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OBSERVATIONS ON GASTEROMYCETES–X

The Nidulariaceae in Persoon's herbarium

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(With 27 Text-figures)

The 31 collections of Nidulariaceae in Persoon's Herbarium, bearing 23 names in all, are revised into 8 species: *Crucibulum laeve* (Bull. ex DC.) Kambly, *Cyathus microsporus* Tul., *C. olla* (Batsch) ex Pers., *C. poeppigii* Tul., *C. stercoreus* (Schw.) De Toni, *C. striatus* (Huds.) ex Pers., *C. triplex* Lloyd and *Nidularia farcta* (Roth ex Pers.) Fr. Nine names are unpublished and hence nomina nuda. Six specimens appear to be of West Indian origin and two from Mauritius. As one West Indian specimen was named "*Nidularia Domingensis*", the type of *Cyathus microsporus* var. *domingensis* Tul., which is the type variety of the species, was examined and the two collections agree in most respects. However, the spores of *C. microsporus* are larger than is given in the literature. The spores of both *C. striatus* and *C. triplex* are reported to have a proximal notch which does not appear to have been previously reported.

INTRODUCTION.—Persoon (1801) published six species under the genus *Cyathus: C. striatus, C. olla, C. crucibulum, C. scutellaris, C. farctus* and *C. deformis*. He also placed *Cyathus nitidus* as a variety of *C. olla* and described a second variety, "*C. olla β. Cyathus agrestis*" Later (1819), he published the new name *Nidularia plumbea*, citing *C. olla*, which he had earlier validated, as a synonym. Although there are illustrations (Figs.9 —11) closely resembling *Crucibulum laeve* in his final work (Persoon, 1822), they are without a name, and there is no reference to either these figures or any other Gasteromycetes in the text.

Today, *Cyathus olla* and *C. striatus* are the two common European species of *Cyathus*, *Cyathus crucibulum* has been placed in a separate genus as *Crucibulum vulgare* (= *Crucibulum laeve*) and *Cyathus farctus* is treated under *Nidularia*. *Cyathus scutellaris* and *C. deformis* were inadequately described and have not been definitely recognized since.

Five collections are undetermined and 23 have the following names: *Cyathus farctus* (1), *C. fimetarius* (1), *C. griseus* (1), *C. laevis* (1), *C. leucospermus* (1), *C. nitidus* (1), *C. olla β. agrestis* s[eu] minor (1), *C. plicatulus* (1) and *C. striatus* (2), *Nidularia Domingensis* (1), *N. laevigata* (1), *N. laevis* (2), *N. leucosperma* (2), *N. plicata* (2), *N. plumbea* (1), *N. striata* (2) and *N. sylvestris* (1), and *Fungus parvus lamellatus pectunculus forma alba* [or: *albo*] *adnescens* (1). Four of these collections also have additional names:

the collection of *N. plumbea* bears the synonyms of *Cyathus olla* and *Nidularia vernicosa*; one of the collections of *Nidularia laevis* has the synonym *Cyathus crucibulum*; the collection of *Cyathus farctus* is annotated with the unpublished name "*Nidularia sphaeroidea*"; and the unpublished name "*Nidularia cubensis*" appears on the sheet of *Cyathus plicatulus*. Three collections are determined only as *Cyathus*.

It is probable that Persoon (1801) included in *Cyathus* all the species described by earlier authors which he considered sound. There is, however, no evidence to show that he had then actually seen material of these six species but he no doubt wished his monograph to be as complete as possible. It is also well-known that Persoon's basic work (1801) was written in Germany and, therefore, probably based on specimens collected in that region whereas his herbarium mainly dates from the later period when he was living in Paris. As I have previously indicated (Palmer, 1959), the collections now preserved at Leiden cannot be regarded as the types of the "Synopsis methodica fungorum" (Persoon, 1801), the starting point for the nomenclature of the Gasteromycetes, except in a few instances. However, they do show what Persoon meant by his names. Of course, this does not apply to the few species of Gasteromycetes which he published later. Persoon (1801) used the generic name *Cyathus* but later (1819) changed to *Nidularia*, no doubt following contemporary authors, and it seems likely that the collections determined as *Nidularia* were collected and named during the later period.

The presence of four definite and two probable West Indian, as well as two Mauritian, collections was unexpected although, on reflection, we should not be surprised that Persoon should also have retained curiosities which came his way. Whilst the European members of *Cyathus* seem to be few and fairly well understood, this cannot be said of the non-European species. Brodie & Dennis (1954) reviewed the Nidulariaceae of the West Indies and their short monograph, together with the works of Lloyd (1906) and Martínez (1956), has been of considerable assistance in studying Persoon's specimens.

The 31 collections can be placed in the three genera *Crucibulum*, *Cyathus*, and *Nidularia*, and comprise a total of eight species. Five species, *Crucibulum laeve*, *Cyathus olla*, *C. stercoreus*, and *C. striatus*, and *Nidularia farcta* are well-known for Europe but *Cyathus microsporus*, *C. poeppigii*, and *C. triplex* appear to be of tropical distribution.

TECHNIQUE.—The measurements of the peridia and peridioles were taken from perfectly dry specimens although some collections were initially soaked out to facilitate examination. Both structures shrink during the drying of fresh material and will expand again after wetting. The practice of examining microcharacters in Erythrosin Ammonia (Palmer, 1955) has been followed as this mountant quickly swells desiccated material and, as it also appears to inhibit the development of micro-organisms, slides can be preserved without any apparent deterioration. Microscopic characters are camera-lucida drawn and the formulae show minimum, average, and maximum measurements.

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1.—NOTES ON THE TAXA

CRUCIBULUM Tul.

Crucibulum Tul. *in* Ann. Sci. nat. (Bot.), sér. 3, **1**: 89. 1844.

Cup-shaped fruit-body with a single-walled peridium, mouth at first covered by an epiphragm and peridioles attached by a funiculus.

CRUCIBULUM LAEVE (Bull. ex DC.) Kambly apud Kambly & Lee

Cyathus crucibulum Pers., Syn. meth. Fung. 238. 1801.

Cyathus laevis Bull. *ex* DC., Fl. fr. **2**: 269. 1805.—*Crucibulum laeve* (Bull. ex DC.) Kambly *apud* Kambly & Lee *in* Univ. Iowa Stud. **17**: 167. 1936.

Cyathus fimetarius DC., Fl. fr. **5**: 104. 1815.

Crucibulum vulgare Tul. *in* Ann. Sci. nat. (Bot.), sér. 3, **1**: 90. 1844.

Cyathus leucospermus Pers. in Herb.—*Nidularia leucosperma* Pers. in Herb.—*Nidularia leucosperma* Pers. msc. in Herb. crypt. Par. cl. Thuill. nunc, cl. Ad. Brongniartii gr., Herb. Musaei Par. augenti, Tul. *in* Ann. Sci. nat. (Bot.), sér. 3, **1**: 90. 1844.

