

V.—FUNGI ON HOSTS OTHER THAN VASCULAR PLANTS.

The fungi parasitic on algae, hepatics and mosses have not yet been studied. Sparrow (1943 : 7) states, that from the scanty evidence now available, it seems probable that aquatic phycomycetes are world-wide in their distribution. When fresh-water algae collected in South Africa are examined, fungi belonging to the Chytridiales are frequently seen invading the algal cells and are apparently quite common. None of these has been studied nor has any record been found of species collected in southern Africa.

Only one fungus is known on the Hepaticae ; several collections of *Riccia* sp., made by Miss A. V. Duthie at Stellenbosch, were parasitised by a fungus described by S. J. du Plessis as *Olpidiopsis Ricciae*.

Fungi developing upon Other Fungi.

A number of fungi actively parasitic on other fungi, which are apparently cosmopolitan are common in South Africa. *Darlucula filum* is very frequent on Uredineae, and in wet seasons attacks the uredo-sori so severely that the teleutospores do not develop ; the perfect stage of this fungus, *Eudarlucula australis*, has been observed only occasionally. Tuberculina spp. have been found on rusts, *Cicinnobolus* is common on Erysiphaceae and *Mycogone* occurs on Agarics, especially *Russula*. No parasites of Phycomycetes have been recorded.

Leaf-inhabiting ascomycetes in the indigenous forests support a wide range of hyper-parasites. These organisms have been studied by C. G. Hansford and to him grateful thanks are due for the identification of a large number of species. On the Meliolaceae are

