EUROPEAN FUNGI IN THE TROPICS.

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The earliest records of Ceylon Fungi are to be found, fide Berkeley, in the thirteenth edition of the *Systema of Linnaeus*. I have only been able to consult a Dutch version of that work, published in 1783; in that there are only two Ceylon records. Apparently nothing further was recorded until 1842, when Berkeley described several Ceylon Fungi which had been collected by König in 1777-1781, and had been stored in the British Museum during the intervening 60 years. Up to 1846, about twenty Ceylon species had been recorded, but after that date names began to accumulate much more rapidly. In 1847, Gardner sent a collection of about one hundred and twenty species to Berkeley; his successor, Thwaites, also sent small consignments from time to time and finally, about 1868, overwhelmed Berkeley and Broome with a collection of some twelve hundred gatherings. Both Gardner and Thwaites appear to have had some doubts as to the value of this kind of work, for each of them took the trouble to send paintings of at least the agarics. Gardner's paintings are poor; the figures are much reduced and they are somewhat "impressionist"; in some cases it is impossible to decide from the painting whether the figure represents an agaric or not. But the paintings which were executed by de Alwis under Thwaites' supervision are the best figures of agarics I have ever seen.

Thanks to Thwaites' work, the Ceylon Fungi were allowed to rest for over thirty years, except for the periodic juggling of the herbarium specimens. Various visitors have added a few new species, but fortunately we have not been troubled with many. The species maker has not cared to visit a country where so many species have already been described. At the present time the published records of Ceylon Fungi contain about fifteen hundred names.

Now, this is the state of affairs which confronts every mycologist who takes up work in the Tropics. He has to deal with a host of names which have been accumulating for more than a century, and with *so-called descriptions which do not refer to any living Fungus*. There are two ways open to him. He may accept all that has already been written, and continue the same work, collecting all the Fungi he happens to meet and forwarding them to Europe to be named. But if he tries to

recognise, from the descriptions, the species he has sent, he will soon come to the conclusion that such work is useless. Unfortunately, few of the people who forward these miscellaneous consignments take any further interest in the matter.

The alternative is to collect all the existing records and descriptions, and to try to fit Fungi to them. But this is an extremely slow business, and I often regret that I undertook it. It is very much easier to make new species. As a result of six years' work we know what about half the Ceylon names refer to.

During the last few years, I have had the good fortune to meet the two mycologists who are taking the lead in clearing up the present mycological chaos, namely, Mr. C. G. Lloyd and Prof. F. v. Höhnelt. Their comments were identical. They agreed that a revision of the Ceylon Fungi was desirable, but doubted whether the facilities for such work in Ceylon were adequate. I am glad to say that I was able to convince both of them that the facilities in Ceylon were not only adequate, but unequalled elsewhere. We have the co-types, and in many cases, the types, of the species collected by Thwaites and named by Berkeley and Broome; and we have in addition the original paintings from which (and not from the specimens) the Ceylon agarics were described. In that respect we stand alone among British Colonies: for in no other case were specimens and paintings (where any existed) returned.

Several interesting results have followed from this re-examination of tropical Fungi on the spot. The genera which we transfer from one place to another in our text books were founded in many cases on immature specimens, in others on freaks of nature, and in yet others on freaks of the imagination. Theories of the evolution of the different forms of Fungi have been based on species which never existed in the form described. Parallel species are found in different groups solely as a result of misdescriptions; e.g., ANTHRACOPHYLLUM is said to be a *black-spored* genus *with split gills*, corresponding with the *white-spored* SCHIZOPHYLLUM, yet ANTHRACOPHYLLUM really has *entire gills* and *white spores*. But it is among the agarics that the greatest confusion exists; and the results prove, what might have been expected, that it is impossible to describe, or identify, or even classify generically, a dried agaric. Among the Ceylon Fungi, the same agaric occurs sometimes under half-a-dozen different names and often in two or three genera, all described at the same time by the same authors. Each of our common Ceylon LENTINI has been named about six times; and when it is realised that the same sort of thing has occurred to *the same species* in most other tropical countries, some idea of the present state of affairs may be imagined.

Among the Fungi recorded for Ceylon we find the names of many European species, and it is to those that I wish specially to direct your attention. Gardner's collection included one hundred and thirty-five numbers, four of which were too imperfect to be named; of the remainder, fifty-two were assigned to European species. Thwaites' main collection included about twelve hundred species, and of those less than two hundred were assigned to European species. This comparison is most instructive, Gardner's figures were very imperfect and more than one-third of his species were said to be European. When Thwaites sent better figures the European species numbered only one-sixth of the collection, in spite of the fact that it included over fifty cosmopolitan mycetozoa. If we confine ourselves to the agarics, we find that Gardner sent forty-two species, twenty-seven of which were European, while Thwaites sent three hundred and thirty-four species, forty-six of which were European. The proportion of European species drops from two-thirds to one-seventh.