This is one of the commonest members of the Nidulariaceae in Europe and other temperate regions, although apparently unknown from the tropics, characterized by the greyish to purplish-black peridioles covered by a thick, persistent, creamy-white tunica and spores averaging 10 × 5 μ. The species is mainly found on wood-chips, twigs, etc., and dead herbaceous stems, but also occurs on other substrates such as old jute sacking and the dung of herbivores.

Collections on dung are far from common and, although *Cyathus fimetarius* has been retained as a distinct species by such modern authors as Cejp (1958), others have considered it a synonym of *C. laeve*. Lloyd (1906a) reported the type specimens of *Cyathus fimetarius* in De Candolle's Herbarium to be "*Crucibulum vulgare* growing on manure". De Candolle (1815) wrote: "Cette jolie espèce a été trouvée par M. Chaillet, à la fin de l'automne, sur la bouse des vaches". Therefore, it is very interesting to find a collection (L 910.255–610) determined as *C. fimetarius* and annotated by Chaillet in Persoon's Herbarium. It is possible that Chaillet passed part of his original collection to Persoon and Persoon's annotation "An satis diversus ab *Cyatho Crucibulo?*" shows that he was doubtful whether it was distinct.

"*Cyathus leucospermus*" or "*Nidularia leucosperma*" appear to be unpublished and are hence nomina nuda. The latter was cited by the Tulasnes (1844). The annotation

on L 910.255–632 refers to "Mycologia europaea" vol. 1, Fig. 9 (Persoon, 1822), which shows a bracket-like group of fruit-bodies on a twig. Killermann (1926) referred this figure to the present species under the synonym *C. vulgare*. As "*leucosperma (us)*" is not validly published, the epithet has no nomenclatural standing, but it can be conjectured that Persoon would have formally published it if he had been able to complete the "Mycologia europaea". L 910.255–632 comprises a group of aggregated fruit-bodies growing on a piece of decayed rope. The other two collections under this epithet are on woody substrates. All three are *Crucibulum laeve*.

Whilst the Tulasnes (1844) clearly described *Crucibulum vulgare*, by which name the species has been commonly known up to very recent times, Kambly (apud Kambly & Lee, 1936) pointed out that the valid name is *Crucibulum laeve*. There are three collections under the epithet "*laevis*", two of which, respectively placed under *Cyathus* and *Nidularia*, but without data, are *Cyathus olla*. The third, determined as "*Nidularia laevis* B.", also bears the synonym "*Cyathus Crucibulum*, Syn. fung." and is typical *Crucibulum laeve*.

CYATHUS Pers.

Cyathus Pers., Syn. meth. Fung. 236. 1801.
Nidularia Bull. *ex* J. St.-Hil., Expos. Fam. natur. germinat. Pl. 1. 1805.
Cyathia P. Br. *ex* V. S. White *in* Bull. Torrey bot. Cl. **29**: 255. 1902.

Cylindrical to cyathiform fruit-bodies with a 3-layered peridium, mouth at first covered by an epiphragm and peridioles attached by a funiculus.

Brodie & Dennis (1954) were the first to demonstrate that the species could be clearly separated on whether the peridioles had a single or a double-walled cortex, combined, of course, with spore sizes, etc. Lloyd (1906b) had indicated this structure when he stated in his synopsis of the sections of the genus *Cyathus* "Outer peridiole wall not strongly different from the inner" or "Outer peridiole wall thick, of coarse, colored fibrils". The exocortex is, of course, quite distinct from the tunica, absent in certain species, and comprises a very thin white or brown membrane, not always easy to see, which often disappears with age.

CYATHUS MICROSPORUS Tul.

Cyathus microsporus var. *domingensis* Tul. *in* Ann. Sci. nat. (Bot.), sér. 3, **1**: 73. 1844.
Nidularia domingensis Pers. in Herb.
Nidularia cubensis Pers. in Herb.

This species is stated to be distinguished from other small, dark brown species of *Cyathus* with a smooth or only faintly ridged endoperidium and a single-walled cortex by the very small spores, 6.6 × 4.4 μ (Tulasnes, 1844) and 5–6 × 4 μ (Brodie & Dennis 1954). The Tulasnes (1844) described their species *Cyathus microsporus* from two collections which they kept distinct as the two varieties, "α.

domingensis", collected on the Island of Hispaniola by Poiteau, and "*β. Berkeleyanus*" from Brazil. The variety *berkeleyanus* was raised to specific rank by White (1902) as *Cyathia berkeleyana* on account of its striate peridium leaving the variety *domingensis* as the type variety of *C. microsporus*.

The presence of the collection named "*Nidularia Domingensis*", whilst having spores averaging 8.6 × 5.4 μ, prompted me to borrow the type of *C. microsporus α. domingensis* from Paris. The sheet bears the words "*Cyathus microsporus α domingensis* Tul./St. Domingue/M. Poiteau" and has three groups of specimens attached to it. The two groups which macroscopically most closely resemble L 910.256–1582 ("*N. Domingensis*") have a tufted to felted, buffy- to snuff-brown exoperidium with the endoperidium buffy-fawn or grey-brown and lightly striate whilst the third comprises a single, externally tufted-hirsute, buffy-brown peridium with a smooth, buffy-grey endoperidium. The peridioles all have a black, one-walled cortex with a thin, buffy-brown tunica, sometimes missing, and spores 6.5–8–9.5 × 4.5–5.5–6.5 μ.

Cyathus microsporus was characterized by the Tulasnes (1844) as having small spores. However, according to the type these are no smaller than those recorded for *Cyathus pallidus* Berk. & Curt., said to differ by the light-coloured, fragile fruit-bodies with long, rigid hairs and, of course, the larger spores. Lloyd (1906b) gave *Cyathus hookeri* Berk. as having spores 6 × 8 μ although later (Lloyd, 1915) he thought that it should be considered a synonym of *C. microsporus*. Tai & Hung (1948) refer to *C. hookeri* a collection with spores 8–11 × 7–8 μ.

L 910.256–1582 is annotated "In Hispaniola", the West Indian island, today shared by the Dominican Republic and the Republic of Haïti, variously known as La Española, Santo Domingo and the Island of Hispaniola. The Tulasnes (1844) referred to both "in insula Haïti" and "individus recueillis à Saint-Domingue" in their discussion of Poiteau's material. According to Moscoso (1943), the French botanists A. Poiteau and J. F. Turpin collected in northern Haïti (Cabo Haitiano, Santa Susana and on the island Tortuga), with Turpin also collecting between Monte Christi and Santiago in the Dominican Republic, between 1796 and 1801. As there is also in Persoon's Herbarium a collection labelled "*Nidularia plicata*" which Poiteau found in Cayenne (French Guiana), it is possible that "*N. Domingensis*" was collected by Poiteau too, and might even be part of the type collection.

