than those which have received the general appellation of "Horse-hair Blight," a designation which has been bestowed by planters in Ceylon, India, and the West Indies on thin rhizomorphic mycelium, which spreads freely over bushes and trees at some height above the ground. As far as these mycelia have been identified, they belong in all cases to some species of *Marasmius*, the common species in the Eastern tropics being *Marasmius equicrinis*, and that in the West Indies (according to the records) *Marasmius sarmentosus*. The following details relate chiefly to those species which have been found in Ceylon.

Marasmius equicrinis Muell.

The mycelium of this species is the common horse-hair blight of Ceylon. It consists of a smooth, tough, black cord, from one-tenth to one-eighth of a millimetre in diameter, which runs in all directions over bushes and trees, up to a height of 20 feet above the ground, attached to the living stems and leaves at intervals of one to four centimetres, or throwing out long free threads to adjacent branches. Its course is quite a random one. After proceeding along a branch for a short distance, it may leave it and attach itself to a leaf, and after crossing several leaves may return to its original branch. Or it may travel from a branch to a leaf *viâ* the leaf stalk, and may make a complete circuit of one surface of the leaf before proceeding further. In general, the whole of the mycelium is aerial; it is not connected with any mycelium on the ground, and does not ascend the tree from the ground level. It has been observed at the base of

Hevea trees, where it grows on the outer dead bark, but this is an exceptional case, and it has not been known to climb up to the leaves from that position.

When the leaves die they adhere to the mycelium until they decay and disintegrate, and consequently there is produced a tangled mass of leaves and mycelium, with sometimes twigs also, suspended in the bush or tree. The mycelium, however, does not appear to be parasitic.

In India what is apparently this species is said to be common in the jungle, especially on *Terminalia tomentosa* Bedd., and to spread thence to tea bushes. It is quite common in low-country jungles in Ceylon, where, with the white "thread blight," it grows on the bushy undergrowth. It has not been found on cacao in Ceylon, as *M. sarmentosus* has in the West Indies, and this is somewhat surprising, since the conditions in a cacao plantation are such as favour its growth; but, on the other hand, cacao in Ceylon is grown chiefly at medium elevations, not in the moist low-country, where horse-hair blight flourishes most luxuriantly. In the Royal Botanic Gardens, Peradeniya, it occurs with "thread blight" on nutmeg trees (*Myristica fragrans* Houtt.), but it does not spread far. In the damp low-country jungles it spreads freely from bush to bush, *e.g.*, in the jungle at Henaratgoda (elevation 33 feet, rainfall 107 inches per annum).

Cultivated tea forms a low bush about 75 centimetres high, and the bushes are planted so close together that their branches meet; but though the ground is sometimes hidden, the vegetation is not high enough to retain a permanently moist atmosphere. Probably for that reason the mycelium on tea is usually confined to the main branches in the centre of the bush. This is the case in the Kelani Valley district, in which it is most prevalent, though in the jungle surrounding the tea it runs freely over the bushes, as at Henaratgoda. Further inland, at an elevation of 400 to 500 feet, and with a rainfall of 80 to 90 inches per annum, it has been found to spread similarly over the tops of tea bushes; but in this case the tea was shaded by interplanted *Hevea*, and the conditions more nearly approach those of the jungle than did those in the other tea fields in which it has been observed. I have no record of its occurrence at higher elevations than Peradeniya (1,600 feet, rainfall 82 inches), though another species with slightly different mycelium occurs in the jungle at Hakgala (5,600 feet). In accordance with the idea that Peradeniya is its upper limit, we find that it does not spread there to any extent. The Nutmeg Grove in which it grows consists of closely planted old trees, whose branches interlace and create a dense shade. There horse-hair blight is practically confined to the lower branches of two trees, both of which are overhung by tall specimens of *Derris dalbergioides.* It would appear that the fungus prefers the moist low-country, and that it flourishes best on bushes which are shaded by trees.

The black mycelial cords are cylindrical, smooth, and shining. Towards the growing point the colour becomes paler, and the last millimetre is brownish-white. The cross section is circular or slightly oval, and as the component hyphæ run parallel and adhere to each other throughout the whole length of the cord, the section presents a ring of polygonal "cells," which are 2 to 4 μ in diameter. In the older regions the external hyphæ are blackish-brown, and the colour becomes paler inwardly through brown and yellow-brown until the internal hyphæ are hyaline. The full-grown cord is hollow, the cavity occupying half the thickness of the cord; near the growing point the cord is solid, and the colour varies internally from pale brown to hyaline, while the diameter is only about 60 μ.

The growing point is protected by a cap, easily discernible without a lens, which bears a striking resemblance to a root cap. This cap is 220 to 280 μ long and about 120 μ broad, and is rather darker than the cord immediately behind it. The tip is conical, the breadth increasing uniformly to the middle, after which the remainder is cylindric, or diminishes almost to the diameter of the immature cord. The conical tip is solid and its outer edge is amorphous, *i.e.*, it shows no trace of constituent hyphæ when mounted; but the hinder half of the cap forms a free curtain round the stem, and in it the constituent hyphæ are distinguishable in mounted specimens. The free edge of this fringe or curtain is irregularly laciniate. As a rule, the fringe is continuous with the outer layer of the solid tip, but in some cases it arises from a deeper layer, and the cap then appears double.

At first sight this cap appears to be a developing pileus. But when the mycelium produces pilei, these do not arise from the tip, but always on short stalks developed as side branches from the older parts. Further, the developing pilei differ from the cap in not having a laciniate fringe at their margin. That the cord grows on without any change in the character of the tip has now been observed in numerous instances when the mycelium has been kept growing in the laboratory. Hence it would appear that the cap is a special structure, though most probably a modified pileus, for the protection of the growing point.

The mycelium adheres to the leaves and branches by means of thin discs of fine brown hyphæ which spring from the under surface and sides of the cord. These discs may be circular, about 0·6 mm. in diameter, or oval, up to 3 × 0·75 mm. The individual hyphæ are glued together into a sheet which thins out towards its margin, and the same fixing substance (? from a degeneration of the outer wall of the hypha) fastens the disc to the leaf or branch. On old rough branches these discs give rise to a few free hyphæ which wander between the fragments of dead bark; on young green stems and leaves there are no free hyphæ, and in neither case have I been able to detect any mycelium in the living tissues of the host plant. When any part of a stem or leaf with its adhering mycelium is placed in alcohol, the fixing substance is apparently dissolved, since the whole mycelium separates from the host at the slightest touch. This tends to confirm the view that the mycelium is entirely superficial. But the individual hyphæ of the attaching disc do not separate from each other in alcohol.

These anchoring hyphæ may arise anywhere along the whole length of the cord, and their production seems to depend on external conditions. If a piece of mycelium is placed in a glass dish and kept so moist that it is always in a thin film of water, a fringe of brown spreading hyphæ, to a length of over a centimetre, develops from each side of it. It would seem, therefore, that an abundant supply of moisture at certain points would result in the formation of discs at those points, but I have not been successful in attempts to prove that by experiment. There is no relation between the position of the discs and the stomata of the leaf ; indeed, the cord adheres to either side of a leaf, even in cases, *e.g.*, nutmeg and tea, where there are no stomata on the upper surface. It appears to prefer leaves which have a glabrous surface.

A careful examination of the trees tends to confirm the supposition that the mycelium is not parasitic. In the case of nutmeg, leaves bearing the cords of horse-hair blight do not die out of their natural order ; this is the more easily determined, since dead leaves remain attached to the mycelium. It is seldom that all the leaves of a shoot are attacked, and any gaps with hanging leaves could not be overlooked. It seems certain that the dead leaves in the tangle (when they belong to the tree on which the fungus occurs) have died normally, and that the mycelium merely prevents their fall to the ground. The twigs which sometimes occur in the tangle present more difficulty, but an examination of the branch usually shows that they are not part of that particular one. In the case of nutmeg, an examination of unaffected trees brings out the fact that twigs of the latter are often broken off (by the wind ?) from the upper branches, and remain entangled in the denser lower ones ; they would be far more likely to be caught when the lower branches are overgrown by horse-hair blight. But that leaves and twigs blown by the wind or falling from higher trees are caught in the tangle is fully demonstrated. The largest leaf, indeed the only one recognizable, in the photograph of horse-hair blight on tea is that of *Grevillea robusta*, which is grown as a wind-break in tea ; and the commonest " twig " in the tangle on nutmeg in the Peradeniya Gardens is the rachis of the inflorescence of the overhanging *Derris dalbergioides*. This rachis is only about 10 cm. long and is very slender, but it falls with the seed pods attached at an acute angle and thus hooks over the cords of the horse-hair blight. Leaves of the latter tree are also common in the tangle.

Thus, both the absence of mycelium from the internal tissues and the effect of the fungus on the tree bear out the view that this horse-hair blight in Ceylon is merely epiphytic. The fungus may obtain its nourishment at first from the dead bark of the older branches, and later from the leaves and twigs of the tangle. But that all " horse-hair blight " is the same and will have the same effect is, however, by no means probable.

A parasitic white mycelium of normal texture, usually known as thread blight, grows on branches and leaves in the same position as horse-hair blight, though it follows closely the course of the branch, and only passes from one leaf or twig to another when these are in contact. This often occurs with horse-hair blight in the West Indies and Ceylon, and the association has given rise to the idea that the two are forms of one fungus. But in Ceylon they are quite as often found separate, and are, in fact, totally distinct fungi. Any damage done to the tree when the two are found together is due to the thread blight ; indeed, it is most probable that in these cases the horse-hair blight only begins to grow after the thread blight has killed some of the twigs. There is no doubt that they are distinct fungi ; the horse-hair mycelium produces a *Marasmius*, but the immature fructifications of the Ceylon thread blight are small white sessile pilei with hardly a trace of gills. The fructification of horse-hair blight may easily be obtained ; that of thread blight refuses to grow under similar conditions. The horse-hair blight of the West Indies has not been studied apart from thread blight, and no definite decision as to its possible parasitism has been arrived at.

The fructification of this horse-hair blight occurs fairly frequently on the mycelium on the tree, but is usually very poorly developed in that situation. It generally arises laterally from a free portion of the cord, not from a point of attachment to a leaf or branch. Many of them arise not directly from the horse-hair mycelium, but from the decayed twigs in the tangle. The stalks are 2 to 10 mm. long ; there is a slight thickening at the point of origin, but elsewhere they are about the same diameter as the cord. As a rule, the pilei do not exceed 2 mm. in diameter, but after continued rains they may attain 5 mm. They are yellow-brown to red-brown, somewhat membranous, hemispherical, umbilicate, deeply sulcate ; the sulcæ correspond with the gills in number and position, and are usually five to seven. There is a small black point or umbo at the base of the umbilicus, and unexpanded specimens of about a millimetre in diameter are often sharply umbonate. The gills are white, then cream or yellowish, becoming brown in drying ; in large specimens they are comparatively broad, but narrowed behind, where they unite into a well-defined collar round the apex of the stem. In poorly developed specimens the gills are so far attenuated behind that this collar is not very evident, but it can always be demonstrated by cutting diametrical sections of the pileus. The spores are white in mass, narrow-oval and inequilateral, or clavate, 10–14 × 4 μ ; contents granular. The pellicle of the pileus when magnified appears minutely roughened, and sections show that it is composed of elongated cells, echinulate, or rather nodular, with numerous close set, blunt spines at the outer ends.

If the tangle be placed in a glass dish with sufficient water to moisten the lower twigs and leaves, the fructification may be developed, as a rule, within two or three weeks. In this case, owing to its development in a constantly saturated atmosphere, the stalks are longer, 2–4 cm., and the pileus may attain a diameter of 8 mm. The pileus is somewhat thinner, paler in colour, varying from ochraceous to almost white, and it frequently becomes repand. In the case of a tangle taken direct from the tree to the laboratory the pilei developed in sixteen days, but on living tea branches, which were sent through the post, taking three days in transit, they did not develop until seventy-one days had elapsed.

The fructification of this horse-hair blight is clearly a *Marasmius*, and, from a comparison with the specimens in the Kew Herbarium, it is *Marasmius equicrinis* Müll. The question of nomenclature will be dealt with subsequently.

On searching during the wet season among the dead leaves and twigs beneath the nutmeg trees on which *Marasmius equicrinis* flourishes, one finds specimens exactly similar to those which develop on the tangle when it is placed in a glass dish and kept moist. As in the latter case, the gills are often so attenuated behind that the collar is not at first sight evident.

The pileus varies from white to ochraceous, the number of gills is usually about eight, and the stalk may attain a length of 2 cms. It has the same black spot at the base of the umbilicus, and the same pellicle on the pileus. The leaves are overrun by black rhizomorphic mycelium identical with that on the trees, but the agarics, as a rule, arise from the internal tissues, not from the creeping mycelium. There can be no doubt that this is *Marasmius equicrinis* growing under more ordinary conditions.

More common than the above, in the same situation, is another *Marasmius* which grows similarly on leaves overrun with mycelium indistinguishable from that of *Marasmius equicrinis*. This species is 2–4 cm. high ; its stalk is black and polished, and is about 0·15–0·2 mm. diameter. The pileus is 4 to 6 mm. in diameter, hemispherical, umbilicate, generally with a minute umbo at the base of the umbilicus, rough, radially sulcate with from eight to eighteen rays, yellow-brown, greyish-brown, or ashy. The gills are white or yellowish, eight to eighteen in number, distant, fairly broad, with the lower edge almost horizontal, and united behind into a collar round the apex of the stem. The spores are white, narrow-oval, 8–12 × 3–4 μ. This agrees with the type specimens of *Marasmius rotalis* B. & Br., which, according to the original description, has a pileus with about twelve deep grooves, with sometimes a minute umbo at the base of the umbilicus. Berkeley and Broome describe it as " pulverulent," but the appearance is due to inequalities in the pileus and not to a superficial powder. The cotype at Peradeniya shows the same cord-like mycelium on the leaves, though the agarics arise from the internal tissue. Berkeley and Broome do not mention the collar, but they appear to have recognized its existence, since they state : " This is *M. rotula*, var. *fuscus*, of the Cuban fungi." Their identification of the Ceylon species with the Cuban one may, however, be doubted.

Marasmius rotalis has a pellicle of the same structure as *Marasmius equicrinis*. In the form just described it differs from the latter species in its more numerous gills, more decided collar, and in the stouter, less membranous pileus, which in many instances resembles that of *M. ramealis*, appearing dry and opaque, instead of being somewhat translucent as is *M. equicrinis* under the same conditions. One is at first inclined to suppose that *Marasmius rotalis* is merely *M. equicrinis* with a stouter pileus and more numerous gills ; but as it has never been developed from the tangle in spite of numerous attempts, it must still be considered a distinct species. Berkeley and Broome's cotype of *Marasmius rotalis* at Peradeniya, however, contains both forms, *i.e.*, *Marasmius rotalis*, and *M. equicrinis* as it grows on dead leaves on the ground.

A specimen of *Marasmius equicrinis* consisting of mycelium attached to green living leaves only was gathered on January 23 in the dry season and placed in a glass dish. In the same dish was also placed a piece of mycelium, not more than a foot in length, attached to a dead twig 7 cm. long and 1·5 mm. diameter. In eighteen days a *Marasmius* developed from the mycelium attached to the dead twig, but nothing was obtained from the mycelium on living leaves, though the experiment was continued for sixty-seven days. A similar experiment was instituted on February 15, still in the dry weather ; in one dish was placed a large tangle of dead leaves and mycelium taken from the tree about 6 feet from the ground, and in another mycelium attached to living leaves and twigs only. The two were kept side by side. The tangle developed agarics in twenty days, and gave a continuous crop until the experiment was abandoned (March 31) ; the mycelium which was attached to living leaves when gathered did not produce a single specimen during that time. It appears, therefore, that for the production of agarics (and the continued growth of the mycelium) it is essential that the mycelium should be attached to some dead tissues, into which it can penetrate, and from which it can obtain food. The results of these experiments confirm the view that mycelium is only epiphytic on living tissues.

Although the black " horse-hair " mycelium continues to grow over the dead leaves after the tangle has fallen to the ground, the majority of the agarics then produced arise from the internal tissues of the leaf and break through the epidermis. The mycelium in the decayed leaf consists of very fine separate hyaline hyphæ; there is no black cord internally. I have seen instances in which the black cord passed down the centre of a dead twig, but in such the latter was probably hollow from the first. The mycelium, when it enters decaying tissues, becomes quite normal.

It has been suggested that horse-hair blight is spread by birds which use the mycelium in the construction of their nests. If it can be shown that the mycelium is employed for that purpose, the suggestion might be feasible. In Ceylon I have only been able to examine a few nests from the neighbourhood of affected trees, and these did not contain any mycelium. This method of dispersion would not account for its widespread distribution on tea in certain districts, since tea bushes which are interfered with in the course of plucking every three weeks or so are seldom adopted by birds as nesting sites. Further, it would be necessary that the nest be built in a situation where it would be afterwards soaked by the rain. The naturalist of temperate climates will immediately picture the nests of the hedgerows, protected in the summer and exposed in the winter, but he must remember that most of the vegetation in the Tropics—and especially that on which horse-hair blight flourishes—is evergreen, and that in a country where rain falls throughout the year few birds would build a nest in an exposed position. A nest built in such a position that the rain does not then reach it is protected for an indefinitely long period, since there is no universal leaf fall. This appears to throw considerable doubt on the supposition that horse-hair blight is spread by birds.

But it is easy to demonstrate that if the mycelium is transferred from one bush to another it will become attached, if suitable localities are selected. My first experiments attempted to transfer horse-hair blight from nutmeg to tea. The only tea bushes available were ten growing in a single line in an exposed situation and in full sunshine the whole day. The conditions were, therefore, unfavourable. A twig of nutmeg, about a foot long, bearing the mycelium was placed in the middle of one of the bushes in November, 1905, during the wet season. It did not make any new growth, and died in the ensuing dry season. In May, 1906, a similar twig was placed in a denser bush, and as at the end of the rains (July) it had not travelled to the tea branches, this was regarded as another failure ; but in the following wet season (November) it was found that the mycelium had become attached in three places to the leaves and stem of the tea. The delay was no doubt caused by the unsuitability of the isolated tea bushes ; but the case is the more interesting in that it shows that the mycelium on detached branches can survive the comparatively dry months of August (rainfall 6·63 inches) and September (rainfall 2·37 inches). The total rainfall of the dry season (December–March), which proved fatal to the first experiment, was 13·49 inches, and the four months included periods of nineteen, seventeen, and twelve days without rain.

In a further experiment two twigs of nutmeg bearing the mycelium were tied to branches of other nutmeg trees in shaded situations. From the twig which received most "drip" from the overhanging branches the mycelium spread to the new host in nine days. From the other, which was sheltered by a thick cover of foliage, forty-three days elapsed before the mycelium had become attached. The rainfall for the first nine days was 6·25 inches, and for the whole period 13·05 inches. These experiments demonstrate the possibility that horse-hair blight may be spread by pieces of mycelium conveyed with twigs to other bushes by the wind ; but here, again, the growth on tea presents another difficulty in those localities in which it is confined to the interior of a dense tea bush ; for wind-carried mycelium would be arrested at the exterior of the bush, and would be compelled to grow from that position. It seems probable that in spite of these other possible methods, the chief mode of distribution is by means of spores. Spores shed upon a glass slip soon germinate in a damp atmosphere ; indeed, a "spore print" deposited in a closed glass dish usually contains a large number of germinating spores after about twelve hours. But infection experiments made with the spores on the older stems of tea bushes have up to the present been unsuccessful.

It would appear that, since a strand of horse-hair blight has a single definite growing point, it would afford eminently suitable material for the determination of the rate of growth of a mycelium under various conditions. By placing the mycelium in an Esmarch dish with a little water, it may be determined that growth only occurs if the mycelium is attached to dead tissues; if a piece of the tangle which contains dead leaves and twigs is used growth may be recorded, but if the piece of mycelium is attached to living leaves only no growth takes place. Attempts have been made to extend this rough observation, but so far without much success. It was found that in the Esmarch dish growth occurred during the first night, and then practically ceased; one series of observations may be quoted:—February 23, 4 P.M., to February 24, 10 A.M., 10·8 mm.; February 24, 10 A.M. to 6 P.M., 0·9 mm.; February 24, 6 P.M., to February 25, 8 A.M., no growth. The following apparatus was then set up:—A horizontal chamber was formed by cementing a sheet of glass to either side of an oval gun metal frame; the mycelium attached to dead twigs, &c., was laid in this, in a thin film of water on the lower glass. Two thermometers, a wet and a dry bulb, were inserted through openings in the frame, and a current of moist air was drawn slowly through the apparatus. With this arrangement the humidity within the chamber was constant. Measurements were made by observing the position of the end of the strand by means of a travelling microscope. The observations may be summarized as follows:—

Mycelium gathered 3 P.M.; experiment begun 4 P.M., October 10.

4 P.M. to 5 P.M., Oct. 10, no growth.

5 P.M., Oct. 10, to 8 A.M., Oct. 11, 3·45 mm.

8 A.M., Oct. 11, to 6 P.M., Oct. 11, 0·75 mm.

6 P.M., Oct. 11, to 6 A.M., Oct. 12, 0·6 mm.

6 A.M., Oct. 12, to Oct. 19, no growth.

It is probable that the metal frame may have injuriously affected the mycelium, though the inner side of the frame was waxed in order to avoid that. As no other apparatus was available at the time, the experiment was not carried further, and it has not since been found possible to resume it. But it would seem probable that growth occurs in bursts, and that these are of such short duration that they do not afford much scope for experiment.

Marasmius obscuratus Berk.

Another species of *Marasmius* with similar mycelium has been found in the jungle at elevations from 400 to 2,000 feet. Its mycelium is dull black, and more rigid and thicker than that of *Marasmius equicrinis*. It differs, too, in habit from the latter species. In general, it keeps near the ground, not ascending higher than about 3 feet. Its cords may be long when they are attached to living bushes, but it is more frequently found running over dead branches or twigs near the ground, and in that case the cords are only 10 to 20 centimetres in length. Apparently it does not attach itself to leaves.

The mycelium is cylindric, 0·4–0·6 mm. in diameter. When it comes in contact with living branches, it fixes itself to them by rather large cushions of brown or white hyphæ, which penetrate into the plant and ultimately kill the branch. As a rule, the mycelium does not grow along a branch, but across it. But when it meets a dead branch, either on a bush or on the ground, it disappears into the dead tissue and breaks out again some distance further along the latter. Consequently the tangle on the ground and in the lower parts of the bushes consists of dead twigs united by short lengths of rigid black mycelium. The mycelium within the dead twig is normal ; the black rhizomorphic cord breaks up into separate hyphæ when it enters the host tissues. On specimens kept in the laboratory the growing point bore a subglobose, white tuft of hyphæ, but this has not been observed in the field.

A tangle of mycelium and dead twigs was kept on damp soil under a bell-glass for nearly a year. At first it produced only long free strands of mycelium. At the end of nine months several specimens of a *Marasmius* appeared on the dead twigs, but as they were not connected with the black mycelium it was thought that they might be intrusive. A month later, however, the same *Marasmius* developed on the black mycelium.

The pileus is hemispherical, umbilicate, up to 1 cm. in diameter, usually with the margin narrowly re-curved. Some specimens become infundibuliform. It is plicato-sulcate almost to the centre. In the umbilicus it is dark brown, elsewhere reddish-brown, becoming ashy or brownish-white, streaked with brown fibrils and points. The pileus and gills are dry and somewhat coriaceous. The gills are distant, usually narrow and arched, and united to a disc at the apex of the stalk ; they are at first reddish, then creamy white, rather thick, with the interstices sometimes veined ; they are nearly all the same length. The stalk is up to 1 cm. high and 1 mm. diameter, blackish-brown, rough with minute fascicles of hairs, insititious when growing on dead twigs ; internally it is blackish with a central white core ; it is not horny, but somewhat cartilaginous. The spores are white, narrow-oval, inequilateral, and sometimes curved at one end, 8–10 $\times$ 3–4 μ. The pileus is red-brown when dried. This agrees with the type specimen of *Marasmius obscuratus* B. & Br.

Marasmius coronatus, n. sp.

In the jungle at Hakgala one meets with another rhizomorphic mycelium, which occupies the same position as that of *M. obscuratus*, *i.e.*, it is attached to dead or living branches and stems, but not at a greater height than about 4 feet from the ground.

This mycelium is about half a millimetre in diameter, dark brown, except near the growing point, where it becomes white, and somewhat lax. It is closely covered everywhere with adpressed white hairs, and in that respect resembles the mycelium of *Marasmius sarmentosus*. These hairs are simple, up to 0·6 mm. long and 4–6 μ diameter, septate, thick-walled, equal, with the apex rounded, or often irregularly bent at the upper end. The mycelium is united to dead or living stems by a rather large brownish cushion of hyphæ, up to 5 millimetres in diameter, which usually envelops the rhizomorph.

It is most frequently attached to dead twigs, either lying on the ground or still attached to the tree or shrub, but it will adhere to any living stem it happens to meet, apparently without penetrating into the living tissues of the tree. It overruns old stems which have a considerable thickness of bark and evidently penetrates into the latter, as the sporophore develops on the bark without any visible connection with the external rhizomorph. Occasionally it attaches itself to dead leaves on the ground. As far as has been ascertained the mycelium is not parasitic.

A single strand of mycelium may be traced for several yards, united here and there to anything which comes in its way. But it has also the same habit as *M. obscuratus*, of disappearing into the tissues of a dead branch and breaking out again some distance away, no rhizomorph being discoverable within the branch. The growing end of the rhizomorph tapers to a point which is not protected by any kind of cap.

The mycelium, after running for some distance attached to various twigs, may become erect, if it is not so already, and produce the sporophore at its extremity, or the sporophore may be developed from dead twigs or on the bark of living trees at some distance from the rhizomorph. In the former case the connection of the sporophore with the mycelium is clear, but in the latter it would not be suspected without a previous knowledge of the other mode of development. I have not met with specimens borne laterally on the mycelium.

The pileus is hemispherical, broadly convex, or almost plane, about one centimetre in diameter. The centre is black or dark brown, depressed, usually with a minute conical papilla, clothed with coarse radially arranged fibrils which project in a fringe beyond the margin of the central area. Elsewhere the pileus is brownish-white, with radial ridges of coarse hairs which project over the margin. These ridges are frequently interrupted, so that pileus may appear somewhat concentrically zoned.

The gills are white, crowded, free, and slightly ventricose. The spores are white, narrow-oval, slightly inequilateral, 7–9 × 4–5 μ.

The stalk is 4–7 centimetres high, 0·25–0·5 mm. in diameter, black, dull, not horny, equal, thickly clothed with adpressed white hairs.

The hairs on the pileus are 3·5–4 μ diameter, smooth, simple, thick-walled, flexuose below, separate at the base, cohering above in pointed, tapering fascicles up to 0·5 mm. long.

This species appears to be undescribed, and may receive the name of *Marasmius coronatus*, in allusion to the central ring of projecting hairs. A variety occurs in which the stalk and pileus are golden brown.

Marasmius coronatus :—Pileo hemisphærico, vel late convexo, vel plano, usque 1 cm. diam.; centro nigro, depresso, umbonato, fibrillis patulis circumdato; alibi brunneo-albido, fibrillis radiatim dispositis, ultra marginem productis, ornato; lamellis albis, confertis, liberis, subventricosis; stipite 4–7 cm., alto, 0·25–0·5 mm. diam., æquali, nigro, crinibus adpressis, albidis vestito; sporis albis, anguste ovalibus, subinequilateralibus, 7–9 × 4–5 μ.

UNDETERMINED SPECIES.

Another species of horse-hair blight which occurs fairly commonly in the jungle at Hakgala has not yet been determined. It is usually found on the bark of living trees, ascending to a height of 40 or 50 feet. It is closely applied to the bark, sometimes running along the fissures, the vertical strands being united by lateral branches, so that the bark is covered with a network of black rhizomorphs. When it reaches the crown of the tree it runs more loosely along the twigs and freely among the foliage from leaf to leaf, forming a tangle similar to that of *M. equicrinis*. Less frequently it is found overrunning low bushes, and in these cases it is apparently parasitic, the hyphæ of the adhering cushions penetrating into the tissues of the plant.

The rhizomorphs are black, glabrous, angular, and somewhat flattened and twisted, from 0·2–0·4 mm. broad; the diameter is not uniform, but varies considerably within a short distance on the same strand. The mycelium is reduced to a fine thread at its extremity.

Up to the present the fructification has not been obtained. Twigs with attached mycelium have been kept under suitable conditions at Peradeniya for more than a year, but, though the mycelium has covered the soil of the pot in which it was kept with a black network, it has not produced any sporophore. In the field a *Marasmius* has been found sparingly, and a *Xylaria* in large quantity on the débris of the crown of a tree infested with this mycelium, which had been felled. But there is as yet no evidence of any connection of the mycelium with either. The *Xylaria* was included on Plate VII. in the belief that the mycelium pertained to it, but this has not been substantiated.

General Conclusions.

The species which constitute the section *Sarmentosi* of *Marasmius* are characterized by the possession of a black creeping mycelium from which the agaric arises. In the *Insititii* a mycelium of normal structure runs within the leaf or twig, and the stalk of the agaric pierces the outer layers of the matrix and emerges through a distinct hole. But both *Marasmius equicrinis* and *Marasmius obscuratus* demonstrate that these two sections are not mutually exclusive. *M. equicrinis* clearly belongs to the *Sarmentosi* when it develops on the aerial mycelium, and when the tangle falls to the ground it may still retain the same habit; but, in addition, the mycelium breaks up into individual hyphæ when traversing the interior of a dead leaf, and the stalk then bursts abruptly through the epidermis, in which case it belongs to the *Insititii*. If the tangle is cut from the bush and kept moist in a glass dish, both types occur at random. In the case of *M. obscuratus*, the majority of specimens which have been grown from tangles similarly treated have been *Insititii*. The fact that the same fungus may fall into both sections is not new. *Marasmius rotula*, which Fries classed among the *Insititii*, sometimes arises from a blackish creeping rhizomorphic mycelium; and it was placed by Morgan among the *Sarmentosi*. And Theissen has recorded that *M. trichorrhizus* Speg. arises either from rhizomorphic mycelium or independently from twigs.

Nomenclature.

Comparison of the Ceylon species with the *Sarmentosi* recorded from other parts of the Tropics is attended with considerable difficulty, especially when descriptions only are available, because the latter have been described from pilei developed upon the aerial mycelium, and in that situation they are frequently so minute that an accurate description is impossible. Only when the mycelium falls to the ground is a fully-developed pileus produced, and from that situation it has probably been described under another name. Until each aerial mycelium has been submitted to experiment it is scarcely possible to correlate them.

The horse-hair blights of India and Ceylon have usually been attributed to *Marasmius sarmentosus*, a West Indian species which was described by Berkeley. Recently it has become customary to refer aerial mycelium of this type, even from the West Indies, to *Marasmius equicrinis*, which is an Australian species collected by Mueller and described by Kalchbrenner.

Marasmius sarmentosus was described as " pileo hemispherico, subspadiceo, primum umbonato, *dense sericeo*. margine involuto, demum expanso ; stipite *villo depresso vestito*, demum glabrescente, eximie sarmentoso. Pileus 1–2·5 mm. broad, brown ; stalk thickened at the base, 20–22 cm. long, slender." An examination of the Kew specimens shows that the mycelium is brown, and densely hoary with minute adpressed hairs ; some of the specimens are bright brown, but it is possible that the colour may have been changed in preservation. The pilei are on short lateral stalks, up to 1 cm. in length, and are densely radially fibrillose or shaggy. Berkeley's description is correct, except that the mycelium has been confused with the stalks. Included in the same cover is a specimen of mycelium sent by Hart from Jamaica in 1886 ; this is much thicker and more rigid, and resembles the mycelium of *Marasmius obscuratus ;* it is certainly not *M. sarmentosus*. There is also a Ceylon specimen (mycelium only), labelled *M. sarmentosus*, from the herbarium of Baron von Mueller, which was collected by Thwaites ; this again is, as far as can be determined, the mycelium of *Marasmius obscuratus*.

Marasmius equicrinis was described by Kalchbrenner, under the name of *M. crinis equi* Muell., in Grevillea, VIII., page 153, and again by Berkeley in Jour. Linn. Soc., XVIII., page 383. The description in the former is as follows : " Albido-fulvescens, minimus, Pileo raro, membranaceo, convexo, obtuso (1–2 mm. lato). Stipite (1 cm. et ultra longo), setaceo, rigido, atro, nitido, e mycelio atro, equi crinis similari, assurgente. Lamellæ paucæ, distantæ, pileo pallidiores. The rhizomorphoid mycelium resembles horse-hair, and is profusely developed, whilst the pilei are very seldom produced. The stems rise at right angles from the decumbent mycelium. The only perfect specimens are in the Berkeley Herbarium, Royal Gardens, Kew."

The second description, by Berkeley, is—

"*M. equicrinis* Muell. Pileo parvo ex umbrino lacteo paucisulcato, e fibris sterilibus repentibus nigris stipiti similis oriundo.

"Dalrymple creek (Lieut. Armitage) : Richmond River (Mrs. Armitage) and in various places, but seldom producing pilei. Nearly allied to *M. tomentillus*, which has very short stems. See Grevillea, Vol. VIII., page 153, where it is called *M. crinis equi.* I, however, follow the original name of Mueller." Mueller's name does not appear to have been published independently, and the strict " legal " name in that case would be *M. crinis equi* Kalch. The majority of mycologists will no doubt prefer Berkeley's version. Examination of the specimens at Kew shows that this is identical with the common Ceylon species. The collar can be distinguished on some of the specimens, and though they are umbonate, they can be matched in this respect by Ceylon specimens of the same size collected on the aerial mycelium. In the same cover is a specimen from Angola, which bears similar pilei, on which the collar can also be detected. Some of the specimens of mycelium from Australia are pale brown, but here, again, it is probable that the colour has been altered in preservation, though it is, of course, possible that this brown mycelium is another species. A specimen from Hart, of Trinidad, included under *M. equicrinis*, has quite a different habit, and is nearer *M. hippiochætes*, though the stalks are glabrous ; it is a collection of stalks, rather than rhizomorphic mycelium.

In addition to the above, the Kew Herbarium contains several specimens of similar mycelium, without any fructifications, from Berkeley's Herbarium, &c. One of these, on tea from Northern India (included with *Stilbum nanum*), is exactly like *Marasmius equicrinis* on tea in Ceylon ; and another collected by Teysmann in Java is indistinguishable from *Marasmius equicrinis*.

It would appear from the examination of the Kew specimens that the common aerial horse-hair blight of the West Indies is *Marasmius sarmentosus* Berk.; at any rate there is no West Indian specimen in the herbarium which can be attributed to *Marasmius equicrinis.* On the other hand, the specimens from Australia, India, Java, and Africa are *Marasmius equicrinis*, and these agree with the Ceylon form.

In " Enumeration des Champignons recoltés à Java par M. Massart " (Annal. Buitenzorg. Suppl. I., 1897, page 107) Patouillard has described and figured *Androsaceus ramentaceus* Pat., which appears to be *Marasmius equicrinis.* I quote the description verbatim :

" *Androsaceus ramentaceus* Pat. (voir., pl. XXIV., fig. 1–4). *Agaricus ramentaceus* Berk. sec. Lev. ap. Zoll. 16 : H. Z. No. 1,144.

" Mycelium rhizomorphoide, glabre, noir, terne, tenace, tres grêle, variant de l'epaisseur d'un cheveu à celle d'un crin de cheval, rameux, long de 30 à 50 centim., formant des touffes laches entourant les feuilles et les petits rameux sur lesquels il s'insere a l'aide de dilatations membraneuses, orbiculaires, larges de ·5 mm. à 1·5 mm. Chapeau convexe, atteignant à peine 2 millim. de diametre, ocrace roux, deprime au centre qui est releve d'une papille obtuse, marque de 5 ou 6 sillons profonds allant du centre à la circonference ; cellules de la pellicule distantes, ovoides ou arrondies, parfois fourchues, échinulees superieurment, pales roussatres, mesurant 6–10 × 8–12 μ ; lames peu nombreuses (5–6), entieres, elargies vers leur partie moyenne, attenuees aux deux extremites, atteignant le sommet du stipe, etroites, un peu plus pales que la face superieure du chapeau. Stipe central, noir, capillaire, aigu vers le haut, peu à peu epaissi vers la base, long de 4 à 5 millim., insere sur le mycelium.

" Le champignon est analogue et tres voisin de *Marasmius equicrinis* Mull. et de *M. trichorhizus* Speg.; *M. Balansæ* Pat., du Tonkin, est plus grand dans toutes ses parties et n'a pas de pellicule specialisee sur le chapeau."

Patouillard does not state that the gills are united behind ; but in specimens from the tangle the gills are generally attenuated behind, and the collar is extremely obscure.

Marasmius equicrinis has a specialized pellicle on the pileus, the cells being simple, up to 20 μ broad, echinulate at the upper end.

Agaricus ramentaceus Berk. is apparently a *nomen nudum.* Léveillé, in Zollinger, " Systematisches Verzeichnis der im Indischen Archipel gesammelten sowie der aus Japan 1842/48 empfangen Pflanzen," p. 16, lists " *A. ramentaceus* Berk., H. 1144. Ad ramos et folia pr. Tjikoya," without any description. This is the reference cited by Patouillard. Zollinger's list was published 1854–55, but the same list of fungi was published previously in Moritzi, " Systematisches Verzeichniss," &c., 1845–46 ; in the latter the record is "*Agaricus ramentaceus* Berk., No. 1144." In Hooker's London Journal of Botany, III. (1844), p. 329, Berkeley described specimens of Zollinger's collection which had been sent him by Montagne, but he did not describe *A. ramentaceus,* nor is there any description under another name which would apply to Patouillard's species. Berkeley's earlier lists appear to be equally blank, and hence it would seem that the description was never published. The first effective publication of *Agaricus ramentaceus* in this sense is therefore Patouillard's in 1897. There is a previous *Agaricus ramentaceus* Bull., which is an *Armillaria.*

In " *Fragmenta Brasilica* " (Ann. Mycol., Vol. VI., 1908, page 531) F. Theissen re-describes *Marasmius trichorrhizus* Speg. He states that it is identical with *M. equicrinis* Mull., *M. Balansae* Pat., *M. polycladus* Mont., and *M. repens* P. Henn., while *M. Baumanni* P. Henn. is only a variety. The pileus is 0·5–5 mm. in diameter, light to dark brown, flat or depressed in the centre, with or without a papilla ; the gills are at first white, very narrow, but generally become brown and broad, even ventricose ; the spores are somewhat pear-shaped, 8–13 × 4·5–6 μ. He notes that the fructification arises either from the rhizomorphoid mycelium or independently from twigs.

Rick (Ann. Myc., IX., page 176) also states that *M. trichorrhizus* Speg. = *M. polycladus* Mont.; that *M. Balansæ* Pat. is a form with a larger pileus ; and that *M. equicrinis* Mull. and *M. repens* P. Henn. are not " spezifisch verschieden."

I have not seen a specimen of *Marasmius trichorrhizus* Speg., but as Theissen does not mention any "collar," it would appear to differ in that respect from *M. equicrinis.* The identification of *M. polycladus* with *M. equicrinis* is certainly incorrect. A specimen of the former from Montagne, in the Kew Herbarium, arises from rather coarse mycelium, 0·4–0·5 mm. diameter, and closely resembles *M. obscuratus ;* it differs from the latter in having a glabrous stalk.

The type specimen of *Marasmius multiceps* B. & C. at Kew closely resembles that of *M. polycladus,* but it was said to differ in the colour of the pileus, the former being white and the latter brown becoming purple. *Marasmius hippiochætes* was said by Berkeley to be near *M. polycladus,* but the type specimen shows that it is a species with a small pileus and very long stalks, not a species which arises from a rhizomorphoid mycelium, as far as the specimen indicates. *Marasmius tomentellus* B. & C. from Cuba is another species which possesses rhizomorphoid mycelium, but its mycelium is clothed with white spreading hairs, which are apparently deciduous ; it is not *M. sarmentosus,* since the pileus is not shaggy. *M. erumpens* Mass., which was said to be "*M. sarmentoso* affinis," bears no resemblance to that species ; it has no rhizomorphoid mycelium, and its pileus is glabrous.

Without an inspection of the type specimens it is impossible to come to any valid conclusions concerning the other similar species of *Marasmius* which have been described from various parts of the Tropics. The following descriptions are quoted for reference, with some notes which they suggest. The Ceylon and Indian specimens would appear to indicate that the mycelium of any one species is constant in size and appearance.

"*Marasmius trichorrhizus* Speg. Mycelio rhizomorphoideo, gracili, setæ equinæ crassitudine v. vix ultra, rigidulo, glabro, atro, subnitente substrigose ramoso laxissime latissimeque expanso, 20–50 cm. long. et lat., ad corticem ac præcipue in ejusdem rimas repente, hinc inde ramulos fertiles (seu stipites) paucos, breviusculos, 1–2 cm. long., 0·15–0·18 mm. crass., erectos emittente ; pileo hemisphærico, 0·5–1 mm. diam., glabro, obscure testaceo v. rufescente ; lamellis paucis, stricte pliciformibus, pileo concoloribus; stipite rigido, erecto v. subflexuoso (in sicco), atro subnitente glabro, levissimo, ad basim non v. minute leniterque annulato incrassato; ad corticem truncorum putrescentium in silva virginea, Caa-Guazu Brasiliæ. Species ab omnibus adhuc cognitis forma magnitudine mycelii inconsueti distinctissima; specimina senescentia ac nonnihil obliterata, iterum inquirenda; an novum genus?" According to Spegazzini's description, the mycelium grows on dead trunks, not on living branches, and it is closely applied to the substratum, instead of being for the most part free as in *M. equicrinis;* it also differs from *M. equicrinis* in being rather rigid. But Theissen states (*loc. cit.*) that the black tough mycelial cords climb either singly or in clusters up to the crown of a tree, or form thick tangles in the bushes.

"*Marasmius bavianus* Pat. Pileo convexo, dein plano, sulcato, centro umbonato, albido v. fulvo, 0·5–1·5 mm. lato, tenui, pellicula cellulis clavatis, sursum muricatis, subhyalinis obtecto; lamellis pallidis, parum numerosis (7–8), adnatis; stipite glabro, setaceo, rigido, lucente, brunneofulvo, supra albido, 2–3 cm. long., $\frac{1}{3}$ mm. diam., sporis fusoideis uno apice obtusis, 10–12 × 3–4. Gregarius ad folia putria in silva Bavi, Tonkin Sinæ. Mycelium rhizomorphoideum lucens, ramosum. *M. aciculiformi* affinis." This species would seem to be near *M. equicrinis.* But a specimen in Herb. British Museum (Balansa, Champignons du Tonkin, No. 106) consists of dead leaves bearing only barren stalks, about 0·1 mm. diam.; there is no "horse-hair" mycelium.

"*Marasmius Balansæ* Pat. Mycelio rhizomorphoideo, cæspitoso, gracili, 1 mm. cr. (but see below), rigido, glabro, nigrobrunneo, intus albo; pileo campanulato convexo, margine deorsum involuto, 5 mm. lat., 3–4 mm. alt., brunneo, margine striato; carne ex hyphis ramosis septatis, centro hyalinis, exterioribus brunneis intertexta; lamellis distantibus, crassis, parum numerosis, albidis; stipite centrali, 15–18 mm. long., gracili, rigido, brunneo-nigro, glabro, apice attenuato, 1 mm. cr. Ad ramos arborum, Tonkin, Sinæ. A. *M. equicrini* et *trichorrhizo* quoad mycelium abundans, differt statura majore." This species appears to resemble *M. obscuratus*, from which it differs, according to the description, in its glabrous stalk. A specimen in Herb. British Museum (Balansa, Champignons du Tonkin, No. 98) consists of a mass of coarse, rather rigid mycelium, 0·35–0·55 mm. diameter ; there are no pilei.

" *Marasmius Stuhlmanni* P. Henn. Pileo membranaceo, convexo-plano, radiato-plicato, centro vix umbonato, margine repando-sinuato, pallide cinereobrunneo ; stipite setaceorigido, spadiceo-nigro, glabro, curvato e mycelio atrofusco, equi crini similis, assurgenti : lamellis adnatis, valde distantibus, angustis, anastomosantibus, concoloribus. In locis humidis pr. Butumbi, Kjenkesi Africæ centr. Pileus usque ad 1 cm. diam. ; stipes usque ad 3·5 cm. long., vix 0·5 mm. cr." From Hennings' figure this species appears to be different from both *M. equicrinis* and *M. obscuratus ;* but, on the other hand, the figure does not display any special characteristics. The shape of the pileus differs from that of *M. equicrinis*, being broadly convex and not umbilicate.

" *Marasmius repens* P. Henn. Pileo membranaceo, convexo, explanato, centro depresso, levi glabroque, margine sinuoso-crenato, rufobadio, 1–2·5 mm. diam.; lamellis coloratis, distantibus, paucis (6–8), ventricosis, pallidis ; stipite setiformi, corneo, rigido, atro, glabro, subnitente, circ. 1 cm. longo, e mycelio repente rhizomorphoideo, rigidulo, atro, ramoso oriente. Inter folia decidua in Camerunia. *M. trichorrhizo* similis."

" *Marasmius Baumanni* P. Henn. Pileo membranaceo, convexo-explanato, pallide flavo, plicato, centro depresso-umbilicato, papillato, atro, 3–5 mm. diam.; stipite corneo, filiformi, rigido, brunneo, nitente, basi obscuriore, 0·5–2 cm. longo, 0.3 mm. crasso ; lamellis coloratis, distantibus, paucis, acie subincrassatis, pallide flavescentibus ; mycelio rhizomorphoideo, filiformi, castaneo. In ramis putridis in Togo Afr. Occ. *M. rotulæ* Fr. affinis."

" *Marasmius pallide-sepiaceus* P. Henn. Pileo membranaceo, campanulato-expanso, obtuso, granuloso-squamuloso, pallide cinnamomeo, radiato-striato, 0·5–2 cm. diam.; stipite fistuloso, subcorneo, pruinoso, pallide brunneo, 0·5–1 cm. longo, 1–1·5 mm. crasso, basi discoideo villoso, e mycelio rhizomorphoideo, filiformi, atro oriente ; lamellis subtriquetro-decurrentibus, distantibus, ventricosis, pallide sepiaceis ;

sporis globosis, 3–3·5 μ diam., hyalinis. Ad ramos putres, Kamerun Afr." The decurrent gills and globose spores distinguish this species from *M. equicrinis*, if the description is correct.

It will be seen that in none of these species are the gills said to be united into a collar round the stalk. Therefore, on that character alone, it might be decided that none of them can be identical with *Marasmius equicrinis*. But, on the other hand, the original description of *M. equicrinis* does not mention the collar, and it is quite probable that the descriptions of the other species may be similarly defective. Exception might be made in the case of *Marasmius trichorrhizus*, which has presumably been examined in the fresh state by several mycologists.

Addendum.

The *Xylaria* figured on Plate VII. was included under the belief that it was the fructification of the undetermined horse-hair blight found at Hakgala. This, however, has not been established.

This species is common at Hakgala on dead leaves in the jungle. It has a black rhizomorphoid mycelium, which usually runs in short lengths from one leaf to another and fastens them together.

The *Xylaria* is produced on the dead leaves, not necessarily in direct connection with the black rhizomorphs. As a rule, several occur together on a single leaf. It varies from 1 to 4 centimetres in height. The stalk is about 0·5 mm. in diameter at the base, smooth, shining, longitudinally striate. The clava is from 5 to 15 millimetres long and about 1 millimetre in diameter; it is either continuous with strongly projecting perithecia, or interrupted with scattered perithecia. Above the perithecia the stroma is attenuated into a hair-like tip of varying length, sometimes 2 to 3 centimetres; this sterile tip may be simple or forked. In some cases growth continues at the tip, which ultimately becomes united to another dead leaf; the clava then resembles a group of perithecia on a long strand of mycelium. One such example is 20 centimetres in length, and bears sixteen perithecia scattered over a length of 14 millimetres.

The perithecia are projecting, with an acute ostiolum; internally they are oval, being flattened in the direction parallel to the clava, and measure 0·5 × 0·3 mm. The asci are cylindric, with a long tapering pedicel, the sporiferous part measuring 68–72 × 6 μ. The spores are black-brown, cymbiform, with rounded ends, 9–12 × 5–6 μ.

In some respects this species resembles *Xylaria filiformis* A. & S., but it is smaller, and its spores differ from those of the available specimens of the latter. It may be named *Xylaria vagans*.

Xylaria vagans n. sp. 1–4 cm. alta; stipite 0.5 mm. diam. nigro, glabro, longitudinaliter striato; clava, 5–15 mm. longa, 1 mm. diam., continua vel interrupta, apice in processu prælongo filiformi producta, peritheciis prominentibus, ostiolo acuto, ovalibus, 0·5 × 0·3 mm.; asci cylindraceis, longe pedicellatis, octosporis, sporis oblique uniseriatis, parte sporifera 68–72 × 6 μ; sporis cymbiformibus, apice obtusis, nigro-brunneis, 9–12 × 5–6 μ; mycelio rhizomorphoideo.

Description of Plates.

Plate II.—Mycelium of *Marasmius equicrinis* on a tea branch: leaves of the tea removed to show the mycelium. × ½.

Plate III.—*Marasmius equicrinis* growing on dead leaves, twigs, &c., developed in the laboratory: about natural size.

Plate IV.A.—*Marasmius equicrinis* developed in the laboratory from the aerial mycelium: natural size.

Plate IV.B.—*Marasmius rotalis*; natural size.

Plate V.—*Marasmius obscuratus*; natural size.

Plate VI.—*Marasmius coronatus*; natural size.

Plate VII.—Fig. 1.—Mycelium of *Marasmius equicrinis* on Nutmeg: natural size.

Fig. 2.—*Marasmius equicrinis* on aerial mycelium: natural size.

Figs. 3 and 4.—Growing points of the aerial mycelium of *Marasmius equicrinis*. × 40.

Figs. 5–7.—*Xylaria vagans*, on dead leaves. × 2.

Fig. 8.—Sterile mycelium of *Xylaria vagans*. × 2.

Fig. 9.—*Xylaria vagans*; longitudinal section of clava. × 8.

Fig. 10.—*Xylaria vagans*; ascus and spores. × 650.

MYCELIUM OF MARASMIUS EQUICRINIS X 1/2

MARASMIUS EQUICRINIS

A

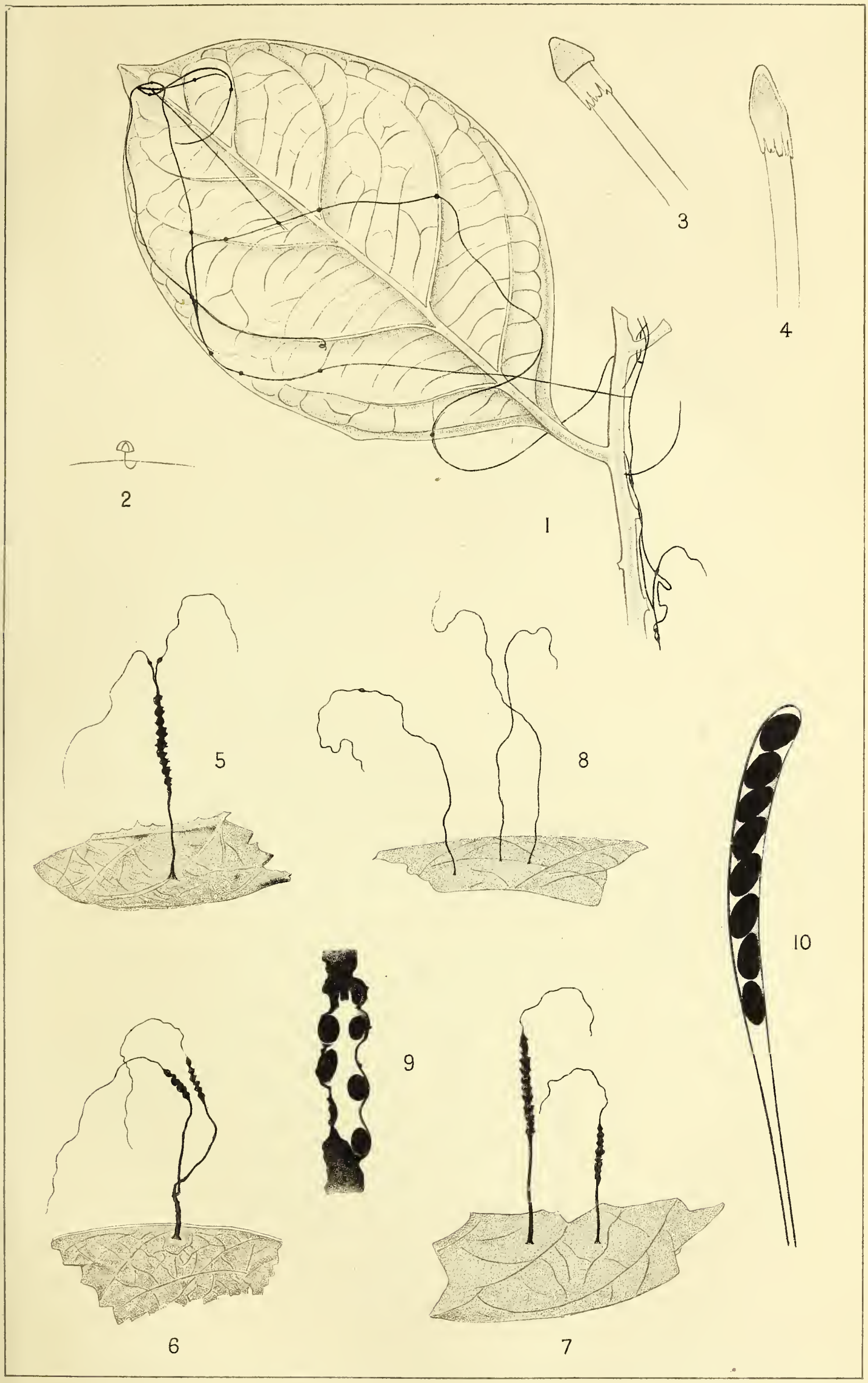
MARASMIUS EQUICRINIS

B

MARASMIUS ROTALIS

MARASMIUS OBSCURATUS

MARASMIUS CORONATUS



West, Newman lith.

HORSE-HAIR BLIGHTS.

NOTES.

Centranthera procumbens Benth.—The white variety of this species was collected by Mr. F. Lewis at Hiripitiya, North-Western Province, in February, 1915. In Trimen's Flora of Ceylon "seeds spirally striate " is given as a character of *C. hispida* Br. only ; from the herbarium specimens it is a feature common to all the Ceylon species.—T. P.

Sesamum prostratum Retz.—Specimens of this plant were collected by Mr. F. Lewis at Panawa, Eastern Province, where it was common on the seashore, in August, 1914. This is the first record of this species for Ceylon.—T. P.

Ferns.—*Gymnopteris tomentosa* (Lam.) Und., a South American fern, is now common along the roadside from the Botanic Gardens to the Railway Station, and in the neighbouring tea, at Peradeniya ; we have no record of its introduction. The common silver fern *Ceropteris Calomelanos* (L.) Und., another American species, has also escaped from cultivation and become established in the neighbourhood of Peradeniya over a wide area.—T. P.

Psoralea corylifolia L.—Specimens of this plant have been sent me by Mr. C. Drieberg from Bodiwela near Lemesuriagama (Walapane district), where it is used as a green manure. Its use for that purpose in Delft was recorded, on the authority of Mr. J. P. Lewis, in Ann. Peradeniya, V., p. 186. The description in Flora of Ceylon and Flora of British India states that the leaves are copiously sprinkled with black glandular dots. That applies to the dried specimens only ; on the fresh leaves the glands are green. Flora of British India gives the flowers as yellow ; in Ceylon specimens they are purple, as described by Trimen.—T. P.

Liparis Walkeriæ Graham.—This species, which is not uncommon at the edge of the jungle at Hakgala, is said to have sepals five-veined. In specimens collected at Hakgala the sepals were found to be three-veined, and an examination of the herbarium specimen, C. P. 2376, showed that the same was true of that specimen also. The base of the lip of this species bears two elongated subparallel purple tubercles. The character relied upon for its separation in Trimen's (?) key of the genus, " column long, slender," though true for the dried specimens, is inapplicable to fresh specimens ; in the latter the column is about 3 mm. long, and 1 mm. broad in the middle.—T. P.

Mgandamalej.—In an article on "*Bidens Chinensis* (L.) Willd. und verwandte Arten" (Engler's Bot. Jahrb., Bd. L. (supplement), pp. 176–187), O. E. Schulz states that specimen No. 15023 in Herb. Willdenow, named *Bidens Chinensis* Willd., was collected by Klein on February 29, 1796, at Mgandamalej in Ceylon. As Mgandamalej is evidently not a Ceylon name, this record appeared doubtful, but the puzzle was solved by Trimen (Flora of Ceylon, iv., p. 27), who wrote as follows with regard to a similar record of *Blepharispermum petiolare* DC. :—" The original specimens were collected ' Prope Uganda-malej ' on ' 29 February, 1796,' Wight says by Klein ; but this is apparently an error for Rottler, who travelled down our East Coast in that month and year. The place is now called Ukanda. The specimens, however, are no longer in Rottler's Herbarium, having been, as in some other cases, probably transferred to Klein's, who was also a member of the Tranquebar Moravian Mission."—T. P.

Lastræa sparsa var. undulata.—In Wall's catalogue of the ferns indigenous to Ceylon this variety is said to be confined to the upper part of Wattakelle Hill. Beddome, in " The Ferns of British India and Ceylon," states that it is only found on the top of the hill over the Hakgala Government Gardens ; this is apparently in error, as we have no specimens in the Herbarium from that locality. Some years ago this variety was discovered by Mr. T. Farr near Wettanagala Peak, 12–14 miles east-south-east of Adam's Peak ; and specimens collected in Maskeliya have recently been received from Mr. R. Maclure. —T. P.

New Aliens.—*Veronica serpyllifolia* L. is now common along the golf links at Nuwara Eliya (April, 1915). *Prunella vulgaris* L. is well established at Nuwara Eliya in drains by the roadside (April, 1915). A form of *Sonchus arvensis* is now well established up-country, and during the last few years has spread to medium elevations. It was not collected by Thwaites or Trimen, nor by Willis and Smith in their investigation of the up-country flora in 1906. In 1912 the writer noted it in abundance below Haputale, along the road to Haldummulla. During the last two or three years it has sprung up in considerable quantity on the " made " ground round the new museum in the Botanic Gardens, Peradeniya, and still persists there. It was not sent in from any estate during the inquiry into the presence of weed seeds in manure in 1912–13.—T. P.

Native Names for Plants.—*Mollugo nudicaulis* L. is known as " Kawudu-tirar " at Okanda, Eastern Province, *fide* F. Lewis. The Water Hyacinth (*Eichhornia crassipes* Solms.) has received the name of " Japan Yabara " in the Tangalla district, *fide* W. E. Wait. *Mikania scandens* Willd. is known as " Mokattu " T. (veil creeper) in the Trincomalee district. Mr. C. Drieberg points out that the Sinhalese name of *Jatropha Curcas* is not " Rata-endaru " as given in Trimen's Flora of Ceylon, p. 46, but " Wata-endaru " (wata = hedge). From the Southern Province *Uvaria Narum* Wall. has been received, with the information that it is called " Pangan." *Andropogon aciculatus* Retz. has been sent in with the names " Pitinei Pillu " T., " Bin Thanakola " S., and " Ambagamuwa Grass." From the Elkaduwa district Dr. C. M. Thomasz reports that *Achyranthes aspera* L. is known as " Navarangi Ella " T., *Leucæna glauca* Benth. as " Vada Raja " T., *Jatropha Curcas* L. as " Sen Cotta Ella " T., *Vitex Negundo* L. as " Ang-ela Nutchi " T. and " Nika Korla " S. *Symplocos spicata* Roxb. has been sent in from the Gampola district under the name of " False Tea Plant."—T. P.

Eulophia.—The key to the genus *Eulophia* in Trimen, Vol. IV., p. 175, appears to have been badly " pied " by the printer. According to it, *E. macrostachya* has a tuberous hypogeal rootstock, and its column is not produced into a foot, but the description of that species correctly states that its column is produced into a very short foot and that it has a pseudo-bulb. The key would appear to require re-arranging as follows :—

Column not produced into a foot—

sep. linear oblong, acute or obtuse .. *E. virens*
sep. lanceolate, acuminate .. *E. graminea*

Column produced into a foot—

Pseudo-bulb epigeal .. *E. macrostachya*

Rootstock tuberous, hypogeal—

L. and fl. produced together .. *E. nuda*
L. produced after flowers .. *E. sanguinea*

Alternatively the primary division may be made to depend on the presence of an epigeal pseudo-bulb in the first three species.

The difference (in the key) between *E. nuda* and *E. sanguinea* is not constant ; the flowers of *E. nuda* may appear before or at the same time as the leaves. The statement that the sepals of *E. nuda* are connivent " at the base " should be " at the apex," but this character is not universal.—T. P.

Blumea amplectens DC.—The C. P. specimens of this species appear to have been considerably mixed. In Herb. Peradeniya, C. P. 1730 is *B. amplectens*, and *Erigeron asteroides* Roxb., C. P. 1732 (2 sheets) is *Blumea bifoliata*, and C. P. 3523 (marked in pencil, also marked 1730) is *B. amplectens* and *Erigeron asteroides*. Clarke, Compositæ Indicæ, states that C. P. 1732 is *Blumea amplectens*, and C. P. 3523 is *B. bifoliata*. Flora of British India gives C.P. 1730 (in part) as *B. amplectens* and C. P. 3523 as *B. bifoliata*. Trimen's Flora of Ceylon gives C. P. 1730 and 1732 as *B. amplectens* and states that C. P. 3523 is not in Herb. Peradeniya. In Trimen's Flora the achene of *B. amplectens* is said to be very small, oblong, compressed, three-ribbed ; this description is evidently taken from C. P. 1730 and refers to *E. asteroides ;* the fruit of *B. amplectens* is purple-brown, oblong, not ridged, covered with white adpressed hairs, and with a crown of minute hairs at the apex.—T. P.

An abnormal Clathrus Egg.—Five eggs of *Clathrus crispatus* were gathered at Hakgala in 1914. All appeared to be normal, but when they expanded one of them proved to be double.

The surface of the egg of this species is marked with a network of lines which correspond in position with the meshes of the net. Between the lines it is swollen, so that the surface consists of a series of tubercular elevations. These swellings at the top of the egg are roughly hexagonal (in plan) and about a centimetre broad, but those which run down to the base are much larger and elongated. A figure of the normal egg was published in the Annals of the Royal Botanic Gardens, Peradeniya, Vol. IV., Plate xiii. When the egg is mature, but not expanded, the receptaculum forms a compact sphere in the centre, surrounded by a thick layer of jelly, and the tubercular swellings contain jelly only.

In the present case the diameter of the egg was 8 centimetres. The central receptaculum was quite normal, but one of the surface swellings situated near the base contained an additional receptaculum. The elongated tubercular area was 4·5 centimetres long and 2·5 centimetres broad, and the miniature receptaculum nearly filled this space.

This additional receptaculum was separated by a layer of jelly from the normal receptaculum in the centre, and sprang from the outer wall of the egg at a node of the superficial network. As it was not separated from the main egg by any layer corresponding with the outer wall of the egg, it was not a case of the fusion of two eggs which originally arose independently, but close together, from the mycelium, as so often occurs in *Dictyophora*.

The abnormal receptaculum was laterally compressed. Its lower half formed a funnel, 1·5 centimetre high and 1 centimetre diameter above, which divided into the five primary arms of the net. On one side the funnel was continuous, except for a single perforation, but the other side was netted almost to the base. The arms of the net were 1·5–3 mm. broad, and the number of meshes in the upper part of the net about nine. It may be noted that in normal specimens of *Clathrus crispatus* the arms of the net are 2–2·5 cm. broad. The receptaculum did not differ notably from the normal, except in its small size and in the absence of any gleba.

Doubling of the receptaculum within a single egg is fairly common in *Simblum periphragmoides* (see Annals, Peradeniya, IV., p. 167 ; V., p. 13), though in the cases observed both the stalks arise from the base of the egg. This is the first time I have met with the phenomenon in *Clathrus*.—T. P.

Beetles and Fungi.—In Jour. Linn. Soc. XVI., p. 41, Berkeley recorded the presence of a fluffy mass of insect dung on *Hirneola rufa*. The note, which runs as follows, is apparently one made by the collector of the specimens during the " Challenger " expedition :—" These fungi were all found in the dry condition, being collected in the dry season. Some are attacked by an insect larva, whose dung takes the form of a curious fluffy mass."

Similar occurrences of a loose fluffy mass on the more persistent species of fungi, *e.g.*, *Polyporus*, *Fomes*, *Hexagonia*, &c., are common in Ceylon. These masses are composed of rather rigid curly threads, about 0·1 mm. diameter, loosely intertwined, and resemble a handful of curled horse hair. The colour varies according to the fungus. On *Polystictus Persoonii* and *Polypori* of similar context it is white or yellowish ; on *Fomes australis* it is yellowish brown ; on *Hexagonia apiaria* and *Hirneola hispidula* it is red-brown.

After numerous discussions with several entomologists who insisted that no insect could produce such a structure, it was found in course of formation on an extensive growth of *Polyporus secernibilis* in my garden at Peradeniya. From the *Polyporus* several beetle larvæ were isolated, and these were kept under observation in glass dishes in the laboratory, being fed with *Polyporus secernibilis*, or *Lentinus subnudus*, or *Polystictus flabelliformis*. When placed on the under surface of the fungus the larva immediately began to eat, and almost simultaneously the white filament began to issue *ab ano*. There was, therefore, no possible doubt that the fluffy mass was produced by an insect. Apparently the filaments are produced continuously as the larva eats. As a rule, the larvæ feed on (or near) the surface of the fungus, and the fluffy mass of dung may serve as a protection.

To obtain the beetle the pieces of *Polyporus* on which the larvæ were feeding were placed on sterilized (baked) soil in glass dishes. As a further check several larvæ were transferred to similar dishes containing pieces of *Polystictus flabelliformis*, which had also been baked. The beetles emerged in about three weeks after the larvæ had gone to earth. Of 135 beetles obtained in these dishes, 118 were *Ceropria induta* Wied., and 16 *Toxicum oppugnans* Walk. The remaining beetle was a smaller species ; it has apparently been mislaid, but, like the two already mentioned, it was a *Tenebrionid.* Possibly the habit of producing a fluffy mass of dung is common in that group, though I have not been able to find any reference to it, nor to meet any entomologist who was aware of it. But the specific name of the *Ceropria* suggests that it was known to the describer of that species.—T. P.

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DEPARTMENT OF AGRICULTURE, CEYLON.

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EDITED BY

T. PETCH, B.A., B.Sc.

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The Girth Increment of Hevea brasiliensis.

BY

T. PETCH, B.A., B.Sc.

IN January, 1912, regular girth measurements on *Hevea brasiliensis* were begun at Peradeniya as part of an investigation into certain phases of the physiology of the tree. It was not, however, found possible to carry out the investigation planned, but the girth measurements were continued; and as few such measurements relating to the growth of trees in the tropics have been published, it has been thought desirable to place them on record.

Sixteen trees were selected, eleven of which were seven years old, and the remaining five five years old. They formed three groups, of seven, four, and five trees, respectively. The trees of the first two groups were planted 20 feet by 30 feet in tea. The first group consisted of seven consecutive trees in the same row on the same level. The second group was situated a short distance away, in a slight depression, about 6 feet below the level of the first group, the four trees standing consecutively in the same row. The trees of the third group were more closely, but irregularly, planted through cacao, the latter being planted at the same time as the *Hevea*. All three groups were within a distance of 200 yards.

As numbered in the present account, trees 1, 4, 8, 9, 10, 11, 12 constitute the first group, trees 2, 5, 13, 14 the second, and trees 3, 6, 7, 15, 16 the third.

Measurements were taken weekly, on the same day each week at 9.30 A.M., and as the trees were being grown under ordinary estate conditions, they were taken at a height of 6 feet from the ground, in order to avoid any errors due to the removal of the bark during tapping. A line was drawn on the stem at that height, and measurements were made along the line with a steel tape.

When the measurements were begun, trees Nos. 1 to 8 were untapped, while the remainder had been in tapping for one or two years. All the trees were rested, *i.e.*, not tapped, from February to June, 1912, after which tapping was resumed on the trees Nos. 9 to 16. In October, 1912, tapping was begun on trees Nos. 4 to 8. In August, 1913, trees Nos. 1, 2, 5, 10, 11 were felled.

The girths of the trees, at a height of 6 feet, varied from 19·8 to 44·3 cm. The difference were not in any way related to the position of the trees, both the largest and the smallest trees being situated in the same group. Tree No. 4, girth 20·2 cm., stood next to tree No. 9, girth 44·3 cm.

Measurements were taken to the nearest millimetre. The results have been grouped in periods of four weeks each, or thirteen for the year. The curves on Plates VIII.–XI. show the total increment in millimetres from the beginning of the year up to the end of each four-week period as ordinates, at distances of 1 centimetre for each period. The curves for each tree for the consecutive years 1912, 1913, 1914 are grouped together under one another.

On Plate XII. the total increment from the beginning of the year is given for each week for the months January to March, the curves of the three years, in the case of each tree, being arranged on the same horizontal line. As before, the ordinates represent the actual increment in millimetres, while the weeks are represented by distances of 5 millimetres each.

The minimum temperature at Peradeniya ranges from about 68° F. to 73° F., and the maximum from 86° F. to 91° F. The rainfall is divided between two distinct periods, corresponding to the north-east and south-west monsoons. January, February, March are usually dry months, the temperature gradually increasing during that period. April should be wet and hot, but rather less rain falls in May. In June and July the heavy rains of the south-west monsoon prevail, and the temperature falls. August and September have only about one-half the rainfall of June and July. In October the rains of the north-east monsoon set in, and continue into December.

There is thus, on the average, one distinctly dry period, January–March, and two periods of heavy rain, June–July and October–November. The coldest nights and the hottest days occur in the dry period.

Hevea brasiliensis, after attaining the age of two years, sheds its leaves completely, once a year, at Peradeniya, and, as in the case of most other deciduous trees which have a yearly period, this occurs during the dry season. Flowers are produced immediately after, or simultaneously with, the new leaves (about March–April), and the fruit ripens in August–September.

From the curves for 1912 it will be seen that there is no increase in growth, as a rule, during the dry period, January–March, in which the leaf-fall occurs. As far as is indicated by external measurements, growth in thickness begins at the end of March or the beginning of April, and continues at a fairly uniform rate until about October. It then falls off to about half its former rate during October, November, December, or it may cease altogether at any date during these months.

It has to be borne in mind that the data here recorded were obtained by external measurements, as in the earlier experiments on the same subject in temperate climates, and they do not necessarily give any indication of the actual activity of the cambium at a given date. Brown (1) has pointed out that "any data secured through bark measurement are unreliable because of the continual changes going on in the older parts of the secondary cortex, and changes which bear no relation to the newly-forming rings. As a result, only broad generalizations can be drawn from data based on such methods." It is probable that such changes are of minor importance in the present case, as the trees were young and the bark smooth and continuous during the period under review.

In Brown's experiments on *Pinus Strobus*, based on the determination of the actual increment in the annual ring, two periods of optimum growth intensity during the year were observed. "The cambium may be very active for a time, then slacken its growth, this to be followed again by renewed activity, with a final slump toward the end of the growing season." He notes that this had been previously determined by Friedrich, who made his observations with the help of calipers and found that in both coniferous and hard-wood trees there were two periods of growth, one lasting to the end of May, then sinking until the middle of June, followed later by another maximum again in July, and then rapidly diminishing and ceasing altogether. A similar course of growth has been postulated for trees in countries which enjoy two well-defined rainy seasons, it being supposed that a period of maximum growth would coincide with each wet season. The data obtained in the present case do not, however, support this conclusion, the growth in general declining regularly during the second wet season, or ceasing altogether.

In exceptional cases a tree may show no increase in girth between two consecutive weekly measurements in the growing season. Thus, tree No. 4 showed no increase during the first week of June, 1913, and again during the second and third weeks of July of the same year. The largest tree, No. 9, showed no increase for three weeks in July, 1912.

In 1913 the rainfall for January was abnormal, 22·5 inches, instead of the average 3·5 inches. Probably for that reason nine of the trees show a marked increase in girth during January and February, due to a continuance of the growing period into those months. The contrast between the growth during the first three months of 1913 and that of 1912 and 1914 is most marked in the case of tree No. 12. Seven of the trees, however, fail to exhibit any response, so far as the girth increment is concerned, to the abnormal rainfall.

In several cases it is evident that the curves for the two years are strikingly similar, and more or less independent of external conditions. In the case of tree No. 3 growth ceases in both years at the beginning of November, and does not begin again until March. Tree No. 6 presents a similar case. But in the case of tree No. 15 growth is continued each year into February. The first two of these trees have a non-growth period (not a leafless period) of four or five months, while the third has only one of four to seven weeks. These instances would appear to indicate that the character of the growth curve is, in some cases, peculiar to the individual tree, and is to some extent an expression of the "individuality" of the tree rather than a reflection of external conditions.

The curves for the first three months of each year are shown on Plate XII., the two vertical lines indicating the time of the change in the colour of the leaf and of the full development of new leaf respectively. Generally speaking, this occupies from four to six weeks. Within a week after the change of colour all the leaves have fallen and the tree is bare. In another week the buds are shooting. A week later the new leaves are evident, but another two or three weeks elapses before they are fully formed and rigid. As an example, the records of tree No. 3 for 1912 may be quoted. These are as follows :—

January 28 : Leaves changing colour.
February 4 : Leafless.
February 11 : Buds just shooting.
February 18 : Leaves just developing.
February 25 : Leaves half normal size.
March 3 : Leaves full size but limp.
March 10 : Leaves rigid.

These records were, as previously stated, taken only at weekly intervals, and the exact date of the final change may lie anywhere between the last two dates.

In 1913 the period occupied by these changes was greatly extended, in one case to ten weeks. This was due chiefly to the irregular "wintering" of the trees, the different branches of the same tree shedding their leaves at different times, so that several trees were never entirely leafless. For example, the upper branches of tree No. 6 began to lose their leaves on January 5, and on February 23 their new leaves were fully formed, but the leaves on the lower branches were then just beginning to fall, and these branches did not complete the change until March 16. The total change of leaf was spread over ten weeks, but the tree "wintered" in two distinct halves. This individuality of different branches on the same tree is often a marked feature in the leaf-fall of deciduous trees in the tropics, as has been previously recorded by Wright and others, but it is not usually so pronounced in the case of *Hevea brasiliensis* as it was in this abnormally wet season.

In 1914 the period occupied by these changes was shorter than usual, being only three to four weeks.

In general no increase in girth occurs during the change of leaf. Some exceptions to this rule will be noted in the curves for 1913, but these are, at least in part, explainable by the irregularity in the leaf-fall which occurred in that year. How long before the leaf-fall the growth in girth ceases depends apparently upon the individual tree. It may be three months, as in tree No. 3, or only one or two weeks, as in tree No. 15. In general the increase in girth begins again from one to three weeks after the leaves are fully formed.

Brown states that, in *Pinus Strobus*, growth in thickness begins before growth in length in each year. His data were obtained from determinations of cambial activity, and are therefore more accurate than those of the present case, but he quotes Christison's results, which were obtained from bark measurements, as agreeing with his own. The measurements on *Hevea* indicate that in this species growth in length occurs before the stem increases in thickness by any amount perceptible by external measurements at a height of 6 feet.

In Ceylon increase in length in the stems and branches of *Hevea brasiliensis* proceeds by sudden and brief bursts. A green shoot, varying in length from about 3 inches on the lower branches to about 2 feet in the case of a leader, is produced, bearing rudimentary leaves ; the latter develop to their full size, remain limp for a few days, and then become rigid and assume their normal position. The leaves are born chiefly towards the apex of the new shoot, and the petioles of the lower are elongated, so that the leaves form, more or less, a rosette. The whole process occupies from two to four weeks at the elevation of Peradeniya.

At various times during the year other outbursts of new shoots occur. Indeed, it is scarcely possible to look at a *Hevea* plantation of about ten years' standing at any time without seeing new shoots on some of the trees. The pale green of the new shoots contrasts strongly with the darker older foliage, and consequently the phenomenon is one well-known to all rubber planters. But opinions differ widely as to the number of times it occurs during the year, as many as six having been claimed.

Observations on the measured trees at Peradeniya have shown that at this elevation, in addition to the first re-clothing of the tree, there may be two main periods of production of new shoots on any given tree, one at the end of April and the beginning of May, and the other at the end of June and the beginning of July. But all the branches of any given tree do not produce new shoots at the same time, and consequently their appearance is prolonged, so that the two periods overlap, and the second is indefinitely extended. On a tree which showed new growth in the leader on June 23, the lower branches were elongating on August 25. Counting the first of these dates as the beginning of the third burst of the year, this period of growth was spread over two months. The "individuality" of the separate branches has here full play, and it is this which has given rise to the exaggerated idea as to the number of times these growth bursts occur during the year. On any given tree of this species there may be, including the first growth after the leafless period, three outbursts of new shoots during the year at Peradeniya. On the other hand, many trees in the immediate neighbourhood may not produce any new foliage after the first. In the case of a leader three new lengths may be produced in the year, but on the lower branches it would appear that at most only two occur.

It will be noted that in several of the curves a decrease in girth is indicated during the dry months. As the unit adopted is only a millimetre, it might be considered that this decrease is only an apparent one, and due to errors of measurement. But as the measurements were always repeated whenever no increase was shown, and as the decrease continues in several cases for some weeks, it is believed that the figures indicate an actual occurrence. In 1912 this decrease varied from 1 to 3 millimetres, and was exhibited by twelve trees out of the sixteen. In the wetter season of 1913 it was in no case greater than 1 millimetre, and was shown by only seven trees. In 1914 it occurred in four trees out of ten, and varied from 1 to 2 millimetres. There was no scaling off of the bark during these periods, the pencil mark which served to indicate the place of measurement remaining distinct throughout. It would appear, therefore, that a slight shrinkage of the stem can occur in the dry season.