When fresh specimens are found, to match the old specimens and paintings, most of the supposed European species prove to be something quite different. The *Lepiota procera* of Gardner's collection is the *Lepiota dolichaula* n.sp. of Thwaites'; this is a tall species, sometimes eighteen inches high, with a smooth pileus, but if the weather turns dry when it is expanding, the pileus becomes scaly. Gardner did not send any figure of this species: his specimen was a tall, scaly, *Lepiota*, and therefore was attributed to *procera*; but when Berkeley and Broome saw Thwaites' figure they recognised that it was a new species. But they did not recognise that it was in any way related to the specimen which Berkeley had assigned to *procera*, twenty years previously.

The Ceylon record of *Lepiota cepaestipes* Sow. is I believe correct. Our species is always yellow, never white. But it scarcely resembles the figures in Cooke's Illustrations. When unexpanded it is exactly hour-glass shaped, the diameter of the inflated stalk equalling that of the unexpanded pileus. When expanded, the pileus is membranous, and plicato-sulcate almost to the centre; it is *Hiatula*, rather than *Lepiota*. The gills are yellow, not white as given in Saccardo.

Lepiota granulosa Batsch was merely a convenient dumping ground for small forms of various Ceylon species. There are certainly two or three species included under that name, and none of them is *granulosa*.

The species attributed to *Tricholoma nudum* resembles the latter somewhat in colour, but it differs in being always acutely umbonate. Berkeley and Broome named it twice, the second name being *Clitocybe laccata*, var. *amethystea*.

Our *Russula emetica* is really a white species which turns red when attacked by a *Hypomyces*. In its normal condition it is *Russula periglypta* B. & Br.

The species referred to *Clitocybe candicans* F. has pink spores: it was named twice, being included among the *Lentini* the second time.

Of the first one hundred and fifteen white-spored agarics of Thwaites' collection, only eight were attributed to European species; but when we come to the *Mycenæ* we find that of sixteen species seven were said to be European. These are nearly all minute species which it is impossible to make anything out of when they are dried. This illustrates the general rule that when the material is bad the percentage of European species increases.

Gardner is supposed to have collected *Pleurotus dryinus*; Thwaites did not, but he sent our common Ceylon *Pleurotus*, and it was named twice, *Pleurotus angustatus* and *Pleurotus flabellatus*. There is no doubt that these three names refer to the same species in Ceylon. It is soft and smooth, generally white but sometimes pink.

There is a very common Ceylon *Pluteus* which grows in troops round decaying stumps. It resembles *cervinus* in general appearance, and when Gardner sent it to Berkeley it was referred to *cervinus*. But when Thwaites sent it, it was referred to *cervinus* and *nanus*, and a number of new species. How many new species it represents I have not yet determined, but the number seems to be about eight. It is very variable, but there is one character which runs through all its forms, namely, that the centre of the pileus is scabrous.

Among the *Entolomas* we have *Entoloma rhodopolium* recorded. Our species which was so named is infundibuliform and has a striate margin: it is not umbonate: the pileus is greyish-brown with dark radial streaks; the stalk is greyish-brown and solid.

In Thwaites' collection Berkeley and Broome found *Flammula sapinea* "on dead wood, evidently of some conifer." This proves to be a very common species on dead coconut, the "wood" of which may, at a casual glance, be mistaken for pine. Its earlier stages were named *Armillaria rhodomala* n.sp., while the mature form was named *Flammula dilepis* n.sp., *Flammula sapinea* and *Naucoria furfuracea*. Needless to say, it is neither of the last two. When Gardner sent it, it was apparently named *Hypholoma sublateralitium*.

Fifteen Ceylon species of *Naucoria* have been recorded, of which seven are European. Two of these have been determined up to the present. "*Naucoria furfuracea*" is the *Flammula* just mentioned, and "*Naucoria pediades* var. *major*" is a *Psalliota*.

In *Psalliota*, we have records of *Ps. campestris*, *Ps. arvensis*, and *Ps. sylvatica*. The species attributed to *campestris* was also named *endoxantha* n.sp., because the stem turns yellow internally when cut, but it has several other names. I have never met with *arvensis*, and it is scarcely possible to say what it really was from Gardner's figure; it was collected by Gardner, but not by Thwaites. "*sylvatica*" is a stout species, with the stalk and pileus shaggy with red-brown scales; it is distinguished by the colour of the gills, which are at first dingy cream coloured becoming yellow when cut.