L 911.18–102, whilst bearing the name "*Cyathus plicatulus* mihi" (i.e. Gustav Kunze) as well as the herbarium name "*Nidularia cubensis* P.", is the same species.

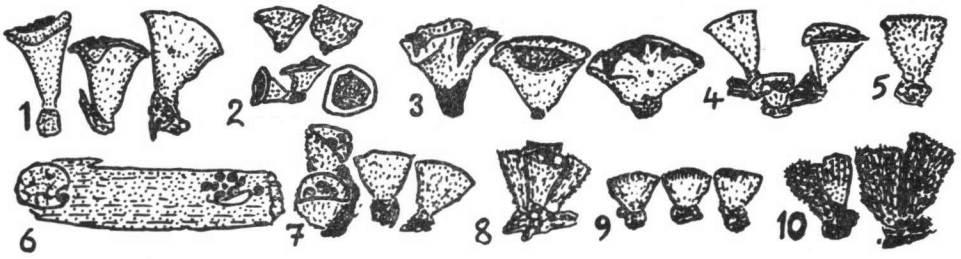
CYATHUS OLLA (Batsch) ex Pers.

Cyathus olla (Batsch) *ex* Pers. *α. C. nitidus* (Roth) Pers. et *β. C. agrestis* Pers., Syn. meth. Fung. 237. 1801.
Cyathus vernicosus [Bull.] DC., Fl. fr. **2**: 270. 1805.
Nidularia plumbea Pers., Traité Champ. comest. 110. 1819.
Nidularia sylvestris Pers. in Herb.

A not uncommon species on herbaceous debris and, less frequently, on ligneous substrates in Europe, readily recognized by the typically flaring, internally smooth

and lead-coloured peridium, the massive peridioles 2–3 mm diam. with a one-walled cortex and a persistent tunica, and spores circa 10 × 7.5 μ.

Eight collections can be referred to *C. olla*, including single collections named "*Cyathus laevis*" and "*Nidularia laevis*" respectively, one with the herbarium name "*Nidularia sylvestris*" and two without a specific determination.



Figs. 1–10. Macroscopic view, nat. size

(The remaining specimens of importance were in too poor condition for drawing.)

Figs. 1–4. *Cyathus olla:* 1—(L 910.255–649, as *C. nitidus*); 2—(L 910.256–1377, as *C. olla β agrestis* s. minor); 3—(L 910.255–672, as *Nidularia plumbea*); and 4—(L 910.256–1636, as *N. sylvestris*).

Fig. 5. *Cyathus striatus* (L 911.34–54, as *C. griseus*).

Fig. 6. *Nidularia farcta* (L 910.255–658, as *Cyathus farctus?*).

Fig. 7. *Cyathus microsporus* (L 910.256–1582, as *Nidularia Domingensis*).

Fig. 8. *Cyathus triplex* (L 910.222–2897, as *Nidularia laevigata*).

Fig. 9. *Cyathus poeppigii* (L 910.222–2912, as *Nidularia plicata*).

Fig. 10. *Cyathus striatus* (L 910.261–39).

Persoon (1801) placed *Cyathus nitidus* Roth (1797) under *Cyathus olla* as "*α. Cyathus nitidus*" with the description "campanulatus, griseus tomentosus; striis (zonis) concentricis". L 910.255–649 bears the generic name "*Nidularia*" followed by "*Cyathus nitidus* Roth" and represents the typical form of *C. olla*. The endoperidium is now somewhat dark and certainly not as conspicuously zoned as the following.

A second taxon, "*β. Cyathus agrestis*", was included in *Cyathus olla* by Persoon (1801), with his description running "minor subhemisphaericus: margine erecto". L 910.256–1377, with the name "*Cyath. olla β. agrestis* s. minor" is a small form of *Cyathus olla*, which I have not previously seen, with a flaring mouth and a zoned interior, although the walls of one of the peridia seemed to become erect when it was soaked.

Nidularia plumbea was described by Persoon (1819) and, as both *Cyathus olla* and *Nidularia vernicosa* were cited as synonyms, was presumably intended to replace his earlier *C. olla*, probably as being a more appropriate name. L 910.255–672 is a form with a very broad mouth, much folded and longitudinally wrinkled. This appears to be what Lloyd (1906b) called *Cyathus anglicus* and Brodie (1952) reported from Argentina, England and the U.S.A. as *C. olla* forma *anglicus*.

CYATHUS POEPPIGII Tul.

Cyathus poeppigii Tul. *in* Ann. Sci. nat. (Bot.) sér. 3, **1**: 77. 1844.

A tropical species, this fungus is described as having the peridia externally dark-brown, shaggy or hirsute, sulcate both externally and internally, a double-walled cortex and large spores circa 33 × 23 μ.

The somewhat similar *Cyathus limbatus* Tul. is stated to have spores up to 22 × 12 μ. Although *Cyathus costatus* Lloyd (nomen nudum, see Stevenson & Cash, 1936) has large spores, circa 44 × 16 μ, it is only known from the type collection (on manure, Puerto Rico) and is said to be close to *C. poeppigii* but with the fruit-bodies about half the size and the striations of the peridia much coarser.

Nidularia plicata Fr. was described from Brazil with a somewhat scanty description. The Tulasnes (1844), who recombined the epithet as *Cyathus plicatus*, kept it distinct and described *C. poeppigii* as a new species, citing the exciccate "*Cyathus plicatulus* Pöpp. Plant. Cubenses exsicc., no. 47". In Persoon's Herbarium is a collection (L 911.18–102) annotated "*Cyathus plicatulus* mihi/in Pöppig pl. Crypt. Cubens. exsiccat. + En. pl. Cub. MSS/Cub. ad ligna vetusta sylvar./Kunze" which I refer to *Cyathus microsporus* Tul.

L 911.18–26 from Mauritius, under the name *Cyathus*, comprises a single fruit-body to this species although their peridia are rust-coloured. I have, however, been unable to find any spores in those peridioles which I have examined but Lloyd (1906b) mentioned that it is not uncommon to find the spores to be sparse or absent in the large-spored species, to which he considered it safe to refer sterile specimens.

CYATHUS STERCOREUS (Schw.) De Toni

Nidularia stercorea Schw. *in* Trans. Amer. phil. Soc. **4**: 253. 1834. — *Cyathus stercoreus* (Schw.) De Toni *in* Sacc., Syll. Fung. **7**: 40. 1888.
Cyathus lesueurii Tul. *in* Ann. Sci. nat., (Bot.), sér. 3, **1**: 79. 1844.

This species, whilst apparently uncommon in Europe, is world-wide in distribution and readily recognized by the externally shaggy peridium, smooth endoperidium, blackish, double-walled cortex without a tunica and large, subglobose or ellipsoid spores 30–35 μ. It is usually found on the dung of herbivores or rich soil.