It has been stated that *Hevea brasiliensis* responds rapidly, by alterations in girth, to differences in the amount of water available. It has, for example, been recorded that if a "ligature" be tied tightly round the stem in the early morning, it will be found to be quite slack at midday, and the explanation has been given that this is due to the shrinkage of the stem owing to the loss of water during the day by transpiration. Actual figures have been given, *e.g.*, that a tree 36 inches in girth will decrease by half an inch between sunrise and midday (2). The kind of ligature employed has not been recorded, but it may be pointed out that if a piece of string were tied round the stem in the early morning when everything is damp it would naturally become slack, through drying, by midday on a dry day.

It has further been stated that *Hevea* of the same age as those of the present account and at the same elevation, 20 inches in girth, will show an increase of a quarter of an inch in girth after a heavy shower, as determined by ordinary estate measurements.

Both these effects have been sought for unsuccessfully in the case of the trees whose measurements are recorded here. Measurements have been taken in the early morning, at midday, and in the evening, but they did not show any appreciable difference. Again, measurements have been taken after heavy rain which followed several days of fine weather, when rain fell on the day, or the next day after, the usual measurements had been recorded, but in no case was any increase observable.

The average increase in girth at Peradeniya during the maximum period of growth is about 2 millimetres per week. A sudden increase of 6 millimetres would, therefore, equal three weeks' growth. Moreover, if such increases really occurred, one might expect to find corresponding decreases during the dry weather, but the greatest decrease recorded only amounts to 3 millimetres in nine weeks, and it was never greater than 1 millimetre per week. In ordinary estate measurements, in which the trees are not measured at a fixed line, but only approximately at a height of 3 feet, it has been found that the possible error is fully half an inch.

The initial girths of the trees and the increments for each year are given in the following table. The increments are tabulated separately for January–March, the dry season, April–October, the period of most active growth, and November–December. All measurements are given in centimetres :—

No. of Tree.	Initial Girth, 1912.	Jan. to March.	April to Oct.	Nov. to Dec.	Initial Girth, 1913.	Jan. to March.	April to Oct.	Nov. to Dec.	Initial Girth, 1914.	Jan. to March.
1	19·8	0	7·1	0·8	27·7	0·3	—	—	—	—
2	21·6	0·3	5·7	0·5	28·1	0·2	—	—	—	—
3	23·8	0·1	4·2	0	28·1	0·5	3·9	0	32·5	0·5
4	20·2	0·3	5·7	0·4	26·6	0·2	5·0	0·4	32·2	0·1
5	20·2	0·2	5·2	0·8	26·4	1·1	—	—	—	—
6	25·0	0	5·0	0·2	30·2	0	3·4	0·4	34·0	0·1
7	28·0	0·1	7·0	1·1	36·2	0·8	5·8	1·1	43·9	0·3
8	23·5	0	7·3	1·1	31·9	1·0	7·1	1·3	41·3	0·4
9	44·3	0·2	2·8	1·1	48·4	1·0	2·7	1·0	53·1	0·3
10	31·5	0	6·1	1·1	38·7	0·4	—	—	—	—
11	32·6	0·1	6·0	1·3	40·0	1·0	—	—	—	—
12	35·0	0	8·4	1·2	44·6	0·8	7·6	0·5	53·5	0
13	36·9	0·1	5·0	0·1	42·1	0·1	5·3	0	47·5	0·3
14	31·2	0·1	8·5	1·0	40·8	0·5	6·9	0·6	48·8	0·2
15	38·6	0·4	6·2	1·0	46·2	0·7	4·1	1·0	52·0	0·9
16	33·2	0·1	5·8	0·3	39·4	0·1	5·5	0·7	45·7	0·4

The percentage increases for each year are given below :—

No. of Tree.	Girth, January, 1912.	Percentage Increase, 1912.	Girth, January, 1913.	Percentage Increase, 1913.
1	19·8	39·9	27·7	—
2	21·6	30·1	28·1	—
3	23·8	18·1	28·1	15·7
4	20·2	31·7	26·6	21·1
5	20·2	30·7	26·4	—
6	25·0	20·8	30·2	12·6
7	28·0	29·3	36·2	21·3
8	23·5	35·7	31·9	29·5
9	44·3	9·3	48·4	9·7
10	31·5	22·8	38·7	—
11	32·6	22·6	40·0	—
12	35·0	27·4	44·6	20·0
13	36·9	14·1	42·1	12·8
14	31·2	30·8	40·8	19·6
15	38·6	19·7	46·2	12·6
16	33·2	18·7	39·4	16·0

As previously stated, the first three trees were untapped during the whole period, the next five were not tapped during the period of most active growth of the first year, while the last eight had been tapped for some time previous to 1912. There does not appear to be any marked effect in the growth of trees Nos. 4 to 8, which can be attributed to the tapping. The poor growth of tree No. 9, the initially largest tree, will be noted ; this tree bore a heavy crop of seed in both years.

Rainfall.

	1911. Inches.	1912. Inches.	1913. Inches.	1914. Inches.	Average, 31 Years. Inches.
January	1·68	0·39	22·29	1·65	3·58
February	—	—	0·91	·45	1·75
March	8·02	4·74	3·99	4·33	4·96
April	3·67	5·83	9·26	5·22	10·45
May	1·43	4·20	4·43	5·39	6·02
June	15·93	9·79	7·21	9·59	10·26
July	8·13	15·08	5·54	5·35	8·13
August	4·85	4·59	5·20	4·50	6·00
September	7·96	2·44	2·22	8·78	6·72
October	12·54	10·89	32·03	14·41	14·02
November	7·85	9·67	11·14	8·77	9·77
December	20·23	14·84	16·18	16·27	9·18

References.

(1) Brown, H. P.—Growth Studies in Forest Trees. 2. Pinus Strobus L. Botanical Gazette, LIX., pp. 197–240.

(2) Ridley, H. N., and Derry, R.—Agricultural Bulletin of the Straits and Federated Malay States, IX., p. 258.

Explanation of Plates.

Plate VIII.—Growth curves of three untapped trees.

Plate IX.—Growth curves of four trees tapped from October, 1912.

Plate X., XI.—Growth curves of tapped trees.

Plate XII.—Growth curves of the above trees from January to April.

As the vertical lines which indicate the dates of the change in colour of the leaf and the full development of the new leaf respectively are not clearly indicated on Plate XII., these dates are given in the following table:—

No. of Tree.	1912.	1913.	1914.
1	Feb. 11–Mar. 10	Jan. 26–Mar. 16	—
2	Feb. 11–Mar. 10	Feb. 9–Apr. 6	—
3	Feb. 4–Mar. 10	Jan. 5–Mar. 2	Jan. 23–Feb. 15
4	Jan. 28–Mar. 10	Feb. 9–Mar. 23	Feb. 15–Mar. 8
5	Feb. 18–Mar. 24	Feb. 9–Apr. 6	—
6	Jan. 28–Mar. 10	Jan. 5–Mar. 16	Feb. 15–Mar. 15
7	Feb. 11–Mar. 17	Mar. 2–Mar. 30	Feb. 15–Mar. 15
8	Feb. 11–Mar. 10	Feb. 16–Mar. 30	Feb. 15–Mar. 15
9	Feb. 11–Mar. 10	Feb. 9–Mar. 30	Feb. 15–Mar. 15
10	Feb. 11–Mar. 17	Feb. 16–Mar. 30	—
11	Feb. 4–Mar. 10	Feb. 9–Mar. 23	—
12	Feb. 11–Mar. 17	Feb. 9–Mar. 30	Feb. 22–Mar. 15
13	Jan. 21–Mar. 3	Feb. 16–Mar. 23	Feb. 15–Mar. 15
14	Feb. 4–Mar. 3	Feb. 9–Mar. 23	Feb. 15–Mar. 15
15	Feb. 11–Mar. 17	Mar. 2–Mar. 23	Mar. 1–Mar. 22
16	Feb. 11–Mar. 17	Feb. 16–Mar. 23	Feb. 15–Mar. 15

PLATE VIII

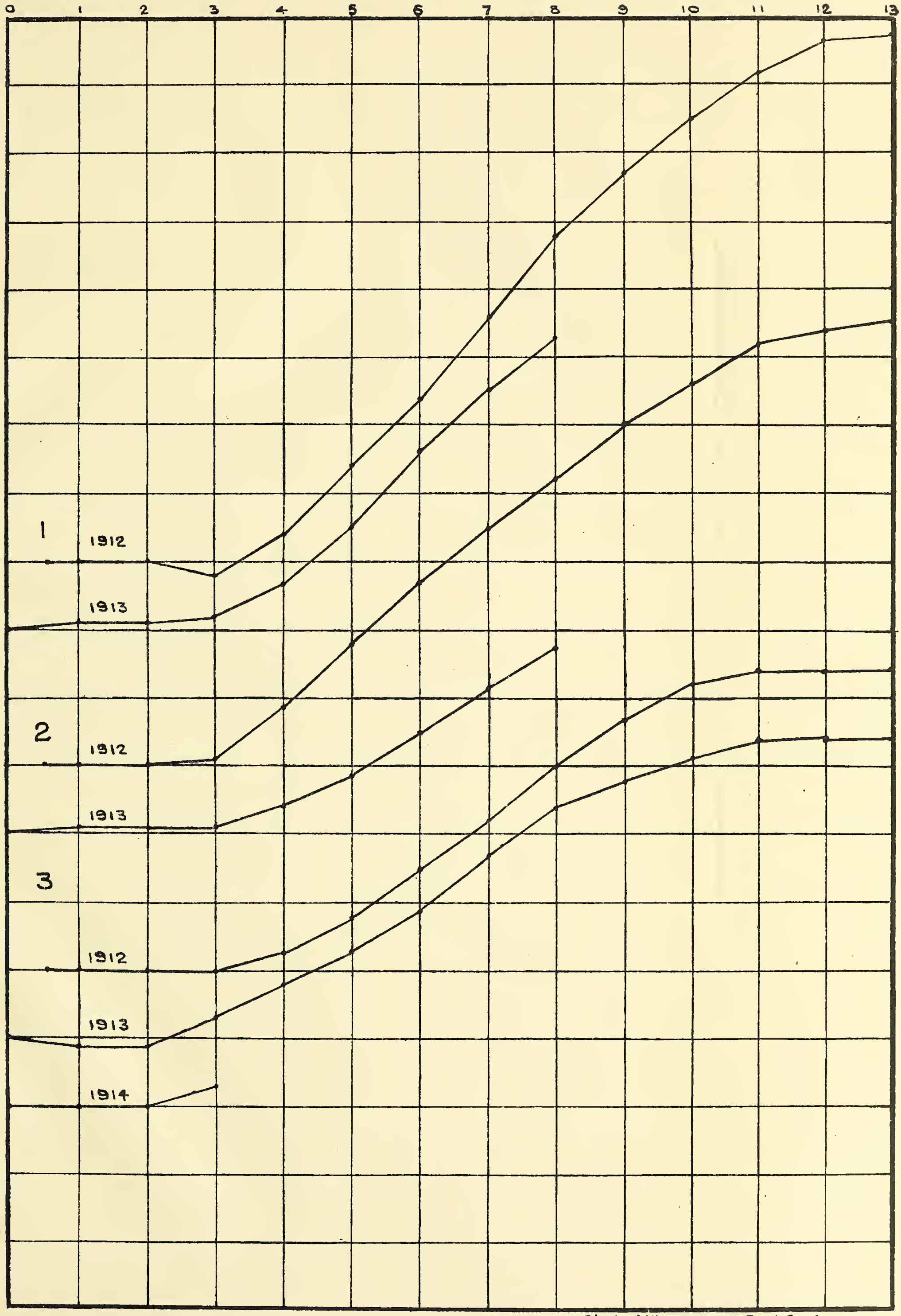

Photo-Litho Survey Dept. Ceylon. 5. 8. 16.

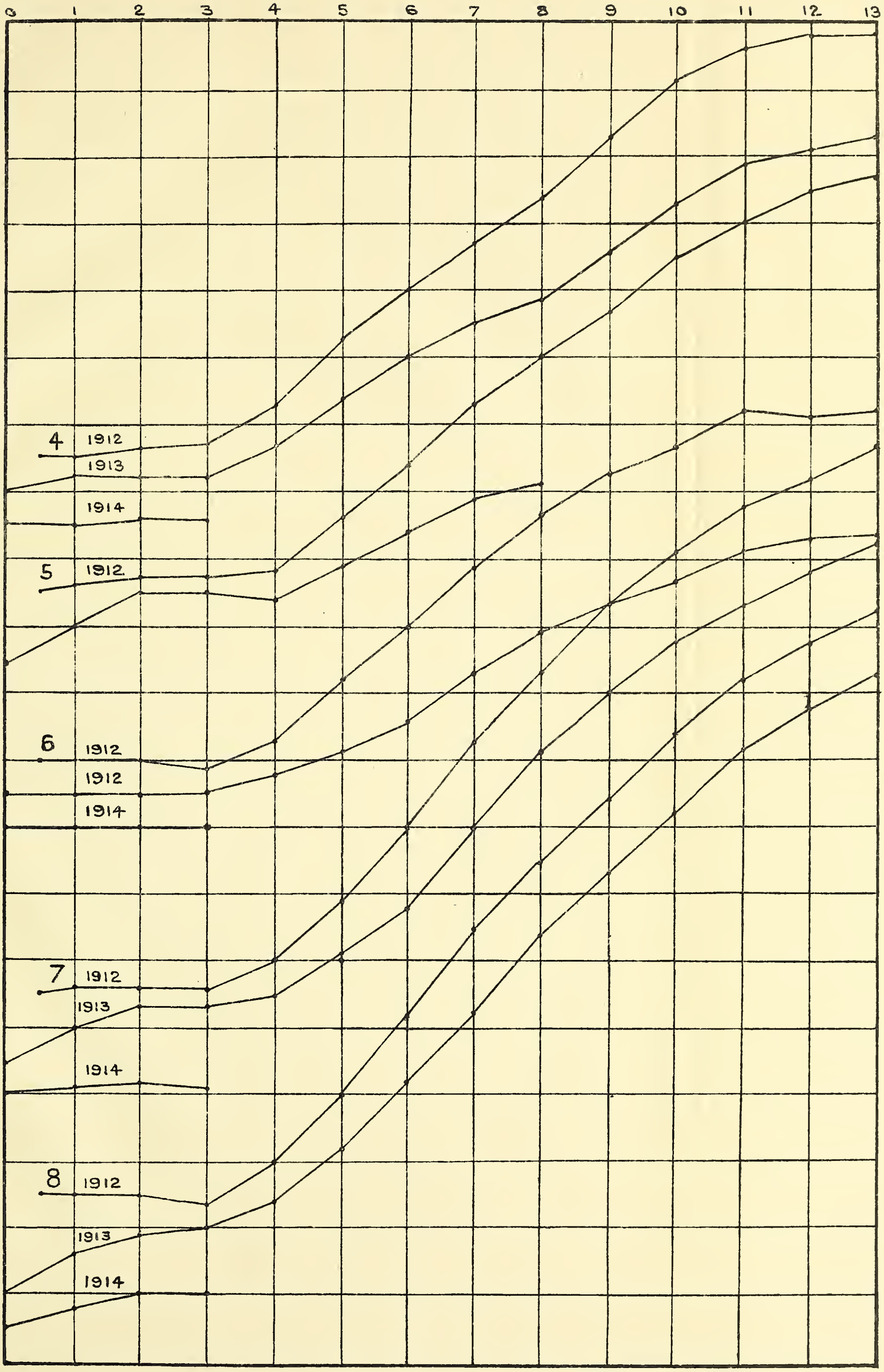

Photo-Litho Survey Dept Ceylon 5.8.16.

PLATE X

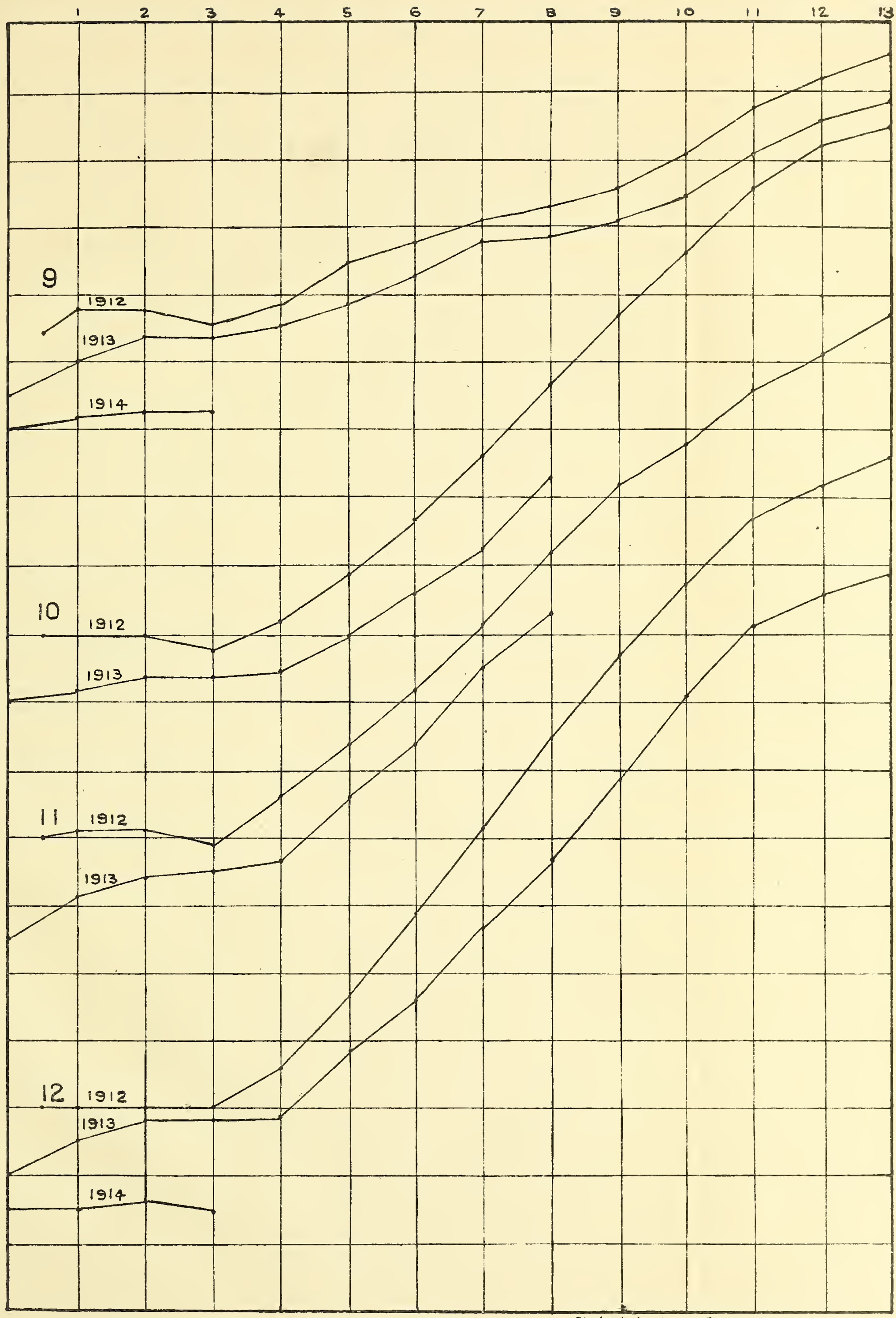

Photo-Litho Survey Dept. Ceylon

PLATE XI

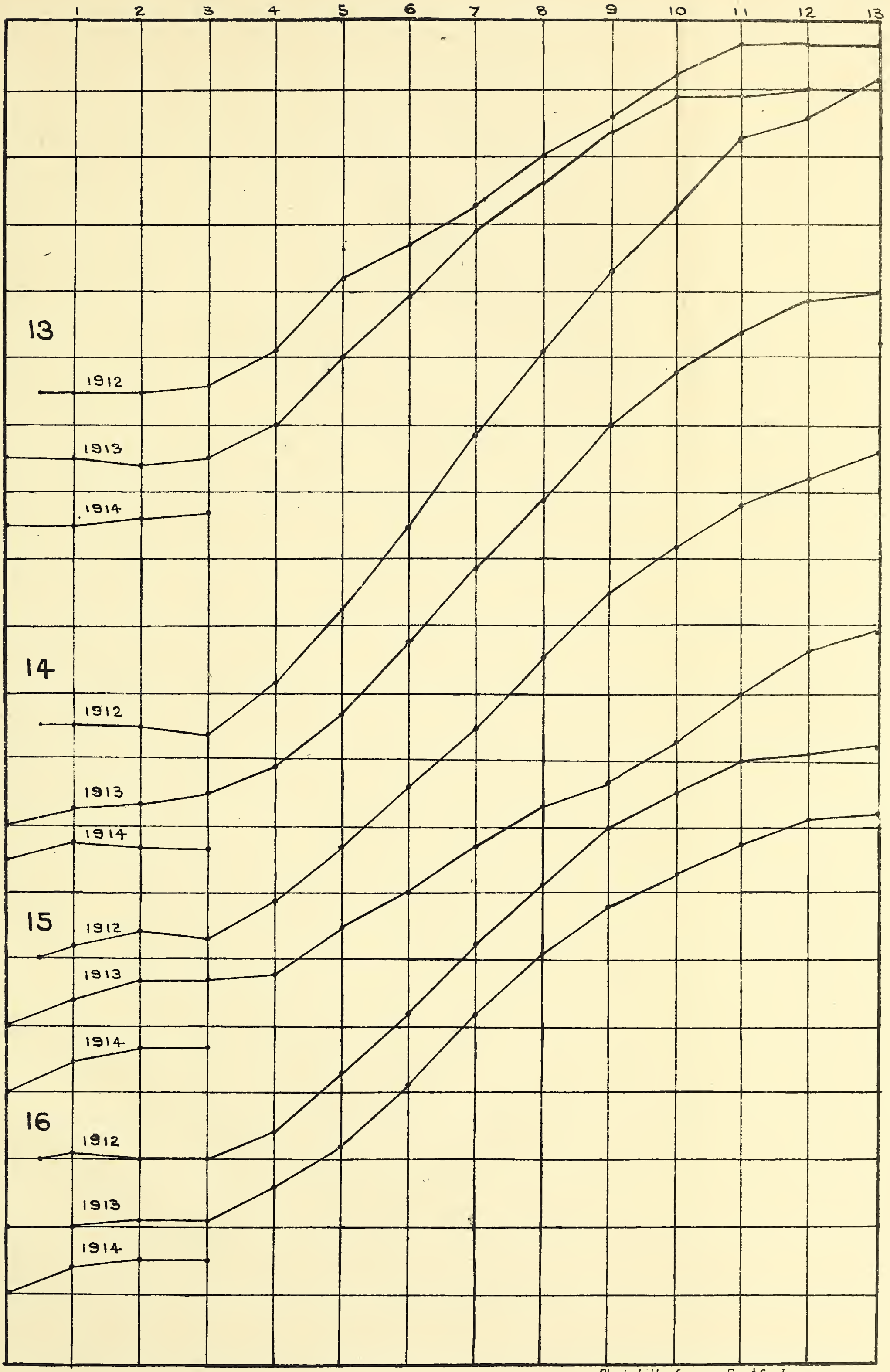

Photo Litho Survey Dept. Ceylon. 5.8.16.

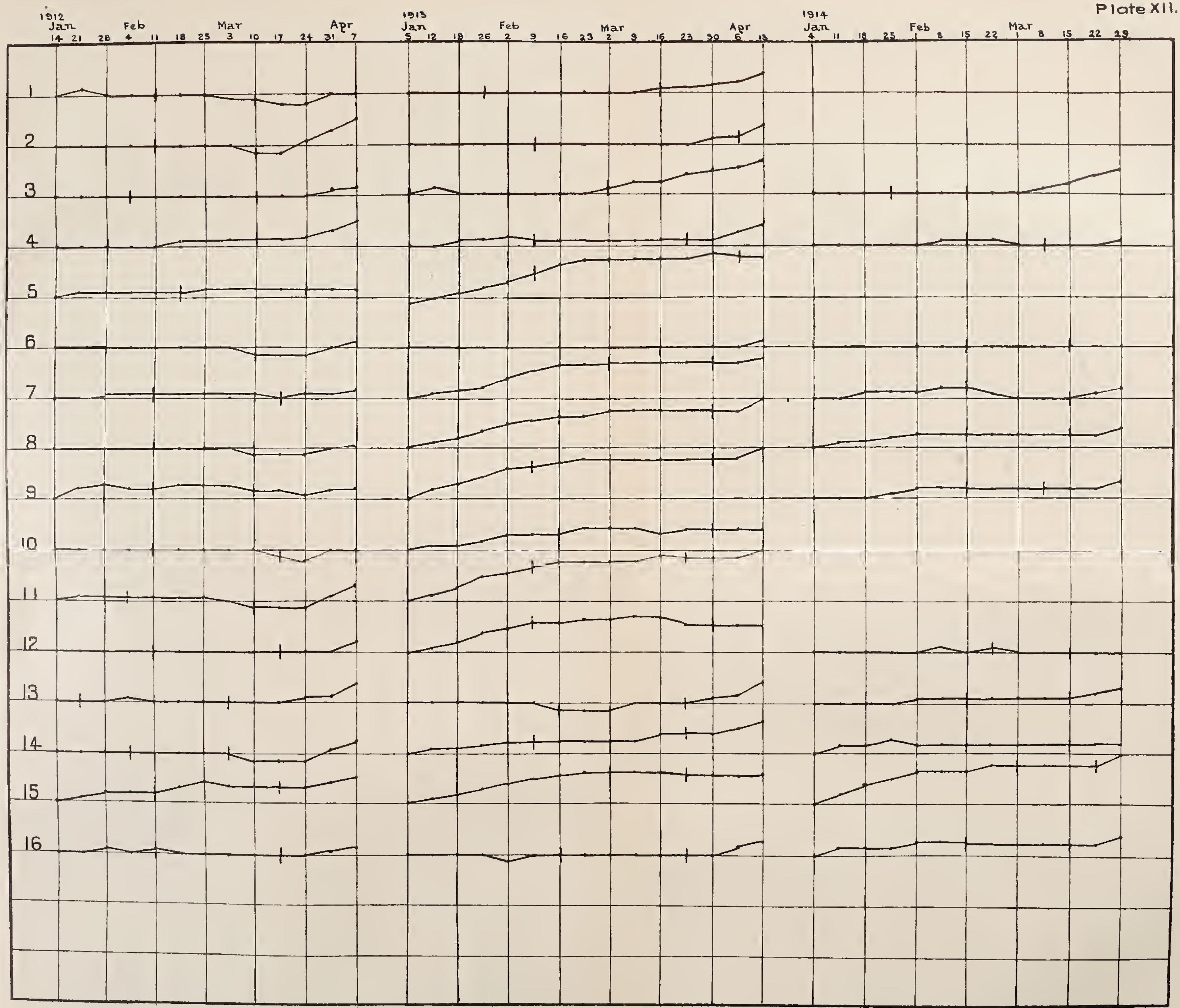

Photo-Litho. Survey Dept. Ceylon. 15 . 8 . 16.

A Preliminary List of Ceylon Polypori.

BY

T. PETCH, B.A., B.Sc.

THE earliest record discovered, up to the present, of any Ceylon Polyporoid is contained in Houttuyn, Handleiding tot de Plant-en Kruidkunde, &c., published at Amsterdam in 1783. In that work two Ceylon fungi, obtained by the author from Herr Chr. P. Meijer, are described, under the names of *Peziza Ceylonsche* and *Peziza limbosa*, with figures. From the description *Peziza Ceylonsche* was probably *Polystictus xanthopus*, but the figure is that of a *Lentinus*; *Peziza limbosa* may have been *Trametes ochroleuca*.

It might have been expected that the numerous botanists who collected in Ceylon from the time of Hermann would have gathered some of the larger fungi, but no record of their having done so has been found, except in the case of König (1777–1781). König's specimens remained in the British Museum unnamed until 1842, when Berkeley described them in "Notices of Fungi in the Herbarium of the British Museum," Ann. Nat. Hist., X., pp. 369–384. The Polyporoids recorded for Ceylon in that paper are :—

Polyporus agariceus.
P. xanthopus.
P. crenatus.
P. Kœnigii.
P. dubius.
P. zonalis.
P. zeylanicus.
P. nigrocinctus.
Trametes læticolor.
Dædalea inæquabilis.
Hexagonia Kœnigii.

Trametes lactinea, described without locality, was probably also from Ceylon. König's specimens are still in the Herbarium of the Natural History Museum (South Kensington).

Annals of the Royal Botanic Gardens, Peradeniya, Vol. VI., Part II., Nov., 1916.

In 1844 Léveillé, in "Champignons Exotiques," Ann. Sci. Nat., Ser. 3, II., pp. 167–221, also recorded *P. crenatus* and *Favolus agariceus* for Ceylon ; and in 1846, in "Descriptions des Champignons de l'herbier du Museum de Paris," Ann. Sci. Nat., Ser. 3, V., pp. 111–167, he described *Polyporus sericellus* and *P. phæus* from Ceylon.

About 1846 Gardner forwarded to Berkeley a consignment of 135 gatherings of fungi, which were recorded in Decades of Fungi, XV.–XIX., Hook. Lond. Jour. Bot., VI., pp. 479–514. Forty-three of these were Polyporoids. Thwaites, on succeeding Gardner in 1849, continued sending fungi to Berkeley, and several records of Ceylon species are to be found in the lists published by the latter up to 1871, in which year Berkeley and Broome began the publication of "The Fungi of Ceylon" in the Journal of the Linnean Society.

This memoir was based on a large consignment from Thwaites, which has provided the bulk of the Ceylon fungi now found in European herbaria. The section dealing with the Polyporoids, over one hundred species, was published in 1873.

In 1879 Cesati published an account of the fungi collected in Ceylon and Borneo by Beccari, and enumerated ten Polyporoids from this country. After this active period of the seventies work ceased, and except for a few odd specimens collected at random, and the christening of species which Berkeley left unnamed, no further additions were made to our knowledge of Ceylon Polyporoids until the present century. Professor F. von Höhnel visited Ceylon in 1907, and the Polyporoids collected by him, about fifteen, were enumerated by Bresadola in "Polyporaceæ Javanicæ," Ann. Myc., X. (1912), pp. 492–508. Three of von Höhnel's species had not been previously recorded for Ceylon.

The present paper includes (1) a list of all the species previously recorded from Ceylon, with notes on the specimens where these are available ; and (2) a list of the species which have been collected in Ceylon up to the present time. In the compilation of both of these lists I have been greatly indebted to Mr. C. G. Lloyd, both for the ever ready assistance afforded in numerous letters, and for the critical information contained in his published writings.

It has been my aim in the final list to enumerate the different species under some name recognizable by mycologists in general. If a given species is found as Polystictus or Polyporus or Trametes, it is placed there, as a rule, because that name has been previously employed for it, not because of any views of mine on the limits of the genera in question. That the name given is the earliest, or the one which will finally be adopted is not claimed.

Berkeley and Broome's list of Polyporoids in the Fungi of Ceylon has been taken as the basis of the following list of previous records, their names and numbers being quoted verbatim for each species; other records are interpolated without numbers :—

PREVIOUS RECORDS.

431. **Lenzites applanata** Fr.

Specimen, Ceylon, 1851, in Herb. Kew is *Hexagonia ochroleuca;* specimen, "Ceylon, 4–5,000 feet, G. H. K. T." also in Herb. Kew is *Lenzites Palisoti* (*repanda*).

432. **Lenzites deplanata** Fr. (224).

Thwaites 224 in Herb. Kew is *Lenzites Palisoti* (*repanda*).

433. **Lenzites repanda** Fr. (962 ; Gardner 68, 120).

Thwaites 962, Gardner 68 and 120, and Thwaites of 1850 unnumbered are *L. Palisoti* (*repanda*).

434. **Lenzites aspera** Kl., Linn. 1833, p. 480 ; (Gardner 83).

Gardner 83 is in Herb. Kew.

436. **Polyporus arcularius** Fr. (177). On dead wood. Talagalla, &c., Gardner.

Specimens in Herb. Kew are Gardner 21 and Thwaites 177. König's Ceylon specimens were named *Polyporus agariceus* by Berkeley. Part of Thwaites 177 is in Herb. Peradeniya. Ceylon examples assigned to this species are subcartilaginous when fresh, and usually become horny when dry. Though it appears to be generally agreed that the tropical examples are identical with the European species, acquaintance with these in the fresh state makes this rather doubtful. Ceylon examples, especially from the low-country, would appear to agree better with *Favolus* than with *Polyporus*. This is probably the species collected by Beccari at Peradeniya, and recorded by Cesati as "*Favolus cillario* Mntg."

437. **Polyporus olivaceo-fuscus** B. & Br. (826).

Part of Thwaites 826 is in Herb. Kew, and the remainder in Herb. Peradeniya, sections of the same single specimen. This is apparently an immature example of *Boletus portentosus* B. & Br. (see Ann. Peradeniya, IV., p. 58).

438. **Polyporus oblectans** Berk. (Gardner 60, cum icone).

Gardner 60 is in Herb. Kew. *Fide* Lloyd, the Ceylon examples are nearer *cinnamomeus* than *oblectans*.

439. **Polyporus rugosus** Nees (728, cum icone ; Gardner 57).

Gardner 57 in Herb. Kew contains young specimens Thwaites 728 in Herb. Peradeniya contains three examples ; the remainder in Herb. Kew is *Polyporus rugosus*, except for one specimen. The latter is thicker than usual, with a superior lateral attachment, but the stalk is wanting ; it resembles some forms of *Fomes lucidus*, but the specimen was not cut to confirm this surmise. Berkeley and Broome's note, "Pileus when fresh somewhat brick-coloured," is incorrect ; the immature pileus becomes red when cut or bruised.

440. **Polyporus xanthopus** Fr. (377 in part).

Herb. Kew contains six specimens from Gardner, one from Thwaites, 1850, and others, Thwaites 377. Herb. Peradeniya contains part of Thwaites 377. This species was recorded for Ceylon by Berkeley from König's collection.

441. **Polyporus hemicapnodes** B. & Br. (600).

Herb. Peradeniya contains eight examples of Thwaites 600. In Herb. Kew are Thwaites 600, May, 1868, and another sheet marked Thwaites 600, March, 1869. The latter appears to be a different species, but the specimens are too much insect-eaten to determine. The type in Herb. Kew is marked by Bresadola

"Tantum forma gracilior *Polypori melanopodis* Sw." It was collected at Peradeniya by von Höhnel, and recorded by Bresadola (*loc. cit.*).

442. **Polyporus picipes** Fr. (403).

Herb. Peradeniya contains part of one specimen of Thwaites 403 in sections, and much damaged by insects Herb. Kew contains part of the same Thwaites' collection. One specimen in Herb. Kew, marked "*Pol. picipes* Fr. *var.*, Ceylon, Gardner," appears to be a young *P. rugosus.* The other specimens are *P. dictyopus* Mont.

443. **Polyporus sanguineus** Fr. (381 ; Gardner 111).

Herb. Peradeniya contains four specimens of Thwaites 381, thin, attached along one edge or by a definite disc. In Herb. Kew, *sub Polystictus sanguineus* are a Ceylon specimen, *ex* Herb. Hooker, labelled *P. cinnabarinus* by Berkeley, with the name changed by Berkeley (in pencil) to *P. sanguineus ;* six other Ceylon specimens, two of them white, collected by Thwaites in 1850 ; another collected by Thwaites in 1851 ; and a specimen from Thwaites 381.

In Hooker's London Journal of Botany, VI., pp. 479–514, Berkeley recorded, for Ceylon, *P. sanguineus* Fr., Gardner 111, and *P. cinnabarinus* Fr., Gardner, without number. The latter was not enumerated in Fungi of Ceylon, Jour. Linn. Soc., XIV., pp. 1–140. Under *P. cinnabarinus*, in Herb. Kew, are a specimen from Ceylon without number or collector's name, and another "Talagalla, Ceylon, Gardner," neither of which differ from the specimen with name changed *sub P. sanguineus ;* and another marked *P. cinnabarinus,* Ceylon 111. The last-mentioned is a thin specimen, and was published as *P. sanguineus* in the 1847 list.

All the specimens from Ceylon are the same species, viz., *P. sanguineus.* It would seem possible that specimens recorded from the tropics as *Trametes cinnabarina* are merely thicker examples of *P. sanguineus. Trametes* forms of the latter, growing on the under surface of a log or in a crack in the wood, frequently occur with the normal thin form.

444. **Polyporus flabelliformis** Kl. (377 in part).

Herb. Kew contains one specimen, Gardner; three specimens, Thwaites 377; two specimens, collected by Thwaites in 1850; and nine Thwaites' specimens, without number.

445. **Polyporus discipes** Berk.

The type specimen collected by Gardner, Talagalla, Ceylon, is in Herb. Kew. There is only one example. It resembles the Ceylon specimen of *P. Emerici*, but has a brighter yellow-brown context.

446. **Polyporus Menziezii** Berk.

Herb. Kew contains five Ceylon specimens, Thwaites, without collection number. Though the name was published in the "Fungi of Ceylon," it would appear that Berkeley regarded the Sumatran specimen as the type. The Ceylon specimens are *Polyporus Didrichsenii* according to Lloyd, but they seem to me to be *Polyporus Gaudichaudii*.

447. **Polyporus rhipidius** Berk. (1 and 363).

Herb. Peradeniya contains numerous specimens from Thwaites 363. Herb. Kew contains Thwaites' specimens unnumbered; Thwaites 1, December, 1854; and Thwaites 363.

448. **Polyporus dilatatus** Berk. (599).

In Herb. Peradeniya are seven specimens of Thwaites 599. Herb. Kew contains the type specimens from Gardner, without number or locality; eleven specimens, Thwaites 599; and part of the latter collection *ex* Herb. Cooke. The name was changed by Cooke to *Polystictus Adami* (Proc. Bot. Soc., Edinburgh, XIII., p. 171), because of the previous *Polyporus dilatatus* Lév. The Thwaites' collection in Herb. Kew is marked *P. lacer* Jungh. by Bresadola.

Cooke's change of name might have had a curious result. The type of *Polystictus Adami* Cooke is the part of Thwaites' gathering in Herb. Cooke. But the type of *P. dilatatus* was not Thwaites' gathering, but Gardner's. Fortunately the two collections are the same species. Cooke wrote " *Polystictus Adami* Berk," but there is apparently no evidence that the name was authorized by Berkeley. *Fide* Lloyd, the Ceylon specimens are *Polyporus obovatus* Jungh.

449. **Polyporus russiceps** B. & Br. (961, cum icone).

Three specimens in Herb. Peradeniya ; six specimens in Herb. Kew. In the same cover in Herb. Kew are two specimens of *P. grammocephalus*, marked " 34 or 261." *Polyporus russiceps* is distinct from *P. grammocephalus* (see Patouillard, Bull. Soc. Myc. France, XXX., pp. 36–40). *Polyporus grammocephalus* was recorded for Ceylon from Gardner's collection, but not from Thwaites'. In Herb. Peradeniya are three specimens of *grammocephalus*, marked " ? 261 ? 34," while in Herb. Kew are specimens, Gardner 118, Gardner 24, and Thwaites " 34 or 261." *P. grammocephalus* was collected at Peradeniya by von Höhnel, and recorded by Bresadola (*loc. cit.*).

450. **Polyporus sulfureus** Fr. (601).

A large specimen in Herb. Kew (Thwaites 601), and a smaller piece of the same in Herb. Peradeniya. This appears to be identical with the Gardner specimen " referred doubtfully to *lacteus* " by Berkeley in 1847, and the species named *Polyporus appendiculatus* B. & Br. in 1873.

451. **Polyporus eurocephalus** B. &. Br. (969).

Parts of Thwaites 969 are in Herb. Kew and Herb. Peradeniya. According to the present determination, on comparison with fresh specimens, this is a *Merulius* (see Ann. Peradeniya, IV., p. 408).

452. **Polyporus lacteus** Fr.

Gardner's specimen, referred doubtfully to *lacteus* by Berkeley, is in Herb. Kew. It appears to be the same as the species referred by Berkeley and Broome to *P. sulfureus*.

453. **Polyporus appendiculatus** B. &. Br.

Thwaites' specimen at Kew consists of fragments only; it appears identical with the Ceylon species assigned to *P. sulphureus* and *P. lacteus*.

454. **Polyporus dissitus** B. & Br. (966).

Part of Thwaites 966 is in Herb. Kew, and the remainder in Herb. Peradeniya. In each case the specimen is almost entirely resupinate with a slightly reflexed margin. Bresadola has appended to the Kew specimen the following note:—"Forma resupinata juvenilis *Polypori adusti* Fr. Structura quoque identica." The fresh specimens, however, do not resemble *Polyporus adustus*. This species is, in my opinion, identical with *Polyporus secernibilis* Berk., but not with the Ceylon specimens assigned by Lloyd to *P. secernibilis*.

455. **Polyporus polytropus** B. & Br. (604).

Two specimens from Thwaites 604 are in Herb. Peradeniya, and the remainder in Herb. Kew, part under *P. polytropus* and part under *P. bicolor* Jungh. All the specimens are the same species. A note by Bresadola on the type specimen in Herb. Kew reads "*P. polytropus* B. & Br. = *P. pruinatus* K., 1833 = *P. anisopilus* Lév., 1843 = *P. anebus* Berk., 1847."

456. **Polyporus kermes** (970).

The type in Herb. Kew contains three specimens without any Thwaites' number. The specimen returned to Ceylon under Thwaites 970 is not *P. kermes*, but *Fomes dochmius*. In the type specimen of *P. kermes* the upper surface is hard and concentrically zoned. Specimens recently collected in Ceylon are soft and spongy when fresh, almost completely resupinate, with a narrow free margin; but when dry the fungus contracts and the upper surface becomes hard. Judged by these recent specimens the apparently free upper surface of the type specimens was, when growing, closely applied to the substratum. *P. kermes*, from the fresh specimens, is a Polyporus, not a Fomes. To the type in Herb. Kew Bresadola has appended the synonymy, " *P. kermes* B. = *P. albomarginatus* Lév., 1844 = *P. kermes* B., 1875 = *P. læticolor* B., 1878 = *P. pyrrocreas* Cke., 1855." The last-named species, however, is not the same as *P. kermes*.

457. **Polyporus rubidus** Berk. (Gardner 96).

The type in Herb. Kew is Gardner 96. There are also numerous unnumbered Ceylon specimens from Thwaites. The species recorded by Cesati as *P. bubidus* is evidently an error for *rubidus*.

458. **Polyporus zonalis** Berk.

In Herb. Kew are Gardner 69 and part of Thwaites 605. The former is marked " type," but this species was described by Berkeley in 1842, and the type should be in the British Museum. Thwaites 605, *sub P. zonalis* in Herb. Kew, contains two specimens of *P. zonalis* and two specimens, marked by Berkeley, *P. cartilagineus*. Berkeley and Broome's reference to Thwaites 608 in Jour. Linn. Soc., XIV., p. 49, is probably an error for 605.

459. **Polyporus cartilagineus** B. & Br. (605 in part).

Thwaites 605 was apparently a mixture of several species. In the type of *P. cartilagineus* in Herb. Kew are three specimens, one of which is *Polyporus durus* Jungh., while the other two are the species described by Berkeley and Broome as *P. cartilagineus*. And, as noted above, in the cover *P. zonalis* at Kew there are two other specimens, agreeing with those already referred to, marked *P. cartilagineus* by Berkeley. A note by Bresadola states that *P. cartilagineus* = *P. durus* Jungh., but this determination only applies to one example in the type, and it obviously does not apply to the species described by Berkeley and Broome.

Part of Thwaites 605 was described by Berkeley and Broome as *P. epilinteus*. In the type of this in Herb. Kew there are three specimens, one of which is young *P. kermes*, while the other two are marked by Bresadola "*P. zonalis resupinatus.*" In the same cover are part of

Thwaites 605 *ex* Herb. Currey and Herb. Cooke ; these are chiefly resupinate, but show a marginal dimidiate portion. These latter are identical with the part marked " *P. zonalis* resupinate " by Bresadola, and with the specimens of *P. cartilagineus*, *sub P. zonalis* and *P. cartilagineus*.

Another part of Thwaites 605 is included in Herb. Kew under *P. dochmius*. It contains a resupinate piece, matching Bresadola's " *P. zonalis* resupinate " *sub P. epilinteus ;* and a specimen said to be young *P. dochmius*. The latter resembles *P. dochmius* to some extent, but is thinner, and appears to have been somewhat cartilaginous. I have not seen young *P. dochmius* in this form. This part of Thwaites 605 originally contained *P. siennæcolor* also, but the specimen of the latter was removed by Cooke to another cover.

The part of Thwaites 605 in Herb. Peradeniya contains one specimen of *Polyporus durus*, three specimens of the form assigned to immature *P. dochmius*, and one specimen of " *P. zonalis* resupinate."

Thwaites 605 therefore consisted of—

(1) *Polyporus durus.*
(2) *Polyporus zonalis.*
(3) A species assumed to be young *F. dochmius.*
(4) A species named *P. cartilagineus* in its dimidiate form, and *P. epilinteus* in its resupinate form.
(5) *P. siennæcolor.*

The determination of (3) as *F. dochmius* appears doubtful ; no form matching this has been collected recently. According to Bresadola's determination, (4) is *Polyporus zonalis ;* petaloid forms of *P. zonalis* are not uncommon, though not so markedly pseudostalked as in *P. cartilagineus*. But Bresadola's determination of *P. epilinteus*, as resupinate *zonalis*, appears to be correct, and hence *P. cartilagineus* is *P. zonalis*.

460. **Polyporus australis** Fr. (379, 380 ; Gardner 75).

Gardner 75 and Thwaites 380 in Herb. Kew are *Fomes australis*. Thwaites 379 in Herb. Peradeniya is the same species. Thwaites 380 in Herb. Peradeniya appears to be a dark specimen of *Fomes lucidus*.

461. **Polyporus igniarius** Fr. var. **applanatus** (Gardner 110).

Gardner 110 in Herb. Kew is young *Fomes australis*. Thwaites 380 in Herb. Peradeniya, labelled *P. igniarius*, is *Fomes subresinosus* ; it is listed in "Fungi of Ceylon" as *Fomes australis*.

462. **Polyporus fulvus** Fr. (367).

Thwaites 367, *sub P. fulvus* in Herb. Kew is *Polyporus hydnophorus* B. & Br. Beccari collected a Polyporus on Pedrotalagala which Cesati identified as *P. fulvus, juvenilis*.

463. **Polyporus senex** Mont. (565).

Two specimens of Thwaites 565, *sub P. scruposus* at Kew, are *P. gilvus*. Another specimen, same number and locality, *sub P. senex* in Herb. Kew, but labelled "*P. senex P. scruposus var.*," is *P. senex* Mont. *P. substygius* Cooke was also part of Thwaites 565. In Herb. Peradeniya Thwaites 565 is *P. gilvus*, Thwaites 565* is *P. gilvus* and *P. substygius* Cooke, and 565** is *P. Emerici* Berk.

464. **Polyporus licnoides** Mont. (261).

Specimen in Herb. Kew is Thwaites 211 (not 261). It has no setæ, and is *P. Emerici* Berk.

465. **Polyporus isidioides** Berk.

Specimen from Ceylon in Herb. Kew, without collection number, is *P. gilvus* (*P. scruposus*).

466. **Polyporus holosclerus** Berk.

In Herb. Kew Thwaites' specimen, without number, is *P. gilvus*. A specimen from Gardner, without number, is also *P. gilvus*, and the same is true of Ceylon specimens *ex* Herb. Cooke, Currey, and Hooker.

467. **Polyporus ferreus** Berk. (Thwaites 397 in part ; Gardner 104, 106).

Herb. Kew contains numerous specimens of Gardner 104 and 106. Another Ceylon specimen, *sub P. ferreus* is *P. dochmius*. A note by Bresadola in Herb. Kew reads " *P. nubilus* Fr. = *P. ferreus* Berk., 1847 = *P. dochmius*, 1873." *P. dochmius*, however, is distinct from *P. ferreus*.

468. **Polyporus anebus** Berk.

Herb. Kew contains eight Ceylon specimens, probably all collected by Gardner. (See also *P. polytropus.*)

469. **Polyporus dochmius** B. & Br.

Type in Herb. Kew is Thwaites 970. In the same cover is part of Thwaites 605, already noted under *P. cartilagineus.*

470. **Polyporus Persoonii** Fr. (224).

Herb. Kew contains an abundance of Ceylon material, chiefly resupinate, viz., specimens from Gardner, Thwaites 224, and Ceylon specimens *ex* Herb. Hooker. A Ceylon specimen *ex* Herb. Currey is *P. bicolor.* Thwaites 224 is represented in Herb. Peradeniya.

471. **Polyporus caperatus** Berk. (210).

Thwaites 210 was divided into *P. caperatus* and *P. phocinus* B. & Br. The specimens in Herb. Kew and Herb. Peradeniya are all the same species, a thin form of *P. caperatus.* In addition to Thwaites 210, there is another specimen in the cover of *P. caperatus* in Herb. Kew (Thwaites, without number), which is probably not that species.

472. **Polyporus cichoraceus** Berk.

The specimen in Herb. Kew, collected by Thwaites in 1854, is the same species as that named *P. setiporus* B.

473. **Polyporus setiporus** Berk. (375).

Herb. Kew contains the type specimens from Ceylon collected by Gardner, and others collected by Thwaites in 1851. Thwaites 375 is in Herb. Kew and Herb. Peradeniya.

474. **Polyporus strigatus** Berk.

Specimens, Gardner 123, are in Herb. Kew.

475. **Polyporus vittatus** Berk.

The type " Gardner, Talagalla, Ceylon," is in Herb. Kew.

476. **Polyporus albo-cervinus** Berk.

Ceylon specimens in Herb. Kew are *P. bicolor* Jungh.

477. **Polyporus venustus** Berk. (530).

Thwaites 530 in Herb. Kew and Herb. Peradeniya is *Trametes versatilis*.

478. **Polystictus Peradeniæ** B. & Br. (221).

Type, Thwaites 221, is in Herb. Kew. This is said to be identical with *Polyporus cervinogilvus* Jungh. and *Trametes dermatodes* Lév. A number of specimens distributed from the Philippines as *P. cervinogilvus* Jungh. are *Irpex flavus* Jungh.

479. **Polystictus personatus** B. & Br. (133, 535).

133 and 535 are on the same sheet in Herb. Kew. The sheet is stained greenish, as is also the sheet of *P. Peradeniæ*.

480. **Polyporus hirsutus** Fr. (378, 564).

Thwaites 378 and 564 in Herb. Kew are *Polyporus hirsutus* (*P. occidentalis*). 564 in Herb. Peradeniya is the same. Recorded by Cesati, from Nuwara Eliya, collected by Beccari.

481. **Polyporus versicolor** Fr. (374, 563, 965, 1123).

In Herb. Kew are Gardner 100, Thwaites, collected 1851, Thwaites 374 (some marked *versicolor var.*), Thwaites 563, 965, and 1123. Thwaites 1123 appears to be resupinate *P. Persoonii* (in part), while 965 is *Gaudichaudii*. Ceylon specimens are usually thinner than European forms, and cream-coloured below. I have distributed them as *P. pictilis* Berk., but they are not so closely zoned as the type of that species. In Herb. Peradeniya 1123 is *P. hirsutus*, 965 is *P. Gaudichaudii*, and 374 is *P. versicolor*.

482. **Polyporus elongatus** Berk. (373).

Specimens in Herb. Kew from Gardner (without number), Gardner 101, and Gardner (Horton Plains); from Thwaites, collected 1850 and 1854, and Thwaites 373.

483. **Polyporus secernibilis** Berk.

The type in Herb. Kew contains two specimens from Gardner. This appears to be identical with *P. dissitus* B. & Br. The species assigned by Lloyd to *P. secernibilis* is, to me, different. Ceylon specimens of the latter are included among the unnamed species in Herb. Kew, without name or number, *ex* Herb. Hooker, and also (?) in the cover of *Polyporus radiatus*, " Ceylon, Golagama, February, 46."

484. **Polystictus phocinus** B. & Br. (210).

Thwaites 210, *sub P. phocinus* in Herb. Kew and Herb. Peradeniya are thin specimens of *P. caperatus*.

485. **Polyporus Thwaitesii** Berk.

Herb. Kew contains the type specimens, collected Thwaites, 1850, and also *P. Thwaitesii var.* The specimens are *P. Gaudichaudii*.

486. **Polyporus obliquus** Fr. (213).

Two pieces in Herb. Kew and five in Herb. Peradeniya Those in Herb. Peradeniya include two species, one with and one without setæ. The setæ have inflated bases and resemble those of *Fomes setulosus* Lloyd. This part of Thwaites 213 is probably resupinate *Fomes setulosus*.

487. **Polyporus acupunctatus** B. & Br. (651).

Thwaites 651 in Herb. Kew includes four pieces ; there is also a piece *ex* Herb. Currey, and another *ex* Herb. Cooke, both originally parts of Thwaites 651. The sheet is marked by Bresadola. " On trouve dans cette collection trois especes bien distinctes, mais steriles, savoir (*a*) une espece, (*b*) une autre espece, (*c–d*) une autre espece avec l'hymenium de meme structure du genre *Ganoderma*." The piece from Herb. Cooke is (*b*) ; that from Herb. Currey is (*d*). In Herb. Peradeniya are eight pieces ; five of these are Bresadola's (*a*), and the other three Bresadola's (*d*). (*a*) is resupinate *Fomes setulosus*. The description appears to refer chiefly to (*d*), though the thickness, one-third of an inch, is taken from (*a*).

488. **Polyporus contiguus** Fr. (389, 653).

Herb. Kew contains both Thwaites 389 and 653, probably two different species. In Herb. Peradeniya is a sheet marked *P. contiguus*, but bearing the Thwaites' numbers 209, 653, the former of which should be *P. epimiltinus*; it contains two pieces of 653, and eleven pieces of *P. epimiltinus*. 653 has shallow pores, which are lined with brown tapering setæ up to 64 μ long; 389 has no setæ, but the edges of its pores bear numerous processes composed of fascicles of hyphæ. 653 appears to differ from *P. contigua* Fr. in its shallower pores, which are 0·2-0·3 mm. diameter and up to 0·4 mm. deep.

489. **Polyporus variolosus** B. & Br. (650).

Specimens in Herb. Kew and Herb. Peradeniya.

490. **Polyporus melleus** B. & Br. (535 in part).

In Herb. Kew, the type is marked "133 and 535, February, 1869." The corresponding sheet in Herb. Peradeniya does not contain this species.

491. **Polyporus diversiporus** B. & Br. (535 in part).

The type in Herb. Kew contains two species, *P. diversiporus* and *P. Peradeniæ* (or *P. personatus* ?). In Herb. Peradeniya is a sheet marked " 133, 535, 650," which bears two pieces of *P. diversiporus*, two of *P. variolosus*, and one of *P. personatus*.

492. **Polyporus niger** Berk. *var poris minoribus* (261).

Poria niger B., var β., Thwaites, Ceylon, 1854, is *Polyporus vinosus* Berk., in Herb. Kew. Three pieces (Thwaites 261) *sub P. niger* in Herb. Kew are *P. Ravenalæ.*

493. **Polyporus Ravenalæ** B. & Br. (261).

In Herb. Kew, Thwaites 261 is marked "*Polyporus niger var.* γ : on petioles of *Ravenala*." It is on a palm, not on *Ravenala*. All the specimens of Thwaites 261 are marked *P. niger* by Berkeley, but Cooke's Ceylon specimens (*ex* Herb. Berkeley) are labelled *P. Ravenalæ*. This species was collected by von Höhnel at Peradeniya, and recorded by Bresadola.

494. **Polyporus fuligo** B. &. Br. (967).

Type, Thwaites 967, in Herb. Kew, is marked "*cf.* with 261." It is on a palm, like *P. Ravenalæ*, but has much smaller pores, and tends to break up in drying. It is apparently only a small-pored form of *P. Ravenalæ*,—pores 50–80 μ diameter, instead of 100–200 μ as in the common form. Collected by von Höhnel at Peradeniya, and recorded by Bresadola (*loc. cit.*).

495. **Polyporus aneirinus** Fr. (371).

The Ceylon specimen, Thwaites 371, in Herb. Kew, is quite unidentifiable. It consists of five small patches, chiefly earth and sand, glued on paper.

496. **Polyporus Vaillantii** Fr. (161).

Thwaites 161 is represented in Herb. Kew and Herb. Peradeniya. The Ceylon specimens have the habit of the European species, but have pores up to 3 mm. long and 0·1–0·2 mm. diameter, developed over nearly the whole surfare ; no cords of mycelium are evident, except those spreading from the margin of a patch. It is most probably not identical with the European species. As noted by Thwaites, it grows on the ground or on very rotten wood.

497. **Polyporus vaporarius** Fr. (367, 369).

498. **Polyporus vulgaris** Fr. (367, 369 in part).

Thwaites 367 and 369 provided *P. vaporarius* Fr., *P. vulgaris* Fr., *P. hydnophorus* B. &. Br., and *P. fulvus* Fr. As is usual in such cases in Herb. Berkeley, the various species were not completely separated, especially in the duplicates, nor were the different Thwaites' numbers kept distinct. The specimens included under *P. fulvus* Fr. at Kew are identical with those under *P. hydnophorus* B. & Br. ; this is a good species.

Under *P. vaporarius*, in Herb. Kew, are Thwaites 133, and one piece marked 367, 369 ; there is also another piece, unnumbered, and a packet of duplicates. Under *P. vulgaris*, in Herb. Kew, are Thwaites 367, 369 mixed, and Thwaites 369 separate. The "*vaporarius*" duplicates, already referred to, are identical with one specimen on the sheet of *P. vulgaris*, Thwaites 369.

In Herb. Peradeniya is a sheet marked "367 and 369," which bears sixteen pieces; nine of these are *P. hydnophorus*, four are "*P. vulgaris*," and three are "*P. vaporarius*." Another sheet marked "367, 369" bears three pieces of "*P. vulgaris*."

Neither of these names appears to be correctly applied. The species assigned to *P. vulgaris* is identical with that named *P. interruptus* B. & Br., the latter being, in Herb. Kew, a younger stage; it is a pinkish-white species, with rigid, thin dissepiments (when fresh). The species assigned to *P. vaporarius* is white, but stout, with pores up to 5 mm. deep, and thick, rather soft dissepiments (when fresh).

499. **Polyporus callosus** Fr. (370).

In Herb. Kew, Thwaites 370 consists of four pieces on one sheet, and a single piece on another sheet which seems different; there is also a piece marked 367, *P. callosus*.

In Herb. Peradeniya the sheet marked 370 bears five pieces, probably all *P. callosus*, and two pieces of another species. Another sheet marked 968, which should be *Trametes versiformis*, bears three pieces of *P. callosus*, and one of *P. niphodes*.

Probably not *P. callosus*, but I have not met with it, and do not know it in the fresh state. It is thin, with extensive glabrous patches on which the pores are barely developed.

500. **Polyporus vinctus** Berk. (208).

Thwaites 208 in Herb. Kew is identical with the species which we have for some years been naming *Poria hypolateritia* in Ceylon. It is, I believe, identical with the type specimen of *Poria hypolateritia* Berk. from the Nilgiris, the latter being young and poorly developed. Thwaites 208 in Herb. Peradeniya is a different species; it resembles *P. hypolateritia* superficially, but the basal layer is brown.

501. **Polyporus subvinctus** B. & Br. (603).

Thwaites 603 in Herb. Kew is a thick species, up to 4 mm. thick, with a broad sterile margin; the co-type, Thwaites 603, in Herb. Peradeniya is the same species, but much thinner. Another sheet at Kew is marked "with 208"; this collection is also represented in Herb. Peradeniya.

502. **Polyporus epimiltinus** B. & Br. (209).

Thwaites 209 is in Herb. Kew and Herb. Peradeniya; in the latter case a mixture. Specimens distributed from the Philippines as *Poria borbonica* Pat. appear to be the same species.

503. **Polyporus Stephensii** B. & Br. (971).

Trametes serpens Fr., *fide* Saccardo. Thwaites 971 is in Herb. Kew, together with specimens from all parts of the tropics under the same name.

504. **Polyporus hydnophorus** B. & Br. (367, 369 in part).

The type in Herb. Kew is poor; better specimens will be found under *Fomes fulvus*. Well represented in Herb. Peradeniya.

505. **Polyporus leptodermus** B. & Br. (1033).

Thwaites 1033 is in Herb. Kew and Herb. Peradeniya.

506. **Polyporus calceus** B. & Br. (598).

Polyporus calcicolor (B. & Br.) Sacc. & Syd., Sylloge Fungorum, XIV., p. 192. Thwaites 598 is in Herb. Kew and Herb. Peradeniya.

507. **Polyporus niphodes** B. & Br. (652).

In Herb. Kew two sheets, Thwaites 652, marked *P. niphodes* by Berkeley, are all the same species; another sheet, marked 652, contains four pieces, two of which are *niphodes*, and two marked by Bresadola "not *niphodes*." The two latter may be *P. interrupta*.

In Herb. Peradeniya Thwaites 652 is a mixture, containing three pieces of *P. niphodes*.

Both in Herb. Kew and Herb. Peradeniya are other specimens of *P. niphodes*, or an allied species, *sub Trametes versiformis* (Thwaites 968).

508. **Polyporus interruptus** B. & Br. (652 in part).

Thwaites 652 is in Herb. Kew and Herb. Peradeniya. The specimens appear to me to be the same as those assigned to *P. vulgaris*.

509. **Polyporus epilinteus** B. & Br. (605).

Thwaites 605 in Herb. Kew, *sub P. epilinteus*, includes three pieces on one sheet, *ex* Herb. Berkeley, two marked by Bresadola, *P. zonalis* B. *resupinatus*, and the other, *P. albomarginatus* Lév., *f. resupinatus*. Specimens (Thwaites 605) *ex* Herb. Currey and Herb. Cooke are the same as the first of these, and show a resupinate margin. With the exception of the piece labelled *P. albomarginatus*, which is young *P. kermes*, all are *P. cartilagineus* B. & Br., *i.e.*, *P. zonalis* Berk. *Poria epilintea* is recorded for Peradeniya by Bresadola (*loc. cit.*) from von Höhnel's collection.

— **Polyporus contractus** Berk.

Named from Gardner's collection, Decades of Fungi, 176. The type is either *Polyporus zonalis* or *Fomes lignosus*.

— **Peziza Ceylonsche.**

From the figure this was a *Lentinus*, but the des cription is that of a *Polyporus*, probably *P. xanthopus*.

— **Peziza limbosa.**

The description and figure indicate a Polyporoid fungus, probably *Hexagonia ochroleuca*. The pores shown in the figure are too large for those of *P. bicolor*, to which it might otherwise be referred.

— **Polyporus crenatus** Berk.

The type specimens in Herb. British Museum are *P. flabelliformis* with a lobed margin, a fairly frequent form.

— **Polyporus Kœnigii** Berk.

The type specimens in Herb. British Museum are apparently *P. grammocephalus* or *P. russoceps*. They have not been microscopically examined.

— **Polyporus zeylanicus** Berk.

The type in Herb. British Museum is the same as specimens distributed from the Philippines as *Polystictus pergamenus* (Berk.) Bres., and from Annam as *Polystictus pergamenus* Fr. Presumably these records are based on the identity of the specimens concerned, with *Hexagonia pergamenea* Berk. *P. zeylanicus* requires comparison with the latter, a point which I regret I overlooked when in England.

— **Polyporus nigrocinctus** Berk.

The specimens in Herb. British Museum are labelled " *Boletus fragilis* Fl. Zeyl," and marked by Berkeley *P. nigrocinctus var.* It seems probable that they are *Tr. occidentalis.*

— **Polyporus dubius** Berk.

The type is in Herb. British Museum ; it somewhat resembles *P. Gaudichaudii*, but is thicker, and has different pores.

— **Polyporus sericellus** Lév.

Described from Ceylon specimens by Léveillé in Ann. Sci. Nat., Ser. 3, V. (1846), pp. 111–167. Lloyd (Synopsis of the section Apus of the Genus Polyporus) states that no type is known.

— **Polyporus phæus** Lév.

Described from Ceylon specimens by Léveillé (*loc. cit.*). Lloyd states (Synopsis of the Genus Fomes) that *Polyporus phæus* Berk. is *Fomes melanoporus.*

— **Polyporus siennæcolor** Cooke.

Polyporus siennæcolor was part of Thwaites 605. It was labelled *P. siennicolor* by Berkeley on the herbarium specimen, but the name was not published by him. Cooke, in his description in Grevillea, gives the Berkeleyan number *2379, but this is a number which Cooke inserted in the MSS. catalogue of Berkeley's herbarium. The piece of paper to which the specimen is gummed fits into one of the sheets, Thwaites 605, and thereby affords confirmation of Cooke's statement that it was part of that Thwaites' number. There are two other specimens, labelled "*Pol. siennæcolor* B. Panuré" by Berkeley, which were probably named by him prior to the Ceylon specimen, but from Cooke's citation the Ceylon specimen is the type. It is plane, subcircular, about 5 cm. diameter, with a short lateral stalk ; it resembles in colour a dull *Fomes lucidus*, purple-red, but very thin ; the context is eaten out by insects, but was apparently pale. The sheet from which it was removed by Cooke contained the thin form said to be young *Fomes dochmius*, and the stalked and resupinate pieces of *P. zonalis*, of which the stalked specimens were named *P. cartilagineus*. Except for the colour, one might refer *P. siennæcolor* to *P. zonalis* also. It has a more decided stalk, but is margined behind like several recent collections of *P. zonalis*.

— **Polyporus griseus** Bres.

Collected at Colombo and Peradeniya by von Höhnel, and described by Bresadola in Ann. Myc., X., p. 494. Lloyd considers that this is *P. ostreiformis*.

— **Polyporus rugulosus** Lév.

Collected by von Höhnel at Peradeniya and recorded by Bresadola (*loc. cit.*). Lloyd states that this is usually taken to be *P. zonalis ;* no type known.

— **Polyporus lucidus** (Leys.) Fr.

This species was recorded by Berkeley from Gardner's collection, but was not included in the "Fungi of Ceylon." There are apparently no Ceylon specimens of this species in Herb. Kew.

— **Polyporus Amboinensis** (Lam.) Fr.

Recorded by Berkeley from Gardner's collection, but not included in the "Fungi of Ceylon." No Ceylon specimens in Herb. Kew. The specimens I have seen of this species in European Herbaria do not impress me as being more than immature examples of *Fomes lucidus*.

— **Polyporus rufoflavus.**

Collected by Beccari at Colombo, and identified by Cesati. This is otherwise only known from America.

As Cesati describes his specimen as laccate, he probably had *Polyporus lucidus*, the lower surface of which may turn yellow in drying.

— **Polyporus gilvus** Schw.

Collected by von Höhnel at Peradeniya, and recorded by Bresadola (*loc. cit.*). See *P. holosclerus*, *P. isidioides*, and *P. senex*.

— **Polyporus zonatus** Fr.

Collected by Beccari on Pedrotalagala, and recorded by Cesati.

— **Fomes substygius** Cooke.

Under *Polyporus senex*, in "Fungi of Ceylon," Berkeley and Broome noted that one form was repeatedly zonatosulcate. This was subsequently cited by Cooke as *Fomes substygius*.

— **Fomes levissimus** Fr.

Recorded for Ceylon in Fries, Epicrisis ; said to have been collected in Ceylon by Wahlenberg. As the latter collected in Africa, the locality may be an error. Lloyd (Synopsis of the Genus Fomes) states : "My notes concerning the type are 'very poor, not recognizable, not a *Fomes* however.' I have since gotten *Fomes floccosus* from Ceylon, and from description of *levissimus*, I believe it is probably same."

— **Fomes ulmarius** Fr.

Collected by von Höhnel at Peradeniya, and recorded by Bresadola (*loc. cit.*).

— **Fomes lignosus** Kl.

Collected by von Höhnel at Peradeniya, and recorded by Bresadola (*loc. cit.*). See *P. contractus* Berk.

— **Poria hypolateritia** Berk.

Collected by von Höhnel at Peradeniya, and recorded by Bresadola (*loc. cit.*).

510. **Trametes colliculosa** Berk. (Thwaites 568 ; Gardner 97).

In Herb. Kew are Gardner 97, Gardner (Dimbula), and Gardner (without number) ; also Thwaites' specimens (without number). There is no specimen marked

"Damboul, March, 1868," as cited by Berkeley and Broome, but several Ceylon specimens are not localized. All are *Trametes* (*Hexagonia*) *ochroleuca.*

511. **Trametes rugosa** B. & Br.

The type in Herb. Kew, "Thwaites 568, Central Province, 1868," is a single specimen, a rather thick form of *Trametes ochroleuca*, according to Lloyd. The sections marked Thwaites 568 in Herb. Peradeniya appear to be nearer *Hexagonia durissima*, but they are scarcely identifiable.

512. **Trametes lobata** Berk. (257).

I was unable to find any specimen marked Ceylon, or 257, *sub T. lobata* in Herb. Kew. A Ceylon specimen in Herb. British Museum, *ex* Herb. Broome, is *Polyporus Peradeniæ.*

513. **Trametes læticolor** Berk.

Herb. Kew contains a Ceylon specimen, coll. Gardner, and another Ceylon specimen without collector's name. These are *Trametes ochroleuca.*

514. **Trametes occidentalis** Fr. (Gardner 77, 95, 122).

In Herb. Kew *sub P. occidentalis* is 77, labelled *Trametes occidentalis ;* also Gardner 77, 95, 122, and Thwaites, 1850. In Herb. Peradeniya are Thwaites 77 and 222. The latter are *Irpex flavus.*

515. **Trametes gibbosa** Fr. (406).

The sheet of Thwaites 406 is in Herb. Kew, but the specimen is missing.

516. **Trametes levis** Berk. (121).

Only one specimen, from Gardner, in Herb. Kew.

517. **Trametes versiformis** B. & Br. (968).

Thwaites 968 in Herb. Kew contains four pieces, marked by Bresadola : "a–b ne pas Tr. = d qui serait le type de *Trametes versiformis :* c ne pas = ab, ne pas = d : sont tres especes diverses." C is represented in Herb. Peradeniya, and is either *P. niphodes*, or some closely allied species. It appears to me that a, b, and d, might be the same species.

— **Trametes lactinea** Berk.

This was described by Berkeley from König's collection "König, Herb. British Museum, without habitat." There is a fine specimen in the Herb. British Museum, which agrees with specimens recently collected in Ceylon. It was recorded for Ceylon by Berkeley from Gardner's collection, and there are three Ceylon specimens so named in Herb. Kew. The latter are somewhat softer than the British Museum specimen. One marked by Berkeley, "*Trametes lactinea* var.," is marked "doubtful" by Bresadola. A third specimen labelled "Ceylon" is marked "*Trametes lactinea* type" (unsigned), and "co-type" by Lloyd. All are thinner than the British Museum specimen. *Trametes lactinea* was not included by Berkeley and Broome in "Fungi of Ceylon."

— **Trametes corrugata** (Pers.) Bres.

Collected by von Höhnel at Peradeniya, and recorded by Bresadola (*loc. cit.*). Is *Polyporus* or *Trametes Persoonii*.

518. **Dædalea pavonia** Berk. (Gardner 108).

In Herb. Kew are two parts of Gardner 108, one marked *Dædalea pavonia* Berk., and the other *Dædalea pavonia var.* In the same cover are two specimens, marked "*Dædalea pavonia* Berk., Dimboola, Ceylon, Gardner." The latter specimens are *Polyporus vittatus* Berk., and are so marked by Bresadola. But the type is Gardner 108, Hantane range ; and the type specimens are not *P. vittatus*. The type specimens are much insect-eaten ; the largest is about 10 cm. diameter, probably originally white, zoned gray, red behind ; they appear to be thin specimens of *Trametes ochroleuca*.

519. **Dædalea subsulcata** B. & Br. (567).

Thwaites 567 is in Herb. Kew and Herb. Peradeniya. In Herb. Peradeniya this number contains probably two species : one, with dædalioid pores, and a finely tomentose or almost glabrous upper surface ; the other, with lenzitoid pores, and a more coarsely tomentose surface.

— **Dædalea inæquabilis** Berk.

The type of this species, which was collected by König, is in Herb. British Museum. It is *Hexagonia ochroleuca*.

— **Dædalea vetulina** Ces.

This species was collected by Beccari on Pedrotala gala. Cesati was in doubt whether the single specimen should be referred to *Lenzites* or *Dædalea*. From the description it may be suggested that it was *Lenzites betulina*, which grows at that elevation in Ceylon.

— **Dædalea flavida** Lév.

Collected by von Höhnel at Peradeniya, and recorded by Bresadola (*loc. cit.*). ? *Hexagonia ochroleuca*.

— **Dædalea pruinosa** Lév., forma trametoidea (= Hexagonia glabra Lév.).

Collected by von Höhnel at Peradeniya, and recorded by Bresadola (*loc. cit.*). *Fide* Lloyd, this should be referred to *Hexagonia ochroleuca*.

520. **Hexagonia crinigera** Fr. (566).

Thwaites 566 in Herb. Peradeniya is *Hexagonia apiaria*.

521. **Hexagonia Kœnigii** B.

The specimen at Kew is effete. Bresadola has marked it *H. apiaria*, and Lloyd has come to the same conclusion (Synopsis of the Genus Hexagona, p. 44).

522. **Hexagonia polygramma** Mont. (365).

Ceylon specimens are said to be all referable to *Hexagonia discopoda* Pat. & Har. Thwaites 365, in Herb. Peradeniya, is the medium-pored form named *H. tenuis*.

523. **Hexagonia similis** B. (211).

Thwaites 211, in Herb. Kew, is marked by Bresadola "not *Hexagonia*, but a *Polyporus* unknown to me." The same species is Thwaites 211 in Herb. Peradeniya; it appears to be *Polyporus luteo-olivaceus*. Another specimen in Herb. Kew, collected by Thwaites in 1850, marked "Inter *H. affinem* et *polygramma* intermedia," is *H. discopoda*. There is also another specimen, no date or number, originally about 6 inches in diameter, half from Herb. Cooke and half from Herb. Berkeley ; my notes on this example have been mislaid.

524. **Hexagonia durissima** B. & Br.

— **Hexagonia sulcata** Berk.

This species was described from Gardner's collection, and is probably the same as *Hexagonia durissima*. Lloyd (*loc. cit.*) states : " This strongly-marked species is only known from Ceylon. Berkeley published it in 1847 with a good figure, and sent specimens to both Fries and Montagne. That sent to Montagne was typically sulcate, but the specimen to Fries was more even. Berkeley did not retain a specimen in his own herbarium, and when some twenty years later he received the smooth form also from Ceylon he described it as *Hexagonia durissima*. It is the same as the specimen of *sulcata* he sent Fries. Whether or not it is the same species as *sulcata* I do not know, but I think it probably only a smooth form."

Hexagonia durissima is represented in Herb. Kew and Herb. Peradeniya. Though there is now no specimen of *H. sulcata* in Herb. Kew, it is clear that Berkeley retained one for some time, for there is a specimen in the British Museum which he gave to Phillips.

525. **Hexagonia adnata** B. & Br. (610).

The type in Herb. Kew is merely a fragment in a much damaged condition, and hardly warranted a name. It was a large-pored, thick species. Lloyd (*loc. cit.*) regards it as an anomaly of some kind.

526. **Hexagonia pergamenea** B. & Br.

Fide Lloyd, this is a species close to *Polystictus dermatodes*. In my notes I find that I have put it down as *T. dermatodes*, but now think that that determination may be erroneous. It requires comparison with *Polyporus zeylanicus* Berk. A specimen forwarded to me from Annam, determined by Graff as *Polystictus* *pergamenus* Fr., is exactly *Polyporus zeylanicus*, except that the pores are not fully developed; and another specimen, from the Philippines, determined by Bresadola as *Polystictus pergamenus* (Berk.) Bres., is the same species. It remains to be determined whether *P. zeylanicus* is a form of *T. dermatodes* or a distinct species.

— **Hexagonia brevis** Berk., Kew Garden Miscellany, 1854, p. 229.

There is no type of this species at Kew or at the British Museum.

— **Hexagonia Deschampsii** Hariot, Bull. Soc. Myc., France, VII., p. 207.

This species was collected by Deschamps in Ceylon in 1891. Lloyd states that abundant specimens reached Berkeley from Ceylon, and were referred by him to *H. crinigera*.

— **Hexagonia velutina.**

Recorded for Ceylon by Lloyd (Synopsis of the Genus Hexagona, p. 14). Lloyd states : " Nearly the same plant (one collection) reached Berkeley from Ceylon. He referred it to *variegata*." So far as I am aware, Berkeley never published this record. I regret that I overlooked Lloyd's record, and consequently did not examine this species at Kew.

527. **Favolus ruficeps** B. & Br. (46 in part).

Thwaites 46 is represented in Herb. Kew and Herb. Peradeniya, *sub F. ruficeps*. It is *Hexagonia* rather than *Favolus*.

528. **Favolus brasiliensis** Fr. (35 in part).

Herb. Kew contains *sub F. brasiliensis*, Thwaites 35, marked by him : " This has a disagreeable fishy smell when fresh," and also specimens collected by Thwaites in 1854. In Herb. Peradeniya B. & Br. 528 and 530 are on the same sheet. This is apparently not the *F. brasiliensis* figured by Lloyd (Polyporoid issue, No. 2, p. 20). (See B. & Br., 530.)

529. **Favolus Friesii** B. & C. (November, 1867).

One Ceylon specimen, in Herb. Kew, is labelled "*Favolus lacerus* Fr., Ceylon, 1854," another single specimen is marked Thwaites 91. Both are small examples of the species assigned to *F. brasiliensis*.

530. **Favolus multiplex** Lév. (35, cum icone).

In Herb. Kew, *sub F. multiplex*, are Thwaites 35; and also specimens collected by Thwaites in 1851, marked "*Favolus multiplex* Lév.=*Favolus Thwaitesii* Berk." The latter was published as *Favolus multiplex var. Thwaitesii*, in Kew Garden Miscellany, 1854, p. 229. In Herb. Peradeniya, *Favolus multiplex* and *F. brasiliensis* are on the same sheet.

