Entomogenous fungi from the Galápagos Islands

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Twenty-one species of entomogenous fungi, collected during a mycological survey of the island of Santa Cruz, are listed. Several coccid-associated species are described in detail, including ***Hirsutella sphaerospora*** sp. nov. on Eriococcid larvae; *Hirsutella besseyi* Fisher; and *Torrubiella confragosa* Mains, putative teleomorph of *Verticillium lecanii* (Zimm.) Viégas. In addition, ***Hirsutella darwinii*** on a spider host is described as new. The entomogenous mycoflora is similar to that of mainland Ecuador and the ecological implications are discussed particularly in relation to coccid populations.

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Vingt-et-une espèces de champignons entomogènes récoltés durant un inventaire mycologique de l'île Santa Cruz sont énumérées. Plusieurs espèces associées à des Coccidés sont décrites en détail, y compris ***Hirsutella sphaerospora*** sp. nov. sur des larves d'Eriococcidés, *Hirsutella besseyi* Fisher, et *Torrubiella confragosa* Mains (le téléomorphe présumé de *Verticillium lecanii* (Zimm.) Viégas. De plus une nouvelle espèce d'*Hirsutella* trouvée sur une araignée est décrite: ***Hirsutella darwinii***. La mycoflore entomogène de l'île Santa Cruz est semblable à celle de la terre ferme de l'Equateur; les implications écologiques de cette observation sont discutées, surtout en rapport avec les populations de Coccidés.

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Introduction

The fungal flora of the Galápagos Islands is imperfectly known and few collections have been made. The only detailed survey has been confined to soil and litter microfungi (Mahoney 1971).

During a 2-week period in May and June 1976, a collection of macrofungi was made by the senior author on the island of Santa Cruz, an annotated list of which has recently been published (Reid *et al.* 1981). Special attention was paid to the Basidiomycetes, and the search for other fungi was superficial; nevertheless, various entomogenous fungi were encountered and the present paper reports for the first time the occurrence of these fungi in the Galápagos Islands and provides a preliminary species check list. Two species of *Hirsutella* proved to be undescribed and are proposed as new.

Collecting area

Santa Cruz (formerly Indefatigable) is the second largest of the Galápagos Islands and can be broadly divided into four main ecological zones, although these may be further subdivided (Wiggins and Porter 1971); (*i*) the arid lowlands dominated by *Opuntia* cactus; (*ii*) the transition zone of dense underbrush; (*iii*) the moist *Scalesia* (Compositae) forest; and (*iv*) the upper bracken or moorland zone. The two latter zones (above 200 m) are by far the most interesting mycologically since they are humid, often being covered by low cloud, and although annual precipitation is highly variable, rainfall can reach 2000–2500 mm in wet years. From February–April 1976 the humid zones were abnormally dry and the rains were delayed until early May. Drizzle and mist were a constant feature of the collecting period.

In a 12- to 15-km walk from the Charles Darwin Research Station on the coast, via Bellavista and Media Luna, to the highest part of the island (Mt. Crocker, *ca.* 860 m above sea level), it is possible to collect in all the ecological zones. On these south-facing slopes, between 200 and 500 m, the land has been converted to agriculture and little of the *Scalesia* forest remains. However, collecting was supplemented in the still extensive *Scalesia* zone on the north side of Mt. Crocker.

A brief visit was made to the nearby island of Santa Fé (Barrington), which is predominantly arid lowland.

Species check list

R.S. numbers refer to herbarium material and CBS numbers to cultures deposited at the Centraalbureau voor Schimmelcultures, Baarn.

ZYGOMYCOTINA
Zygomycetes

Entomophthorales
Entomophthora sp.

On adult Reduviidae (Hemiptera, Heteroptera) on stroma of *Xylaria* (Sphaeriales) on bark of dead *Scalesia* tree, 500 m, R.S. 957.

The insect is covered by a thin layer of white mycelium, without rhizoids, and only primary obovoid conidia (16–24 × 8–11 μm) are present. On the basis of host specificity and conidial dimensions, the species is

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closest to *E. blissi* (Lakon) Macleod & Müller-Kögler (1973). There are no previous records of *Entomophthora* on Reduviids, but the scanty material and absence of other spore stages do not justify a full taxonomic description.

ASCOMYCOTINA
Pyrenomycetes

Clavicipitales

Torrubiella confragosa Mains Figs. 1 and 2, 8

ANAMORPH: *Verticillium lecanii* (Zimm.) Viégas, syn.: *Hirsutella confragosa* Mains.

On Coccidae (Hemiptera, Homoptera) of the genus *Saissetia* on *Coffea arabica* (coffee) and *Psidium guajava* (guava) in the agricultural zone to the north and east of Bellavista, 250–350 m, R.S. 924, 925, 928; *Zanthoxylum fagara* (Rutaceae) in transition zone below Bellavista, 100–250 m, R. S. 922, 926; *Pteridium aquilinum* (bracken) throughout the moorland zone, 500–800 m, R.S. 923, 927, 929, CBS 537.81; epiphytic fern on *Scalesia* bark, 450 m, R.S. 950.