L 911.18–26 from Mauritius, under the name *Cyathus*, comprises a single fruit-body with peridioles, which I refer to this species.

CYATHUS STRIATUS (Huds.) ex Pers.

Cyathus striatus (Huds.) *ex* Pers., Syn. meth. Fung. 237. 1801.
Cyathus hirsutus (Schaeff.) *ex* Quél., Enchir. Fung. 232. 1886.
Cyathus griseus Pers. in Herb.

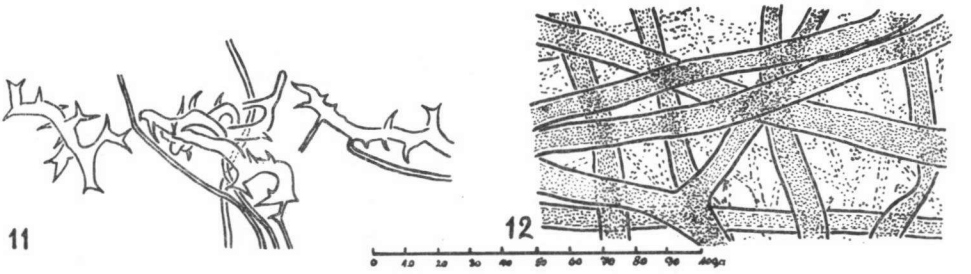
This well-known European species, characterized by the elongated brown peridia, usually densely hirsute externally and internally striate, with angular peridioles

covered by a light-coloured tunica and spores 19 × 10 μ, is represented by seven collections. There are two under *Cyathus striatus* and two under *Nidularia striata* as well as two unnamed collections.

The seventh, L 911.34–54, labelled "*Cyathus griseus*" and "sem. triquetra" belongs to this species. Although an unpublished name, "*C. griseus*" is interesting because of the reference to the triangular form of the peridioles, very typical for the species but only briefly referred to in the literature. The peridioles are also usually hemispherical in section with the under part often lobed and a deep umbilicus beneath.

The spores have very thick walls and are usually narrower towards the proximal end where a notch can be clearly seen when the median field of the horizontal spore is in focus. This feature does not appear to have been mentioned in the literature and could be used as an additional character in critical cases. A similar proximal notch has been observed in the spores of the specimens referred to *Cyathus triplex* Lloyd.

In most of the collections, particularly the more mature specimens, the exoperidium was usually distinctly sulcate.



Figs. 11–12. Microscopical characters

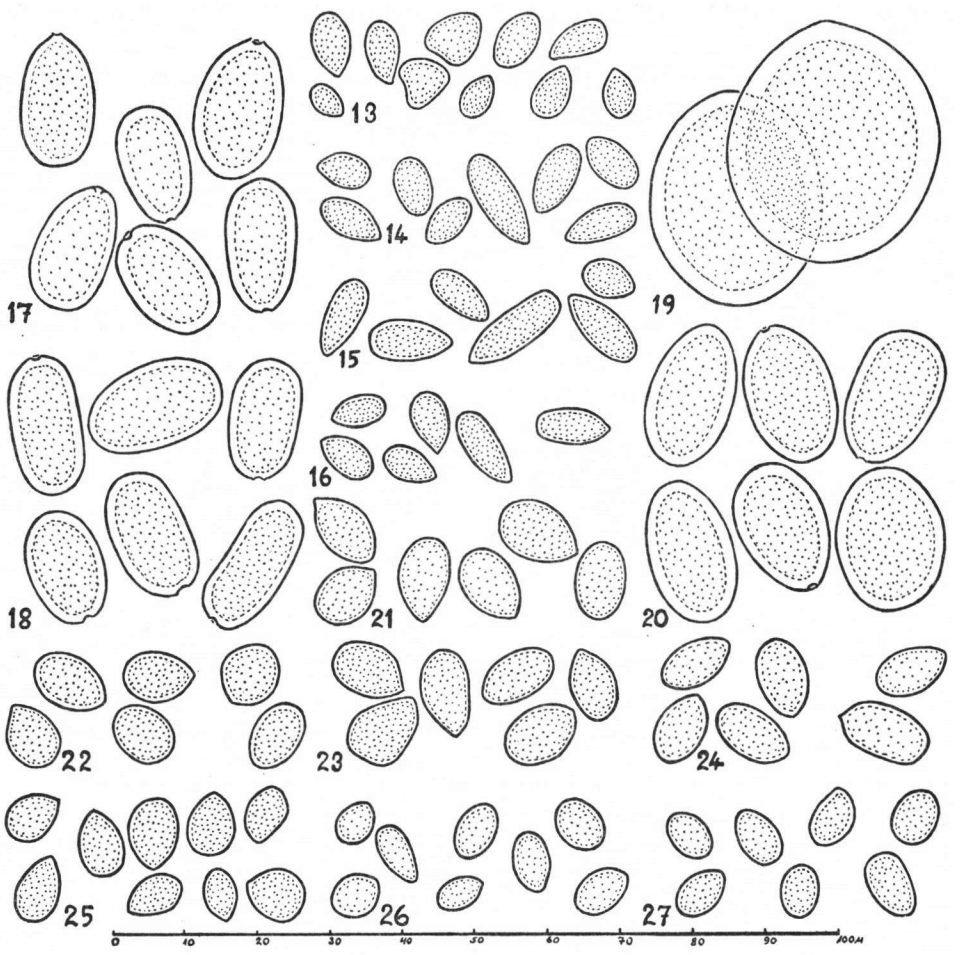
Figs. 11–12. *Nidularia farcta* (L 910.255–658, as *Cyathus farctus?*): 11—peridial hyphae; 12—cortical hyphae.

CYATHUS TRIPLEX Lloyd

Cyathus triplex Lloyd, Nidulariaceae 23. 1906.
Nidularia laevigata Pers. in Herb.

The species is recognized by the dark brown, strigose exoperidium, smooth to lightly plicate endoperidium, double-walled cortex and spores 16–22 × 12–14 μ. The peridioles are reported to have a thin, silvery tunica and the exocortex is stated not to be readily separable as, for instance, in *Cyathus stercoreus*. The spores in the present collections were observed to have a proximal notch similar to what I have found in the spores of *C. striatus*.

I refer L 910.222–2897 with the unpublished name "*Nidularia laevigata*" and annotated "(Cayenne)/(Intus laevis nec striata)" and L 910.255–669, which is



Figs. 13–27. Spores

Fig. 13. *Nidularia farcta* (L 910.255–658, as *Cyathus farctus?*).

Figs. 14–16. *Crucibulum laeve:* 14—(L 910.256–1389, as *Nidularia laevis*); 15—(L 910.255–610, as *Cyathus fimetarius*); 16—(L 910.255–632, as *C. leucospermus*).

Figs. 17–18. *Cyathus striatus:* 17—(L 910. 261–39); 18—(L 911.34–54, as *C. griseus*).