The specimens of this are merely the older form of those assigned to *F. brasiliensis*; the figure, however, labelled *F. multiplex*, represents the thinner younger stage, the specimens of which were placed under the former name. If the division of Thwaites 35 into two species were correct, the figure should have been named *F. brasiliensis*.

Berkeley and Broome's 528, 529, 530 are all the same species, probably *Favolus multiplex* Lév., but apparently not the *Favolus multiplex* figured by Theissen in Polyporaceæ Austro-brasilienses, 1911.

531. **Favolus tessellatus** Mont. (46, cum icone).

Herb. Kew contains eleven specimens of Thwaites 46, *sub F. tessellatus*. There are six specimens in Herb. Peradeniya. The figure represents *F. ruficeps*, but is labelled *F. tessellatus*. The Ceylon specimens are almost sessile, and probably not *Favolus tessellatus* Mont. They agree exactly with Lloyd's figure of *Hexagonia Miquelii* (Mont.) in Synopsis Hexagona, p. 36.

532. **Favolus scaber** B. & Br. (618, 46 in part).

In Herb. Kew are five specimens of Thwaites 618 and one specimen Thwaites 46. This species bears much resemblance to *F. tessellatus*, but is not glabrous above. It is distinct, and should be *Hexagonia*, not *Favolus*.

— **Favolus cucullatus** Mont.

Recorded by Cesati for Peradeniya from Beccari's collection. Lloyd (Synopsis of the Genus Hexagona, p. 35) states that Beccari's Ceylon collection at Kew is named by Cesati *Favolus chartaceus*, and is probably *Hexagona cucullata*. From Cesati's description, *sub F. cucullatus*, it would appear to be identical with the Ceylon species assigned to *F. multiplex*.

The following list includes all the Polyporoids known to the writer to occur in Ceylon, either from herbarium specimens or recently-collected examples, with the exception of some species as yet unnamed, and others, *Resupinati*, recorded by Berkeley and Broome, which are based on undetermined mixtures, or which have not been recently collected and consequently cannot be redescribed.

The prevalence of Polypori, or at least of those species which are saprophytic, in any country depends obviously on the quantity of fallen timber and decaying stumps available, provided that climatic conditions are favourable to their development. Over the south-western parts of Ceylon climatic conditions are favourable almost throughout the year, and the drier northern and eastern regions have a rainy season of about three months, which suffices for the growth of a normal number. Fallen timber and old stumps are plentiful, at least in the wetter regions, with the consequence that specimens, if not species, of Polypori are abundant.

When any great extension of planting occurs in Ceylon, large tracts of jungle are felled and burnt, a process which leaves tree trunks scattered in all directions, and countless huge stumps up to 4 feet in height over thousands of acres. Such conditions prevailed during the extension of rubber planting in 1905–1910, and it was possible then to gather cartloads of Polypori. Yet the nett results in such a case are disappointing, as comparatively few species colonize the logs which lie on the bare hillsides, exposed alternately to the scorching sun and the tropical rains. Vast numbers appear, but they are, as a rule, limited to a few species, and one grows weary of seeing *Trametes ochroleuca*, *Trametes occidentalis*, *Trametes Persoonii*, *Polyporus sanguineus*, *Lenzites repanda*, with, perhaps, *Polyporus gilvus* and *Fomes senex*. Only when logs have been rolled into an uncleared ravine, under the shelter of the trees and shrubs, is anything rarer to be found.

Though our knowledge of the distribution of Ceylon Polypori is only in a preliminary state, it is clear that there are considerable differences in the distribution of the various species which can be, more or less, correlated with the varying climatic conditions in different regions of the Island. Some species occur in the wet low-country only, others have only been found at the top of the hills (5,000 to 7,000 feet), while others again prefer the dry low-country zone.

Among the species which are generally distributed over the wet zone, from sea level to the hill tops, are *Lenzites repanda*, *Polyporus gilvus*, *P. agariceus*, *P. Gaudichaudii*, *Fomes senex*, *F. caryophylli*, and *Trametes occidentalis*. *Fomes applanatus* has the same range, and is common at 5,600 feet, but *Fomes lucidus*, though occurring at 5,600 feet, is distinctly rarer in these higher regions.

Among the species apparently confined to the wet low-country we find *Fomes dochmius*, *F. rhinocerotis*, *Trametes dubius*, *Polyporus rubidus*, *P. Didrichsenii*; but a large number of low-country species ascend to the elevation of Peradeniya, these latter including *Polyporus ostreiformis*, *P. zonalis*, *P. durus*, *P. grammocephalus*, *P. sanguineus*, *P. xanthopus*, *Fomes subresinosus*, *F. lignosus*, *F. kermes*, *Trametes ochroleuca*, and the ubiquitous and polymorphic *Trametes Persoonii*.

The up-country jungles, at 5,000 to 7,000 feet, have their own peculiar species in *Polyporus elongatus*, *P. versicolor*, *P. anebus*, *P. ochroleucus*, *Fomes pectinatus*, *Dædalea subsulcata*, and *P. secernibilis*, while *P. dictyopus* and *P. setiporus*, which are abundant there, descend to medium elevations. In the Hakgala Botanic Garden *Trametes cervinus* abounds, and *Lenzites betulina* and *L. abietina* occur, but in this locality European introductions are to be suspected; *Boletus luteus* grows there in troops, and *Collybia radicata* has been found.

The dry regions have not yet been worked with any approach to thoroughness, and we have very few records from them. *P. grammocephalus*, *P. sanguineus*, *P. xanthopus*, *Trametes* *ochroleuca*, *T. Persoonii*, *Fomes lucidus*, *F. senex*, and *F. subresinosus* occur, and our only records of *P. luteus* and *P. affinis* are from these districts. The most striking feature, mycologically, as one traverses these parched tracts in the dry season, is the abundance of *Fomes rimosus*. Noteworthy, too, in the jungles, is the prevalence of *Hexagonia apiaria*, a species I have never collected in the wet zone.

Lenzites.

Lenzites abietina Fr.

2690, Hakgala, September, 1908 (det. Lloyd).

Lenzites betulina Linn.

3433, Hakgala, May, 1912 (det. Lloyd); 4069, Hakgala, April, 1914; 4458, Hakgala, 1914 (det. Lloyd).

Lenzites repanda Pers.

Lenzites applanata Fr., B. & Br., Fungi of Ceylon, 431; *Lenzites deplanata* Fr., B. & Br., Fungi of Ceylon, 432.

2378, Peradeniya, May, 1907; 2965, Hapugastenna, October, 1909; 2178, Yatipauwa, November, 1906; 3396, Mirishena, February, 1912 (det. Lloyd); 3586, Peradeniya, October, 1912; 4633, Peradeniya, January, 1915; 4762, Gikiyanakanda, July, 1915 (det. Lloyd). 2180 (Trametes), Peradeniya, June, 1906 (det. Lloyd).

Lenzites striata Swartz.

2773, Kelani estate, August, 1908 (det. Lloyd); 4765, Colombo, July, 1915.

Lenzites subferruginea Berk.

3594, Lagos estate, December, 1912 (det. Lloyd).

Lenzites aspera Kl.

Not recently collected.

Polyporus.

Polyporus ostreiformis Berk.

4253, Colombo, October, 1914; 4255, 4256, Galle, October, 1914; all det. Lloyd. 3640, Gangaruwa, April, 1913; 4196, Colombo, July, 1914. Lloyd considers that *P. griseus* Bres. is the same species (Section Apus of the Genus Polyporus, p. 379).

Polyporus ochroleucus Berk.

3447, Hakgala, May, 1912 (det. Lloyd); 2970, Hapugastenna, October, 1909; 2684, Hakgala, September, 1908; 3154, Hakgala, May, 1910; 3975, Hakgala, April, 1914; 4144, Hakgala, September, 1914; 4717, Hakgala, April 1915; 4086, Peradeniya, August, 1914; 4738, Peradeniya, June 1915.

Common at Hakgala; usually pendent from comparatively thin branches or stems.

Polyporus obtusus Berk.

3551, Peradeniya, August, 1912 (det. Lloyd).

Pure white when fresh.

Polyporus hydnophorus B. & Br.

Polyporus (Resupinati) hydnophorus B. & Br., Fungi of Ceylon, 504.

4225, Peradeniya, October, 1914; 4374, Peradeniya, 1912.

Dimidiate, decurrent behind. Pilei narrow orbicular, about 2 cm. long, 0·5 cm. broad, confluent; white, becoming ochraceous when old. Upper surface strigose, or bearing erect, Stilbum-like processes. Pores up to 3 mm. deep, dissepiments at first thick, becoming thin, irregular. Pores about 0·2 mm. diameter, but variable, up to 1 mm. Substance soft. Frequently forming pulvinate cushions, circular, up to 1 cm. diameter, or linear when emerging from cracks in the bark; margin tomentose; these cushions may bear pores in the centre and stilboid processes towards the margin, or may be covered with stilboid processes only. These processes are clavate, up to 0·5 mm. high, 0·1 mm. diameter below, 0·2 mm. diameter above; stalks tomentose; head bearing simple basidia with oval, pointed conidia, 8–12 $\times$ 5 μ.

In cases where the fungus has emerged from a crack in the bark of a branch, and the bark has subsequently fallen off and exposed the thin film of mycelium which overlies the wood, this mycelium produces the Stilbum conidial form in abundance.

Polyporus secernibilis Berk.

Polyporus secernibilis Berk., Hook. Lond. Jour. Bot. (1847), p. 500; *Polyporus dissitus* B. & Br., Fungi of Ceylon, 454.

3410, Haputale, March, 1912 (det. Lloyd as *dissitus*); 3894, Hakgala, January, 1914; 4038, Hakgala, April, 1914.

Bresadola and Lloyd consider that *P. dissitus* is the same as *P. adustus* of temperate climates. Our species is at first pure white, watery, and spongy, hymenium subtranslucent; the hymenium becomes black when old, and on drying. This species apparently occurs only up-country.

Polyporus introfuscus n. sp.

P. secernibilis of Lloyd, non Berk., in Herb. Kew. 3595, Peradeniya, December, 1912; 3474, Peradeniya, May, 1912.

Dimidiate, decurrent behind, or pseudostalked, fused into large imbricated masses. Individual pilei comparatively small, up to 4 cm. long and 3 cm. broad, plane, moderately thick (up to 8 mm. behind), pale yellow-brown, with darker brown zones; radially silky. Context coarsely horizontally fibrous, dark brown when moist, pale brown when dry. Lower surface pallid, becoming brownish when bruised, black-brown when dry. Pores minute; pore layer up to 1·5 mm. deep. Spores white in mass, narrow-oval or subcylindric, 5–8 × 3 μ.

Dimidiatis, decurrentibus, vel pseudostipitatis, imbricatis; pileis parvis, ad 4 cm. long., 3 cm. lat., planis, crassiusculis, pallide flavo-brunneis, zonatis, radiatim sericeis; contextu horizontaliter fibroso, vivo fuscobrunneo, sicco pallide brunneo; hymenio pallido, sicco nigro-brunneo; poris minutis, ad 1·5 mm. long.; sporis albis, angusto-ovalibus vel sub-cylindraceis 5–8 × 3 μ.

Polyporus conchoides Mont.

3748, Peradeniya, April, 1913 (det. Lloyd).

Polyporus zonalis Berk.

Polyporus cartilagineus B. & Br., Fungi of Ceylon, 459; *Polyporus* (*Resupinati*) *epilinteus* B. & Br., Fungi of Ceylon, 509.

2685, October, 1908, May, 1909; 3295, December, 1911; 4236, November, 1914; 4484, January, 1915; all Peradeniya.

Common throughout the low-country. The pilei develop on anything that comes in the way of the mycelium, even on bricks. Easily distinguished from *Fomes lignosus*, when fresh, by the livid gray, sometimes pallid, hymenium, and by the upper surface being wood colour or reddish when wet, instead of the deep red-brown of *Fomes lignosus*.

Polyporus rugulosus Lév., recorded by Bresadola as collected by von Höhnel at Peradeniya, is stated by Lloyd to be usually applied to a thin form of *P. zonalis*. This form is apparently abundant in Malaya, but we have not collected it in Ceylon

Polyporus strigatus Berk.

Not collected recently.

Polyporus semilaccatus Berk.

2967, Hapugastenna, October, 1909 (det. Lloyd); 3754, Moratuwa, September, 1913 (det. Lloyd); 3441, Hakgala, May, 1912 (det. Lloyd).

At first grayish-white or grayish-brown, with faintly brown zones, minutely tomentose; gradually becoming almost entirely purple-brown or blackish-brown, and glabrous, sometimes a few grayish zones persisting. Hymenium white, becoming ochraceous; substance white. The Hakgala specimen had, when young, a yellow margin, followed by a red-brown zone, then reddish-purple to purple-black; it is possibly a different species.

Polyporus anebus Berk.

Polyporus bicolor Jungh. *Polyporus polytropus* B. & Br., Fungi of Ceylon, 455.

4723, Hakgala, April, 1915 (det. Lloyd); 3465, Hakgala, May, 1912 (det. Lloyd); Haputale, May, 1916.

In my experience an up-country species, and not common.

Polyporus vittatus Berk.

Not collected recently.

Polyporus durus Jungh.

3305, Peradeniya, December, 1911 (det. Lloyd); 3752, Henaratgoda, September, 1913; 3971, Peradeniya, February, 1914; 4464, Peradeniya, October, 1914 (det. Lloyd); Peradeniya, August, 1915.

A common low-country species, frequently occurring in trametoid masses with a narrow free margin. Deep violet-purple when fresh, acquiring an ashy "bloom" on drying.

Polyporus vinosus Berk.

2974a, Hapugastenna, October, 1909 (det. Lloyd); 4701, Peradeniya, February, 1915 (det. Lloyd).

Polyporus gilvus Schw.

Polyporus isidioides Berk., in Fungi of Ceylon, 465; *Polyporus holosclerus* Berk., in Fungi of Ceylon, 466.

2674, Peradeniya, October, 1908 (det. Lloyd); 3395, Peradeniya, February, 1912; &c.; 4596, Hakgala, May, 1913; 4574, Hakgala, May, 1912; 4054, Hakgala, April, 1914 (det. Lloyd); 3645, Hakgala, May, 1913, (det. Lloyd); 3720, Culloden, August, 1909; 2780, Ferriby estate, February, 1909; 2930, Culloden, August, 1909 (det. Lloyd); 2760, Gangaruwa, November, 1908; 2761, Henaratgoda, December, 1908; 3553, Henaratgoda, August, 1912 (det. Lloyd); 3865, Kalupahani, March, 1912; 3462, Kalupahani, May, 1912 (det. Lloyd).

One of the commonest Ceylon Polypori. *P. scruposus* forms are frequent.

Polyporus carneo-fulvus Berk.

4705, Hakgala, April, 1915 (det. Lloyd).

Polyporus licnoides Mont.

3589, Lagos estate, Kalutara, December, 1912 (det. Lloyd).

Polyporus substygius Cooke.

2349, Hakgala, April, 1907 ; 2968, Hapugastenna, October, 1909 ; 4159, Hakgala, September, 1914.

Polyporus rubidus Berk.

2777, Puwakpitiya, February, 1909.

Apparently a low-country species ; rose-coloured when fresh. Not common.

Polyporus Didrichsenii Fries.

3397, Mirishena, February, 1912 (det. Lloyd).

Polyporus discipes Berk.

Gardner's specimen is the only one known.

Polyporus grammocephalus Berk.

Polyporus Kœnigii Berk., Ann. Mag. Nat. Hist., X., pp. 369–384.

2182, Ukuwela, November, 1906 ; 2982, Maha Iluppallama, September, 1909 ; 3842, Siyambalagomuwa, November, 1912 ; 4083, Gangaruwa, July, 1914.

Common in the low-country, both in the wet and dry zones, but not found in up-country districts. White specimens occur.

Polyporus russiceps B. & Br.

Not found recently.

Polyporus Emerici Cooke.

3298, Peradeniya, December, 1911 (det. Lloyd).

Polyporus siennæcolor Cooke.

Not found recently.

Polyporus sanguineus Linn.

3237, Eladuwa, May, 1910 (with *Trametes* forms) ; 3297, Peradeniya, December, 1911 ; 3311, Maha Iluppallama, January, 1912 ; 3321, Matale, January, 1912 ; 3525, Peradeniya, July, 1912 ; 3600, Peradeniya, December, 1912 ; 4254, Colombo, October, 1914 ; 4776, Colombo, July, 1915.

One of our commonest Polyporoids. Records of *Trametes cinnabarina* from the tropics appear to relate to thick or misshapen specimens of *sanguineus ;* the Ceylon specimens under the two names are indistinguishable. White specimens, *i.e.*, fresh, not old and bleached, occur with the normal form.

Polyporus udus Jungh.

4662, Peradeniya, May, 1915 (det. Lloyd); **4364**, Peradeniya, December, 1914.

Brownish-gray, with scattered, irregular, purple-brown spots ; or sordid brown, with radial irregular, black-brown streaks. Flesh white, more than 1 cm. thick in the centre ; hymenium pallid, subtranslucent. Spores white, oblong-oval, 10–13 × 5–6 μ ; basidia 4-spored ; sterigmata up to 8 μ long, conical. Soft and watery, becoming membranous when dried.

Polyporus rhipidium Berk.

3557, Peradeniya, August, 1912 ; 4174, Peradeniya, October, 1914. White at first.

Polyporus dictyopus Mont.

Polyporus picipes Fr., in B. & Br., Fungi of Ceylon, 442.

2809, 2810, 2689, 3732, 4045, 4495, all from Hakgala. 3472, Hakgala, May, 1912 (det. Lloyd as *P. Blanchetianus*).

I find this chiefly up-country. The pileus is at first white, then yellow-brown to chestnut, finally black. The specimen determined as *P. Blanchetianus* was a small example of the normal form. It varies in diameter from 1–10 cm.

Polyporus hemicapnodes B. & Br.

2710, Hakgala, September, 1908.

Cartilaginous, deeply umbilicate, or infundibuliform, margin incurved, pale ochraceous brown, smooth. Pore surface white, turning brown when bruised ; pores minute. Stalk black-brown, slightly tomentose, base expanded or not. My specimens are not "primum minutissime sericeo-lineato."

Polyporus agariceus Berk.

Polyporus arcularius Fr., in B. & Br., Fungi of Ceylon, 436.

2261, Peradeniya, September, 1906 ; 3559, Peradeniya, August, 1912 ; Pattipola, October, 1906 ; 3355, Peradeniya, November, 1911 ; 2175, Hakgala, September, 1908 ; 4066, Hakgala, April, 1914.

Common : spores white, oblong-oval, 6–8 × 2–3 μ.

Polyporus obovatus Jungh.

Polyporus dilatatus Berk., Hook. Lond. Jour. Bot. (1847), p. 499 ; *P. Adami* Cooke, Proc. Bot. Soc., Edinburgh, XIII., p. 171. 2962, Hapugastenna, October, 1909.

Subcartilaginous ; dark purple-brown, obscurely zoned ; or yellow, with purple-brown, gray-brown, or yellow-brown zones. Resembles *P. xanthopus* when fresh, but has a dull, not polished, surface. Pore surface white, then yellow. Stalk yellow, minutely tomentose.

Polyporus heteroporus Fries.

4050, Hakgala, April, 1914 (det. Lloyd) ; 4257, Hakgala, September, 1914 (det. Lloyd).

Specimens flabelliform, growing from the side of a log. I have one mesopod specimen from the top of the same log.

Polyporus sideroides Lév.

3552, Henaratgoda, August, 1912 (det. Lloyd) ; 3649, Henaratgoda, May, 1913 ; 4491, Henaratgoda, January, 1915 ; 3528, Peradeniya, July, 1912 ; 3750, Peradeniya, August, 1913 ; 3851, Peradeniya, November, 1913 ; 3907, Peradeniya, December, 1913 ; 3952, Hakgala, January, 1914 (det. Lloyd) ; 4756, Hakgala, April, 1915.

At Henaratgoda (low-country) and Peradeniya this grows on palm stumps ; at Hakgala (5,600 feet) on dicotyledonous stumps.

Polyporus rugosus Nees.

3898, Peradeniya, November, 1913 ; 4754, Peradeniya, July, 1915 ; 2175, Peradeniya, December, 1906 ; 2732, Peradeniya, 1908, &c.

Fairly common. It grows on the ground round decaying stumps, not actually on the wood. The growing point of the stalk is white. The stalk grows up to its full height and then spreads horizontally to form the pileus, either all round, in which case the pileus is circular and the stalk central, or on one side, in which case the pileus is reniform and the stalk lateral. Adjacent stalks or pilei frequently touch in the actively growing stage and then fuse. The white apex of the stalk and the white growing edge of the pileus turn red when bruised, as does the white flesh (of the fresh plant) when cut. Spores, in mass, pale purple-gray, spherical, 7–9 μ diameter, apiculus small or not evident.

Polyporus vivax Berk.

4461, Hakgala, April, 1914 (det. Lloyd).

Polyporus versicolor Fr.

2348, 2359, 2688, 2712, 3437, 3443, 3450, 3468, 3469, 4070, all from Hakgala, 1907–1914.

Common at Hakgala. I have distributed this as *P. pictilis* Berk., but it is not so closely zoned as the type of that. It grows to a comparatively large size, up to 8 × 6 cm.; the lower surface is white or cream-coloured.

Polyporus appendiculatus B. & Br.

Polyporus sulphureus in B. & Br., Fungi of Ceylon, 450; *Polyporus lacteus* in B. & Br., Fungi of Ceylon, 452.

3917, Hakgala, January, 1914 (det. Lloyd as *sulphureus*); 3964, Hakgala, March, 1914. Also at Peradeniya.

Imbricated in large masses; lobes up to 20 × 12·5 cm., horizontal or suberect, plane or slightly convex; thickness 1–1·5 cm. Pale wood-coloured, or cream, or pallid, usually with a broad watery-looking brown zone towards the margin; margin subtranslucent. When dry becoming dirty white. Surface minutely tomentose. Lower surface pallid; pores minute; context cheesy.

Lloyd regards this as *Polyporus sulphureus*, from which perhaps it differs only in colour. In one instance, where a stump on the top of a bank produced the normal pallid form, a piece which grew from an exposed root on the side of the bank was orange-red.

Polyporus mesotalpæ Lloyd.

4467, Peradeniya, October, 1914 (Lloyd type) ; also Peradeniya, June, 1907, &c.

Mesopodial, with a thick stem ; stem up to 10 cm. high and 6 cm. diameter ; pileus up to 40 × 20 cm. and 10 cm. thick, usually tuberculate and lobed, depressed in the centre. At first wholly white, becoming deep chocolate ; surface minutely velvety, with a black crustaceous layer beneath. Context white when fresh, watery, turning red when cut. The whole fungus turns deep blackish-brown if handled in the white stage. Stalk deep chocolate-brown, minutely velvety. Pores minute, watery when fresh, forming a distinct layer about 2 mm. deep.

The species grown at Peradeniya on rotten stumps. The change of colour occurs rather late ; specimens are usually brought me in the white stage and change colour in the laboratory in a few hours. I have not yet succeeded in obtaining a painting or a spore print, as it is a most difficult species to dry, and specimens are usually smothered in moulds in a day or two.

Polyporus pilosus n. sp.

2459, Peradeniya, May, 1907.

Pileus circular, regularly convex, 13 cm. diameter, densely clothed with grayish-white, erect, fasciculate tomentum, which turns dark gray in drying ; margin incurved. Flesh white, spongy, thick, about 2 cm. thick near the stalk. Stalk central, 4·5 cm. high, 2·5 cm. diameter at the base, expanding upwards into the pileus, dirty white, tough exteriorly, spongy within. Pore surface white, even, descending on the stem ; stratum of pores distinct from the flesh of the pileus ; depth of pores 5 mm., mouths strongly toothed and irregular, medium size.

I have seen only one specimen of this, which was brought to me in 1907. Mr. Lloyd, who saw it at Kew in 1911, informed me then that it was an unnamed species.

Pileo rotundo, convexo, 13 cm. diam., tomento griseo-albo, erecto, fasciculato, sicco fusco-griseo, dense vestito, margine incurvo ; carne albo, spongioso, crasso ; stipite centrali, sursum in pileo dilatato, sordide albo, intus spongioso, extra lento ; hymenio albo, plano, in stipite decurrente ; poris dentatis, irregularibus, ad 5 mm. long., mediocribus.

Polyporus violaceo-cinerascens n. sp.

2678, Peradeniya, October, 1908 ; 2845, Peradeniya, May, 1909.

Mesopodial. At first violet or purple, becoming ashy or pale brown when old. Pileus circular, up to 11 cm. diameter, strongly lobed, centre depressed and irregularly nodulose, obscurely zoned, minutely tomentose, subcartilaginous, tough. Flesh thin, brownish-white. Pore surface white, then violet, descending irregularly on the stem ; pores large, up to 0·75 mm. diameter, angular ; with a broad sterile margin. Stalk of the same colour and texture as the pileus, irregularly compressed and lacunose, up to 7 cm. high, 1·5 cm. broad, 7 mm. thick, central, equal or expanding upwards, sometimes bulbous at the base, sometimes rooting, clothed with violet or purple-black bristles. Spores white, broadly oval, 7–9 × 5–6 μ.

In rings among grass, probably from buried wood. Shown in 1911 to Mr. Lloyd, who informed me that it was then undescribed.

Mesopus ; primo violaceus vel purpureus, deinde cinereus vel pallide brunneus. Pileo rotundo, ad 11 cm. diam., lobato, centro depresso, irregulariter noduloso, obscure zonato, subtiliter tomentoso, subcartilagineo, lento ; carne tenui, brunneo-albo ; hymenio albo, deinde violaceo, in stipite irregulariter decurrente ; poris magnis, angulatis ; margine sterile lato ; stipite concolori, irregulariter compresso, lacunoso ad. 7 cm. long., 1·5 cm. lat., 7 mm. crass., centrali, æquale vel sursum dilatato, modo basi inflato, modo radicante, violaceis vel purpureo-nigris setis vestito ; sporis albis, ovalibus, 7–9 × 5–6 μ.

Polyporus obscurus n. sp.

3481, Peradeniya, May, 1912, on rotten wood.

White, resupinate over a large area, with dimidiate pilei at the margin. Pilei semi-elliptic, about 1·5 cm. long, 6 mm. broad, laterally fused, white, fibrillose, radially ridged, margin acute. Pores small, oval, about 0·15 × 0·1 mm. Resupinate parts stout, pores up to 3 mm. long, not splitting on drying. Basal layer a thin weft of hyphæ from 0·1–0·2 mm. thick.

Albo, resupinato, margine dimidiato ; pileis semi-ellipticis circa 1·5 cm. long., 6 mm. lat., supra fibrillosis, radiatim rugosis, margine acuto. Parte resupinata, crassa, poris ad 3 mm. long. ; poris parvis, ovalibus, 0·15 × 0·1 mm. ; contextu tenui.

Polystictus.

Polystictus xanthopus Fr.

2429, Peradeniya, 1909 ; 2774, Peradeniya, January, 1909 ; 3609, Peradeniya, January, 1913 ; 3835, Peradeniya, June, 1913 ; 3901, Peradeniya, December, 1913 ; 4073, Peradeniya, July, 1914 ; 4506, Peradeniya, November, 1914 ; 4507, January, 1915 ; 2107, Ritigala, March, 1905 ; 3310, Maha Iluppallama, January, 1912 ; 2174, Polgahawela, February, 1907.

Common in the low-country.

Polystictus luteus Nees.

3581, Sigiriya, August, 1912 (det. Lloyd).

Polystictus affinis (Bl. et Nees) Fr.

2980, Maha Iluppallama, August, 1909 (det. Lloyd).

Polystictus flabelliformis Kl.

Polyporus crenatus Berk., Ann. Mag. Nat. Hist., X. (1842), pp. 369–384.

2680, Hakgala, September, 1908 ; 2679, ditto ; 3968, Hakgala, April, 1914 ; 4720, Hakgala, April, 1915 ; 2179, Kegalla, July, 1906 ; 3293, Peradeniya, December 1911 ; 4763, Peradeniya, August, 1915.

Polystictus setiporus Berk.

Polyporus cichoraceus in B. & Br., Fungi of Ceylon, 472.

2808, Hakgala, September, 1908 ; 3444, Hakgala, May, 1912 ; 3712, Hakgala, May, 1913 ; 2929, Peradeniya, August, 1909.

Polystictus Gaudichaudii Lév.

Polyporus Menziezii Berk., Fungi of Ceylon, 446 ; *Polyporus Thwaitesii* Berk., Hook. Lond. Jour. Bot. (1854), p. 229.

3304, Peradeniya, December, 1911 (det. Lloyd) ; 2965, Hapugastenna, October, 1909 ; 2871, Peradeniya, July, 1909 ; 2778, Ferriby estate, February, 1909 (det. Lloyd) ; 3749, Hakgala, September, 1913 ; 4457, Hakgala, November, 1914 (det. Lloyd).

Polystictus caperatus Berk.

Polyporus phocinus B. & Br., Fungi of Ceylon, 484.

4098, Gangaruwa, January, 1914 (confirmed by Lloyd).

The two recorded Ceylon gatherings of this species are both the thin form named *P. phocinus* by Berkeley and Broome.

Polystictus elongatus Berk.

2687, 3453 (det. Lloyd), 3470 (det. Lloyd), 3475 (det. Lloyd), 4065 ; all from Hakgala, where it is abundant.

The pilei are usually united behind by a thick leathery sheet of white tissue. Both the upper and the under surfaces are violet at first. Lloyd states that *P. pergamenus* is distinguished from *P. elongatus* by having the hymenium violet at first ; if this is the only distinction, the two are identical.

Polystictus luteo-olivaceus Berk.

3351 (det. Lloyd), 3642 (det. Lloyd), 3948, 4753 (det. Lloyd), 3529 ; all from Peradeniya.

Polystictus perennis Linn.

3896, Hakgala, January, 1914 (det. Lloyd).

Polystictus cinnamomeus Jacq.

Polyporus oblectans Berk., Fungi of Ceylon, 438.

2686, Peradeniya, July, 1908 ; 2809, Peradeniya, June, 1909.

I follow Lloyd in placing the Ceylon form under *P. cinnamomeus* rather than under *P. oblectans*.

Polystictus zeylanicus Berk.

Not collected recently.

Fomes.

? **Fomes hornodermus** Mont.

3945, Portswood, Kandapola, January, 1913 (det. Lloyd provis., specimen immature).

Fomes subresinosus Murr.

2470, Peradeniya, May, 1909 (det. Lloyd) ; 3755, Henaratgoda, September, 1913 ; Ritigala, March, 1905.

Spores pale brown, ovate, minutely warted, 15–18 × 12 μ.

Fomes floccosus Bres.

3303, Peradeniya, December, 1911 (det. Lloyd) ; 3497, Peradeniya, June, 1912.

Parasitic on *Poinciana regia* and *Bombax malabaricum*.

Fomes dochmius B. & Br.

2779, Puwakpitiya, February, 1909 ; 4706, Korossa, May, 1915.

When fresh, blue-black and violet-black, with a white margin ; minutely silky ; finally black, or weathered to gray, glabrous.

Fomes ferreus Berk.

Not collected recently. The type appears to me the same as 3754, Moratuwa, September, 1913, assigned to *P. semilaccatus*.

Fomes geotropus Cooke.

4052, 4053, Hakgala, April, 1914 (det. Lloyd).

Considered by some the tropical form of *F. ulmarius*. See Bresadola's record of *F. ulmarius* for Ceylon.

Fomes lignosus Kl.

2914, Peradeniya, August, 1909; 4237, Peradeniya, November, 1914; 4772, Houpe, July, 1915.

Common on stumps of *Ficus* spp., *Artocarpus integrifolia*, *Bambusa* sp., &c. Parasitic on *Hevea brasiliensis*, *Artocarpus*, Tea, *Manihot Glaziovii*, *Ficus* spp., *Derris*. Distinguished from *P. zonalis*, when fresh, by its deep red-brown upper surface, yellow margin, and orange hymenium.

Fomes kermes B. & Br.

2964, Hapugastenna, October, 1909.

Rare in the districts hitherto visited. Soft and spongy when fresh, resupinate, on the under surface of a rotten log in patches up to 15 × 10 cm. Free edge bright red, becoming darker in drying; hymenium orange-red, becoming dark red when dry.

Fomes Robinsoniæ Murr.

4704, Hakgala, April, 1915 (det. Lloyd).

Fomes adamantinus Berk var. **setiferæ** Lloyd.

3464, Kalupahana, May, 1912 (det. Lloyd).

Fomes caliginosus Berk.

2974, Hapugastenna, October, 1909 (det. Lloyd); 2868, Peradeniya, July, 1909.

Fomes setulosus Lloyd.

3442, Hakgala, May, 1912 (det. Lloyd); 3460, Hakgala, May, 1912; 3459, Hakgala, May, 1912 (det. Lloyd); 4147, Hakgala, September, 1914.

Fomes conchatus Pers.

4707, Hakgala, April, 1915 (det. Lloyd).

Fomes lamæensis Murr.

2969, Idangoda, September, 1909 (det. Lloyd).

Fomes rimosus Berk.

3596, 3597, 3598, Jaffna, August, 1912 (det. Lloyd); 2781, Ferriby estate, February, 1909 (det. Lloyd); 4702, Hakgala, April, 1915 (det. Lloyd).

The common Fomes of the dry region.

Fomes endotheius Berk.

4087, Peradeniya, August, 1914 (det. Lloyd).

Fomes caryophylli Rac.

2794, Peradeniya, February, 1909, on clove ; 3466, 3467, Hakgala, May, 1912 (det. Lloyd) ; 3966, 3973, Hakgala, April, 1914 ; 3580, Kanana, September, 1912 (det. Lloyd).

Fomes pectinatus Kl.

3445, Hakgala, May, 1912 (det. Lloyd).

A frequent species at Hakgala.

Fomes Sanfordii Lloyd.

3446, Hakgala, May, 1912 (det. Lloyd) ; 3963, Hakgala, March, 1914 (det. Lloyd) ; 3647, Hakgala, May, 1913.

Fomes senex Mont.

2879, Peradeniya, July, 1909 ; 2675, Indurawa, October, 1908 ; 3299, Waharaka, December, 1911 (det. Lloyd) ; 3322, Pallegodda, January, 1912 ; 3611, Gangaruwa, January, 1913 ; 4055, Hakgala, April, 1914 (det. Lloyd) ; Ritigala, March, 1905.

Fomes rhinocerotis Cooke.

2842, Yatipauwa, May, 1909 (det. Lloyd).

Pileus 7–11 cm. diameter, deeply infundibuliform, margin slightly recurved ; at first regular, afterwards lobed with new growth from the margin ; strongly radiately rugose ; concentrically sulcate. Reddish-purple ; new growth reddish-purple to red-brown, somewhat zoned ; margin yellow-brown. The newer parts bear narrow tomentose zones, old parts glabrous. Flesh white, corky, up to 7 mm. thick. Pore surface white ; pores minute, rather distant, brownish in section when old ; stratose. Stalk 4–8 cm. high, 7–12 mm. thick, somewhat attenuated upwards, with a distinct crustaceous outer layer ; internally white, externally purplish-red, pruinose ; springing from a sclerotium up to 8 cm. long and 4 cm. diameter, yellowish with red patches. A young specimen, pileus undeveloped, has a reddish stalk, covered with brown tomentum ; apex of stalk obconoid, yellow below, white above.

Fomes lucidus (Leys.) Fr.

2839, Mirigama, March, 1909; 3390, Maha Iluppallama, December, 1911; 3391, Kandy, January, 1912 (det. Lloyd); 4523, Peradeniya, February, 1915; 2979, Maha Iluppallama, August, 1909; 2927, Culloden, August, 1909 (det. Lloyd), &c.

One of our commonest species. Always stalked, but varying greatly in the length and breadth of the stalk. The thin-stalked forms, after the pattern of *P. rugosus*, are often found growing in bamboo clumps, and are called Una Bimmal, the bamboo fungus, by the Sinhalese. In the more massive forms the stalk is reduced to a broad base several inches in diameter, but only an inch or less in height. My largest specimen (3389, Peradeniya) measures 50 × 42 cm. Specimens 2927 from Culloden are exactly the shape of *Polyporus fornicatus;* they were dull red-brown, not shining, when fresh; stalk and pileus unicolorous.

Fomes Petchii Lloyd.

3238, Hakgala, May, 1910.

Specimen sent to Lloyd as "*Fomes lucidus* perennial." This form occurs at Hakgala (5,600 feet). The stalk is lateral, as in *Fomes lucidus* 2927 (see above). It differs from *F. lucidus* in being perennial, with a vertical ridged margin, exactly as *F. annularis* differs from *F. applanatus*.

Fomes applanatus Pers.

3751, Peradeniya, September, 1913; 3471, Hakgala, May, 1912; 2728, Hakgala, September, 1908; 2729, 2730, Peradeniya, October, 1908.

Extremely common and highly variable in shape. Stalked forms, matching *P. gibbosus* Nees, are frequent, but Nees' figure shows setæ in the pores (?).

Fomes annularis Lloyd.

This form occurs at Hakgala, the specimens being sometimes about 8 inches in diameter and a foot thick. We take it to be a stratose form of *F. applanatus*. *F. applanatus* is rarely stratose at lower elevations, but at the top of the hills it is generally so. Even the large specimens become stratose there, as shown in Plate XII., Circular 10, Vol. V., Root Diseases of Acacia decurrens.

Polyporus cupreus Fr.

4700, Korossa, May, 1915 (det. Lloyd).

A thin form of *F. applanatus*.

Fomes pallidus n. sp.

2793, Colombo, February, 1909; 2840, Deviturai, April, 1908.

Resupinate; in large patches, usually oval, up to 20 × 10 cm.; lenticular in section, up to 6 mm. thick, stratose; gray or pale slate-coloured, bleaching almost white when old. Margin thin, definite, tomentose, brownish-gray, blackening when old. Pores up to 0·15 mm. diameter, circular, dark brown in section, usually mottled with white ingrowths. Basal layer thin, dark brown, or absent.

This is a common species in the low-country. It is represented in Thwaites' collection by three pieces in Herb. Peradeniya included under *Polyporus epimiltinus* B. & Br.

Resupinato, stratoso, griseo, ætate pallescente; margine tenui, limitato, tomentoso, brunneogriseo, ætate nigrescente; poris rotundatis, ad 0·15 mm. diam., intus fuscobrunneo; contextu tenui vel nullo, fuscobrunneo.

Poria.

Poria mellea B. & Br.

4021, Peradeniya, May, 1914; 4291, Peradeniya, November, 1914; 4535, Peradeniya, January, 1915.

Sulphur yellow, margin paler; resupinate, spreading in circular or elongated patches, with a more or less orbicularly lobed margin; context very thin; margin adpressed, about 1 mm. wide, radially tomentose; pores variable, generally large, dissepiments thin and toothed.

Poria interrupta B. & Br.

Poria vulgaris Fr., in B. & Br., Fungi of Ceylon, 498.

White, becoming buff or pinkish-buff, with a white byssoid margin, which appears pulverulent. Margin thin. Pores at first tomentose, becoming glabrous or nearly so, rigid, subhexagonal, 0·1–0·15 mm. diameter, with a few larger scattered pores up to 0·3 mm. Context thin, fibrous, white or yellowish; total thickness 0·5–1 mm. Frequently developing in small circular patches which subsequently become confluent.

Frequent on dead mango branches at Peradeniya. 3479, 3480, Peradeniya, May, 1912; 4224, Peradeniya, October, 1914; 4282, Peradeniya, November, 1914; 4668, Hakgala, April, 1915.

Poria Ravenalæ B. & Br.

2187, Peradeniya, February, 1907, &c.

Pale slate-gray, with a narrow paler or white margin; widely effused in patches up to 24 cm. long; very thin, total thickness up to 0·2 mm. Pores angular, 0·1–0·25 mm. diameter; dissepiments thin, rigid.

Common on dead petioles of palms, palm stems, &c. I have not seen it on *Ravenala*. It turns black when old, or when pickled with mercuric chloride in alcohol.

Poria Vaillantii Fr.

2235, Kandapola, May, 1906.

The Ceylon fungus spreads over rotten wood or bare ground by coarse white rhizomorphs, which expand and unite into sheets bearing the hymenium. These sheets are up to 7 cm. long and 3 cm. broad, and are completely covered with pores, except at the membranous edges. The pores are small, angular, with thin dissepiments when dry, and are up to 3 mm. deep. The whole fungus is white.

The Ceylon form appears to differ from the European species in its greater development of the hymenium. I have left it under Berkeley and Broome's name, as it is probable that *Poria leptoderma* will prove to be an immature form of the same thing.

Poria calcicolor Sacc. & Syd., Sylloge, XIV., p. 192.

Polyporus (*Resupinati*) *calceus* B. & Br., Fungi of Ceylon, 506.

Not found recently. Before examination with a lens it appears to be a *Corticium*. The specimens are now pale yellow to pale ochraceous, with a broad, white, powdery margin. The pores are subhexagonal, up to 0·2 mm. diameter, and 0·1 mm. deep, with thin dissepiments which here and there consist of separate erect fascicles of hyphæ. The subiculum is white, about 0·1 mm. thick.

Poria variolosa B. & Br.

4013, Hakgala, April, 1914.

The type specimen, Thwaites 650, is young and undeveloped ; it has broad shallow hexagonal pores, up to 0·75 mm. diameter. Specimens recently collected have more fully developed pores.

This species begins at different points as small circular patches which ultimately fuse. The ultimate sheets have, therefore, a much-lobed and irregular outline, and are frequently perforated with large angular holes, where the fusion has not been completed. The hymenium is cream-coloured or yellowish. The pores are at first hexagonal, large, up to 1 mm. diameter and 2 mm. deep, with thin dissepiments, but in the older parts long parallel linear pores are formed, involving several of the original hexagonal pores. The basal layer is very thin, but tough and flexible, and the whole fungus can be peeled away from the substratum. The lower surface is olive, minutely tomentose, with the individual points of origin clearly marked and often concentrically zoned round them.

Poria hypolateritia Berk.

Poria vincta Berk., in B. & Br., Fungi of Ceylon, 500 (in part).

2290, Lindula, August, 1906 ; 2292, Pattipola, October, 1906 ; 2293, Hakgala, April, 1906 ; 3620, Haputale, March, 1913 ; 3619, Kalupahana, 1912.

Pinkish-red, with a white radiating tomentose margin at first ; basal layer thin, white, lower surface red or red-brown, horny. In old specimens the margin becomes the same colour and consistency as the basal layer. Pores medium, up to 0·2 mm. diameter, angular, dissepiments thin and rigid. Total thickness about 1 mm.

This species causes one of the commonest root diseases of tea in Ceylon. The affected roots are covered with red rhizomorphs and sheets of mycelium, which ultimately turn black. This is probably *Trametes theæ* Zimm.

Poria hypobrunnea n. sp.

Poria vincta Berk., in B. & Br., Fungi of Ceylon, 500 (in part).

Reddish-pink, becoming brownish-red when old ; margin white, tomentose. Total thickness 1·5 mm. Basal layer blackish-brown, stout, constituting half the total thickness, firmly attached to the substratum. Pores small, 0·1 mm. diameter.

3930, Gangaruwa, December, 1913 ; 3974, Peradeniya, February, 1914.

This, when fresh, appears to be a small-pored form of *Poria hypolateritia*, but its basal layer is dark brown, without any trace of red, and not horny.

Subruber, ætate brunneo-ruber. Margine albo, tomentoso ; circa 1·5 mm. crassitudine ; contextu fuscobrunneo, crasso, matricem arcte applicato ; poris parvis, 0·1 mm. diam.

Poria albobrunnea n. sp.

3184, Hakgala, May, 1910, on *Acacia decurrens*.

Watery and somewhat spongy when fresh ; rigid and separating from the substratum when dry. Totally resupinate. White becoming yellowish-brown when dry. Sterile margin white, rather broad, minutely tomentose. Up to 3 mm. thick. Pores in section pale brown ; basal layer stout, compact, blackish-brown, composed of interwoven yellow-brown hyphæ. Lower surface blackish-brown or olive, usually mottled, strigose. Pores angular, about 0·1 mm. diameter; dissepiments thin, appearing somewhat horny and translucent when dry.

Albus, sicco flavobrunneus; vivo aquosus, spongiosus, sicco rigidus matrice secernens. Margine albo, minute tomentoso, latiusculo; usque 3 mm. crassitudine; poris angulatis, ad 0·1 mm. diam., intus pallidobrunneo; contextu crasso, compacto, fuscobrunneo; inferiore fuscobrunneo, strigoso.

Poria gilvoides n. sp.

2884, Peradeniya, July, 1909, on a dead branch.

Resupinate, up to 16 cm. long, 2 cm. broad, yellow-brown, with a paler tawny margin, becoming ferruginous brown when old. Thickness about 1 mm.; basal layer about 0·1 mm. thick, yellow-brown. Margin narrow, tomentose. Pores angular, 0·12–0·25 mm. diameter, dissepiments thin. No setæ.

Resupinato, ad 16 cm. long., 2 cm. lat., flavobrunneo, margine fulvo, ætate ferrugineobrunneo, ad 1 mm. crassitudine; margine angusto, tomentoso; poris angulatis, 0·12–0·25 mm. diam., dissepimentibus tenuibus; contextu ad 0·1 mm. crassitudine, flavobrunneo.

Poria purpureogilva n. sp.

4688, Peradeniya, April, 1915, on a dead branch.

In patches up to 6 × 2 cm., grayish-purple; margin purple-brown, subvertical, glabrous. Thickness about 1 mm.; internally yellow-brown. Pores minute, rounded, about 0·1 mm. diameter. Basal layer up to 0·2 mm. thick, yellow-brown. Setæ in the pores, conical, or cylindric below and tapering above, acute, yellow-brown, 16–32 × 6 μ.

Griseo-purpureo; margine purpureo-brunneo, glabro, subdirecto; circa 1 mm. crass.; intus flavobrunneo; poris parvis, rotundatis, circa 0·1 mm. diam., setiferis, setis acutis, conicis, flavobrunneis, 16–32 × 6 μ; contextu ad 0·2 mm. crassitudine, flavobrunneo.

Poria aquosa n. sp.

Poria vaporaria B. & Br., non Fr., Fungi of Ceylon, 497.

4810, Peradeniya, May, 1916, &c.

White, effused, covering dead trunks of trees for a length of several feet ; margin narrow and tomentose ; pores at first soft and watery, with thick dissepiments which become thin and rigid on drying, minute, angular when dry, up to 2 mm. long. Basal layer a thin weft of hyphæ, almost absent.

This is a much stouter species than *Poria vaporaria* to which Berkeley and Broome referred it. In drying it splits owing to the shrinkage of the hymenium. When growing on a vertical surface, the upper edge simulates a narrow dimidiate pileus, radially fibrillose, tomentose behind ; this is not evident on the shrunken dried specimens.

Albo ; margine angusto, tomentoso ; poris vivo mollibus aquosisque, dissepimentibus crassis ; sicco poris rigidis, minutis, ad 2 mm. long., dissepimentibus tenuibus ; contextu tenuissimo.

Poria glaucescens n. sp.

3653, Hakgala, May, 1913.

At first amber-brown (Ridgway) at the margin, pores darker ; becoming entirely greenish-gray when old. Margin slightly swollen, nodular, tomentose. Pores small, 0·1 mm. diameter, irregular, dark brown in section, up to 3 mm. long. Basal layer very thin, almost wanting. No setæ. Spores small, yellow brown, oval, 4×2 μ, or globose, 3 μ diameter.

Cracks when old and become reticulated with amber-brown tomentose lines, due to new growth through the cracks.

The small, coloured spores resemble those of *Fomes caryophylli*, but the colour of the fungus is different, and old patches, up to a foot in length, do not show any trace of the hard black margin which characterizes resupinate *Fomes caryophylli.* The specimens without setæ in Berkeley and Broome's *Fomes obliquus* from Ceylon are apparently this species.

Primo rufobrunneo, deinde glaucescente ; margine leniter incrassato, noduloso, tomentoso ; poris parvis, irregularibus, 0·1 mm. diam., intus fuscobrunneo, ad 3 mm. long. ; contextu tenuissimo ; sporis minutis, flavobrunneis, ovalibus, 4 × 2 μ, vel globosis, 3 μ diam.

TRAMETES.

Trametes badia Berk.

3756, Moratuwa, September, 1913 (det. Lloyd) ; 4703, Korossa, May, 1915 (det. Lloyd).

Trametes cingulatum Berk.

3523, Peradeniya, July, 1912 (det. Lloyd) ; 3562, Sigiriya, August, 1912 ; 3301, Maha Iluppallama, January, 1912 (det. Lloyd) ; 3398, Mirishena, February, 1912 ; 3602, Peradeniya, December, 1912 ; 3852, Peradeniya, November, 1913 (det. Lloyd) ; 4751, Colombo, July, 1915.

Trametes lævis Berk.

Not re-identified. It appears to be a form of *T. lactinea* with rather large pores.

Trametes lactinea Berk.

2676, Peradeniya, October, 1908 ; 3302, Peradeniya, December, 1911 ; 3531, Peradeniya, July, 1912 ; 2733, Peradeniya, July, 1908 ; 3550, Peradeniya, August, 1912 ; 2768, Peradeniya, January, 1909 ; 2767, Gangaruwa, January, 1909.

Trametes ochroleuca Lév.

Trametes colliculosa Berk., Hook. Lond. Jour. Bot. (1847), p. 506 ; *Trametes rugosa* B. & Br., Fungi of Ceylon, 511 ; *Trametes læticolor* Berk., Ann. Nat. Hist., X., p. 374 ; *Dædalea pavonia* Berk., Hook. Lond. Jour. Bot. (1847), p. 507.

2766, Gangaruwa, January, 1909 ; 3591, Peradeniya, December, 1912 (det. Lloyd) ; 3592, 3593, Glassel estate, December, 1912 (det. Lloyd) ; 3610, Gangaruwa, January, 1913 ; 3612, Pusella, January, 1913 ; 2978, Maha Iluppallama, September, 1909.

Abundant.

Trametes versatilis Berk.

Polyporus venustus Berk., in B. & Br., Fungi of Ceylon, 477 ; *Irpex colliculosus* B. & Br., Fungi of Ceylon, 555

2189, Ruanwella, July, 1906; 2928, Culloden, August, 1909; 3627, Diyagama, January, 1912.

Trametes dubius Berk.

Polyporus dubius Berk., Ann. Mag. Nat. Hist., X., pp. 369–384.

3315, 3316, Pallegodda, January, 1912; 3590, Lagos estate, December, 1912.

White with gray zones, or grayish-brown with darker zones. Shortly stalked or almost sessile, flabelliform, up to 7 × 5 cm. Minutely tomentose; feebly concentrically sulcate. Up to 7 mm. thick, margin usually thin; context ochraceous. Pores medium, irregular; hymenium with a narrow sterile margin.

Trametes occidentalis Kl.

Polyporus hirsutus Fr., B. & Br., Fungi of Ceylon, 480; *Trametes occidentalis* Fr., B. & Br., Fungi of Ceylon, 514; ? *Polyporus nigrocinctus* Berk., Ann. Mag. Nat. Hist., X., pp. 369–384.

2181, Kegalla, July, 1906; 2268, Kegalla, June, 1906; 3544, Hakgala, May, 1912 (det. Lloyd); 3829, Peradeniya, October, 1913; 3625, Diyagama, January, 1913 (det. Lloyd).

Abundant.

Trametes lutescens Pers.

4459, Hakgala, January, 1914 (det. Lloyd).

Trametes polyzonus Pers.

4460, Hakgala, January, 1914 (det. Lloyd).

Trametes Persoonii Fr.

3320, Peradeniya, January, 1912; 3493, Peradeniya, June, 1912; 4249, Peradeniya, November, 1914; 2525, Ritigala, July, 1907, &c.

Abundant.

Trametes cervinus Pers.

3643, Hakgala, May, 1913 (det. Lloyd); 3886, 4042, 4043, all Hakgala.

Common at Hakgala on dead stumps of *Acacia decurrens*.

Trametes dermatodes Lév.

Polyporus Peradeniæ B. & Br., Fungi of Ceylon, 478.

2813, Hakgala, September, 1908 ; 3021, Peradeniya, November, 1909 ; 3435, Hakgala, May, 1912 ; 4099, Gangaruwa, January, 1914 ; 4250, Peradeniya, October, 1914 (det. Lloyd).

Trametes serpens Pers.

Polyporus Stephensii B. & Br., Fungi of Ceylon, 503.

4687, Peradeniya, April, 1915.

DÆDALEA.

Dædalea subsulcata B. & Br.

2354, Hakgala, April, 1907 ; 3062, Hakgala, May, 1910.

HEXAGONIA.

Hexagonia sulcata Berk.

Not recently collected.

Hexagonia apiaria Pers.

2921, Maha Iluppallama, August, 1909 ; 3409, Haputale, March, 1912 (det. Lloyd) ; 3566, Sigiriya, August, 1912 (det. Lloyd).

Common in the dry zone, and ascending the hills on that side.

Hexagonia Burchelli Berk.

3494, Hakgala, May, 1912 ; 4056, Hakgala, April, 1914 ; 4716, Hakgala, April, 1915 (det. Lloyd).

Thin and leathery, several inches in diameter, under surface glaucous, when in moist situations ; becoming thick-stalked, cornucopioid, with ferruginous pores, in drier places.

Hexagonia Deschampsii Hariot.

3409 bis, Haputale, March, 1912 (det. Lloyd).

Hexagonia discopoda Pat.

2229, Peradeniya, March, 1907, &c. ; 2379, Hakgala, March, 1907 ; 2807, Hakgala, September, 1908 ; 2262, Elston, April, 1906 ; 3562, Sigiriya, August, 1912 ; 2920, Maha Iluppallama, August, 1909 ; 3383, Undugoda, February, 1912 (det. Lloyd) ; Ritigala, March, 1905.

The common Ceylon Hexagonia.

Hexagonia pulchella Lév.

2925, Peradeniya, July, 1909.

Hexagonia tenuis Hook.

3840, Peradeniya, July, 1913; 4275, Peradeniya, October, 1914.

Hexagonia ruficeps (B. & Br.), comb, nov.

Favolus ruficeps B. & Br., Fungi of Ceylon, 527.

3484, Peradeniya, June, 1912; 3491, Peradeniya, June, 1912; 3558, Peradeniya, August, 1912.

Pallid to pale reddish-brown, with rufous radiating streaks when fresh, dark red-brown when dry; flabelliform, up to 5 × 3·5 cm. Stalk up to 1 cm. long, stout, sometimes affixed to the substratum by a tomentose disc. Upper surface scabrous with minute fascicles of brown tomentum. Pores hexagonal, large; walls sparsely setulose with minute, black, conical setæ. Margin of pileus fimbriate; pores descending to the base of the stalk. Pileus not tessellated.

This appears to be Hexagonia and will stand as *Hexagonia ruficeps*. Thwaites' figure, referred by Berkeley and Broome to *Favolus tessellatus*, is good.

Hexagonia scabra (B. & Br.), comb. nov.

Favolus scaber B. & Br., Fungi of Ceylon, 532.

2270, Peradeniya, December, 1906; 2749, Peradeniya, December, 1908; 4241, Peradeniya, November, 1914.

Flabelliform, shortly stalked, pale yellow-brown. Upper surface tessellated, radially silky, sometimes scabrid behind; margin fimbriate. Stalk frequently arising from a circular tomentose base. Pores large, hexagonal, up to 5 mm. long and 4 mm. deep, decurrent on the stalk, cream-coloured; no setæ. Spores white, narrow-oval, 10–12 × 3 μ. Flesh very thin.

This is also Hexagonia, and will stand as *Hexagonia scabra*.

This and another Hexagonias, which grow on dead branches attached to the tree, are usually collected after the branches have fallen. In that case, especially in wet weather, if the branches have been lying on the ground for some time, it will often be found that the normally straight edges of the pores are lacerated, and frequently bear irregular horizontal teeth.

Hexagonia Miquelii Mont.

Favolus tessellatus Mont., in B. & Br., Fungi of Ceylon, 531.

3490, Peradeniya, June, 1912; 4153, Peradeniya, October, 1914.

Frequent at Peradeniya. At first white, then red-brown. Subcartilaginous, as shown by the undulating margin when dry.

Favolus.

Favolus multiplex Lév.

Favolus multiplex Lév., in B. & Br., Fungi of Ceylon, 530; *Favolus brasiliensis* Fr., in B. & Br., Fungi of Ceylon, 528; *Favolus Friesii* B. & C., in B. & Br., Fungi of Ceylon, 529.

2942, Peradeniya, September, 1908; 4628, Peradeniya, 1914.

I do not know the correct name of this species, and have left it under the name assigned by Berkeley and Broome to the drawing of it. It is a common species at Peradeniya and grows in large troops.

Flabelliform, frequently lobed, up to 8 × 5 cm.; stalk usually short, almost absent; white, tomentose behind, glabrous in front, radially streaked when moist; texture tough, lentinoid; flesh white, thin, about 1 mm. thick. Pore layer about 2 mm. thick; pores decurrent to the base of the stalk, hexagonal, radially elongated, up to 2 mm. long, 0·5 mm. broad, edges regular. Spores white, narrow-oval, 6–8 × 3 μ.

Thwaites' figure is good. In wet weather it is soft but tough, and dries somewhat translucent, especially towards the margin; in drier weather it is firmer, and dries pale brown. Though appearing readily putrescent, it dries and revives, new growth occurring along the edges of the pores, so that they become lacerated. It has a somewhat fishy smell when fresh.

Ceylon Lentini.

BY

T. PETCH, B.A., B.Sc.

WHEN König visited Ceylon in 1777–81, he gathered, among other fungi, a *Lentinus*, which Berkeley, sixty years later, assigned to *Lentinus connatus* (Ann. Nat. Hist., X. (1842), pp. 369–384), the latter being a Philippine species which Berkeley had recently described. Specimens of this gathering are in the herbaria of the British Museum and Kew, and these support Berkeley's identification.

In the collection sent from Ceylon by Gardner, and described by Berkeley in Decades of Fungi, XV.–XIX. (Hook. Lond. Jour. Bot., VI., pp. 479–514), there were five white *Lentini*, viz., *L. revelatus* n. sp., *L. subnudus* n. sp., *L. pergameneus* Lév., *L. inconspicuus*, and *L. exilis* Klotzsch.

The type of *L. revelatus*, Gardner 117, Herb. Kew, is *L. connatus*. *L. subnudus*, Gardner 116, type in Herb. Kew, had not been previously described from Ceylon. The specimens assigned to "*L. pergameneus*," now in Herb. Kew, are *L. subnudus*. *L. inconspicuus*, "Talagalla, Gardner," without any number, type in Herb. Kew, is also *L. subnudus*. Gardner 107, two sheets in Herb. Kew, said to be allied to *L. anthocephalus*, but injured by insects, is, as far as can be determined, *L. subnudus*. The specimens assigned to *L. exilis* Klotzsch, Gardner 67 and 81, are in each case identical with *L. sajor-caju* Fr.

Twenty years later, Berkeley and Broome examined and described the large collection forwarded by Thwaites. They found only one of the six species previously recorded, viz., *L. exilis*, but they described as new the following closely allied species, *L. velatus*, *L. multiformis*, *L. cretaceus*, *L. infundibuliformis*, *L. manipularis*, *L. lobatus*, and *L. apalus*. It will be convenient to consider these under Thwaites' numbers.

L. velatus is Thwaites 1057. From the figure and specimen it was evidently quite immature, the pileus having just begun to expand. Comparison with specimens recently collected leaves no doubt that this is immature *L. connatus.*

Thwaites 206 furnished *L. cretaceus*, *L. manipularis*, and *L. lobatus*. There was apparently an abundance of specimens. In Herb. Kew, under *L. cretaceus*, are to be found specimens labelled " 206 *L. cretaceus* B. & Br. *subnudus* B. Central Province, common," others marked " 206 *Lentinus subnudus* var. *cretaceus* B. & Br. Ceylon, G. H. K. T., Nov., 1867," and others, " 206, cream-coloured, Peradeniya, &c." ; all these are *Lentinus subnudus.* The type of *Lentinus lobatus* in Herb. Kew is a single specimen on a sheet of five, the sheet being marked " 206, *Lentinus subnudus* var. *cretaceus* " ; the specimen is merely a lobed example of *L. subnudus. L. manipularis*, type in Herb. Kew, is *L. subnudus.* The examples of Thwaites' 206 in Herb. British Museum and Herb. Peradeniya are all *L. subnudus.*

Thwaites 725 was accompanied by an excellent drawing. It was divided by Berkeley and Broome into two species, *Clitocybe candicans* Pers. and *L. apalus* (" *hapalus* " in Saccardo). The figure was named *Clitocybe candicans*, but the note on the specimens, " tender, white, with the pileus perfectly smooth and shining," was included in the description of *L. apalus.* In the type of *L. apalus*, in Herb. Kew, one cluster of small *Lentini*, growing on wood, has been marked by Berkeley, " excl. *L. manipularis* B. & Br." ; these are *L. manipularis*, *i.e.*, *L. subnudus.* The remainder of the type of *L. apalus* grew on the ground, and they are identical with the specimens assigned to " *Clitocybe candicans* " ; this is a *Clitopilus.*

Thwaites' 609 was divided into *L. multiformis*, *L. infundibuliformis*, and *L. exilis.* In Herb. Kew the type of *L. infundibuliformis* is *L. connatus*, and the same is true of the co-type in Herb. British Museum. The part of Thwaites 609 assigned to *L. exilis* in Herb. Kew is *L. sajor-caju.* The type of *L. multiformis* in Herb. Kew contains two specimens, one old and dilapidated, the other in better condition ; these are *L. subnudus.* In Herb. Peradeniya Thwaites 609 is represented by one sheet bearing five specimens, labelled " *L. exilis*, *L. multiformis*, &c." ; three of the specimens are *L.*

connatus, the remaining two being probably *L. sajor-caju*. It may be noted that *L. multiformis* was described from the painting which accompanied the specimens. The painting is marked by Thwaites, " No. 609, small, poor specimen." It is certainly not *L. connatus*, but probably *L. sajor-caju*; it was drawn from one of the doubtful specimens at Peradeniya.

Of the unnumbered Ceylon specimens in Herb. Kew, one, *ex* Herb. Hooker and probably of Gardner's collection, *sub L. exilis*, is *L. sajor-caju*; another " Ceylon G. H. K. T." *sub L. subnudus*, marked by Berkeley, " *L. subnudus* B., *inconspicuus*," is *L. subnudus*.

We have therefore three species under the following names :—

A.	B.	C.
L. connatus B.	L. subnudus B.	L. exilis Kl.
L. revelatus B.	L. pergameneus Lév.	L. multiformis B. & Br.
L. velatus B. & Br.	L. inconspicuus B.	
L. infundibuliformis B. & Br.	L. anthocephalus Lév.	
	L. cretaceus B. & Br.	
	L. manipularis B. & Br.	
	L. lobatus B. & Br.	

According to Bresadola (Ann. Myc., IX., p. 549), *L. infundibuliformis* is identical with *L. javanicus* Lév.

I have not inquired into the question of nomenclature beyond ascertaining the synonymy of the Ceylon records. For the present, A is included in Ceylon lists as *L. connatus* Berk., with the other three names as synonyms. *L. subnudus* Berk. is adopted for the second species, with four Ceylon synonyms; whether this species is identical with *L. pergameneus* or *L. anthocephalus* must be decided elsewhere. C is *Lentinus sajor-caju*, of which, judging from the figure from which the description was drawn up, *L. multiformis* is a synonym. I have not seen the type of *Lentinus exilis* Klotzsch.

Of the other specimens collected by Gardner, *L. giganteus* B., *L. stenophyllus* B., *L. obnubilus* B., and *L. maculatus* B., are the same species (see Ann. Perad., IV., p. 406). This species has a long rooting base, and when sent by Thwaites was re-named *L. radicans* B. & Br. (see Ann. Perad., V., p. 273).

The specimens collected by Thwaites and assigned by Berkeley and Broome to L. *blepharodes* B. & C. are not that species, but are identical with *L. similis* B. & Br. Similarly, the Ceylon specimens assigned to *L. badius* are *L. similis* B. & Br., and differ from the original *L. badius* from the Philippines (see Ann. Perad., V., p. 274).

Gardner 18 assigned to *L. strigosus* Fr., and Gardner 1 and 13, named *L. Lecomtei* Fr., are the same species. When sent by Thwaites, this species was again attributed to *L. Lecomtei*. It seems to be now generally held that this species is identical with *Panus rudis*, but this determination would appear doubtful.

L. cartilagineus B. is identical with *Collybia albuminosa* (Berk.) Petch. *L. percomis* B. & Br. is distinct from all the other Lentini recorded from Ceylon.

From the herbarium specimens, *L. eximius* B. & Br. is identical with *L. estriatus* B. & Br. There is another collection of the same species in Herb. Kew labelled *Lentinus Thwaitesii* B. & Br. by Berkeley; apparently this name was never published.

There is apparently no type specimen of *L. zonifer* B. & Br. either in Herb. Kew or in Herb. British Museum. Herb. Peradeniya contains both *L. zonifer* B. & Br. and the Ceylon specimens attributed to *L. Hookerianus* B. These were part of the same Thwaites' number, 532, and are the same species. It appears to be *L. Hookerianus*.

Lentinus giganteus Berk., Decades of Fungi, 162.

L. stenophyllus Berk., Hook. Lond. Jour. Bot. (1847), p. 495; *L. obnubilus* Berk., *loc. cit.*, p. 495; *L. maculatus* Berk., *loc. cit.*, p. 494; *L. radicans* B. & Br., Fungi of Ceylon, 416.

When unexpanded, wholly black, except the subterranean rooting base, the convex pileus covered with scattered black fibrillose scales. Universal veil black, remaining attached in fragments to the margin for some time. When expanded, typically infundibuliform, up to 30 cm. in diameter and 28 cm. high, rarely plane, sometimes campanulate. Pileus ochraceous or yellow-brown, covered with blackish-brown squamules, densely in the centre, scattered and concentrically arranged elsewhere. In addition to these scales, which are formed by the splitting of the cuticle of the pileus, there is usually a regular ring of large, black, superficial, flattened, polygonal warts, representing the remains of the veil, midway towards the margin. Margins striatosulcate. Flesh white, spongy, thin, except over the stalk. Stalk equal, 1–2 cm. diameter, or expanding upwards, 1·5–3 cm. diameter at ground level, 2–5 cm. at the ends of the gills, densely velvety with brown, or blackish-brown, short tomentum, outer layer cartilaginous, internally white and spongy, 3·5–12 cm. high. Gills white, then cream-coloured, decurrent, not crowded, rather broad (up to 13 mm.), attenuated outwards, sometimes anastomosing; the tomentum of the stalk extends partly along the edges of the gills. Spores white, broadly oval, 6–8 × 5–6 μ, or globose, 6–7 μ diameter.

On the ground among grass, arising from buried wood at a depth of 8 inches or more below the surface.

Lentinus sajor-caju Fr., Epicr., p. 393.

Lentinus exilis Kl. in B. & Br., Fungi of Ceylon, 401 ; *L. multiformis* B. & Br., Fungi of Ceylon, 404.

Pileus at first gray, mottled with gray-brown patches, becoming pale ochraceous, grayish in the funnel, often spotted with red-brown when fully expanded in wet weather, but uniformly brown or grayish-brown in drier weather ; faintly radially fibrillose, becoming glabrous, depressed, then strongly infundibuliform, thin, tough, margin incurved, entire or lobed. Up to 11 cm. diameter. Gills white, then ochraceous, narrow (1 mm.), crowded, decurrent, their faces covered with erect obclavate processes, 60–80 μ high, 20–30 μ diameter, composed of fasciculate hyphæ. Stalk short and stout, about 2 cm. high, 5 mm. diameter, at first white, longitudinally striate, with a thick, broad, fleshy decurved ring, triangular in section, which usually disappears, leaving the stalk irregularly fibrillose or squarrose.

On a decaying erect tree trunk, Peradeniya. This species is not common at Peradeniya, where I have only once collected it. A thick, leathery, white layer was present between the bark and the wood, and the majority of the specimens arose from this layer and forced their way through cracks in the bark. The stout ring, the remains of a universal veil, soon disappears, being apparently eaten off by insects. When the fungus begins to dry *in situ*, it turns yellow-brown, the discolouration extending from the margin inwards ; at the same time it shrinks and becomes semitranslucent, horny, and radially striate ; the stalk also shrinks and becomes glabrous, longitudinally ridged, and black. Specimens gathered and dried when recently expanded appear quite different from these old, naturally dried examples. Young, partially expanded specimens do not appear to have any processes on the gills.

Lentinus connatus Berk., Hook. Lond. Jour. Bot., I., p. 145.

Lentinus revelatus Berk., Decades of Fungi, 160 ; *L. velatus* B. & Br., Fungi of Ceylon, 403 ; *L. infundibuliformis* B. & Br., Fungi of Ceylon, 406.

Cæspitose ; deeply infundibuliform, up to 20 cm. high and 18 cm. diameter, cream-coloured or pale ochraceous, often blackish at the base of the funnel, sometimes radially streaked gray, minutely tomentose or scurfy, glabrous towards the margin, sometimes dotted with minute black points ; flesh thin. Gills decurrent, crowded, very narrow (1–2 mm.), white, then cream-coloured. Stalk usually long, up to 1·6 cm. diameter, clothed with woolly tomentum, which is at first white, becoming gray or sometimes blackish, the tomentum usually extending along the edge of the gills. Spores white, oval, 5–8 × 3–3·5 μ.

Common on logs and stumps, Peradeniya, &c.

Lentinus subnudus Berk., Decades of Fungi, 161.

Lentinus inconspicuus Berk., Decades of Fungi, 164 ; *L. cretaceus* B. & Br., Fungi of Ceylon, 405 ; *L. manipularis* B. & Br., Fungi of Ceylon, 407 ; *L. lobatus* B. & Br., Fungi of Ceylon, 417 ; *L. pergameneus* Lév., in Berkeley, Decades of Fungi, inter 161 et 162 ; *L. anthocephalus* Lév., in Berkeley, Decades of Fungi, inter 161 et 162.

Cæspitose ; up to 8 cm. diameter and 7 cm. high, infundibuliform, margin usually regularly decurved, white, clothed with closely adpressed scales, or squarrose ; in drier weather sometimes gray ; flesh thin. Gills rather crowded, broad (up to 3 mm.), decurrent, edge naked. Stalk white, blackening at the base, about half the total height of the fungus, up to 5 mm. diameter, usually squarrose, sometimes almost smooth. Spores white, narrow oval, 6–9 × 2–3 μ.

Common on logs and stumps at Peradeniya and in the low-country.

Lentinus percomis B. & Br., Fungi of Ceylon, 402.

Up to 7 cm. diameter and 7 cm. high, infundibuliform, feebly radially sulcate, at first purple or reddish-purple, becoming pale ochraceous or cream-coloured, glabrous, margin ciliate or almost naked. Gills decurrent, purple, then cream-coloured, moderately broad, rather distant. Stalk up to 2 cm. high, 6 mm. diameter, clothed with spongy tomentum, or minutely scurfy-tomentose.

Hakgala, on fallen trunks, fairly common.

Lentinus Lecomtei Fr., Epicr., p. 368.

Centrally stalked, deeply infundibuliform to almost plane, or laterally stalked, orbicular to reniform, usually growing in tufts, connate at the base. Pileus up to 11 cm. diameter; at first violet or violet-purple, becoming brown, yellow-brown, or pale ochraceous; densely clothed with erect hairs which form fasciculate spine-like tufts at the margin; margin regular or lobed. On young examples, the hairs are white, but become yellow-brown later. Gills decurrent, violet then pale ochraceous, crowded, rather broad (up to 3 mm.). Stalk usually short and stout, about 1 cm. long, and 6–8 mm. diameter, densely strigose. Spores oval, 6–7 × 3 μ, faintly yellow.

Common at Peradeniya on decaying stumps.

Lentinus Hookerianus Berk., Decades of Fungi, 322.

Lentinus zonifer B. & Br., Fungi of Ceylon, 413.

Up to 5 cm. diameter, and 7 cm. high. Infundibuliform, sometimes lobed, covered with erect bristly fascicles of brown hairs, chocolate-brown. Gills at first purple, then pallid, finally brown, dark when dry, crowded, very narrow, decurrent. Stalk comparatively long and thin, up to 5 cm. high, 4 mm. diameter, clothed as the pileus. Spores white, oval, 5–6 × 3–3·5 μ.

On stumps and fallen logs, Peradeniya, Gallawatta, &c. The form named *L. zonifer* is concentrically depressed or zoned ; this is due to the temporary arrest of the expansion of the pileus owing to changes in the weather. This species frequently splits to the centre when pressed.

Lentinus similis B. & Br., Fungi of Ceylon, 409.

L. blepharodes B. & C., in B. & Br., Fungi of Ceylon, 408 ; *L. badius* Berk., in Decades of Fungi, inter 159 et 160.

Amethyst or violet when young, becoming pale brown to red-brown when old. Pileus up to 8 cm. diameter, deeply infundibuliform, edge decurved or plane, regularly plicato-sulcate to the centre, coarsely velvety with short close-set hairs, which are often grouped into tufts within the funnel, margin regular and fimbriate. Total height up to 14 cm. Stalk long, straight, equal, expanded at the base, clothed with long silky hyphæ entangled in a spongy mass. Gills decurrent, narrow, rather distant, violet, then cream-coloured, finally brown. Spores white, narrow-oval, or oblong-oval, $5–7 \times 3–3{\cdot}5\ \mu$.

On dead wood, usually scattered.

Lentinus eximius B. & Br., Fungi of Ceylon, 415.

L. estriatus B. & Br., Fungi of Ceylon, 418.

Not collected recently ; apparently the same texture as *L. similis*, but even, and shortly stalked ; the gills dry very dark.

Revisions of Ceylon Fungi.

(PART IV.)

BY

T. PETCH, B.A., B.Sc.

107.—Panus melanophyllus Fr.

IN " The Fungi of Ceylon " Berkeley and Broome recorded " *Xerotus Bertierii* Mont. " on dead wood, Hakgala, and *Xerotus lateritius* B. & C. on dead wood, Peradeniya, February, 1869; and Beccari, when passing through Ceylon, gathered a fungus, for which Cesati instituted the new genus *Anthracophyllum*, the species being *A. Beccarianum.*

Cesati's genus was characterized as follows :—" Genus Marasmius affine, hymenio extus intusque nigrescenti, lamellis arescentibus, exsiccatione immutatis et ipsi cultro duris corneis. Pileus suborbicularis sessilis, vix pollicaris diametri, sat explanatus, supra sulcatus (more Schizophylli) fulvellus adustus et fere pulverulentus ; lamellæ distantes, acie acuta, integerrimæ, inæquales, 2–3 mill. latæ, attingentes, ad centrum attenuatæ."

In Fungi Macowaniani (Grevillea, IX., p. 137), Kalchbrenner adopted Cesati's genus and species, but changed the name to *Anthracophyllum nigrita* on the ground that Cesati's *Anthracophyllum Beccarianum* was identical with *Xerotus nigrita* Lév. He gives the synonymy *Anthracophyllum nigrita* (Lév.) Kalch. = *Panus melanophyllus* Fr. = *Xerotus nigrita* Lév. = *Anthracophyllum Beccarianum* Ces. It had been previously stated by Fries (Novæ Symbolæ Mycologicæ, p. 41) that if the specimen supplied to him was authentic, *Xerotus nigrita* Lév. was not different from *Panus melanophyllus*.

According to Kalchbrenner, the spores were black, and therefore the fungus could not be included under *Panus* or *Xerotus ;* the pileus was " sulcis parallelis, ad modum Schizophylli in lobos radiantibus ornatus."

The specimens of *Xerotus lateritius* and *X. Berterii* from Ceylon, in Herb. Kew, bear the same Thwaites' collection number, 393, not consecutive numbers as given in the Fungi of Ceylon. There is no difference between them ; both agree with the common Ceylon species.

Kalchbrenner's type of *Anthracophyllum nigritum* from Natal, which is also in Herb. Kew, does not show any points of difference from the Ceylon species. Under the same name, in Herb. Kew, there are twelve specimens from Natal (J. M. Wood) ; four specimens, Perrottet, 627 ; two specimens Perrottet, Manila ; and specimens from Cuba (Wright). These all agree with Kalchbrenner's type, but there is another gathering under the same name from South Carolina, " 892 and 917," which may be a different species. The Kew herbarium also contains a specimen of *Panus melanophyllus* from Fries which agrees with *Anthracophyllum nigritum*.

It would appear, therefore, that Kalchbrenner's synonymy is correct as far as regards *Anthracophyllum nigritum* and *Panus melanophyllus*. It is not clear how he arrived at the inclusion of *A. Beccarianum*, but it is quite certain that our common Ceylon species is identical with his *Anthracophyllum nigritum*. Moreover, the Ceylon species attributed to *Xerotus lateritius* and *Xerotus Berterii* are the same thing. In Herb. British Museum *X. lateritius*, *X. Berterii*, and *X. viticola* are apparently all the same species.

As far as Ceylon is concerned, therefore, the three names *Xerotus lateritius*, *X. Berterii*, and *Anthracophyllum Beccarianum* refer to the same species, which is identical with *Panus melanophyllus* Fries. This fungus is very common in jungles, especially in the hills, where it grows in abundance on dead twigs and branches. At first it is brownish-red or brick red above, paler towards the margin, which is strongly incurved in the early stages. The under surface is at first cinnabar, subsequently changing to violet, then purple, and finally black. It is soft and pliable, like kid leather, when young, but becomes rigid and brittle when old. In shape it is orbicular or reniform, up to 3 cm. broad, at first campanulate, then almost plane, shortly stalked, the stalk eccentric, black-brown, minutely tomentose, with a cushion of tawny hyphæ at the base. The surface of the pileus is radially sulcate, the margin straight or lobed. The gills are distant, thin, sharp-edged, becoming rigid when old, of the same colour as the lower surface of the pileus; the interstices are usually smooth. The spores are white and oval; measurements on one set of specimens from Hakgala (5,600 feet) gave 5–8 × 3–4 μ; on another set from the same locality, 10–11 × 7 μ.