Mycelium thin, white to cream yellow, pulverulent, covering the insect and extending onto the substratum; loose, white mycelium internally. Perithecia irregularly scattered to crowded, superficial or slightly embedded in the mycelium, ovoid to pyriform, 360–510 × 175–240 μm, brownish yellow to orange, translucent; asci cylindrical, 210–280 × 3.6–4 μm, thin walled, thickened at the apex, 8-spored; ascospores filiform, hyaline, 0.7 μm wide, almost as long as the ascus, multiseptate, not breaking into part spores, sometimes spirally grouped in the ascus.

Conidiogenous structures of the anamorph consistently present on the mycelium covering the host. Conidiophores mostly erect, verticillate, occasionally with solitary phialides. Phialides awl-shaped, in whorls of 2–5, 15–35 μm long with the base 1–2 μm wide tapering to a neck about 0.5 μm in diameter. Conidia in heads, one-celled, hyaline, smooth walled, cylindrical with rounded ends, 2.5–4.5 × 1.2–1.8 μm.

The species of *Torrubiella* associated with coccids have been described by Petch (1923) and Mains (1949). The Galápagos specimens agree most closely with the description of *T. confragosa* Mains (1949) and their identity was confirmed by comparing the type specimen, loaned by courtesy of Dr. R. L. Schaffer (MICH). Mains (1949) named the anamorph *Hirsutella confragosa*, but conidiophore and phialide structure clearly show that it belongs to the genus *Verticillium* (see Fig. 8*d*). Ascospore isolations of the Galápagos specimens were not attempted, but *Verticillium* cultures (CBS 537.81) were consistently obtained from internal mycelium. The morphology of the anamorph on the insect and that produced in culture cannot be distinguished from the admittedly broad species concept of *Verticillium lecanii* (Zimm.) Viégas as envisaged by Gams (1971) and this is the first indication of a teleomorph connection for this ubiquitous hyphomycete (Domsch *et al.* 1980). A specimen of *T. confragosa* on bracken coccids from the crater lip of Cerro Camote (750 m) was found to be hyperparasitized by *Melanospora parasitica* Tul. (Hypocreales).

Hypocreales

Hypocrella epiphylla (Massee) Sacc.

ANAMORPH: *Aschersonia cubensis* Berk. & Curt.

On scale insects (Coccidae) on *Asplenium* ferns in transition zone south of Bellavista, 120 m, R.S. 934; coffee and rubiaceous shrubs in the agricultural zone east of Bellavista, 250 m, R.S. 932.

The teleomorph was not found and the fungus is generally much better known from its *Aschersonia* anamorph, in which the yellow, hemispherical stromata, large pycnidia, and broadly fusoid conidia (9–11 × 3–4 μm) are characteristic (Petch 1921). An isolate of R.S. 932 grew and sporulated well on potato dextrose agar (PDA) but was lost after subsequent subculturing. Difficulties in maintaining *Aschersonia* in axenic cultures have also been experienced with isolates of *A. aleyrodis* Webber and *A. placenta* Berk. & Br.

Nectria flammea (Tul.) Dingley Figs. 3–5

ANAMORPH: *Fusarium coccophilum* (Desm.) Wollenw. & Reink.

On Diaspididae (Hemiptera, Homoptera) of the genus *Ischnapsis*, possibly *longirostris* Sign., on coffee, guava, and remnant endemic shrubs, including *Psychotria rufipes* (Rubiaceae), in the agricultural zone near Bellavista, 250–350 m, R.S. 921, 952.

The pinkish-orange, conical sporodochia formed around the host margin (Fig. 4) are typical of this species, which is described fully by Booth (1971). The orange perithecia of the teleomorph are common on the Galápagos material (Fig. 3).