Fig. 19—*Cyathus stercoreus* (L 911.18–26, as *Cyathus*).

Fig. 20—*Cyathus triplex* (L 910.222–2897, as *Nidularia laevigata*).

Fig. 21–24. *Cyathus olla:* 21—(L 910.255–672, as *Nidularia plumbea*); 22—(L 910.255–649, as *Cyathus nitidus*); 23—(L 910.256–1377, as *Cyathus olla β agrestis* s. minor); 24—(L 910.256–1636, as *Nidularia sylvestris*).

Fig. 25–27. *Cyathus microsporus:* 25—(L 910.256–1582, as *Nidularia Domingenis*); 26—Type ex Herb. Paris; 27—(L 911.18–102, as *Cyathus plicatulus* Kunze and *Nidularia cubensis*).

undetermined, to this species. L 911.18–25, undetermined except for the generic name "*Cyathus*" and annotated "fig. 60/148/I. de Fr. [*]/ded. du Petit Thours" [* Mauritius], also appears to be referable to this species although the cinnamon-brown exoperidium is felted to lightly tufted. It is noteworthy that the type collection of *C. triplex* also came from Mauritius.

Lloyd (1906b) considered *C. triplex* a doubtful species because of its closeness to *C. intermedius* Tul. and *C. pallidus* Berk. & Curt.

NIDULARIA Fr.

Nidularia Fr., Symb. Gast., Fasc. 1: 2. 1817.

The genus is characterized by the globose fruit-bodies with the peridium wall constructed of irregular, rigid, spinose, ramose and long, simple, aseptate hyphae, and by the absence of an epiphragm and the free peridioles.

NIDULARIA FARCTA (Roth ex Pers.) Fr.

Cyathus farctus Roth *ex* Pers., Syn. meth. Fung. 239. 1801.—*Nidularia farcta* (Roth ex Pers.) Fr., Syst. myc. 2: 301. 1823.

Nidularia confluens Fr., Symb. Gast., Fasc. 1: 3. 1817.

N. pisiformis [Roth] Tul. *in* Ann. Sci. nat. (Bot.), sér. 3, 1: 95. 1844.

Nidularia sphaeroidea Pers. in Herb.

The species is characterized by the creamy-ochraceous peridium and free peridioles with a reddish-brown, one-walled cortex (wrinkled when dry) formed of loosely interwoven, sparsely branched, thick-walled, brown hyphae. It was originally hoped that authentic material would be found whereby the species could be typified.

L 910.255–658, determined as *Cyathus farctus* with a question mark, belongs to this species. The name "*Nidularia sphaeroidea*", which is unpublished, is appended in a hand which may be Persoon's. There is a similar collection in Fries's Herbarium at Uppsala with the name "*Nidularia farcta* (Roth) Fr." from "France" which is annotated "*sphaeroidea* Pers. in Litt./In Lignis abiegnis/Mougeot".

2.—PERSOON'S SPECIMENS

Although all specimens were firmly glued to the sheets, some were attached in such a manner that it was not possible to form any definite opinion as their taxonomic characters were obscured. Permission was received to soak off specimens where necessary, the most important of which have been remounted in transparent plastic boxes. In addition, many specimens were in poor condition whilst others, particularly those from the West Indies, were sparsely represented, which has hindered identification.

A further difficulty has been in both reading and recognizing the handwriting. Persoon's crabbed hand is obvious in most cases but some sheets have been annotated by Chaillet, Mougeot and other people. I am grateful to Drs. Dennis and Maas Geesteranus for their assistance in this respect.

L910.222–2897.—*Nidularia laevigata* (Cayenne)/(Intus laevis nec striata) [Persoon's handwriting].

A group of four fruit-bodies on a piece of wood. Fruit-bodies long cyathiform, 7.5–9 × 1–1.5 mm, tapering upwards to 3.5–4 mm; exoperidium of brown, tufted hyphae, somewhat abraded; endoperidium smooth to indistinctly ribbed, with ribs ca. 0.3 mm apart; peridioles 1.7–1.8 × 1.4–1.7 × ca. 0.4 mm, flattened disciform with a 2-walled (not readily separating), black and slightly wrinkled cortex with faint traces of a tunica; spores hyaline, ellipsoid, usually narrowing towards the proximal end, where there is an apical notch, very thick walls, 17–19.5–22 × 11–13–14.5 μ.

Redetermination: *Cyathus triplex* Lloyd.

L 910.222–2912.—*Nidularia plicata*/Cayenne (Poiteau) [Persoon's handwriting].

Eight loose fruit-bodies, each with a prominent emplacement, campanulate to cyathiform; exoperidium rust-coloured, felted and somewhat powdery with deep sulcations 0.3–0.6 mm broad for about one-third of the height; endoperidium sulcate; peridioles lenticular, grey-black, 2-walled, 1.9–2.3 × 1.7–1.9 × 0.3–0.5 mm. Spores absent from all peridioles examined.

Redetermination: Probably *Cyathus poeppigii* Tul.

L 910.255–610.—*Cyathus fimetarius* De Cand./An satis diversus ab *Cyatho Crucibulo?* [Persoon's handwriting]; *Cyathus fimetarius*/: 726a/9bre [Chaillet's handwriting].

Two rather squat and flattened fruit-bodies on vegetable debris resembling manure. Fruit-bodies 3.6–5.3 × 3–3.6 mm, with one fruit-body being little more than a rim embedded in the substrate bearing closely packed peridioles whilst the other fruit-body and its contents have been partly eaten away by animals; exoperidium ochraceous-yellow, felted; endoperidium creamy-ochraceous, smooth; peridioles 1.3–1.8 × 1.1–1.3 × 0.2–0.4 mm, lenticular, 1-walled, with a dull, purplish-black cortex obscured by a thick, loose, creamy-yellow tunica; spores hyaline, somewhat irregular in shape and size, varying from fusiform to ellipsoid, with prominent walls, 8–10–11.5 × 4.5–5–5.5 μ.

Redetermination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.255–632.—*Cyathus leucospermus*/Myc. Europ. t.1.f.9 videtur [Persoon's handwriting]; *Cyathus Crucibulum* Pers. S. 238. 3:/il me paroit tenir le milieu entre votre plante et le *fimetarius* C./Cable pourri/9bre. [Chaillet's handwriting].

A piece of decayed rope, as indicated by Chaillet, bearing a large cluster of closely aggregated fruit-bodies, 7–8 × 2–3 mm, tapering upwards to 5–7 mm, broadly cyathiform and thin-walled; exoperidium buffy-ochraceous, felted; endoperidium creamy-yellow, smooth; epiphragm whitish and gelatinous; peridioles 1.8–2.6 × 1.7–2.3 × 0.3–0.6 mm, disciform to ovate, 1-walled, with a purplish-grey cortex obscured by a thick, creamy-yellow tunica; spores hyaline, somewhat irregular in shape and size, long-ellipsoid with rounded ends, thick-walled, 7.5–9–10 × 4.5–5–5.5 μ.