The genus *Anthracophyllum* is popularly supposed to include species with split gills and black spores. It has, however, been known for some time that the specimens attributed to *Anthracophyllum* in herbaria had white spores; in Herb. Kew, for example, the specimens are marked by Massee, "spores white." The idea that the gill edge was split may have been derived from Cesati's comparison with *Schizophyllum*, but there is no resemblance whatever to the latter genus; the gill edges are acute and entire. In herbarium specimens the edge of the rigid gills is often broken by pressure, and this might give rise to the impression that it was split or channelled. But on the fresh specimens there is nothing to warrant a reference to *Schizophyllum* or *Xerotus*. The species is a *Panus*, and must be known as *Panus melanophyllus* Fr.

It may be noted that alcohol extracts a vivid red-brown colour; and in herbaria in which the specimens are preserved by an alcoholic solution, this species usually betrays its location by the intense red-brown stains on the covers.

108.—Hydnum mucidum P.

This species was recorded for Ceylon by Berkeley and Broome, Fungi of Ceylon, 547. The collection on which they based the record, Thwaites 382, is in Herb. Kew and Herb. Peradeniya. Examination of fresh specimens shows that it bears a general resemblance to *Hydnum mucidum* only when dry.

The species is totally resupinate, and spreads over the substratum in irregular broken patches. The subiculum is very thin, white or pallid, tomentose at the margin. The colour of the whole fungus is pallid to pale brown. It usually grows on a subvertical surface, and the spines curve downwards; they are up to 12 mm. long, and 1 mm. diameter, moderately distant, terete or slightly laterally compressed, acute, sometimes forked, sometimes bearing lateral protuberances, subcartilaginous, pale brown with white tips, becoming purplish and subtranslucent when old. It may be named *Hydnum pseudomucidum*.

109.—Marasmius coronatus Petch.

The species described and figured in Ann. Perad., VI., pp. 56–58, Pl. V. 1, as *Marasmius coronatus* n. sp. proves to be *Marasmius actinophorus* B. & Br. We have no part of the type specimen of *M. actinophorus* in Herb. Peradeniya, but we have the original painting. From the latter it had been supposed that *M. actinophorus* was an expanded, weathered specimen of *M. Thwaitesii*. Examination of the type at Kew shows that this was a mistake. There is only one specimen in the type, and that very small and collapsed, but an examination of the structure of the hairs on the pileus proves that it is the same as *M. coronatus* and distinct from *M. Thwaitesii*.

The painting is a very poor one, because it attempts to show a very small specimen, life size. Hence it gives no indication of the radial fascicles of hyphæ on the pileus. Massee's figures of *M. actinophorus* in Cooke's Illustrations, Pl. 1136, do not resemble the Ceylon fungus or painting ; they presumably represent the British *Marasmius* assumed to be this species. They are sufficient to demonstrate that the British species is not *M. actinophorus* B. & Br., and, indeed, the description in Massee's Fungus Flora, Vol. III., p. 172, refers to something quite different from the Ceylon plant. I did not find these British specimens in Herb. Kew.

110.—Corticium flavo-rubens B. & Br.

This species is not uncommon on the dead bark of decaying trees at Hakgala. It forms small patches, usually irregularly oval, up to about 8 mm. in diameter and 0·5 mm. thick, powdery, usually with a definite rounded margin, which is slightly tomentose. At first these patches are bright yellow, but they become orange-yellow owing to the development of a large number of minute red-brown bodies on or near the surface. Internally the colour is white.

The tissue of the fungus is composed of fine interwoven hyphæ, 1–2 μ diameter, roughened with copious deposits of calcium oxalate. The red-brown bodies which appear in the upper layer are oval or irregular, up to 24 × 20 μ; they are amorphous, not cellular. This fungus has been under observation for several years, but no spores or basidia have been observed. It has not, therefore, been possible to confirm Berkeley and Broome's reference of this species to *Corticium*.

Corticium flavo-rubens was described by Berkeley and Broome in Fungi of Ceylon, 647 (Thwaites 437). In 602 of Fungi of Ceylon they recorded *Stereum sulphureum* Fr. (Thwaites 437). The Ceylon specimens in the cover of the latter species in Herb. Kew are identical with *C. flavo-rubens*. The packet of duplicates was first marked *Corticium flavo-rubens*, and this crossed out and *Stereum sulphureum* substituted. There is another Ceylon specimen of the same thing, Thwaites 134, also marked *Stereum sulphureum* by Berkeley. This species is probably the basis of the record of "*Corticium sulphureum* Fr., Hakgala, Ceylon," in Saccardo. It was cited by Massee as *Stereum strumosum* Fr., in Mon. Thelephoreæ.

111.—Corticium peroxydatum B. & Br.

This was described by Berkeley and Broome in Fungi of Ceylon, 633, as "Resupinatum, immarginatum, inæquabile, læve, subtiliter pulverulentum, martianum, intus cinnabarinum (270)." It was transferred by Massee to *Coniophora* (Jour. Linn. Soc., XXV., p. 136). The type in Herb. Kew is a developing *Hypoxylon*, and has been so marked by E. A. Burt. On cutting into the fungus the black stroma of the *Hypoxylon* is found beneath the outer coloured layer.

112.—Stereum acerinum Fr.

This species was recorded for Ceylon by Berkeley and Broome in Fungi of Ceylon, 603. The specimens, at least in part, are now in Herb. Peradeniya. They consist of pieces of bark, not dead wood as stated by Berkeley and Broome, which bear numerous white patches. These patches are irregularly circular or oval, elevated, with a definite rounded margin. They are up to 4 mm. in diameter and 1 mm. in thickness. The surface appears powdery, and when lightly rubbed the white upper layer comes off, leaving a pale brown surface.

These patches occur in up-country jungles on the bark of living trees, the underlying tissues of which appear quite healthy. The species of tree has not been determined. A longitudinal section of a patch shows that the basal portion is composed of parenchymatous cells arranged in concentric layers round a central point. In some fresh specimens this structure continues almost to the periphery, but in the old herbarium specimens it is succeeded by a zone of partly disorganized tissue. The whole of this stains yellow-brown with chlorzinc iodide. Here and there occurs a solitary sclerenchymatous cell, which stains pink with phloroglucin and hydrochloric acid.

The white external layer consists of a mass of amorphous granules. These dissolve in sulphuric acid without effervescence, and crystallize out in bundles of needle-shaped crystals on the slide. They are evidently composed of calcium oxalate.

There is apparently no evidence of any *Corticium* in the structures in question. They appear to be a bark formation analogous to that of lenticels, with an external covering of calcium oxalate.

113.—**Irpex vellereus** B. &. Br.

On the underside of decaying logs, in large sheets with a free dimidiate edge up to 5 cm. broad, spreading to, and surrounding, grasses and shrubs in the neighbourhood. The upper surface of the free edge is dirty white, with concentric brownish zones, and strongly radially strigose. The species is remarkable, when fresh, for the strong differentiation of its substance into two distinct layers. The thickness, excluding the teeth, is 2 to 3 mm. ; the upper two-thirds of this are white, soft, and spongy, composed of loosely interwoven hyphæ ; the lower third is also white, but forms a compact *brittle* layer. The hymenium is white, becoming purplish or brownish ; sterile margin broad ; extreme edge tomentose, white becoming pale purple. Aculei irregular, compressed, often sublabyrinthiform, 2 mm. long. When dry, the hymenium is minutely tomentose, being covered everywhere with erect hairs, up to 50 μ long and 5 μ diameter, minutely verrucose.

On rotting logs in jungle, Hakgala.

114.—**Irpex colliculosus** B. & Br.

This species was described in Fungi of Ceylon, 555, as "Totus resupinatus orbicularis, demum confluens convexus gilvus, margine tenui subbyssoideo pallido aculeis compressis farinaceis. On dead wood. Forming little elevated patches, which at length become confluent; hymenium sometimes persistently poriform, at first black-purple when moist." From the co-type in Herb. Peradeniya it appears to be resupinate, immature *Trametes versatilis.*

115.—**Hymenochæte floridea** B. & Br.

Thwaites 366 was listed by Berkeley and Broome in Fungi of Ceylon as two species, viz., *Hymenochæte floridea* B. & Br. (619), and *Thelephora floridea* B. & Br. (579). The former was described as "Resupinata, immarginata, tenuissima, purpureo-rubiginosa"; and the latter as "Resupinata, tenuis, atropurpurea, subtiliter tomentosa, margine pallidiore vel obsoleto."

There is only one specimen of Thwaites 366 in Herb. Peradeniya, and that is marked "619 *H. floridea*"; it contains several pieces, which are all *Hymenochæte.* Massee, in Monograph of the Thelephoreæ, does not mention either species, but the type specimen of *T. floridea* is in Herb. Kew, and is marked *Hymenochæte* by him; the specimens are *Hymenochæte.* It would appear, therefore, that the attribution of Thwaites 366 to two species by Berkeley and Broome was a mistake.

This species is fairly common on dead sticks and tree trunks at Hakgala. It is totally resupinate, effused, indeterminate, extremely thin, forming purple-red, oval or irregular patches, up to 5 cm. long and 2 cm. broad. The setæ, which are scarcely evident with a hand lens, are conical, yellow-brown, 30–50 μ long and 7 μ diameter at the base, projecting 15–30 μ above the surface.

116.—**Duportella velutina** Pat.

Specimens issued in Baker, Fungi Malayana, 25, as *Duportella velutina* Pat., n. g. & n. sp., are identical with *Corticium tristiculum* B. & Br., Fungi of Ceylon, 636 = *Hymenochæte tristiuscula* (B. & Br.) Massee, Mon. Thelephoreæ, Pt. II., Jour. Linn. Soc., XXVII., pp. 99–205.

117.—**Thelephora atropurpurascens** B. & Br.

Berkeley and Broome described this species from Thwaites' 989, as " Effusa, hymenio granulato-rugoso atropurpureo, marginem versus album, breviter fimbriatum rubescente. Forming elongated patches about three-quarter inch wide, rough, with irregular raised nodules, in the centre vinous-brown, more red towards the white margin." Parts of the type specimen are in Herb. Kew and Herb. Peradeniya.

In Herb. Peradeniya another gathering of the same species is included on a sheet, which is inscribed " 738 and 739," *i.e.*, *Reticularia atrorufa* B. & C. and *Reticularia venulosa* B. & C. There are four pieces of bark, but they do not bear any mark which would enable the two species to be distinguished. Three of them bear *Thelephora atropurpurascens* in addition to a pulverulent " *Reticularia* " mass ; the fourth bears the former only. This gathering has been previously re-described in " The Mycetozoa of Ceylon," Ann. Perad., IV., pp. 309–371.

During the last few years *Thelephora atropurpurascens* has been gathered on several occasions, usually on dead branches of mango. It forms thin, effused, encrusting, more or less circular patches, up to 3 cm. or more in diameter and about 0·5 mm. thick. The patch often originates from a small hole, such as an insect boring, in the branch, and is then umbilicate in the centre, and radially grooved.

The centre is subgelatinous, the margin byssoid. The general colour is vinous, purplish in the centre, and reddish elsewhere. The margin is white. The central portion is covered with close-set pulvinate elevations, sometimes radially elongated. In section the lowest layer is red-brown and byssoid, the middle layers white, and the upper layer brown and subgelatinous. The fungus is horny when dry. It is evident that this is a *Punctularia*, and will stand as *Punctularia atropurpurascens* (B. & Br.).

In very wet weather this fungus assumes quite a different form. Instead of coalescing into a flat stroma, the hyphæ remain more or less free, and form loose, pulvinate, floccose tufts up to 6 mm. thick, 2 to 3 cm. long, and 1 to 2 cm. broad. These are at first lavender with a white margin, then lavender to grayish-blue in the centre, and reddish-purple outwards ; they finally collapse into a purple-brown mass of matted hyphæ and spores. The hyphæ are lax, about 3 μ diameter, often agglutinated into strands, purple-brown when old. The ultimate sporiferous branches are simple and 1·5–2 μ diameter. The conidia are purple-brown, spherical, 4 μ diameter, or oval, 5–6 × 3–4 μ, minutely verrucose ; they are at first terminal, becoming lateral through the further growth of the hyphæ.

This second form may be found on the same branches as the *Punctularia*, and in some cases a *Punctularia* stroma may give rise to this growth, either on one side, or all round the margin. The inclusion of *Punctularia atropurpurascens* with " *Reticularia atrorufa* " and " *Reticularia venulosa* " on the herbarium sheet is thus explained. I may add that the fungus grows in my garden at Peradeniya and I have had numerous opportunities of observing it.

Reticularia atrorufa B. & C. and *R. venulosa* B. & C. were originally described by Berkeley from Cuba. Massee (Jour. Myc., 1889, p. 185) referred both to *Trichosporium Curtisii.* Torrend has found (Bull. Soc. Portugaise des Sciences Nat., IV., fasc. 1, p. 9) that *Reticularia venulosa* B. & C. is a *Ceriomyces* form of *Punctularia tuberculosa* Pat.

The Ceylon *Punctularia atropurpurascens* (B. & Br.) would appear to be different from *Punctularia tuberculosa* Pat. It agrees with the latter in having a *Ceriomyces* form, which has been attributed to the Cuban species *Reticularia atrorufa* and *R. venulosa.*

118.—Cyphella epileucina Sacc.

This species was described by Berkeley and Broome as " *Cyphella epileuca* B. & Br. Alutacea, pruinosa, pileo galeato e mycelio tenui albo oriundo ; hymenio lævi, sporis binucleatis." The name was changed by Saccardo, because of the existence of a previous *Cyphella epileuca* B. & C. It occurs in some abundance on dead leaves of *Amomum* at Hakgala. It is lemon-yellow, cylindrico-campanulate, pendent, up to 4 mm. long and 2 mm. diameter, affixed by a short curved stalk, or almost sessile, membranous, pale within, minutely tomentose ; the mouth is fimbriate and straight ; the stalk is up to 0·3 mm. long and 0·15 mm. diameter.

Berkeley and Broome cite Thwaites 98 as the type, and state that Thwaites 99 is a little darker. Both specimens are in Herb. Peradeniya. Thwaites 98 contains specimens on bark and also on a leaf, perhaps two different species. Thwaites 99 contains another species with an evident basal mycelium, which is absent in the case of the species on the leaf for which the name has here been adopted.

119.—**Triphragmium clavellosum** Berk.

Triphragmium Thwaitesii B. & Br.

In an article on Vegetable Pathology, No. CXLVIII., in the Gardeners' Chronicle, 1857, p. 21, Berkeley included a paragraph on *Triphragmium*, in which he wrote : " I now figure two additional species, *T. deglubens* and *T. clavellosum*, the latter of which grows apparently on some cherry, and is remarkable for the forked processes with which it is sparingly clothed, and the rather long hyaline stem. Léveillé's species on *Meum*, like this, has spinulose processes, and like the former of them parallel dissepiments." The rough figure is labelled " *Triphragmium clavellosum* Berk. from Montreal."

In the same journal, 1865, p. 196, Berkeley returned to the subject of the genus *Triphragmium*, and after describing *T. echinatum* Lév., wrote : " At a later period Mr. Thwaites forwarded to us from Ceylon a parasite on a species of Hedera (*H. Vahlii*), agreeing with the parasite on *Meum* in every particular, as Mr. Broome has observed, except that every process is either bifid or trifid, the short divisions being strongly recurved, whereas in M. Léveillé's plant, the spines, if forked, have the divisions much shorter and not in the least reflexed. ...... our plant may be regarded, then, as a marked variety of *Triphragmium echinatum*, characterized by the re-curved divisions of the spines, and may bear the name of *T. echinatum var. Thwaitesii*. The diameter of the spores, exclusive of the spines, varies from 1/500 to 1/550 of an inch. Our figure represents two of the spores of the Ceylon plant and a spine magnified," &c.

In 1873 Berkeley and Broome published the second part of their Fungi of Ceylon, and included descriptions of two species of *Triphragmium*, viz., *T. Thwaitesii* and *T. clavellosum*, as follows :—

" 822. *Triphragmium Thwaitesii* B. & Br. Sporis globosis, processibus bifurcatis ornatis. On leaves of *Hedera Vahlii*, Peradeniya, April, 1861.

" 823. *Triphragmium clavellosum* B. in Gard. Chron., 1857. Sporis obovatis, processibus apice emarginatis ornatis. On *Paratrope terebinthacea*. At first obovate, simple, then divided by a horizontal septum; the upper articulation divided into two vertically. Spots on *Hedera* and *Paratrope*, broad and diffuse; in the Canadian specimens much narrower."

Here the confusion begins. *Triphragmium Thwaitesii* B. & Br. is the species which Berkeley regarded in 1865 as a variety of *T. echinatum;* it is described here for the first time. The name *Triphragmium clavellosum* had been published previously, but with scarcely anything that could be called a description, and it might be claimed that this is the first publication of that species also. In any case this description is based on Ceylon material (on *Paratrope*), and it is the first occasion on which the name of a host-plant is given with certainty. Berkeley further confuses matters by referring to both *Hedera* and *Paratrope* under *T. clavellosum*, though he had named the species on *Hedera T. Thwaitesii*. However, this last point is immaterial, so far as Ceylon is concerned, since *Hedera Vahlii* and *Paratrope terebinthacea* are synonyms. There can be no doubt whatever that the records of these two species of *Triphragmium* in the Fungi of Ceylon refer to the same fungus on the same host-plant. The questions to be decided are, Is the Ceylon species identical with the Canadian species named in 1857, and, if so, is it to be called *T. clavellosum?*

In Grevillea, III., p. 55 (September, 1874), Berkeley again described *Triphragmium clavellosum* :—" Soris in maculas orbiculares congestis epidermide cinctis nigris; sporis truncato-obovatis biseptatis; septo superiore verticali, processibus apice incrassatis emarginatis asperis.—Gard. Chron., 1857. On leaves apparently of *Amygdaleæ*. St. Lawrence. No. 5467, Montreal, Dr. Maclagan. Forming orbicular black patches; sori surrounded by the cuticle. Spores at first oblongo-ovate, even, then truncato-ovate, with one horizontal and one vertical division, rough with clavate processes emarginate at the tips." This is the description cited in Saccardo, VII., p. 770, with the addition, "in foliis *Araliæ nudicaulis*, *Paratropæ terebinthaceæ*, *Hederæ*, et *Amygdaleaceæ* cujusdam in America boreali et in insula Ceylon." It would appear that this description of Berkeley's is merely a repetition of the original American record, with details added from the Ceylon specimens.

In the Journal of Mycology, VI., pp. 123, 124, F. W. Anderson re-describes these two species. He states: "In Saccardo's Sylloge, VII., p. 770, are given brief descriptions of *Triphragmium clavellosum* Berk. and *Triphragmium Thwaitesii* B. & Br. The former occurs in America on *Aralia nudicaulis*, and is said (*l. c.*) to occur also in Ceylon on *Paratrope terebinthacea*, *Hedera*, and *Amygdaleæ* species. The latter is given for Ceylon as occurring on *Hedera Vahlii*, and the question is asked whether it is not the same as *T. clavellosum*. I have not been able to secure Ceylon specimens referred to *T. clavellosum*, but it is quite likely that all such are referable to *T. Thwaitesii*. Of this latter, I have secured an authentic specimen from Mr. J. B. Ellis, to whom it was sent by Dr. M. C. Cooke, of London, England. As *T. clavellosum* and *T. Thwaitesii* are related species, it is easy to understand why confusion should arise concerning them, especially when we consider the meagre published descriptions in which spore measurements are entirely omitted. *T. Thwaitesii* is a quite distinct species from North American forms of *T. clavellosum*, and it is pretty safe to say that *T. clavellosum* is American, and that *T. Thwaitesii* is Asiatic."

The above communication seemed to have decided at least one of the points at issue, viz., the question of the identity of the two species, though Anderson is in error in referring the record on *Amygdaleæ* to Ceylon. The Ceylon fungus grows on *Heptapleuron stellatum* (= *Hedera Vahlii* = *Paratrope terebinthacea*); the cherry record is American. A few years later the subject was reopened by Massee in Grevillea, XXI., p. 118 (June, 1893). Massee describes *Triphragmium clavellosum* B., quoting Gard. Chron., 1857, as the original record, and citing all the references given above, except that of Anderson. He does not refer to the type specimen, but cites "Rab.-Wint. Fungi Eur., No. 2918," a specimen on *Aralia nudicaulis*, collected in New Hampshire, United States. Massee states that *Triphragmium Thwaitesii* is identical with *T. clavellosum*, and expresses doubt whether both are not the same as *T. echinatum* Lév.; he does not state which specimens of *T. Thwaitesii* and *T. clavellosum* were compared, and hence there is an element of doubt in this determination, since the fact that Ceylon specimens of these two are identical does not assist in any way. Nor does he say anything about the host-plant of the type specimen of *T. clavellosum*, which was supposed to be some cherry.

In 1904 Milesi and Traverso published "Saggio di una monografia del genere Triphragmium," Annales Mycologici, II., pp. 143–156. They keep *Triphragmium clavellosum* and *T. Thwaitesii* distinct, but record both for Ceylon. The former is said to grow on *Aralia nudicaulis*, *A. hispida*, *Paratrope terebinthacea*, *Hedera* sp., and *Amygdalaceæ* in North America and Ceylon; and the latter on *Hedera Vahlii*, *H. stellata*, and *Heptapleurum* sp. in Ceylon and Java.

More recently Keissler has recorded "*Triphragmium clavellosum* syn. *T. Thwaitesii*" on leaves of *Akebia* sp., Kandy, Ceylon. This is certainly a misdetermination of the host-plant, *Akebia* not being known in Ceylon.

No one has attacked the problem of the identity of the host-plant in the type specimen of *T. clavellosum*. It seems to have been presumed that Berkeley's reference to a species of cherry was an error; if it was not, there is the alternative that the *T. clavellosum* of 1857 was another species altogether different from that on *Aralia*.

H. and P. Sydow (Monographia Uredinearum, III., p. 179) settle the difficulty by retaining *T. clavellosum* Berk. for the American species, and *T. Thwaitesii* B. & Br. for the Ceylon species. They state that the two species are very close to one another, but *T. Thwaitesii*, as a rule, has less numerous but longer appendages, and a shorter stalk. They omit all reference to the cherry as a host-plant, but include the erroneous reference to *Akebia*.

In the " Uredineæ and Ustilagineæ of Ceylon " the identity of the two species was accepted, and the fungus recorded as *T. clavellosum*. The adoption of the latter name was an error, as *T. clavellosum* of 1857 is *nomen nudum*, and it is necessary to fall back on the description of 1873. According to the latter, *T. Thwaitesii* must be adopted for the Ceylon fungus, whether it is the same as the American species or not. We thus reach the same conclusion as Sydow, but by a different route.

It would be interesting to ascertain the date of the first description, based on American material, of *T. clavellosum*. Apparently it is that by Anderson, in Journal of Mycology, VI., p. 124 (1890). Previous descriptions refer to Ceylon material, with an American locality attached.

120.—**Æcidium Pavettæ** Berk.

In the Fungi of Ceylon (Jour. Linn. Soc., XIV., p. 95) Berkeley and Broome included, under 854, " *Æcidium Pavettæ* B., Hook. Jour. (1853), p. 231. Maculis orbicularibus hypophyllis nigris tenuibus, pseudoperidiis sparsis, margine angusto. On *Pavetta indica*." There is no type specimen of this species at Kew or Peradeniya, and, as stated in the Uredineæ and Ustilagineæ of Ceylon (Ann. Perad., V., p. 243), it is by no means clear from this description that it was an *Æcidium*, more especially in view of the fact that " pseudoperidiis sparsis, margine angusto " might be taken to fit the now well-known bacterial domatia which occur on *Pavetta* leaves.

The description quoted above is the one given in "Saccardo," but on referring to Hooker's London Journal of Botany the original is found to be somewhat more definite. It is to be found in Vol. VI., n. s. (1854), p. 231, not in Vol. V. (1853), and runs as follows :—"*Æcidium Pavettæ* n. s.; maculis orbicularibus fuligineis ; peridii margine reflexo lobato ; sporis subangulatis. Hab. On the undersides of leaves of *Pavetta*. Ceylon (G. H. K. Thwaites, Esq.). Spots half an inch or more broad, dingy ; peridia scattered, more numerous towards the centre ; border reflexed, lobed. Cells not crenate at the edge, as in the last (*i.e.*, *Æcidium rhytismoideum*). Spores somewhat angular. A far more minute species than the last. The spot is merely discoloured and not incrassated as in that species." It is to be noted that Berkeley did not state that it was on *Pavetta indica*.

Two species of Æcidium, *Æcidium flavidum* B. & Br. and *Æcidium Pavettæ* Berk., were listed in the Fungi of Ceylon. *Æcidium flavidum* was described as " Maculis effusis flavidis hypophyllis ; soris sparsis ; pseudoperidiis margine crenatis laceris. On leaves of *Pavetta indica*. Peradeniya, February, 1868."

It will be seen that there is very little difference between the two descriptions. *Æcidium Pavettæ* is said to produce a black spot, but not a thickened black spot as in *Æcidium rhytismoideum*, while *Æcidium flavidum* produces a yellow spot. This difference may be merely a matter of age ; *Æcidium argyreiæ* produces a yellow spot which becomes thin and black later. In the absence of type specimens there is nothing to contradict the supposition that *Æcidium flavidum* is identical with *Æcidium Pavettæ*, as indicated by Sydow and Butler (Fungi Indiæ Orientalis, IV.).

In the Uredineæ and Ustilagineæ of Ceylon an Æcidium on *Pavetta hispidula* W. & A. was listed under the name of *Æcidium flavidum* ; it occurred on the leaves, on pale yellow-green spots, which were slightly bullate. Since that publication an Æcidium identical in microscopic character has been found on several occasions on *Pavetta indica* L. at Hakgala. It occurs on the young stems and petioles, which are in consequence distorted and thickened ; the stems are greatly swollen, and the leaves are reduced in area. The affected shoots form Witches' brooms.

The species which causes these distortions on *Pavetta indica* does not appear to differ from that which occurred on undistorted leaves of *Pavetta hispidula*. The case may be parallel to that of *Tabernæmontana dichotoma* attacked by *Æcidium ceraceum*, which causes swellings and distortions on the stems, but may not produce any such effect when on the leaves.

121.—Peziza oncospermatis B. & Br.

This species was described by Berkeley and Broome in Fungi of Ceylon, 942 :—" *Peziza* (*Dasyscypha*) *oncospermatis* B. & Br., Cupulis breviter stipatis cyathiformibus tomentosis luteis : sporidiis fusiformibus angustis (435). On *Oncosperma fasciculatum* Thw., Habgalla, December, 1867. Minute, scattered, pale yellow ; sporidia fusiform, sharply pointed, thicker at one end, ·0008–·001 long ; cups ·012 high."

This well-marked species is common at Hakgala. It does not, however, grow on *Oncosperma* (which is unknown at Hakgala), but on the dead frond bases which sheath the stems of the tree fern, *Hemitelia Walkeræ*.

The total height of the fungus is about 0·6 mm. Its stalk is about 0·1 mm. diameter and 0·1–0·2 mm. high, either simple, or dividing above into two to four branches, each of which bears a cup. The margins of the individual cups are strongly plicate, so that the whole fungus has the appearance of a rosette, up to 1 mm. diameter. It is sulphur yellow, the outer surface tomentose or hairy, with long, adpressed, upwardly directed hairs ; the margin is strongly fimbriate with septate hairs, which are up to 80 μ long, and 3–4 μ diameter with a blunt apex, slightly warted, and bear coarse yellow granules. The asci are clavate, shortly pedicellate, with obliquely uniseriate spores, 75–90 × 9 μ ; paraphyses simple, slender. The apex of the ascus is not coloured blue with iodine. The ascospores are slightly cymbiform, ends pointed, hyaline, continuous ; extruded spores measure 30–33 × 3–4 μ ; Berkeley and Broome's measurement is 20–25 μ.

It is clear that this species falls in the genus *Aranæa* Penz. & Sacc., and must accordingly be known as *Aranæa oncospermatis* (B. & Br.). It agrees exactly with the description of *Aranæa macrospora* Penz. & Sacc., but differs in colour from the figure of the latter.

122.—Peziza verruculosa B. & Br.

In Fungi of Ceylon, 938, Berkeley and Broome recorded *Peziza hirta* (Thwaites 2 and 273). In Herb. Kew, in the cover of *P. hirta*, there are drawings of spores, marked Ceylon 109, and Ceylon 2 and 273 ; specimens, *Peziza hirta*, Ceylon, 1854, G. H. K. T.; and two sheets, *ex* Herb. Currey, *Peziza hirta*, Ceylon 2, and *P. hirta*, Ceylon, 273. This species is very common on rotten wood, especially in up-country districts; from the length of its hairs it should probably be referred to *P. badioberbis*.

Immediately succeeding *P. hirta*, Berkeley and Broome described *P. verruculosa* B. & Br. It was "Ascis linearibus; sporidiis uniseriatis globosis fortiter verruculosis, paraphysibus linearibus intus globulis repletis; cætera *P. hirtæ*." They gave a figure of the ascus and spores.

There is no specimen of *P. verruculosa* in Herb. Kew, and hence the species is not mentioned in Massee's Revision of Berkeley's types. During the last ten years numerous Ceylon gatherings of *P. hirta* have been examined in the hope of discovering *P. verruculosa*, but without any success. Odd spherical spores occur in the asci of *P. hirta*, and it was thought possible that Berkeley and Broome might have met with a specimen in which spherical spores predominated, though we did not find any such. On a recent visit to England, however, it was found that the type of *P. verruculosa* is in Herb. British Museum, *ex* Herb. Broome. It consists of part of one specimen. But it does not in the least resemble *P. hirta*. It is a much larger species, and has no marginal hairs whatsoever. It proves to be *Barleina albocærulea* Penz. & Sacc., which often occurs in quantity at Peradeniya.

This same species apparently provided the *Peziza sarmentorum var. geophila* of Berkeley and Broome's list. Massee referred these latter specimens to *Barlæa lobata*, in the cover of which they will be found at Kew. If the colour given for *B. lobata* in the published descriptions is correct, the Ceylon species is immediately distinguishable. The spores of *P. sarmentorum var. geophila* are slightly larger than those of the type of *P. verruculosa*, but otherwise the two do not appear to differ. This species will now stand as *Barleina verruculosa* (B. & Br.) = *B. albocærulea* Penz. & Sacc.

123.—**Cudoniella javanica** P. Henn.

This species is not uncommon at Hakgala. In Hennings' description the stalk is said to be 3–5 cm. long. From his figure it is evident that this should be millimetres, not centimetres.

124.—Hypocrea Bambusæ B. & Br.

This species was described by Berkeley and Broome in the Fungi of Ceylon, 999, as " Placentiformis, fusca, granulata, ascis linearibus : sporiidiis filiformibus. On inflorescence of Bambusa." In Michelia, I., p. 323, it was transferred to *Hypocrella* by Saccardo. The fungus has not been found recently in Ceylon, and the following description has been drawn up from the co-type in Herb. Peradeniya.

The fungus is parasitic on some species of bamboo. Its stromata are situated at the apex of short lateral branches, and it appears probable that these owe their suppressed condition to the action of the fungus. Part of the fungus consists of a mass of hyphæ, which encloses the inner leaves of the terminal bud and forms a pseudostroma, hidden by the outer leaves. At the apex of this the external stroma is produced.

The external stroma is black, hemispherical, plane beneath and somewhat flattened above, about 1·5 mm. diameter, rough with close-set conical ostiola, which project up to 0·1 mm. The perithecia are flask-shaped, usually close-set and sometimes wedge-shaped owing to the lateral compression, regularly arranged round the periphery of the upper surface ; they are up to 0·6 mm. deep (including the neck) and 0·2 mm. diameter. The asci are about 400 μ long and 4–6 μ diameter ; the spores are about as long as the ascus, and 1–1·5 μ diameter, apparently continuous.

This species must now be placed in *Balansia*, though it is difficult to understand where recent revisions of the *Balansia* group have left the various genera, and what differences are relied upon to separate them. It will therefore stand, at least temporarily, as *Balansia Bambusæ* (B. & Br.) Petch.

In Journal of Botany (1896), p. 152, Massee stated that *Hypocrella axillaris* Cooke, on *Eragrostis*, Queensland, is identical with *Hypocrea Bambusæ* B. & Br. Cooke's description in Grevillea, XX., p. 4, is " Stroma obturbinate, or obclavate, seated in the upper axils (5 mm. long, 2–3 mm. broad), black, opaque, minutely granular with the ostiola ;

substance white. Perithecia very minute, immersed in the periphery. Asci cylindrical, 120 μ long. Sporidia filiform, at length multiseptate (about 100 μ long), hyaline. On grasses, Brisbane. Somewhat resembling *H. Bambusæ*, but larger and less globose. Size and form not unlike *H. strangulans* Mont."

It is difficult to see any resemblance between the two species, except that both are black. *Hypocrea Bambusæ*, as a rule, has a definite hemispherical stroma seated on the apex of the shoot. *Hypocrella axillaris* also grows on and involves a lateral shoot, but, just as in *Balansia brevis*, the stroma is adnate to the lowest leaf of the shoot over its whole length. It is not obturbinate or obclavate, unless one looks at it from the natural erect position of the grass. Viewed with the leaf to which it is adnate horizontal, it is pulvinate, tapering to one end.

The stromata are pulvinate, tapering to one end, wrinkled, almost smooth, black, adnate to the leaf, up to 5 mm. long, 3 mm. broad, and 2 mm. high. The internal tissue is white, and composed of hyphæ and the tissues of the bud; the black outer layer is up to 0·1 mm. deep. The perithecia are flask-shaped, close-set, about 0·3 mm. deep (including the neck), and 0·15 mm. diameter; the ostiola do not, or scarcely, project. The asci are about 180 × 5 μ, and the spores filiform, as long as the ascus, 1–1·5 μ diameter, septate. The Queensland species differs from *Balansia Bambusæ* in the smaller perithecia, and the smooth larger stromata of different shape and habit. It will stand as *Balansia axillaris* (Cooke) Petch.

125.—**Nectria dorcas** (B. & Br.) Cooke.

Berkeley and Broome described this species as *Peziza dorcas*, Fungi of Ceylon, 944. It was transferred to *Nectria* by Cooke, Grevillea, XII., pp. 77–83, but placed in *Dialonectria*. An examination of the type specimens confirms Cooke's diagnosis so far as *Nectria* is concerned, the ostiolum being clearly evident in mounted examples.

The perithecia are yellowish-brown to fawn-coloured, globose, 0·3 mm. diameter, scattered or clustered. When dry the centre collapses. They are densely clothed with interwoven hyphæ, hyaline or brownish in colour, with free spreading ends, nodular above, up to 30 × 4 μ. The asci are clavate, 8-spored, spores biseriate, 80 × 12 μ. The ascospores are oblong-oval, ends rounded, 1-septate, not constricted at the septa, 12–16 × 5 μ, wall faintly striate.

As would be judged from Berkeley and Broome's reference to *Dasyscypha*, the fungus is *Lasionectria*, not *Dialonectria*.

126.—Nectria rigidiuscula B. & Br.

This species was described by Berkeley and Broome, Fungi of Ceylon, 1024, as "Cæspitosa ; peritheciis ovatis pallide coccineis, vix collabentibus : sporidiis submetulæformibus quadrinucleatis, demum 3-septatis (173C)." It was listed by Saccardo as *Calonectria rigidiuscula* (Syll. Fung., II., p. 543). Broome's drawing and the type specimen are in Herb. British Museum. It is the same as *Calonectria sulcata* Starb., and provides an earlier name for this widely-distributed and equally widely-named tropical species. Berkeley and Broome's description is incorrect as to colour, and incomplete.

127.—Nectria fenestrata Cooke.

Nectria fenestrata was described by Cooke in Grevillea, XII., p. 81, from specimens in Berkeley's herbarium. In the cover of this species in Herb. Kew is a drawing, marked Ceylon 28, which bears a note in Berkeley's handwriting : "A *Nectria* mixed with *Sphærostilbe*." There is an abundance of specimens, Thwaites 48. On the same sheet is a specimen from Canada labelled "*Sphærostilbe pseudotrichia. Nectria fenestrata*." The specimens are *Megalonectria pseudotrichia* Schw. ; 28 and 48 are the Thwaites' numbers recorded by Berkeley and Broome for *Megalonectria pseudotrichia*. Apparently Berkeley discovered that his *Nectria fenestrata* was *Megalonectria pseudotrichia*, and did not publish the former name, but his original mistake was resurrected by Cooke.

128.—Epichloë pulvinulus B. & Br.

This species was described by Berkeley and Broome in Fungi of Ceylon, 981. It grew on a species of Panicum. In Saccardo, Syll. Fungorum, II., p. 581, it is listed as *Hypocrella pulvinulus*.

The fungus develops on a lateral shoot of the grass, arresting its development while still enclosed in the leaf sheath. Within the sheath it forms a white sterile stroma, which encloses the tissues of the shoot, and at the mouth of the sheath this gives rise to an external fertile stroma. The fertile stroma is honey-coloured, dotted with brown, translucent ostiola ; it is flattened pulvinate (flattened in a plane parallel to the stem of the host), and measures up to 3 mm. in length, 2 mm. in breadth, and 1 mm. in thickness ; internally it is pale brown. The perithecia are flask-shaped, totally immersed, and crowded in a distinct peripheral zone ; they have rather thick walls, and are up to 0·5 mm. deep and 0·15 mm. in diameter. The asci are cylindric, 250–300 × 5–6 μ, capped, the cap being furnished with a central pore. The spores are filiform, as long as the ascus, and septate.

This species has the same structure as *Balansia*, but its stroma is light-coloured ; it must therefore be included in *Balansiella* P. Henn., as *Balansiella pulvinula* (B. & Br.).

129.—Epichloë cinerea B. & Br.

This was described by Berkeley and Broome as " Cylindrica, cinerea : sporis longis filiformibus. On *Eragrostis nutans*."

The co-type in Herb. Peradeniya contains five inflorescences of the grass. In each of these the branches and spikelets are bound into a cylindrical mass by mycelium, which does not, however, spread over the exterior. There are indications which appear to show that there may have been a continuous thin white covering originally, but if so, it has disappeared. At various points this pseudostroma has produced perithecii-gerous areas. These fertile parts are about 0·3 mm. thick ; they may be elongated-oval, several on one inflorescence, or they may run nearly the whole length of the inflorescence. In one case an inflorescence bears a fertile stroma 6 cm. long and 1·5 mm. broad on one side, and two others each about 1 cm. long and 1 mm. broad, in the same straight line, on the other side.

The stromata are now blackish-brown, dotted with black ostiola, and about 0·3 mm. thick ; the margin is somewhat abrupt. The stroma consists of very little more than a layer of perithecia crowded together ; the perithecia are roughly oblong or cuboid in section, and measure about

0·2 mm. in depth and 0·1–0·2 mm. in breadth; the asci are cylindric, up to 150 × 4 μ, and contain filiform ascospores, 1 μ diameter, as long as the ascus. The specimens appear to be not quite mature.

Sydow and Butler, in Fungi Indiæ Orientalis, III. (Ann. Myc., IX., p. 394), have re-described *Epichloë cinerea* from specimens collected in India. In their specimens the stroma occupies the whole inflorescence, and is 1·5–4 cm. long and 1–2 mm. thick; probably the latter measurement includes the whole inflorescence. The stromata are said to be at first cinereous, owing to the production of conidia, then purplish-black. The perithecia are 150–200 × 60–90 μ, with black ostiola; the asci 125–165 × 5–6·5 μ; and the spores 1·5–2 μ in diameter, multiguttulate or obsoletely septate, "intra ascos haud in articulos dilabentibus."

Sydow and Butler's specimens apparently entirely enclose the inflorescence. The Ceylon specimens, on the other hand, have discontinuous stromata on the pseudosclerotium formed by the mycelium and the branches of the panicle. On the available specimens the Ceylon species would be referable to *Dothichloë*, though it is possible that in some cases the scattered stroma may coalesce and form a continuous covering. Again, the colour of the herbarium specimens suggests that *Epichloë cinerea* is never purple-black, as described by Sydow and Butler; the surface of the stroma is now blackish-brown, and contrasts strongly with the black ostiola. It appears to have been pale coloured when fresh.

It would seem probable that the species described by Sydow and Butler is not identical with *Epichloë cinerea* B. & Br., but it may be preferable to obtain a further series of specimens of the latter before arriving at a definite decision.

130.—Rosellinia bothrina B. & Br.

Examination of the Kew specimens of *Rosellinia bothrina* B. & Br. has shown that the species which causes root disease of tea, &c., hitherto referred to *Rosellinia bothrina*, is quite distinct from the latter. The type of *Rosellinia bothrina* (Thwaites 299) probably contains two species, one of them immature. The mature form has perithecia 1·5–2 mm. in diameter, depressed globose, minutely adpressed hairy, black-brown, embedded in a dense weft of purple-brown mycelium; the ostiolum is small, conical, black, and glabrous. The spores are narrow-oval, ends rounded, subcymbiform in one aspect, with a thin hyaline coat, 28–38 × 8–11 μ. They do not at all agree with Berkeley and Broome's description "sporidiis fusiformibus acutissimis," which fits the parasitic species far better.

I have what I take to be the same species from Hakgala, but in that gathering the perithecia are not depressed. The adpressed hairy covering, derived no doubt from the surrounding mycelium, weathers off, and the perithecia become black. The spores of this collection are 24–32 × 9–13 μ: they are the same shape as in the type, and, like those of the latter, are uniseriate in the ascus.

The species which we have hitherto referred to *R. bothrina* was collected by Thwaites (219), but was assigned by Berkeley and Broome to *Rosellinia aquila* Fr., from which it differs completely. Indeed, it differs so much that one is inclined to suggest that Berkeley and Broome confused their numbers, and that Thwaites 299 should have been *Rosellinia aquila* (which it resembles), and Thwaites 219, which the brief description fits, *Rosellinia bothrina*. As this species (Thwaites 219) does not appear to have been named, it may be known as *Rosellinia arcuata* n. sp. A full description was given in Ann. Perad., IV., pp. 433, 434, under *Rosellinia bothrina*.

Rosellinia arcuata.—Peritheciis gregariis, primo in mycelio purpureobrunneo immersis, fuscobrunneis, deinde nigris, liberis, carbonaceis, globosis, leniter depressis, 1·5–2·4 mm. diam., levibus, ostiolo conico, 0·1 mm. alt., basi 0·4 mm. diam. oriundo. Ascis cylindraceis, 300 μ long., 8 μ diam., sporis oblique uniseriatis; paraphysibus circa 2 μ diam., ascos æquantibus. Sporis nigris, cymbiformibus, apicibus acutis et sæpe subito contractis, 30–47 × 5–7 μ.

131.—**Rosellinia catervaria** (B. & Br.) Sacc.

This species was sent by Thwaites, mixed with *Bombardia Janus*, and was described by Berkeley and Broome under the name of *Sphæria* (*denudatæ*) *catervaria* B. & Br., Fungi of Ceylon, 1104.

The perithecia are superficial, scattered or clustered, up to 0·4 mm. diameter, black, minutely rugose, with a small conical ostiolum. The asci measure 70–80 × 6–7 μ. The ascospores are elliptic, with rounded ends, 1-guttulate, pale blackish-brown, 8–11 × 3·5–4 μ.

132.—Sphæria Janus B. & Br.

This species was described by Berkeley and Broome in Fungi of Ceylon, 1105. The ascospores were said to be like those of *Sphæria Bombarda*. It was listed in Saccardo as *Lasiosphæria*.

From the type specimen and recently collected examples it is found that the perithecia grow on dead wood, and are either scattered or clustered, black, leathery, superficial, with a slight basal weft of hyphæ, globose below, conical above, up to 0·6 mm. diameter, minutely rugose, longitudinally sulcate at the apex. When mounted the perithecial wall is areolated with thinner pale brown lines, and the outer layer appears as a series of black polygonal areas united by hyphæ. The asci are cylindrico-clavate, with a long tapering pedicel, and 8-spored; they measure 250–350 × 12 μ. The spores are at first hyaline, elliptic, about 20 × 12 μ, with an apical appendage, up to 30 μ long and 2 μ diameter, and a basal appendage which consists of a thick part, 30–40 × 4 μ, followed by a thinner part, up to 36 × 2 μ. When mature the ascospores lose their appendages, and are black-brown, broadly oval, slightly attenuated at one end and truncate at the other, 17–22 × 10–12 μ The fungus is a *Bombardia*, and will stand as *Bombardia Janus* (B. & Br.).

133.—Rosellinia Tetradeniæ (B. & Br.) Sacc.

Sphæria (*byssisedæ*) *Tetradeniæ* was described by Berkeley and Broome in Fungi of Ceylon, 1094. No Thwaites number was quoted. It was included in Saccardo, Syll. Fungorum, I., p. 256, as *Rosellinia*, with the additional information, not in the original description, that it grew on branches.

There is apparently no specimen of *Rosellinia Tetradeniæ* in Herb. Kew or Herb. British Museum. The description is " Mycelio repente e fibris tenellis septatis ; peritheciis globosis subliberis ; ascis ovatis, brevibus ; sporidiis oblongo-ellipticis. On Tetradenia. Sporidia ·0016 long."

In Fungi of Ceylon, 1173, Berkeley and Broome described *Dothidea Tetradeniæ*,—" Mycelio floccis reticulatis radiantibus; pseudoperitheciis hic illic sparsis : ascis ellipticis : sporidiis oblongis hyalinis. On the under side of leaves of *Tetradenia*. Forming little thin patches. Sporidia ·0015 long." This was listed in Saccardo as *Homostegia*. It has been re-described by Theissen and Sydow as *Meliola Tetradeniæ* (Ann. Myc., XII., p. 177).

It is evident that Berkeley and Broome's description of *Sphæria Tetradeniæ* would apply to a *Meliola* equally with their description of *Dothidea Tetradeniæ*, and in the absence of any type specimen of the former, it may be suggested that the same specimen has been described twice.

After *Dothidea Tetradeniæ*, Berkeley and Broome mentioned a variety *triseptata*, which is listed in Saccardo as *Meliola triseptata* (Syll., I., p. 762). Theissen and Sydow (*loc. cit.*) state that the variety is not to be found. It is represented in Herb. Peradeniya, and also in Herb. Kew, but in the latter it is named *Meliola amphitricha var. triseptata*, and is included in the cover of *Meliola amphitricha*. As this latter species is B. & Br. 1174, their note may have been accidentally transposed; presumably it should have followed 1174, not 1173 as printed.

134.—Pemphidium dilatatum B. & Br.

Thwaites' specimen 293 was described by Berkeley and Broome in Fungi of Ceylon, 1134, as *Pemphidium dilatatum*,— " Peritheciis depressis, basi dilatatis, opacis; ascis clavatis : sporidiis breviter subcymbiformibus. On the petioles apparently of some palm. Sporidia ·0008 long by ·0006 (inches)." In Saccardo, Syll., II., p. 659, it is transferred to *Myiocopron*.

The co-type in Herb. Peradeniya contains four pieces of the host-plant. Three of them bear a fungus which answers to Berkeley and Broome's brief description, but the fourth is a different species. In all cases, however, the fungus is subepidermal, not superficial, and cannot be included either in *Pemphidium* or *Myiocopron*. The spores are dark in both cases, and the fungi belong to *Anthostomella*. The following are the descriptions.

Anthostomella dilatata (B. & Br.) Petch. Perithecia scattered, subepidermal, lenticular, black, carbonaceous, about 0·35 mm. diameter, 0·1 mm. high, opening by a circular pore about 0·05 mm. diameter, ostiolum not projecting : asci not seen ; spores cymbiform, or broadly oval, ends rounded, brown, 16–19 × 8–13 μ. *Pemphidium dilatatum* B. & Br., in part. On petioles of some palm (?).

Anthostomella confluens Petch. Perithecia subepidermal, lenticular, black, carbonaceous, about 0·3 mm. diameter, opening by a circular pore, ostiolum not projecting ; scattered, surrounded by a pseudostroma formed from the blackened epidermis, which unites with adjacent pseudostromata to form a continuous black sheet. Asci not seen. Spores narrow-oval, ends rounded, fuliginous to black, 9–12 × 3–4 μ.

135.—Gymnosporium confusum B. & Br.

This forms 813 of the Fungi of Ceylon. The description is "Effusum nigrum ; sporis magnis subglobosis. With *Monatospora fusigera*. Spores ·0001–·0008 in diameter." It is listed in Saccardo as *Coniosporium confusum* (Syll., IV., p. 245). *Monatospora fusigera* B. & Br. is Fungi of Ceylon, 891, described as "Floccis hyalinis, apice attenuatis ; sporis fusiformibus fuscis, utrinque obtusiusculis (148). Apparently on the leaves of some palm. Spores ·001 long."

In Herb. Kew *sub G. confusum* are only the duplicates of Thwaites 148, marked *Monatospora fusigera* and *Gymnosporium confusum ;* under *Monatospora fusigera* is a sheet bearing three pieces, labelled *Monatospora fusigera*, two of which are chiefly *Gymnosporium*.

Coniosporium confusum has linear acervuli, up to 4 mm. long, bordered by the upturned epidermis of the host ; its conidia are rather pale yellowish-brown, spherical, 14–36 μ diameter, or oval, 16–30 × 10–20 μ.

Monatospora fusigera forms a thin black crust over the substratum, and overruns the acervuli of the *Coniosporium*. Its hyphæ are hyaline, loosely interwoven, about 2 μ diameter. The conidia are fuliginous to black, narrow-oval, ends blunt, sometimes acuminate, 14–19 × 7–9 μ.

136.—Stysanus monilifer (B. & Br.) Sacc.

This species was originally described by Berkeley and Broome, Fungi of Ceylon, 893, as *Periconia monilifera*. Their description is " Floccis erectis scabris : capitulo e floccis furcatis compacto: sporis concatenatis subglobosis (246). Spores ·00015–·00025 in diameter." In Saccardo, Syll. IV., p. 622, it is transferred to *Stysanus*. The reason for that change is not obvious. Berkeley and Broome's figure shows a simple stalk, and a head composed of radiating conidiophores. From the figure the fungus is evidently *Aspergillus* or *Sterigmatocystis*, and the phrase " floccis furcatis " points to the latter. The type is now in Herb. British Museum, with the original figure, and an examination shows that it is a *Sterigmatocystis*. The name will, therefore, stand as *Sterigmatocystis monilifera* (B. & Br.).

The conidiophores are pale yellow, clustered, up to 3 mm. high, and the total diameter of the head (in herbarium specimens) is 0·25 mm. The stalk is up to 20 μ diameter, not septate, closely and strongly verrucose; its apex is globose, up to 100 μ diameter ; the primary ramuli are up to 60 μ long, and bear at their apices numerous secondary ramuli, up to 16 μ long. The conidia are pale yellow, almost hyaline, minutely warted, 3–4 μ diameter (from herbarium specimens).

Another species collected by Thwaites, *Aspergillus flavidus* B. & Br., bears a striking resemblance to *Sterigmatocystis monilifera*, and on naked-eye characters would be thought to be the same species. It was described as " Flavidus : floccis granulatis inarticulatis : sporis late ellipticis (244)." To this is added the explanatory note : " The flocci have little straight ramuli at the top ; these, however, all rub off when the covering glass is moved. Spores ·00025." The types of this species are in Herb. Kew and Herb. Peradeniya. Examination shows that this is another *Sterigmatocystis*, but apparently a different species from *monilifera*. The conidiophores are pale yellow, clustered, up to 2 mm. high. The stalk is up to 50 μ diameter, smooth, not septate ; the apex is globose, up to 150 μ diameter. The primary ramuli are cylindric, 16–32 μ long, and the secondary flask-shaped, 12 μ long. The spores are pale yellow, minutely warted (almost smooth), spherical, 3–4 μ diameter (from herbarium specimens). It differs from *Sterigmatocystis monilifera* in the stouter stalk and head, and the shorter ramuli. Berkeley and Broome state that the stalk is granulated, but those of the specimens examined were perfectly smooth. Their reference to the conidia as elliptical is probably based on those of a parasitic mould which overruns the specimens. There may be some doubt whether the differences are constant, but for the present this species may be known as *Sterigmatocystis flavida* (B. & Br.).

Penicillium flavovirens Cooke & Mass. is a *Penicillium*.

137.—**Bactridium clavatum** B. & Br.

This was described in Fungi of Ceylon, 807, as " Melleum, pulvinulatum, sporis clavatis 4-septatis, articulo medio majore (240). On dead wood, Nuwara Eliya. Spores when mature ·008 (inch.) long." From the herbarium specimens, and others recently collected at Hakgala, there seems to be no doubt that this is identical with *Arthrosporium chrysocephalum* Penz. & Sacc., Icones Fungorum Javanicorum, p. 109. Penzig and Saccardo describe their species as " Sparsum v. laxe gregarium, carnulosum, crassiusculum, 2 mm. alt.; stipite tereti-conico, erecto, candido, ex hyphis dense intricatis formato, extus (ob cellulas exertas) minute asperulo, basi 0·7 mm. cr.; capitulo sphærico, 1 mm. diam., aureo; conidiis maximis, clavatis, apice rotundatis, basi acutatis, 7–8-septatis, ad septa non constrictis, 250–275 × 40–44 μ, flavis, utrinque subhyalinis, ex apice hypharum in vertice stipitis constipatarum oriundis."

Penzig and Saccardo's description fits the Ceylon fungus exactly. In specimens recently collected the conidia were obclavate, 4–9-septate, 150–240 × 30–36 μ. The conidia form a globose head, in a continuous waxy mass, as in *Fusarium*, not pulverulent or with distinct radiating conidia as shown in Penzig and Saccardo's figure (which is named *Arthropodium*). As these authors state, it is a stalked *Bactridium*, not an *Arthrosporium*, and their suggested new generic name *Podobactridium* may well be adopted. The species will then stand as *Podobactridium clavatum* (B. & Br.).

NAME INDEX.

NOTES.

Water hyacinth.—In the Kadugannawa district the name "Diya-kehel" (water plantain) has been given to this recently introduced plant. "Diya-kehel" was included by Moon in his list of varieties of plantains, but, as far as ascertainable, this name is not in use at the present day.—T. Petch.

Stachys arvensis.—The occurrence of *Stachys arvensis* at Nuwara Eliya was referred to by Thwaites in a letter to W. Ferguson, December 7, 1859; and was recorded in the preface to the "Enumeratio Plantarum Zeylaniæ." It was not mentioned by Trimen in his "Handbook to the Flora of Ceylon." In April, 1915, it was found to be common at Nuwara Eliya on roadsides towards Pedro.—T. Petch.

Mimosa pudica L.—In "Notes on Animal and Plant Life in the Vedda Country" (Spolia Zeylanica, X., 119–165), Mr. F. Lewis records *Mimosa pudica* as "occasional." Exact localities are not stated, but the district traversed lies between Muppane, Panawa, and Kumuna. The record is of interest, in view of the gradual extension of this weed to the eastern parts of the Island. In 1908 the furthest point reached by it on the Lunugala-Batticaloa road was a few yards towards the east of Maha-oya. Apparently it has not yet (1916) arrived at Batticaloa.—T. Petch.

Agrimonia zeylanica Moon.—This endemic species is very near the common *A. eupatorium* of Europe, but, *fide* Trimen, is a sufficiently well-marked local variety to deserve a name. In fruit the spines of the calyx tube are red. For the purpose of comparison with the local species, seeds of *A. eupatorium* (*odorata*) were collected in Norfolk, England, in August, 1911, and sown at Hakgala in December of the same year. The resulting plants developed healthy rosettes, somewhat stout and pulvinate, but they made no attempt to flower up to August, 1915. The experiment was brought to a conclusion by their death during my absence on leave in 1915–16.—T. Petch.

Cuscuta chinensis Lam.—This species, recorded by Trimen for the Colombo District only and said to be very rare, was common in July, 1915, along the road to Gangaruwa, on the hillside facing the Botanic Gardens. It grew on practically everything it met, the particular species determined being *Argyreia populifolia* Chois., *Mikania scandens* Willd., *Ocimum gratissimum* L., *Mimosa pudica* L., *Spondias mangifera* Willd., and *Ficus parasitica* Koen. It was again abundant in July, 1916.

New Weeds.—*Erechtites valerianæfolia* DC. was observed at Hakgala in the shrubbery below the Botanic Gardens in April, 1912. In 1914 it began to be common in the neighbourhood of Peradeniya, and it has since been found at Lunugala and Watagoda. It is evidently spreading generally over the up-country districts.

Salvia tiliæfolia Vahl was found in abundance in April, 1912, on the site of abandoned cooly lines at Hakgala, near the oak plantation. It was again found on the site of an old boutique at Ambawela, May, 1913 ; in a similar situation below the Hakgala Gardens, 1915 ; and on waste ground below cooly lines at Bandarawela in August, 1916. In all cases it appeared to be flourishing, but attempts to grow it at Peradeniya from Ceylon seed have not been successful. Its constant association with native habitations suggests that the seed is used, medicinally or for some other purpose, by Tamil coolies, but I have not been able to obtain any information on this point as regards either Ceylon or India. It is apparently not known as a weed or casual in India.

From the Colombo District, the Rev. P. T. Cash has sent in *Acanthospermum humile* DC. (August, 1916) and *Mitracarpus villosus* Cham. et Schlect., the latter from the Victoria park (August, 1916). The latter led to the discovery in the herbarium of another species of *Mitracarpus*, probably *M. Torresianus* Cham. et Schlect., which had been sent in by Sir Solomon Dias Bandaranaike in June, 1912, and wrongly identified ; the locality is not recorded.—T. Petch.

Nagadarana.—I am indebted to Mr. H. C. P. Bell for a specimen of " Nagadarana," which he informs me is carried by the snake charmers as a charm against snake bites. This particular specimen was purchased in the Kandy bazaar under the name cited. It is the fruit of *Martynia diandra* Glox. The same identification was made by Mr. J. P. Lewis in Jour. Asiatic Society, 1884. Trimen gives for this plant only the Tamil name Nakatali (Nagatali). In India it is sold as an antidote to scorpion stings.

In the Botanic Gardens, Peradeniya, the name Nagadarana has for some years been applied to *Bauhinia anguina* Roxb. Clough (Sinhalese and English Dictionary) gives Nagadarana as " The creeping or winding of a snake ; circular path of a snake ; medicinal root efficacious in the bite of snakes." It would seem clear that the application of this name to *Bauhinia anguina* has been prompted by its peculiar twisted stem, and from this point of view the name is much more appropriate to the latter than to *Martynia diandra*. But *Bauhinia anguina* is practically confined to the Botanic Gardens ; it does not flower in Ceylon, and is most probably not native, but an early introduction. Under such circumstances, it is improbable that it should have a wide-spread native name, and hence we must regard *Martynia diandra* as the true Nagadarana.

The first discovery of *Bauhinia anguina* in Ceylon, other than in the Botanic Gardens, was made by Trimen, who found it at the foot of Doluwekanda, in the Kurunegala District. On his communicating the discovery to W. Ferguson, the latter wrote as follows :—" When we lived at Peradeniya in 1854 I recollect some one, native, paying us a visit with a walking stick made of what he called Naga Tali, made of the flexuose stem of *Bauhinia anguina*, which was then in great force over the old gateway and pillars in the Gardens ; and I never saw or heard of it outside of these in Ceylon. But the plant is in such repute for frightening away snakes that bits of it may have been taken by the plumbago diggers to Doluwekanda, and that may account for the plants you got there."

It is interesting to note that the reputation of *Bauhinia anguina* as a charm against snakes has extended over more than sixty years, and that both the native names of *Martynia diandra* have been applied to this plant.—T. Petch.

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OF THE

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EDITED BY

T. PETCH, B.A., B.Sc.

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Effect of Foreign Pollination on Cycas Rumphii.

PRELIMINARY OBSERVATIONS.

BY

M. J. LE GOC, O.M.I., PH.D., M.A. (Cantab.), B.Sc. (Lond.),

Fellow of the Cambridge Philosophical Society.

Cycas Rumphii is widely distributed in the low-country of Ceylon, where it was supposed to be native. It is met with frequently in private gardens, it forms an ornament to many railway stations, and is not even of rare occurrence on the borders of some jungles. At the present day, however, the dispersal of this species of Cycas does not take place by means of seeds, but by the separation of adventitious offshoots that grow on the aerial part of the stem or from just below the surface of the ground. True seeds are to be found nowhere in Ceylon, as far as my information goes.

After travelling to a great extent in the main open tracts in the low-country, it appears to me that no ovules of *Cycas Rumphii* reach their full development along the road that runs from Galle to Chilaw, or in a wide radius round Colombo. On the other hand, I have found an ample supply of large ovules in the Botanic Gardens, Peradeniya, occasional crops in the Botanic Gardens at Henaratgoda, and have obtained also a few from Matara, a small town in the extreme south of Ceylon. But while something like a hundred apparently mature ovules have been examined, not a single one contained even the trace of an embryo. These facts suggested an interesting problem, the solution of which was first attempted at the end of 1914, and a note on the subject was sent to the "Ceylon Antiquary" in June, 1915 (2).

The first idea that suggested itself was to look for male cones of *C. Rumphii* and to try experiments on artificial pollination. But all search was in vain ; not a single male plant could be found. Mr. T. Petch, Government Botanist and Mycologist, Peradeniya, whom I then consulted on this point, sent me the following historical information :—" You know, from Trimen's "Flora," that W. Ferguson sent male *Cycas Rumphii* to Thwaites in abundance. I have been arranging old correspondence here lately, and I find that Trimen asked Ferguson, in 1883, to find him some more. Under date February 22, 1883, Ferguson wrote: 'The splendid male plants of *Cycas Rumphii* that used to grow near Rock House, Mutwal, are gone, but I'll look one up ...... I sent Thwaites quite a supply from one of them.' On February 24, 1883, he wrote: 'I had a hunt in the Queen's House garden here to-day for the male of *Cycas Rumphii*, with the result that all the plants in it—several—are offshoots from the old female one in a line with Baillie street, and several of them now with their cone-like masses of female flowers just going to expand. They are all from one old plant, but I will hunt up for you in Colombo and as far as Panabokai, 7 miles up the Kelani river.' Apparently he never found a male again."

[Thwaites, in letter to Ferguson, October 15, 1864, wrote: "I put in the box a male scale of *Cycas circinalis*, which you will see is totally different from the Colombo one in this respect. I am very much obliged to you indeed for the male scales of yours, which are in as good a state as need be for examination. It is the *Cycas Rumphii* of Miquel, Fl. Ind. Bat." Another letter, dated October 23, 1864, states: "Thank you for the female inflorescence of *Cycas Rumphii*. It quite corresponds with specimens I got in Reigam Corle. Bennett was certainly bringing 'Coals to Newcastle' in conveying Cycas to this Island. That plant at Bagatelle, if it exists, ought to be the same as our Central Province one, I should think." Ferguson's letters to Thwaites are unfortunately not available. The Bennett referred to was J. W. Bennett, who published "A Treatise on the Coconut Tree," "A selection of rare and curious Fruits indigenous to Ceylon," and "Ceylon and its Capabilities." In the last-named work, p. 96, Bennett stated that he had brought two plants of *Cycas circinalis* from the Government Garden, Mauritius, to Ceylon in 1821, one of which was planted at Bagatelle, near Colombo, while the other "was transferred by the late Honourable the Chief Justice, Sir Hardinge Giffard, to the Royal Botanic Garden at Peradeniya, near Kandy, where it flourished as well as in its natural soil." It would appear from this that the introduction of *Cycas Rumphii* cannot be attributed to Bennett, unless he was mistaken with regard to his species. But it is of interest to note that Rock House, where Ferguson obtained male *C. Rumphii*, was once the residence of Sir Hardinge Giffard. Bennett's statement about the plant transferred to Peradeniya is perhaps only another instance of his characteristic "optimism."—Ed.]

So far then all search has been without any positive result. Further, I did not even find male cones of any of the Cycads in the neighbourhood of Colombo. The fate of the prosperous young ovules that start life in this district is then settled by a rigid law; they lack a stimulus to further growth, and naturally shrivel in course of time, decay, and fall to the ground. A great number of these ovules have been examined at different intervals; not one showed the presence of pollen grains. Frequently, however, they contained spores of fungi, which at a later stage produced a mycelium and caused the decay of the tissues. But, as will be explained later on, the growth of the fungus is consequent upon the lack of vitality in non-pollinated ovules, and not the cause that checks their growth.

However, the growth of ovules of *C. Rumphii* to the full size of mature seeds at Peradeniya and other localities, but without ever producing an embryo, offered a more tempting problem, and one that was likely to yield more interesting results. It could not be a mere question of climatic conditions; for, although Peradeniya is situated at a higher altitude (some 1,600 feet), Matara, for instance, is on the same level as Colombo, and, like the latter place, in the vicinity of the sea. We must therefore look for some more important physiological factor. Now, at Peradeniya, male cones of Encephalartos or Macrozamia are to be found at practically any season of the year; while quite recently I came across a male cone of *C. circinalis* in the same locality. I was also fortunate enough in finding lately at Henaratgoda a gigantic cone of *C. circinalis* 2 feet 8½ inches high; and I also met with a similar male cone while visiting Matara. It must be noted that the rarity of male cones in the two last localities corresponds with the spasmodic occurrence of fully grown-up ovules in the same places; at Peradeniya, on the other hand, the abundance of the same ovules may be accounted for by the constant supply of male cones of Encephalartos and Macrozamia.

Experiments were then carried out in order to obtain more positive and more definite information. Young megasporophylls at Peradeniya were screened off against pollen grains by means of muslin bags applied before the ovules were ripe for pollination or were exposed to the action of the wind or of visiting insects. But any one who has tried the use of muslin bags in open places knows the practical difficulty of this type of experiment. Only one bag remained *in situ*. This single case was successful as far as it goes; all the ovules, six in number, on the screened megasporophyll were found shrivelled two months later, although the sporophyll itself was still healthy. Further attempts are again being made on the same line, as well as experiments on artificial pollination. But we shall have to wait some time before finding out the effect of these tactics.

On the other hand, the examination of full-grown ovules of *C. Rumphii*, obtained from Peradeniya, has yielded conclusive results. Pollen grains belonging either to Encephalartos or Macrozamia were found in the pollen chamber of these ovules; they had germinated within the pollen chamber and penetrated the nucellus, and had no doubt given the necessary stimulus for the full growth of the ovule, although in no case had fertilization in the strict sense taken place. We have here then a case of foreign pollination culminating in the production of a male gametophyte, which by penetrating the nucellus has given an impetus to the growth of the ovule, but which, because foreign, belonging to a different genus, was incapable of fertilizing the ovum and of producing an embryo; that is to say, of producing a seed in the strict meaning of the word. This statement will receive justification from the description and explanation of the figures on Plate XIII.

Fig. 1 shows a sketch of a megasporophyll of *C. Rumphii* considerably reduced in size. The sporophyll itself is about 30 cm. long, and is narrower than that of *C. circinalis*. The serrate indentations represent pinnæ, and suggest a reduced foliage leaf; the tip is entire, subulate, and some 6 cm. in length. The two healthy ovules (*ov.*) are about two months old;

the two shrivelled ones are in a state of decay. In this young stage the ovules are subglobose, but later on they become oval and somewhat elongated at the base (Fig. 3). The micropyle (*mp.*) is situated in a notch. The sporophylls form at first a cone-like dense cluster, but soon begin to spread out in a horizontal position. At this stage a drop of mucilage may be seen on the micropyle. The sticky mucilage collects pollen grains, particles of dust, spores of fungi that float in the air, are carried about by the wind, and happen to come into contact with the micropyle. Some time later the drop of mucilage, together with its load, is sucked in through the micropyle, which becomes hermetically closed, and ends in a pointed, dry, and sharp tip.

In Fig. 2 is drawn a somewhat diagrammatic sketch of a pollen grain of Macrozamia as seen just before it is shed out of the pollen sac. It has already undergone partial germination through a double nuclear division and wall partition. *V.* is the vegetative cell, often called the prothallus cell, *g.* the generative cell, *t.c.* the tube cell.

Fig. 3 is a longitudinal section of a fully grown ovule of *C. Rumphii.* It is oval, but not quite regular in shape. Such an ovule is much larger than those of *C. circinalis,* and reaches some 6 or 7 cm. along its main axis.

The integument is single, but consists of three distinctive layers : an outer fleshy layer (*o.l.*), a hard stony layer (*st.l.*), and an inner fleshy layer (*i.l.*), which is permeated by numerous vascular bundles not shown in the diagram. The inner fleshy layer is far from being uniform in thickness, being remarkably broad and spongy at the base of the ovule. This feature is characteristic of *C. Rumphii,* as contrasted with *C. circinalis.* In the latter the inner fleshy layer is of a more or less uniform thickness, allowing the endosperm to expand freely into the shape of an egg, while the endosperm (*end.*) of *C. Rumphii* remains spherical, but somewhat flattened at the base. In this respect Fig. 127 in Coulter and Chamberlain (after Miss Stopes) is misleading (1). The diagram does not represent a section of *C. circinalis,* neither as a young stage nor as a nearly mature seed, but agrees well with a grown-up ovule of *C. Rumphii,* as may be seen by referring to Fig. 3, which I have drawn from nature with the help of a camera lucida. The nucellus (*nuc.*) is attached to the inner fleshy layer along the greatest part of its course, and is reduced to a film, except at the apex, where it bulges out into a pointed cushion enclosing the characteristic pollen chamber (*p.c.*). The endosperm (*end.*), at first soft and jelly-like, becomes harder when older, and contains a great abundance of starch grains. It bears five or six archegonia (*a*), with their necks projecting into a depression situated just below the pollen chamber and called the archegonial chamber.

In Fig. 4 we have a magnified view of a pollen chamber (*p.c.*) formed as a cavity at the pointed end of the nucellus (*nuc.*). Particles of dust and spores of fungi frequently met with inside the pollen chamber have been purposely omitted in the sketch. It may be noted that these spores do not generally germinate inside a healthy ovule. It is only in the case of ovules that are not pollinated that the fungus thrives vigorously and causes decay, or perhaps also in a fully grown ovule whose vitality has become impaired. On rare occasions pollen grains other than of Cycads have been found ; this is what would be expected, and has also been independently worked out recently by Mr. Birbal Sahni (4) and by Prof. F. W. Oliver (3). These pollen grains make no attempt to germinate, and have no more effect on the ovules of *C. Rumphii* than an ordinary foreign body such as a particle of dust.

Far different is the behaviour and effect of pollen grains belonging to other species, or even other genera, of Cycads. The pollination of *C. Rumphii* that took place at Henaratgoda Gardens must be attributed to *C. circinalis ;* for no other male Cycads are to be seen in the neighbourhood. But most of the material used has been gathered from Peradeniya Gardens, where no male cone of the genus Cycas has been observed by me until quite recently. On the other hand, as already stated, male cones of Encephalartos and Macrozamia are frequent and abundant. The specimens sketched on Plate XIII. are all from Peradeniya.

Fig. 4 is a typical sample of the findings inside a growing healthy ovule of *C. Rumphii* some four months old. There is an ungerminated pollen grain (*p.g.*) stuck in a mass of mucilage (*muc.*). This pollen grain is an abortive one, and has lost its contents. On the left side of the pollen chamber are four male gametophytes (*m.g.*) that have grown normally and produced a pollen tube that has penetrated the nucellus. There is no definite orientation in the direction followed by the pollen tubes, except that they never seem to push their way through the base towards the archegonial chamber. This may be due to the fact that Cycas itself is not fertilized by means of a pollen tube, but by swimming ciliated gametes which pass through the broken base of the nucellar cap into the archegonial chamber. The stimulus directing the germinating pollen grain is then more or less lateral; and the pollen tube growing into the nucellus acts then chiefly as an absorbing organ; and this holds good even when the genus Cycas is pollinated either by Encephalartos or Macrozamia.

Fig. 5 represents a detailed view of a fairly advanced condition of a male gametophyte. The ovule under examination was about four months old, judging from its size. The diagram explains itself: *v.c.* is the vegetative cell, *st.c.* the stalk cell, *p.t.* the pollen tube; *m.c.* is the mother cell, also called the body cell, and contains a large nucleus which will give rise to two male gametes; the two blepharoplasts (*bl.*) have already taken their definite orientation prior to the formation of the two male gametes. One feature of the male gametophyte is the great thickness of its outer cell-wall. From lack of sufficient literature ready at hand it is difficult to determine from the structure itself the genus to which the male gametophyte belongs. But it is clear enough it does not belong to the genus Cycas, and from personal observation and frequent visits to Peradeniya Gardens, I must refer this gametophyte either to the genus Encephalartos or to the genus Macrozamia.

It is the writer's hope to proceed further in his investigations and to establish more definitely some minor points that are still hypothetical. Meanwhile we may sum up the results obtained.

Summary.

1. While female plants of *Cycas Rumphii* are very abundant in Ceylon, no male plant has been observed of late years.

2. The dispersal of this species of Cycas in Ceylon takes place by means of offshoots, and no true seeds can be obtained.

3. In the districts where no male plant of any Cycad can be found, the ovules of *C. Rumphii* thrive only for a short time, shrivel, decay, and fall off.

4. But in localities where male cones even of different genera occur, the ovules of *C. Rumphii* attain the size of a fully mature seed; but they contain no embryo, and consequently do not germinate.

5. On investigation it is found that foreign pollen grains belonging to Encephalartos or Macrozamia not only have pollinated *C. Rumphii*, but have produced male gametophytes.

6. The full growth of the ovules of *C. Rumphii* must be attributed to the stimulus exercised by these foreign male gametophytes. No true fertilization, however, has been observed, or is likely to have taken place.

7. Some minor points, such as the effect of spores of fungi received inside the pollen chamber, have also been discussed.

It is the writer's pleasant duty and wish to thank Mr. Petch and all the authorities at Peradeniya for having kindly granted him every help and facility for carrying out these investigations.

Literature cited.

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Explanation of Plate XIII.

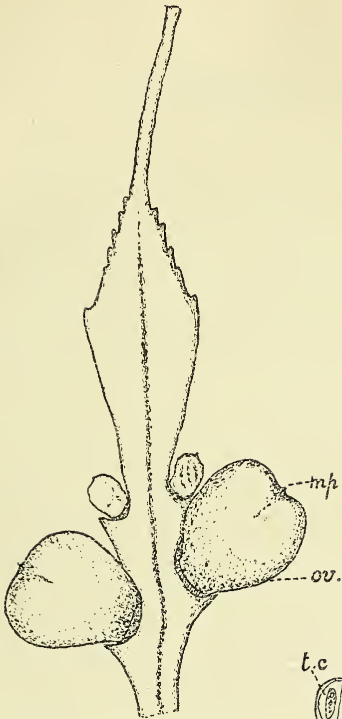
Fig. 1.—Megasporophyll of *Cycas Rumphii* considerably reduced in size; *ov.* a healthy ovule, *mp.* micropyle.

Fig. 2.—Pollen grain of Macrozamia; *v.* vegetative cell, *g.* generative cell, *t.c.* tube cell.

Fig. 3.—Fully grown ovule of *C. Rumphii; o.l.* outer fleshy layer, *st.l.* stony layer, *i.l.* inner fleshy layer, *nuc.* nucellus, *p.c.* pollen chamber, *a* archegonium, *end.* endosperm.

Fig. 4.—A pollen chamber; *muc.* mucilage, *p.g.* pollen grain, *m.g.* male gametophyte.

Fig. 5.—A male gametophyte; *v.c.* vegetative cell, *st.c.* stalk cell, *bl.* blepharoplast, *m.c.* mother cell, *p.t.* pollen tube.



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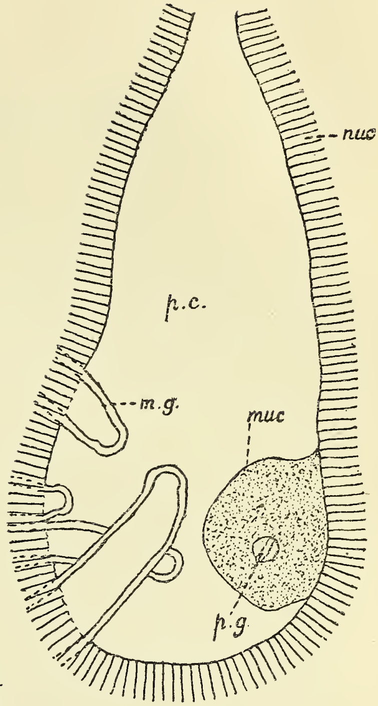

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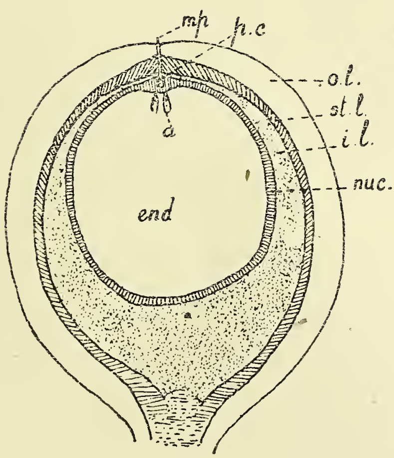

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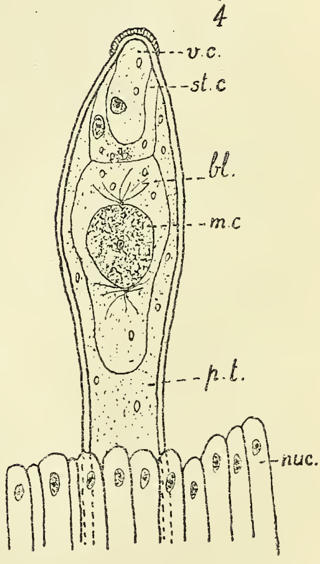

5

CYCAS RUMPHII.

(*Drawn by* M. J. *le Goc.*)

Additions to Ceylon Fungi.

BY

T. PETCH, B.A., B.Sc.

THE fungi enumerated in the following list have been collected in Ceylon during recent years. Some of them have been recorded previously in various journals and reports, and are included here for convenience of reference.

Hymenomycetæ.

Agaricaceæ.

Lepiota viridiflava n. sp.