BASIDIOMYCOTINA
Hymenomycetes

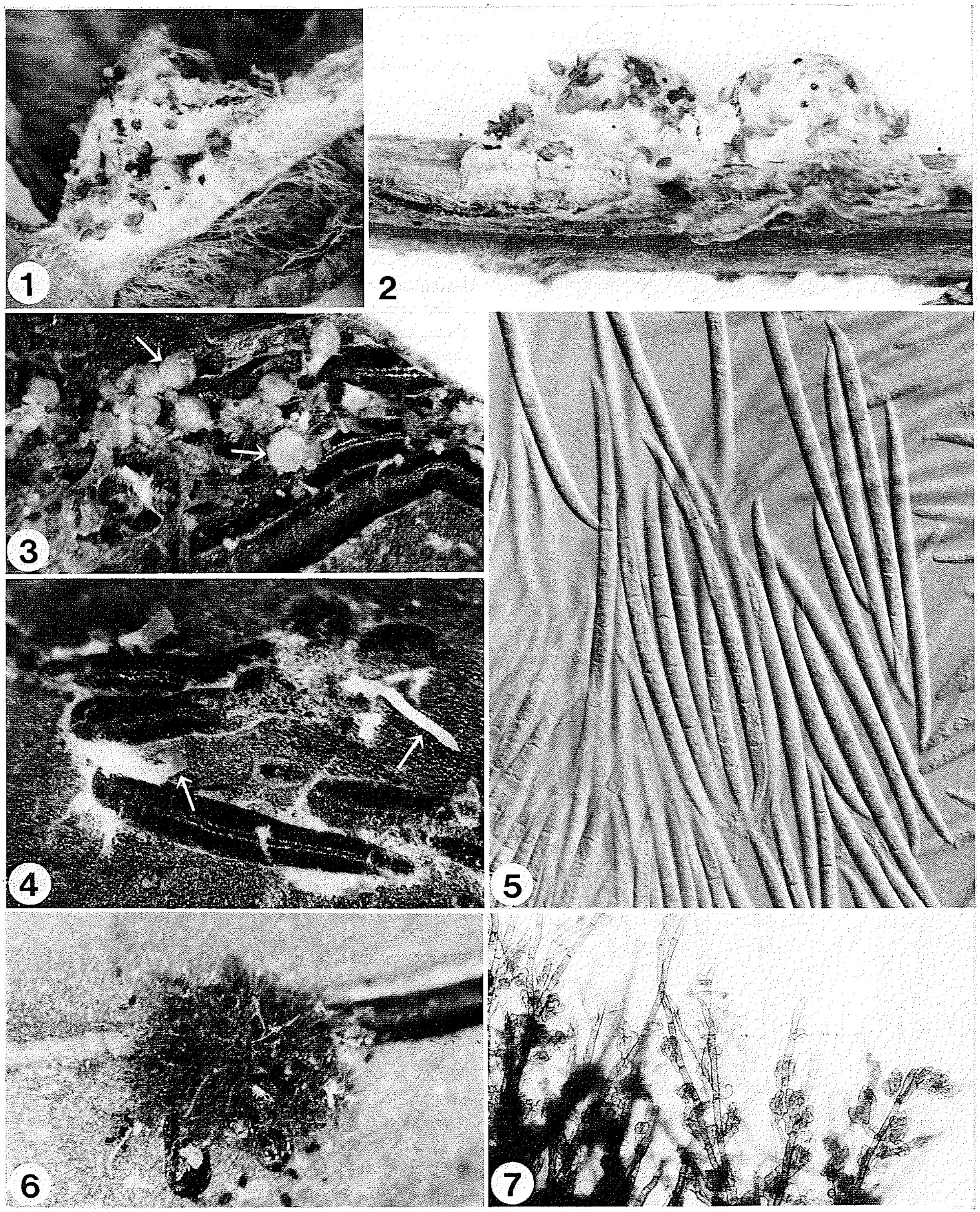
Septobasidiales

Septobasidium pilosum Boedijn & Steinmann Figs. 6 and 7, 9

ANAMORPH: *Aegerita webberi* Fawcett

On *Ischnapsis* sp. (Diaspididae) on coffee and remnant shrubs in agricultural zone, east of Bellavista, R.S. 930, 952, 953; on Eriococcidae (mealybugs) on various shrubs and trees, including *Zanthoxylum fagara*, in transition zone, 100–150 m, R.S. 948, 951.

This species is characterized by typically brown, dichotomously branched conidiophores, bearing clusters of globose, hyaline cells, which function as complete propagules (Fig. 9*b*). No basidia or basidiospores have been found (Petch 1926) and the taxonomic status of *Aegerita webberi* as an anamorphic Basidiomycete is



FIGS. 1 and 2. *Torrubiella confragosa* on *Saissetia* coccids on bracken frond, showing perithecia partly embedded in mycelium covering the host. ×14. FIGS. 3–5. *Nectria flammea*. Fig. 3. Perithecia (arrowed) on *Ischnapsis* scale insects. ×30. Fig. 4. Sporodochia (arrowed) emerging from host margin. ×30. Fig. 5. Conidia of *Fusarium* anamorph. ×650. FIGS. 6 and 7. *Septobasidium pilosum*. Fig. 6. Dark brown colony on *Ischnapsis* host. ×30. Fig. 7. Conidiogenous structures. ×160.