Redetermination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.255–634.—*Fungus parvus lamellatus pectunculus forma alba* [or: *albo*] *adnescens.* Raj Syn. 14 N 27 T 10 F 7 minor Rotund/[the sheet of paper is cut off on the left-hand side and it is possible that one or more words have been lost, for instance "differt"] a *Clavaria* Roy [not Ray!]: minor s varitas [handwriting unknown; someone else has written on a tiny slip of paper: "ded. Raddi in hb. Pers."; it is impossible to find out if that is correct].

There are six fruit-bodies, including two pairs, without sign of the substratum, broadly tubular, ochraceous-brown and felted, with the peridioles covered by a thick, loose, whitish-ochraceous tunica and irregular spores, 6.5–11.5 × 4–5 μ.

Dr. Dennis informs me that the annotation is from Ray (1696) "No. 27 Fungus parvus ... adnascens. Common in Woods in Ireland. Dr. Sherard" in the section headed "Fungi lamellati, terrestres et arborei" which, in Ray (1724), is placed under *Agaricus.*

Redetermination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.255–645 without determination.

Four fruit-bodies with traces of woody debris at their bases, cyathiform with flaring mouths and smooth, buffy-grey and zoned within, large peridioles (up to 2.7 mm diameter), 1-walled, and spores 8.2–14.2 × 5.7–9.3 μ.

Determination: *Cyathus olla* (Batsch) ex Pers.

L 910.255–648.—*Nidularia leucosperma* [Persoon's handwriting].

Three fragments comprising a piece of soil-caked wood bearing a part fruit-body, two fruit-bodies with a common wall, and a flattened fruit-body full of peridioles. Fruit-bodies 4 × 5 mm, more or less tubular; exoperidium ochraceous-cinnamon, felted; endoperidium ochraceous-yellow, smooth; peridioles 1.3–1.7 × 1.2–1.5 × 0.3–0.8 mm, disciform, funiculate, with a purplish-grey cortex covered by a thick, ochraceous-yellow tunica; spores hyaline, rather irregular in shape and size, varying from ellipsoid to broadly lanceolate, often with a prominent apiculus, 6.5–9.5–13.5 × 3.5–4.5–6 μ.

Redetermination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.255–649.—*Nidularia/Cyathus nitidus* Roth/Catal. bot. 1. p. 236 [Persoon's handwriting].

Four fruit-bodies with soil and woody debris at their bases, obconic, with mouths tending to flare and somewhat revolute; 10–12 × 1.5–2 mm, tapering upwards to 8–10 mm, exoperidium buffy-brown, slightly shaggy; endoperidium dark grey, smooth; peridioles 2.3–3.1 × 2.2–2.7 × 0.6–1.3 mm, irregularly lenticular with a 1-walled, black cortex obscured by a shiny, fawn-brown tunica; spores hyaline, typically broadly ellipsoid, usually narrower at one end, varying to ellipsoid, 9–9.9–11.2 × 6.4–7.5–8.5 μ.

Redetermination: *Cyathus olla* (Batsch) ex Pers.

L 910.255–658.—*Cyathus farctus* Pers.? / Voila une espece que jai trouvé cet Eté sur des bois pourri au bord des Eaux. Je partage avec vous mes Echantillons. Je n'ai garde pas autant que je vous en envoye. Je la rechercherai [Mougeot's handwriting]; *Nidularia sphaeroidea* [possibly Persoon's handwriting].

Four pieces of wood bearing fruit-bodies in different stages of development; fruit-bodies –7.2 × –5.7 mm, depressed globose, broadly seated, mainly immature and indehiscent but two irregularly opened; exoperidium more or less cinnamon-ochraceous, varying from densely pubescent to felted or almost smooth and constructed of rigid, spinose hyphae with the spines tapering into long, simple, aseptate threads, internally buffy-cream and smooth, with remains of gelatinous matrix containing hyaline, ramose hyphae with septa and clamp-connections adhering; peridioles free, 1.2–1.4 × 1.2–1.3 × 0.4 mm, lenticular, reddish-brown, with cortex formed of loosely woven, mainly simple threads, wrinkled when dry; spores hyaline, very irregular in shape and size but typically ellipsoid, usually narrower at one end, with prominent walls, 5.9–8.1–12.4 × 3.9–5–5.9 μ.

Redetermination: *Nidularia farcta* (Roth ex Pers.) Fr.

L 910.255–668 without determination.

Ten single fruit-bodies with soil and debris adhering to their bases, long cyathiform, externally brown and hirsute, internally sulcate; peridioles angular, 1-walled; spores 17.3–20.5 × 9–11.2 μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.255–669 without determination.

Eleven fruit-bodies with mycelium, soil or wood at their bases, 6–9.5 × 1–2 mm, tapering upwards to 4–6 mm, narrowly cyathiform; exoperidium purplish-brown, with densely tufted hyphae; endoperidium dark grey, faintly striate; peridioles 1.6–2.2 × 1.5–1.9 × 0.4–0.5 mm, disciform, with a dull black cortex, wrinkled or minutely pitted, 2-walled but not readily separating, with traces of a very thin, evanescent tunica; spores hyaline, broadly ellipsoid, usually pointed at one end, with very thick walls and a notch in the proximal end, 18.7–19.7–20.7 × 12.4–13–14.3 μ.

Determination: *Cyathus triplex* Lloyd.

L 910.255–672.—*Nidularia plumbea* / — *vernicosa* B. / *Cyathus olla*, Syn. fung. [Persoon's handwriting].

Eight single fruit-bodies with several bearing small nodules of soil at their bases and one with a few sand grains adhering to the exoperidium, 7.5–11 × 1–2 mm, tapering upwards to 8–15 mm, broadly cyathiform, much flared with longitudinally folded and wrinkled mouths; exoperidium fawn to dark grey, smooth; peridioles 3.1–3.7 × 1.8–3.1 × 0.5–1 mm, very irregularly disciform, 1-walled black cortex obscured by a buffy-brown and persistent tunica; spores hyaline, broadly ellipsoid to pip-shaped, usually narrower at one end, 9.6–11.7–14.7 × 6.2–7.5–9.3 μ.

Determination: *Cyathus olla* (Batsch) ex Pers.

L 910.255–685 without determination.

Seven fruit-bodies on two pieces of vegetable material, possibly dung of herbivore, distorted and tubular, dirty ochraceous and felted, with peridioles covered by a thick, creamy-yellow tunica and spores irregular in shape, 6.5–9.6 × 4–5.6 μ.

Determination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.255–890 without determination.

Seven fruit-bodies, including one pair with soil and mycelium adhering, long cyathiform; exoperidium brown, densely tufted; endoperidium sulcate, spores 17.1–23.3 × 9.7–12.1 μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.255–892.—*Cyathus laevis* [Persoon's handwriting].