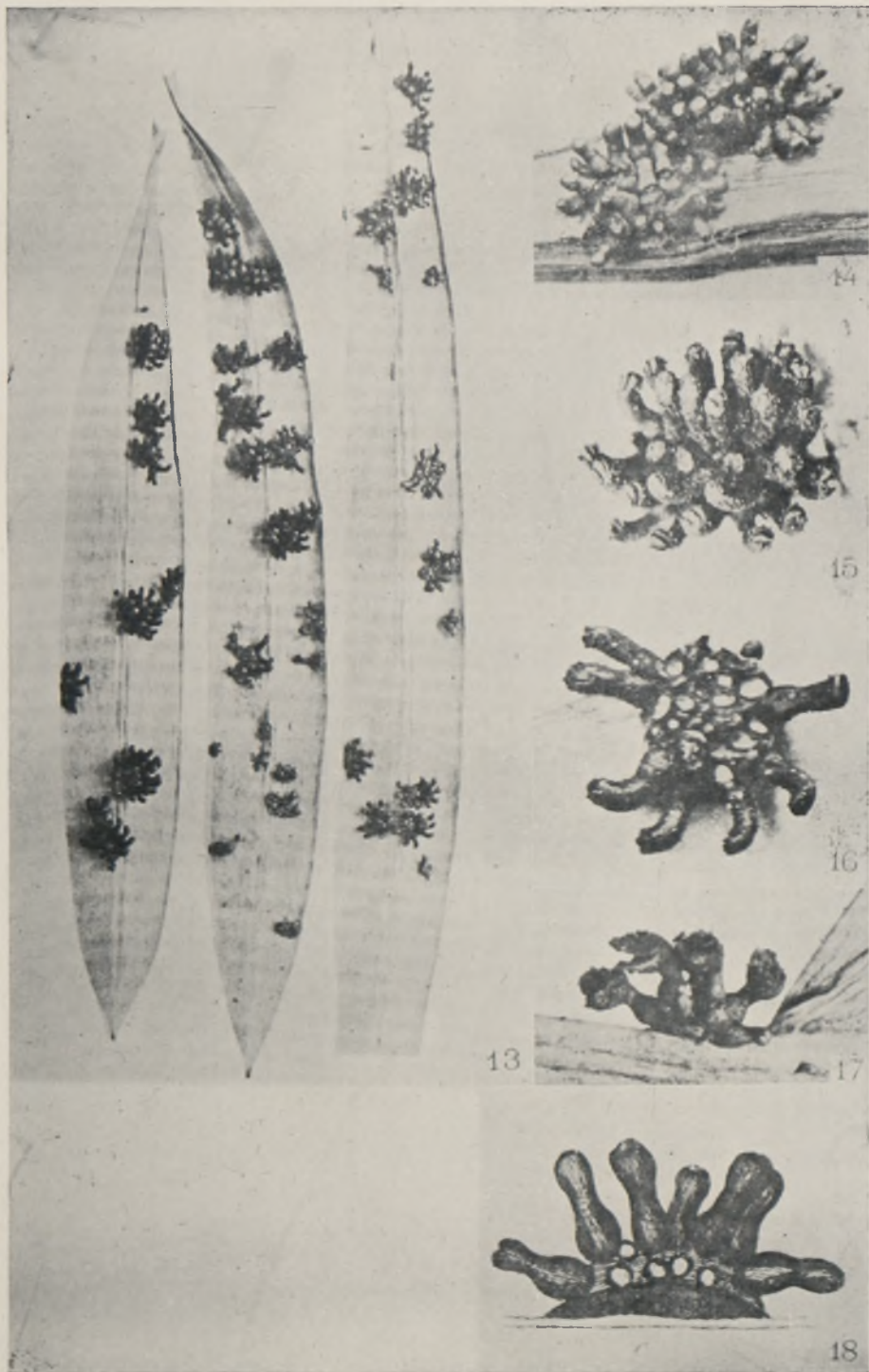


Plate 10.—*Corynelia uherata* Fr. ex Ascharius (after Fitzpatrick 1920, Pl. 14). Fig. 13. Clusters of perithecia on leaves of *Podocarpus latifolia* (x 2½). Fig. 14. Clusters of immature perithecia the tips of several individuals crushed in the lower cluster (x 11). Fig. 15. A cluster of almost mature but unruptured perithecia (x 11). Fig. 16. A similar cluster of perithecia, but with many individuals broken away, exposing their white interiors (x 11). Fig. 17. A small group of perithecia, several of which show the characteristic method of dehiscence by a single, deep-apical cleft (x 11). Fig. 18. A copy of one of the illustrations published by Ascharius in connection with the original description in *Observaciones Mycologicas de Fries*.

found Sphaeriaceae of the genera *Dimerium*, *Phaeophragmeriella*, *Dimerina* and *Chaetodimerina*, Hypocreaceae including species of *Calonectria*, *Paranectria*, *Philonectria* and *Nectria*, Trichothyriaceae (*Trichothyrium* spp.) and Microthyriaceae (*Echidnodes lembosoides*). There are also a number of Fungi Imperfecti belonging to several genera of which the most common are *Helminthosporium*, *Spegazzinia*, *Cephalosporium* and *Eriomycopsis*. Hyperparasites on the Asterinaceae are less numerous; one of the most interesting is *Mycolangloisia nitida* belonging to the Trichothyriaceae; in addition there are several species of the genera *Dimerium*, *Phaeodimeriella*, *Mycophaga*, *Calonectria* and *Eriomycopsis*.

Amongst the Sphaeriaceae, a species of *Cicinnobella* has been found on *Englerula Macaranga*. The genera *Cryptogene* and *Cryptogenella* were described by Dr. H. Sydow on *Parodiella perisporioides* collected in Southern Rhodesia.

Lasmeniella globulifera is a hyperparasite on *Endodothella Deightoni*, *Phyllachora Halsei* and *Ph. Pterocarpi*, which are Phyllachoraceae on leguminous hosts; the first two were found in the coastal scrub and the last in the parkland of the northern and eastern Transvaal and of Southern Rhodesia. Several parasites are found in the stromata of Phyllachoras on grasses; *Cryptodidymosphaeria clandestina* is fairly common; in addition, *Pleospora Doidgeae*, *Coniothyrium occultum* and *Stagonospora cryptogea* occur, chiefly in the perithecial cavities of *Phyllachora Doidgeae* which is a common parasite of the Andropogoneae. *Fusarium expansum* has been found parasitising *Phaeochorella Parinarii* on *Parinarium mobola* in the parkland of the northern Transvaal. The tale of hyperparasites on Phyllachoraceae is by no means complete; several unidentified species have been observed, notably one which invades old perithecial cavities of *Phyllachora Strelitziae*; the two-celled spores of this parasite were originally described as those of the stromatal ascomycete, which was therefore placed in the genus *Endodothella*.

On *Hypoxyton*, in the Xylariaceae, are found *Nectria episphaeria* and *Tympanopsis euomphala*; the latter species is also known in England and in North Africa and is restricted to *Hypoxyton rubiginosum*, it is not known on any other host.

Amongst the Hypocreaceae, the stromata of *Epichloe cinerea* are often covered with a pink mat consisting of mycelium and spores of *Fusarium ciliatum*; from this mat *F. decemcellulare* has also been isolated. *F. avenaceum* is frequently found on sclerotia of *Claviceps Paspali* and *F. heterosporum* var. *congoense* on those of other species of *Claviceps* and on ovaries infected with smuts such as *Ustilago bromivora*. *Fusarium culmorum* has been found on *Sphacelotheca Sorghi*, a smut of Kaffir corn; *F. avenaceum* has been observed destroying the teleutospores of *Puccinia ranulipes* on *Asparagus loricinus*.