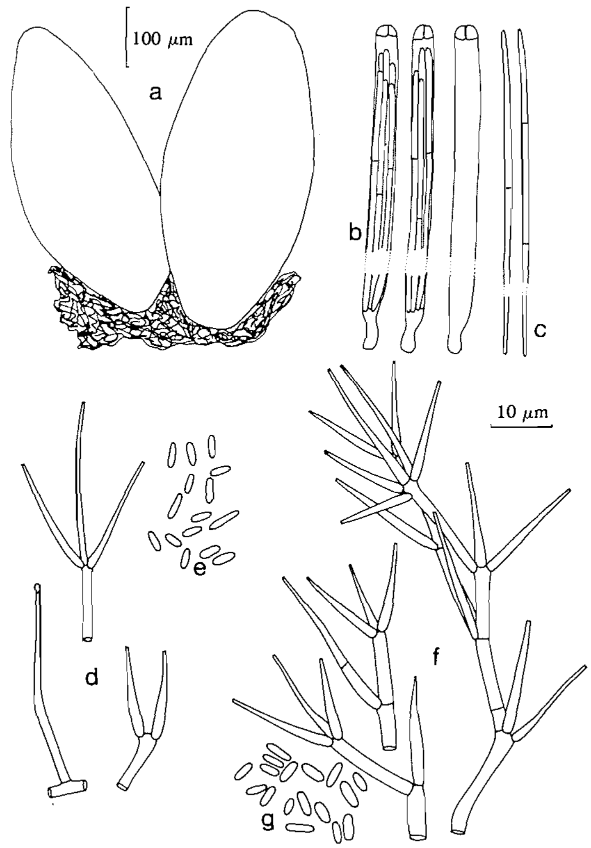


FIG. 8. *Torrubiella confragosa*. (*a*) Perithecia. (*b*) Asci. (*c*) Ascospores. (*d* and *e*) Comparison of phialides and conidia of holotype. (*f* and *g*) Galápagos specimen R.S. 928.

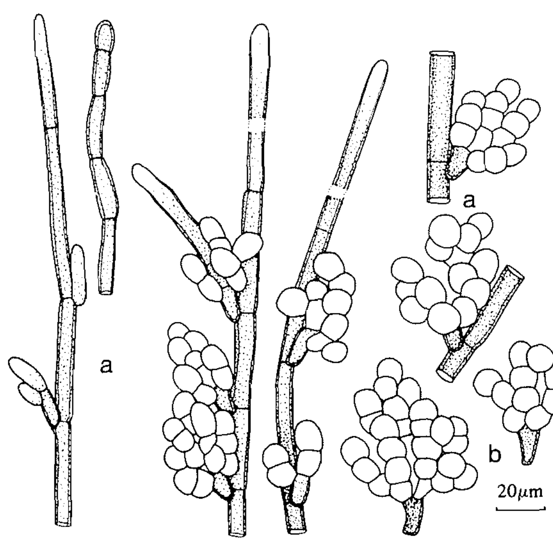


FIG. 9. *Septobasidium pilosum*. (*a*) Conidiophores. (*b*) Conidial propagules.

debatable. However, Couch (1938) considered this species to belong in *Septobasidium* on the basis of its growth habit and the presence of haustoria.

DEUTEROMYCOTINA
Hyphomycetes

Akanthomyces aculeatus Lebert

On a small moth (Noctuidae, Lepidoptera) on soil in plantations of *Persea americana* (avocado) in agricultural zone above Bellavista, 300 m, R.S. 940, CBS 542.81.

Akanthomyces pistillariiformis (Pat.) Samson & Evans

On a large moth (*Agrotis cingulatus* Fabr., Sphingidae, Lepidoptera), among grasses in agricultural zone above Bellavista, 350 m, R.S. 939.

The specimen is immature, but the synnematal form is typical of *A. pistillariiformis* (Samson and Evans 1974).

Beauveria amorpha (Höhn.) Samson & Evans

On adult weevils (Curculionidae, Coleoptera) beneath bark of a dead *Scalesia* tree, north side of Mt. Crocker, 550 m, R.S. 941, CBS 543.81.

The collection consists of several weevils covered by powdery mycelium of the fungus, and synnemata are absent. Although the conidia of these specimens are smaller than those described from Brazil (Samson and Evans 1982), the pure culture is identical with the Brazilian isolates.