Pileus almost plane, obtusely umbonate, up to 2·5 cm. diameter, dark green in the centre, elsewhere greenish-yellow or sulphur-yellow, with thin dark green patches and minute green points, which are slightly viscid when moist and shining when dry; margin strongly appendiculate, not striate. Flesh yellow, rather thick, turning green when cut. Stalk 2·5–3 cm. high, 3 mm. diameter in the middle, attenuated upwards, base curved and slightly inflated, greenish-yellow or sulphur-yellow, fibrillose, with dark green striæ towards the base, hollow, lined with white fibres, flesh yellow. Gills greenish-yellow or sulphur-yellow, free, crowded, rounded behind, equal or ventricose, turning green when bruised. Spores pale yellow, broadly oval, somewhat tapering towards one end, 5–8 × 3–4 μ.

On the ground in flower beds, Peradeniya, July–November, 1909.

Pileo fere plano, obtuse umbonato, ad 2·5 cm. diam., centro fusco-viridi, alibi viridi-flavo vel sulphureo, punctis minutis viridibus et squamulis tenuibus fusco-viridibus ornatis, margine valde appendiculato, estriato. Carne flava, crassiuscula, secto viridescenti. Stipite, 2·5–3 cm. alt., medio 3 mm. diam., sursum attenuato, basi curvato et leniter inflato, viridi-flavo vel sulphureo, fibrilloso, ad basim striis fusco-viridibus, cavo, carne flava. Lamellis viridiflavis vel sulphureis, liberis, confertis, posteriore rotundatis, æqualibus vel ventricosis, fracto viridescentibus. Sporis pallide flavis late ovalibus, uno apice attenuatis, 5–8 × 3–4 μ.

Tricholoma spongiosum n. sp.

Pileus 15 cm. diameter, almost plane, slightly umbonate, undulating, with a cuticle of radiating innate black-brown fibrils, blackening here and there, split in the centre into minute areolæ. Flesh white, thin, spongy. Stalk 6 cm. high, attenuated upwards, 2·5 cm. diameter below, 1·75 cm. diameter above, slightly rooting, blackish-brown or livid brown below, becoming paler above, sprinkled with minute brown points, solid, white, and spongy internally. Gills white, distant, broad (2 cm.), slightly attenuated outwards, sinuate, with a decurrent tooth, strongly ridged and veined above, edge irregular. Spores white, broadly oval, 5–7 × 3–5 μ.

Hakgala, April, 1912 ; No. 3535 in Herb. Peradeniya.

Pileo 15 cm. diam., fere plano, sub-umbonato, undulato, fibrillis innatis, nigrobrunneis radiantibus ornato, hic illic nigrescente, centro minute areolato. Carne alba, spongiosa. Stipite 6 cm. alt., sursum attenuato, basi 2·5 cm. diam., supra 1·75 cm. diam., subradicante, nigrobrunneo, sursum pallescenti, minutis brunneis punctis sparso, solido, intus albo, spongioso. Lamellis albis, remotis, latis (2 cm.), exteriore subattenuatis, sinuato-decurrentibus, valde venosis, acie irregulari. Sporis albis, late ovalibus, 5–7 × 3–5 μ.

Clitocybe nigra n. sp.

Pileus at first conico-campanulate, margin incurved ; then expanded, plane or repand, undulating, up to 7 cm. diameter. Young specimens black, minutely tomentose ; full-grown specimens black or black-brown in the centre, sordid brown, mottled with black streaks and patches, elsewhere, sometimes grayish-brown towards the margin, minutely sprinkled with blackish particles. Flesh white, thick over the stalk. Stalk white, blackening when handled, becoming gray when old, sometimes strongly ridged longitudinally, scurfy, solid, up to 9 cm long, 1 cm. diameter. Gills white, broad, rather distant, adnato decurrent or decurrent, the united gills sometimes splitting from the stalk, interstices strongly veined, arcuate, or slightly ventricose ; edge fibrillose, sometimes coloured, bearing minute conical fascicles of hyphæ. Spores white, broadly oval, 9–12 × 7–8 μ.

In bamboo clumps, Peradeniya, November, 1914 ; No. 4242 in Herb. Peradeniya ; stains the fingers red when handled.

Pileo primo conico-campanulato, margine incurvo, dein expanso, plano vel repando, undulato, ad 7 cm. diam., primo nigro, minute tomentoso, dein centro nigro vel nigro-brunneo, alibi sordide brunneo, nigro-brunneo maculato, minute nigris particulis sparso ; carne alba, centro crassa. Stipite albo, ætate griseo, interdum valde longitudinaliter striato, furfuraceo, solido, ad 9 cm. alt., 1 cm. diam. Lamellis albis, latis, remotiusculis, decurrentibus vel adnato-decurrentibus, interstitiis valde venosis, arcuatis vel subventricosis, acie fibrilloso. Sporis albis, late ovalibus, 9–12 × 7–8 μ.

Collybia multicolor n. sp.

Pileus 2–2·5 cm. diameter, plane, centre slightly umbonate or depressed, tough, centre dark green, clothed with a dense pile of short green hairs, shining when viewed obliquely, reddish-purple towards the margin. Flesh purplish. Stalk curved, 2·5 cm. long, 3 mm. diameter in the middle, almost equal, or inflated above and below, cartilaginous, rusty or orange-red, becoming more vividly orange-red at the apex, minutely and densely tomentose, stuffed, yellow internally. Gills dull yellow, ventricose, sinuate behind, adnato-decurrent, united by veins. Spores white, narrow oval, 5–6 × 3 μ.

On dead wood, Hakgala ; No. 3053 in Herb. Peradeniya.

Pileo 2–2·5 cm. diam., plano, leniter umbonato vel depresso, lento, centro fusco-viridi, tomento erecto brevi viridi vestito, marginem versus rubro-purpureo, carne purpureo. Stipite curvato, 2·5 cm. long ; medio 3 mm. diam., fere æquali, vel sursum et deorsum inflato, cartilagineo, ferrugineo vel aurantiaco, apice saturatiori, minute dense tomentoso, farcto, intus flavo. Lamellis flavis, ventricosis, sinuatis, adnato-decurrentibus. Sporis albis, angusto-ovalibus –6 × 3 μ.

Collybia radicata Rehl.

Hakgala, September, 1914.

Mycena miniata n. sp.

Bright crimson ; pileus 5 mm. diameter, broadly conical, with a minute acute umbo ; gills white, distant, emarginate, adnate ; stalk white, then pinkish, glabrous, up to 4 cm. long, 0·4 mm. diameter, with a tuft of white hyphæ at the base.

On dead leaves, Hakgala, September, 1914 ; No. 4128 in Herb. Peradeniya.

Pileo vivide coccineo, ad 5 mm. diam., late conico, umbone minuto, acuto ; lamellis albis, remotis, emarginatis, adnatis ; stipite albo, rubescenti, glabro, ad 4 cm. long., 0·4 mm. diam., basi tomentoso.

Omphalia cylindraceo-campanulata (P. Henn.) v. Hohnel.

Pattipola, October, 1906 ; Hakgala, January, 1914.

Pleurotus reticulatus n. sp.

Pileus 6–12 cm. diameter, infundibuliform, outer half at first decurved, then almost wholly infundibuliform, yellow-brown in the centre, yellow or brownish-yellow elsewhere, blackening in the centre and becoming paler at the margin when old, glabrous, margin not striate. Total height, 6–9 cm. Flesh white over the gills, becoming yellow over the stalk. Stalk 3–3·5 cm. high, 1–1·4 cm. thick, equal, expanding into the pileus, expanding slightly at the base, golden yellow, reticulated with red-brown lines of innate fibrils, solid, slightly tomentose at the base, excentric, internally golden yellow or golden brown. Gills yellow, becoming pallid when old and turning green when drying, decurrent, continued down the stem in lines of four lengths which frequently anastomose, crowded, broad, arcuate, edge slightly irregular. Spores white, globose or broadly oval, 4·5–6 μ diameter.

On dead wood, Hakgala, April, 1912 ; No. 3536 in Herb. Peradeniya.

Pileo 6–12 cm. diam., infundibuliformi, centro flavo-brunneo, nigrescente, alibi flavo vel brunneoflavo, glabro, estriato ; toto fungo 6–9 cm. alt. Carne centro flava, exteriore alba. Stipite 3–3·5 cm. alt., 1–1·4 cm. diam., deorsum subincrassato, aureo, fibrillis rubrobrunneis innatis reticulato, solido, basi subtomentoso, excentrico, intus aureo vel aureobrunneo. Lamellis flavis, ætate pallescentibus, sicco viridiscentibus, decurrentibus, in stipite anastomosantibus, confertis, latis, arcuatis, acie subirregulari. Spores albis, globosis vel late ovalibus, 4·5–6 μ diam.

Hygrophorus rufus n. sp.

Pileus up to 3 cm. diameter, almost plane, repand, undulating, deep red-brown, mottled with yellowish-brown, minutely scurfy, especially in the centre. Stalk up to 3·5 cm. high, 4 mm. diameter, flexuose, paler than the pileus, slightly fibrillose. Gills moderately distant, colour of the pileus or slightly paler (terracotta), adnato-decurrent, rather narrow, attenuated outwards. Spores white, broadly oval, 5–6 × 4 μ.

On the ground among grass, Peradeniya ; specimen and painting, No. 4220 in Herb. Peradeniya.

Pileo ad 3 cm. diam., fere plano, repando, undulato, saturo rubro-brunneo, flavo-brunneo maculato, minute furfuraceo. Stipite ad 3·5 cm. alt., 4 mm. diam., flexuoso, pileo pallidiore, parum fibrilloso. Lamellis subremotis, pileo unicoloribus vel pallidioribus, adnato-decurrentibus, subangustis, exteriore attenuatis. Sporis albis, late ovalibus, 5–6 × 4 μ.

Cantharellus pellucidus n. sp.

Whole fungus white, translucent. Pileus up to 4 mm. diameter, almost plane, centre umbilicate, or broadly infundibuliform, membranous, faintly rugose, sulcate to the centre, margin crenate or fimbriate. Stalk up to 7 mm. high, attenuated upwards, 1 mm. diameter at the base, minutely tomentose. Gills about six in number, distant, narrow, rather thick, adnate, or slightly decurrent, scarcely evident when dry. Spores white, oval, inequilateral, 8–10 × 4–5 μ.

On the bark of living trees, Peradeniya, October, 1908 ; No. 2896 in Herb. Peradeniya.

Albus, pellucidus. Pileo ad 4 mm. diam., fere plano, umbilicato, vel late infundibuliformi, membranaceo, leniter rugoso, sulcato, margine crenato vel fimbriato. Stipite ad

7 mm. alt., sursum attenuato, basi 1 mm. diam., minute tomentoso. Lamellis circa sex, remotis, angustis, crassiusculis, adnatis vel subdecurrentibus, sicco inconspicuis. Sporis albis ovalibus, inequilateralibus, 8–10 × 4–5 μ.

Cantharellus furfuraceus n. sp.

Up to 1·5 cm. diameter, orbicular, almost plane, depressed behind, margin decurved, white, thin, minutely scurfy ; stalk lateral, short, up to 1·5 mm. diameter, clothed with spreading hairs ; gills adnate, distant, forked and anastomosing, up to 0·75 mm. high, edge thick.

On the ground among moss, Hakgala, April, 1915 ; No. 4639 in Herb. Peradeniya.

Pileo ad 1·5 cm. diam., orbiculari, fere plano, post depresso, albo, tenui, minute furfuraceo, margine decurvo ; stipite laterali, brevi, ad 1·5 mm. diam., setis patulis vestito ; lamellis adnatis, remotis, furcatis, anastomosantibus, ad 0·75 mm. alt., acie crassa.

Russula purpurea-nigra n. sp.

Whole fungus at first white, then blackish-gray, finally purple-black. Pileus up to 15 cm. diameter, infundibuliform, glabrous, with a viscid separable cuticle. Flesh thick, at first white, becoming black when cut. Stalk up to 6 cm. high, 2·5 cm. diameter, minutely pruinose, equal, solid. Gills crowded, narrow, attenuated outwards, adnate or adnato-decurrent. Spores white, globose, nodular, 5–7 μ diameter.

Among grass, often in rings, Peradeniya, October, 1914, &c. ; specimens and painting, No. 4175 in Herb. Peradeniya.

Primo alba, deinde fusco-grisea, postremo purpureo-nigra. Pileo ad 15 cm. diam., infundibuliformi, glabro, cute viscido, separabili ; carne crassa, alba, secto nigrescente. Stipite ad 6 cm. alt., 2·5 cm. crass., minute pruinoso, æquali, solido. Lamellis confertis, angustis, exteriore attenuatis, adnatis, vel adnato-decurrentibus. Sporis albis, globosis, nodulosis, 5–7 μ diameter.

Claudopus fusco-lamellatus n. sp.

Sessile, orbicular or flabelliform, up to 7 × 5 cm., cream coloured, smooth behind, sometimes slightly tomentose towards the margin ; margin incurved ; gills slightly fuscous, blackening in drying, narrow, crowded ; spores salmon-pink, oval, inequilateral, 4–5 × 2–3 μ.

On a decaying tree trunk, Hakgala, April, 1914 ; No. 4061 in Herb. Peradeniya.

Pileo sessili, orbiculari vel flabelliformi, ad 7 × 5 cm., cremicolori, post levi, ad marginem interdum subtomentoso ; margine incurvo ; lamellis subfuscis, sicco nigrescentibus, angustis, confertis ; sporis ovalibus, inequilateralibus, 4–5 × 2–3 μ.

Inocybe cutifracta n. sp.

Pileus almost plane, broadly and obtusely umbonate, up to 3 cm. diameter, sulcate up to the broad umbo, margin decurved ; umbo red-brown, smooth or slightly scabrous, elsewhere brownish-gray, shining, the cuticle split into radial fascicles of coarse, innate fibrils ; margin crenate ; flesh thin, brownish. Stalk up to 4 cm. high, 3 mm. diameter, equal or slightly attenuated upwards, solid, brittle, slightly bulbous at the base, white, clothed with scattered, white fibrils. Gills white, then fuscous, finally brown, somewhat ventricose, adnexed, rather distant, margin pallid. Spores pale brown in mass, pale yellow-brown when magnified, oval, smooth, 8–10 × 4–6 μ. Cystidia clavate or oblong-oval, up to 50 μ, pedicel short, 5–8 μ diameter, expanding suddenly into an oblong-oval, or more gradually into a clavate head, 12–18 μ diameter.

Peradeniya, October, 1914 ; No. 4176 in Herb. Peradeniya.

Pileo fere plano, late obtuse umbonato, ad 3 cm. diam., sulcato, margine decurvo, centro rubro-brunneo vel brunneo, levi vel subfurfuraceo, alibi brunneogriseo, nitente, cute in fasciculis radiantibus fracta, margine crenato ; carne tenui subbrunneo. Stipite ad 4 cm. alt., 3 mm. diam., æquali vel sursum leniter attenuato, solido, fragili, basi subbulboso, albo, fibrillis albis sparsis vestito. Lamellis albis, dein fuscis, tandem brunneis, subventricosis, adnexis, remotiusculis, margine pallido. Sporis pallide flavobrunneis, ovalibus, levibus, 8–10 × 4–6 μ. Cystidiis clavatis vel oblongo-ovalibus, ad 50 μ, stipite brevi, 5–8 μ diam., capite 12–18 μ diam.

Inocybe umbonata n. sp.

Pileus campanulate or conicocampanulate, 2–4 cm. diameter, 1–3 cm. high, with an abruptly acute, conical, pointed, or obtuse umbo, 2–3 mm. high, readily detachable. Umbo black, glabrous ; pileus elsewhere bay to yellow-brown, with minute black-brown scales round the umbo, and thin, narrow, fibrillose, dark-tipped scales elsewhere ; radially fibrillose and striato-sulcate almost to the centre. Flesh thin, white. Stalk 7–12·5 cm. high, 2–4 mm. diameter, dark brown, with a purplish tinge when moist, squamulose or fibrillose below, fibrillose above, at first with a rudimentary fibrillose ring, longitudinally striate, equal or attenuated upwards, stuffed, inflated at the base, brittle. Spores globose, 7–9 μ diameter, thickly covered with long, conical, diverging spines, 2–3 μ long, pale brown when magnified, brown in mass. Cystidia clavate or flask-shaped, 32–40 × 8–16 μ, with an irregular crystalloid cap.

Peradeniya, among grass, October, 1914 ; specimens and painting, Nos. 3499, 4173 in Herb. Peradeniya.

Pileo campanulato vel conico-campanulato, 2–4 cm. diam., 1–3 cm. alt., acute umbonato ; umbone nigro, glabro, conico, obtuso vel acuto, facile secernibili, 2–3 mm. alt. ; pileo badio vel flavo-brunneo, centro squamulis minutis, fuscobrunneis, alibi squamulis tenuibus, fibrillosis, angustis, fusco-marginatis ornato, radiatim fibrilloso, striato-sulcato. Carne tenui, alba. Stipite 7–12 cm. alt., 2–4 mm. diam., fusco-brunneo, udo subpurpureo, deorsum fibrilloso vel squamuloso, sursum fibrilloso, primo annulo fibrilloso, longitudinaliter striato, æquali vel sursum attenuato, farcto, basi inflato, fragili. Sporis globosis, 7–9 μ diam., spinis conicis, divergentibus, 2–3 μ long., dense echinulatis, pallide brunneis. Cystidiis clavatis vel ampullaceis, 32–40 × 8–16 μ, capitulo crystalloideo irregulari.

Paxillus lateritius n. sp.

Pileus light red to brick-red, becoming ochraceous when old, almost plane, centre depressed, margin inrolled at first, narrowly decurved when fully expanded, up to 6 cm. diameter, minutely tomentose. Flesh white. Stalk up to 5 cm. high, 1 cm. diameter, solid, equal, expanding into the pileus, yellowish-red, covered with minute red points. Gills decurrent, arcuate, narrow, rather thick, cream coloured. Spores oval, somewhat inequilateral, with a prominent apiculus, minutely verrucose, pale ochraceous in mass, pale yellow when magnified, 8–9 × 6–7 μ. All parts turn purple-brown when bruised, the flesh tinged purple when cut.

Peradeniya, November, 1914; specimen and painting, No. 4230 in Herb. Peradeniya.

Pileo pallide-rubro vel lateritio, ætate ochraceo, fere plano, centro depresso, margine primo involuto, expanso anguste decurvo, ad 6 cm. diam., minute tomentoso. Carne alba. Stipite ad 5 cm. alt., 1 cm. diam., solido, æquali, flavo-rubro, punctis rubris minutis sparso. Lamellis decurrentibus, arcuatis, angustis, crassiusculis, cremicoloribus. Sporis ovalibus, apiculo prominente, minute verrucosis, pallide flavis, coacervatis pallide ochraceis, 8–9 × 6–7 μ.

Psathyra trechispora n. sp.

Pileus at first conical, then broadly hemispherical or convex, up to 7 cm. diameter, smooth and red-brown at first, becoming lacunose, dull brown, with a yellowish-brown centre and a paler margin when moist, or pale yellow-brown to ashy, with a darker brown centre when drier; hygrophanous; flesh thin, pallid. Stalk up to 9 cm. long, 8 mm. diameter, brownish-white or pallid, shining, longitudinally striate, twisted, hollow, equal or slightly attenuated upwards, slightly inflated at the base. Gills narrow (3 mm.), very crowded, attenuated outwards, the longer adnate with a decurrent line, intermediate gills free, but close to the stem, pallid, slowly becoming pale purple-brown. Cystidia not found. Spores purple-brown, broadly oval, 6–7 × 5 μ, or globose, 5 μ, thick-walled, verrucose.

On the ground, round decaying stumps, in troops along the lines of the lateral roots, Peradeniya; No. 4919 in Herb. Peradeniya, October, 1916. A frequent species, but not identified among the species described by Berkeley and Broome. As the gills remain pallid for a long time, it may have been included by them among the Leucosporæ; *e.g.*, in some details it resembles *Collybia rufipicta* B. & Br.

Pileo primo conico, deinde late hemisphærico vel convexo, ad 7 cm. diam.; primo levi, rufo, dein lacunoso, udo brunneo, centro flavo-brunneo, margine pallidiore, sicco pallide flavo-brunneo vel cinereo, centro fusco brunneo; hygrophano; carne tenui, pallida. Stipite ad 9 cm. alt., 8 mm. diam., brunneo-albo vel pallido, nitente, longitudinaliter striato, torto, cavo, æquali vel leniter sursum attenuato. Lamellis angustis, confertissimis, exteriore attenuatis, longioribus adnatis linea decurrente, intermediis liberis, approximatis, pallidis, tarde pallide purpureo-brunneis. Sporis purpureo-brunneis, late ovalibus, 6–7 × 5 μ, vel globosis 5 μ, episporio crasso, verrucoso.

Polyporaceæ.

Boletus luteus Linn.

Hakgala, December, 1905; common.

Poria rubrochorda n. sp.

Mycelium forming orange-red strands up to 1 mm. diameter, or spreading in sheets over dead twigs, leaves, &c., producing here and there small patches of hymenium; thin, indeterminate, orange-red, margin narrow and tomentose; pores angular, about 0·1 mm. diameter.

Peradeniya, November, 1914, at the base of clumps of *Dendrocalamus giganteus* Munro; No. 4263 in Herb. Peradeniya.

Mycelio rhizomorphoideo, rubro, ad 1 mm. diam., vel byssoideo; hymenio sparso, parvo, tenui, effuso, rubro, margine tomentoso, angusto; poris angulatis, ad 0·1 mm. diam.

Merulius polychromus n. sp.

Centre green, olive-green, or olive-brown with a glaucous bloom, surrounded by a yellow-green zone and broad outer yellow zone; extreme margin white and floccose. Yellow or brown when old. Substance white, thin. Surface even. Spores dark olive in mass, pale yellow-brown by transmitted light, oval, smooth, 8–10 × 5–6 μ.

On newly-built mud and wattle walls, Hakgala, May, 1913; No. 3769 in Herb. Peradeniya. When the wall is plastered and limewashed, the fungus produces only a thin white patch, and brown strands spreading over the surface.

Centro viridi, olivaceo-viridi, vel olivaceo-brunneo, glauco, zonis flavo-viridi et flavo cincto ; margine albo, floccoso. Ætate flavo vel brunneo. Contextu albo, tenüi ; superficei æquali. Sporis ovalibus, levibus, pallide flavo-brunneis, coacervatis fusco-brunneis, 8–10 × 5–6 μ.

Thelephoraceæ.

Thelephora terrestris Ehrh.

Common at Hakgala in one locality, perhaps introduced, December, 1905, &c.

Skepperia zeylanica n. sp.

Stalked, orbicular, auricular, or spathulate, up to 5 mm. high and broad. Margin at first strongly incurved, so that the pileus appears infundibuliform but split down one side ; finally plane or reflexed, white, waxy, translucent, brown when old. Stalk 0·5–3 mm. high, 0·3 mm. diameter, yellow-brown, translucent, blackening when old, sometimes slightly fibrillose at the base. Stalk and pileus covered with hyaline cystidia, consisting of a fusoid or cylindrical stalk, 50 μ long, 4–6 μ diameter, with a globose, slightly flattened head up to 10 μ diameter, stalk and head rough with minute conical warts. Basidia clavate, four-spored, 40 × 7 μ. Spores oval, inequilateral, 7–10 × .4–5 μ. On decaying fronds of *Oncosperma*, Peradeniya, July, 1909 ; No. 2894 in Herb. Peradeniya.

Stipitata, orbicularis, auricularis, vel spathulata, ad 5 mm. alt. et lat. ; margine primo valde involuto, dein pileo plano vel reflexo, albo, ceraceo, pellucido, ætate brunneo : stipite 0·5–3 mm. alt., 0·3 mm. diam., flavo-brunneo, pellucido, ætate nigrescenti, interdum basi fibrilloso ; toto fungillo cystidiis hyalinis induto ; cystidiis stipite fusoideo vel cylindraceo, 50 μ long., 4–6 μ diam., capite globoso, subapplanato, ad 10 μ diam., verrucis minutis conicis asperis ; basidiis clavatis, 4-sporis, 40 × 7 μ ; sporis ovalibus, inæquilateralibus, 7–10 × 4·5 μ.

Exobasidium indicum Syd. & Butl.

On *Symplocos* sp., Hakgala, May, 1912.

Clavariaceæ.

Clavaria Zippellii Lev.

Hakgala, September, 1908, &c.; Peradeniya, November, 1912.

Physalacria villosa n. sp.

White; head globose, up to 0·4 mm. diameter; stalk up to 0·7 mm. high, 0·1 mm. diameter below, tapering to 40 μ above, twisted above, fibrous, rough, with minute crystals, covered with rigid, horizontal, conical or flask-shaped cystidia, up to 30 μ high, 8 μ diameter at the base, tapering from the middle upwards, thick-walled, slightly rough, apex usually truncate, sometimes subcapitate; basidia four-spored. On dead leaves, Hakgala; No. 4391 in Herb. Peradeniya.

Albus; capite globoso, ad 0·4 mm. diam.; stipite ad 0·7 mm. alt., basi 0·1 mm. diam., sursum ad 40 μ attenuato, apice torto, fibroso, aspero, cystidiis rigidis, patulis, conicis vel ampullaceis, ad 30 μ alt., basi 8 μ diam., sursum e medio attenuatis, pariete crasso, aspero, apice plerumque truncatis, interdum subcapitatis; basidiis 4-sporis.

Tremellaceæ.

Auricularia mesenterica Fries.

Gangaruwa, December, 1913.

Sebacina rufochracea von Höhnel in litt.

Gampola, November, 1909.

Gloiocephala zeylanica n. sp.

Pileus up to 2·5 mm. diameter, broadly convex, or plane, or infundibuliform, white, subtranslucent, membranous, not gelatinous; margin fringed with capitate cystidia, which are also scattered over the upper surface of the pileus; under surface even, or in large specimens plicate towards the stalk; stalk up to 7 mm. high, 0·12 mm. diameter, black, horny, covered with horizontal cystidia as on the pileus, and with minute, brown, rigid hairs, 8–20 × 4–6 μ. Cystidia up to 130 μ high, 16 μ diameter below, tapering to 12 μ above, thin-walled, head subglobose, 16 μ diameter, sometimes encrusted. Basidia clavate, about 20 × 8 μ, four-spored. On dead leaves, Hakgala, January, 1914, &c., common; No. 4374 in Herb. Peradeniya.

Pileo ad 2·5 mm. diam., late convexo vel plano vel infundibuliformi, albo, subpellucido, membranaceo, non gelatinoso, cystidiis capitatis, margine præcipue, ciliato, infra æquali vel exemplis majoribus ad stipitem plicato ; stipite ad 7 mm. alt., 0·12 mm. diam., nigro, corneo, cystidiis horizontalibus et setis rigidis brunneis 8–20 × 4–6 μ vestito ; basidiis clavatis, circa 20 × 8 μ, 4-sporis. Cystidiis ad 130 μ alt., basi 16 μ diam., supra 12 μ diam., attenuatis, pariete tenui, capite subgloboso, 16 μ diam., interdum incrustato.

GASTEROMYCETÆ.

Hymenogastraceæ.

Rhizopogon flavum n. sp.

Subglobose or ellipsoidal, scattered or fused in clusters, up to 3 cm. × 2 cm., sordid yellow, sparsely covered with brown mycelial strands. Peridium about 0·5 mm. thick, yellow internally ; septa thin. Internally blackish-brown, gleba yellow when mounted. Spores pale yellow, narrow-oval or cylindric, ends obtuse, 4–6 × 2–3 μ. Hakgala, January, 1914 ; No. 3936 in Herb. Peradeniya.

Subglobosum vel ellipsoideum, sparsum vel conglobatum, ad 3 cm. × 2 cm., sordide flavum; rhizomorphis brunneis sparsis vestitum ; peridio circa 0·5 mm. crass., intus flavo ; septis tenuibus ; gleba flava, per saturam nigro-brunnea ; sporis pallide flavis, angusto-ovalibus vel cylindricis, obtusis, 4–6 × 2·5–3 μ.

Hymenogaster zeylanicus n. sp.

Subglobose or depressed, up to 2 cm. diameter, brownish-yellow, rugose, internally reddish-brown (dry). Chambers small, irregularly polygonal towards the centre, tending to rectangular and tangentially elongated towards the periphery, up to 1 × 0·3 mm. Wall thin, about 25 μ thick when dry, dissepiments 10 μ thick (dry). No central columella. Basidia one-spored, sterigmata short (3 μ). Spores yellow-brown, verrucose, thick-walled, oval or bi-apiculate, 12–16 × 8–9 μ. Hakgala, May, 1913 ; No. 4603 in Herb. Peradeniya.

Subglobosus vel depressus, ad 2 cm. diam., brunneo-flavus, rugosus, intus (sicco) rubrobrunneus ; loculis parvis, centro irregulariter polygoniis, exteriorem versus quadrangulis et elongatis, ad 1 × 0·3 mm. ; peridio tenui, circa 25 μ crass. (sicco), dissepimentibus, 10 μ crass. ; columella nulla ; basidiis unisporis, sterigmatibus brevibus ; sporis flavobrunneis, verrucosis, episporio crasso, ovalibus vel biapiculatis, 12–16 × 8–9 μ.

Phallaceæ.

Mutinus bambusinus (Zoll.) Fischer.

Peradeniya, a single specimen, May 30, 1912 ; abundant. October 29–November 23, 1914.

10–16 cm. high, head 5–8 cm. long. Stalk usually attenuated below, pink above, becoming white below, outer walls of chambers perforated, passing with or without an abrupt change of diameter into the head. Head (gleba removed) regularly conical, rugose, crimson to dark red, inner walls of chambers perforated or almost wanting. Apex of head often destitute of gleba for a length of about 3 mm., laterally compressed, open or closed ; if open, the two lips of the orifice are closely applied to one another. Smell, vinous or fruity at a short distance, but fœtid when close.

USTILAGINACEÆ.

Sphacelotheca monilifera (Ell. & Ev.) Clinton.

In ovaries of *Andropogon contortus* L., Jaffna, November, 1916.

In the affected inflorescences, the awns are suppressed and the glumes are destitute of hairs, though the tubercles persist. There are specimens in the phanerogamic herbarium at Peradeniya collected at Jaffna by Trimen.

UREDINACEÆ.

Uromyces.

Uromyces Vestergreni Syd.

On *Bauhinia tomentosa* L., Sigiriya, August, 1912.

Uromyces Rumicis (Schum.) Wint.

On *Rumex obtusifolius* L., Hakgala, September 9, 1913. Uredo.

Uromyces decoratus Syd.

On *Crotalaria ferruginea* Grah., Bandarawela, August, 1916. Uredo on *Crotalaria albida* Heyne, Hakgala, April, 1915.

Uromyces Isachnes n. sp.

On *Isachne Kunthiana* W. & A., Hakgala, May, 1912.

Sori circular, hypophyllous, dark brown. Uredospores pyriform, oval, or subglobose, 18–24 × 16–18 μ, fuliginous brown, spinulose; teleutospores pyriform, 18 × 16 μ, dark brown, smooth, thick-walled, with a paler pedicel 16 μ long.

Puccinia.

Puccinia Polygoni-amphibii Pers.

On *Polygonum punctatum* Ham., Nuwara Eliya, September 9, 1913. Uredo.

Puccinia Eragrostidis n. sp.

On *Eragrostis nigra* Nees., Hakgala. Uredo, May, 1910. Teleutospores, September 9, 1913. Uredo recorded in Ann. Perad., V., p. 231, as *Uromyces Eragrostidis* Tracy.

Uredo sori linear, 0·25–0·5 mm. long, hypophyllous, reddish orange when fresh, pale brown when dry. Uredospores globose, pale brown or almost hyaline, contents orange, wall hyaline, echinulate, 14–22 μ diameter.

Teleutosori black, circular or oval, hypophyllous, 0·25 × 0·2 mm. Teleutospores oval or oblong-oval, yellow-brown with a darker apex; apex usually rounded and scarcely thickened; base usually rounded, sometimes slightly attenuated; slightly constricted at the septum, smooth, 20–32 × 15–17 μ; pedicel hyaline, obliquely inserted, equal or slightly tapering, 30–50 × 3–5 μ.

Puccinia purpurea Kalch. & Cke.

Uredo. On *Sorghum halepense* (Johnson grass), Gangaruwa, May 13, 1914.

Puccinia Vernoniæ-scariosæ n. sp.

On *Vernonia scariosa* Arn., Hakgala, March, 1914.

Uredo sori hypophyllous, scattered, circular, up to 0·2 mm. diameter; uredospores yellow-brown, spinulose, oval, 28–33 × 24–26 μ, or globose, 25 μ.

Teleutospores hyaline, irregularly clavate, apex rounded, upper cell wall usually thickened (up to 8 μ), constricted at the septum, pedicel short, 33–50 × 18–24 μ (without pedicel), germinating in the sorus. Triangular Diorchidium teleutospores present.

Puccinia Cynodontis Desm.

On *Cynodon Dactylon* Pers., Jaffna, November, 1916.

Phragmidium.

Phragmidium disciflorum (Tode) James.

On calyx of cultivated rose, Edinburgh estate, Nanu-oya, January, 1913. Cæoma stage; pustule 9 mm. diameter; spores 16–20 × 14–16 μ.

Ravenelia.

Ravenelia emblicæ H. & P. Syd.

On *Phyllanthus polyphyllus* Willd., Sigiriya, August, 1912.

Cronartium.

Cronartium Zizyphi Syd. & Butl.

On *Zizyphus œnoplia* Mill. Uredo, Peradeniya, January 11, 1914, &c.; Teleutospores, Peradeniya, February 14, 1915; March, 1915.

Coleosporium.

Coleosporium Erythrinæ n. sp.

On leaves of *Erythrina lithosperma* Bl., Gallebodde Estate, July 26, 1915.

Spots small, circular, gray, up to 5 mm. diameter. Sori minute, epiphyllous, scattered, black-brown, up to 0·2 mm. diameter. Teleutospores pale brown, cylindric, oval or subclavate, ends rounded, three-septate, slightly constricted at the septa, apex slightly thickened, 38–56 × 16–18 μ. Uredospores (few seen) globose, 17–20 μ, pale brown, minutely spinulose.

Diorchidium.

Diorchidium lævigatum Syd. & Butl.

On *Oplismenus compositus* Beauv., Hakgala, May, 1912.

Uredospores rather dark brown, strongly echinulate, ovoid, 22–28 × 16–19 μ, or globose, 20–21 μ.

Diorchidium orientale Syd. & Butl.

On *Panicum* sp., Peradeniya, February 21, 1913. On *Panicum trigonum* Retz., Peradeniya, January 11, 1914.

Diorchidium Polyalthiæ Syd.

On *Polyalthia longifolia* B. & Hk. f., Peradeniya, January 21, 1914.

Chrysomyxa.

Chrysomyxa Bombacis n. sp.

On leaves of *Bombax malabaricum* DC., Peradeniya, January, 1915.

Teleutosori hypophyllous, pulvinate, yellow, about 0·25 mm. diameter. Teleutospores eight-celled, up to 110 × 16 μ, cells cubical, about 14 × 16 μ, constricted at the septa, wall hyaline, contents yellow.

Æcidium.

Æcidium Breyniæ Syd.

On *Breynia patens* Hk. f., Peradeniya, December, 1914, &c.

Æcidium Serpiculæ n. sp.

On *Serpicula hirsuta* W. & A., Nuwara Eliya, April 28, 1915.

Æcidia 0·25 mm. diameter, hypophyllous, situated in minute prominences, surrounded by a black line. Pseudoperidium white, narrow, recurved; mass of spores orange. Pseudoperidial cells sub-hexagonal, 24–36 × 16–18 μ, verrucose, with warts and short ridges. Æcidiospores broadly oval or subglobose, 16–18 × 14–18 μ, wall hyaline, smooth.

Æcidium micranthum Syd.

On *Psychotria elongata* Hk. f., Hakgala, May, 1910. Recorded in Ann. Perad., V., p. 243, as *Æcidium iquitosense* P. Henn.

Æcidium Emiliæ comb. nov.

Æcidium Gynuræ Petch, Ann. Perad., V., p. 244. This species is on *Emilia sonchifolia* DC., not on *Gynura lycopersicifolia* DC., the host plant having been previously wrongly identified.

Æcidium Vernoniæ-cinereæ n. sp.

On *Vernonia cinerea* Less., Anuradhapura, July, 1915.

Æcidia hypophyllous, scattered, 0·15 mm. diameter, pseudoperidium tubular, well developed. Æcidiospores oval or globose, minutely warted, 14–16 × 8–12 μ. Pseudoperidial cells polygonal, closely verrucose, thick-walled, 20–32 × 16–24 μ.

Æcidium Vernoniæ-Hookerianæ n. sp.

On leaves of *Vernonia Hookeriana* Arn., Peradeniya, May, 1910. Recorded in Ann. Perad., V., p. 243, as *Æcidium Vernoniæ* P. Henn.

Spots pale yellow-green, often extending over the whole leaf. Æcidia usually hypophyllous, rarely one or two on the upper surface, scattered over the whole leaf, often densely crowded, 0·25–0·5 mm. diameter, pseudoperidium strongly developed, stout, recurved, white; mass of spores yellow. Æcidiospores ovoid, 18–21 × 13–15 μ, or globose, 16–21 μ diameter, wall hyaline, closely and minutely verrucose; contents yellow. Pseudoperidial cells pentagonal or quadrangular, 18–31 × 15–25 μ, verrucose, with large close-set warts and ridges; wall up to 4 μ thick.

Uredo.

Uredo Ophiorrhizæ n. sp.

On *Ophiorrhiza Mungos* L., Gangaruwa, December 25, 1913; January 18, 1914.

Sori pale orange, scattered, hypophyllous, about 0·2 mm. diameter, circular. Uredospores oval to subglobose, contents orange, wall hyaline, echinulate, 16–22 × 16 μ.

Uredo Momordicæ n. sp.

On *Momordica Charantia* L., Peradeniya, May 12, 1914.

Sori scattered, on either side of the leaf, dark brown, usually circular, up to 0·25 mm. diameter. Uredospores oval or globose, dark brown, echinulate, 30–34 × 24–28 μ.

Uredo Phyllanthi-longifolii n. sp.

On *Phyllanthus longifolius* Jacq., Peradeniya, August, 1912.

Sori hypophyllous, scattered or clustered, circular, 0·25 mm. diameter. Uredospores oval or pyriform, hyaline, verrucose, 20–28 × 13–16 μ. Paraphyses hyaline, clavate, apex curved or straight, rather thin-walled, up to 55 μ long, 6 μ diameter below, 12 μ above.

Uredo cristata Speg.

On *Sapindus bifoliatus* Hiern, Sigiriya, August, 1912.

Uredo Hyperici-mysorensis n. sp.

On *Hypericum mysorense* Heyne, Sita Eliya, April 22, 1915; Nuwara Eliya, April 28, 1915.

Spots purple-red. Sori amphigenous, clustered, orange, pulvinate, circular or elongated, up to 0·4 × 0·2 mm. Uredospores oval or globose, 18–26 × 16–18 μ, contents orange, wall almost hyaline, minutely echinulate. Paraphyses short, subclavate, or cylindric with a globose head, apex thickened, yellow-brown, 40–50 × 6–8 μ.

Uredo Vernoniicola n. sp.

On *Vernonia cinerea* Less., Peradeniya, December, 1908. On *Vernonia Wightiana* Arn., Hakgala, May, 1910. On *Vernonia setigera* Arn., Hakgala, April, 1915. Recorded in Ann. Perad., V., p. 232, as *Puccinia Lorentzii* P. Henn.?

Sori scattered, hypophyllous, ferruginous when fresh, pale brown when dry, circular, up to 0·4 mm. diameter. Uredospores globose, 20–24 μ diameter, or oval, 24–28 × 18–21 μ, spinulose, wall hyaline, contents orange.

Uredo Vernoniæ-Hookerianæ n. sp.

On *Vernonia Hookeriana* Arn., Peradeniya, June, 1910. Recorded in Ann. Perad., V., p. 231, as *Puccinia Vernoniæ* Cke.?

Sori minute, on red-brown spots when old, scattered, hypophyllous. Uredospores globose, 19–21 μ, or oval or pyriform, 20–24 × 16–20 μ, echinulate, pale brown or hyaline, rather thick-walled. Paraphyses clavate, septate, thick-walled, 36–50 × 12–16 μ.

Uredo Emiliæ-zeylanicæ n. sp.

On *Emilia zeylanica* Clarke, Hakgala, May, 1910.

Spots purple. Uredo sori pulvinate, pale brown, about 0·2 mm. diameter, in small groups on the under surface. Uredospores oval, 24–32 × 15–17 μ, pale brown, minutely spinulose, with short scattered spines. Paraphyses regularly clavate, pale brown, thin-walled, 40–50 μ long, 14 μ diameter above.

Uredo Desmodii-heterocarpi n. sp.

On *Desmodium heterocarpum* DC., Peradeniya, January 11, 1914.

Spots minute, angular, black, scattered, or confluent along the margin of the leaf. Uredo sori scattered, circular or slightly elongated, hypophyllous, ashy, about 0·1 mm. diameter. Uredospores pyriform, 18–20 × 14–16 μ, or globose, 16–18 μ, hyaline, echinulate.

Uredo Desmodii-triquetri n. sp.

On leaves of *Desmodium triquetrum* DC., Peradeniya, January 11, 1914.

Sori hypophyllous, circular, scattered, ashy. No evident spots on the lower surface of the leaf, but minute blackening spots on the upper. Uredospores oval or pyriform, 20–24 × 13–18 μ, or subglobose, 14–16 μ, hyaline, echinulate.

Uredo Desmodii-parvifolii n. sp.

On leaves of *Desmodium parvifolium* DC., Hakgala, May, 1912; April, 1914.

Sori hypophyllous, scattered, circular, 0·25 mm. diameter, or linear, up to 1 mm. × 0·3 mm., surrounded by the strongly upturned epidermis, dark brown. Uredospores rather dark brown, spinulose, globose, 16–19 μ diameter, wall 2 μ thick.

Uredo davaoensis Syd.

On *Cyanotis zeylanica* Hassk., Haputale, March, 1912; Hakgala, May, 1912.

Uredo Stereospermi Syd.

On *Stereospermum chelonioides* DC., Peradeniya, August, 1912.

Uredo Sopubiæ n. sp.

On *Sopubia trifida* Ham., Hakgala, May, 1912.

Sori oval, pulvinate, up to 0·2 mm. broad, covered by the epidermis, opening by an irregular pore, ferruginous on leaves and stems. Uredospores oval to subglobose, 12–24 × 12–16 μ, echinulate, contents yellow, wall almost hyaline.

Uredo Rubiæ Diet.

On *Rubia cordifolia* L., Nuwara Eliya, August 12, 1913.

Uredo Erythrinæ-ovalifoliæ Petch.

On *Erythrina velutina* Willd., Peradeniya, February 2, 1913.

Uredo Lipocarphæ Syd.

On *Lipocarpha argentea* Br., Peradeniya, May 23, 1915.

Uredo Andropogonis-zeylanici n. sp.

On *Andropogon zeylanicus* Nees., Hakgala, April, 1915.

Sori minute, orange, amphigenous, elongated, 0·5 × 0·2 mm., pulvinate. Uredospores ovoid or subglobose, contents orange, wall hyaline, echinulate, thick, 18–25 × 16–20 μ.

Uredo Panici-montani n. sp.

On *Panicum montanum* Roxb., Peradeniya, April, 1909, &c. Spots narrow, elongated, ferruginous. Sori minute, hypophyllous, oval, up to 0·2 mm. long. Uredospores pale brown, echinulate, pyriform or oval, 19–25 × 16–20 μ, or globose, 20 μ.

Uredo ignobilis Syd.

On *Sporobolus diander* Beauv., Peradeniya, May 19, 1912; on *Sporobolus indicus* Br., Peradeniya, January 15, 1914.

Uredo Paspali-longiflori n. sp.

On *Paspalum longiflorum* Retz., Hakgala, May, 1912.

Sori minute, on either side of the leaf, but chiefly on the upper, pulvinate; spots pale brown. Uredospores chiefly globose, 16–34 μ, some broadly oval, 22–27 × 20–25 μ; wall 2–3 μ thick, very minutely echinulate, hyaline to pale brown.

Uredo Paspali-Perrottetii n. sp.

On *Paspalum Perrottettii* Hk. f., Hakgala, May, 1912; April, 1915.

Sori minute, pulvinate, on either side of the leaf. Uredospores oval to subglobose, 19–24 × 14–21 μ or 16–18 μ, thick-walled, yellow-brown, minutely echinulate.

Uredo Cymbopogonis-polyneuri n. sp.

On *Cymbopogon polyneuros* Stapf., Gangaruwa, January 12, 1913; December 30, 1913.

Uredo sori linear, dark brown. Uredospores dark brown, rather thick-walled, echinulate, obovate or ellipsoid, 20–32 × 17–21 μ. Paraphyses short, capitate, almost hyaline, up to 40 μ long, head 16 μ diameter, apex thick-walled (up to 6 μ).

Uredo Kuhnii (Krüg.) Wakker & Went.

On *Saccharum spontaneum* L., Peradeniya, January 31, 1915.

Uromyces Isachnes n. sp.

Soris hypophyllis, rotundatis, obscure brunneis; uredosporis pyriformibus, ovalibus, vel subglobosis, fuligineo-brunneis, echinulatis, 18–24 × 16–18 μ; teleutosporis pyriformibus, 18–16 μ, obscure brunneis, levibus, episporio crasso, pedicello dilute brunneo, 16 μ long.

Puccinia Eragrostidis n. sp.

Soris uredosporiferis, linearibus, 0·25–0·5 mm. long., hypophyllis, udo rubro-aurantiaco, sicco pallide brunneo; uredosporis globosis, dilute brunneis vel fere hyalinis, plasmate aurantiaco, episporio hyalino, echinulatis, 14–22 μ diam.

Soris teleutosporiferis nigris, rotundatis vel ovalibus, hypophyllis, 0·25 × 0·2 mm. Teleutosporis ovalibus vel oblongo-ovalibus, flavo-brunneis, apice saturatiore, plerumque rotundato, vix incrassato, basi sæpius rotundato, interdum subattenuato, leniter constrictis, levibus, 20–32 × 15–17 μ; pedicello hyalino, oblique inserto, æquali vel subattenuato, 30–50 × 3–5 μ.

Puccinia Vernoniæ-scariosæ n. sp.

Soris uredosporiferis hypophyllis, sparsis, rotundatis, ad 0·2 mm. diam.; uredosporis flavo-brunneis, spinulosis, ovalibus, 28–33 × 24–26 μ, vel globosis, 25 μ.

Teleutosporis hyalinis, irregulariter clavatis, apice rotundatis, loculo superiori episporio plerumque incrassato (ad 8 μ), constrictis, 33–50 × 18–24 μ (sine pedicello), breviter pedicellatis.

Coleosporium Erythrinæ n. sp.

Maculis parvis, rotundatis, griseis, ad 5 mm. diam. Soris minutis, epiphyllis, sparsis, nigro-brunneis, ad 0·2 mm. diam. Teleutosporis dilute brunneis, cylindraceis, ovalibus, vel subclavatis, utrinque rotundatis, triseptatis, leniter constrictis, apice subincrassatis, 38–56 × 16–18 μ. Uredosporis globosis, dilute brunneis, minute spinulosis, 17–20 μ diam.

Chrysomyxa Bombacis n. sp.

Soris teleutosporiferis hypophyllis, pulvinatis, flavis, circa 0·25 mm. diam. Teleutosporis octo-locularibus, ad 110 × 16 μ, loculis cuboideis, circa 14 × 16 μ, constrictis, episporio hyalino, plasmate flavo.

Æcidium Serpiculæ n. sp.

Æcidiis 0·25 mm. diam., hypophyllis, linea nigra cinctis, verrucis minutis insitis; pseudoperidio albo, angusto, recurvo; sporis per saturam aurantiacis; cellulis peridiis sub-hexagonis, 24–38 × 16–18 μ, verrucis et lineis brevibus ornatis; æcidiosporis late ovalibus vel subglobosis, 16–18 × 14–18 μ, levibus, exosporio hyalino.

Æcidium Vernoniæ-Hookerianæ n. sp.

Maculis pallide flavo-viridibus, totum folium sæpe extensis ; æcidiis plerumque hypophyllis, sæpe dense confertis, 0·25–0·5 mm. diam. ; pseudoperidiis crassis, recurvis ; æcidiosporis ovoideis, 18–21 × 13–15 μ, vel globosis, 16–21 μ, dense et minute verrucosis, episporio hyalino : cellulis pseudoperidiis pentagonis vel quadrangulis, 18–31 × 15–25 μ, dense verrucosis, pariete crasso (4 μ).

Æcidium Vernoniæ-cinereæ n. sp.

Æcidiis hypophyllis, sparsis, 0·15 mm. diam., tubulosis ; æcidiosporis ovalibus vel globosis, minute verrucosis, 14–16 × 8–12 μ ; cellulis pseudoperidiis, polygonis, dense verrucosis, incrassatis, 20–32 × 16–24 μ.

Uredo Ophiorrhizæ n. sp.

Soris dilute aurantiacis, sparsis, hypophyllis, circa 0·2 mm diam., rotundatis ; uredosporis ovalibus vel subglobosis echinulatis, episporio hyalino, 16–22 × 16 μ.

Uredo Momordicæ n. sp.

Soris sparsis, amphigenis, obscure brunneis, plerumque rotundatis, ad 0·25 mm. diam. ; uredosporis ovalibus vel globosis, obscure brunneis, echinulatis, 30–34 × 24–32 μ.

Uredo Phyllanthi-longifolii n. sp.

Soris hypophyllis, sparsis vel congregatis, rotundatis, 0·25 mm. diam. ; uredosporis ovalibus vel pyriformibus, hyalinis, verrucosis, 20–28 × 13–16 μ ; paraphysibus hyalinis, clavatis, apice curvis vel rectis, pariete subtenui, ad 55 μ long., infra 6 μ diam., supra 12 μ.

Uredo Hyperici-mysorensis n. sp.

Maculis purpureo-rubris ; soris amphigenis, congregatis, aurantiacis, pulvinatis, rotundatis vel elongatis, ad 0·4 × 0·2 mm. ; uredosporis ovalibus vel globosis, minute echinulatis, episporio fere hyalino, 18–26 × 16–18 μ ; paraphysibus brevibus, subclavatis, vel capite globoso cylindraceis, apice incrassatis, 40–50 × 6–8 μ.

Uredo Vernoniicola n. sp.

Soris hypophyllis, sparsis, ferrugineis, sicco dilute brunneis, rotundatis, ad 0.4 mm. diam.; uredosporis globosis, 20–24 μ diam., vel ovalibus, 24–28 × 18–21 μ, echinulatis, episporio hyalino.

Uredo Vernoniæ-Hookerianæ n. sp.

Maculis rubro-brunneis; soris hypophyllis, minutis, sparsis; uredosporis globosis, 19–21 μ diam., vel ovalibus vel pyriformibus, 20–24 × 16–21 μ, echinulatis, dilute brunneis vel hyalinis, episporio crassiusculo; paraphysibus clavatis, septatis, pariete crasso, 36–50 × 12–16 μ.

Uredo Emiliæ-zeylanicæ n. sp.

Maculis purpureis; soris pulvinatis, hypophyllis, dilute brunneis, congregatis, circa 0·2 mm. diam.; uredosporis ovalibus, 24–32 × 15–17 μ, dilute brunneis, minute echinulatis; paraphysibus clavatis, dilute brunneis, pariete tenui, 40–50 μ long., apice 14 μ diam.

Uredo Desmodii-heterocarpi n. sp.

Maculis minutis, angulatis, nigris, sparsis, vel margine foliorum confluentibus; soris sparsis, rotundatis vel subelongatis, hypophyllis, cinereis, circa 0·1 mm. diam.; uredosporis pyriformibus, 18–20 × 14–16 μ, vel globosis, 16–18 μ, hyalinis, echinulatis.

Uredo Desmodii-triquetri n. sp.

Maculis epiphyllis, nigris, minutis, hypophyllis nullis; soris hypophyllis, rotundatis, sparsis, cinereis; uredosporis ovalibus vel pyriformibus, 20–24 × 13–18 μ. vel subglobosis, 14–16 μ, hyalinis, echinulatis.

Uredo Desmodii-parvifolii n. sp.

Soris hypophyllis, sparsis, rotundatis, 0·25 mm. diam., vel linearibus, ad 1 × 0·3 mm., epidermide rupta cinctis, obscure brunneis; uredosporis obscure brunneis, echinulatis, globosis, 16–19 μ, episporio 2 μ crass.

Uredo Sopubiæ n. sp.

Soris foliicolis vel caulicolis ovalibus, pulvinatis, ad 0·2 mm. diam., epidermide tectis, poro irregulari dehiscentibus, ferrugineis; uredosporis ovalibus vel subglobosis, 12–14 × 12–16 μ, echinulatis, episporio fere hyalino.

Uredo Andropogonis-zeylanici n. sp.

Soris minutis, amphigenis, aurantiacis, elongatis, ad 0·5 × 0·2 mm., pulvinatis; uredosporis ovalibus vel subglobosis, echinulatis, incrassatis, 18–25 × 16–20 μ, episporio hyalino.

Uredo Panici-montani n. sp.

Maculis angustis, elongatis, ferrugineis; soris minutis, hypophyllis, ovalibus, ad 0·2 mm. long.; uredosporis dilute brunneis, echinulatis, pyriformibus vel ovalibus, 19–25 × 16–20 μ, vel globosis, 20 μ.

Uredo Paspali-longiflori n. sp.

Maculis dilute brunneis; soris minutis, amphigenis, præcipue epiphyllis; uredosporis plerumque globosis, 16–34 μ diam., raro late ovalibus, 22–27 × 20–25 μ, minute echinulatis, hyalinis vel dilute brunneis, episporio 2–3 μ crass.

Uredo Paspali-Perrottetii n. sp.

Soris minutis, amphigenis, pulvinatis; uredosporis ovalibus vel subglobosis, incrassatis, flavo-brunneis, minute echinulatis, 19–24 × 14–21 μ, vel 16–18 μ diam.

Uredo Cymbopogonis-polyneuri n. sp.

Soris linearibus, obscure brunneis; uredosporis obscure brunneis, obovatis vel ellipsoideis, 20–32 × 17–21 μ, episporio crassiusculo; paraphysibus brevibus, capitatis, fere hyalinis, ad 40 μ long., capite 16 μ diam., apice incrassatis (ad 6 μ).

Phycomycetæ.

Cystopus candidus (Pers.) Lev.

On *Brassica juncea* Hk. f. & Thoms., Badulla, January 27, 1917.

Cystopus platensis Speg.

On *Boerhaavia diffusa* L., Kalodai, April, 1908.

Cystopus Ipomœæ-panduratæ (Schw.).

On *Argyreia populifolia* Chois., Gangaruwa, June, 1910; Kandy, June, 1910.

Cystopus Bliti (Biv.) De Bary.

On *Achyranthes aspera* L., Jaffna, November, 1916.

Plasmopara viticola.

On *Vitis vinifera* L., Bandarawela, January, 1915.

PYRENOMYCETÆ.

Perisporiaceæ.

Penicilliopsis clavariæformis Solms.

On fruits of *Diospyros embryopteris* Pers., Peradeniya, December, 1913.

Penicillium Petchii Sartory and Bainier, Ann. Myc., XI., p. 272.

On scrap rubber, in the laboratory, Peradeniya, May, 1912. The locality is erroneously stated to be South America in the original description.

Sphæriaceæ.

Fracchiæa depressa n. sp.

Perithecia scattered or in small groups, developing within the bark and splitting off the outer layers, subglobose, depressed, circular or oval in plan, or angled by mutual pressure, up to 0·8 mm. diameter, united, or surrounded, by a basal weft of brown hyphæ, black, minutely rugose, ostiolum not evident; wall cellular, up to 0·1 mm. thick, collapsing when dry. Asci clavate, with a thin pedicel, strongly inflated upwards, 70–90 × 10 μ, polysporous; no paraphyses. Spores hyaline, curved, cylindric, or slightly tapering to the obtuse ends, 8–12 × 2 μ.

On dead branches of *Hevea brasiliensis*, Hapugastenne, September, 1909; No. 2922 in Herb. Peradeniya.

Peritheciis sparsis vel congregatis, immersis dein subliberis, subglobosis, depressis, sicco collapsis, ad 0·8 mm. diam., nigris, minute rugosis, basi hyphis brunneis cinctis, ostiolo inconspicuo, pariete crasso. Ascis clavatis, stipite tenui, sursum valde inflatis, multisporis, 70–90 × 10 μ. Sporis hyalinis, cylindraceis, obtusis, curvatis, 8–12 × 2 μ.

Calosphæria pachydermata n. sp.

Perithecia up to 1 mm. diameter, carbonaceous, thick-walled (0·15 mm.), united in groups up to 5 mm. diameter, sometimes distichous, immersed in the cortex ; ostiola long, cylindric, equal, up to 2 mm. high, 0·1 mm. diameter, emerging in groups, mixed with barren stalks. Asci clavate, eight-spored, pedicel moderately long, 25 × 4–5 μ ; spores sub-cylindric, curved, greenish-hyaline, 4–5 × 1·5–2 μ.

On dead bark, Henaratgoda, August, 1916 ; No. 4993 in Herb. Peradeniya.

Peritheciis ad 1 mm. diam., carbonaceis, pariete crasso ad 0·15 mm., cortice immersis, in gregibus ad 5 mm. diam. confluentibus, interdum distichis ; ostiolis longis, cylindraceis, æqualibus, ad 2 mm. alt., 0·1 mm. diam., fasciculatim emergentibus, stipitibus sterilibus intermixtis ; ascis clavatis, octosporis, infra attenuatis, 25 × 4–5 μ ; sporis subcylindraceis, curvis, viridi-hyalinis, 4–5 × 1·5–2 μ.

Calosphæria sulcata n. sp.

Perithecia about 0·6 mm. diameter, globose, immersed, in small groups at the base of the cortex ; ostiola up to 1·2 mm. long, 0·1 mm. diam., thickened above, and bearing four vertical grooves, converging and emerging in clusters. Asci eight-spored, clavate, with a tapering pedicel, 28–36 μ, sporiferous part 18–22 × 6–8 μ ; paraphyses very long : spores cylindric, curved, greenish-hyaline, 6–7 × 1·5 μ.

On dead branches of *Hevea brasiliensis* Muell-Arg., Peradeniya, February, 1917 ; No. 4969 in Herb. Peradeniya.

Peritheciis circa 0·6 mm. diam., globosis, gregibus parvis basi corticis immersis ; ostiolis ad 1·2 mm. long., 0·1 mm. diam., supra incrassatis et sulcis quatuor ornatis, convergentibus, emergentibus ; ascis octosporis, infra attenuatis, 28–36 × 6–8 μ, parte sporifera, 18–22 μ ; paraphysibus longissimis ; sporis cylindraceis, curvis, viridi-hyalinis, 6–7 × 1·5 μ.

Myelosperma tumidum Syd.

On coconut midrib, Badalgama, January, 1912.

Læstadia Jasmini n. sp.

Spots circular, 3–4 mm. diameter, white, arid. Perithecia subepidermal, 0·1–0·2 mm. diameter, black. Asci clavate, eight-spored, spores biseriate, 54–56 × 8–9 μ. Spores oval or subcymbiform, ends obtuse, hyaline, continuous, 12–15 × 5–6 μ. On leaves of *Jasminum flexile* Vahl, Hakgala, September, 1913 ; No. 3828 in Herb. Peradeniya.

Maculis rotundatis, 3–4 mm. diam., albis, aridis, peritheciis subepidermalibus. 0·1–0·2 mm. diam., nigris ; ascis clavatis, octosporis, sporis biseriatis, 54–56 × 8–9 μ. Sporis ovalibus vel subcymbiformibus, obtusis, hyalinis, continuis, 12–15 × 5–6 μ.

Læstadia Theæ Rac.

On leaves of tea, Mattakele, June 11, 1905, &c. Generally distributed.

Glomerella Musarum n. sp.

Perithecia superficial or erumpent, black, 100–120 μ diameter, ovate, shortly rostrate, membranous ; asci clavate, 50–60 × 10 μ, eight-spored, spores uni- or bi-seriate ; no paraphyses ; spores hyaline, continuous, cymbiform, straight or curved, ends obtuse, 14–18 × 3·5–4 μ. On leaves of *Musa paradisiaca* L., attacked by *Glœosporium Musarum* Cke. & Mass., *Scolecotrichum Musæ* Zimm., &c., Panadure, June, 1916 ; No. 4805 in Herb. Peradeniya.

Peritheciis erumpentibus vel liberis, nigris, 100–120 μ diam., ovatis, breviter rostratis, membranaceis ; ascis clavatis, 50–60 × 10 μ, octosporis, sporis uni- vel bi-seriatis ; sporis hyalinis, continuis, cymbiformibus, rectis vel curvatis, obtusis, 14–18 × 3·5–4 μ.

Sordaria grisea Ces.

Hakgala, May, 1912.

Sphærella Heveæ n. sp.

Perithecia gregarious, subepidermal, slightly elevated, black, 60–70 μ diameter ; asci clavate, eight-spored, 30 × 6 μ ; no paraphyses ; spores subfusoid or narrow oval, ends rounded, one-septate, slightly constricted, upper cell the larger, 9–10 × 2·5 μ. On leaves of *Hevea brasiliensis* Muell-Arg., with effete acervuli of *Colletotrichum* sp. Spots at first minute, purple to purple-brown, somewhat thickened, afterwards forming dry irregular areas extending along the margin of the leaf, yellow-brown, becoming gray, with a purple-brown margin. Suduganga, October, 1916 ; No. 4922 in Herb. Peradeniya.

Peritheciis gregariis, subepidermalibus, subprominentibus, nigris, 60–70 μ diam. ; ascis clavatis, octosporis, 30 × 6 μ ; sporis subfusoideis vel angusto-ovalibus, obtusis, uniseptatis, leniter constrictis, 9–10 × 2·5 μ.

Sphærella Fragariæ Tul.

On cultivated strawberry, Nuwara Eliya, December, 1905.

Venturia emergens n. sp.

Perithecia scattered, or crowded and confluent at the base, developing in the bark, and cracking off the outer layers ; groups of perithecia appearing in the cracks, but never completely free ; 0·2 mm. diameter, flask-shaped, with spreading setæ on the upper half. Asci 40–50 × 8 μ, clavate, pedicel short, with a distinct foot, eight-spored, spores obliquely uniseriate ; paraphyses linear, longer than the ascus ; spores greenish-olive, narrow-oval, or subfusoid, ends rounded, one-septate, slightly constricted, upper cell rather larger, 8–10 × 4 μ. On dead branches of *Hevea brasiliensis* Muell-Arg., Lassahena, August, 1916 ; No. 4841 in Herb. Peradeniya.

Peritheciis sparsis, vel congregatis et basi confluentibus, in rimis corticis, 0·2 mm. diam., ampullaceis, setis patulis supra ornatis ; ascis clavatis, breviter pedicellatis, octosporis, sporis oblique uniseriatis ; paraphysibus linearibus, ascos superantibus ; sporis viridi-olivaceis, angusto-ovalibus vel subfusoideis, obtusis, inequaliter uniseptatis, leniter constrictis, 8–10 × 4 μ.

Phæosphærella Theæ n. sp.

Perithecia immersed, epiphyllous, black, minute, 80–100 μ diameter ; asci few, eight-spored, clavate, 50 × 12 μ ; no paraphyses ; spores fusoid, one-septate, constricted at the septum, pale brown, upper cell the larger and rounded at the apex, lower cell somewhat oblong and apex obtuse, 9–14 × 4–5 μ. On leaves of tea ; spots at first small, irregular, yellow, then angular, branching, gray-brown or gray, arid, with a yellow-green margin, the centre cracking and dropping out, leaving holes often confluent and extending over the whole length of the leaf; Peradeniya, March, 1915; No. 4558 in Herb. Peradeniya.

Peritheciis immersis, epiphyllis, nigris, minutis, 80–100 μ diam.; ascis paucis, clavatis, octosporis, 50 × 12 μ; sporis fusoideis, uniseptatis, loculo superiori majore, apice rotundato, inferiori sub-oblongo, apice obtuso, 9–14 × 4–5 μ.

Leptosphæria Musarum Sacc. & Berl.

On leaves of *Musa paradisiaca* L., Peradeniya, April, 1915.

Leptosphæria Smilacis n. sp.

Perithecia erumpent, finally superficial, up to 0·4 mm. diameter, globose, ostiolum acute and black, elsewhere covered with a greenish-yellow granular or rugose layer, becoming brown, then black, scattered, or in groups of four to six; asci clavate, pedicel short, truncate, apex and lateral walls towards the apex thickened, 100–135 × 12 μ, spores biseriate; spores narrow-oval, slightly curved, three-septate, slightly constricted, 20–25 × 4·5–5 μ. Causing witches' brooms on *Smilax aspera* L., Hakgala, April, 1915; No. 4640 in Herb. Peradeniya.

Peritheciis erumpentibus, tandem superficialibus, ad 0·4 mm. diam., globosis, ostiolo acuto nigro, alibi viridi-flavis granulosis vel rugosis, brunnescentibus, tandem nigris, sparsis vel 4–6 congregatis; ascis clavatis, breviter pedicellatis, truncatis, supra pariete incrassato, 100–135 × 12 μ, sporis biseratis; sporis angusto-ovalibus, subcurvatis, triseptatis, leniter constrictis, 20–25 × 4·5–5 μ.

Ceratostomaceæ.

Ceratostoma australe Speg.

Hakgala, May, 1910.

Xylariaceæ.

Poronia minuta n. sp.

Total height up to 1·5 mm.; head 0·5–1·5 mm. diameter, irregularly globose, slightly flattened, ostiola prominent, white or brownish-white, minutely tomentose, internally reddish-brown; stalk up to 0·5 mm. high, 0·3 mm. diameter.

Perithecia scattered, oval, 0·4 × 0·2 mm. ; asci clavate, 110 × 12–14 μ, spores uniseriate or obliquely uniseriate ; spores black-brown, opaque, narrow-oval, slightly inequilateral, ends obtuse, 14–18 × 6–8 μ, with a hyaline coat, 1 μ thick, not evident on extruded spores. On hare's dung, Peradeniya, September, 1912, &c.; No. 3584 in Herb. Peradeniya.

Ad 1·5 mm. alt. ; capite 0·5–1·5 mm. diam., irregulariter globoso, sub-applanato, ostiolis prominentibus, albo vel brunneo-albo, minute tomentoso, intus rubro-brunneo ; stipite ad 0·5 mm. alt., 0·3 mm. diam. Peritheciis sparsis, ovalibus, 0·4 × 0·2 mm. ; ascis clavatis, 110 × 12–14 μ, sporis uniseriatis vel oblique uniseriatis ; sporis nigro-brunneis, angusto-ovalibus, sub-inequilateralibus, obtusis, 14–18 × 6–8 μ.

Poronia macrorhiza Speg.

Hakgala, December, 1905.

Valsaceæ.

Thyridium flavum n. sp.

Stroma yellow, 0·5 mm. thick, several mm. long and broad, embedded in the cortex, composed of yellow hyphæ and cortical tissue. Perithecia rather distant, globose, 0·3 mm. diameter ; wall thin, brown, membranous, collapsing when dry and easily removed from the stroma ; ostiola conical, not projecting, scattered, not converging. Asci cylindric, eight-spored, sporiferous part 80 × 10 μ. Paraphyses numerous. Spores muriform, with three transverse and one longitudinal septa, thick-walled, oblong-oval, blackish fuliginous with black septa, or almost opaque, 16–20 × 8–10 μ. Pycnidia superficial, gregarious, confluent below, subglobose or ovoid, black, thick-walled, wall yellow internally ; spores minute, linear, hyaline, 3–4 × 1 μ.

On dead branches of *Hevea brasiliensis* Muell-Arg., Peradeniya, February, 1917 ; No. 4968 in Herb. Peradeniya.

Stromatibus flavis, 0·5 mm. crass., multis mm. long. et lat., cortice immersis, hyphis flavis et cellulis corticis compositis ; peritheciis subremotis, globosis, 0·3 mm. diam., sicco facile separabilibus, pariete tenui, membranaceo, brunneo, sicco collapso, ostiolis conicis, immersis, non convergentibus ; ascis cylindraceis, octosporis, parte sporifera 80 × 10 μ; paraphysibus numerosis; sporis oblongo-ovalibus, episporio crasso, muriformibus, transverse triseptatis, longitudinaliter uniseptatis, nigro-fuligineis, septis nigris, vel fere opacis, 16–20 × 8–10 μ. Pycnidiis superficialibus, gregariis, basi confluentibus, subglobosis vel ovalibus, nigris, pariete crasso, interne flavo; sporis bacillaribus, hyalinis, 3–4 × 1 μ.

Dothidaceæ.

Phyllachora Glycosmidis n. sp.

Stromata circular, up to 2 mm. diameter, multilocular, loculi up to 0·3 mm. diameter, ostiola not projecting; asci cylindric, about 100 × 6 μ, with a long pedicel, spores obliquely uniseriate; spores oblong-oval, ends rounded, hyaline, continuous, 8–12 × 4–5 μ. On leaves of *Glycosmis pentaphylla* Corr., Nalanda, May, 1912; No. 3564 in Herb. Peradeniya.

Stromatibus rotundatis, ad 2 mm. diam., multilocularibus, loculis ad 0·3 mm. diam., ostiolis non prominentibus; ascis cylindraceis, circa 100 × 6 μ, longe pedicellatis, sporis oblique uniseriatis; sporis oblongo-ovalibus, obtusis, hyalinis, continuis, 8–12 × 4–5 μ.

Phyllachora Hibisci Rehm.

On *Hibiscus furcatus* Roxb., Peradeniya, July, 1910.

Phyllachora Andropogonis Karst. & Har.

On *Cymbopogon confertiflorus* Stapf., Hakgala, April, 1915.

Microcyclus Walsuræ Syd.

On *Walsura piscidia* Roxb., Peradeniya, February, 1914.

Phæodothis sparsa n. sp.

Stromata epiphyllous, on small yellowish spots, usually solitary, irregularly oval, 0·5–0·9 × 0·3–0·4 mm., pulvinate, two to four locular, ostiola not projecting. Asci clavate, eight-spored, spores obliquely uniseriate below, biseriate above, sporiferous part 40–60 × 9–10 μ. Spores oblong-oval, ends truncate, unequally one-septate, not constricted, blackish-green, 8–10 × 4–5 μ. Conidia black, lenticular, circular or angular, 4–5 μ diameter. On leaves of *Acacia cæsia* Willd., Peradeniya, August, 1913. No. 3681 in Herb. Peradeniya.

Maculis parvis, flavis; stromatibus epiphyllis, sæpius solitariis, irregulariter ovalibus, 0·5–0·9 × 0·3–0·4 mm., pulvinatis, 2–4-locularibus, ostiolis inconspicuis. Ascis clavatis, octosporis, parte sporifera, 40–60 × 9–10 μ. Sporis oblongo-ovalibus, truncatis, inequaliter uniseptatis, non constrictis, fusco-viridibus, 8–10 × 4–5 μ. Conidiis nigris, lenticularibus, rotundatis vel angulatis, 4–5 μ diam.

Rhopographella Ochlandræ n. sp.

Stromata clustered on yellow areas, chiefly hypophyllous, minute, about 0·4 mm. diameter, erumpent, black, rugose, pulvinate, perithecia sometimes subprominent, ostiola not projecting, perithecia about 0·1 mm. diameter, two or three in each stroma; asci broadly clavate, or oval, thick-walled, 4 (?) spored, spores in a parallel bundle; spores fusoid or sub-cymbiform, hyaline, three-septate, not constricted, 28–36 × 3 μ. Paraphyses short, flexuose, linear. Some stromata contain pycnospores, hyaline, falcate, or variously curved, three-septate, 32–70 × 3 μ. On living leaves of *Ochlandra stridula* Thw., Gikiyanakande, June, 1916; No. 4801 in Herb. Peradeniya.

Stromatibus maculis flavis congregatis, sæpius hypophyllis, erumpentibus, nigris, rugosis, pulvinatis, peritheciis interdum subprominentibus, ostiolis non prominentibus; peritheciis circa 0·1 mm. diam., 2–3 in quoque stromate; ascis late clavatis vel ovalibus, pariete crasso, 4 (?) sporis, sporis parallelis; sporis fusoideis vel subcymbiformibus, hyalinis, triseptatis, 28–36 × 3 μ. Paraphysibus linearibus, flexuosis, brevibus. Pycnosporis hyalinis, falcatis, vel varie curvatis, triseptatis, 32–70 × 3 μ.

Hypocreaceæ.

Hyponectria Emdeliæ n. sp.

Spots reddish orange, usually circular, up to 2 cm. diameter, dotted with minute translucent ostiola. Perithecia totally immersed, scattered, ovoid or subglobose, conical above, 0·4 mm. high, 0·25–0·3 mm. diameter, wall hyaline, ostiolum not projecting, opening on the upper surface. Asci cylindric, shortly pedicellate, eight-spored, spores uniseriate, often transverse, 100–120 × 10–14 μ. Paraphyses linear, numerous. Spores broadly oval, hyaline, continuous, rather thick-walled, 10–12 × 7–8 μ.

On leaves of *Embelia viridiflora* Scheff., Hakgala, May, 1913, &c.; No. 3107 in Herb. Peradeniya.

Maculis rubro-aurantiacis, rotundatis, ad 2 cm. diam., ostiolis minutis, pellucidis punctatis. Peritheciis immersis, sparsis, ovalibus vel subglobosis, supra conicis, 0·4 mm. alt., 0·25–0·3 mm. diam., pariete hyalino, ostiolo epiphyllo; ascis cylindraceis, breviter pedicellatis, octosporis, sporis uniseriatis, sæpe transversis, 100–120 × 10–14 μ; paraphysibus linearibus, numerosis; sporis late ovalibus, hyalinis, continuis, episporio crassiusculo, 10–12 × 7–8 μ.

Neocosmospora vasinfecta Sm.

On *Indigofera* sp., Peradeniya, November, 1909.

Melanospora parasitica Tul.

On *Cephalosporium* on *Icerya purchasi* on *Acacia decurrens*, Ambawela, January, 1917.

Nectria striatospora Zimm.

On cacao, *Albizzia*, &c., common.

Nectria (Cosmospora) Rickii Rehm.

On *Ustulina zonata* Lev., Peradeniya, August, 1909; Dehiowita, 1911; Hakgala.

Hypomyces flavo-lanatus n. sp.

Perithecia orange-yellow, globose, 150–200 μ diameter, clothed with radiating yellow hyphæ, crowded on a thin white subiculum; ostiolum papillate, dark red. Asci eight-spored, spores uniseriate, up to 70 × 4 μ. Spores greenish hyaline, oval, sometimes slightly attenuated towards one end, one-septate, slightly constricted, ends rounded, very minutely warted, 6–8 × 2·5–3 μ. Conidial stage stilboid, up to 1·2 mm. high ; stalk orange-yellow, 40 μ diameter below, tapering upwards, rather loosely built, often arising from a tuft of suberect yellow hyphæ, sometimes Isarioid ; head globose, hyaline, up to 100 μ diameter ; conidiophores penicillioid ; conidia subglobose, hyaline, 2·5 μ diameter.

On a Poria, Peradeniya, December, 1916 ; No. 4938 in Herb. Peradeniya. Also on *Trichia botrytis*, Hakgala.

Subiculo albo, tenui ; peritheciis confertis, aurantiacis, globosis, 150–200 μ diam., hyphis flavis radiantibus vestitis, ostiolo papillato fusco-rubro. Ascis octosporis, sporis uniseriatis, ad 70 × 4 μ. Sporis viridi-hyalinis, ovalibus, interdum attenuatis, uniseptatis, leniter constrictis, obtusis, minutissime verrucosis, 6–8 × 2·5–3 μ. Statu conidiophoro stilboideo, ad 1·2 mm. alt. ; stipite aurantiaco, basi 40 μ diam., sursum attenuato, laxo ; capitulo globoso, ad 100 μ diam. ; conidiophoris penicillioideis ; conidiis subglobosis hyalinis, 2·5 μ diam.

Podocrea zeylanica n. sp.

Stromata clustered, simple, clavate, or cylindric, sometimes compressed, apex often irregularly lobed, up to 3 cm. high, 4 mm. diameter, rufous or pale brown, ostiola darker, pallid towards the base, glabrous. Perithecia crowded, up to 0·25 mm. diameter ; asci 60–80 × 3–4 μ, cylindric, eight-, then sixteen-spored ; part-spores white in mass, greenish hyaline when mounted, globose, 3–4 μ diameter, or oval, 3·5 × 2·5 μ, faintly warted. On decaying stumps, Peradeniya, July, 1912, &c. ; No. 4573 in Herb. Peradeniya.

Stromatibus fasciculatis, simplicibus, clavatis, vel cylindraceis, interdum compressis, supra sæpe lobatis, ad 3 cm. alt., 4 mm. diam., rufis vel pallide brunneis, ostiolis saturatioribus, basi pallescentibus, glabris. Peritheciis confertis, ad 0·25 mm. diam. ; ascis 60–80 × 3–4 μ, cylindraceis, octo- dein sexdecim-sporis ; sporis viridi-hyalinibus, globosis, 3–4 diam., vel ovalibus, 3·5 × 2·5 μ, leniter verrucosis.

Cordyceps coccinea Penz. & Sacc.

Hakgala, October, 1914.

Microthyriaceæ.

Vizella guaranitica Speg.

On bamboo, Hakgala, April, 1915.

Lophiostomaceæ.

Schizostoma applanata n. sp.

Perithecia scattered or gregarious, black, shining, smooth, 1–1·5 mm. diameter, with a flattened crest, 0·25 mm. high, oval in outline when viewed from above, 0·3 mm. broad in the centre, tapering to either end, extending completely across the perithecium and often projecting on either side. Asci clavate, apex rounded, with a long tapering pedicel, spores biseriate, 126–136 × 10–11 μ; sporiferous part 64–80 × 10–11 μ. Paraphyses numerous, linear, branched. Spores dark brown, fusiform, ends acute and sometimes contracted, one-septate, constricted slightly at the septum, appearing three-septate through the shrinkage of the cell contents from each end for a distance of about 3 μ, 20–27 × 5–6 μ. On dead wood, Hakgala, September, 1908; No. 2848 in Herb. Peradeniya.