A *Polyporus* sp. has been seen supporting the fructifications of *Trametes Sycamori* and Hollós found *Phoma Geasteropsisidis* on the Gastromycete *Geasteropsis Conrathi*. Cultivated mushrooms are sometimes attacked by an unidentified species of *Verticillium*. Amongst the Fungi Imperfecti, the 'bagworm fungus', *Isaria Psychidae*, is often attacked by *Melanospora parasitica*.

Fungi on Lichens.

Pharcidia Psorae was recently found near Cape Town by S. Garside, on a species of *Lecidea*; *Homostegia Piggottii* was identified by Zahlbruckner on *Parmelia rudecta* collected in South West Africa. Other fungi on lichens listed by Vouaux were found on specimens sent to Europe by collectors such as MacOwan, McLea, Wilms and Miss Armstrong in the 19th century. These include *Celidium stictarum* on *Lobaria*, *Abrothallus Parmeliarum* on *Sticta*, *Triblidia capensis* on *Lecidea*, *Mycobilimbia quaternella* on *Pertusaria*, *M. acervata* and *Nesolechia perforans* on *Parmelia*. The form 'pleurocarpa' of *Lobaria pulmonaria*, according to Garside, was based on specimens of this lichen in which the apothecia were rendered abortive by an attack of the parasitic fungus *Celidium stictarum*; a specimen of this 'form' was found by MacOwan on a tree trunk in the Boschberg.

Fungi attacking Insects and Spiders.

The entomogenous fungus which has attracted the most attention in South Africa is undoubtedly *Empusa Grylli*. In seasons when climatic conditions are suitable, this fungus causes heavy mortality amongst the locust swarms; hundreds of infected insects climb high up on the vegetation and just before they die, fold their legs round the stem or leaf to which they are clinging. It is no uncommon sight, where mortality due to *Empusa* has been high, to see the tops of plants bearing locusts in all stages of disintegration (McMartin 1935 a). This fungus is an obligate parasite and attempts to grow in artificial culture have failed. *Empusa Grylli* attacks the redwing and the brown locust and is also found on grasshoppers. Next in importance is a parasite of locusts is *Beauveria bassiana* causing the 'white fungus disease' which occasionally occurs in epidemic form. *Metarrhizium anisopliae* is fairly common on the redwing locust. A number of species of *Fusarium* have been recorded on the redwing locust, but these are probably saprophytes.

House flies become infected with *Empusa Muscae* and when conditions are suitable, Aphids are decimated by *Entomophthora Aphidis*. The cutworm, *Euxoa segetis*, is attacked by *Entomophthora megasperma* and the larvae of the cabbage moth, *Plutella maculipennis* by *Entomophthora sphaerosperma*. *Entomophthora apiculata* is found on a wide range of insect hosts.

Fusarium coccophilum is common on scale insects in the more humid areas; the perfect form of this fungus has not been observed in South Africa. *Fusarium coccophilum*, in wet seasons, is an important factor in the control of the red scale, *Aonidiella auranti*, on citrus and on roses; it is also found on a number of species of *Aspidiotus* and on the Mussel scale, *Lepidosaphes Gloveri*. The latter scale is often attacked by the 'white-headed fungus', *Tetracium rectisporum*, especially in citrus orchards near the coast; the perfect stage of *Tetracium* has not been found. *Myriangium Montagnei* is known on *Lepidosaphes* and also parasitises unidentified scale insects on indigenous plants. *Fusarium lateritium* found on the waxy scale, *Ceroplastes sp.*, and *Aspergillus spp.*, observed on indigenous scale insects are possibly saprophytes. A number of species of *Septobasidium*, recorded on branches of cultivated and indigenous trees, are associated with scale insects infesting these hosts, but in no case has the insect been identified.

When conditions are suitable, *Isaria Psychidae* causes great mortality amongst bagworms, *Acanthopsyche Junodi*, in the wattle plantations, and according to Ripley, an unidentified *Entomophthora* caused extensive epidemics amongst these insects in 1923. *Beauveria Bassiana* has been found attacking larvae and chrysalides of *Cactoblastis cactorum*, an insect introduced from Australia to assist in the destruction of the prickly pear. Two specimens of *Cordyceps* have been collected, and those by MacOwan, on larvae of *Elateridae*.

Local collectors have paid no attention to the Laboulbeniaceae and the few species described were probably found by Thaxter on museum specimens of the insect hosts.

The only fungus parasite of spiders which is known is *Gibellula aranearum*, found in Natal on a spider of the family *Lycosidae*.

Fungi causing Diseases of Animals.

Saprolegnia has been observed on goldfish in the ornamental water at the Union Buildings, Pretoria and on a frog, but apart from this, nothing is known in South Africa of the parasitic Saprolegniaceae.