Hirsutella besseyi Fisher Figs. 10–12, 16

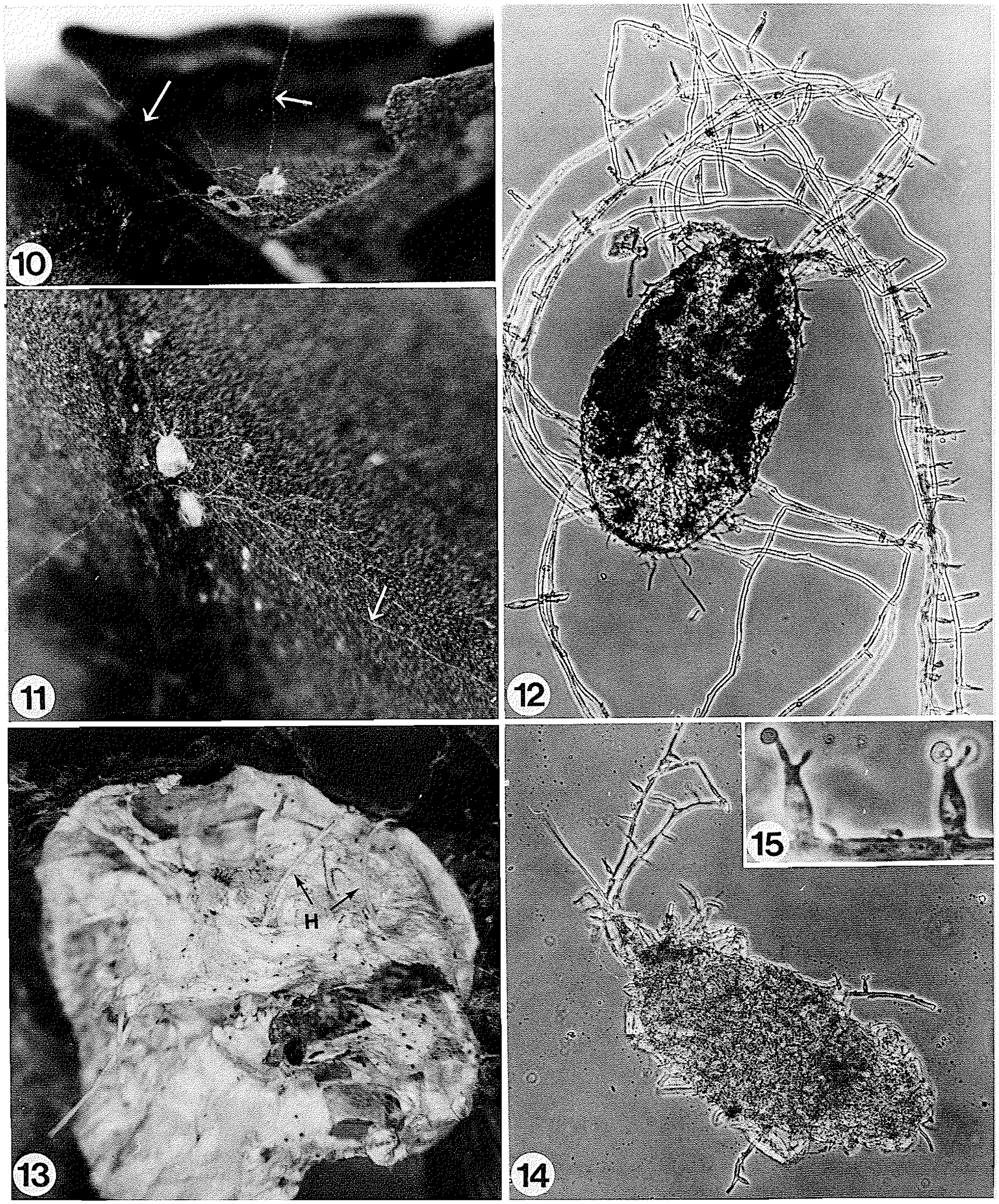
On Diaspididae nymphs (probably *Ischnapsis*) on coffee and *Psychotria* in the agricultural zone near Bellavista, R.S. 952.

Originally, *H. besseyi* was described from purple scale nymphs (*Lepidosaphes beckii* Newm.) in Florida by Fisher (1950). Minter and Brady (1980) redescribed it from a lectotype but excluded it from their section *Mononematosa* because of the reported synnematal habit. Our examination of the holotype, loaned by courtesy of Dr. J. Kimbrough (FLAS), revealed no synnemata. The Galápagos specimens agree in all respects with the holotype. Although phialides are extremely numerous, conidia are difficult to locate *in situ*.

Hirsutella besseyi can be easily overlooked when searching for fungal parasites. The mycelium is very limited and the presence of the fungus can only be revealed by the scanty, thin, hyaline hyphae emerging from the insects (Figs. 10 and 11). On the same colonies of scale insects, *Nectria flammea* and its anamorph occurred in association with *H. besseyi*.

Hirsutella darwinii Evans & Samson, sp.nov. Figs. 13, 17

ETYMOLOGY: named after Charles Darwin (1809–1882).



FIGS. 10–12. *Hirsutella besseyi*. Figs. 10 and 11. Aerial hyphae emerging from *Ischnapsis* nymphs. ×30. Fig. 12. Aerial hyphae with solitary phialides. ×160. FIG. 13. *Hirsutella darwinii*. Spider host encased in silken cocoon bearing cylindrical synnemata (H). ×7.5. FIGS. 14 and 15. *Hirsutella sphaerospora*. Fig. 14. Aerial hyphae with solitary phialides emerging from Eriococcid larva. ×160. Fig. 15. Phialides with multiple necks and conidia. ×600.

Aranea sericis inneta hyphis hyalinis tenuitunicatis, 1–3 μm latis, obtecta. Synnemata nonnulla undique serica penetrant, alba ad dilute flava, cylindrica, sursum angustata, 4–8 mm longa, 100–150 μm lata, saepe pro magna parte sterilia. Phialides praecipue in parte superiore sparsae, anguste aculeatae, 12–45 μm longae, e 1.5–2.5 μm ad 0.5–0.8 μm angustatae. Conidia pauca, singula, raro bina, anguste fusiformia, nonnunquam modice curvata, muco carentia, hyalina, continua, levia, 4.5–11.5 × 1.5–2.0 μm. Teleomorphosis ignota.

HOLOTYPUS: R.S. 942 in parva aranea (Arachnida, Araneida) in folia pteridii, in monte Cerro Camote, 750 m alt., lectus in Insula Santae Crucis Galapagosensis, 2 Jun. 1976, H. C. Evans (in herb. CBS praeservatus).