Peritheciis sparsis vel confertis, nigris, nitentibus, levibus, 1–1.5 mm. diam.; ostiolo applanato, ovali, medio 0·3 mm. crasso, transverso, sæpe utrinque prominenti. Ascis clavatis, apice obtuso, longe pedicellatis, sporis biseriatis, 126–136 × 10–11 μ; parte sporifera 64–80 × 10–11 μ. Paraphysibus numerosis, linearibus, ramosis. Sporis fuscobrunneis, fusiformibus, acutis, uniseptatis, parum constrictis, spurie triseptatis, 20–27 × 5–6 μ.

Hysteriaceæ.

Lembosia Pavettæ Theiss.

On *Pavetta indica* L., Peradeniya, December, 1911.

DISCOMYCETÆ.

Geoglossum hirsutum f. americana Durand.

Peradeniya, November, 1908; July, 1909.

Pezizella glaberrima Penz. & Sacc.

Hakgala, September, 1908.

Erinella bogoriensis Henn. & Nym.

Peradeniya, December, 1914 (det. G. Bryce).

Karschia nigerrima subsp. globuligera Penz. & Sacc.

On palm midrib, Peradeniya, December, 1914 (det G. Bryce).

Exoascus deformans Fckl.

On peach, Hakgala, August, 1908.

Taphrina Laurencia Giesenh.

Common on *Pteris quadriaurita* Retz., Hakgala.

Taphrina cornu-cervi Giesenh.

On *Aspidium aristatum* Sw., Hakgala, May, 1913.

Myxomycetæ.

Diderma subdictyospermum Lister.

Peradeniya, July, 1912.

Diderma arboreum G. Lister & Petch.

On jak trees, Peradeniya; recorded previously under Diderma rugosum in Ann. Perad., IV., p. 345.

Diachæa radiata G. Lister & Petch.

Trincomalee, 1910.

Hemitrichia Karstenii Lister.

Hakgala, May, 1913. Previously recorded by Lister from Thwaites' collection.

Arcyria denudata Sheldon.

This species has been found to arise from yellow plasmodium on two occasions in the same locality at Hakgala.

Plasmodiophoræ.

Plasmodiophora Brassicæ Wor.

Common on cultivated cabbage, Nuwara Eliya.

Deuteromycetæ.

Sphærioidaceæ.

Phyllosticta Resedæ n. sp.

Spots white or brownish-white, dry, membranous, orbicular, usually extending from the margin of the leaf. Pycnidia scattered, or arranged in concentric lines, 130–180 μ diameter, black, ostiolate, prominent, hypophyllous; spores oblong-oval, hyaline, ends rounded, 7–10 × 2·5 μ. On leaves of *Reseda odorata* L., Hakgala, October, 1914; No. 4699 in Herb. Peradeniya.

Maculis albis, vel brunneo-albis, aridis, membranaceis, orbicularibus; pycnidiis sparsis, vel concentrice dispositis, 130–180 μ diam., nigris, prominentibus, hypophyllis; sporis oblongo-ovalibus, hyalinis, obtusis, 7–10 × 2·5 μ.

Phyllosticta Violæ Desm.

On *Viola odorata* L., Peradeniya, March, 1907.

Phyllosticta Sapotæ Sacc.

On *Achras Sapota* L., Peradeniya, November, 1914.

Phyllosticta Piperis Tassi.

On leaves of *Piper Betle* L., Madulsima, March, 1915.

Phoma Murrayæ n. sp.

Spots pale brown, bordered by a purple line, membranous, usually extending from the edge of the leaf. Pycnidia black, scattered, prominent, about 125 μ diameter; spores broadly oval, ends obtuse, 7–11 × 4–6 μ. On leaves of *Murraya Koenigii* Spreng., Peradeniya, January, 1915; No. 4453 in Herb. Peradeniya.

Maculis pallide brunneis, margine purpureis, membranaceis; pycnidiis nigris, sparsis, prominentibus, circa 125 μ diam.; sporis late ovalibus, obtusis, 7–11 × 4–6 μ.

Phoma cocoicola n. sp.

Spots irregular, gray in the centre, brown towards the margin. Pycnidia lenticular, subepidermal, then erumpent, irregularly circular, scattered or confluent, up to 140 μ diameter; ostiolum 20 μ diameter, not projecting; spores fusoid, ends acute, 3–5 × 1 μ. On leaves of *Cocos nucifera* L., December, 1914 ; No. 4400 in Herb. Peradeniya.

Maculis irregularibus, centro griseis, marginem versus brunneis ; pycnidiis lenticularibus, subepidermalibus, dein erumpentibus, irregulariter rotundatis, sparsis vel confluentibus, ad 140 μ diam. ; ostiolo 20 μ diam., non prominentibus ; sporis fusoideis, acutis, 3–5 × 1 μ.

Phoma insidiosa Tass.

On fruits of *Sorghum vulgare* Pers., Peradeniya, October, 1914.

Phoma Camelliæ Cke.

On leaves of tea, Ratnapura, February, 1915 ; Pelmadulla, February, 1915.

Macrophoma Musæ (Cke.) Berl. & Vogl.

On plantain fruits, Peradeniya, February, 1915.

Macrophoma theicola n. sp.

Pycnidia immersed, scattered, or clustered, elevating and cracking the outer layers of the cortex irregularly when mature, 0·25 mm. diameter, black, thin-walled, ostiolum about 25 μ diameter, not projecting ; spores narrow-oval or fusoid, ends obtuse or subtruncate, hyaline, continuous, 27–32 × 5–7 μ.

On stems of tea, Kalutara, February, 1917 ; No. 4967 in Herb. Peradeniya.

Pycnidiis immersis, sparsis vel congregatis, 0·25 mm. diam., nigris, pariete tenui, ostiolo circa 25 μ diam., non prominenti ; sporis angusto-ovalibus vel fusoideis, obtusis vel subtruncatis, hyalinis, continuis, 27–32 × 5–7 μ.

Aposphæria Heveæ n. sp.

Pycnidia globose, ostiolum conical, or oval, black, minutely rugose, 0·15–0·2 mm. diameter, clustered in cracks in the cortex, arising from a thin immersed black stroma. Wall stout, cellular ; basidia simple, short, up to 12 μ long ; spores narrow-oval, hyaline, continuous, thin-walled, 8–12 × 3–4 μ, a few broadly oval, 6 × 4 μ.

In the cortex of exposed lateral roots of *Hevea brasiliensis* Muell-Arg., February, 1917 ; No. 4964 in Herb. Peradeniya.

Pycnidiis globosis, ostiolo conico, vel ovalibus, nigris, minute rugosis, pariete crasso, celluloso, in rimis corticis congregatis, stromate nigro tenui immerso oriundis ; basidiis simplicibus, brevibus, ad 12 μ alt. ; sporidiis angusto-ovalibus, hyalinis, continuis, episporio tenui, 8–12 × 3–4 μ, paucis late ovalibus, 6 × 4 μ.

Sphæronema nigrum n. sp.

Pycnidia black, superficial, globose, 0·3 mm. diameter, with an ostiolum, 1–1·25 mm. long, 20–40 μ diameter, hyaline and fimbriate at the apex. Spores subglobose, hyaline, 5–6 μ diameter.

On roots of tea, Mahawale, March, 1909 ; No. 2857 in Herb. Peradeniya.

Pycnidiis nigris, superficialibus, globosis, 0·3 mm. diam. ; ostiolo 1–1·25 mm. alt., 20–40 μ diam., apice hyalino, fimbriato ; sporis subglobosis, hyalinis, 5–6 μ diam.

Cicinnobolus quercinus Syd.

On *Oidium quercinum* on *Quercus pedunculata*, Hakgala. [*Cicinnobolus* spp. are very common on Oidia in Ceylon.]

Sirothecium globosum n. sp.

Pycnidia superficial, black, spherical, 0·3 mm. diameter, glabrous, not ostiolate ; wall black, opaque ; conidia pale fuscous, oval, 4–6 × 3–3·5 μ. On dead tobacco stem, Peradeniya, June, 1915 ; No. 4691 in Herb. Peradeniya.

Pycnidiis superficialibus, nigris, globosis, 0·3 mm. diam., glabris, non ostiolatis ; pariete nigro, opaco ; conidiis pallide fuscis, ovalibus, 4–6 × 3–3·5 μ.

Haplosporella crypta n. sp.

Stroma within the bark, spreading indefinitely, black, thin, chambered ; loculi up to 0·2 mm. diameter ; spores extruded in black pulvinate masses through cracks in the outer bark, black-brown, oval, 5–6 × 3–4 μ, rarely globose, 4 μ diameter. On dead *Hevea* bark, Lassahena, August, 1916 ; No. 4862 in Herb. Peradeniya.

Stromatibus in cortice immersis, indeterminatis, nigris, tenuibus, locularibus; loculis ad 0·2 mm. diam.; conidiis nigro-brunneis, ovalibus, 5–6 × 3–4 μ, raro globosis, 4 μ diam.

Botryodiplodia Sorghi P. Henn.

On fruits of *Sorghum vulgare* Pers., Peradeniya, October, 1914.

Ascochyta Pisi Lib.

On *Pisum sativum* L., Nuwara Eliya, December, 1905.

Ascochyta Heveæ n. sp.

Pycnidia totally immersed, not beaked, ostiolate, black, 60–100 μ diam.; spores oblong-oval, hyaline, one-septate, not constricted, ends obtuse, 9–12 × 5 μ. On leaves of *Hevea brasiliensis* Muell-Arg., Henaratgoda, August, 1916; No. 4864 in Herb. Peradeniya. Affected areas marginal, extending along the edge of the leaf, sometimes nearly all round, brownish-white; margin red-brown, narrow.

Pycnidiis toto immersis, erostratis, ostiolatis, nigris, 60–100 μ diam.; sporidiis oblongo-ovalibus, hyalinis, uniseptatis, non constrictis, obtusis, 9–12 × 5 μ.

Septoria Petroselini Desm.

On celery, Hakgala, January, 1914.

Septoria Dianthi Desm.

On leaves of carnation, Hakgala, April, 1915.

Septoria nesodes Kalch.

On *Hydrocotyle asiatica* L., Bandarawela, August, 1916. Pycnidia chiefly hypophyllous; spores lanceolate, subacute, straight or flexuose, 3–5-septate, 34–50 × 3·5–4 μ.

Septoria Arisæmæ n. sp.

Spots transparent. Pycnidia epiphyllous, black, prominent, about 0·1 mm. diameter; ostiolum not projecting, 40 μ diameter. Spores linear, equal, ends obtuse, hyaline, three-septate, 30–38 × 1·5–2 μ, extruded in a small column.

On leaves of *Arisæma Leschenaultii* Bl., Hakgala, September, 1908 ; No. 2799 in Herb. Peradeniya.

Maculis pellucidis ; pycnidiis epiphyllis, nigris, prominentibus, circa 0·1 mm. diam. ; ostiolo 40 μ diam. ; sporis linearibus, æqualibus, obtusis, hyalinis, 3-septatis, 30–38 × 1·5–2 μ.

Septoria cocoes n. sp.

Spots irregular, gray in the centre, brown towards the margin. Pycnidia lenticular, circular, subepidermal, about 100 μ diameter, ostiolum 10 μ diameter, not projecting ; spores fusoid, straight, hyaline, ends acute, 1–3-septate, 12–16 × 2 μ. On leaves of *Cocos nucifera* L., December, 1914 ; No. 4399 in Herb. Peradeniya.

Maculis irregularibus, centro griseis, marginem versus brunneis ; pycnidiis lenticularibus, rotundatis, subepidermalibus, circa 100 μ diam., ostiolo 10 μ diam., non prominente ; sporis fusoideis, rectis, hyalinis, acutis, 1–3-septatis, 12–16 × 2 μ.

Phlyctæna Heveæ n. sp.

Pycnidia 0·15 mm. diameter, flattened pulvinate, black, smooth, simple, scattered, opening by a circular pore ; spores hyaline, continuous, linear, usually curved at one end, 17–24 × 1·5–2 μ.

On branches of *Hevea brasiliensis*, in cracks in the bark, becoming superficial, Arampola, December, 1911 ; No. 3279 in Herb. Peradeniya.

Pycnidiis 0·15 mm. diam., depresso-pulvinatis, nigris, levibus, simplicibus, sparsis, ostiolo rotundato ; sporis hyalinis, linearibus, plerumque uno apice curvatis, 17–24 × 1·5–2 μ.

Phlyctæna anomala n. sp.

[Pycnidia erumpent, black, pulvinate, oval, up to 0·5 × 0·3 mm. and 0·25 mm. high, with one or two cylindrical ostiola, up to 0·2 mm. high, 0·1 mm. diameter ; wall stout above, thin at the base ; spores hyaline, linear, uncinate at one end or almost straight, 12–15 × 1 μ, issuing in a white tendril. On dead bark of *Theobroma cacao* L., Uganda, April, 1915 (per W. Small) ; No. 4641 in Herb. Peradeniya.

Pycnidiis erumpentibus, nigris, pulvinatis, ovalibus, ad 0·5 × 0·3 mm., 0·25 mm. alt.; ostiolis unis vel duobus, cylindraceis, ad 0·2 mm. alt., 0·1 mm diam.; pariete supra crasso, infra tenui; sporis hyalinis, linearibus, uncinatis vel fere rectis, 12–15 × 1 μ.]

Nectrioidaceæ.

Ampullaria succinea n. sp.

Pycnidia superficial, globose, 0·3 mm. diameter, white, then amber, clothed with white, spreading or intertwined hairs; ostiolum 0·4 mm. high, 70 μ diameter, tapering slightly upward, mouth fimbriate; spores extruded in a black mass, broadly oval, usually biapiculate, blackish-gray, 15–20 × 11–13 μ. On decaying fruits of *Musa paradisiaca* L., Peradeniya, March, 1915; No. 4540 in Herb. Peradeniya. Also on fruits of *Hevea brasiliensis*, Peradeniya, July, 1916; No. 4817 in Herb. Peradeniya.

Pycnidiis superficialibus, globosis, 0·3 mm. diam., albis, dein succineis, hyphis patulis vel intertextis albis vestitis; ostiolis 0·4 mm. alt., 70 μ diam., sursum leniter attenuatis, apice fimbriatis; sporis nigro-griseis, late ovalibus, plerumque biapiculatis, 15–20 × 11–13 μ.

Ciliospora gelatinosa Zimm.

On hevea bark, High Walton, March, 1910, &c.

Melanconiaceæ.

Glœosporium Musarum Cke. & Mass.

On plantain leaves and fruits, Peradeniya, February, 1915, &c.

Glœosporium Psidii Delacr.

On fruits of guava, Colombo, August, 1907.

Glœosporium Mangæ Noack.

On fruits of mango, Kalkudah, July, 1909.

Glœosporium coffeanum Delacr.

On *Coffea robusta*, Akuressa, January, 1912, &c.

Colletotrichum Crotalariæ n. sp.

Spots irregular, pale ochraceous with a grayish-brown margin. Acervuli epiphyllous, minute, black, circular, 0·1–0·2 mm. diameter. Setæ up to 70 μ long, 4 μ diameter at the base, tapering to the apex. Conidia cylindric, ends rounded, hyaline, continuous, 12–16 × 5 μ.

On leaves of *Crotalaria striata* DC., Peradeniya, December, 1916; No. 4936 in Herb. Peradeniya.

Maculis irregularibus, pallide ochraceis, margine griseo-brunneo; acervulis epiphyllis, minutis, nigris, rotundatis, 0·1–0·2 mm. diam.; setis ad 70 alt., 4 diam., sursum attenuatis; conidiis cylindraceis, obtusis, hyalinis, 12–16 × 5 μ.

Colletotrichum incarnatum Zimm.

On diseased cacao pods. Common.

Colletotrichum Camelliæ Mass.

On tea. Common.

Colletotrichum orchidearum Allesch.

On leaves of orchid (cult.), Hindugala, May, 1916.

Colletotrichum Funtumiæ n. sp.

Spots irregularly circular, brown with a gray centre, ultimately falling out. Acervuli amphigenous, black, peritheciiform, about 0·1 mm. diameter. Setæ black, paler towards the tip, septate, tapering, somewhat nodulose, 25–50 × 3 μ. Conidia oval or cylindric, 10–14 × 3–4 μ.

On leaves of *Funtumia elastica* Stapf., Peradeniya, August, 1913; No. 4201 in Herb. Peradeniya.

Maculis irregulariter rotundatis, brunneis, centro griseo, tandem secedentibus; acervulis amphigenis, nigris, peritheciiformibus circa 0·1 mm. diam.; setis nigris, apice dilutiore, septatis, attenuatis, nodulosis, 25–50 × 3 μ; sporis ovalibus vel cylindraceis, 10–14 × 3–4 μ.

Colletotrichum Piperls n. sp.

Spots large, angular, black, becoming gray, surrounded by a yellow-green zone. Acervuli minute, ochraceous or pinkish ochraceous, on either side of the leaf; conidia 12–19 ×

3·5–4·5 μ ; setæ tapering, somewhat irregular, apex blunt, varying from 24 × 3 μ to 100 × 4 μ. On *Piper Betle* L., Madulsima, March, 1915 ; No. 4544 in Herb. Peradeniya. Also on *Piper nigrum* L., Peradeniya.

Maculis magnis, angulatis vel rotundatis, nigris, canescentibus, margine flavo-viridi ; acervulis minutis, ochraceis vel rubro-ochraceis, amphigenis ; conidiis 12–19 × 3·5–4·5 μ ; setis attenuatis, irregularibus, obtusis, 24 × 3 μ–100 × 4 μ.

Colletotrichum Urenæ n. sp.

Spots red-brown, becoming black, angular. Acervuli epiphyllous, minute, black, about 100 μ diameter; setæ up to 55 μ long, 4 μ diameter at the base, conical, acute, irregular, blackish-brown ; conidia cylindric, ends rounded, 10–14 × 4 μ. On living leaves of *Urena lobata* L., Peradeniya, June, 1915 ; No. 4679 in Herb. Peradeniya.

Maculis rubrobrunneis, nigrescentibus, angulatis ; acervulis epiphyllis, minutis, nigris, circa 100 μ diam. ; setis ad 55 μ long., basi 4 μ diam., conicis, acutis, irregularibus, nigro-brunneis ; conidiis cylindraceis, obtusis, 10–14 × 4 μ.

Melanconium Dendrocalami n. sp.

Acervuli circular or oval, up to 1·2 × 0·8 mm., covered for a long time by the epidermis ; conidia oval, 22–30 × 14–20 μ, or circular 20–24 μ, compressed, black-brown, thin-walled, often with a pale line on one edge. On sheaths of *Dendrocalamus giganteus* Munro, Peradeniya, November, 1914 ; No. 4335 in Herb. Peradeniya.

Acervulis rotundatis vel ovalibus, ad 1·2 × 0·8 mm., epidermide diu tectis ; conidiis ovalibus, 22–30 × 14–20 μ, vel rotundatis, 20–24 μ, compressis, nigro-brunneis, pariete tenui, sæpe una acie pallida.

Melanconium fructicolum n. sp.

Acervuli subepidermal, erumpent, 0·1–0·2 mm. diam., circular; conidia globose or slightly ovoid, thick-walled, smooth, fuliginous, 10–12 μ diam. Causing large brown patches on unripe fruits of *Punica granatum* L., Bandarawela, May, 1916 ; No. 4795 in Herb. Peradeniya.

Acervulis subepidermalibus, erumpentibus, 0·1–0·2 mm. diam., rotundatis; conidiis subglobosis vel subovoideis, episporio crasso, levibus, fuligineis, 10–12 μ diam.

Septogloeum Mappiæ n. sp.

Spots brownish-gray, with a black margin, circular. Acervuli scattered, numerous, circular or linear, up to 0·4 mm. long, 0·2 mm. broad, sometimes branching, white or flesh-coloured, epiphyllous; conidia cylindric, irregularly curved, septate, ends obtuse, hyaline, 60–100 × 4–6 μ. On living leaves of *Mappia ovata* Miers, Hakgala, October, 1914; No. 4730 in Herb. Peradeniya.

Maculis brunneo-griseis, margine nigro, rotundatis; acervulis sparsis, numerosis, rotundatis vel linearibus, ad 0·4 mm. long., 0·2 mm. lat., interdum ramosis, albis vel carneis, epiphyllis; conidiis cylindricis, curvatis, septatis, obtusis, hyalinis, 60–100 × 4–6 μ.

Septoglœum Manihotis Zimm.

On *Manihot utilissima* Pohl., Peradeniya, June, 1907.

Septoglœum Arachidis Rac.

On *Arachis hypogæa* L., Peradeniya, April, 1905, &c.

Pestalozzia viticola Cav.

On *Vitis vinifera* L., Jaffna, March, 1907.

Pestalozzia palmarum Cke.

General on coconut and other palms; on tea; on cinnamon, Ambalangoda, July, 1907; on hevea; on *Litsea fuscata* Thw., Hakgala, May, 1912.

Hyphomycetæ.

Mucedinaceæ.

Oospora Aurantii n. sp.

Tufts minute, white, bristly, lax, at first distinct, then confluent. Fertile hyphæ up to 1 mm. long, suberect, diverging, rarely branched, 1·5–4 μ diameter; conidia cylindric, ends truncate, from 2 × 1·5 μ–16 × 4 μ. Causing sodden patches on immature oranges, which then turn yellow; Agrapatna, July, 1915; No. 4760 in Herb. Peradeniya.

Acervulis minutis, albis, laxis, confluentibus; conidiophoris ad 1 mm. long., suberectis, divergentibus, raro ramosis, 1·5–4 μ diam.; conidiis cylindraceis, truncatis, 2 × 1·5–16 × 4 μ.

Oospora grisea n. sp.

Forming loose gray masses; creeping hyphæ 4 μ diameter, hyaline, with erect conidiophores, up to 30 μ high, 2 μ diameter below, tapering upwards, bearing branching chains of conidia at their apices; conidia narrow-oval, ends acute, hyaline, 4–7 × 1·5–2 μ. On dead patches on coconut leaves attacked by *Pestalozzia*, &c.; No. 4401 in Herb. Peradeniya.

Grisea, laxa; hyphis repentibus 4 μ diam., hyalinis; conidiophoris erectis, ad 30 μ alt., basi 2 μ diam., sursum attenuato; conidiis catenulatis, angusto-ovalibus, acutis, hyalinis, 4–7 × 1·5–2 μ.

Monilia carbonaria Cooke.

Common on burnt sticks.

Physospora spiralis Penz. & Sacc.

Henaratgoda, October, 1912, &c.

? **Langloisula zeylanica** n. sp.

Effused, irregularly shaped, up to 1·5 × 0·5 cm.; pale ochraceous, surface minutely innately fibrillose, 0·1–0·2 mm. thick, composed of repeatedly dichotomous, yellow hyphæ, about 3 μ diameter, rigid, forming a loose network, free ends sharply pointed; containing at the base a layer of globose or ovoid, yellow spores, 22–24 μ diameter or 22–26 × 16–21 μ; spore wall 4–6 μ thick, ornamented with a network of broad bands, usually interrupted and often broken up into short lines and warts. On dead bark, Hakgala, May, 1913; No. 4580 in Herb. Peradeniya.

Effusa, irregularis, ad 1·5 × 0·5 cm., pallide ochracea, minute innato-fibrillosa, 0·1–0·2 mm. crass.; hyphis repetiter dichotomis, flavis, 3 μ diam., rigidis, laxe intertextis, apicibus acutis ; sporis globosis, vel ovoideis, flavis, 22–24 μ diam., vel 22–26 × 16–21 μ; episporio, 4–6 μ crass., reticulato, lineis latis, plerumque interruptis, sæpe in verrucis fractis.

Oidium tingitaninum Carter.

On *Citrus* spp. Common.

Oidium Tuckeri Berk.

On *Vitis vinifera* L., Hakgala, September, 1908.

Oidium tabaci Thuem.

On cultivated tobacco. Common.

Oidium quercinum Thuem.

On *Quercus pedunculata* Ehrh., Hakgala, May, 1912.

The following Oidia have been collected, and are recorded here in view of the prevalent opinion that Oidium is rare in the Tropics :—

On *Sida mysorensis* W. & A., Peradeniya, December, 1913.
On *Tribulus terrestris* L., Jaffna, November, 1916.
On *Oxalis corniculata* L., Peradeniya, May, 1912.
On *Tropæolum majus* L., Hakgala, September, 1908.
On cultivated Balsam, Mirigama, September, 1907, &c.
On *Limonia alata* W. & A., Peradeniya, March, 1917.
On *Ægle Marmelos* Corr., Colombo, February, 1917.
On *Pisum sativum* L. [*Erysiphe polygoni* (DC.)], Haputale, August, 1913.
On *Tephrosia purpurea* Pers., Peradeniya, April, 1915, &c.
On *Tephrosia villosa* Pers., Teldeniya, August, 1907, &c.
On *Sesbania grandiflora* Pers., Peradeniya, March, 1917.
On *Clitoria ternatea* L., Peradeniya, September, 1907.
On *Tamarindus indica* L., Teldeniya, August, 1907.
On *Phaseolus lunatus* L., Peradeniya, January, 1907.
On *Cassia occidentalis* L., Teldeniya, August, 1907.
On *Cassia Tora* L., Teldeniya, August, 1907.
On *Curcurbita* sp., Teldeniya, August, 1907.
On *Sonchus arvensis* L., Peradeniya, January, 1912, &c.
On *Solanum melongena* L., Sudu-ganga, June, 1916.
On *Capsicum annuum* L., Peradeniya, January, 1907, &c.

On *Verbena venosa* Gill. & Hook., Bandarawela, January, 1917.

On *Leucas zeylanica* Br., Bandarawela, January, 1917.

On *Aristolochia indica* L., Peradeniya, March, 1917.

On *Piper Betle* L., Bandarawela, September, 1910.

On *Euphorbia hirta* L., Teldeniya, August, 1907, &c.

On *Phyllanthus reticulatus* Poir., Peradeniya, May, 1916.

On *Jatropha Curcas* L., Peradeniya, January, 1917.

Ovularia aurantii McAlp.

On orange, Hakgala, April, 1914.

Ovularia Bixæ Rac.

On *Bixa orellana* L., Experiment Station, Peradeniya, May, 12, 1905, &c. Generally distributed.

Verticillium attenuatum n. sp.

White. Conidiophores up to 0·5 mm. high, clustered, rigid, straight, tapering gradually, then suddenly towards the apex, up to 14 μ diameter below, with walls 4 μ thick, septate, with septa 8–18 μ apart, tapering suddenly into a thin-walled fertile apex about 80 μ long, which bears horizontal lateral branches in whorls of three, the lower branches again ternately divided ; ultimate branchlets flask-shaped, 8–16 μ long, each terminating in two to three minute sterigmata ; conidia hyaline, continuous, narrow-oval or subcylindric, ends rather acute, 4–6 × 1·5 μ. On *Lycoperdon* sp., Hakgala, January, 1914 ; No. 3937 in Herb. Peradeniya.

Album ; conidiophoris ad 0·5 mm. alt., congregatis, rigidis, rectis, leniter dein ad apicem abrupte attenuatis, basi 14 μ diam., pariete 4 μ crass., septatis, loculis 8–18 μ long., parte conidiophora, 80 μ long., pariete tenui, ramis ternateis ; conidiis hyalinis, continuis, angusto-ovalibus vel subcylindricis, subacutis, 4–6 × 1·5 μ.

Verticillium lateritium Berk.

On *Scleroderma* sp., Hakgala, May, 1912.

Cylindrocladium Pithecolobii n. sp.

Spots white, circular, up to 4 mm. diameter. Conidiophores and mycelium hypophyllous, white. Creeping hyphæ, hyaline, 3 μ diameter. Conidiophores hyaline, up to 160 μ high, 8 μ diameter at the base, septate, dichotomously branched, bearing up to three sterigmata at the apices of the branches or at the septa. Sterigmata sub-oval or fusoid, inequilateral or curved, apex acute, 7–16 × 3 μ. Conidia solitary, cylindrical or slightly fusoid, ends obtuse, one-septate, rarely slightly constricted, hyaline, 36–60 × 5–7 μ.

On living leaves of *Pithecolobium Saman* Benth., which soon fall; Peradeniya, March, 1917; No. 4996 in Herb. Peradeniya.

Maculis albis, rotundatis, ad 4 mm. diam.; conidiophoris et mycelio albis, hypophyllis; hyphis repentibus hyalinis, 3 μ diameter; conidiophoris hyalinis, ad 160 μ alt., basi 8 μ diam., septatis, dichotome furcatis, sterigmatibus apicalibus vel verticillatis; sterigmatibus subovalibus vel fusoideis, curvis vel inæquilateralibus, acutis, 7–16 × 3 μ; conidiis hyalinis, solitariis, cylindraceis vel subfusoideis, obtusis, uniseptatis, raro leniter constrictis, 36–60 × 5–7 μ.

Trichothecium luteum n. sp.

Tufts pulvinate, confluent in sheets for several centimetres, pale buff, conidiophores 4 μ diameter; conidia elliptic or pyriform, lower cell sometimes curved, not constricted at the septum, wall and septum thick (1·5 μ), 16–32 × 10–14 μ. On drying fruits of *Hevea brasiliensis* Muell-Arg., in laboratory, Peradeniya, July, 1916; No. 4818 in Herb. Peradeniya.

Acervulis pulvinatis, confluentibus, luteis; conidiophoris, 4 μ diam.; conidiis ellipticis vel pyriformibus, episporio crasso, uniseptatis, loculo inferiori interdum curvato, 16–32 × 10–14 μ.

Mycogone rufa n. sp.

Forming minute, dark ochraceous, powdery masses, up to 0·25 mm. diameter, scattered, then crowded. Hyphæ stout, hyaline, about 4 μ diameter, creeping or erect; conidia on short side branches, pyriform, thick-walled, upper cell the larger, verrucose, yellow-brown, lower cell hyaline, conical, smooth, not constricted at the septum, 30–36 × 24–28 μ. On decaying fruit stalks of *Musa paradisiaca* L., Peradeniya, March, 1915; also on decaying coconut stems; No. 4542 in Herb. Peradeniya.

Acervulis minutis, pulverulentis, ochraceis, ad 0·25 mm. diam., sparsis dein confertis; hyphis crassis, hyalinis, circa 4 μ diam., repentibus vel erectis; conidiis lateralibus, pyriformibus, episporio crasso, loculo superiori majore, verrucoso, flavo-brunneo, inferiori hyalino, conico, levi, non constrictis, 30–36 × 24–26 μ.

Cercosporella Theæ n. sp.

Spots circular; upper surface zoned light and dark brown and marked with concentric raised ridges; under surface gray-brown with a somewhat translucent green margin. Hyphæ forming a thin white film on the under surface, hyaline, 4–6 μ diameter; conidia cylindric, almost equal, hyaline, three-septate, ends obtuse, 80–120 × 8 μ. On leaves of tea, Dunsinane, September, 1909; No. 3009 in Herb. Peradeniya.

Maculis rotundatis, supra pallide et fusco-brunneo zonatis, lirellis concentricis ornatis, infra griseo-brunneis, margine viridi subpellucido; hyphis hypophyllis membrana alba intertextis, hyalinis, 4–6 μ diam.; conidiis cylindraceis, fere æqualibus, hyalinis, triseptatis, obtusis, 80–120 × 8 μ.

Dematiaceæ.

Echinobotryum olivaceum n. sp.

Creeping hyphæ 4 μ diameter, with short lateral branches, 4 μ high, which bear two or more flask-shaped or oval sterigmata about 6 μ high, sometimes forming globose heads up to 0·1 mm. diameter; conidia in chains, globose, blackish olivaceous, 3 μ diameter. On dead coconut leaf, December, 1914; No. 4402 in Herb. Peradeniya.

Hyphis repentibus 4 μ diam.; conidiophoris brevibus, lateralibus, 4 μ alt.; basidiis ovalibus vel ampullaceis, 6 μ alt., plerumque paucis, interdum capitibus ad 0·1 mm. diam.; conidiis catenulatis, globosis, nigro-olivaceis, 3 μ diam.

Trichobotrys trechispora n. sp.

Conidiophores erect, crowded, in patches up to 1 cm. long, 5 mm. broad, simple, up to 1·5 mm. high, 10–12 μ diameter at the base, 8 μ above, olivaceous, septate, everywhere minutely spinulose ; conidia pale olivaceous, oval, 5 × 3 μ, or spherical, 4 μ diameter, ornamented with sharp, raised, broken ridges, about 1 μ high, sometimes radiating, sometimes parallel. On dead wood, Peradeniya, July, 1909 ; No. 2924 in Herb. Peradeniya.

Conidiophoris erectis, confertis in gregibus ad 1 cm. long., 5 mm. lat., simplicibus, ad 1·5 mm. alt., basi 10–12 μ diam. ; sursum 8 μ diam., olivaceis, septatis, minute spinulosis ; conidiis pallide olivaceis, ovalibus, 5 × 3 μ, vel globosis, 4 μ diam., lirellis acutis, 1 μ alt., radiantibus vel parallelis, ornatis.

Trichosporium arborescens Penz. & Sacc.

Hakgala, September, 1914.

Trichosporium fusco-olivaceum n. sp.

Tufts dark olive, widely effused, up to 2 mm. thick ; hyphæ olivaceous, 4 μ diameter, sterile parts regular, fertile parts closely flexuose ; conidia rather dark olivaceous, oval or pyriform, 5–6 × 3–4 μ. On dead wood, Hakgala, April, 1914 ; No. 3959 in Herb. Peradeniya.

Fusco-olivacea, late effusa, ad 2 mm., crass. ; hyphis olivaceis, 4 μ diam., partibus sterilibus regularibus, fertilibus arcte flexuosis ; conidiis fusco-olivaceis, ovalibus vel pyriformibus, 5–6 × 3–4 μ.

Cladosporium herbarum var.

On fruits of *Sorghum vulgare* Pers., Colombo, July, 1913 ; Peradeniya, October, 1914. On *Hypericum* sp. (cult.), Hakgala, April, 1915.

Cladosporium fuligineum Bon.

On *Tricholoma crassum* B. & Br., Peradeniya, May, 1916.

Cladosporium fulvum Cke.

On leaves of tomato. Common.

Scolecotrichum Musæ Zimm.

On plantain leaves, Peradeniya, February, 1915, &c.

Ceratophorum Albizziæ n. sp.

Mycelium scanty, 4 μ diameter ; conidiophores short, about 12–16 μ long, 6–8 μ diameter ; conidia solitary, pale fuscous, fusoid, usually curved, three-septate, not constricted at the septa, base truncate, apex subconical, with from two to five, simple or branched, septate, tapering ciliæ, up to 50 μ long, 2 μ diameter, arising together or scattered from the apical cell ; dimensions (without ciliæ) 40–66 × 10–14 μ. On leaves of seedling *Albizzia moluccana* Miq., causing pale brown spots, the leaves subsequently falling off, Ratnapura, December, 1914 ; No. 4359 in Herb. Peradeniya.

Mycelio parvo, 4 μ diam. : conidiophoris brevibus, circa 12–16 μ long., 6–8 μ diam. ; conidiis solitariis, pallide fuscis, fusoideis, plerumque curvatis, triseptatis, non constrictis, basi truncatis, apice subconicis, ciliis simplicibus vel ramosis, 2–5, attenuatis, septatis, ad 50 μ long., 2 μ diam., fasciculatis vel sparsis, (sine ciliis) 40–66 × 10–14 μ.

Helminthosporium Ravenelii B. & C.

On *Sporobolus indicus* Br., Hakgala, September, 1908.

Helminthosporium incurvatum Bern.

On coconut leaves, December, 1914.

Helminthosporium Garciniæ n. sp.

Spots red-brown, covering ultimately almost the whole leaf, bearing minute, scattered, black points. Conidiophores clustered, arising from a sclerotioid body beneath the epidermis, on either surface, slightly flexuous, attenuated upwards, septate, fuliginous, 100–120 × 6 μ ; conidia multiseptate, fuliginous, slightly curved, scarcely constricted, attenuated towards either end, 28–36 × 4–7 μ. On leaves of *Garcinia Mangostana* L., June, 1912 ; No. 3483 in Herb. Peradeniya.

Maculis rubro-brunneis, magnis, puncta minuta, sparsa, nigra gerentibus ; conidiophoris congregatis, e sclerotio subepidermidale oriundis, amphigenis, subflexuosis, sursum attenuatis, septatis, fuligineis, 100–120 × 6 μ ; conidiis multiseptatis, fuligineis, leniter curvatis, haud constrictis, utrinque attenuatis, 28–36 × 4–7 μ.

Brachysporium torulosum Syd.

On plantain leaves, Peradeniya, June, 1916.

Sporodesmium striatum n. sp.

Spores black in mass, in cracks in the cortex, forming heaps up to 0·8 mm. long, 0·3 mm. broad. Spores oval, rounded at either end or attenuated below, blackish olivaceous, clathroseptate, sometimes with one to three stronger, more or less straight, transverse septa, closely covered with raised longitudinal wavy and anastomosing dark ridges, 30–62 × 26–32 μ; conidiophore short, hyaline.

On dead branches of *Hevea brasiliensis* Muell-Arg., Peradeniya, February, 1917; No. 4971 in Herb. Peradeniya.

Conidiis coacervatis nigris, acervulos ad 0·8 mm. long., 0·3 mm. lat. in rimis corticis efformantibus; conidiophoris hyalinis, brevibus; conidiis ovalibus, utrinque rotundatis, vel deorsum attenuatis, nigro-olivaceis, clathro-septatis, interdum septis 1–3 transversis crassis plus minus rectis, lineis elevatis fuscis flexuosis longitudinalibus anastomosantibus dense ornatis, 30–62 × 26–32 μ.

Macrosporium hurculeum E. & M.

On horseradish, Hakgala, April, 1915.

Cercospora Averrhoæ n. sp.

Spots white, with a purple-red margin, circular, up to 4 mm. diameter, acervuli amphigenous; conidiophores clustered, fuliginous, up to 120 μ high, 5 μ diameter, equal, inflated at the base; conidia hyaline, multiseptate, straight, or rarely curved, base truncate, up to 150 μ long, 4 μ diameter below, tapering to the apex.

On living leaves of *Averrhoa Carambola* L., which soon fall; Peradeniya, March, 1917; No. 4997 in Herb., Peradeniya.

Maculis albis, margine purpureo-rubris, rotundatis, ad 4 mm. diam.; acervulis amphigenis; conidiophoris fasciculatis, fuligineis, ad 120 μ alt., 5 μ diam., æqualibus, basi inflatis; conidiis hyalinis, multiseptatis, rectis, raro curvis, basi truncatis, ad 150 μ long., basi 4 μ diam., regulariter sursum attenuatis.

Cercospora Pseudarthriæ n. sp.

Spots yellow-brown to brown on the upper surface; mycelium forming a blackish or olivaceous felt on the lower; mycelium pale olivaceous: conidia terminal or lateral, pale olivaceous, variously curved, rounded at the base, apex obtuse, four to six septate, 40–60 × 5–6 μ. On leaves of *Pseudarthria viscida* W. & A., Peradeniya, December, 1913; No. 4096 in Herb. Peradeniya.

Maculis supra flavo-brunneis vel brunneis, infra mycelio nigrescente vel olivaceo tectis; conidiis apicalibus vel lateralibus, pallide olivaceis, varie curvatis, basi rotundato, apice obtuso, 4–6 septatis, 40–60 × 5–6 μ.

Cercospora Calpurniæ n. sp.

Tufts minute, scattered over diffuse yellow areas; conidiophores clustered, up to 80 μ high, bent and nodular, pale fuliginous; conidia clavate, almost hyaline, three-septate, 38–50 × 5–6 μ. On leaves of *Calpurnia aurea* Baker, Peradeniya, May, 1916; No. 4799 in Herb. Peradeniya.

Maculis flavis diffusis; acervulis minutis, sparsis, hypophyllis; conidiophoris fasciculatis, ad 80 μ alt., flexuosis, nodulosis, pallide fuligineis; conidiis clavatis, fere hyalinis, triseptatis, 38–50 × 5–6 μ.

Cercospora Cardiospermi n. sp.

Spots white, about 1 mm. diameter; acervuli on either side of the leaf, minute, black, about 30 μ diameter; conidiophores 30–60 μ high, 6 μ diameter, irregularly bent above, fuscous; conidia greenish-hyaline, truncate at the base, tapering regularly to the apex, 110–160 μ long, 5 μ diameter below, 2 μ above. On leaves of *Cardiospermum Helicacabum* L., Peradeniya, January, 1915; No. 4454 in Herb. Peradeniya.

Maculis albis, circa 1 mm. diam.; acervulis amphigenis, minutis, nigris, circa 30 μ diam.; conidiophoris, 30–60 μ alt., 6 μ diam., sursum irregulariter flexuosis, fuscis; conidiis viridi-hyalinis, basi truncatis, ad apicem regulariter attenuatis, 110–160 μ long., basi 5 μ diam., apice 2 μ diam.

Cercospora Hiptages n. sp.

Spots brown or blackish-brown, sometimes with a yellow margin, up to 1·5 cm. diameter. Acervuli minute, 0·1–0·2 mm. diameter, black, crowded, somewhat circularly arranged. Conidiophores olivaceous, flexuose, slightly nodular, 35–110 × 5–7 μ, clustered, septate ; conidia almost hyaline, straight or curved, multiseptate, 85–130 μ long, 4–5 μ diameter at the base, 2 μ at the apex. On leaves of *Hiptage Madablota* Gaertn., Peradeniya, June, 1910 ; No. 3079 in Herb. Peradeniya.

Maculis brunneis vel nigro-brunneis, interdum margine flavo, ad 1·5 cm. diam. ; acervulis minutis, 0·1–0·2 mm. diam., nigris, confertis, subcirculatim dispositis ; conidiophoris olivaceis, flexuosis, subnodulosis, septatis, fasciculatis, 35–110 × 5–7 μ ; conidiis fere hyalinis, rectis vel curvatis, multiseptatis, 85–130 μ long., basi 4–5 μ diameter, apice 2 μ diam.

Cercospora Sesami Zimm.

On *Sesamum indicum* DC., Peradeniya, November, 1909.

Cercospora beticola Sacc.

On *Beta vulgaris* L., Hakgala, April, 1915.

Cercospora medicaginis Syd.

On lucerne, Hakgala, April, 1915.

Cercospora subsessilis Syd.

On *Melia Azedarach* L., Colombo, July, 1913.

Cercospora Solani Thuem.

On *Solanum nigrum* L., Bandarawela, January, 1917.

Cercospora viticola (Ces.) Sacc.

On *Vitis vinifera* L., Batticaloa, March, 1907.

Cercospora Nicotianæ E. & E.

On tobacco, Teldeniya, August, 1907, &c.

Cercospora Theæ Breda de Haan.

Common on tea.

Dictyosporium zeylanicum n. sp.

Conidiophores short, clustered, conidia forming minute black heaps ; conidia composed of five rows of cells, irregularly ovoid, blackish-green, then opaque, base acute, apex rounded or truncate, 30–34 × 20–24 μ ; cells about 4 × 4 μ ; pedicel subpersistent, hyaline to olivaceous, up to 30 × 3 μ. On a dead branch, Peradeniya, December, 1914 ; No. 4368 in Herb. Peradeniya.

Conidiophoris brevibus, fasciculatis ; conidiis coacervatis nigris, fusco-viridibus, dein opacis, basi acutis, apice rotundatis vel truncatis, 30–34 × 20–24 μ, quinque lineis loculorum instructis ; loculis, 4 × 4 μ ; pedicello subpersistente, hyalino, vel olivaceo, ad 30 × 3 μ.

Cercosporina ricinella (Sacc. & Berl.) Speg.

On leaves of *Ricinus communis* L., Peradeniya, November, 1913.

Stilbaceæ.

Stilbum villosum n. sp.

Stalk white or pinkish, 0·8 mm. high, 40 μ diameter below, expanding to 0·1 mm. diameter above, apex convex and deep red in outline, tomentose with upwardly directed hyphæ, some of which project above the head ; head red, globose, about 0·1 mm. diameter ; conidia red in mass, hyaline when mounted, narrow-oval, 4–6 × 2 μ. On decaying fruits and corms of *Musa paradisiaca* L., Peradeniya, March, 1915 ; No. 4543 in Herb. Peradeniya.

Stipite albo vel rubescenti, 0·8 mm. alt., basi 40 μ diam., sursum expanso ad 0·1 mm. diam., apice convexo, hyphis suberectis, interdum caput superantibus tomentoso ; capite rubro, globoso, circa 0·1 mm. diam. ; conidiis hyalinis, coacervatis rubris, angusto-ovalibus, 4–6 × 2 μ.

Stilbum candidulum Penz. & Sacc.

On leaves of *Amomum*, Hakgala, April, 1915.

Isaria lanuginosa n. sp.

Gregarious ; total height up to 12 mm. ; stalk tawny brown becoming black, up to 8 mm. high, 0·4 mm. diameter at the base, equal or attenuated upwards, minutely fibrillose; head irregularly ovoid, woolly, grayish-white, up to 6 mm. high, 2 mm. diameter, forming a tangled mass of hyphæ and spores; conidia oval, ends acute, hyaline, 2–3 × 1–1·5 μ.

On dead twigs, Peradeniya, December, 1913; No. 4097 in Herb. Peradeniya.

Gregaria, ad 12 mm. alt.; stipite fulvo-brunneo, nigrescenti, ad 8 mm. alt., basi 0·4 mm., æquali vel sursum attenuato, minute fibrilloso; capite irregulariter ovoideo, lanuginoso, griseo-albo, ad 6 mm. alt., 2 mm. diam.; conidiis ovalibus, acutis, hyalinis, 2–3 × 1–1·5 μ.

Arthrosporium tenue Penz. & Sacc.

Peradeniya, December, 1914.

Sporocybe compacta n. sp.

Conidiophores scattered or clustered, black, up to 1·6 mm. high. Stalk longitudinally striate, often twisted, equal, 50–150 μ diameter. Head compact, subglobose or ovoid, 0·1–0·25 mm. diameter. Conidia narrow-oval, black in mass, very pale fuliginous, almost hyaline, 4–6 × 2·5–3 μ.

On dead branches of *Hevea brasiliensis* Muell-Arg., Peradeniya, February, 1917; No. 4970 in Herb. Peradeniya.

Synnematis sparsis vel congregatis, nigris, ad 1·6 mm. alt.; stipitibus longitudinaliter striatis, sæpe tortis, æqualibus, 50–150 μ diam.; capitibus subglobosis vel ovalibus, 0·1–0·25 mm. diam.; conidiis angusto-ovalibus, coacervatis nigris, pallidissime fuligineis, fere hyalinis, 4–6 × 2·5–3 μ.

Sporocybe favicola n. sp.

Stalk up to 2·5 mm. high, 0·1 mm. diameter at the base, 0·06 mm. diameter at the apex, rigid, black; head globose, 0·3 mm. diameter, black, composed of branching conidiophores, ultimate branches hyaline and about 1 μ diameter, bearing conidia terminally and laterally; conidia narrow oval, ends acute, fuscous, with a pale line down the middle, 4–5 × 2 μ. On a bee's comb, Hakgala, May, 1913; No. 4406 in Herb. Peradeniya.

Stipite ad 2·5 mm. alt., basi 0·1 mm. diam., apice 0·06 mm. diam., rigido, nigro; capite globoso, 0·3 mm. diam., nigro, conidiophoris ramosis composito, ramis ultimis hyalinis, 1 μ diam., conidiis apicalibus et lateralibus; conidiis angusto-ovalibus, acutis, fuscis, medio linea pallida longitudinali ornatis, 4–5 × 2 μ.

Arthrobotryum Glochidii n. sp.

Spots reddish-purple, becoming black. Synnemata hypophyllous, black-brown, up to 0·4 mm. high, scattered, 30 μ diameter below, attenuated upwards to 12 μ diameter above, or attenuated to the middle and expanding upwards to 0·1 mm. diameter, terminating in a brush of clavate conidiophores; conidia fusoid, usually strongly attenuated below, straight or curved, pale brown, three-septate, not constricted, 30–44 × 8 μ. On leaves of *Glochidion coriaceum* Thw., Hakgala, May, 1912; No. 4434 in Herb. Peradeniya.

Maculis rubro-purpureis, nigrescentibus; synnematis hypophyllis, nigro-brunneis, ad 0·4 mm. alt., sparsis, basi 30 μ diam., sursum attenuatis 12 μ diam., vel ad medium attenuatis, sursum inflatis ad 0·1 mm. diam., conidiophoris clavatis fasciculatis coronatis; conidiis fusoideis, plerumque valde deorsum attenuatis, rectis vel curvatis, pallide brunneis, triseptatis, 30–44 × 8 μ.

Tuberculariaceæ.

Tubercularia Hibisci n. sp.

Spots circular, arid, brownish-white, sometimes concentrically ridged, up to 5 mm. diameter, with a purple-red, raised margin. Sporodochia hypophyllous, pinkish-white, about 0·25 mm. diameter, subhemispherical, somewhat contracted below; conidia narrow-oval, ends acute, 5–8 × 1·5–2 μ. On living leaves of *Hibiscus Sabdariffa* L., Peradeniya, January, 1915; No. 4475 in Herb. Peradeniya.

Maculis rotundatis, aridis, brunneo-albis, interdum lirellis concentricis notatis, ad 5 mm. diam., margine purpureo-rubro incrassato; sporodochiis hypophyllis, rubescentibus, circa 0·25 mm. diam., subhemisphericis, leniter deorsum constrictis; conidiis angusto-ovalibus, acutis, 5–8 × 1·5–2 μ.

Chætospermum gelatinosum n. sp.

Sporodochia subgelatinous, cylindric, up to 0·6 mm. high, 0·4 mm. diameter, base immersed ; outer layers composed of parallel hyphæ, 3 μ diameter, which become gelatinous : basidia simple, 30 μ high, 3 μ diameter, conidia terminal ; paraphyses up to 80 μ long, 2 μ diameter, slightly thickened at the apex ; conidia oval, inequilateral, hyaline, contents granular, 36–44 × 16–21 μ, wall 1·5 μ thick, with a tuft of 6 to 12 filaments, up to 80 μ long, 1 μ diameter, at each end, and short filaments up to 10 μ long, or capitate appendages up to 4 μ long, along the more convex side of the conidium. On dead twigs, Hakgala, September, 1908 ; No. 3004 in Herb. Peradeniya.

Sporodochiis subgelatinosis cylindraceis, ad 0·6 mm. alt., 0·4 mm. diam., basi immersis, exteriore hyphis parallelis, 3 μ diam., tandem gelatinosis, instructis ; basidiis simplicibus, 30 μ alt., 3 μ diam., conidiis apicalibus ; paraphysibus ad 80 μ long., 2 μ diam., sursum subincrassatis ; conidiis ovalibus, inequilateralibus, hyalinis, plasmate granuloso, 36–44 × 16–21 μ, pariete 1·5 μ crasso, utroque apice filamentis 6–12, ad 80 μ long., 1 μ diam., convexo latere filamentis brevibus ad 10 μ long., vel capitatis ad 4 μ long., ornatis.

Tuberculina persicina (Ditm.) Sacc.

On *Ipomæa biloba* Forsk., Bentota, April, 1909.

Patellina rosea n. sp.

Sporodochia circular or orbicular, often sinuous, up to 1 mm. diameter, frequently clustered ; excipulum white, tomentose at the margin ; conidia, in mass, red when moist, then pink, hyaline when mounted, oval, slightly apiculate, 4–5 × 2·5 μ ; conidiophores about 35 × 2 μ. On bark of dead *Castilloa* sp., Henaratgoda, December, 1911 ; No. 3264 in Herb. Peradeniya. Also on dead *Hevea brasiliensis*, Peradeniya, July, 1916.

Sporodochiis rotundatis vel orbicularibus, interdum sinuosis, ad 1 mm. diam., sæpe congregatis ; excipulo albo, margine tomentoso ; conidiis hyalinis, coacervatis rubris, ovalibus, subapiculatis, 4–5 × 2·5 μ ; conidiophoris circa 35 × 2 μ.

Fusarium epithele McAlp.

On orange, Weyweltalawa, March, 1914.

Fusarium orchidis n. sp.

Spots oval, about 1·5 × 1 cm., black with a green centre. Acervuli scattered over the centre of the spot, white or pinkish, lax, minute, up to 0·1 mm. diameter; conidia falcate, ends equally curved, three-septate, 24–32 × 4 μ. On leaves of cultivated orchid, Hindugala, May, 1916; No. 4798 in Herb. Peradeniya.

Maculis ovalibus, circa 1·5 × 1 cm., nigris, centro viridi; acervulis sparsis, albidis vel carneis, laxis, minutis, ad 0·1 mm. diam.; conidiis falcatis, utrinque similiter curvatis, triseptatis, 24–32 × 4 μ.

Fusarium uredinicola n. sp.

Acervuli white, minute; conidia falcate, ends obtuse, three-septate, 36–46 × 4 μ. On *Uredo Microglossæ* Petch on leaves of *Microglossa zeylanica* Clarke, Hakgala, May, 1913; No. 4731 in Herb. Peradeniya.

Acervulis, albis, minutis; conidiis falcatis, obtusis, triseptatis, 36–46 × 4 μ.

Cerebella Ischæmi n. sp.

Stromata circular or elliptic in outline, flattened pulvinate, up to 3 × 1 mm.; conidia in subglobose or ovoid clusters, 14–16 × 12–16 μ, black-brown; single conidia 7–10 μ diameter, minutely warted. On *Ischæmum ciliare* Retz, Hakgala, May, 1912; No. 4435 in Herb. Peradeniya.

Stromatibus rotundatis vel ellipticis, depresso-pulvinatis, ad 3 × 1 mm.; conidiis, 7–10 μ diam., minute verrucosis, nigro-brunneis, in racemis subglobosis vel ovoideis, 14–16 × 12–16 μ, conglobatis.

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EDITED BY

T. PETCH, B.A., B.Sc.

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On the Formation of Nodules in the Cortex of Hevea brasiliensis Muell.-Arg.

BY

G. BRYCE, B.Sc.

Assistant Government Botanist and Mycologist.

WITH the development of the rubber industry and the planting of large areas in the Eastern Tropics under *Hevea brasiliensis,* a striking pathological condition of the cortex was brought to light. In the cortex of certain trees small woody bodies of varying shape and size were found; these bodies were termed "burrs" or "nodules." As the rubber plantations became oldeı and the trees bigger in girth, tapping operations to obtain the latex from the cortex were begun. These burrs or nodules, which were considered to be comparatively rare in untapped trees, now appeared to occur more frequently in trees where tapping had been in progress for some time. However, other circumstances might combine to render their occurrence apparently more frequent; tapping operations would disclose their presence in trees where, perhaps, owing to little outward sign, they had not been suspected before. In parts of the tree not tapped their size, increasing with age, would ultimately result in their discovery.

The presence of nodules of several years' growth is at once detected by the characteristic, gnarled, and knotted appearance of the stem of a tree so affected. Tapping may be seriously interfered with, or even rendered quite impossible in trees badly affected. In a younger stage nodules may cause only a slight swelling externally, and they may then somewhat resemble the callus formed as a result of tapping injuries to the stem wood.

Swellings on the *Hevea* stem were shown by Petch (21) in 1905 to be of two kinds. The first kind is caused by wounding the cambium of the stem, usually by tapping too deeply.

The wound thus produced is closed over in a manner common to trees in general, *i.e.*, the living cambium cells surrounding the wound undergo rapid division and give rise to a callus or cushion of tissue which grows over the wound area and ultimately covers up the wound. A swelling is thus formed over the site of the wound, but this gradually disappears in the subsequent growth in thickness of the stem. Thus, tapping is not interfered with permanently, though care is necessary when again tapping over this point to avoid grazing the woody swelling on the stem wood, if it is not yet merged in the subsequent growth. This healing process is known as "occlusion," and is a method whereby the tree covers up exposed wood areas and re-unites the severed edges of the cambial layer, so that one continuous cambium is again formed, and the stem can continue its normal growth in thickness. The new wood, however, never unites across the wound with the old wood, and in sections across the stem the wound is always visible. The cause of this kind of swelling being known, measures can be adopted to avoid producing it.

The second kind of swelling is due to the production of nodules. About the cause of the production of nodules much difference of opinion prevails; several explanations have been advanced, but none so far has found general acceptance. A nodule at first is a little isolated body of woody tissue lying in the cortex, usually about the size of a "pea" when first observed, and easily "shelled out" with a penknife. There is little to indicate its presence at this stage—occasionally a small protuberance, or a slight cracking of the bark externally. In later stages these "peas" increase to the size of a "hen's egg," or many "peas" fuse together and form an irregular mass; or, again, large sheets of woody tissue are produced. At the same time growing points originate, which grow inwards and unite with the stem wood, and thus ultimately the nodular masses become connected with the stem wood at many points. As the nodules grow larger the stem becomes gnarled; the cortex cracks and latex oozes out; finally, the entire stem to a height of 5 or 6 feet from the ground is affected. In this condition it is impossible to carry on tapping, and the tree is useless.

Distribution.

Nodules have been recorded from every country where plantations of *Hevea brasiliensis* have been established ; they are found in Ceylon, the Federated Malay States, Singapore, Java, Sumatra, South India. One record (16) comes from Dutch Guiana ; this is noteworthy, as Dutch Guiana is on the reverse slope of the Amazon Valley watershed, and probably has *Hevea* indigenous to its flora.

In a report (1) prepared for the Brazilian Government, Akers says of the Malay Peninsula : " The worst pest brought to the notice of the Commissioners was the formation of burrs or nodules in the bark. While these do not materially affect the health of the tree, they are a serious interference to tapping. They occur principally on old trees that have been badly tapped in past years, but they are found also on trees that have never been tapped. Dr. Huber considers that they are the result of suppressed bud expansion combined with bad tapping, and this diagnosis is supported by Mr. Lewton Brain, the Director of Agriculture at Kuala Lumpur. Dr. Huber further thinks that they may be induced by the action of sun on renewed bark causing an irritation ...... It is worthy of note that in the Amazon Valley, where the trees have been hacked about to a merciless extent by the use of the small axe (*machadinho*), these nodules are practically unknown."

It is interesting, in view of the statement contained in the last sentence, to read a report (2) on the Amazon Valley made by Akers for the Brazilian Government : " The older trees are hacked about in disastrous fashion ...... Naturally the trunks have become a mass of wooden warts with only a thin covering of bark." Again, Akers says later : " At every stroke of the axe the cambium is penetrated ...... Moreover, these gashes in a very short time transform the trunk into a mass of knots and warts, half the size of a man's fist, and over these only a thin covering of renewed bark is formed in the course of the next year or two."

As early as 1877 *Hevea* so deformed had been reported from Brazil. Cross in his report (9) to the India Office says : " From the ground up to a height of 10 or 12 feet the trunk was one swollen mass of warty protuberances and knots covered with thick scales and flakes of dry bark." Aker's statement, that nodules are practically unknown in the Amazon Valley, was made before his visit to report on that place, and appears too sweeping. The " warty protuberances and knots " mentioned by Cross, the " mass of knots and warts " mentioned by Akers, and the presence of nodules in Dutch Guiana reported by the Department of Agriculture there are together good evidence that nodules are not " practically unknown in the Amazon Valley." We may conclude that nodules occur in *Hevea* in its native habitat in Brazil.

Previous Records.

Gnarled stems early attracted attention in the East. Ridley in 1904 was the first to describe (25) knots on Para rubber trees : " They are perfectly harmless, and have no connection with any fungus or insect bite, but are due to the irritation caused by suppressed buds in the stem ...... The only objection to them is that they often interfere with the tapping cut, but they are easily knocked out if so, and if left are usually covered up eventually by the later growth of the trunk and so disappear."

Petch in 1905 published a more detailed description (21) : " The structure of these knots is identical with that of the ' maserknollen ' (nodules) of beech and other trees. They are formed in the bark by an adventitious cambium, which has no connection with the main cambium of the stem."

In 1907 Ridley discussed (26) burrs more fully, and adduced some detail in support of his hypothesis, that they are derived from the abnormal development of dormant buds. He mentions that on some trees which had been tapped by the Brazilian method burrs had formed on the tapping cuts, and had later sent forth shoots. In the same Bulletin a correspondent describes nodules as occurring on tapped and untapped trees : the nodule begins as a small globule of wood, and has a spur point penetrating the main cambium and joining up with the wood of the tree. The suggestion is made that the pricker chips off and leaves small fragments of wood surrounded by cambium, and thus these unpleasant growths start.

Petch published a Bulletin (22) in 1909 on "Abnormalities in *Hevea brasiliensis*," in which is given the most detailed description of nodules up to that time, and the question of their origin is discussed. He found that nodules arise wholly in the cortex ; they increase in size, and may fuse together to form woody plates ; as they increase in size a projecting point appears on the inner surface of the nodule, and grows in towards the wood of the stem, with which it ultimately fuses. "The formation of this point appears to be due to the pressure exerted by the developing core, which apparently prevents the formation of normal cortex between it and the wood of the stem at the points of nearest approach." Latex obtained from the cortex over nodules is often of a yellow or chrome colour. Clots of almost dry rubber were obtained from pockets or cavities occurring where the cortex had died and become separated from the wood of the stem. Cross sections of nodules show a central nucleus of dead bark cells or of stone cells ; round these a cambium had been developed, and had given rise to a nodule by laying down wood cells and fibres internally and bark cells externally.

Gallagher in 1909 attributed (11) the formation of nodules to early bad tapping, and believed them to be dormant buds. Later (12) he distinguishes three types of burr : his first two types are simply different stages of our nodule, his third type being the swelling due to the formation of wound wood on the main stem following a wound to the stem cambium.

Bancroft in 1911 published a paper (3) on the occurrence of burrs on *Hevea*. He distinguished between nodules proper and swellings due to wounding the stem cambium. The nodules he attributed to the natural habit of the tree to produce dormant buds, which fail to develop into shoots. These are stimulated to activity by tapping, and give rise to nodules. He mentions the production of woody masses in forest trees as a consequence of wounding or of increased illumination after thinning out ; these woody masses originate from dormant buds stimulated to growth. "The burrs on *Hevea* are similar in all respects to these above-mentioned structures. They are in their nature and mode of origin buds which have failed to develop into shoots. The most convincing evidence in favour of this is the abnormal occurrence in which shoots can sometimes be produced from such burrs, there being a definite organic connection between the shoot and the core of the burr."

Petch in his book on *Hevea brasiliensis* (23) considers that tapping has some effect in leading to the formation of nodules, and that there is no support for the statement that these burrs "work out" if left alone. "The production of burrs is not a universal habit of *Hevea brasiliensis ;* indeed, they are comparatively rare on untapped trees ...... freedom from burrs is a character which should be required in the selection of seed bearers." Petch comes to the conclusion that burrs are not caused by insects or fungi.

Rutgers in Java, in his description of canker in *Hevea* (27) in 1912, says that nodules are an after-result of an attack of canker. From behind the canker areas a brown colouration spreads out in streaks ; these streaks reach the inner cortex and then expand and discolour large areas. These brown-coloured streaks and areas are composed of dead cells, and they remain in the bark long after the external cankered area has disappeared. They are apparently not caused by the fungus itself, but rather by poisonous products emanating from the fungus. The living cells round these dead areas begin to divide, and ultimately nodules are formed. Nodules are thus a secondary result of an attack of canker. Rutgers does not explain how the poisonous products, in their passage through the tissue intervening between the cankered area and the inner cortex, leave that intervening tissue unaffected. This appears to be a serious objection to his hypothesis.

Bateson translated (4) and discussed Rutgers' paper in 1913. Later he published a discussion (5) on the formation of nodules, in which he records from his observations that nodules arise on old leaf scars, although some occur between old leaf scars, and many occur at the base of old trees, where the leaf scars are totally obliterated. The vascular strand of the leaf passes through the cortex of the main stem and joins up with the central vascular system. When the leaf falls, the part of the strand in the main cortex remains there more or less isolated, and in the further growth of the main stem it loses its connection with the central vascular system. The cells of the strand are carried sideways in both directions, and become scattered in small fragments along the whole length of the leaf scar. These cells are functionless, and may contain easily decomposable substances; the decomposition products would set up a state of irritation in the surrounding cortical cells. These would begin to divide and a cambium would arise, which would form cells round the point of irritation so as to isolate it from the adjacent healthy cells, and so a nodule would be formed. Bateson points out that this theory accounts only for nodules occurring on leaf scars, and suggests that for the formation of a nodule it is probably necessary to have only a small point of irritation; thus, local death of cortical cells, from various causes, might give rise to nodules in areas outside the leaf scars. He states further that this theory does not account for nodules occurring on tapped surfaces, where the cortex containing remains of leaf bundles is pared away.

A short note by Bateson (6) in a later Bulletin announces his discovery that the irritant present in the cortex is the coagulated latex in old latex vessels. This causes burrs to originate in both untapped and renewing bark.

Kuijper in 1913 gave a detailed account of the structure of nodules (16); he mentions the presence of a brown point or line in the centre of the nodule, consisting of ordinary cortical parenchyma cells, and occasionally a single sclerenchyma cell. These are surrounded by wood elements arranged radially round the brown centre, consisting of wood parenchyma with tracheidal elements and libriform fibres. Towards the periphery of the nodule the wood parenchyma is disposed in groups between other wood elements. Cells resembling wood vessels occur. The whole is enclosed by a cambium. The wood fibres are strongly curved and of irregular outline. In the cortex are found brown points and lines consisting of dead cell groups round which cambial activity sets in; this represents the first stage in the formation of a nodule, but the origin of the dead cell groups is obscure. Kuijper, after close examination, concludes that plant and animal parasites play no part, and that nodule formation is induced by tapping or otherwise wounding the tree.

In two later Bulletins (17 and 18) Kuijper considers that the formation of nodules points to the existence in *Hevea* of a strong tendency to produce abnormal growths, this tendency being accentuated by tapping or otherwise wounding the tree. Normally the cortex is subjected to internal pressure owing to the growth in thickness of the wood of the stem. In nodular cortex there is, in addition, the pressure owing to the growth of the nodules. This must have a disturbing effect on the tender cambium of the main stem, and probably this disturbance is manifested in the uneven, pitted, and ridged surface of the wood of the main stem under areas of nodular cortex. He contends that the pricker has no effect in inducing nodule formation in normal trees.

Rutgers and Arens (28), in a paper printed for the Rubber Exhibition at Batavia (1914), discuss nodules as the result of an attack of canker (*Phytophthora Faberi* Maubl.). The fungus kills small points and lines of cortical tissue, and these areas of dead cells act as an irritant on the surrounding healthy cells, which then divide to form a cambium, and so nodule formation is begun. Rutgers, after a short visit, claimed to have found *Hevea* canker caused by *Phytophthora Faberi* in the Federated Malay States; but this cannot be held to be conclusive, as it is not borne out by the work of Federated Malay States mycologists. *Cf.* Brooks (8). The presence of nodules in the Federated Malay States is well known; thus, under the circumstances, canker cannot be satisfactorily considered as the cause of nodule formation.

Richards and Sutcliffe, in the Straits Settlements, in a pamphlet (24) issued in 1914, consider the question of the formation of nodules. They accept Bateson's theory of the development of nodules on old leaf scars, the stimulus to nodule formation being the irritation set up by the coagulation or decomposition of the latex in the fragments of latex vessels remaining from old leaf traces. They apply the theory to the formation only of pea-like nodules. The plate and sheet nodules are formed round the outer latex vessels, as they are gradually pushed outwards and broken up by the new cortex which is continually being formed by the cambium; the stimulus to nodule formation is again the irritation set up by the decomposition of the contents of these latex vessels. In the course of tapping latex vessels may be severed above and below, and the latex in the remaining portion may coagulate or decompose and so inaugurate nodule formation. The latex does not appear to coagulate in the latex vessels, but rather seems to exude into the surrounding cells. The authors admit the difficulty that only a few leaf traces give rise to nodules, and only a few stems tapped or untapped have nodules present; their theory would require nodule formation to be the rule rather than the exception.

Keuchenius (14) in 1914 discussed the effect of the pricker in inducing the formation of nodules, and came to the conclusion that the pricker was the chief agent, but that nodules might also be formed as the result of injury from fungus or insect attack. The pricker, especially if the teeth are blunt, tears the cortex and pushes cells bodily out of position. The pricker marks are healed up in the usual way; a cambium forms round them, which produces cork cells externally, and so closes the wound in the cortex. The bodily displaced cells, however, become a source of irritation to the surrounding cells, which then begin to divide, and so give rise to a nodule. It can, however, no longer be maintained that the pricker is even the chief cause, as the pricker has fallen into almost complete disuse; yet nodules are found on many trees now in tapping, but to which the pricker has never been applied.

Bateson in 1914, in a later Bulletin (7), expands his theory of the origin of nodules. He states that "Coagulation of latex inside the vessels takes place normally in the outer cortex, and does not apparently give rise to burrs. From this it may be inferred that the cells of the outer cortex have lost their power of responding to this particular stimulus by forming a cambium; the cells of the inner cortex being younger are probably more easily stimulated into a resumption of cambial activity." From the evidence adduced later it will be seen that this statement is open to some doubt, as inception of nodule formation was observed to occur almost invariably in the outer cortex.

Bateson cites three causes which may lead to the isolation of latex vessels, stagnation of movement of the latex in the vessels, and consequent formation of nodules; these are (1) leaf-fall, (2) disease, (3) wounds. In the case of disease, healthy patches of cortex may be isolated by the diseased tissue, and in these patches nodules are found. Exhaustive tapping is considered as a further cause of the development of nodules. His conception of root pressure is faulty, and the assumption of a diurnal vertical movement of the latex in the latex vessel under the influence of this root pressure is unwarranted on the evidence led. The evidence cited applies normally to every *Hevea* tree; we would therefore, on this theory, expect to find nodules occurring as the normal condition; actually they are found only on a very small percentage of trees.

In the present Paper a clear distinction is drawn between "nodules" and "globular shoots." By "nodules" is understood the woody structures formed round altered latex vessels. "Globular shoots" are the spherical woody structures formed as the result of the slow growth of dormant buds, which have lost their vascular connection with the stem. These latter comprise the great majority of the structures found in untapped trees.

Macroscopic Appearance.

Stems with large nodular growths are externally strongly gnarled and warted. The area of stem affected may range from quite a small patch of a few inches across up to an area comprising the whole circumference of the stem to a height of 5 or 6 feet. The surface of the bark is covered with warts and protuberances; deep cracks and fissures abound, from which latex often of a yellow or chrome colour oozes out and coagulates.

In the early stages the nodules are little spherical or elongated bodies of 1 or 2 millimetres diameter, which can only be detected with difficulty. The first outward indications are a slight raising and cracking of the bark. The nodules at this stage are like little "peas" of wood lying in the cortex, from which they can easily be "shelled out" with a penknife. The nodule separates from the cortex along the line of the nodule cambium; between this and the stem cambium there is a layer of normal cortex.

Where several small nodules occur close together their cambial layers may meet and unite, thus producing a multiple nodule. Often a large nodule in its growth meets and fuses with small nodules, which then appear as excrescences of the large nodule.

The older nodular masses vary considerably in size and shape. Some specimens are much developed in thickness, and project very considerably from the surface of the stem; some of these measure 3 or 4 feet in length, 6 or 7 inches in breadth, and 3 or 4 inches in thickness. At other times a plate or sheet of nodular tissue is formed. One such plate at Peradeniya measures 4 feet 9 inches long, 6 inches broad in the middle, and 1 to 2 inches thick.

Occasionally nodules are obtained which exhibit a network shape strongly resembling the network of a latex vessel cylinder in tangential section. This type of nodule exactly represents what would occur were the latex vessels to be encysted by layers of woody tissue, and as will be seen later this appears actually to be the case.

At a very young stage nodules of only a few millimetres diameter may develop a vascular connection toward the wood of the stem; some nodules apparently never develop any vascular connection. This vascular connection ultimately reaches the wood of the main stem, the cambial layers unite, and the wood of the nodule thus becomes united with the stem wood. As the nodule grows more vascular connections are formed, and thus large nodules become united with the stem wood at many points. In the case of thick, massive nodules large areas of the nodule may become united with the stem wood, but no cases have been observed of complete fusion between nodule and stem. In the case of plate and sheet nodules fusion occurs to a lesser extent, the vascular connections remaining more or less isolated. Hence between such large nodules and the stem wood there are considerable areas of the original cortex.

Similar vascular connections are sometimes developed from the stem cambium and proceed in an outward direction toward the nodule. In addition, the surface of the stem wood is pitted, these pits corresponding in position with the vascular connections from the nodule. The surface of the stem wood and of the nodule is irregular, corresponding with irregularities on the adjacent cortical surface, the condition being due to unequal cambial activity under the abnormal state of the tissues. The surfaces of nodules are marked with raised ridges running in parallel undulating lines and in places describing whorls. Similar raised undulating lines can be traced on the stem wood in many instances.

On cutting into nodular cortex, pockets or cavities of several inches diameter containing rubber are frequently encountered; occasionally these are lenticular in form. Petch (23) states as follows: "I have taken three ounces of almost dry rubber from such a situation." These cavities may have been formed by the rupture of the cortex under the internal strains set up by the developing nodule. Latex would then flow from the ruptured latex vessels into the cavity and would coagulate there. Such pockets of rubber are likewise found in trees subsequent to attack by parasitic fungi, more particularly after attacks of canker (*Phytophthora Faberi*).

Nodules do not extend to the parts cf the plant below ground; they are not found on the roots even when these are exposed to the air, though the stem may be badly affected down to the ground level.

Nodule formation appears to spread out in all directions over the stem from the point of origin.

Untapped trees up to eleven years old have been examined in large numbers, but not one case of large, massive nodular growths has been found by the writer on such trees.

Structure.

Transverse sections of nodules show three zones of tissue :—

(*a*) A central core, dark brown in colour, appearing as a point or line. It consists of cortical elements, and represents that portion of the original cortical tissue round which cambial activity started in the formation of the nodule.

(*b*) Surrounding the core is a zone of wood elements derived from the nodule cambium. These form the bulk of the substance of the nodule.

(*c*) On the outside is the nodule cambium with the few cortical cells which it cuts off externally.

(*a*) *Central Core.*

The central core, in transverse sections, appears to the naked eye as a dark brown point or line, and in longitudinal sections as a brown line or plate respectively. It consists of one or several latex vessels surrounded by cortical cells containing a dark brown tannin, and outside these a few cortical cells without tannin.

In normal cortex transverse sections show the latex vessels disposed in concentric rings; thus, in a length of stem they could be represented diagrammatically by a series of cylinders fitting one inside another, but separated from one another by approximately equal spaces. While the latex vessels of any one cylinder branch and anastomose abundantly within that cylinder, they do not form any connections with latex vessels of neighbouring cylinders. Each cylinder is thus completely isolated from adjacent cylinders. The latex vessels are accompanied by prosenchymatous cells, some of which have a tannin content; such tannin cells are isolated or occur in little rows. The latex vessels with their prosenchymatous cells and the sieve tubes and companion cells pursue a parallel course; when they encounter a medullary ray in their vertical course in the cortex, they diverge and pass round it. In tangential sections, therefore, the medullary rays appear to lie in pockets or enclosed areas formed by the latex vessels, prosenchymatous cells, sieve tubes, and companion cells.

In a nodule the central core shows all these points of structure. The latex vessels in the core are derived from only one latex cylinder, as there is only a single row of them. They are accompanied by prosenchymatous cells, and in longitudinal sections the medullary rays are observed to lie in pockets formed by the latex vessels, prosenchymatous cells, sieve tubes, and companion cells. The tannin cells here completely surround the latex vessels in varying numbers, but much more abundantly than in normal cortex. The central core thus consists of a patch of cortical tissue, which has been encysted by the formation round it of a cambium which produces wood cells.

The presence of latex vessels can be demonstrated by staining and maceration. The rubber content stains pink with tincture of alcannin, and reddish orange with Sudan glycerine, and the characteristic, contorted appearance of a strand of rubber is plainly evident. Digestion of sections in Schulze's maceration mixture for 30 minutes in the cold leaves the rubber content intact, while other cell contents are dissolved. Sections of nodules freshly taken from a tree show that the latex vessel content is already coagulated; no latex oozes out from the cut surface of the central core.

Tannin cells surround the latex vessels of the core in a layer of varying depth. Some cells contain a yellowish tannin, which readily turns blue with ferrous sulphate solution, and appears not to differ from tannin in normal cortex. Similarly, just as in normal cortex, cells with a dark brown tannin content are present. A few of these readily turn blue with ferrous sulphate, but the majority are acted on only very slowly, and apparently contain an insoluble tannin or tannin compound, which is highly resistant even to Schulze's maceration mixture.

In the core the cell walls of the latex vessels, the latex vessel content, and the cell walls of the tannin cells and of the neighbouring cortical cells are all of a yellow colour. This colouration appears to be due to the infiltration of some coloured substance. In some places only the middle lamella is coloured, and occasionally the colouring matter is found occupying neighbouring intercellular spaces. Again, only the secondary thickening layers of a cell wall may be coloured. Generally, however, the whole wall is coloured. The colouring matter permeates the tissue in such a way as to suggest diffusion from the latex vessels of the core. The colouring matter is not acted on by iron salts; in a tannin cell the content turns blue, but the wall remains yellow. It is insoluble in alcohol. With 1 per cent. osmic acid the tannin content rapidly turns blue or black, but the walls darken only very slightly and slowly. The yellow colouration is probably due to the production of some decomposition product in the latex vessels; its subsequent diffusion into the surrounding cells results in the staining of the cell walls. This is the first symptom of the change in the latex vessel content. Sections of nodular cortex showing very early stages have been obtained; and these show the inception of nodule formation round latex vessels belonging to the same latex vessel cylinder. Some latex vessels are surrounded by cortical cells, whose walls show the yellow colouration only. Round adjacent latex vessels the cortical cells have yellow coloured walls and, in addition, an abundant tannin content. Further, some of these last show cell division beginning in the neighbouring cortical cells. The diffusion of this yellow colouring matter appears to stimulate the cells to the production of tannin ; possibly the tannin is secreted as a means of protection against the poisonous effects of the yellow colouring matter.