Nine fruit-bodies, including one attached to a piece of wood and five with white, ramose rhizomorphs attached to their bases, up to 1 cm tall, cyathiform; exoperidium buffy-brown and varying from felted to shaggy; endoperidium greyish-brown, smooth; peridioles up to 3.2 × 2.7 mm, irregularly disciform with a thin brown tunica; spores variable in shape and size, subglobose to ellipsoid with one end narrower, 8.4–10.3–12.1 × 6.2–7.4–9.6 μ.

Redetermination: *Cyathus olla* (Batsch) ex Pers.

L 910.256–1377.—*Cyathus olla β. agrestis* s. [= seu] minor / Ex Sicilia [Persoon's handwriting].

Five fruit-bodies, including one pair, with traces of soil and unidentifiable debris adhering to them, 4–6.5 × 1–2 mm, tapering up to 6–8.5 mm, very broadly cyathiform with a flared and flattened, wavy mouth but somewhat erect in one specimen; exoperidium buffy-ochraceous, felted shaggy; endoperidium buffy-brown, smooth, with a zoned rim and somewhat darker within; peridiole (only one remaining) 2.1 × 1.8 × 0.8 mm, lenticular, ovate, with a 1-walled black cortex obscured by a brown tunica; spores hyaline, variable in shape and size but usually ellipsoid, pointed at one end, with prominent walls, 8.1–11.1–14 × 6.2–6.8–7.9 μ.

Determination: *Cyathus olla* (Batsch) ex Pers.

L 910.256–1387.—*Cyathus* / Prope Belleville (Paris) sub *Seringa vulgari* [Persoon's handwriting].

A mossy twig bearing a closely developed group of three fruit-bodies and two loose fruit-bodies, one with soil at the base, with a mat of buffy mycelium surrounding the fruit-bodies on the twig, 4.8–7.5 × 2–3 mm, tapering to 6.5–9.5 mm, shortly broadly tubular with a flared or flattened mouth; exoperidium smooth, dirty-grey or blackish-brown; peridioles to 2.3 × 2.2 mm, lenticular to disciform, with a thin, closely adhering buffy-brown tunica and a black cortex beneath; spores 10.9–11.9–13.2 × 6–6.5–7.6 μ.

Determination: *Cyathus olla* (Batsch) ex Pers.

L 910.256–1388.—*Nidularia leucosperma* / Gallia / Prope Parisios [Persoon's handwriting].

A twig bearing a small, dense cluster of fruit-bodies and a branch or chip-end with about ten densely clustered, flattened fruit-bodies, to 6 mm tall, somewhat shortly cylindrical with some appearing to have common walls; exoperidium buffy-ochraceous, felted; endoperidium buffy-brown, smooth; peridioles to 1.9 mm diameter, disciform, with a thick, creamy-yellow tunica and a purplish-grey cortex beneath; spores hyaline, rather variable in shape and size, varying from ellipsoid, when usually tapering to one end, to fusiform or naviform, with distinct walls, 7.9–10.3–14 × 4.2–4.8–5.6 μ.

Redetermination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.256–1389.—*Nidularia laevis* B. / *Cyathus Crucibulum* / Syn. fung. / (Vogesia) [Persoon's handwriting].

Four pieces of wood bearing six somewhat insect-attacked fruit-bodies, up to 6 mm tall, broadly cyathiform, broadly based, with a scurfy, cinnamon epiphragm persisting; exoperidium ochraceous-cinnamon and felted; endoperidium buffy-fawn and smooth; peridioles up to 1.7 mm diameter, disciform, with a thick, loose, creamy-ochraceous tunica and a purplish-grey cortex beneath; spores hyaline, somewhat irregular in size and form, mainly ellipsoid, often rounded at both ends but sometimes tapering to one end, to fusiform or naviform, with distinct walls, 7.7–8.8–10.9 × 3.9–4.6–5.3 μ.

Determination: *Crucibulum laeve* (Bull. ex DC.) Kambly.

L 910.256–1571.—*Nidularia striata* [Persoon's handwriting]; leg. Junghuhn. Germania [unknown handwriting].

A confused mass of fruit-bodies and vegetable matter; peridia cyathiform to tubular; exoperidium dark brown and strongly tufted; endoperidium sulcate with somewhat triangular peridioles; spores hyaline, oblong with rounded ends, usually narrower towards one end where there is a distinct proximal notch, very thick walls, 17.1–20.7–23.5 × 9.9–12.8–16.8 μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.256–1582.—*Nidularia Domingensis* / In Hispaniola [Persoon's handwriting].

Four loose fruit-bodies on wood with a basal mycelial emplacement, 6.5–8.3 × 0.5–1 mm, tapering upwards to 6–8 mm, obconic to cupulate, exoperidium ochraceous-brown and felted with occasional tufts (possibly partly denuded); endoperidium buffy-brown, varying from smooth to very faintly striate; peridioles 1.8–2.3 × 1.7–2.1 × 0.2–0.5 mm, disciform, often irregular and wavy, with a dark, buffy-brown tunica and a blackish cortex beneath, 1-walled; spores hyaline, very irregular in shape, varying from ellipsoid to subglobose, very occasionally angular to broadly pip-shaped and tapering towards one end, with a distinct wall, 7.4–8.6–10.1 × 5–5.4–7.3 μ.

Redetermination: *Cyathus microsporus* Tul.

L 910.256–1636.—*Nidularia sylvestris* / var. *Cyathi ollae?* / In Fruticetis (*Seringae vulgaris*) ad stipites s. ramulos dejectos. / Autumno 1816. / Prope Belleville [Persoon's handwriting].

Two loose fruit-bodies and a piece of wood bearing a single fruit-body, 5–8.5 × 1–1.5 mm, tapering up to 6.5 mm, cyathiform to slightly flaring, with a basal emplacement; exoperidium buffy-brown and varying from felted to sparsely tufted with long brownish filaments; endoperidium buffy-brown and smooth; peridioles up to 2.2 mm diameter, lenticular, with a purplish-brown, wrinkled tunica and a black cortex beneath; spores hyaline, somewhat variable in shape but mainly ovate with blunt ends, occasionally subglobose, with distinct walls, 9–10.4–12.1 × 5.9–6.8–9.6 μ.

Redetermination: *Cyathus olla* (Batsch) ex Pers.

L 910.261–36.—*Cyathus striatus* [Persoon's handwriting].

Five loose fruit-bodies with soil-encrusted mycelial emplacements, up to 11.5 mm tall, obconic to almost tubular, rounded above when young and densely covered with shaggy, brown, tufted hyphae, with sulcations apparent in the older specimens; endoperidium sulcate; peridioles 1.7–2 mm diameter, irregularly lenticular to almost triangular, with a buffy-brown tunica and a black cortex beneath; spores hyaline, oblong with blunt ends, slightly tapering towards one end where there is a proximal notch, thick walls, 18–19.4–22.2 × 9.1–10.3–10.9 μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.261–38.—*Nidularia striata* [Persoon's handwriting].