Aspergillus fumigatus is the cause of a fatal disease in young ostriches, the fungus being found in bone cavities, lungs and intestinal tracts. This fungus also invades the air sac of ducks and penguins with fatal results, and has caused a disease of various birds in aviaries.

A condition in merino sheep known as 'lumpy wool' is caused by *Actinomyces dermatonomus*. Isolated outbreaks of this disease have occurred in the Karoo districts, where in some seasons it assumes serious proportions. Outbreaks have also occurred in East Griqualand and in the eastern, southern and south-western districts of the Cape.

One case of sporotrichosis, caused by *Sporotrichum Schencki*, has been diagnosed in a horse and three cases are on record of animals infected with *Rhinosporidium Seeberti*. The

latter fungus has been isolated from a tumour on the septum nasi of a horse and from tumours situated in the regio respiratorio, on the leg and in the nasal cavity of two mules.

Actinomycosis or lumpy jaw, caused by *Actinomyces bovis*, is fairly common in cattle. Ringworm has been diagnosed on horses, cattle, dogs and cats, but no attempt has been made to identify the casual organisms.

Thanks are due to Dr. E. M. Robinson of the Division of Veterinary Services for information about fungi concerned in diseases of animals and for references to literature on the subject.

Fungi causing Disease in Man.

It seems possible that diseases caused by fungi are more common than records indicate, especially in native territories and in subtropical areas. In the colony of Moçambique, according to Dr. Ribeiro, mycoses cause, next to leprosy, the greater number of mutilations in the native population. A large number of natives can be seen rendered absolutely incapable of work owing to lesions caused by fungi. Between 1932 and 1934, 776 cases of unidentified mycoses were observed in Angoche and recorded in the hospital or in the mobile clinic (Ferreira 1941 : 33-34).

The first record of bronchomycosis from South Africa appears to be in 1902, when *Actinomyces Leishmani* was isolated from nodules in the lung and from the pericardial fluid of a soldier who had returned to England from Ladysmith (Birt and Leishman 1902). Further cases were investigated by Dr. A. Pijper, who described *Monilia bethaliensis*, isolated from sputum of a patient suffering from cough, periods of feverishness and bronchitis. The species was transferred by Dodge, to the genus *Candida*. Dr. Pijper also isolated from sputum, in cases of bronchomycosis, several other species classified by Dodge in the genera *Candida* and *Castellania*. *Actinomyces Pijperi* was found in mycopurulent sputum of a patient with chronic bronchitis. *Histoplasma capsulatum* has been isolated from lesions in the mouth of a European and *Rhinosporidium Seeberi* found in several cases of infection of the conjunctiva.

The first isolation of a *Cryptococcus* from spinal fluid in South Africa was made by Dr. Pijper from a fatal case of blastomycotic meningitis; later a number of other cases attributed to *Cryptococcus histolyticus* were described and the organism isolated.

Aspergillus niger has been found in connection with an affection of the ear (otitis externa), *Geotrichum rugosum* in a case of thrush.

From 'mycetoma pedis', forms of 'madura foot', *Actinomyces africanus*, *A. madurae* and *A. transvaalensis* have been isolated, and *A. pretorianus* from mycetoma of the shoulder. *Hanseniospora Guillermondii* was found and described by Pijper causing onychomycosis in the case of a European woman.

Sporotrichosis, characterised by ulcers of the skin and inflammation of the joints and caused by *Sporotrichum Schencki*, var. *Beurmanni*, has claimed many victims among natives working underground in the gold mines of the Witwatersrand; in one mine 650 cases were recorded amongst natives and some Europeans were also affected; several cases amongst natives have also been reported from Moçambique.

Dr. Pijper's isolation of *Sporotrichum Carougeaui*, from a superficial lesion of the skin, is of interest; this fungus was found by Langeron in Madagascar in 1913, but his strain was lost; the South African fungus is on record at the Lister Institute.

The most common mycoses are those causing cutaneous affections. The most frequent cause of ringworm of the scalp, especially in children, is *Microsporon ardouini*; *Ectotrichophyton mentagrophytes* and *Epidermophyton rubrum* have been found causing ringworm of the body, favus is caused by *Achorion Schoenleinii* and *Endodermophyton africanum* was isolated from scales of the body in a form of 'tinea imbricata'. *Malassezia furfur* causes a skin disease of the body known as 'pityriasis versicolor'. *Epidermophyton interdigitale* causes athlete's foot and was one of the most common of the minor ailments in the army (Shapiro 1941).

In recording fungi parasitic on man and the higher animals, the nomenclature used by Dodge (1936) has been followed.

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