The spider host is inside a silk cocoon covered by hyaline, thin-walled hyphae, 1–3 μm wide; synnemata, arising from various parts of the body and growing through the silk cocoon, white to pale yellow, narrowly cylindrical, acuminate, 4–8 mm long, 100–150 μm wide, sterile over most of the length. Phialides scattered, mainly in the upper part, slender, often awl-shaped, 12–45 μm long, 1.5–2.5 μm wide at the base, tapering to a 0.5- to 0.8-μm wide neck. Conidia sparsely produced, usually single, occasionally in pairs, without mucus, hyaline, one-celled, smooth walled, narrowly fusiform, sometimes slightly curved, 4.5–11.5 × 1.5–2.0 μm. Teleomorph not observed.

HOLOTYPE: R.S. 942 on a small spider (Arachnida, Araneida) inside silk cocoon on a bracken frond, Cerro Camote, Santa Cruz, Galápagos Islands, 2 June 1976 (herb. CBS).

The new species is accommodated in the form genus *Hirsutella*, although the phialides are distinctly awl-shaped as in *Verticillium* sect. *Prostrata* W. Gams (1971). However, the solitary not verticillate phialides scattered along distinct synnemata justify its placement in *Hirsutella*. This is the first record of a *Hirsutella* species on spiders.

Hirsutella jonesii (Speare) Evans & Samson

On adult Reduviidae beneath bark of dead *Scalesia* tree, R.S. 947, CBS 545.81.

This fungus was originally described by Speare (1920) as *Synnematium jonesii*. In addition to *Hirsutella*-like phialides, the species is characterized by sclerotia, which occur in a dense layer on the Galápagos specimen. Recent studies on the fungal parasites of ants in tropical forests (Evans and Samson 1983) have shown that the genus *Synnematium* is closely connected with *Hirsutella* by a range of intergrading taxa and should be regarded as synonymous.

Hirsutella sphaerospora Evans & Samson, sp.nov.

Figs. 14 and 15, 18

Hyphae paucae e variis partibus larvarum Coccidarum emergentes, hyalinae, septatae, leves, 4–5 μm latae; intra hospitem chlamydosporae irregulares, sed plerumque globosae, 6–9 μm in diametro. Phialides ex hyphis singulis intervallis regularibus oriundae, e basi cylindrica ad ellipsoidea, 12–22 × 3–6 μm, in collulum angustum 3–7 × 1.0–1.5 μm angustatae, nonnumquam semel vel bis proliferantes. Conidia singula, globosa, hyalina, levia vel nonnunquam muco obtecta, 4–5.5 μm in diametro. Teleomorphosis ignota.

HOLOTYPUS: R.S. 948, in larva Eriococcidarum in foliis plantae cuiusdam, in zona transitionis Insula Santae Crucis Galapagosensis lectus, 5 Jun. 1976, H.C. Evans (in herb. CBS praeservatus).

Mycelium sparse, consisting of a few hyphae emerging from various parts of the body of the coccid larvae; hyphae hyaline, septate, smooth walled, 4–5 μm wide. Irregular to predominantly globose chlamydospores, 6–9 μm in diameter, occur within the host. Conidiogenous cells phialidic, borne at regular intervals along the hyphae, with a cylindrical to ellipsoidal base, 12–22 × 3–6 μm, tapering to a thin neck, 3–7 × 1–1.5 μm, at times proliferating and developing up to 3 necks. Conidia borne singly; globose, hyaline, smooth walled, occasionally covered by mucus, 4.5–5.0 μm in diameter. Teleomorph not observed.

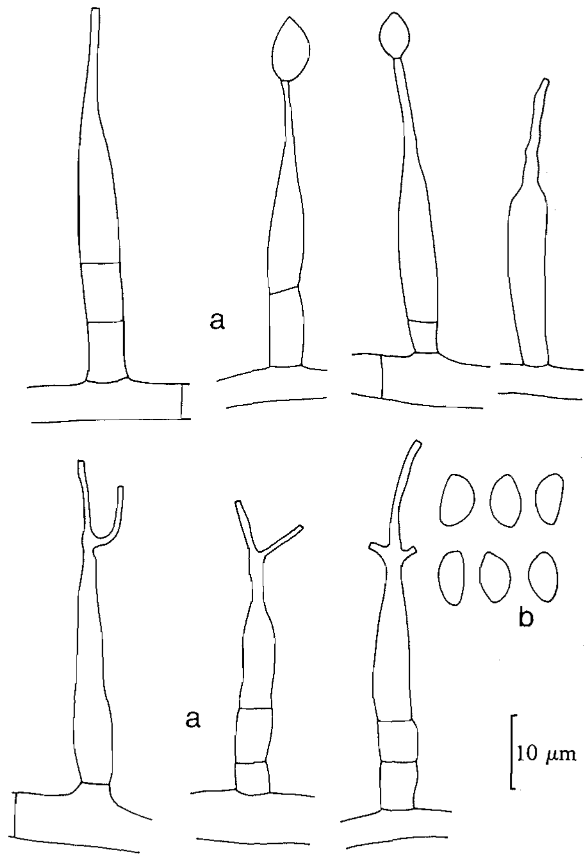


FIG. 16. *Hirsutella besseyi*. (*a*) Phialides. (*b*) Conidia.