The cell walls of the latex vessels and other elements in the central core are thickened, often strongly thickened. The cell walls are lignified and take on all the lignin stains. The fact that the latex vessel walls are lignified indicates that the lignification occurs subsequently to the inception of the nodule. The other lignified cells are ordinary cortical cells, and have no resemblance to the stone cells of the cortex ; their thickened walls are not striated and pitted as are the walls of stone cells. Stone-cell groups occasionally occur in the core as accidental inclusions.

Starch is found in the core in varying quantity, and crystals of calcium oxalate may also be seen.

(*b*) *Wood Elements.*

These consist of cubical wood parenchyma cells, medullary rays, tracheides, short tortuous vessels, and fibres.

The cubical wood parenchyma cells are the first productions of the nodule cambium, and immediately surround the central core. They are disposed in a regular manner radiating out from the centre.

The medullary rays are similar to normal medullary rays, and also radiate out from the centre. They can often be traced continuously from the cortex into the nodule, right across the nodule, and into the cortex beyond again. The nodule cambium thus lays down medullary ray cells continuous with those in the cortex. This facilitates the transport of food material into the nodule and its storage as starch, which is sometimes very abundant. A little tannin may occur in the medullary rays.

Near the centre wood vessels are absent, but they are produced in increasing number toward the outside. They are a little narrower in lumen than normal vessels, and are extremely tortuous. They have a longitudinal course in the nodule, and terminate abruptly at each end. They have large bordered pits as in normal wood.

The libriform fibres are found at the ends of the nodule mainly, where the surface is very sharply curved. At these points wood parenchyma cells are at first produced, but the growth of the nodule entails a very rapid increase in surface. To meet this the cambium cells elongate, and cut off correspondingly elongated wood parenchyma cells. The elongation continues, and long prosenchymatous cells are produced. These cells are interwoven with one another, due perhaps to irregular elongation or curving of the cambium cells under the internal strains set up in the tissue by the growing nodule. Isolated cells can be obtained by maceration; they exhibit many fantastic and bizarre shapes. These are the libriform fibres, but it is possible that in elongating some of the prosenchymatous cells develop abnormal shapes, or that tracheides may also be thus changed.

Over the rest of the surface of the nodule, with increasing girth, the wood parenchyma cells undergo a similar elongation, but to a lesser extent. A cambium cell undergoes for a time ordinary tangential division and consequent elongation; it then divides radially, so that two daughter cambium cells are formed in its place. These undergo the same cycle in the further growth of the nodule.

In large nodules the outer layers are nearly normal. Twisted and curved elements disappear, the vessels pursue a straighter course, and there is little to distinguish the sections from normal wood.

The central core is sometimes excentric, owing to more rapid growth on one side of the nodule than on the other.

The starch content of the wood parenchyma and medullary rays is often abundant.

The vascular connections of nodules, which ultimately join up with the stem wood, are exactly similar to the vascular connections on globular shoots. The vestiges of such vascular connections are frequently found completely overlaid by layers of wood tissue produced in the subsequent growth of the globular shoot. Exactly the same feature is found in some typical nodules, where aborted vascular connections occur completely sunk in the tissue of the nodule. In globular shoots, under suitable change of conditions, growth may be resumed, and disconnected vascular connections again become connected with the stem wood. The vascular connections of nodules arise under conditions of activity in the cortex, and their whole appearance and occurrence suggest a close analogy with those of globular shoots.

(c) *Nodule Cambium.*

The nodule cambium arises from cortical cells, which become active and begin to divide. It cuts off wood cells internally and cortical cells externally, the latter only to a small extent. Latex vessels are produced externally by the nodule cambium only after a long period of division, and then only sparingly. In the cortex overlying old nodules the latex vessels are scanty ; this is very noticeable in sections ; and in the field, in tapping such cortex, a poor yield of latex is obtained. It will be seen from the following that such cortex may with good reason be considered as entirely the product of the nodule cambium.

In normal cortex two zones can be quite clearly distinguished, *i.e.*, the inner cortex and the outer cortex. The inner cortex in longitudinal section exhibits well-developed latex vessels, sieve tubes, cortical cells mostly prosenchymatous, comparatively few cells with tannin content, no stone cells ; and the medullary rays are quite distinct. The outer cortex is marked by the presence of abundant stone cells, fragmentary remains of latex vessels, and abundant tannin cells ; the medullary rays are indistinct, and the cortical cells are hexagonal or isodiametric.

In the cortex overlying old nodules the inner cortex is normal. The outer cortex differs strongly from the normal in the almost entire absence of stone cells and the much greater abundance of tannin cells. The absence of stone cells is very noticeable in cutting sections ; it is extremely difficult to obtain sections of normal cortex, whereas nodular cortex cuts easily. Correlated with the absence of stone cells in the outer cortex are the following :—The medullary rays are distinct, the latex vessels are continuous, and the difference between inner and outer cortex disappears to some extent. There is, however, a slight difference, in that the outer cortex has a greater abundance of tannin cells, and the cortical cells are isodiametric. Such differences in the structure of the cortex, more particularly the absence of stone cells in the outer cortex, could not be brought about by changes in the original cortex. Further, old nodules of large size effectively exclude the stem cambium for contributing cells towards the renewal of the cortex; hence, in the course of time nodules would be exposed by the gradual shedding of the cortex as bark. Tissue thus shed as bark cannot be made good, unless the nodule cambium cuts off cortical cells. The fact that old nodules are not exposed, and the abnormal structure of the cortex covering them, indicate that the nodule cambium produces cortical tissue. This cortex produced by the nodule cambium may become very thick ; some specimens are almost twice the thickness of normal cortex.

After a longer or shorter period of growth the nodule cambium develops a projection directed towards the stem cambium. The two cambia finally meet, merge into one another, and continue to produce wood cells internally. Thus, a bridge of wood cells is formed joining up the wood of the nodule with the wood of the stem. This may proceed simultaneously at several points on the same nodule and several connections be formed, but these remain isolated, hence the inner surface of the nodule never becomes wholly fused to the wood of the stem. In old nodules there are many connections, but there still remain areas of cortical tissue between the nodule and the stem wood.

The writer has obtained radial sections of cortex in which the inward-growing projection of a nodule had a corresponding projection proceeding outward from the stem cambium to meet it.

Sections show that the inward-growing projection of a nodule may cause the stem cambium to lag behind in activity of division in its vicinity, so that a depression or pit is gradually formed in the stem wood. Generally the abnormal strains set up in the cortex by the growth of the nodule would result in irregular cambial activity, and thus ultimately in a pitted and warty surface. This is probably the mode of origin of the majority of the pittings on the stem wood and on the nodule.

Nodular Cortex.

Under this heading will be considered cortex in which nodules are developing. Sections of nodular cortex showing early stages of nodule formation can be readily obtained. Round a developing nodule the cortical tissue is much compressed and distorted. Cells are pushed outwards from the centre of formation and come to lie concentrically round the nodule. Sometimes stone-cell groups are thus displaced and form an almost complete ring, or an entirely complete ring, round the young developing nodule. It is obvious that the formation of a nodule sets up in the surrounding cortical tissue unusual internal strains, which would have an immediate effect on dividing cells and even on mature cells. This probably accounts for the abnormal shape of cells and the abnormal curvature of cell walls often seen. The inner cortex is in nearly every case quite normal; nodules originate in the outer cortex at varying distances from the inner cortex, or very rarely in the inner cortex.

Old nodules are often of considerable size and of various forms; roughly, they form either plates or rounded masses of nodule tissue. Sections through the central core show that cell division begins simultaneously round several adjacent latex vessels in the same cylinder, and that the several cambia on coming into contact merge into one another and form one continuous cambium round the whole. A large nodule in its development may come in contact with small nodules near it and fuse with them. This is plainly seen in the external appearance of some nodules which seem to have small nodules adhering to them; sections show that the central core of the small nodule is not connected with that of the large nodule. By such continued fusion, plate or sheet nodules may arise; but more often these appear to arise by the growth of a nodule from its point of origin along the ramifications of a latex vessel cylinder or by simultaneous encrusting of the latex vessels over a large area. Nodules occur, which branch and have a distinct net structure ; there are open meshes where growth has proceeded along the latex vessels only, and left the intervening cortical tissue unchanged. This intervening cortical tissue consists of medullary rays, as the meshes formed by the ramifications of the latex vessels in normal cortex are occupied by the medullary rays.

In gouging a nodule out of the cortex a brown point is frequently observed at each end of the nodule, and this is seen to coincide with a similar brown point in the cortex. These brown points are the altered latex vessels and their neighbouring cells. The central core of the nodule is here continuous with the cortical tissue ; the nodule would probably continue its growth along the latex vessels thus altered.

In nodular cortex, which is still more or less normal, longitudinal sections show the presence of vertical areas of abnormal tissue consisting entirely of parenchymatous cells. These areas differ from the surrounding tissue in being free from tannin and stone cells, and in having abnormally curved cell walls. They appear to arise as the result of indefinite cell division over a small area, and occur generally between the inner and outer cortex. The medullary rays are quite distinct in the cortical tissue on either side of the abnormal area, and can sometimes be traced through it. This indicates that these areas arise subsequently in the cortex. They stand out prominently in sections as white areas amid the surrounding tannin-stained tissue. It might be suggested that the cortex is stimulated to this indefinite cell division by the presence of irritant substances diffused from the altered latex vessels, or that bud primordia are stimulated to growth and develop abnormally. Such abnormal areas have no definite cambium, and twisted cells with curved cell walls occur, which resemble the twisted tracheides of nodules, but are not lignified. Occasionally these areas are produced in the inner cortex near the stem cambium, when the cells of the inner cortex may be displaced and disposed in undulating lines, giving a tissue which strongly resembles that in the vicinity of developing vascular connections. In one case sections showed a developing bud structure with a definite cambium situated inside an area of abnormal cortex. In other cases the abnormal areas consist of twisted and curved cells with abundant tannin content; often these cells are disposed in the form of a whorl, and have been derived from cortical cells by indefinite division, the tannin content apparently not having any inhibitory action on cell division. The cortical cells surrounding abnormal areas always have an abundant tannin content.

A case was observed where altered latex vessels occurred in the inner cortex near the stem cambium; they were surrounded by a layer of tannin cells, and cell division had just set in. The same section showed a developing globular shoot with its vascular connection almost joined to the stem wood, the whole being in contact with some altered latex vessels in the inner cortex. This appears to be a satisfactory case of the production of a globular shoot from an adventitious bud in tissue stimulated to activity by the presence of altered latex vessels.

Sections of both nodular cortex and normal cortex frequently exhibit brownish-coloured streaks. These coloured streaks are most abundant in nodular cortex, and occasionally are seen in the above-mentioned areas of abnormal tissue and near developing nodules. This brown colouration appears to be confined to the walls of the latex vessels; it gives no reaction with iron salts.

The bright yellow colouration and highly refractive walls of altered latex vessels in nodular cortex are quite distinct from the brownish-coloured cell walls above described. The yellow walls of latex vessels in nodular cortex have no doubt some connection with the chrome-yellow latex sometimes obtained from nodular trees; normal latex is white. It would appear probable that some substance in the altered latex vessels of nodular cortex is of a yellow colour, and imparts this colour to the walls. In some cases nodular cortex yields a normal white latex; here probably the alteration of the latex vessel content has ceased.

Nodules to a small extent are shed with the bark scales. On old *Hevea* trees in the Royal Botanic Gardens, Peradeniya, the writer has found dead nodules of fair size in dead bark scales which were on the point of dropping to the ground. One such nodule was 2 inches long. Other large nodules were partially protruding from the bark, and were exposed on their outer surface. The exposed side was dead and dried up ; the inner side was still in living connection with the cortical tissue. It would be merely a matter of time till these nodules dried up completely and fell away with the bark scales. The writer has observed a similar condition on trees on estates, where the trees were much younger. In both cases other nodules were present which had joined up with the stem wood.

In cutting sections of nodular cortex one may find, in the outer cortex, small reddish-black points, which are extremely brittle, and crumble away before the razor. They appear almost as foreign bodies lying in the cortex, and easily separate from the surrounding tissue. They consist of portions of the cortex, including abundant stone cells and some cortical cells and latex vessels, all saturated with tannin. Sections can with difficulty be obtained, and require treatment with concentrated nitric acid to render them transparent, the tannin being then dissolved. Stone cells are by far the most abundant ; the remaining tissue is normal. The tannin here is probably secreted as a means of protection against some injurious effect emanating from these points. The nature of these reddish-black points has not been determined.

Nodules in Untapped Trees.

The first material collected from an untapped tree consisted of two specimens obtained from near the base of a five-year old *Hevea* on the Government Experiment Station at Peradeniya. Sections of these showed no latex vessels in the core, and the tannin cells so characteristic of nodules were entirely absent. These specimens were undoubtedly globular shoots derived from latent buds.

It became evident that the statement that nodules occur on untapped trees required some definite proof of its accuracy. Accordingly, 2,000 trees seven years old and untapped were examined. These trees formed part of a field on an estate. The result was as follows :—

121 trees had globular shoots, *i.e.*, 6·05 per cent.

6 trees had nodular structures of various types, *i.e.*, ·30 per cent.

No trees had true nodules.

In the 2,000 trees not one case of large nodular masses was observed, nor have such cases ever been noticed in untapped trees examined on many estates in various parts of Ceylon. It may be objected that untapped trees are too young to show nodule formation on a large scale. On one estate eleven-year old trees which had been in tapping only two weeks were examined; no trees showed large nodular masses. On the Experiment Station, Peradeniya, six-year old trees were brought into tapping in 1910, and in 1912, when eight years old, had developed large nodular masses in many cases. Tapping thus apparently supplies conditions favouring the rapid growth of nodules, though it is not necessarily an essential factor in their inception, and age is a negligible factor.

Nodules can be distinguished from globular shoots with certainty only under the microscope. A nodule when cut through the centre exhibits a dark brown point or line at the centre of the cut surface, and this can be used as a rough means of distinguishing it from a globular shoot, which has no such colouring. In the nodule the dark brown colour is due to the presence of the tannin cells surrounding the altered latex vessels. Globular shoots in untapped trees have evidently been frequently mistaken for nodules, and probably are usually the bodies in question when nodules are stated to occur in untapped trees.

Of the six cases of nodular structures obtained in the 2,000 untapped trees, three were found in the callus at the edge of long vertical wounds. In these the structure was not typically nodular; the rubber strands in the core occupied a cavity into which the latex had evidently oozed and coagulated. The cavity may have originated through internal lesions in the cortex, or through slight wounding by some external agency.

In the fourth case there was a large cavity filled with rubber at the base of a globular shoot; the cavity was closed over by subsequent layers of wood elements. The wood tissue of the structure at this point showed signs of a former callus nature, and without doubt this was a case of a globular shoot which had become exposed, possibly through the natural shedding of the bark, or through some injury, as this case was obtained from the callus of a vertical wound. This exposure was accompanied by outpouring of latex, and the callus formed at the exposed area of the globular shoot included the coagulated latex in the process of occlusion.

The fifth case showed no central cavity. In its place there was a core resembling somewhat a leaf-trace and coloured greenish-yellow like the colour of latex vessels in the core of true nodules. Surrounding this core was a shallow layer of tannin cells. Maceration failed to disclose the presence of rubber in the core.

The last case had a core composed of a fairly large portion of cortical tissue with several stone cells present. Maceration showed up two small particles of rubber indicating the presence of latex vessels, but these were in nowise altered, and cannot be taken as being the cause of the formation of the woody sphere. Surrounding the core, again, was a shallow layer of tannin cells, and the neighbouring wood tissue also had a considerable number of cells with tannin contents.

These last two cases are of considerable interest, as here we have instances of the encysting of cortical tissue under conditions other than the alteration of latex vessel content. This condition approaches very closely the condition in beech nodules described by Krick (15).

Here may be mentioned another type of nodule found in nodular trees generally and of not uncommon occurrence. In this type maceration of transverse sections shows the cells of the core embedded, so to speak, in rubber. There is no lesion of tissue. The latex has apparently oozed out of the latex vessels and coagulated in the neighbouring intercellular spaces. Richards and Sutcliffe (24), amongst an excellent series of microphotographs, show a good example of this type of nodule.

Globular Shoots.

Under globular shoots are considered those spherical woody bodies which are found isolated in the cortex, and do not possess a core as in nodules.

Where *Hevea* has been pollarded, strongly growing adventitious shoots develop just below the cut surface. They appear at first as spherical woody protuberances, which attain some size, and then send out a shoot. The protuberances in early stages have no connection with the stem wood, and therefore are derived from dormant or latent buds, and not from adventitious buds, which arise endogenously, and would thus have their vascular strand in connection with the vascular system of the stem. Very often the spherical woody body produced by the continued growth of such dormant buds, after they have lost their connection with the wood of the stem, can be detected at the base of shoots developing near the cut surface of pollarded trees. Sections through such developing shoots show that they consist of wood parenchyma, wood fibres, tracheides, and vessels. The tracheides are curved and the vessels somewhat tortuous, but they are continuous. Later a vascular strand, consisting mostly of tracheides and wood parenchyma, connects the developing shoot with the stem wood. In the centre of the base of the shoot the fibres are much curved and irregular, but become normal in the outer layers, the irregular structure indicating the position of the spherical woody body from which the shoot developed. The vascular connection with the stem wood is formed by a growing point directed inwards from the developing shoot tissue towards the stem wood.

Sections show that the spherical bodies are composed of twisted tracheides and wood fibres, with here and there a tortuous vessel, the several elements being interwoven in a highly irregular manner at the centre and becoming normal towards the outside. A cambium is present which produces a small amount of cortical tissue and latex vessels, the latter being determined as the product of the nodule cambium by their concentric disposition round the spherical body. On the inner side and directed towards the stem there is frequently a tapering point consisting of wood elements and resembling closely the vascular strand of a shoot. This undoubtedly represents the former connection with the wood, but in many cases it is entirely wanting. In some of these cases sections disclose the former connection completely sunk in the tissue of the spherical body ; the tapering point has ceased growth, and has been covered over by the subsequent layers of tissue laid down by the cambium of the spherical body. In other cases no trace of a former connection can be found, and here no doubt the bud primordium has lost connection with the stem at a very early stage before the appearance of vascular elements in the connection. Occasionally, amongst the last-named cases, a small protuberance may be found on the surface of the spherical body, apparently an attempt by the spherical body to develop a vascular connection with the stem. Under favourable conditions, as, for example, if the tree were pollarded, this protuberance would join up with the stem and the spherical body would grow forth as a shoot. Some specimens of these spherical bodies have vestiges of a shoot directed outwards, and sections have been procured which show a typical vegetative cone with leaf rudiments and rudimentary axillary buds.

The spherical bodies are thus shoots, and might be called globular shoots, as described by Strasburger (29). The sprouting of nodules mentioned by Ridley (26) and Bancroft (3) were probably cases of globular shoots stimulated to further growth by changed conditions. A specimen at Peradeniya shows a globular shoot of spherical outline without any external vestige of a connection with the stem, which has developed a shoot 4 inches long bearing a small leaf at its apex.

The material collected from the 2,000 untapped trees already referred to was classified as follows :—

(1) Material collected from old leaf-scars.
(2) Material collected from areas where the bark exhibited no marking.
(3) Material collected from wound callus.
(4) Material collected from the fork of trees with forked stems.

(1) *Material from Leaf-scars.*

The leaf-scars remain distinct on old stems up to six or seven years of age ; they appear as a horizontal line of depression 4 or 5 inches long, with a shallow pit in the middle. Generally, buds if present are dormant, and give no external evidence of their presence. In some cases, however, these dormant or latent buds of the old leaf axils lose their connection with the stem wood, but continue a process of growth, which results in the production of globular shoots lying isolated in the cortex. These bodies vary from the smallest size up to 3 or 4 centimetres diameter, and may be single, or several may be fused together in a horizontal row along the leaf-scar. Globular shoots have been obtained from the cortex of seven-year old trees ; hence the rate of development appears to be much more rapid in *Hevea* than in the beech, where similar bodies are found.

(2) *Material collected from Areas where the Bark exhibited no External Marks.*

This material agreed with the leaf-scar material ; in fact, it is highly probable that it should be considered as leaf-scar material, the leaf-scars having disappeared in the older bark from which this was obtained. Cases occurred where the globular shoots had fused together in a horizontal row, exactly as in the case of leaf-scars.

Two specimens were obtained which showed a deposit of tannin in scattered cells in the centre. This unusual secretion of tannin may have been due to conditions present before the latent bud had resumed activity resulting in the formation of a globular shoot. The tannin content was light coloured and readily turned blue with ferrous sulphate solution.

These first two classes of material comprised nearly the whole of the collection from the 2,000 trees.

(3) *Material collected from Wound Callus.*

Only seven specimens were obtained, and these were typical globular shoots save one, which was considerably elongated.

(4) *Material collected from the Fork of Trees with forked Stems.*

A few globular shoots were obtained which resembled in all respects leaf-scar and wound-callus material.

Trees are frequently seen which have been blown over by the wind or have otherwise been caused to fall ; they may have only a few lateral roots still in the ground, yet along the whole upper surface of the stem a copious production of new shoots occurs. These are derived from the latent buds which are stimulated to growth by the altered conditions. This indicates the readiness with which *Hevea brasiliensis* responds to changed conditions, the latent buds and globular shoots if present growing out into normal shoots. Similarly, standing trees if scorched by fire throw out large numbers of shoots from the adjacent unharmed cortex.

On leaf-scars a row of globular shoots may be found fused together to the number of five or six individual shoots; this demonstrates that several buds are laid down in each leaf axil and remain latent, unless conditions change and become suitable for a resumption of activity.

In both tapped and untapped trees globular shoots are occasionally obtained which have a central core of very small cells with strongly thickened walls. In these the vascular connections are completely wanting, nor do any cases occur where the vascular connection has been covered over in the subsequent growth of the shoot. Here undoubtedly the bud has lain dormant for some time and has slowly developed thickened walls, while at the same time the pressure of the surrounding tissue has prevented the cells from increasing in size. The absence of any point which might represent a vestigial vascular connection with the stem shows that the bud early lost connection with the stem and remained in a completely dormant state. Later, under some change of conditions, cell activity set in in the cells adjacent to the mass of small thickened cells of the bud, and resulted in the production of a globular shoot.

Many globular shoots consist entirely of wood elements, more or less tortuous, and show no traces of a former connection with the stem wood. In these the bud primordium may have become separated from the stem wood at a very early stage before the vascular connection had become differentiated into wood elements.

In the course of growth globular shoots are pushed outwards, and may come to have their outer surface exposed. In many cases the exposed surfaces are again covered over with tissue, but they are readily distinguished in sections owing to the abundant deposit of tannin in the adjacent cells, and the arrangement of the cells in the covering layers as in the callus in wounds. Latex may ooze out and coagulate on the exposed surface and later be included within the covering layers, and thus give the structure a fictitious resemblance to a nodule.

Large nodules in their development may meet with globular shoots, or may stimulate dormant buds to activity. These fuse with the tissue of the nodule on coming into contact with it, and later throw out vascular projections towards the stem wood. In some cases vascular projections might already be present when fusion occurred with the nodule. This does not account for all vascular connections of nodules, as in some nodules the vascular connection can be traced right into the altered latex vessel region of the core. It is possible, however, that even in these cases, at the inception of cell division near the altered latex vessels, a bud primordium was present, or that the cortical cells on being stimulated to activity developed bud or shoot characters.

Globular shoots never develop into large masses of woody tissue. The largest specimens obtained measured approximately 1 inch in diameter.

General.

Isolated wood bodies occur in the cortex of other trees. Sorauer's investigations (19, p. 183) on nodules in apple trees showed that the central core consisted either of hard bast elements or of cortical parenchyma cells ; the outer layers of wood elements were similar in structure to the wood elements of *Hevea* nodules. Sorauer was of opinion that apple nodules arise as a consequence of wounding, as they are readily formed in the vicinity of wounds. He describes short woody strands which he found in the cortex of pear trees ; these had a central core as in apple nodules, but the wood elements were arranged parallel to those in the adjacent wood. Sorauer considered these strands to be new formations.

Krick (15) minutely described the woody nodules found in the cortex of the beech, and distinguishes two types : (1) nodules bearing buds or shoots ; the wood of the bud or shoot can be traced continuously right through into the nodule ;

and (2) nodules independent of buds, which are again divided according as the central core consists of wood elements, of bast elements, and of cork tissue. Wood elements form the core in the majority of nodules, cork tissue is found in some, and bast elements were observed in only a single case. The nodules which occur in connection with dormant buds or abortive shoots, which have subsequently become separated from the stem wood, must be clearly distinguished from those nodules which originate as isolated bodies in the cortex. Krick thus considers beech nodules to arise from dormant buds and abortive shoots, or to be new formations.

Frank (10) comes to a similar conclusion from his own observations, and from a discussion of the papers of Krick, Sorauer, and earlier authors.

Under Kuster's (19) arrangement of plant pathology *Hevea* nodules would come under Hyperplasie, sub-section Heteroplastic Tissue, and would be classed near wound wood as "tissue resembling wound wood," included in which section are nodules of beech, pear, and apple. This classification is not quite satisfactory, as the structures described as "tissue resembling wound wood" appear sufficiently distinct to merit a more detailed definition.

The presence of globular shoots in *Hevea brasiliensis* can be fully accounted for within the normal life of the plant. "Every plant-body forms more primordia of organs than it is able to bring to maturity. Just as by far the greater number of seeds which are annually formed are destroyed, sometimes because they do not find favourable environment for their development, sometimes because they are overcome by other organisms in their 'struggle for existence,' so also some of the primordia of organs remain undeveloped because the plastic material which they require for their unfolding is taken by others which exercise a stronger attraction upon it" (Goebel, p. 207). Thus, of the buds laid down in a leaf axil one develops into a shoot, while its correlation with the other buds in the leaf axil results in their suffering arrest in development. That these arrested buds remain capable of development is seen in the abundant production of new shoots from old stems under suitable change of conditions; consequently these buds experience only temporary retardation. At a later date they may begin a slow process of growth, but having lost their connection with the stem and receiving an inadequate supply of food material, they are unable to develop normally, and thus globular shoots are produced.

The case of nodules is somewhat different, and here we undoubtedly have a new formation. The production of these nodular bodies is induced by a definite determining cause, namely, the alteration in the latex vessel content, where under normal conditions they would not be produced. As this alteration in the latex vessel content advances along the latex vessels, it is accompanied by the laying down of nodular wood round the latex vessels ; this is illustrated in the flat plate-like nodules of net structure with projecting points at the top and bottom ends.

In tapping operations on estates numerous opportunities occur for the transference of this abnormal nodular condition, if it is transferable, from affected trees to non-affected trees. From the small number of trees affected it must be concluded that it is not transferable, but rather that affected trees have a predisposition to alteration in the latex vessel content. This would affect estate practice, in that great care should be taken to select seed for planting from trees free from nodules, as recommended by Petch in 1906.

The question arises as to whether the alteration in the latex vessel content is brought about by external causes or by unknown internal influences ; it must be admitted that this point is still obscure. The evidence, however, lends support to the view that wounding (*e.g.*, tapping) has some effect in inducing the alteration in the latex vessel content in trees which are predisposed to this condition. In support of this view we have the fact that out of a large number of untapped trees systematically examined not one showed development of nodules, though this number includes trees up to eleven years of age. Out of 2,000 untapped trees eleven years old, six yielded nodular structures of about the size of a pea. Microscopic examination showed in four trees, where the structures were obtained from wound callus, that the structures were built up round cavities filled with coagulated latex.

Thus, in the absence of altered latex vessels in the core, these are not typical nodules, nor are they to be classed with nodules. In two trees structures were obtained which showed the central core to be composed of portions of cortical tissue without latex vessels, and thus these differ still more widely from typical nodules. These latter were obtained from the cortex where the bark had no special markings externally.

It would appear therefore that *Hevea* cortex is capable of developing woody bodies as the result of various disturbances in the cortex.

In the production of vascular connections with the stem nodules may exhibit a sort of polarity, as in the production of vascular connections by globular shoots on their inner surface. Some of the vascular connections of nodules may be derived from latent buds or globular shoots which have been caught up and absorbed by the nodule in its development.

There still remains to be determined the nature and cause of the alteration in the latex vessel content, and any advance in this direction will depend on advance in our knowledge of the constitution of latex and its function in the internal economy of *Hevea brasiliensis.*

Summary.

1. Nodules are produced in the cortex of *Hevea brasiliensis* as the result of an alteration in the latex vessel content.

2. This alteration has not been connected with the attack of any parasitic organism, but appears rather to be due to physiological changes in the latex.

3. The tendency to suffer alteration in the latex vessel content appears to be confined to certain individual trees which have a predisposition to develop this condition.

4. Four types of nodule have been distinguished :—

(*a*) Nodules formed round altered latex vessels.

(*b*) Nodules formed round lesions in the cortex into which latex has oozed and coagulated. May occur in any *Hevea* tree.

(*c*) Nodules formed round areas into which latex has oozed and coagulated; the coagulated latex occupies the intercellular spaces without lesion of tissue. May occur in any *Hevea* tree.

(*d*) Nodules formed under unknown conditions round areas of cortex from which latex may be entirely absent. Rare.

5. Globular shoots formed by the subsequent growth of latent buds after these have lost their connection with the stem occur in both tapped and untapped trees. They are distinguished from nodules by the absence of a core, and never form large masses of woody tissue as nodules do.

6. Nodules do not occur on untapped trees.

7. Nodules occur on *Hevea* in its native habitat in Brazil, and in Tropical America and the Eastern Tropics where it has been grown in plantations.

8. The percentage of trees which develop nodules is very small.

9. Tapping appears to induce nodule formation in predisposed trees.

10. This abnormal condition is apparently not infectious.

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Early Ceylon Seed Lists.

BY

T. PETCH, B.A., B.Sc.

THE systematic study of Ceylon botany may be said to have been begun during the Dutch occupation, and the earliest work is based on the collections of Paul Hermann, who was in Ceylon during 1672–79 and collected plants, chiefly in the neighbourhood of Colombo. The catalogue of Hermann's collection was published after his death by W. Sherard, in 1717, under the title of "Musæum Zeylanicum," and his specimens subsequently came into the hands of Linnæus, who published a full description of them under the title of "Flora Zeylanica."

Hermann is supposed to have also collected many fruits and seeds, which remained in the Leyden collection, and were not seen by Linnæus or included in his "Flora Zeylanica." Many of these were subsequently named and described by Gærtner in his "De Fructibus et Seminibus Plantarum" (1789–91), a work which consists of an extensive series of drawings of seeds and fruits from all the then-known parts of the world.

It is possible, however, that the Leyden collection received additions in other ways. In the course of the exchange of seeds and plants between the different Dutch possessions, or in the exploitation of their natural resources, many seeds and fruits of possible economic value, or remarkable for their peculiar form, would reach Holland, and some of these would no doubt find their way into museums and botanical collections.

Direct evidence of the exportation of collections of seeds from Ceylon to Holland is provided by two lists, now in the files of the Royal Botanic Gardens, Peradeniya, dated 1762 and 1785, respectively. The first is a list of one hundred packets of medicinal seeds sent to the Chamber of Delft; the second, a similar list of one hundred and fifty packets of medicinal seeds sent to the Botanic Garden at Leyden. The two lists bear the same signature, "Bt. Aleman." They were originally in the Record Office.

The lists give the native names of the seeds sent. In general, these names are in use at the present day, and the lists therefore are of interest, in that they provide evidence of the persistence of certain names, though we have, of course, no evidence that they now designate the same plant as they did 150 years ago, except in the case of those plants which were collected by Hermann. They are reproduced below, with the addition of the modern form of the name and the scientific name of the plant now known by that name. The inclusion of the modern form of the name in brackets indicates that such is the probable spelling, but no record of any plant bearing that name has been found. When both the modern form of the name and the scientific name are enclosed, the identification has been recorded, but has not been verified by any botanist, as far as has been ascertained. The remaining identifications are taken from Trimen's "Handbook to the Flora of Ceylon."

The spelling is fairly consistent: oe = u and ie = i, unless the e bears a diæresis, when ie = iya. G = h, or may = k.

List No. 1.

Cathalogus der Ceijlonse Rijpe medicinaale Zaden voor de Camer delft, Bestaande in hondert Sakjes; als

1.	Kekkerie	.. Kekiri	.. *Cucumis pubescens* Willd.
2.	Mara	.. Mara	.. *Albizzia Lebbek* Benth.
3.	Kierie gende	.. Kiri henda	.. *Celosia argentea* L.
4.	Siemboela	.. Siyambala	.. *Tamarindus indica* L.
5.	Ankende	.. Ankenda	.. *Acronychia laurifolia* Bl.
6.	Yamanara	.. [? Jamanaran	. *Citrus nobilis*, Clough, p. 190].
7.	Piene	.. [Pinna	.. *Clerodendron infortunatum* L., Clough, p. 353].
8.	Demote	.. Demata	.. *Gmelina asiatica* L.
9.	Moeroenga	.. Murunga	.. *Moringa pterygosperma* Gærtn.

10.	Annona ..	[Anona ..	*Anona squamosa* L., Clough, p. 34].
11.	Kiene ..	Kina ..	*Calophyllum tomentosum* Wight.
12.	Pota ..	Pota-wel ..	*Pothos scandens* L.
13.	Areloe ..	Aralu ..	*Terminalia Chebula* Retz.
14.	Yanbole ..	Jambola ..	*Citrus decumana* Murr.
15.	Talle ..	Tel-tala ..	*Sesamum indicum* L.
16.	Abbe ..	Aba ..	*Brassica juncea* HK. f. & Th.
17.	Giendam ..	Hindan ..	*Eugenia corymbosa* Lam.
18.	Tarenne ..	Tarana ..	*Webera corymbosa* Willd.
19.	Baloe ..	? Bala ..	*Nothopegia Colebrookiana* Bl.
20.	Kodoe mieries ..	Kudu miris ..	*Toddalia aculeata* Juss.
21.	Kook motte ..	Kokmota ..	*Eriocaulon sexangulare* L.
22.	Kerreu ..	Karawu ..	*Phyllanthus indicus* Muell.-Arg.
23.	Aukedie ..	— ..	—
24.	Ran motte ..	Ranmotu ..	*Xyris indica* L.
25.	Kabelose ..	Kabarasa ..	*Smilax zeylanica* L.
26.	Midile ..	Ela-midella ..	*Barringtonia acutangula* Gærtn.
27.	Koeroendoe ..	Kurundu ..	*Cinnamomum zeylanicum* Bl.
28.	Baloetore ..	[Balu tora] ..	—
29.	Gien madoe ..	Hin madu ..	*Ipomœa angustifolia* Jacq.
30.	Gasembile ..	Bu embila ..	*Antidesma Ghæsembilla* Gærtn.
31.	Rato loinde ..	[? Ratu olinda	*Abrus precatorius* var., Moon, p. 52].
32.	Katoetan palla .	Katu tampala	*Amarantus spinosus* L.
33.	Ambe ..	Amba ..	*Mangifera indica* L.
34.	Rat embela ..	Rat-ambala ..	*Ixora coccinea* L.
35.	Kieri poes ..	[Kiri pus] ..	—
36.	Radelie ..	Radaliya ..	*Connarus monocarpus* L.
37.	Baandoera ..	Bandura ..	*Nepenthes distillatoria* L.
38.	Ille-oliende ..	[Ela olinde ..	*Abrus precatorius* var., Clough, p. 85].
39.	Hatawarie ..	Hatawariya ..	*Asparagus* spp.

40.	Koon ..	Kon ..	*Schleichera trijuga* Willd.
41.	Yakberie ..	Yakberiya ..	*Crotalaria laburnifolia* L.
42.	Paluken ..	Palukan ..	*Uvaria zeylanica* L.
43.	Korekaga ..	Kora kaha ..	*Memecylon umbellatum* Burm. f.
44.	Maha poes ..	[Maha pus. ..	*Entada scandens* Benth. Clough, p. 470].
45.	Moore ..	Mora ..	*Nephelium longana* Camb.
46.	Koekoeroemaan	Kukurumaan	*Randia dumetorum* Lam.
47.	Kette kalle ..	Ketakala ..	*Bridelia retusa* Spreng.
48.	Ingoel ..	Hingul ..	*Amoora Rohituka* W. & A.
49.	Moenemal ..	Munamal ..	*Mimusops Elengi* L.
50.	Pere ..	Pera ..	*Pisidium Guajava* L.
51.	Tristewalie ..	Trastawalu ..	*Ipomœa Turpethum* Br.
52.	Dombe ..	Domba ..	*Calophyllum Inophyllum* L.
53.	Gienpoes ..	[Hin pus ..	*Entada scandens* Benth., Clough, p. 373].
54.	Goraeke ..	Goraka ..	*Garcinia Cambogia* Desrouss.
55.	Kienigieri ..	Kinihiriya ..	*Cochlospermum Gossypium* DC.
56.	Loenoe midile ..	Lunumidella ..	*Melia dubia* Cav.
57.	Wellikaga ..	Welikaha ..	*Memecylon capitellatum* L.
58.	Inginie ..	Ingini ..	*Strychnos potatorum* L. f.
59.	Boeroele ..	Burulla ..	*Leea sambucina* Willd.
60.	Nie engela ..	Niyangala ..	*Gloriosa superba* L.
61.	Pere tambela ..	Pera-tambala .	*Gærtnera Kœnigii* Wight.
62.	Gientala ..	Hin tala ..	*Ocimum canum* Sims.
63.	Ma atala ..	[? Maha tala] .	—
64.	Hien bowitia ..	Hin bowitiya .	*Osbeckia aspera* Bl., Moon, p. 35.
65.	Indie ..	Indi ..	*Phœnix zeylanica* Trim.
66.	Koemboeroe ..	Kumburu-wel	*Cæsalpinia Bonduc* Roxb.

67.	Kana Gorreke	Kana Goraka	*Garcinia Morella* Desrouss.
68.	Moessenne	? Mussenda	*Mussænda frondosa* L.
69.	Yakwannasse	Yakwanassa	*Anisomeles ovata* Br.
70.	Bomie	Bomi	*Litsea chinensis* Lam.
71.	Attene	Attana	*Datura fastuosa* L.
72.	Wereloe	Weralu	*Elæocarpus serratus* L.
73.	Lieme	Lima dehi	*Citrus Hystrix* DC.
74.	Ganpile	[Gampila	*Tephrosia purpurea* Pers., Moon, p. 55].
75.	Irrebadoe	Erabadu	*Erythrina indica* Lam.
76.	Ratte neli	Rata nelli	*Phyllanthus longifolius* Jacq.
77.	Karrewile	Karivila	*Momordica Charantia* L.
78.	Karal Gebbe	Gas-karal-heba	*Achyranthes aspera* L.
79.	Koombe	Kohomba	*Azadirachta indica* A. Juss.
80.	Rat koombe	Rat kohomba	*Indigofera aspalathoides* Vahl.
81.	Korre kan	Kurakkan	*Eleusine Coracana* Gærtn.
82.	Baloetore	[?Belitora—plant not ascertained, Clough, p. 430].	
83.	Kitoel	Kitul	*Caryota urens* L.
84.	Wette geja	[Weta keyiya	*Pandanus* sp., Clough, p. 617].
85.	Illa indoeroe	[Ela endaru	*Ricinus communis*, Moon, p. 65].
86.	Masa bowitia	Maha bowitiya	*Melastoma malabathricum* L.
87.	Gooij wel	Goyi wel	*Flagellaria indica* L.
88.	Boeloe	Bulu	*Terminalia belerica* Roxb.
89.	Wal embile	Wel embilla	*Embelia Ribes* Burm.f.
90.	Diivi kadoeroe	Divi kaduru	*Tabernæmontana dichotoma* Roxb.
91.	Wel Gondele	? Hondala	*Modecca palmata* Lam.
92.	Malla batoe	Malabatu	*Solanum ferox* L.
93.	Keppetie	Keppitiya	*Croton aromaticus* var. *lacciferus* Trim.
94.	Geen boetoe	Himbutu wel	*Salacia reticulata* Wight.
95.	Tieboetoe	Tibbatu	*Solanum indicum* L.
96.	Batoe	Batu	*Solanum* spp.
97.	Welkieriende	Wel kirindi	*Rourea santaloides* W. & A.

98.	Ratte Inderoe ..	Rata Endaru .	*Jatropha Curcas* L.
99.	Kaloe Gaberele	Kalu Habaraliya ..	*Maba buxifolia* Pers.
100.	Annoda ..	Anoda ..	*Abutilon asiaticum* G. Don, or *A. indicum* G. Don.

Colombo, Den 16 October, A° 1762.

Notes on List No. 1.

6. *Yamanara.*—The suggested interpretation involves the assumption that the final n has been dropped. No other instance of that occurs in the list. Hermann (Mus. Zeyl., p. 63) has " Jakuarra," probably for Yakinaran.

7. *Piene.*—*Clerodendron infortunatum* is usually known as Gas-pinna (Gas = tree), but Clough has Pinna alone. Hermann (Mus. Zeyl., p. 54) gave " Pinna, *Planta fortunata,*" and " Pinna-kola, *Planta infelix* "; both his specimens were *Clerodendron infortunatum,* according to Burmann. The specific name is derived from Hermann's description.

10. *Anona.*—Hermann gave the name Anon for *Anona* sp. (Mus. Zeyl., p. 62). It is curious that no other botanist has recorded a native name for *Anona squamosa.*

17. *Giendam.*—Gærtner has dam for dan.

23. *Aukedie.*—This is a puzzle. Kedie is perhaps gediya or ketiya, in which case it may be superfluous, *e.g.*, Gærtner cites Lyan-gheddie, which is usually written Lyan. In that case Aukedie may be Ahu, *Morinda* sp.

25. *Kabelose.*—Hermann (Mus. Zeyl., p. 22) has Kabolossa for *Smilax zeylanica* L.

26. *Midile.*—This should be Mudilla, *Barringtonia speciosa;* but the seeds which Gærtner had under the name Medella were *Barringtonia acutangula,* now given as Ela-midella.

28. *Baloetore.*—This occurs again as No. 82. It has not been found elsewhere, unless it is the Belitora listed by Clough (Singh.-Engl. Dictionary) without any scientific name.

30. *Gasembile.*—This is *Antidesma Ghæsembilla* Gærtn., the seeds being in the Leyden collection under the name Ghæsembilla, but the name now accepted for this plant is Bu-embilla.

31. *Rato loinde.*—Olinda is *Abrus precatorius.* No. 38, Ela olinda, and 31, Ratu olinda, may be varieties of that plant, as stated by Clough and Moon, but they are just as likely to be quite different species. They have not been recorded by any botanist.

35. *Kieri poes.*—Kiri pus was recorded by Hermann (Mus. Zeyl., p. 49) as "Puswæl lactescens." It has not been recorded since, and Hermann's specimen was not seen by Linnæus. Hermann described it as "Phaseolus zeylanicus lactescens fructu fusco splendente figura renum." Puswel is *Entada scandens*. Hermann also recorded Hin-pus (Mus. Zeyl., p. 69)—"Phaseolus indicus alatus fructu fusco orbiculata maximo lobis minoribus," which Linnæus stated was very close to Pus-wel—"Phaseolus indicus alatus fructu fusco orbiculata maximo lobis latissimis et longissimis." No other botanist has recorded these two names, nor has any botanist recorded Maha pus. Maha = great; hin = small; kiri = milk.

38. *Ille-oliende.*—See No. 31.

44. *Maha poes.*—See No. 35.

53. *Gienpoes.*—See No. 35.

63. *Ma atala.*—Four species of *Ocimum* bear the name Tala, with different prefixes, but Maha tala is not one of them. Hermann (p. 21) cites Ættælaghas as a variant of Æhælaghas, *i.e.*, Ehela, *Cassia Fistula* L., but no Maha Ehela is known.

82. See No. 28.

84. *Wette geja.*—This may be Watu kaju, cited by Clough (*loc. cit.*, p. 562) as a variety of Kaju, *Anacardium occidentale*. Hermann's spelling of Keyiya is Kegiya.

85. *Illa indoeroe.*—Endaru is *Ricinus communis*. Ela = white, or pale. Compare No. 98; Rata = foreign.

List No. 2.

Leijst der ondervolgende Ceilonse Midicinaale Zaaden voor de hortus te Leijden, bestaande in 150 Sakjes; als

1.	Boekettia	.. Bugetiya	.. *Hugonia Mystax* L.
2.	Hille bebile	.. [Ela bevila	.. *Sida* sp.]
3.	Pienne	.. Gas pinna	.. *Clerodendron infortunatum* L.
4.	Wal oendoe	.. [Wal undu	.. *Flemingia semialata* Roxb., Clough, p. 578, *ex* Moon].
5.	Satsander	.. Sap-sanda	.. *Aristolochia indica* L.
6.	Anoda	.. Anoda	.. *Abutilon asiaticum* G. Don, *A. indicum* G. Don.
7.	Pattengi	.. Patangi	.. *Cæsalpinia sappan* L.
8.	Katoe iemboel	.. Katu imbul	.. *Bombax malabaricum* DC.
9.	Rattembela	.. Ratambala	.. *Ixora coccinea* L.

10.	Porowe Mara ..	Poruwa-mara	*Diospyros insignis* Thw.
11.	Magul karende .	Magul-karanda	*Pongamia glabra* Vent.
12.	Hienbowitia ..	Hin-bowitiya .	*Osbeckia aspera* Bl. (Moon, p. 35).
13.	Hien talla ..	Hin-tala ..	*Ocimum canum* Sims.
14.	Ran Motte ..	Ran-motu ..	*Xyris indica* L.
15.	Kini Girië ..	Kinihiriya ..	*Cochlospermum Gossypium* DC.
16.	Bolloe ..	Bulu ..	*Terminalia belerica* Roxb.
17.	Sawidare ..	Sewandara ..	*Vetiveria zizanioides* Stapf.
18.	Siembela ..	Siyambala ..	*Tamarindus indica* L.
19.	Pipilië ..	Pepiliya ..	*Aporosa latifolia* Thw.
20.	Tite kidi ..	Titta kinda ..	*Tinospora crispa* Miers.
21.	Anona ..	[Anona ..	*Anona squamosa* L., Clough, p. 34].
22.	Rat korreke ..	Rata goraka ..	*Garcinia Xanthochymus* Hk. f.
23.	Kekoene ..	Kekuna ..	*Canarium zeylanicum* Bl.
24.	Patta billi ..	?Beli patta ..	*Hibiscus tiliaceus* L.
25.	Lunu ..	Wal-lunu ..	*Pancratium zeylanicum* L.
26.	Wal tembili ..	?Wal dambala	*Dolichos falcatus* Klein.
27.	Keppittia ..	Keppitiya ..	*Croton aromaticus* var. *lacciferus* Trim.
28.	Yak beria ..	Yak-beriya ..	*Crotalaria laburnifolia* L.
29.	Bien noege ..	Bin-nuga ..	*Tylophora asthmatica* W. & A.
30.	Wel keppittia ..	Wel-keppitiya	*Croton aromaticus* L.
31.	Itte Siembela ..	[Et Siyambala]	—
32.	Rat tanne ..	Rat-tana ..	*Ischæmum ciliare* Retz.
33.	Hie wal tore ..	— ..	—
34.	Moessende ..	Mussenda ..	*Mussænda frondosa* L.
35.	Hamparendael .	Hamparandella	*Mallotus philippinensis* Muell.-Arg., Thwaites, p. 273.
36.	Kohou kirile ..	Kohu kirilla ..	*Grewia Microcos* L.
37.	Hienpoes ..	[Hin pus ..	*Entada scandens* Benth., Clough, p. 373].

38.	Walme ..	Wal me ..	*Phaseolus adenanthus* Meyer
39.	Oendoe piele ..	Undu piyali ..	*Desmodium* spp.
40.	Ahouw ..	Ahu ..	*Morinda* spp.
41.	Pielle ..	Pila ..	*Tephrosia purpurea* Pers.
42.	Katte roddoe ..	Kata rodu wel	*Clitoria ternatea* L.
43.	Kottela ..	Kotala wel ..	*Torenia asiatica* L.
44.	Battoe ..	Batu ..	*Solanum* sp.
45.	Toetiri ..	Tuttiri ..	*Andropogon aciculatus* Retz.
46.	Kiri koerakan ..	[Kiri kurakkan	*Eleusine Coracana* Gærtn., Moon, p. 9].
47.	Hampienne ..	Hampinna ..	*Flemingia strobilifera* Br.
48.	Koedoe miries ..	Kudu miris ..	*Toddalia aculeata* Pers.
49.	Agge moelle netti wel ..	Aga-mula-neti-wel ..	*Cuscuta chinensis* L.
50.	Soeriё Mara ..	Suriya-mara ..	*Albizzia odoratissima* Benth.
51.	Naperite ..	Na-piritta ..	*Hibiscus furcatus* Roxb.
52.	Moene mal ..	Muna mal ..	*Mimusops Elengi* L.
53.	Niengala ..	Niyangala ..	*Gloriosa superba* L.
54.	Penni-tore ..	Penitora ..	*Cassia occidentalis* L.
55.	Ikiri ..	[Ikiri ..	*Barleria Prionitis* L., Clough, p. 67].
56.	Ratte kekoene ..	Rata kekuna .	*Canarium commune* L., or *Aleurites triloba* Forst.
57.	Maha bowitia ..	Maha bowitiya	*Melastoma malabathricum* L.
58.	Hampalenda ..	Han-palanda .	*Terminalia parviflora* Thw.
59.	Hie walda ..	— ..	—
60.	Koerakan ..	Kurakkan ..	*Eleusine Coracana* Gærtn.
61.	Ratte nilli ..	Rata-nelli ..	*Phyllanthus longifolius* Jacq.
62.	Eppelle ..	Epala ..	*Triumfetta rhomboidea* Jacq.
63.	Maddetiё ..	Madatiya ..	*Adenanthera pavonina* L.
64.	Pilile ..	Pilila ..	*Loranthus* spp., *Viscum* spp.

65.	Tite koemetiё ..	? Kumatiya ..	*Allmannia nodiflora* Br.
66.	Hondelle ..	Hondala ..	*Modecca palmata* Lam.
67.	Kekeri ..	Kekiri ..	*Cucumis pubescens* Willd.
68.	Hoenoe kirile ..	Hunu kirilla ..	*Glochidion zeylanicum* A. Juss.
69.	Kotte tiemboela	Kota dimbula .	*Ficus hispida* L. f.
70.	Yak irre baddoe	Yak-erabadu .	*Erythina ovalifolia* Roxb.
71.	Koen koeroe ..	— ..	—
72.	Sammedera ..	Samadara ..	*Samadara indica* Gærtn.
73.	Boerenda ..	Gurenda ..	*Celtis cinnamomea* Lindl.
74.	Koekoeroemaen	Kukuruman ..	*Randia dumetorum* Lam.
75.	Illadan ..	[Ela dan, quoted by Moon, without name].	
76.	Amberella ..	Embarella ..	*Spondias mangifera* Willd.
77.	Ille oliende ..	[Ela olinda ..	?*Abrus precatorius* L., var.].
78.	Kal Rattembela	[Gal Ratambala ..	? *Ixora* sp.].
79.	Ran mannise ..	Ran-manissa .	*Cleome viscosa* L.
80.	Oliende ..	Olinda ..	*Abrus precatorius* L.
81.	Ille inderoe ..	[Ela endaru ..	*Ricinus communis* L., Moon, p. 65].
82.	Midi ..	Midi ..	*Premna serratifolia* L.
83.	Maha Rattembela	Maha-ratambala ..	*Ixora parviflora* Vahl.
84.	Makoeloe ..	Makulu ..	*Hydnocarpus venenata* Gærtn.
85.	Tarrene ..	Tarana ..	*Webera corymbosa* Willd.
86.	Bien tanboeroe .	Bin tamburu ..	*Ipomœa repens* Lam.
87.	Siri Weddi Bebile	Giri wadi bevila ..	*Sida mysorensis* W. & A.
88.	Kokmotte ..	Kokmota ..	*Eriocaulon sexangulare* L.
89.	Attene ..	Attana ..	*Datura fastuosa* L.
90.	Kaveloe ..	Kawalu ..	*Setaria glauca* Beauv.
91.	Pol ambe ..	Pol amba ..	*Mangifera indica* L., var.
92.	Rat inderoe ..	Rata endaru ..	*Jatropha Curcas* L.

93.	Kappoe	Kapu	*Gossypium herbaceum* L.
94.	Iembul	Imbul	*Eriodendron anfractuosum* DC.
95.	Wela	Wela	*Gyandropsis pentaphylla* DC.
96.	Yapara	[Yapura—medicinal plant, not ascertained, Clough, p. 379].	
97.	Dombe	Domba	*Calophyllum Inophyllum* L.
98.	Yak wannasse	Yak wanassa	*Anisomeles ovata* Br.
99.	Boeroella	Burulla	*Leea sambucina* Willd.
100.	Ratte toembe	[Rata tumba]	—
101.	Ienkini	Ingini	*Strychnos potatorum* L. f.
102.	Kolloe	Kollu	*Dolichos biflorus* L.
103.	Ammoe	Amu	*Paspalum scrobiculatum* L.
104.	Welli kaha	Weli-kaha	*Memecylon capitellatum* L.
105.	Et pile	[Et pila, cited by Moon, without name].	
106.	Kette kolle	Keta kala	*Bridelia retusa* Spreng.
107.	Korosse	Korasa-wel	*Delima sarmentosa* L.
108.	Wal koloe	Wal-kollu	*Atylosia* spp.
109.	Kira ambe	[Giri amba	*Mangifera indica* L., var., Clough, p. 161].
110.	Pere	Pera	*Psidium Guajava* L.
111.	Maha talla	[Maha tala]	—
112.	Auweri	Awari	*Indigofera tinctoria* L.
113.	Moendoeme	[Mudu-me	*Phaseolus caracalla*, Moon, p. 52].
114.	Boomboe	Bombu	*Symplocos spicata* Roxb.
115.	Mi	Mi	*Bassia longifolia* L.
116.	Agge Moelle netti wel	Aga-mula-neti-wel	*Cuscuta chinensis* Lam.
117.	Godda kaddoeroe	Goda-kaduru	*Strychnos Nux-vomica* L.
118.	Ettemboela	—	—
119.	Pawata	Pawatta	*Pavetta indica* L.
120.	Toede wedia	—	—
121.	Boepile	Bu-pila	*Tephrosia villosa* Pers.
122.	Palloeken	Palukan	*Uvaria zeylanica* L.
123.	Irië	Iriya	*Myristica Irya* Gærtn.

124.	Moedela ..	Mudilla ..	*Barringtonia speciosa* Forst.
125.	Ratte inderoe ..	Rata-endaru ..	*Jatropha Curcas* L.
126.	Bokere ..	Bo-kera ..	*Ochna Wightiana* Wall., or *Gomphia angustifolia* Vahl.
127.	Hanna ..	Hana ..	*Crotalaria juncea* L.
128.	Kine ..	Kina ..	*Calophyllum tomentosum* Wight, or *Calophyllum Walkeri* Wight.
129.	Andene hiriē ..	Andana hiriya	*Crotalaria* spp.
130.	Apuu mandoe .	[Apasu madu .	*Convolvulus triflorus*, Moon, p. 13].
131.	Ille rat nitoel ..	Ela-rat-netul .	*Plumbago rosea* L.
132.	Kal tanne ..	[Gal tana] ..	—
133.	Boel eppelle ..	[? Bu Epala, cited by Moon, without name].	
134.	Wette kiija ..	Wata keyiya ..	*Pandanus* sp.
135.	Diwi kaddoeroe.	Divi-kaduru .	*Tabernæmontana dichotoma* Roxb.
136.	Koemetiē ..	Kumatiya ..	*Allmannia nodiflora* Br.
137.	Maha iendie ..	Maha Indi ..	*Phœnix sylvestris* L.
138.	Bilien ..	Bilin ..	*Averrhoa Bilimbi* L.
139.	Kattoe karendoe	Katu karandu	*Barleria Prionitis* L.
140.	Areloe ..	Aralu ..	*Terminalia Chebula* Retz.
141.	Wille wel ..	? Wila ..	*Bonnaya veronicæfolia* Spreng.
142.	Pere tambela ..	Pera-tambala .	*Gærtnera Kœnigii* Wight.
143.	Balloe wannasse	[Balu wanassa]	—
144.	Ankenda ..	Ankenda ..	*Acronychia laurifolia* Bl.
145.	Loenoe kinde ..	? Lunu ankenda	*Euodia Roxburghiana* Benth.
146.	Marri tondi ..	Maru tondi ..	*Lawsonia alba* Lam.
147.	Hel kasambilia .	— ..	—
148.	Rat kohombe ..	Rat-kohomba .	*Indigofera aspalathoides* Vahl.
149.	Kiri ..	[Kiri ..	*Eleusine Coracana* Gærtn., Clough, p. 120].
150.	Werelle ..	Eta-werelle ..	*Dodonæa viscosa* L.

Kolombo, Den 29 January A° 1785.

Notes on List No. 2.

2. *Hille bebile.*—Probably Ela bevila, but that name is not on record. Bevila is a generic term for *Sida.*

3. *Pienne.*—See List 1, No. 7.

4. *Wal undu.*—Hermann (Mus. Zeyl., p. 67) recorded Walundughaha, " Est arbor trifoliata," but his specimen was not seen by Linnæus. Walundu was given by Moon for *Flemingia alata,* now *Flemingia congesta,* var. *alata,* but the name has not been recorded since.

24. *Patta billi.*—An alternative is Patta walla, *Gyrinops Walla.* Compare the use of Beligam for Weligama.

25. *Lunu.*—This is a general term, with prefixes, for onions, garlic, &c., but that can scarcely be the correct interpretation in this case. Hermann (Mus. Zeyl., p. 61) has " Wallunu, Lunala, Luna. Narcissus zeylanicus flore albo hexagono major bulbo rotundo." This is *Pancratium zeylanicum* L., Wal-lunu.

26. *Wal tembili.*—Tembili is one of the names of the coconut, and Tembiliya is *Eugenia bracteata* Roxb. Wal tembili has not been recorded.

31. *Itte Siembela.*—Siyambala is *Tamarindus indica.* Et = great. Et-siyambala is not known.

33. *Hie wal tore.*—The first syllable probably represents Si or Gi. Compare No. 59. Tora is a general name for *Cassia* spp.

35. *Hamparendael.*—This is usually written Hamaparanda, but Thwaites, Enumeratio, p. 273, has Hamparandella.

37. See List 1, No. 35.

46. *Kiri koerakan.*—Kurakkan is *Eleusine Coracana;* kiri = milk. The combination Kiri kurakkan is given by Moon.

55. *Ikiri.*—This appears in old lists without a prefix. Katu-ikiri is *Hygrophila spinosa* And. ; the usual name for *Barleria Prionitis* is Katu-karandu.

59. *Hie walda.*—Compare No. 33. Da may be Dan, *Eugenia* sp., or *Ardisia.*

66. Gærtner noted that in the Leyden collection several different kinds of Ceylon seeds were labelled Hondala.

71. *Koen koeroe.*—Hermann (Mus. Zeyl., p. 57) has "Konghuru. Kine major. Hæc arbor fert fructus magnitudine nucis Juglandis nucleo valde oleoso. Nux zeylanica oleosa major"; it is not included in Flora Zeylanica. Or may Kunkuru be an error for Kumburu, *Cæsalpinia Bonduc* Roxb.?

73. *Boerenda.*—Moon stated that Booraenda = Gooraenda. The seeds which Gærtner had under the name Burende were *Clerodendron inerme,* now known as Wal Gurenda.

75. *Illadan.*—This should be a species of *Eugenia* or *Ardisia.* The name has not been recorded except by Moon (Ela dan), and he did not give any identification.

77. *Illa oliende.*—See List 1, No. 38.

78. *Kal Rattembela.*—Gal = rock. Ratambala is *Ixora coccinea* L.

81. *Ille inderoe.*—See List 1, No. 85.

96. *Yapara.*—Yapura is given by Clough (p. 379) as a medicinal plant ; not ascertained. Hermann (Mus. Zeyl., p. 24) recorded "Sabara. Sagittariæ species, flores fert ex medio caulis," and Linnæus (Fl. Zeyl., p. 54) identified this with Diya-habarala, *Monochoria hastæfolia.* The same name, in the form Yabara, has been applied to the recently-introduced Water Hyacinth, which in the Southern Province has received the name Japan Yabara, it having been introduced from Hong Kong. It is probable, therefore, that Yapara was *Monochoria*, either *M. hastæfolia* or *M. vaginalis.*

100. *Ratte toembe.*—Rata tumba. Tumba is a general name for *Leucas*, but Rata tumba is not known.

105. *Et pile.*—Et pila is known only from Moon, and he did not identify the plant.

111. *Maha talla.*—Compare No. 63 in List 1.

113. *Moendoeme.*—Mundu-me. Hermann (Mus. Zeyl., p. 54) recorded "Mundu-mæ, Phaseolus zeylanicus marinus crassus, an flos Thomeus ?" Linnæus did not see Hermann's specimen. Moon recorded the same name in the form Mudu-me, and referred it to *Phaseolus caracalla.* But what he meant by the latter name is not known. Trimen (Flora of Ceylon, II., p. 70) suggested that Moon's plant might be *Phaseolus adenanthus* Meyer, but this does not agree with Moon and Hermann, both of whom, apparently, refer to a sea coast plant. Mudu = sea. The accepted native name of *Phaseolus adenanthus* is Wal-me (No. 38 in this list) ; this is probably Hermann's Wal-limæ (Mus. Zeyl., p. 44), "Phaseolus Zeylanicus tenellus siliquis angustis."

118. *Ettemboela.*—Clough (p. 94) cites Embula, as a variety of *Nymphæa*, evidently for Ambala, *Limnanthemum.* Et-embula is not known.

120. *Toede wedia.*—Tudu wediya. The nearest approach to this name is Udu-wediya (Udhawaedhiya), given by Hermann (Mus. Zeyl., p. 20) for *Loranthus loniceroides* L.

130. *Apuu mandoe.*—Apasu madu, cited by Moon, is evidently the same name (Apuhu = apusu = apasu). Moon identified it as *Convolvulus triflorus*, but there is nothing to show what he meant by that. Madu (Mandu) is a general term for *Ipomœa.* Hermann (Mus. Zeyl., p. 39) gave "Apas. Apathuætha. Convolvulus zeylanicus gracilis tenuifolius"

(etta = seeds), and (*loc. cit.*, p. 43) "Apahu. Convolvulus indicus Cantabricæ folio latiori, floribus albis. Phaseolus silvaticus paludosus." These were not named by Linnæus in Flora Zeyl. Trimen quotes Hermann, p. 39, for *Ipomœa tridentata* Roth., but does not mention Apahu.

132. *Kal tanne.*—Gal = rock ; and Tana is a common constituent of names of grasses, but Gal-tana is not on record.

133. *Boel eppelle.*—Bul epala is not known. Epala is *Triumfetta rhomboidea* Jacq.

143. *Baloe wannasse.*—This name was recorded by Hermann (Mus. Zeyl., p. 25) as Balu wanossa, but no description was given, and the specimen was not seen by Linnæus. It has not been recorded since.

147. *Hel kasambilia.*—Hel kahambiliya is cited by Clough, p. 747, without identification. Kahambiliya is a general term for any irritating plant, *e.g.*, Gas-kahambiliya = *Girardinia heterophylla* Dcne., and Wal-kahambiliya = *Fleurya interrupta* Gaud.

150. *Werelle.*—Hermann (Mus. Zeyl., p. 32) recorded this name as Wærelle ghas. It is *Dodonæa viscosa* L., Eta-werella.

Revisions of Ceylon Fungi.

(PART V.)

BY

T. PETCH, B.A., B.Sc.

138.—Lepiota alborussea B. & Br.

PILEUS up to 5 cm. diameter, almost plane, depressed or obtusely umbonate, sometimes with a depression in the umbo, deep reddish-purple in the centre, elsewhere radially streaked with reddish-purple, sometimes broken into minute scales. Flesh white, turning reddish under the cuticle when cut. Stalk up to 5 cm. high, 5 mm. diameter in the middle, inflated at the base, attenuated upwards, usually curved below, white, shining, stuffed, then hollow. Ring ascending, white, edge slightly coloured. Gills free, white, rather crowded, subventricose, rounded at both ends. Spores white, oval, somewhat pointed at the distal end, 7–9 × 3–4 μ.

In flower beds, Peradeniya.

139.—Lepiota erythrogramma B. & Br.

Under this name Berkeley and Broome placed four of Thwaites's figures, dividing them into the species and two varieties. Figure 1202 was named *Lepiota erythrogramma*, figure 1187, var. b, and two figures, both numbered 1159, var. c.

Figure 1202, the type of *Lepiota erythrogramma*, does not differ from *Lepiota alborussea*. Berkeley and Broome apparently noted the resemblance, for they stated that *L. alborussea* differed in the breadth of its spores. As the specimens are not in Herb. Peradeniya, I am unable to test that statement, but the character does not appear to be one on which to found a species. I find the spores of *L. erythrogramma* var. b, 6–7 × 3 μ, and those of *L. alborussea*, 7–9 × 3–4 μ.

Variety c appears to be identical with *Lepiota carpophylla* B. & Br. Here, again, Berkeley and Broome noted the resemblance, and stated that the latter differed from all forms of *L. erythrogramma* in the different nature of the ring. In both species the ring is movable ; in *L. erythrogramma* it is usually upwardly directed, and is so depicted in the figures, but in *L. carpophylla* it was said to be descending. The point is not clear on the figure, but it is certainly not a " descending " ring in the usual sense, *i.e.*, in which the tissue of the ring is continuous with the outer layer of the stalk apex. *L. erythrogramma* var. c appears to me to be *L. carpophylla*, but whether it is more than a stouter form of var. b is questionable.

Lepiota erythrogramma var. b has a pileus at first conico-campanulate, then almost plane, depressed in the centre, or obtusely umbonate, up to 5 cm. diameter, brick-red in the centre, smooth or furfuraceous, elsewhere split into minute brick-red scales or radiating fibrillose streaks. Flesh white, thin, turning red over the stalk when cut. Young unexpanded specimens may be uniformly brick-red. Stalk up to 5 cm. high, 4 mm. diameter in the centre, equal or attenuated upwards, slightly inflated at the base, white, shining, hollow. Ring upwardly directed, submovable, upper edge coloured red. Gills moderately crowded, free, rounded at both ends, white or faintly cream-coloured. Spores white or pale yellow, oval, 6–7 $\times$ 3 μ.

140.—Lepiota euconiata B. & Br.

Pileus up to 8 cm. diameter, broadly conico-convex or plane, densely covered with loose woolly flocci and meal, purple in the centre, pale violet or pale lilac elsewhere. Pileus (beneath the outer covering) purple in the centre, elsewhere white minutely streaked with purple, margin not striate, slightly appendiculate. Flesh white, spongy, rather thin (4–5 mm.). Stalk up to 8 cm. high, 6–7 mm. diameter below, attenuated upwards, slightly bulbous at the base, rooting clothed with pale lilac meal up to the ring, white and silky striate above, stuffed, then hollow, distinct from the flesh of the pileus ; substance of stem translucent towards the exterior, white internally ; apex large, contrasting strongly with the flesh of the pileus. Ring ample, fragile, powdered like the stem. Gills white, then pale yellow, free, slightly ventricose, up to 6 mm. broad, rounded at both ends, crowded. Spores white, oval or subglobose, 4–6 $\times$ 3 μ.

Among grass, Peradeniya.

141.—Lepiota spongodes B. & Br.

Pileus at first hemispherical, then broadly irregularly convex and undulating, centre usually depressed, up to 9 cm. diameter ; centre covered with purple-black or dark purple, flat, angular scales with a fibrillose margin, white between, elsewhere covered with shaggy, dark purple, fibrillose scales, silky and reddish-purple between them. Margin at first appendiculate. Flesh white, rather thick, turning reddish when cut. Stalk up to 8 cm. high, 1 cm. diameter, attenuated upwards, usually curved, base slightly bulbous, densely clothed below with reddish-purple woolly flocci, white and silky fibrillose above, hollow. Veil cobwebby, evanescent. Gills crowded, free, narrow (4 mm. broad), white or faintly cream, rounded behind, attenuated outwards. Spores white, oval, 4×3 μ.

In many points this species resembles *Lepiota euconiata*, of which it may be only a weather form.

142.—Lepiota erythrosticta B. & Br.

Pileus broadly convex, or almost plane, obtusely umbonate, up to 2·2 cm. diameter, bluish-purple or reddish-purple in the centre, even or broken into minute warts, elsewhere white with a purple tinge, with scattered purple, innate, fibrillose scales. Flesh white, turning purplish when cut, rather thick over the stalk. Stalk up to 4 cm. high, 3 mm. diameter, purplish below, clothed with purple fibrillose scales, or points and fibrils, white and silky striate at the apex, equal, base bulbous, hollow, white internally. Ring evanescent or represented by scales only. Gills white or faintly cream-coloured, free, distant, broad, ventricose, rounded at both ends, or rather square behind. Spores white, oblong-oval, slightly narrowed at the distal end, apiculus sublateral, 6–8 × 3–4 μ.

Among dead leaves, Peradeniya.

143.—Lepiota metulæspora B. & Br.

Pileus 2·5–4 cm. diameter, broadly campanulate, obtusely umbonate, umbo yellow-brown or reddish-brown, smooth, elsewhere clothed with concentrically arranged, thin, floccose, pale brown to whitish, adpressed scales and warts, white and silky fibrillose under the scales, sulcate half way to the centre; margin sometimes appendiculate; flesh white, thin. Stalk 6–8·5 cm. high, 3 mm. diameter, slightly swollen at the base, strongly fibrillose with longitudinal white fibrils, yellowish and glabrous when the fibrils are rubbed off, hollow, turning yellow-brown internally when cut, lined with shining white fibrils. Gills white, free, ventricose, broad, rounded at both ends. Spores white, 2 to 6 guttulate, fusiform, ends pointed, or sigmoid on one side, 15–18 × 6–7 μ.

Among dead leaves, Peradeniya.

The figure in Cooke's illustrations, pl. 39, represents a different species.

144.—Lepiota revelata B. & Br.

Pileus up to 4 cm. diameter, conico-convex, then repand, obscurely umbonate, with a viscid cuticle continuous over the centre, elsewhere splitting and exposing the white or cream-coloured flesh, dark chestnut in the centre, becoming paler outwards. Flesh very thin over the gills, margin appearing striate when moist. Stalk up to 4 cm. high, 3 mm. diameter, slightly attenuated upwards, bulbous at the base, white becoming pinkish, clothed below with minute scales coloured as the pileus, silky fibrillose above, stuffed, then hollow, cavity comparatively narrow. Gills white, then cream-coloured, free, ventricose. Spores white, oval, or oblong-oval, 4 × 3 μ.

Lepiota rhacoderma B. & Br. appears to be the same species, but the figure shows a solid stalk.

145.—Lepiota flavido-rufa B. & Br.

Pileus at first conical, often flattened at the apex, then hemispherical or broadly convex, up to 2 cm. diameter, dull green, blackish-green, olive, or dingy yellow in the centre, elsewhere yellow covered with minute warts and scales of the same colour as the centre; margin appendiculate with yellow flocci; flesh rather thick over the stalk, turning red when cut. Stalk up to 5·5 cm. long, 3 mm. diameter, yellow, mealy with yellow granules and flocci, hollow, lined with white fibrils;

ring evanescent. Gills deep cream-coloured, then pale brown, free, crowded, rounded behind, attenuated outwards, slightly ventricose. Spores oval, $4 \times 2 \cdot 5–3\ \mu$.

On bare ground, gregarious, often in large patches, Peradeniya.

The spores of this species exhibit an extraordinary variability in colour, as will be evident from the following records from different collections :—(1) Spores in mass dark slate-coloured, some yellow ; by transmitted light greenish-yellow, with a dark epispore. (2) Spores shed on a glass plate in contact with the pileus varied from yellow, ochraceous, slate-coloured, to blackish from the same pileus ; those deposited on the top of other pilei were brown or blackish in mass ; others deposited on paper, from pilei supported on pins clear of the paper, were dark slate in mass, with in some places a faint purple tinge ; in all cases the spores were greenish-yellow by transmitted light, with a dark line marking the epispore in the case of the dark spores. (3) Another record, from old specimens, is "spores pale purple-brown in mass, almost hyaline by transmitted light." (4) In two cases the spores in contact with the decaying gills were yellow-brown by transmitted light. (5) Another record gives the spore-print greenish-olive to purple-brown when moist, pale yellow to slate-coloured when dry ; spores pale yellow or almost hyaline by transmitted light, but yellow-brown if taken from the decaying gills.

We leave this species under Berkeley and Broome's earliest name, though it might be preferable to include it under Psalliota. Other names for the same species in the Fungi of Ceylon are *Lepiota hemichlora* B. & Br., *Psalliota subcitrina* B. & Br., *Psalliota myriosticta* B. & Br., and *Psalliota epipasta* B. & Br.

146.—**Omphalia holochlora** B. & Br.

Pileus greenish-yellow, radially streaked with innate, black-brown fibrils, up to 2·5 cm. diameter, at first campanulate, umbilicate, then infundibuliform, margin thin, becoming orange-red in drying, reddish when bruised. Stalk up to 1·5 cm. high, 2 mm. diameter, expanding slightly upwards, dark brown at the base, shading into yellowish-green at the apex, faintly longitudinally striate, powdered with black granules, hollow, flesh-coloured as externally, lined with a few white fibrils, base tomentose. Gills greenish-yellow, distant, up to 4 mm. broad, decurrent, terminating in a definite line round the stem, sometimes forked, rather fleshy, but with a thin edge, interstices sometimes feebly veined. Spores white, oval, somewhat inequilateral, 8–11 × 4–5 μ.

On dead twigs, &c., Peradeniya.

147.—Tricholoma rhacophorum B. & Br.

The painting from which Berkeley and Broome described this species shows a specimen with a dark brown pileus and a slightly scaly stem. I have not met with that form, but the following, which occurred in abundance in November, 1914, agrees with *Tricholoma rhacophorum* in its excentric stalk and echinulate spores, and is probably a variety.

Pileus up to 10 cm. diameter, convex, even or obtusely umbonate, somewhat irregular in outline, white or ochraceous, glabrous or innately hoary, here and there shining. Flesh white, rather thick. Stalk expanding into the pileus, central or excentric, sometimes almost lateral, up to 4 cm. high, 1 cm. diameter, equal, sometimes bulbous at the base, minutely longitudinally fibrillose. Gills crowded, narrow, arcuate, sinuato-decurrent, white or faintly cream. Spores white, broadly oval or subglobose, 5–6 × 3·5–4 μ, minutely echinulate.

On the ground, from masses of mycelium permeating dead leaves, Peradeniya.

148.—Collybia crocobapha (B. & Br.).

Fasciculate, connate at the base. Pileus up to 7·5 cm. diameter, broadly convex, undulating, reddish-yellow in the centre, elsewhere yellow, sometimes with radial red streaks, margin reddish-yellow when sodden, minutely scurfy. Flesh yellow, thin, except over the stalk. Stalk up to 10 cm. high, 1 cm. diameter, sometimes inflated and fistulose in the lower half, stuffed, then hollow, pale yellow, sometimes with reddish streaks, longitudinally innately fibrillose, pruinose at the apex ; base clothed with yellow tomentum. Gills yellow, narrow, crowded, attenuated outwards, rounded behind, adnate. Spores white, globose, 4–6 μ diameter.

At the base of bamboo clumps, Peradeniya, August, 1912.

Described by Berkeley and Broome as *Clitocybe crocobapha.* The original painting shows specimens with an umbonate pileus, as described by Berkeley and Broome, but not decurrent gills.

149.—**Collybia verticolor** B. & Br.

Pileus up to 2 cm. diameter, broadly convex, sometimes with an obtuse excentric umbo, white, subtranslucent, then pallid yellow, glabrous, cartilaginous, margin at first incurved. Stalk usually excentric, the same colour as the pileus, up to 2 cm. high, 2 mm. diameter, equal, expanding into the pileus, glabrous, cartilaginous externally, internally stuffed white, then hollow, strigose at the base, attached to the wood by a patch of radiating hyphæ. Gills the same colour as the pileus, moderately crowded, decurrent, lower edge straight, then suddenly decurrent.

On dead wood, Peradeniya.

150.—**Pluteus balanatus** B. & Br.

Pileus campanulate, 1 cm. diameter, white, diaphanous, membranous, sulcato-striate almost to the centre, glabrous. Stalk up to 2 cm. high, 1 mm. diameter, white, diaphanous, glabrous, longitudinally striate, solid. Gills distant, hyaline, ventricose, broad, free, but close to the stem. Spores broadly oval, 7–8 $\times$ 5–6 μ, or globose 7 μ diameter. Cystidia few, flask-shaped, attenuated below, neck short, 24 $\times$ 8 μ.

On the ground, Peradeniya; the co-type in Herb. Peradeniya is immature.

151.—**Pluteus eugraptus** B. & Br.

Pileus up to 3 cm. diameter, plane, with a strongly developed obtuse umbo, tawny, centre paler yellow-brown, striate almost to the umbo. Flesh thin. Stalk up to 2 cm. high, 2–3 mm. diameter, expanding upwards, glabrous, yellow-brown, white internally, stuffed, base slightly tomentose with white tomentum. Gills pink, ventricose, broad (4 mm.), rather distant, free. Spores pink, narrow-oval, 7–9 × 4 μ.

On wood, Peradeniya.

152.—Pluteus glyphidatus B. & Br.

Pileus campanulate, obtuse, then expanded, umbonate, up to 5 cm. diameter, lemon-yellow, thickly covered with minute ashy, or gray, close-set warts or points, or streaked with ashy fibrils, centre remaining yellow, the remainder becoming pinkish; margin striate; flesh thin, white. Stalk up to 6 cm. high, 4 mm. diameter, pale yellow or white, equal or slightly attenuated upwards, glabrous, sometimes powdered, tomentose at the base, solid. Gills yellowish, then pink, free, distant, edge minutely serrate, broadly ventricose or equal, rounded at both ends. Spores Indian red in mass, globose, 5–7 μ diameter.