Eight loose fruit-bodies with large emplacements of fibrous material at their bases, up to 15 mm tall, long cyathiform; exoperidium densely covered with shaggy tufts of dark-brown hyphae through which the sulcations are readily seen; endoperidium sulcate; peridioles ca. 1.8 mm diameter, irregularly lenticular to almost triangular, with a buffy-brown tunica and a shiny black cortex beneath, 1-walled; spores hyaline, oblong with rounded ends, often tapering towards the proximal end, where there is an indistinct notch, very thick walls, 15.8–18.5–20.4 × 8.2–10.3–12.1μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.261–39.—*Cyathus striatus.* / cum radiculis longis villosis fungum quemdam byssoideum mentientibus. [Persoon's handwriting].

Three rather battered fruit-bodies on woody debris with basal debris encrusted emplacements, 8–9.5 × 1.5–2.5 mm, tapering upwards to 3–8 mm, long cyathiform; exoperidium densely covered with shaggy tufts of dark-brown hyphae through which the sulcations are readily seen; endoperidium brown, sulcate; peridioles 1.5–2 × 1.4–1.6 mm, very irregularly lenticulate, varying from angular to almost triangular with traces of a fawn tunica and a 1-walled black cortex beneath; spores hyaline, oblong with rounded ends, tapering towards the proximal end, where there is an apical notch, thick walls, 15.8–18.6–21 × 9.3–10.7–11.2 μ.

Determination: *Cyathus striatus* (Huds.) ex Pers.

L 910.261–41.—*Nidularia plicata* [Persoon's handwriting].

Fourteen fruit-bodies, including one with traces of woody substratum and several groups of two or three individuals, up to 8 mm tall with a prominent emplacement, broadly obconic, often upwardly curving; exoperidium reddish-ochraceous and appearing to be coated with a fine powdery deposit, with deep sulcations for about one third of the height, both outside and within; peridioles up to 2.1 mm diameter, flattened disciform, lightly corrugated and dull purplish black with a 2-walled cortex. No spores could be found although several peridioles were examined.

Redetermination: Probably *Cyathus poeppigii* Tul.

L 911.18–25.—*Cyathus* / fig. 60 / 148 / I. de Fr. [Persoon's handwriting]; ded. du Petit Thours [handwriting unknown].

A single fruit-body 6.5 × 0.5 mm, tapering to 5 mm at mouth, broadly obconic; exoperidium cinnamon-brown, felted to lightly tufted; endoperidium buffy-grey and lightly striate; peridioles up to 2.2 mm diameter, lenticular, with a somewhat wrinkled buffy-brown tunica persisting in places and a 2-walled, inseparable, black, wrinkled cortex; spores hyaline, varying from oblong with rounded ends to ellipsoid with a distinct proximal notch, thick walls, 15.7–17.7–20.5 × 10.3–11.6–12.6 μ.

I consulted Dr. Dennis regarding the annotations on both this and the following collections. He pointed out that "I. de Fr." (L'Ile de France) was the name of Mauritius before it was captured by the English and that Aubert du Petit Thours was a French traveller and botanist of the Napoleonic era who published a good deal about Madagascar, Mauritius, etc. He was, however, unable to find the figures referred to in any of du Petit Thours' publications in the Kew library.

Determination: Probably *Cyathus triplex* Lloyd.

L 911.18–26.—*Cyathus* [followed by an illegible letter] / 60/147/I. de Fr. [Persoon's handwriting]; ded. du Petit Thours [handwriting unknown].

A single fruit-body, 5 × 1.5 mm, tapering upwardly to 3.2 mm, broadly cyathiform with slightly upwards tapering sides and a somewhat irregular mouth; exoperidium fawn-ochraceous, with matted, tufted hyphae; endoperidium smooth, dark greyish-brown; peridioles up to 2.1 mm diameter, disciform, with externally very dark brown, 2-walled cortex; spores hyaline, broadly ellipsoid to subglobose, with very thick walls, 26.5–30.8–35.7 × 23.3–27.8–32.4 μ.

Determination: *Cyathus stercoreus* (Schwein.) De Toni.

L 911.18–102.—*Nidularia cubensis* P. [Persoon's handwriting]; *Cyathus plicatulus* mihi in Pöppig, pl. Crypt. Cubens. exsiccat. + En. pl. Cub. MSS. / Cub. ad ligna vetusta sylvar. / Kunze [Gustav Kunze's handwriting].

A long sliver of wood bearing two fruit-bodies with mycelial emplacement of a third remaining. Fruit-bodies developing from a dark, prominent, circular emplacement about 2.8 mm diameter, 4.2–6 × 1.2–1.5 mm, tapering upwards to 6.7 mm, cyathiform but rounded below; exoperidium of reddish-brown hairs, weathered away in part and darker below; endoperidium greyish-fawn, smooth with a few longitudinal wrinkles to very faintly striate; peridioles 1.6–1.9–2.2 ×

1.3–1.6–1.7 × 0.3–0.4 mm, irregularly lenticular with a very thin, purplish-brown tunica and a black, 1-walled cortex beneath; spores hyaline, ellipsoid, usually pointed at one end, with prominent walls, 7.7–8.3–9.5 × 4.8–5.5–6.2 μ.

Redetermination: *Cyathus microsporus* Tul.

L 911.18–490.—*Nidularia laevis* [Persoon's handwriting].

Three fruit-bodies with a few moss fragments on one, to 11.3 mm tall, obconic, with a broad mouth tending to flare; exoperidium buffy-ochraceous and felted; endoperidium smooth and buffy-grey; peridiole (single one remaining) 3 × 2.7 mm, lenticular, with a loosely adhering, thin, purplish-brown tunica and a black cortex beneath, 1-walled; spores hyaline, rather irregularly pip-shaped to broadly ovate, narrower at one end, with prominent walls, 9.8–11.4–12.4 × 6.5–7.4–8.2 μ.

Redetermination: *Cyathus olla* (Batsch) ex Pers.

L 911.34–54. —*Cyathus griseus.* / Sem. triquetra. / Prope Parisios lectus [Persoon's handwriting].

A single fruit-body with a prominent mycelial emplacement, 9 × 1.5 mm, tapering upwards to 6.5 mm, cyathiform; exoperidium of coarse, medium brown hairs; endoperidium buffy-grey and lightly sulcate above; peridioles irregular, often ± triangular, with faint traces of a fawn tunica on underside and a black, 1-walled cortex; spores hyaline, oblong, with rounded ends, to ellipsoid, usually tapering to proximal end, where there is a prominent notch, thick walls, 17.1–19–23.3 × 8.5–10.5–12 μ.

Redetermination: *Cyathus striatus* (Huds.) ex Pers.

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