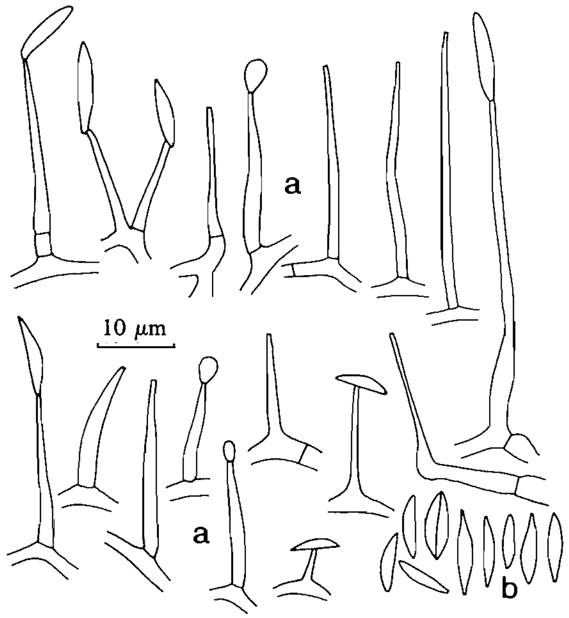


FIG. 17. *Hirsutella darwinii*. (*a*) Phialides. (*b*) Conidia.

HOLOTYPE: R.S. 948 on larvae of Eriococcidae, on leaves of unidentified plant, transition zone (100–150 m), Santa Cruz, Galápagos Islands, 5 June 1976 (herb. CBS).

The specific epithet refers to the smooth-walled, globose conidia which distinguish *H. sphaerospora* from all previously described species of *Hirsutella*. It is reminiscent of *H. thompsonii* Fisher, a parasite of phytophagous mites (Samson, McCoy *et al.* 1980; McCoy 1981), but this species has smaller phialides and verrucose conidia.

Metarhizium anisopliae (Metsch.) Sorok. var. *anisopliae*

On adult Pentatomidae (Hemiptera, Heteroptera) on bracken frond, Cerro Camote, R.S. 937, CBS 540.81.

This is the short-spored form of *M. anisopliae*, conidia averaging 6–9 × 2–2.5 μm (Tulloch 1976).

Metarhizium flavoviride W. Gams & Roszypal

On adult Acridiidae (Orthoptera) on ground among *Cordia* shrubs near coast, Santa Fé Island, R.S. 944, CBS 544.81.

The conidia are rather small, 4–4.8 × 2.5–3.2 μm, but in all other respects the specimen is identical with the type (Gams and Roszypal 1973).

Paecilomyces farinosus (Holm ex S. F. Gray) Brown & Smith

On Lepidoptera larva and pupa among mosses on *Scalesia* bark, R.S. 936, CBS 539.81; R.S. 954, CBS 541.81; on small spider (Araneida) on shrub leaf in agricultural zone near Bellavista, R.S. 938.

The spider host (R.S. 938) is covered by a silken case,

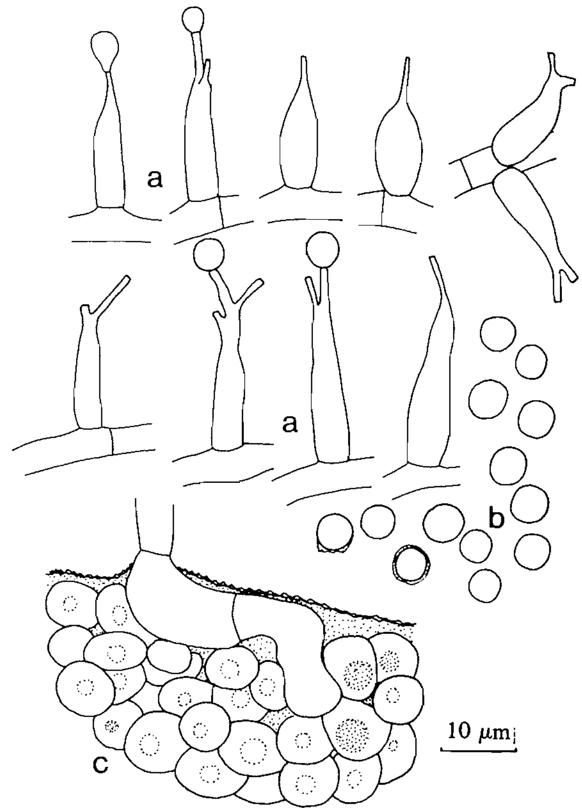


FIG. 18. *Hirsutella sphaerospora*. (*a*) Phialides. (*b*) Conidia. (*c*) Chlamydospores or hyphal bodies within the coccid host.

from which numerous pale yellow synnemata, 0.5–1.2 cm in length, emerge.

Paecilomyces tenuipes (Peck) Samson

On Lepidoptera pupa among bracken litter on north side of Mt. Crocker, 650 m, R.S. 935.