Marasmius, *Lentinus*, and *Panus* account for seventy-three species in the records, but not one of them was given a European name. In the *Polypori*, a few (six out of sixty-five) were said to be European species, but the specimens so named were in some cases too poor to be identified. The specimens of *Fomes fulvus*, for example, are undeterminable. On the other hand Lloyd considers that the Ceylon specimen of *Polyporus sulphureus* at Kew is correctly named. But in the section *Poria*, seven out of twenty-one were said to be European. This appears to be another illustration of the general rule.

These erroneous identifications are not confined to Ceylon lists or to British mycologists. The Ceylon Fungi have been determined under exceptionally favourable conditions; for paintings of nearly all the agarics were submitted with the specimens. If under such circumstances, the results are unreliable, how much reliance is to be placed on diagnoses made on dried specimens only? Judging from Ceylon experience, I should say that all descriptions of dried agarics are worthless, and most of the identifications inaccurate, but the question can only be solved for each particular country by a mycologist on the spot, for nothing can be decided from a list of mere names. Only on rare occasions are particulars added which prove, to mycologists in the Tropics, that an identification is incorrect. For example, a list of Javan Fungi, identified by Patouillard, begins with *Collybia radicata*. Now, every beginner knows *Collybia radicata*, and I suppose we all consider that we could identify it, fresh or dried; so the record passes unquestioned as another instance of the occurrence of European Fungi in the Tropics. But Patouillard adds that, to the base of the stalk there was attached a curious mass which resembled a piece of sponge; and that detail makes it clear that he had not *Collybia radicata*, but *Volvaria eurhiza*, the fungus which grows from termite nests, for the spongy mass was undoubtedly a piece of the termite comb.

Such identifications are based purely on superficial resemblances. Any agaric with a rooting base is *Collybia radicata*, every tall rough *Leptota* is *procera*, every violet agaric is

Tricholoma nudum, and so on. What else is possible? We may welcome these mistakes because they obviate the publication of new species with imaginary descriptions, but it should be clearly understood that such records are quite worthless as a basis for theories on the geographical distribution of Fungi. Of course, it is well known that many species are cosmopolitan, *Schizophyllum commune*, for example; but, on the other hand, the *Fomes lucidus* of the Tropics is apparently not the same as *Fomes lucidus* of temperate climates, though it has been considered so for about a century. I think it will be found that temperate species do not occur in the Tropics to the extent which has been supposed.

I have said that these identifications are based on purely superficial resemblances; and I would venture to point out that the available descriptions of agarics often do not contain anything else. Probably an example will make my point clearer. We have a *Mycena* which Berkeley and Broome assigned to *tenerima*. Its pileus is covered with loose cells which are characteristically ornamented with spines. In comparing it with *tenerima*, I want to know the character of the minute granules which occur on the pileus of the latter, but none of the text books give any information on the point. Again, we have a *Coprinus* which in many particulars matches *Coprinus domesticus*, but its stem is covered with short, erect, capitate hairs; the stem of *domesticus* is described as silky, but what is the character of the hairs? It seems to me that there is room for further work in this direction. In the Tropics, at least, microscopic characters (by which I do *not* mean spore measurements) afford valuable evidence in many cases, and it does not seem probable that they should be entirely useless in temperate countries.

If temperate species occur in the Tropics, there is no reason why tropical species should not occur in temperate climates; and accordingly we find that several Ceylon species have been discovered in England. One of the most notable of these is *Lepiota licmophora*, which is rather an uncommon species in Ceylon. In general appearance it is a yellow *Coprinus*. Its pileus is plane, about one inch in diameter, and radially plicatosulcate almost to the centre. The centre is a slightly convex disc, 3 to 5 mm. in diameter. This disc is either pale-brown or greenish-yellow, and smooth: the crests of the ridges are clothed with sulphur-yellow or greenish-yellow flocci, but between the ridges the pileus is hyaline, and somewhat transversely wrinkled. Except in the central disc, the pileus is membranous. The stalk is 6 to 9 cms. high, attenuated upwards, about 2 mm. diameter at the base, and 1 mm. diameter at the apex, very pale greenish-yellow with a few flocci, or white and almost glabrous, hollow, white internally, and sunk into the central disc. The ring is

about one-third the length of the stalk from the apex, small, yellowish, and evanescent. The gills are white, transparent, narrow, equal; nearly all of them reach and are attached to the central yellow disc which surrounds the apex of the stalk. The spores are white, broadly oval with a papilla at either end, that is, lemon shaped, and measure $11-13 \times 7-8\mu$.