On decaying palm fronds, Peradeniya. A form occurs without any trace of yellow.

153.—Pluteus escharites B. & Br.

Pileus up to 3·5 cm. diameter, centre depressed, black-brown in the centre, the cuticle elsewhere broken into minute black-brown scales, arranged somewhat radially, so that the pileus is feebly radially streaked. Ground colour between the scales pallid, then pinkish. Stalk white or pallid, sub-translucent, up to 3·5 cm. high, 3 mm. diameter, equal or slightly expanded upwards, stuffed, then hollow, glabrous above, with a few fibrils below, which turn blackish when handled, or mealy with minute black granules, base slightly white tomentose, often swollen. Gills free, ventricose, rounded at both ends, white, then pink. Spores globose, 5–7 μ, or broadly oval, 5 × 7 μ, pink, smooth. Cystidia flask-shaped, up to 20 μ high, 16 μ diameter below, 6 μ above, scanty.

Massee (Grevillea, XXI., pp. 77–82) states that the spores are elliptic fusiform, very minutely warted, 10 × 6 μ, and that cystidia are absent. The co-type in Herb. Peradeniya has globose spores 5–7 μ, and flask-shaped cystidia on the edge of the gills. The figure of *Pluteus stigmatophorus* resembles this species, but shows a solid stalk ; there is no specimen in Herb. Peradeniya.

154.—Entoloma rhodopolium Fr.

The species recorded by Berkeley and Broome in Fungi of Ceylon, No. 185, as *Entoloma rhodopolium*, has been collected on several occasions at Peradeniya, where it grows among grass, often in large numbers.

The pileus is up to 16 cm. in diameter, at first broadly campanulate, depressed in the centre, then expanded and infundibuliform with a decurved margin, gray-brown, radially streaked with dark innate fibrils, viscid when moist, glabrous and shining when dry, margin feebly striate, strongly striate when dry. Flesh white, thin. Stalk up to 10 cm. high, 1·6 cm. diameter in the middle, attenuated upwards, pallid, then grayish-brown, often twisted, sometimes longitudinally striate, glabrous, powdered at the apex, solid or stuffed, outer layer cartilaginous. Gills sinuato-adnate, ventricose, margin irregular, pallid, then pink, usually strongly ridged and veined. Spores deep pink, angular, quadrate or pentagonal in plan, 7–11 × 6–9 μ. Cystidia not found.

It is never umbonate, and is clearly not *Entoloma rhodopolium*. It may be known as *Entoloma infundibuliforme*.

Entoloma infundibuliforme.—Pileo ad 16 cm. diam., primo late campanulato, centro depresso, deinde infundibuliformi, margine decurvo, griseo-brunneo, radiatim fibrillis innatis fuscis lineato, udo viscido, sicco glabro nitente, margine leniter striato, valde striato sicco ; carne tenui, alba. Stipite ad 10 cm. long., 1·6 cm. diam., sursum attenuato, pallido, deinde griseo-brunneo, sæpe torto, interdum longitudinaliter striato, glabro, apice farinoso, solido vel farcto, exteriore cartilagineo. Lamellis sinuato-adnatis, ventricosis, margine irregulari, pallidis, deinde roseis, valde venosis. Sporis angulatis, 7–11 × 6–9 μ.

155.—Entoloma stylophorum B. & Br.

From Thwaites's figures of this species it might be thought that the peculiar cylindrical umbo was an abnormality.

Recent collections show that this form is of frequent occurrence, though not constant, many specimens having merely a well-developed conical umbo.

The pileus is broadly conico-campanulate, up to 2 cm. diameter, pinkish-white, subdiaphanous, feebly silky-striate, with a well-developed, conical, obtuse umbo, sometimes prolonged into a cylindrical or horn-like outgrowth, up to 2·5 mm. high and 2 mm. diameter. Gills pallid, then pale pink, broad, ventricose, adnate with a decurrent tooth. Stalk up to 3·5 cm. high, 2 mm. diameter, white, subtranslucent, glabrous, shining, equal, slightly inflated at the base, almost solid, with a very narrow central cavity. Spores pink, irregularly nodular, polygonal in outline, 12 × 9 μ.

On the ground, among grass, Peradeniya.

156.—**Eccilia hyalodepas** B. & Br.

Pileus up to 4 cm. diameter, centre depressed or umbilicate, elsewhere plane, margin decurved, ivory white, pellucid, becoming delicately pink, glabrous; flesh thin, translucent. Stalk up to 3 cm. high, 3·5 mm. diameter, equal, or slightly thickened upwards, white, pellucid, minutely pruinose, base tomentose, stuffed, then hollow, cartilaginous. Gills adnato-decurrent, or sinuato-adnate, slightly arcuate, up to 5 mm. broad. Spores pink, angular, 8–10 μ diameter, quadrangular or pentagonal in plan.

157.—**Omphalia peri** B. & Br.

Pileus up to 1 cm. diameter, convex, then plane, finally depressed or infundibuliform, margin at first incurved, usually undulating when full grown, minutely tomentose, white; flesh thin. Stalk short, about 2 mm. high, 1 mm. diameter, equal, or thickened at the base, minutely tomentose. Gills white, then pinkish, not crowded, comparatively broad (1·5 mm.), adnato-decurrent. Spores salmon-pink in mass, oval, 5–8 × 3–4 μ.

This is a Clitopilus, and will stand as *Clitopilus peri* (B. & Br.). Thwaites's figure shows a longer stalk, and more crowded, narrower gills.

158.—**Galera zeylanica** n. sp.

Thwaites's figure, No. 711, represents a common Ceylon Galera. It was first assigned by Berkeley and Broome to *Galera tenera*, but they afterwards referred it to *Galera lateritia* Fr., under which name it was included in the Fungi of Ceylon. Both names appear on the original painting. It occurs either on the ground, or on dead wood or decaying vegetable refuse, and is probably the *Galera siliginea* Fr. identified by Berkeley among the fungi sent by Gardner. It does not resemble *Galera lateritia,* or *Galera siliginea ;* in some respects it is near *Galera tenera,* from which it differs in its white stalk, bulbous at the base.

Pileus conico-campanulate or conico-convex, 1–5 cm. diameter, red-brown in the centre, yellow-brown towards the margin ; margin striate, sometimes crenate ; flesh thin, brown ; fragile. Stalk 4–15 cm. high, 1–5 mm. diameter, white, becoming brownish, attenuated upwards, bulbous at the base, longitudinally striate, sparsely fibrillose, hollow. Gills pallid, then pale brown, rather distant, sometimes ventricose, usually narrow, outer ends rounded, attenuated behind, shortly adnate. Spores oval, brown in mass, yellow-brown by transmitted light, 8–14 × 4–8 μ.

Measurements of the spores of different gatherings give 10–13 × 6–8 μ ; 11–14 × 7–8 μ ; 8–10 × 5–6 μ ; 8–10 × 4–5 μ. When developed under a bell glass, the stalk and pileus are covered with minute erect white hairs, which collapse when the bell glass is removed.

Galera zeylanica.—Pileo conico-campanulato vel conico-convexo, 1–5 cm. diam., centro rubro-brunneo, ad marginem flavo-brunneo ; margine striato, interdum crenato ; carne tenui, brunneo ; fragili. Stipite 4–15 cm. long., 1–5 mm. diam., albo, deinde brunneo, sursum attenuato, basi bulboso, longitudinaliter striato, sparse fibrilloso, cavo. Lamellis pallidis, deinde pallide-brunneis, remotiusculis, interdum ventricosis, sæpius angustis, extus rotundatis, post attenuatis, breviter adnatis. Sporis ovalibus, flavo-brunneis, 8–14 × 4–8 μ.

159.—Psalliota bolorhiza B. & Br.

Pileus 4 cm. diameter, almost plane, very slightly unbonate, margin repand when old; centre yellow-brown, tomentose, elsewhere sparsely covered with yellow-brown, fibrillose scales on a white ground, which assumes a purple tint when old. Flesh thin, white, darkening when cut. Stalk 5 cm. high, 4 mm. diameter, almost equal or slightly attenuated upwards, bulbous at the base (1 cm. diameter), white, shining, minutely silky, stuffed, then hollow. Ring evanescent. Gills narrow, attenuated at each end, crowded, free. Spores dark purple-brown in mass, pip-shaped, 4–5 × 3 μ.

Among grass, solitary, Peradeniya.

160.—Psalliota hemilasia B. & Br.

Pileus up to 14 cm. diameter, plane, sometimes obtusely umbonate, often undulating, red-brown or purplish-red in the centre, elsewhere covered with minute innate fibrillose scales of the same colour on a white ground. Flesh white, up to 1·5 cm. thick in the centre, thinning out to the margin, turning yellowish just below the cuticle when cut. Stalk up to 12 cm. high, 1·5 cm. thick in the middle, base bulbous, or expanded and truncate, attenuated upwards, striate and shining above the ring, slightly fibrillose or squamulose below, white, hollow. Ring descending, ample, fragile, sometimes covered with red-brown warts on the lower surface. Gills widely free, somewhat crowded, comparatively narrow, white, then pink, finally purple-brown. Spores oval to subglobose, 4–7 × 3–4 μ.

Usually among dead leaves, &c.; fairly frequent at Peradeniya, but not in large numbers.

161.—Psalliota liturata B. & Br.

Pileus almost plane, or slightly obtusely umbonate, up to 4 cm. diameter, at first purple-red in the centre, elsewhere white, with radiating purple-red streaks and spots, finally becoming purple-gray between the streaks. Flesh thin. Stalk up to 7 cm. long, 3–4 mm. diameter, inflated at the base, usually attenuated upwards, white, minutely scaly below the ring, shining and striate above, hollow, lined with shining white fibrils, usually curved at the base; ring weak, usually pendent, white. Gills at first white, then pale pink, finally purple-brown, rather narrow, attenuated behind, widely free, sometimes slightly ventricose. Spores purple-brown, oval, 5 × 3 μ.

Berkeley and Broome's description was drawn up from Thwaites's figure 717*, which represents the fully developed purple-gray foim. It is marked by Thwaites, "certainly identical with 714." There are two figures of 714; one of these was not named by Berkeley and Broome, but is without doubt *Psalliota liturata;* the other is a half-expanded specimen, and from this Berkeley and Broome drew up their description of *Lepiota muticolor.* From recent collections it would appear that Thwaites's statement was correct, and that *Lepiota muticolor* is merely young *Psalliota liturata.*

Psalliota celidota is most probably an old specimen of *Psalliota liturata.* Berkeley and Broome, in describing the figure, stated that the flesh of the pileus was white, except at the head of the stalk, where it was dark umber. This is a common feature in old specimens of Ceylon Psalliotas. The inner layers of the stalk turn brown first, the extreme outer layer remaining white.

162.—**Psalliota zeylanica** n. sp.

Of the paintings of agarics, sent by Thwaites to Berkeley and Broome, two, one marked 753 and 763, and the other marked 1155, were referred by them to *Agaricus campestris* var. It is doubtful whether the two paintings represent the same species, but the second of them has been identified with fresh specimens, and proves to be distinct from *Psalliota campestris.* It may be known as *Psalliota zeylanica.*

Pileus at first conico-cylindric, densely clothed with dark rufous-brown or blackish-brown, adpressed, fibrillose scales; then broadly convex, or almost plane, the larger specimens obtusely umbonate, up to 12 cm. diameter, clothed with rufous-brown, adpressed, fibrillose scales and radial fascicles of fibres. Flesh thin, white. Stalk 4·5–5·5 cm. high, 6–12 mm. diameter, equal or slightly attenuated upwards, base bulbous, often with cord-like mycelium attached, silky striate and shining above the ring, fibrillose, white becoming brown, below; internally white, hollow. Ring descending, weak, edge sometimes brown. Gills at first dingy cream-coloured, becoming yellow when cut, then pallid brown, finally purple-brown, widely free, rounded behind, attenuated outwards, slightly ventricose in large specimens, crowded. Spores pale purple-brown, 4–5 × 3 μ.

On the ground among grass, in troops, Peradeniya.

Psalliota zeylanica.—Pileo primo conico-cylindrico, fusco-rufis squamulis dense vestito; deinde late convexo vel plano, ad 12 cm. diam., rufo-brunneis adpressis fibrillosis squamulis vestito; carne tenui, albo. Stipite 4·5–5·5 cm. long., 6–12 mm. diam., æquale vel leniter sursum attenuato, cavo, basi bulboso, supra sericeo-striato, nitente, deorsum fibrilloso, albo, brunnescente; annulo descendente, fragili, margine brunneo. Lamellis primo sordide cremicoloribus, secto flavescentibus, deinde purpureo-brunneis, late liberis, post rotundatis, exteriore attenuatis, confertis. Sporis pallide purpureo-brunneis, 4–5 × 3 μ.

163.—Psalliota endoxantha B. & Br.

Pileus campanulate or convex, then almost plane, often obtusely umbonate, up to 10 cm. diameter, blackish-brown in the centre, elsewhere covered with black, black-brown, or gray, minute, adpressed scales or points. Flesh white, moderately thick. Stalk up to 20 cm. long, 1 cm. diameter, white, attenuated upwards or equal, sometimes bulbous at the base, smooth or floccose below the ring, hollow, turning yellow at the base when cut; ring variable, ample, thick, floccose or firm. Gills pink, then purple-brown, free, rounded behind, rather crowded. Spores purple-brown, oval, 4–7 × 3–4 μ.

On the ground among grass, usually under trees and in large troops, up to 250, Peradeniya.

Psalliota actinorachis B. & Br. is this species, with the outer layers of the pileus cracked radially and transversely. *Psalliota lepiotoides* B. & Br. is a dwarf, partly expanded specimen. The yellow discolouration at the base of the stem is very fugitive, and it is difficult to obtain specimens which show it, as the base of the stem is usually attacked by insects as soon as the pileus is expanded.

164.—Psalliota erythrospila B. & Br.

Pileus up to 1·5 cm. diameter, hemispherical, convex or conico-convex, or almost plane, purple-red, the cuticle broken into minute scales ; margin at first appendiculate. Stalk up to 3 cm. high, 1·5 mm. diameter, white, equal, minutely tomentose ; ring ascending, white, upper edge purple-red. Gills ventricose, rather crowded, free, but close to the stem, white, then purple-brown. Spores purple-brown in mass, almost hyaline by transmitted light, oval, 6 × 4 μ.

In Ann. Perad., IV., p. 55, this species was referred to *Lepiota earochroa* B. & Br. That has proved to be incorrect.

165.—Psalliota arginea B. & Br.

Pileus broadly conico-campanulate, obtusely umbonate, up to 1 cm. diameter, white or grayish-white, the umbo becoming pinkish-red, membranous, radially silky striate. Stalk up to 2 cm. long, 1 mm. diameter, often flexuose, white, shining, powdered, stuffed ; ring small, spreading, persistent. Gills pinkish, then pale brown, ventricose, free. Spores pale purple-brown in mass, oval, slightly inequilateral, 4 × 2·5 μ.

On bare ground, Peradeniya.

166.—Psalliota microcosmus B. & Br.

Gregarious ; pileus conical, then conico-campanulate, obtusely umbonate, up to 4 mm. diameter, white, silky with short adpressed fibrils ; flesh white, comparatively thick over the stalk. Stalk up to 1·3 cm. high, 1 mm. diameter, white, minutely fibrillose ; ring near the apex, spreading horizontally, rigid ; apex of stem silky striate. Gills pallid, then pale purple-brown, crowded, free, but close to the stem, ventricose. Spores pale purple-brown, oval, 5 × 2·5 μ.

On bare ground, Peradeniya, with *Ps. arginea ;* a stouter species than the latter, not striate, but perhaps only a smaller, more compact form of it. Stains the paper purple when pressed.

167.—Psathyra obtusata Fr.

Berkeley and Broome recorded, as *Psathyra obtusata* Fr., Thwaites's 711*, 712, 829, cum iconibus, and as *Psathyra spadiceo-grisea* Schæff., Thwaites's 712***, 754, cum iconibus.

It is evident from the available specimens and figures that these were mixtures, though it has not been possible to match them all with fresh specimens. Thwaites's 712, however, is a very common species, which grows in troops round decaying stumps, following the lines of the lateral roots. It sometimes occurs in company with *Psathyra trechispora* Petch, which has the same habit; but I have not been able to ascertain that the names quoted cover the latter species. It is not *Psathyra obtusata*. Thwaites's figure, 712, represents poor, unexpanded specimens.

The pileus is at first conical, then broadly conico-convex or almost plane, up to 6 cm. diameter, sometimes with a conical umbo, bay-brown to ashy, darker in the centre, and when ashy, frequently with a purple tinge towards the margin, radially ridged with slightly elevated anastomosing ridges, sometimes atomate, sometimes with scattered, floccose remains of a veil. The flesh is thin and the pileus fragile. The stalk is up to 8 cm. long, and 8 mm. diameter, white, shining, brittle, sparingly floccose, longitudinally striate, attenuated upwards, hollow. The gills are pallid, then purple-brown with a white edge, crowded, adnate, subventricose, up to 7 mm. broad. They bear fusiform or flask-shaped cystidia, 40–50 μ high, 16–20 μ at the widest, with the wall strongly thickened at the apex (up to 8 μ thick) and thinning off along the sides just below. The spores are purple-brown, narrow-oval or oblong-oval, inequilateral, 6–7 × 4 μ. It may be known as *Psathyra reticulata*.

Psathyra reticulata.—Pileo primo conico, deinde late conico-convexo vel plano, ad 6 cm. diam., interdum acute umbonato, badio vel cinereo, centro saturatiore, lirellis parum elevatis anastomosantibus reticulato, modo atomato, modo floccoso; carne tenui, fragili. Stipite ad 8 cm. long., 8 mm. diam., albo, nitente, fragili, sparse floccoso, longitudinaliter striato, cavo, sursum attenuato. Lamellis pallidis, deinde purpureo-brunneis, margine albo, confertis, adnatis, subventricosis, ad 7 mm. latis. Sporis purpureo-brunneis, anguste ovalibus vel oblongo-ovalibus, inæquilateralibus, 6–7 × 4 μ. Cystidiis fusiformibus, 40–50 μ long., 16–20 μ diam., apice incrassato.

168.—Hygrophorus firmus B. & Br.

Fasciculate. Pileus 2–3·5 cm. diameter, deeply umbilicate, margin decurved, finally infundibuliform, orange-red to orange-yellow, becoming pale yellow when old, glabrous. Total height up to 6·5 cm. Flesh yellow. Stalk yellowish-red or reddish-orange, yellow at the base, expanding upwards, 3–5 mm. diameter in the middle, glabrous, stuffed, then hollow. Gills pale yellow, distant, broad (up to 4 mm.), decurrent. In all the spore prints of this species, two sizes of spores occur, one 13–16 × 9–12 μ., oval, closely and minutely warted; the other 6–7 × 5–6 μ., smooth, subglobose.

On the ground, among grass, in clusters of twenty or more, the clusters often arranged in rings.

The specimens attributed to *Hygrophorus lætus* Fr., Fungi of Ceylon, 318, appear to be this species; and, from the figure, *Clitocybe anisa* B. & Br., Fungi of Ceylon, 85, is the same.

169.—Hygrophorus cæsius B. & Br.

Pileus broadly convex, then expanded, margin repand and split, up to 4·5 cm. diameter, dark green, with densely clustered, dark olive, wart-like scales in the centre, and scattered, dark olive points and striæ elsewhere; showing blue where the cuticle is split. Flesh thin, green when cut. Stalk up to 5 cm. high, 3–7 mm. diameter, equal or fistulose, stuffed, then hollow, deep indigo-blue, becoming pale blue, smooth, shining, pale blue internally. Gills at first deep Prussian blue, gradually becoming dull green, broad (up to 9 mm.), distant, thick, ventricose, slightly sinuate behind, broadly adnate, strongly veined above, interstices veined. Spores white, oval, 7–9 × 4–5 μ.

On the ground, among grass, Peradeniya.

Hygrophorus multicolor B. & Br., Fungi of Ceylon, 317, would appear to be very close to this species. It has a longer stalk, white at the base. But the specimen bears a note by Thwaites, "Blue, shaded with green, yellow, and orange." The figure, however, does not show any yellow or orange.

170.—Hygrophorus roseostriatus B. & Br.

This species is common at Peradeniya, growing among grass in large rings. The pileus is conico-campanulate, then almost plane, obtusely umbonate, crimson, or crimson with yellow streaks, or entirely yellow or orange-yellow, up to 5 cm. diameter, with adpressed fibrils, which become ashy in drying. Flesh thin, yellow, white in the centre. Stalk up to 7 cm. long, 1 cm. diameter, pale yellow to orange, white at the base, stuffed, then hollow, white or yellow internally. Gills often irregular, thick, distant, ventricose, up to 1 cm. broad, free or sinuato-adnate, pale yellow or orange-yellow. Spores white, 8–10 × 4–5 μ.

This species has several other names in the Fungi of Ceylon. It is "324, *Hygrophorus ceraceus* Fr. var. *moschatus* B. & Br.," and "337, *Hygrophorus chlorophanus* Fr." *Hygrophorus bicolor* B. & Br. is a specimen which has been caught by dry weather, and *Hygrophorus glanduliformis* B. & Br. is a distorted specimen.

171.—Hygrophorus elegantissimus B. & Br.

Pileus conico-campanulate, then broadly convex, umbonate, up to 4 cm. diameter, at first brown with a pinkish tinge, then pale pink, sometimes retaining the brown colour at the margin, innately silky striate when dry ; margin irregular. Flesh pink. Stalk pink, up to 4·5 cm. high, 5 mm. diameter, equal, or inflated below, smooth, glabrous, stuffed. Gills pale pink, whitish at the edge, distant, broad, ventricose, veined, edge irregular, decurrent with a broad sinus. Spores, white, broadly oval, 6–9 × 4–6 μ. The whole fungus becomes reddish-orange when decaying.

On the ground, among grass, Peradeniya, July, 1908 ; July, 1913.

172.—Hygrophorus cinerascens B. & Br.

Pileus at first broadly convex, centre depressed, sometimes becoming almost plane, with a repand and undulating margin, 5 cm. diameter ; or conico-campanulate, up to 5 cm. diameter and 3 cm. high ; livid brown when moist, becoming gray-brown, streaked with ashy innate fibrils, margin usually pale ;

cuticle splitting when old into radial fascicles and scales of adpressed fibrils ; turning black when drying. Often fissured in the centre and exposing the hollow stalk ; flesh livid-brown over the gills. Stalk up to 7 cm. high, 3–8 mm. diameter, equal, often compressed and irregularly sulcate, pallid, then pale livid brown, glabrous, stuffed, soon hollow, turning pink internally when cut ; base fibrillose or tomentose. Gills pallid, then cinereous or lead-coloured, broad (up to 1 cm.), ventricose in large specimens, regularly attenuated outwards in small plane specimens, broadly adnate with a decurrent tooth, sometimes sinuate behind, margin irregular. Spores white, oblong oval, 6–9 × 4–6 μ. Has a strong nitrous smell.

Among grass, in rings, Peradeniya.

Hygrophorus cinereus B. & Br. (Thwaites's figure 1195) appears to be merely a young *Hyg. cinerascens.*

173.—**Hygrophorus erinaceus** Pat.

The specimens attributed by Berkeley and Broome to *Hygrophorus conicus* var., Fungi of Ceylon, 329, agree with the description of *Hygrophorus erinaceus* Pat.

Pileus up to 3·5 cm. diameter, broadly convex, or almost plane and undulating, greenish-yellow, densely covered with black-brown, or olive-brown, minute scales and streaks. Flesh greenish-yellow. Stalk up to 4·5 cm. long, 3–7 mm. diameter, greenish-yellow, glabrous, stuffed. Gills greenish-yellow, distant, ventricose, sinuate behind, decurrent. Spores white, broadly oval, or somewhat pyriform, 6–10 × 5–8 μ.

Among grass, under trees, Peradeniya.

174.—**Hygrophorus dimorphus** (B. & Br.).

This species was described by Berkeley and Broome as *Agaricus* (*Clitocybe*) *dimorphus* in Fungi of Ceylon, 86.

Pileus broadly campanulate or almost plane, depressed or rather acutely umbonate, 2–2·5 cm. diameter, orange in the centre, pale yellow outwards, margin sometimes whitish, smooth, subdiaphanous, radially striate. Flesh yellowish. Stalk up to 3 cm. long, 3–4 mm. diameter, fistulose, equal, or attenuated at the base, white or faintly yellow, feebly longitudinally silky, stuffed, then hollow. Gills cream-coloured, yellow when old, distant, rather narrow, decurrent, connected by strong veins. Spores white, oval, 7–8 × 4 μ.

On the ground, in flower beds, Peradeniya.

175.—**Cantharellus humilis** B. & Br.

Whole plant 3–5 cm. high. Pileus 3–6 cm. diameter, deeply infundibuliform, the hollow extending to the base of the stalk, white or pallid, glabrous, margin undulating, sometimes lobed; flesh thin. Stalk 1–1·5 cm. high, 3–4 mm. diameter, hollow, expanding upwards, white, becoming ochraceous when dry, slightly tomentose above, strongly tomentose below. Lower surface of the pileus white; gills narrow, repeatedly forked, united by numerous veins. Spores white, oval, 4 × 3 μ.

On the ground among dead leaves and twigs, which are bound together by the mycelium, often cæspitose, Peradeniya.

176.—**Lentinus apalus** B. & Br.

Thwaites's 725 was divided by Berkeley and Broome into two species, *Clitocybe candicans* Pers. and *Lentinus apalus* B. & Br. The figure was named *Clitocybe candicans.* The type specimens of *Lentinus apalus* include a group of Lentini, but these are correctly marked off by Berkeley as *Lentinus manipularis* B. & Br. The remainder of the specimens grew on the ground, and they are identical with the Ceylon specimens of *Clitocybe candicans.*

This species proves to be a Clitopilus, and will stand as *Clitopilus apalus.* It is gregarious, often connate at the base, 2–3·5 cm. high, with a pileus, 2–3 cm. in diameter, at first umbilicate with the outer half plane, then infundibuliform, margin incurved, white, smooth, shining, generally circular in outline, but sometimes elliptical and undulating at the margin. The gills are at first white, then faintly pink, decurrent, moderately crowded, narrow. The stalk is about 1·5 cm. high, 3 mm. diameter, expanding upwards, at first white, slightly tomentose, then pinkish, strongly tomentose at the base, solid. The spores are dull pink, broadly oval, 5–6 × 4 μ. It has a strong smell of meal.

177.—**Coniophora Broomeiana** Mass.

The type in Herb. Kew is Thwaites's 256. It is an immature Hypoxylon, of the same type as *Sphæria albofulta* B. & Br.

178.—**Sphærella Chionanthi** (B. & Br.) Cooke.

Sphæria (*Obturatæ*) *Chionanthi* was described by Berkeley and Broome in Fungi of Ceylon, 1114, as " Peritheciis minutis epidermide hyalina tectis ; sporidiis uniseptatis ; spermatiis aculearibus (518). On *Chionanthus zeylanica*, Dambool, March, 1868. Forming little yellow patches consisting partly of the minute perithecia, partly of the larger bodies containing the spermatia ; sporidia 20 × 7·5 μ ; spermatia 12·5–20 μ long." In Saccardo, I., p. 549, it was listed as *Didymella Chionanthi* (B. & Br.) Sacc. ; while Cooke, in Jour. Bot., 1883, p. 107, transferred it to *Sphærella*, stating that the asci were cylindrico-clavate and the spores fusiform, one-septate, 18 × 5 μ.

The type in Herb. Kew is labelled " on *Chionanthus zeylanica*," a plant now known as *Linociera purpurea* Vahl. But the co-type in Herb. Peradeniya is labelled " Thw. 518. Dambool. *Memecylon umbellatum*." The two specimens are identical, both as regards host plant and fungus, and from specimens recently collected there is no doubt that the plant is *Memecylon umbellatum*.

On the upper surface of infected leaves the fungus causes pale yellow, somewhat diffuse spots, with a broad yellow-green margin. On the lower surface the spots are bright orange-yellow and circular, and bear orange-red, pulvinate, subtranslucent swellings, the pycnidia, or minute, dark red, circular points, the ostiola of the perithecia, either separately or intermixed.

The pycnidia are lenticular, subepidermal, raising the epidermis in minute blisters, either oval or circular, up to 0·6 mm. broad and 1·2 mm. long. The overlying epidermis is orange-red, not hyaline. The pycnidium is about 0·5–1 mm. thick, with an orange-yellow basal layer. The pycnospores are linear, straight or curved, 11–18 × 1–2 μ.

The perithecia are totally immersed, pyriform, 0·25 mm. diameter, and 0·3 mm. deep. The perithecial wall is stout, and orange-yellow. The asci are cylindrico-clavate, 140–180 × 11–12 μ, with a very stout pedicel and a well-developed foot. Numerous paraphyses are present, and spermatia identical with the pycnospores. The ascospores are fusoid, or narrow-oval attenuated towards one end, thick-walled, wall rough, greenish-hyaline, 16–22 × 6–7 μ. They are not septate, as far as I can discover from the co-type and from fresh specimens; some spores show a pale transverse line near the centre, but, on staining with cotton blue, a broad blue band appears across the spore, showing a concentration of the cell contents there.

It is evident that the fungus is a *Hyponectria*, and it may stand as *Hyponectria Memecyli*. Should the spores prove to be uniseptate ultimately, it would be *Charonectria*.

179.—**Diatrype irpex** B. & Br.

This was described by Berkeley and Broome in Fungi of Ceylon, 1083. They stated that it was "late effusa," and in Saccardo, II., p. 145, it is listed as *Melogramma*. Berlese, Icones Fungorum, Tab. XXVII., fig. 3, figures it under the name *Rhyncosphæria irpex* (B. & Br.) Berl.

The perithecia are up to 0·75 mm. diameter, superficial, densely crowded, but not confluent, in large patches; globose below, passing rather gradually into a long cylindrical ostiolum up to 5 mm. long, and 0·2 mm. diameter, black or black-brown, strigose, becoming glabrous. There is a thin purplish film of mycelium between the perithecia, which spreads beyond them over the substratum. I have not seen the conidia described by Berkeley and Broome. The asci are clavate, eight-spored, the sporiferous portion measuring 160–175 × 16–20 μ; the spores are biseriate, or uniseriate below and in an irregular bundle above. The spores are fusoid in one aspect, elongated cymbiform in another, straight or slightly curved, 7–8 septate, not constricted at the septa, thin-walled, ends obtuse, black-brown, with the terminal loculi paler, 52–70 × 8–10 μ. Berlese's classification appears to be correct.

180.—Diatrype theloides B. & Br.

This was described by Berkeley and Broome in Fungi of Ceylon, 1082, from Thwaites's 543, as "Pustulata, ostiolis lævibus in disco parvo erumpente collectis; sporidiis allantoideis. Pustules closely adnate with the cuticle, which is blackened, sometimes merely lifting it up; sporidia, ·0003 (inches) long."

The type specimen in Herb. Kew shows blackened oval areas, about 2 mm. diameter, slightly elevated, covered, except at the apex, by the radially ruptured epidermis; other areas, not so definitely blackened and more widely split, show groups of projecting ostiola. The stroma is immersed in the bark, and is about 1·5 mm. diameter; it consists of a group of oval, or globose, perithecia or pycnidia, 0·3–0·4 mm. diameter. The pycnidia have stout, barely projecting ostiola; the ostiola of the perithecia are produced into cylindrical or clavate necks, up to 0·5 mm. high and 120 μ diameter, which converge to a common centre. Within the cortex above and below the fructification, and at a little distance from it, is a thin black layer, which encloses the perithecia or pycnidia and the cortical tissues in a Valsa-like lenticular stroma. This is more evident in the pycnidial stromata, over which it forms the blackened areas noted above.

The wall of the perithecium is cellular and not carbonaceous. The pycnospores are linear, straight or curved, $4–6 \times 0·75$ μ, hyaline. The asci are clavate, not long pedicelled, small, about 24×5 μ, eight-spored. The spores are hyaline, cylindric, curved, $6–8 \times 2$ μ. The fungus is apparently Valsa, and will stand as *Valsa theloides* (B. & Br.).

181.—Diatrype chlorosarca B. & Br.

Stromata erumpent, up to 2 mm. diameter, flattened pulvinate, almost plane, up to 0·8 mm. thick, minutely furfuraceous becoming glabrous, rarely showing projecting perithecial elevations; ostiola depressed, surrounded by a raised ring; internally greenish-yellow, perithecial walls black, brown when mounted. Perithecia globose, 0·4 mm. diameter, or flask-shaped, up to 0·7 mm. high, 0·4 mm. diameter, usually in a single layer. Asci eight-spored. Spores cylindric, curved, greenish-hyaline or fuscous, 8–10 × 2 μ.

Found recently on dead branches of *Hevea brasiliensis*. The figure in Berlese, Icones, III., plate CXV., is not typical. In general the stroma is flat, with a single layer of perithecia, and pulvinate stroma which show distinct perithecia are rare. The ostiola, too, do not project as shown in the figure ; except with a high magnification they are not discernible.

182.—**Diatrype griseotecta** B. & Br.

Described by Berkeley and Broome as " Peritheciis globosis immersis nigris, ostiolo papillæformi, e bysso griseo emergentibus." They stated that the spores were 25 μ long, scarcely mature. Cooke, in Grevillea, XIII., p. 58, stated that it was not a Diatrype, and that the spores were 40 × 3 μ.

The co-type in Herb. Peradeniya has scattered, superficial perithecia, black, subglobose below, conical above, with a fluted ostiolum. The perithecial wall is not carbonaceous, and is areolated (by transmitted light). The substratum is covered by a thin layer of purple-brown hyphæ, which extends over the perithecia, leaving only the apices naked. The perithecia are " immersed " in this layer, not in the wood. The asci are cylindrico-clavate with a thickened apex, up to 200 × 16 μ, eight-spored, and the spores are cylindric, with rounded ends, about 60 × 4 μ. They are immature, but from the structure of the perithecium, and comparison with immature examples of *Bombardia Janus* (B. & Br.) Petch, this species is evidently an immature gathering of the latter.

183.—**Eriosphæria imitatrix** (B. & Br.) Sacc.

This species was described in Fungi of Ceylon, 1086, as " *Sphæria* (*Byssisedæ*) *imitatrix* B. & Br. Lata effusa, e strato nigro oriunda ; peritheciis minutis collapsis asperulis ; sporidiis uniseptatis." The spores were said to be oblong, subcymbiform, 15 μ long.

In the co-type in Herb. Peradeniya the perithecia are crowded together, seated on, or partly immersed in, a thin layer of purple-brown hyphæ. They are about 0·3 mm.

diameter, collapsed, rugose, without a projecting ostiolum, bearing short, irregular, erect hyphæ or remnants of conidiophores. The wall is cellular, not carbonaceous. The asci are shortly pedicellate, 135–150 × 10 μ, subcylindric, eight-spored. Linear paraphyses are present. The ascospores are greenish-hyaline or pale fuscous, oval, one-septate, constricted at the septum, ends rounded, 15–20 × 7–9 μ. It appears to be correctly placed in Eriosphæria.

184.—**Eriosphæria nigrita** (B. & Br.) Sacc.

This was described by Berkeley and Broome in Fungi of Ceylon, 1091, as " *Sphæria* (*Byssisedæ*) *nigrita* B. & Br. Mycelio acanthimorpho ; peritheciis minute hispidulis ; ascis linearibus ; sporidiis ellipticis submetulæformibus, uniseptatis utrinque hyalinis. The mycelium resembles that of *S. acanthostroma* Mont. ; but the sporidia are much larger, besides having the tips hyaline; sporidia ·0005 (inches) long."

The perithecia are embedded in a compact layer of mycelium which is composed of stout (7 μ diameter) branched interwoven hyphæ. The hyphæ do not resemble those of *Sphæria acanthostroma*, but in the younger parts they terminate in long, acute, spine-like branchlets, often in groups of three. The perithecia are globose, about 0·3 mm. diameter, covered with spreading setæ, which are cylindric below, tapering and acute above, black, opaque, 50–100 × 6 μ. The wall of the perithecium is cellular and rather thick. The ascospores are oval, with rounded ends, three-septate, slightly constricted at the septa, at first hyaline, the two middle cells becoming dark brown, the smaller terminal cells remaining hyaline and ultimately collapsing, so that the ends appear truncate. They measure 16–20 × 7–8 μ. Berkeley and Broome's measurement probably refers to the collapsed barrel-shaped spore.

This is evidently *Chætosphæria*, and will stand as *Chætosphæria nigrita* (B. & Br.).

185.—**Chætosphæria bihyalina** (B. & Br.) Sacc.

The original description, in Fungi of Ceylon, 1087, is " Effusa, nigerrima ; peritheciis globosis collapsis minutissime granulosis e mycelio byssoideo oriundis; sporidiis cymbiformibus triseptatis utrinque hyalinis." The spores were said to be 30–62·5 μ long. The second of these figures is probably a misprint. The species was figured by Berlese, in Icones Fungorum, I., pl. XVII., fig. 6.

The perithecia are crowded or scattered, seated on, or embedded in, a purple-brown byssoid mycelium. They are about 0·3 mm. diameter, minutely rugose, collapsed, and strongly resemble those of *Eriosphæria imitatrix*, but they are not villous. The asci are clavate, shortly pedicelled, about 90 × 16 μ. The spores are subcymbiform, straight or curved, ends rounded, three-septate, constricted at the median septum, the two middle cells pale brown, and the terminal cells hyaline, with one of the middle cells frequently inflated, 28–32 × 5–8 μ.

Berlese's figure was taken from a specimen collected in Europe by Prof. Saccardo, which had been "minutiose" compared with the type. But he states that the spores are 18–22 × 6–7 μ, and show a villous perithecium. It is probable that the European species is not the same as that from Ceylon.

186.—Schizostoma pachythele (B. & Br.).

Perithecia scattered or gregarious, globose, about 0·8 mm. diameter, rough, black, with a conical or orbicular crest (oval in cross section), up to 0·3 mm. high, extending over about one-half the perithecium. Asci clavate, apex rounded, 100–112 × 6–7 μ; sporiferous part 52–62 × 6–7 μ, with a long, tapering, curved pedicel; spores biseriate. Paraphyses numerous, linear. Spores blackish-brown, fusiform, one-septate, appearing spuriously three-septate, deeply constricted at the septum and readily breaking into two, 17–20 × 4 μ.

This was described by Berkeley and Broome as *Sphæria* (*Macrostomæ*) *pachythele*. Saccardo (Michelia, I., p. 336) included it in *Schizostoma*. Berlese, Icones Fungorum, Vol. I., p. 2, gives the spores 14–16 × 3·5–4 μ. The spores appear three-septate, owing to the contraction of the contents from the ends.

187.—Fracchiæa Broomeiana (Berk.).

Sphæria Broomeiana was described by Berkeley in Hooker's London Journal of Botany, VI. (1854), p. 231, from Ceylon specimens. In Saccardo, Sylloge, I., p. 106, it was listed as *Coronophora Broomeiana.* No spore measurements were given. In Notices of North American Fungi, Grevillea, IV., p. 47, Berkeley subsequently described *Cucurbitaria brevibarbata* B. & C., which was included in Saccardo, Sylloge, I., p. 94, with a query, as *Fracchiæa brevibarbata.* In Grevillea, XX., p. 113, Cooke stated that *Fracchiæa brevibarbata* "was found on *Acer rubrum* in South Carolina, on bark in Ceylon, and on *Rhus copallina,* Santee Canal, S. Carolina." In the cover of *Fracchiæa brevibarbata* at Kew is a specimen from Ceylon, labelled "*Sphæria Broomeiana* Berk. Ceylon G. H. K. T., Sept. 10, 1850." This is the type of *Coronophora Broomeiana.* Evidently Cooke considered *Coronophora Broomeiana* to be identical with *Fracchiæa brevibarbata.*

Fracchiæa brevibarbata was figured and re-described by Berlese (Icones Fungorum, III., p. 27, pl. XXXV., fig. 2) as "Perithecia in greges parvos cæspitose collecta, globoso depressa, sed sæpius mutua pressione difformia, stromate crustaceo, effuso vel vix pulvinato insidentia, subinde etiam breviter stipitata, rugoso-aculeata, aspera, nigra, superficialia, $\frac{1}{3}$–$\frac{1}{2}$ mm. diam.; asci late clavati, longe et abrupte stipitati, 110–120 × 14–18, parte sporifera 55–65 et stipite 45–65 μ long., polyspori; sporidia allantoidea, 6–7 × 1·5–2, hyalina." He stated that he had examined specimens from the original collection sent to him by Cooke.

Sphæria Broomeiana, according to the type specimen, has globose perithecia, about 0·5 mm. diameter, clustered in groups of about a dozen, forming small pulvinate heaps. They are in some cases flattened above, with a minute conical ostiolum. The surface is echinulate, with short conical spines up to 32 μ high, 10 μ diameter at the base, which bear minute projections along their sides. The asci are clavate, polysporous, the sporiferous part measuring 75–100 × 15–20 μ, with a tapering pedicel 36–50 μ long. The spores are cylindric, curved, greenish-hyaline, 5–7 × 2 μ. The species is evidently *Fracchiæa,* and will stand as *Fr. Broomeiana.*

The American species, specimen on *Rhus* examined, is practically identical. Its perithecia are clustered, about 0·5 mm. diameter, with a minute conical ostiolum; the apex is not flattened. The surface is echinulate, with conical spines, up to 30 μ high, which are not so markedly thorny along their sides as in the Ceylon specimens. The asci are smaller than in the Ceylon species, the sporiferous part measuring 55–65 × 16–18 μ, and the pedicel about 30 μ; but the spores are larger, 8–10 × 1·5 μ, hyaline. The spores do not appear to be quite mature, but even so they are longer than in *Fr. Broomeiana.*

It will be noted that Berlese's measurement of the spore agrees with that of *Fr. Broomeiana,* and his measurement of the ascus with *Fr. brevibarbata.* If both his measurements are from the same American specimen, it must be assumed that the spores may vary 5–10 × 1·5–2 μ. The earliest name is *Sphæria Broomeiana.*

188.—Trichosphæria acanthostroma (Mont.) Sacc.

Thwaites's 1029 was referred to this species by Berkeley and Broome. It consists of a thin, purple-brown, somewhat velvety stratum of mycelium, extending for several centimetres, and composed of suberect, rigid, flexuose hyphæ, with simple or forked, acute, lateral branches. The perithecia are scattered, 0·2 mm. diameter, globose, without an evident ostiolum, collapsing into a cup when dry. The perithecial wall is brown by transmitted light, cellular, almost membranous, and smooth. The asci are eight-spored, with narrow-oval, hyaline, continuous spores, 5–7 × 2 μ, but they do not appear to be quite mature.

189.—Trichosphæria regulina (B. & Br.) Sacc.

Thwaites's 1075 was described by Berkeley and Broome as "*Sphæria* (*Byssisedæ*) *regulina.* Peritheciis minutissimis ovatis obtusis e mycelio tenui oriundis; ascis clavatis; sporidiis biseriatis oblongis curvatis tenuibus. Perithecia invisible to the naked eye; asci ·003 (inches) long; sporidia ·0008 by ·0002." In Saccardo, Sylloge, I., 454, it is listed under *Trichosphæria.*

The perithecia are black, globose, 0·15–0·2 mm. diameter, minutely rugose, shining, with a minute conical ostiolum, at first covered with fragments of mycelium, becoming naked; they are crowded, seated on, or partly embedded in, a thin purple-brown layer of mycelium. The asci are eight-spored, clavate, 90–100 × 10 μ. The spores are cylindric with rounded ends, straight or variously curved, three-septate, very slightly constricted at the septa, 16–24 × 5 μ. The septa are scarcely visible, except under a high magnification.

This is a *Lasiosphæria*, and will stand as *Lasiosphæria regulina* (B. & Br.).

190.—Lasiosphæria acanthigera (B. & Br.).

Sphæria (*Villosæ*) *acanthigera* B. & Br. was described as "Peritheciis ovatis, sub lente pallide fuscis spinis brevibus latis concoloribus vestitis; sporidiis linearibus curvis. On dung. The spines of this species are extremely curious, broad at the base, resembling in miniature those of a rose. The sporidia, when mature, are probably like those of *S. hirsuta*; but in the specimens before us they are clearly young." It was included in Saccardo, Sylloge, II., 198, under *Lasiosphæria*.

The only specimen in Herb. Kew is part of the type, ex Herb. Cooke. In Herb. Peradeniya this species is included with *Sphæria nigrita*, Thwaites 596. The specimens sub *Lasiosphæria acanthigera* in Herb. British Museum, ex Herb. Broome, are the conidial fungus, "Thwaites 576, Dolosbagey," attributed by Berkeley and Broome to *Xylaria tentaculata*.

The specimens in Herb. Peradeniya are more mature than those in Herb. Kew. The perithecia are ovate, or conical above, 0·4 mm. diameter, now black, minutely aculeate. The perithecial wall is cellular, and the outer cells are produced into short spines, which, as stated by Berkeley and Broome, resemble the prickles of a rose. These spines are broadly conical below, with a narrow, conical, acute tip, which is curved or falcate; they are 24–34 μ broad at the base and 28–34 μ high. The asci are eight-spored. The spores are at first hyaline and cylindric, about 66 × 5 μ ; they become oval, black-brown, opaque, 18–24 × 9–11 μ, with a hyaline appendage, 5 μ diameter, which ultimately disappears.

The mature spores show that this species is a *Sordaria*, and it will stand as *Sordaria acanthigera* (B. & Br.).

191.—**Lasiosphæria hemipsila** (B. & Br.) Sacc.

Thwaites's 1078 was described by Berkeley and Broome as *Sphæria* (*Villosæ*) *hemipsila*, " Sparsa ; peritheciis minutis subglobosis dealbatis sursum nudis, basi filis rigidis munitis ; sporidiis curvis flexuosis triseptatis. Sporidia biseriate, ·002 (inches) long, triseptate." It was included under *Lasiosphæria* in Saccardo, Sylloge Fungorum, II., 198.

The specimen in Herb. Peradeniya is on a decaying palm frond, which bears here and there a thin film of mycelium and the scattered remains of conidiophores. The perithecia are scattered, superficial, ovoid, 0·25 mm. diameter, black, sparsely clothed up to the apex with rigid, spreading, shining hairs (stalks of conidiophores) up to 0·25 mm. long and 6 μ diameter. Paraphyses are present. The ascospores are cylindric or fusoid, straight or curved, three- to five-septate, scarcely constricted at the septa, pale brown, except the small terminal cells, which are hyaline, 36–48 × 8 μ.

This species is figured by Berlese in Icones Fungorum, I., pl. 117, fig. 2, from part of the type communicated by Cooke. Berlese gave the ascus 150–160 × 16–20 μ, and the spores 48–52 × 6–8 μ. But he did not find the smaller, three-septate spore. His figure shows one seven-septate spore and others five-septate. The figure of the perithecium shows flexuose hairs, and in that respect is incorrect. Berlese retains it in *Lasiosphæria*, but it is evidently *Chætosphæria*, and will stand as *Chætosphæria hemipsila* (B. & Br.).

192.—**Lasiosphæria tephrocoma** (B. & Br.) Sacc.

This species was said to grow on palm leaves, but the type in Herb. Kew is on bamboo. The description is " *Sphæria* (*Villosæ*) *tephrocoma*. Peritheciis setis sparsis rigidis vestitis ; ascis clavatis ; sporidiis fusiformibus triseptatis ; conidiis conformibus uniseptatis. Sporidia ·0011 long ; spores from pycnidia, ·0004; helminthosporoid conidia ·003 (inches)." In Saccardo, Sylloge Fungorum, II., 198, it was placed in *Lasiosphæria.*

The substratum bears a thin purple-brown layer of mycelium, almost membranous, densely covered with the remains of erect, rigid conidiophores, up to 1 mm. high. These stalks are compound, about 30 μ diameter at the base, tapering to 16 μ above, and arise more or less in clusters. The perithecia are produced within the base of these clusters, and consequently bear the remains of the conidiophores, but these are readily detached; the perithecia are globose, black, about 0·3 mm. diameter. The asci are clavate, with a tapering pedicel, eight-spored, spores biseriate, 40–50 × 6 μ. The spores in the perithecia examined by me were narrow-oval or subcylindric, with rounded ends, greenish-hyaline, one-septate, 6–9 × 2–3 μ. They were obviously immature, and Berkeley and Broome's statement that they are ultimately three-septate may be correct, but their measurement, 27·5 μ, is an error. There may be a mixture of species in the type, but the perithecia and spores described above clearly belong to the conidiophores, which form the chief part of it.

193.—Lasiosphæria chloronema (B. & Br.) Sacc.

Thwaites's 1109, which was immature, was described by Berkeley and Broome as "*Sphæria* (*Villosæ*) *chloronema.* Peritheciis globosis breviter albo-tomentosis, ostiolo nigro, intus materie viride repletis." In Saccardo, Sylloge Fungorum, II., 214, it is placed in *Lasiosphæria.*

The perithecia are scattered, superficial, globose, clothed with yellow interwoven hyphæ, the ostiolum black and projecting. The perithecial wall appears black in section, but when mounted is found to be parenchymatous, with a brown outer layer, blackening at the apex, and a yellow inner layer. The mass of asci and linear, septate paraphyses is yellow. The spores in the co-type in Herb. Peradeniya are not fully mature; they are hyaline, cylindric, straight or curved, multiguttulate, 30–36 × 4 μ.

194.—Chætosphæria xanthotricha (B. & Br.) Sacc.

This was described by Berkeley and Broome as "*Sphæria* (*Villosæ*) *xanthotricha*. Peritheciis aggregatis flavo-lanatis; ostiolo punctiformi nigro; sporidiis subcymbiformibus 4–5-septatis. Sporidia ·00065 (inches) long." It was included in Saccardo, Sylloge Fungorum, I., p. 95, as *Chætosphæria*.

The perithecia are about 0·4 mm. diameter, superficial, gregarious, globose, with a papillate ostiolum, black, clothed, except at the ostiolum, with yellow spreading hyphæ, which extend slightly over the substratum at the base. The perithecial wall is parenchymatous, not carbonaceous, dark brown when mounted. The external hyphæ are septate, 3–4 μ diameter, slightly inflated at the tip, and strongly encrusted; yellow, oval, continuous conidia, 5–7 × 3–4 μ, are present, apparently borne on the external hyphæ. The asci are eight-spored, about 60 × 8 μ. The spores are fusoid, three- to five-septate, slightly constricted at the septa, ends obtuse, pale fuscous, 16–20 × 5 μ. It would perhaps agree better with *Lasiosphæria* than with *Chætosphæria*.

195.—Melanomma Vesuvius (B. & Br.) Berl.

Berkeley and Broome described this species as "*Sphæria* (*Pertusæ*) *Vesuvius* B. & Br. Sparsa; peritheciis magnis, e basi truncata conicis, ostiolo acuto; sporidiis fusiformibus fuscis biconicis, medio contractis, utrinque uniseptatis. On decayed wood. Perithecia ¾ line across and as much high; sporidia ·0018 by ·0005 (inches)." It was included in Saccardo, II., 119, as *Trematosphæria*. Berlese, in Icones Fungorum, I., p. 36, tab. 24, fig. 2, referred it to *Melanomma*.

The perithecia occur on decaying palm fronds. They are scattered, almost superficial, with the base slightly immersed, black, smooth, carbonaceous, conoid, with a minute conical ostiolum, base flat, 0·75–1·5 mm. diameter, 0·5–1 mm. high. The spores are pale to dark brown, fusoid, three-septate, constricted at the median septum, straight or slightly curved, ends obtuse, 38–48 × 6–8 μ, with one of the middle cells often inflated to 10 μ wide.

196.—Trematosphæria agnocystis (B. & Br.) Cooke.

This was described by Berkeley and Broome as "*Sphæria* (*Pertusæ*) *agnocystis* B. & Br. Innata, conica, coffeicolor, lævissima ; ostiolo papillæformi ; sporidiis biconicis, utrinque hyalinis. On dead wood." In Saccardo, I., 722, it was listed as *Amphisphæria.* Cooke, in Grevillea, XVI., p. 92, referred it to *Trematosphæria,* and gave the spore as three-septate, 40 × 8 μ.

The type specimens are on a decaying palm frond. The perithecia are scattered, conical, with a flat base, almost superficial, with the base slightly immersed, up to 1 mm. diameter and 0·5 mm. high, with a thin purple-brown pruinose outer layer. The wall is black, carbonaceous, about 0·1 mm. thick. In some cases it bears a few scattered globose wart-like bodies, which are the immature perithecia of a parasitic Sphæria. The spores are pale brown, fusoid, three-septate, constricted at the median septum, ends obtuse, 33–39 × 5–6 μ.

This species is very near *Melanomma Vesuvius,* but differs in the shape of the perithecium and the smaller, non-inflated spores. It must stand as *Melanomma agnocystis* (B. & Br.).

197.—Rosellinia plicatula (B. & Br.) Sacc.

This species was described by Berkeley and Broome as "*Sphæria* (*Cæspitosæ*) *plicatula* B. & Br. Fasciculato-congesta ; peritheciis atris collapsis minute granulatis plicato-rugosis ; sporidiis doliiformibus utrinque leviter attenuatis, nucleo magno (Nos. 39, 1069). On bark. Asci clavate, sporidia biseriate, ·0006–·0008 long by ·0004–·0005 (inches). Very near *Sphæria Pezizula* B. & Rav., which has shorter hyaline sporidia." In Saccardo, I., 261, it was included in *Rosellinia.*

Thwaites's 1069 shows superficial, irregularly circular, pulvinate stromata, up to 2·5 mm. diameter and 1 mm. thick. They appear to bear circular, flattened, rugose, discoid perithecia up to 0·15 mm. diameter, but sections through the stroma disprove that interpretation. The substance of the stroma is pseudoparenchymatous, and the perithecia are totally immersed ; they are narrow-oval, up to 200 μ deep and 70 μ diameter, with a thin hyaline wall. The superficial bodies are immature, but appear to be pycnidia ; they are oval or turbinate, about 0·1 mm. high, with a thick pseudoparenchymatous wall. The turbinate, flat-topped shape appears to be normal, not a result of drying. The asci are clavate, thick-walled, about 125 × 16 μ, eight-spored. The spores are oval, continuous, pale brown to blackish-brown, thin-walled, ends usually rounded, rarely attenuated, 14–22 × 6–11 μ. The stroma has the structure of *Botryosphæria,* and the species will stand in *Phæobotryosphæria* as *Phæobotryosphæria plicatula* (B. & Br.).

I have not seen Thwaites's 39, but Thwaites's 30 in Herb. Peradeniya is the same species. This was included by Berkeley and Broome in Fungi of Ceylon, 789, as a form of *Sphæropsis undulata* B. & C. with spores 17·5 μ long. The *Sphæropsis undulata* of the Fungi of Ceylon is *Haplosporella Cesatii* Sacc. *Sphæria plicatula* bears a superficial resemblance to the latter species, and when the asci have disappeared the two might possibly be confused, but *Haplosporella Cesatii* has thick-walled spores. Thwaites's 30, however, contains asci. The wall of *Haplosporella Cesatii* is pseudoparenchymatous, not carbonaceous, as stated in Ann. Perad., IV., p. 61.

198.—**Thyridaria crocosarca** (B. & Br.) Cooke.

This species was described by Berkeley and Broome in the Fungi of Ceylon as "*Trypethelium crocosarca.* Croceum pulvinatum, contextu concolori; peritheciis nigris, ostiolis immersis; sporidiis fusiformibus multiseptatis. On wood. Forming little pulvinate masses, ½–¾ line wide, saffron yellow, dotted where the ostiola open; substance of the same colour; sporidia ·0015 long by ·0005, with twelve or more septa; paraphyses linear." The type in Herb. Kew was marked *Melogramma crocosarca* by Berkeley. Cooke, on finding the specimen under this name in Herb. Kew, published another description under the name of *Thyridaria crocosarca* in Grevillea, XX., p. 83. His description is "Erumpent. Perithecia saffron colour, mealy, cæspitose, 2–6 together, often confluent, on a narrow stroma, pierced at the apex, forming clusters 2 mm. long. Asci clavate, octosporous. Sporidia fusiform, 7–11-septate, pale, not constricted, 40 × 12 μ, with linear paraphyses."

The perithecia are not separate, as would be supposed from Cooke's description, but totally immersed in a stroma. The stromata are elevated, covered at first by a thin lichen stroma, flattened pulvinate, irregularly circular, up to 2 mm. diameter, brownish-yellow or orange-yellow ; the surface is smooth, or broken and minutely granular, dotted with dark, scattered ostiola. The stromata are about 0.4 mm. thick, greenish-yellow internally when fresh, orange-yellow in dried specimens ; the context is rather loose and granular. The perithecia are in a single layer, somewhat distant from one another, and occupying nearly the entire thickness of the stroma ; they are black, oval, about 0·3 mm. high, 0·2 mm. diameter, with a conical ostiolum, which does not project. The asci are clavate, thick-walled towards the apex at first, 140–160 × 12–14 μ. The abundant paraphyses are linear, branched above. The spores are fusoid, ends obtuse, greenish hyaline, thick-walled, 7–11-septate, 36–50 × 8–9 μ.

Berkeley and Broome described this species in a footnote, a course which they also followed in the case of *Platygrapha*. It is evident that they considered these to be lichens, and, in fact, *Trypethelium crocosarca* B. & Br. is identical with part of the Ceylon specimen assigned by Leighton to *Trypethelium Sprengelii* Ach., 196 in Trans. Linn. Soc., XXVII., p. 185. It is *Trypethelium*, not *Thyridaria* nor *Melogramma*.

199.—**Piptostoma spilotum** B. & Br.

This species was described from Thwaites' 348 as " Minutum, planum, cito circumcissum ; ascis lanceolatis ; sporidiis oblongis curvulis. Sporidia ·0025 (inches) long." Saccardo, Sylloge, II., p. 813, places *Piptostoma* among the " Genera dubia," but in Sylloge, IX., p. 1054, it is included in *Microthyriaceæ*.

There is apparently no specimen of *Piptostoma spilotum* at Kew, the British Museum, or Peradeniya.

200.—**Sordaria sarawacensis** Ces.

This species was collected by Beccari, and was recorded by Cesati as occurring in both Ceylon and Sarawak. His description is " Perithecia ex hyphasmate subiculum sat tenax albescens constituente emersa, minutissima, atra, ovalia, in ostiolum acutum carbonaceum excurrentia, cæterum substantia minute vesiculosa. Asci tetraspori, sporidiis ovalibus utrinque obtusis, polo inferiori crasse caudato, 18 μ longa (quorum 10 μ appendicem ipsam spectant), 8–10 μ lata."

In Herb. Kew is a specimen ex Herb. Cesati. The perithecia are black, globose, up to 0·3 mm. diameter, furnished with a cylindric, or slightly attenuated, ostiolum, up to 0·2 mm. high and 0·1 mm. diameter. A thin, white layer of mycelium overlies the perithecia, and through this the ostiola project. The perithecia are free below. The specimen examined was too ripe to show asci, and I am therefore unable to confirm Cesati's statement that they are four-spored. But the spores are black-brown, oval, apex somewhat papillate, base truncate, 20–28 × 9–12 μ; they possess at first a hyaline appendage, of which some remnant occasionally persists in the herbarium specimen.

The perithecia and the white mycelial layer agree with Cesati's description, but the spore measurement is so different that one might suppose that this was not the species examined by him. It may be suggested that the published measurement, 9/500 mm., should be 19/500 mm.; allowing 10 μ for the appendage, this would give a length agreeing with the dimensions found. As it stands, the length of the spore is less than the breadth, if the length of the appendage be deducted. The appendage, however, is certainly more than 10 μ long.

Following *Sordaria sarawacensis*, Cesati described *Sordaria punctiformis*, found on dung on Pedrutalagala, Ceylon. It was "Perithecia minutissima in subiculo crustaceo albicante, ovata, glabra, ostiola vix conspicuo; contextu grosse vesiculoso. Sporidia late ellipsoidea, fusca, simplicia, gutta centrali, 16 × 14 μ, ecaudata (an primitus ?)." Asci were not seen. In Saccardo, Sylloge, I., p. 247, this is listed as *Hypocopra punctiformis*. But in his remarks on this species, Cesati added: "Calvities peritheciorum in nostro fungillo ex senescenti ejus ætate peti posset"; this would appear to negative the supposition that the species is *Hypocopra*, though he compared it to *Hypocopra discospora* Fck.

201.—Sphærella Rottleræ (B. & Br.) Sacc.

Berkeley and Broome described this species as "*Sphæria* (*Depazea*) *Rottleræ* B. & Br. Epiphylla, e macula umbrina pallida oriunda, orbicularis, nivea, limitata ; peritheciis atris." It was said to occur on leaves of *Rottlera quadricocca* Roxb., evidently an error for *Rottlera tetracocca* Roxb., a plant now known as *Mallotus albus* Muell.-Arg. It was included in Saccardo, Sylloge, I., p. 536, as *Sphærella Rottleræ*. Cooke did not refer to it in his "Sphærella and its allies" (Jour. Bot., 1883).

In the type specimen, Thwaites's 1228 in Herb. Kew, the leaves bear circular, white spots, about 2·5 mm. diameter, surrounded by a broad, diffuse, purplish zone. The pycnidia are clustered in the centre of the spot, and are epiphyllous, subepidermal, black, about 0·15 mm. diameter. They do not contain asci, but oval, or subglobose, hyaline, continuous, obtuse pycnospores, 7–12 × 7–8 μ.

As Berkeley and Broome did not record any measurement or description of the spores, it is uncertain whether the form described above is the species seen by them. It is quite possible that perithecia may occur on some of the spots. But as far as examination of the type shows, the fungus is a *Phyllosticta* and must be known as *Phyllosticta Rottleræ* (B. & Br.).

The type in Herb. Kew is Thwaites's 1228. Under 1142, *Asterina nubecula* B. & Br., in the Fungi of Ceylon, Berkeley and Broome noted : "There is also a species on *Rottlera tinctoria* with depressed perithecia situated on snow-white spots, but unfortunately without fruit." This description fits Thwaites's 1228. The leaf in Thw. 1228 is that of *Mallotus albus* (*Rottlera tetracocca*).

202.—Sphæria (Depazea) Oxalidis Kirsch.

Under this name Berkeley and Broome placed Thwaites's 486, in Fungi of Ceylon, 1122. It occurred on *Oxalis corniculata*. They stated that the asci were broader at the base, 37·5 μ long, 10 μ broad, and the spores 10–12·5 μ long, with from one to three nuclei. In Saccardo, I., p. 429, the Ceylon record was included under *Læstadia Oxalidis* (Rabh.) Sacc.

Cooke (Journal of Botany, XXI., p. 109) listed " *Sphærella Oxalidis* Kirsch. in Lotos, 1856, 203 ; Berkeley and Br., Ceylon Fungi, 1122," and added: " This is referred to *Læstadia Oxalidis* (1635) by Saccardo ; but it is quite a different species, as will be evident from a comparison of the diagnosis in Lotos, and the description 1635. It approaches more closely to *Sphærella depazeæformis*, 1984. Whether all these may be forms of one species may be matter of opinion."

The Ceylon fungus produces membranous, circular, brownish-white spots, up to 2 mm. diameter. The perithecia are clustered in the centre of the spot, amphigenous, usually hypophyllous, black, about 75 μ diameter, sub-epidermal, prominent. The asci are oval, or oblong-oval, sometimes attenuated upwards, with a short pedicel, 30–36 × 8 μ. The spores are biseriate, narrow-oval or subcymbiform, straight or sometimes curved, one-septate, not constricted, hyaline, 10–11 × 2·5 μ. It is certainly a *Sphærella.*

Læstadia Oxalidis (Rabh.) Sacc. is said to have asci 32–36 × 8 μ, sessile, lanceolate ; spores fusiform, ventricose, 14 × 4 μ. *Sphærella depazeæformis* (Auersw.) Ces. et de Not. has perithecia 40–46 μ diameter ; asci ovate, attenuated below, 34–36 × 8 μ ; and spores fusiform-oblong, straight, one-septate, 8–10 × 2–3 μ.

From the dimensions of the spores it would appear that the Ceylon species is near *Sphærella depazeæformis*, though the shape of the spores appears to be different. The shape of the ascus agrees with that described for *Læstadia Oxalidis.* It would seem possible, however, that these two species are the same, as Cooke suggested. I have not been able to consult the original description of *Sphærella Oxalidis* Kirsch.

203.—Hypoxylon umbrinellum B. & Br.

This was described in Fungi of Ceylon, 1075, as " Late effusum ; peritheciis minutis ovatis metulæformibusque umbrinellis materie furfuracea vestitis ; ascis linearibus ; sporis subellipticis, uniseptatis, demum echinulatis (1111). On dead wood with Byssisedæ. Margin of the stroma often barren, as in *H. rubiginosum ;* sporidia ·0005 by ·00025." In Saccardo, I., p. 729, it was listed, with a query, as *Amphisphæria.*

In the co-type in Herb. Peradeniya the perithecia are quite separate from one another, but crowded together on a slight basal layer of mycelium. They are conoid, 0·3 mm. diameter, apex papillate, pruinose, dark brown. The ostiolum is punctiform, and furnished with periphyses. The spores are elliptic to fusoid, ends obtuse, one-septate, not constricted, pale brown, with a striate, verrucose wall, 11–14 × 5 μ.

The species is evidently *Phæonectria*, and will stand as *Phæonectria umbrinella* (B. & Br.).

204.—Hypoxylon niphidium B. & Br.

The original description of this species, in Fungi of Ceylon, 1067, is " Peritheciis prominulis in pulvinulos parvos aggregatis pulvere niveo conspersis; sporidiis cymbiformibus hyalinis three-septatis (No. 1089). On bark. Sporidia ·001 long by ·0003." In Saccardo it was included under *Melogramma*. Berlese, in Icones Fungorum, I., p. 50, stated that the original specimens were sterile.

The co-type in Herb. Peradeniya bears mature stromata. They are superficial, circular, up to 4 mm. diameter, pulvinate or flattened pulvinate, minutely tomentose, with prominent ostiola, and apparently pale yellow. The tissue of the stroma is rather loose and white. The perithecia are situated at varying depths and have thick yellow walls; the perithecial cavity is oval, about 0·35 × 0·25 mm., and the neck is up to 1·5 mm. long, totally immersed. The asci are 6–8 μ in diameter, with uniseriate spores. The spores are hyaline, fusoid, spinulose, three-septate, slightly constricted, ends apiculate or rounded, 30–34 × 6–8 μ; sometimes one cell is inflated.

The structure of the stroma is that of *Hypocrea*. The spores resemble those of a *Hypomyces*, but are three-septate. The species agrees very well with *Broomella*, though the spores have only a short apiculus, not the long terminal filament figured by Broome for *Broomella Vitalbæ* (B. & Br.). It may therefore stand as *Broomella niphidium*. It is not, however, co-generic with *Broomella Ichnaspidis* Zimm.

205.—**Xylaria carpophila** Fr.

This species was recorded for Ceylon by Berkeley and Broome from Thwaites's 615 on the seeds of *Goniothalamus Hookeri* and on seeds of *Diospyros Ebenum*. The clavæ on *Goniothalamus Hookeri* are about 1 mm. in diameter, with a minute central core and a loose peripheral zone ; they turn vivid purple with caustic potash, have long oval spores up to $8 \times 4\ \mu$, and bear the typical basidia of *Penicilliopsis*. They are indistinguishable from *Penicilliopsis clavariæformis*, but are conidial only. As the latter species is recorded for *Diospyros* only, this conidial form may be a different species. The specimen of " *Xylaria carpophila* " on *Diospyros* is also *Penicilliopsis*.

206.—**Eutypa penes** (B. & Br.) Sacc.

This was described in Fungi of Ceylon, 1112, as " *Sphæria* (*Obvallatæ*) *penes* B. & Br. Cortici immersa ; ostiolis minimis congestis, tandem emergentibus ; ascis clavatis ; sporidiis minimis allantoideis. On bark, which seems at first merely sprinkled with black spots." In Saccardo, I., p. 179, it was listed as *Eutypa*. Berlese (Icones Fungorum, III., p. 51) suggested that it might be *Eutypella*.

The ostiola are cylindric or subclavate, up to 0·5 mm. long and 0·1 mm. diameter. They burst through the epidermis in linear, oval, or circular clusters, up to 0·4 mm. long. The perithecia lie side by side beneath the epidermis ; they are not united into a stroma, nor is there any black boundary line in the cortex ; they are irregularly ovoid or globose, distorted by mutual pressure, about 0·25 mm. diameter, thin-walled, not carbonaceous. The asci are eight-spored, $12–16 \times 4–5\ \mu$, with obliquely uniseriate spores. The spores are hyaline, subcylindric, ends obtuse, slightly curved, $4–5 \times 1·5\ \mu$.

This species appears to be a *Calosphæria*, and will stand as *Calosphæria penes* (B. & Br.).

207.—**Amphisphæria megalospora** (Mont.) Sacc.

This species was recorded for Ceylon by Berkeley and Broome from Thw. 302. They described the spores as " brown, very obtuse, equal or larger above, uniseptate, ·002 inches long."

In the part of Thwaites's 302 in Herb. Peradeniya the perithecia are scattered, or confluent in small groups, immersed in the cortex and splitting off the outer layers ; they are about 1 mm. diameter, black, depresso-convex, with a flat base, about 0·5 mm. high, sparingly clothed at first with purple-brown mycelium, becoming naked, minutely rugose. The ostiolum is papillate, or slightly cylindric, circular, broad. The upper wall of the perithecium is thick, but not carbonaceous ; the base is thin. The asci are thick-walled, eight-spored, about 240 × 32 μ. Numerous linear, branched paraphyses are present. The ascospores are brown, then opaque, subcymbiform or reniform, with rounded ends, one-septate, constricted at the septum, the upper cell frequently larger than the lower, 37–40 × 12–13 μ.

I am unable to refer to Montagne's figure. The spores agree fairly well with Currey's figure in Trans. Linn. Soc., XXII. (1858), tab. 49, fig. 192.

208.—Leptosphæria nesodes (B. & Br.) Sacc.

Described by Berkeley and Broome in Fungi of Ceylon, 1121, as "*Sphæria* (*Depazea*) *nesodes* B. & Br. Peritheciis minutissimis, in maculas pallidas congestis, fuscis ; sporidiis fusiformibus curvulis triseptatis. On leaves of *Hydrocotyle asiatica*, Peradeniya, January, 1868. Sporidia ·0005 (inches) long." It was listed as *Leptosphæria* in Saccardo, II., p. 85. Berlese (Icones Fungorum, I., p. 88) stated that the specimens were not well developed, but were rather *Metasphæria*. This opinion is supported by recently collected specimens, identical with the co-type in Herb. Peradeniya. The species will therefore stand as *Metasphæria nesodes* (B. & Br.).

The perithecia are crowded on the under surface of brown, or blackish-brown, spots ; they are globose, black, immersed, prominent, about 0·75 mm. diameter. The asci are broadly clavate, very shortly pedicellate, thick-walled at first, about 40 × 10 μ. The ascospores are narrow subcymbiform, hyaline, ultimately three-septate, 15–20 × 3–4 μ. The majority of the spores in the available specimens are uniseptate, the other two septa apparently being formed much later than the median one. This is probably identical with *Stigmatea Hydrocotyles* Rac., on leaves of *Hydrocotyle* sp. from Java.

On the same plants occurs *Septoria nesodes* Kalch. The pycnidia of this species are chiefly hypophyllous ; the spores are lanceolate, subacute, straight or curved, three- to five-septate, 34–50 × 3·5–4 μ.

209.—**Cladosporium apicale** B. & Br.

Berkeley and Broome described this from the leaves of *Cycas circinalis* at Peradeniya ; " floccis sparsis erectis sursum attenuatis, sporis apicalibus subfusiformibus. Forming transverse patches. Spores ·0002–·0004 (inches) long." It occurs also on *Cycas Rumphii.*

The spots are pale brown, or brownish-white, with a purple-brown margin on the upper side ; on the under side the margin is red-brown. They usually extend transversely from the margin to the midrib, and are consequently often rectangular. The conidiophores are hypophyllous, solitary or in small clusters, up to 0·2 mm. high, 5 μ diameter, rigid, blackish-brown, unbranched, with an apical cluster of somewhat irregular basidia, which measure about 12 × 5 μ. The conidia are catenulate, hyaline, then pale fuliginous, narrow-oval, ultimately one-septate, 5–8 × 2–3 μ.

210.—**Graphium clavisporum** Berk.

This was recorded for Ceylon in Fungi of Ceylon, 902, on vine leaves, without locality or collection number. In Saccardo, Sylloge, IV., p. 631, this name is changed to *Isariopsis clavispora* (B. & C.) Sacc. In the cover of *Isariopsis clavispora* at Kew are Berkeley's specimens of *Graphium clavisporum* from Carolina, but no Ceylon specimen. The cover is marked by Massee " *Cercospora viticola* Ces." There is no Ceylon specimen in Herb. British Museum or Herb. Peradeniya.

211.—**Stilbum graphoideum** B. & Br.

This was described by Berkeley and Broome as " Nigrum, capitulo globoso basi in stipitem contracto ; sporis minutis oblongis." No collection number was given. It was recorded doubtfully by Cesati, collected by Beccari at Nuwara Eliya. The name was changed by Saccardo (Sylloge, IV., p. 614) to *Graphium obsoletum.* There are no specimens in Herb. Kew, British Museum, or Peradeniya.

212.—**Oidium simile** Berk.

Oidium simile was described by Berkeley in Hooker's London Journal of Botany (1845), p. 310, as "Effusa, submembranacea, fulva ; hyphis ramosiusculis ; articulis ultimis globosis." The type specimens were from Ohio. It was recorded from Ceylon in Fungi of Ceylon, 896, with the information that it occurred also in Ohio, Cuba, and the Nilgiris. In Saccardo it is listed as *Oospora similis.*

Ceylon specimens form effused, thin patches up to 4 cm. long and 3 cm. broad, or larger by confluence ; they are orange, red-brown, or dark red-brown, with a fairly broad, white or yellowish, byssoid margin. The stroma is up to 0·3 mm. thick ; its basal part is fairly compact, and consists of loosely interwoven hyphæ, 3–4 μ diameter ; the upper free ends of the hyphæ bear the conidia, either terminally or on short lateral branches. The conidia are yellow-brown to dark brown, smooth, globose, 12–17 μ diameter, or pyriform, 20 × 12–14 μ.

The Ceylon species is a *Hyphoderma.* It differs from Berkeley's figure and description of *Oidium simile,* and is evidently a different species. It may be known as *Hyphoderma zeylanica.*

Hyphoderma zeylanica. Stroma effusum, ad 4 cm. long., 3 cm. lat., 0·3 mm. crass., aurantiacum, vel rufo-brunneum, margine albo vel flavescenti, byssoideo ; hyphis 3–4 μ diam. ; conidiis flavo-brunneis vel fusco-brunneis, levibus, globosis, 12–17 μ diam., vel pyriformibus, 20 × 12–14 μ.

213.—**Mucor Artocarpi** B. & Br.

This is evidently identical with *Rhizopus Artocarpi* Rac., and will stand as *Rhizopus Artocarpi* (B. & Br.) Rac. Biological details of this species have been published by Sartory and Sydow in Annales Mycologici, XI., pp. 421–424, from specimens sent by C. F. Baker from the Philippines. It occurs in abundance on the fallen flowers of *Artocarpus integrifolia.* In Ceylon morphologically identical species have been found on ripe plantains (bananas) and on drying copra (the " kernel " of the coconut).

214.—Cyphella reticulata B. & Br.

This was described by Berkeley and Broome in Fungi of Ceylon, 667, " Pallida brevis erecta vel decumbens massam reticulatam polyporoideam simulans (Nos. 265, 958). On dead wood."

Part of the type specimen is in Herb. Peradeniya, and fresh specimens have been collected. The individual cups are either peziziform, up to 0·2 mm. diameter, or tubular, up to 1 mm. high, 0·2 mm. diameter, or infundibuliform, up to 1 mm. high, 0·2 mm. diameter below, 0·8 mm. diameter above. The margin is inflexed at first. They are white, with a powdery outer layer, but pale yellow internally and beneath the powdery layer. In old weathered specimens and the old herbarium specimens the white layer has usually disappeared, and the cups are then yellow, and somewhat translucent. The basidia are clavate, about 15 $\times$ 6 μ, and the spores hyaline, oval, 4–6 $\times$ 3–4 μ. When growing close together, the cups coalesce, and form a Poria-like fructification, with irregular " pores," varying from 0·2 to 0·8 mm. in diameter.

NAME INDEX.

NOTES.

The Brazil-nut Tree in Ceylon.—When the notes published in Ann. Perad., V., pp. 421–431, were written, no fruits of the Brazil-nut tree at Henaratgoda were available. In 1915 this tree produced a single fruit, which ripened in 1916. The fruit was of the same type as those of the Peradeniya tree; the diameter of the operculum exceeded that of the opercular orifice, and consequently the operculum was retained within the ripe fruit. If this fruit character is considered of specific value, both the Ceylon trees must be referred to *Bertholletia nobilis*.—T. Petch.

The Pollination of the Bombax.—When the Bombax (*B. malabaricum* DC.) is in flower, even the casual observer cannot fail to notice the riotous congregations of crows which frequent the trees. One current explanation is that they feed on the flowers, but it can be clearly seen, with the aid of a field glass, that they are drinking from them. The fallen flowers do not bear any signs of having been bitten. The flowers, which stand, as a rule, more or less erect upon the branches, contain a comparatively large quantity of a bluish, somewhat opalescent liquid, and there seems no doubt that it is this which attracts the birds. They push their beaks down the middle of the flower, and, after withdrawal, perform the usual actions of drinking. To humans the liquid seems to lack any particular taste, but the more than ordinary talkativeness of the crows suggests interesting possibilities. It would appear probable that these birds are the chief agents in conveying pollen from one flower to another. Other smaller birds visit the flowers, but it is doubtful whether these could reach the nectar from the top of the flower; and as the style overtops the long clusters of stamens, it would not be touched by birds which inserted their beaks at the side. The crow which frequents the Bombax at Peradeniya is *Corone macrorhyncha*.—T. Petch.

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