This species may be confused macroscopically with *P. farinosus* but can be recognized by the cylindrical, usually curved and larger conidia. Those of *P. farinosus* are typically lemon shaped.

Pleurodesmospora coccorum (Petch) Samson, W. Gams & Evans

On scale insects (Coccidae) on leaves of *Eugenia jambos* (rose apple) in agricultural zone near Bellavista, R.S. 946, CBS 471.80.

This species was originally placed in the genus *Gonatorrhodiella* (Petch 1925) but has recently been accommodated in a new monotypic genus *Pleurodesmospora* (Samson, Gams *et al.* 1980).

Stilbella buquetii (Mont. & Robin) Samson & Evans

On adult weevil (Curculionidae) on soil in *Scalesia* forest, 550 m, R.S. 956.

The ecology and taxonomy of this species have been recently revised (Samson *et al.* 1981).

Tilachlidium larvarum Petch

On Coleoptera larva, beneath bark of dead *Scalesia* tree, R.S. 933, CBS 538.81.

Although the Galápagos specimen has smaller conidia than the type (3.6–4 × 0.8–1.2 μm), in other respects it conforms to the species concept of *T. larvarum* (Petch 1931).

Verticillium insectorum (Petch) W. Gams

On larvae of scale insects (Coccidae) on shrubs and trees in transition zone below Bellavista, 100–250 m, R.S. 953.

Verticillium lecanii (Zimm.) Viégas

On a small spider (Araneida) on fern frond below Mt. Crocker, 700 m, R.S. 931; on Eriococcidae on various shrubs in transition zone, 150 m, R.S. 948, CBS 546.81.

Discussion

By virtue of the restricted collecting period, this check list is essentially preliminary. Nevertheless, the common occurrence of entomogenous fungi in the Galapogeian ecosystem is noteworthy and their abundance on plant-feeding homopterans is of particular interest. These insects were probably introduced into the agricultural zone on planting material and thence spread to endemic shrubs and herbs in the humid and transition zones.

The structure of the *Scalesia* forest is reminiscent of an upper montane or cloud forest and the high density of dead and dying trees offers suitable habitats for wood-colonizing insects. Several diseased insects were collected by chance beneath the bark of dead trees, during excavation of saprophytic macrofungi, and the zone as a whole promises to be a rich source of entomogenous fungi. Similarly, the superficial examination of the bracken zone yielded several entomogenous species from a very small area (Cerro Camote) and *Torrubiella confragosa* was collected in epizootic proportions on bracken-inhabiting coccids. *Verticillium lecanii*, which was consistently associated with *T. confragosa* and is considered to be its anamorph, has shown promise as a biological control agent of scale insects and aphids in glasshouses (Hall 1981). The collections of *V. lecanii* on coccids and a spider support our observations that this entomopathogenic hyphomycete is a polyphagous species on various groups of both beneficial and harmful arthropods. The wide application of *V. lecanii* as a biological insecticide in an integrated control system should be considered therefore with caution.

Nectria flammea, *Septobasidium pilosum*, and *Hirsutella besseyi* were collected on different stages of scale insects of the genus *Ischnapsis* on various introduced trees and endemic shrubs in the agricultural zone and may be exerting a significant control of this important pest of tropical tree crops. The fire ant, *Wasmannia aeropunctata*, has invaded several of the islands and is threatening endemic insects. Coccid-tending may be important as an additional food source for the ant, especially in the drier zones. Therefore, some of the entomogenous species reported here may indirectly control *Wasmannia* populations by reducing coccid infestation.

Akanthomyces aculeatus, *A. pistillariiformis*, *Metarhizium anisopliae*, *Paecilomyces farinosus*, and *P. tenuipes* are common representatives of the entomogenous mycoflora of mainland Ecuador (H. C. Evans, unpublished data) and since they all produce masses of airborne conidia, it is not surprising to find them in the Galápagos Islands.

In the cocoa-growing region of western Ecuador, *Entomophthora* epizootics have been recorded on Lepidoptera larvae and pupae, on Diptera, on leafhoppers (Jassidae), and on spittlebugs (Cercopidae), while *Hirsutella* (*Synnematium*) *jonesii* is common on froghoppers (Membracidae). However, neither fungus has been collected on Reduviidae, in contrast with the Galápagos records.

Despite the dry period preceding the foray, the number of species collected was high and a more intensive study of entomogenous fungi throughout the Galápagos Islands seems justified. The entomogenous mycoflora of the much larger island of Isabela (Albermarle), which has extensive humid zones, would make an interesting comparison with that of Santa Cruz.

Hirsutella besseyi and *H. sphaerospora* were not observed macroscopically during collecting and were found only after laboratory examination of the coccid colonies. The occurrence of inconspicuous fungal parasites on small arthropods, such as mites and coccids, is probably more common than generally suspected. Some of these species can dramatically control arthropod populations (e.g., *Hirsutella tydeicola* Samson & McCoy (1982) on *Tydeus* mites), but they will only be recognized following intensive collecting and more detailed microscopical investigations.

Acknowledgements

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