This species is represented in Cooke's Illustrations, Pl. 1179. The figures in the upper right- and left-hand corners are copies of the original Ceylon paintings, but they have been copied very badly. Both are represented as sulphur-yellow throughout, but in the original of the left-hand figure, the pileus is brownish-yellow in the centre, greenish-yellow along the ridges, and white in the furrows, while the stalk is white with a tinge of yellow; and in the original of the right-hand figure the gills and the interior of the stalk are white. Further, the pileus in the original is plicato-sulcate up to the disc, while in the copy it appears to have little more than a striate margin; and the attachment and shape of the gills are also reproduced incorrectly. The remainder of the figures on Cooke's plate resemble the Ceylon *L. cepaestipes* rather than *L. licmophora*. They are certainly not the latter species. The spores of *cepaestipes* are altogether different from those of *licmophora*, being broadly oval or subglobose, $5-7 \times 4-5\mu$.

In Massee's British Fungus Flora, vol. III., p. 247, *L. licmophora* is said to be entirely pale lemon-yellow, and distinguished from *cepaestipes* by the glabrous pileus. Both these characters are wrong. From the paintings I have seen, I should say that what passes for *licmophora* in England is only a form of *cepaestipes*. The true *licmophora* is, I believe, identical with *Leucocoprinus flavipes* Pat.

Another Ceylon *Lepiota* found in England is *Lepiota metulae-spota*; but again I have to dissent. In Ceylon this species grows among dead leaves from a white thread-like mycelium. Its pileus is 2.5-4 cm. diam., broadly campanulate, and obtusely umbonate; the umbo is yellow-brown or reddish-brown, and smooth; elsewhere the cuticle is broken up into thin, floccose, adpressed scales or warts which vary in colour from pale brown to whitish, and are somewhat concentrically arranged. Under the scales, the pileus is white and silky-fibrillose. It is sulcate half-way to the centre; the flesh is thin and white; and the margin is sometimes appendiculate. The stalk is 6-9 cm. high, 3 mm. in diameter, slightly swollen at the base, densely clothed with white fibrils, yellowish when the fibrils are rubbed off; it is hollow, turns yellow brown when cut, and is lined with shining white fibrils. The gills are white, free, rounded at the outer ends, and doubly rounded behind, ventricose, up to 7 mm. broad. The veil is fibrillose and evanescent. The spores are white, 2 to

6-guttulate, and measure $15-18 \times 5-7\mu$; in one aspect they are fusiform with sharply pointed ends, in another they are uniformly curved on one side but sigmoid on the other. I cannot trace much resemblance to a ninepin.

In the original figure, the stalk is yellow and glabrous, because the fibrils had been rubbed off. The scales on the pileus in that figure are depicted as thin, square warts, rather than scales, i.e., they do not merge into the pileus at their upper ends. The figure in Cooke's Illustrations appear to be quite a different species; it is a different shape, is more scaly, and the flesh is thicker; it has a ring with a brown edge and the gills are tinged yellow above. The Ceylon *metulaespora* resembles *zeylanica*, from which it differs mainly in the comparatively long and thin, fibrillose stalk. From the figures which I have seen of the British species I think the latter is not *metulaespora*.

Next we have *Lepiota biornata* B. & Br. Here I am unable to give any definite information, but I am under the impression that the Ceylon species will be found to be an immature *Psalliota*.

The Ceylon *Pluteus spilopus* is recorded for England. The only thing we can fit to this description and figure in Ceylon is one of the forms of our common *Pluteus*. But the description of the English *spilopus* says that the pileus is radiately rugulose, a character not found in the Ceylon species; and it makes no mention of the scabrous centre.

Finally, not to weary you longer, I may mention *Hygrophorus bicolor*, originally found in Ceylon, and recorded for England in the Naturalist, November, 1902. As far as I have been able to determine, *Hyg. bicolor* is the common Ceylon *Hygrophorus*, *Hyg. roseostriatus*, in course of dessication. The figure of *bicolor* fits specimens of *roseostriatus* drying from the margin upwards. The revision of the Ceylon records proves that it is impossible to identify an agaric from a dried specimen; and consequently that the records of European species in the Tropics are untrustworthy. It also proves that it is impossible to draw up accurate descriptions from dried specimens; and consequently that those who rediscover tropical species in temperate climates are relying upon descriptions of agarics which never existed. Mycologists who compile descriptions of dried agarics are merely wasting time; if it were only their own time it would not matter so much, but they are wasting also the time of others who have to fit fungi to their descriptions. Personally, I think that it is fully established that tropical mycology, to be of any value, must be studied in the Tropics. There are very few groups which can be dealt with satisfactorily merely from herbarium material.