STYGIOMYCES AND *PSEUDONITSCHKIA*: TWO NEW GENERA OF LICHENICOLOUS FUNGI

B. J. COPPINS* & S. Y. KONDRATYUK†

Two new genera, *Stygiomyces* (Coelomycetes) with type species *S. galliformis* on *Pseudocyphellaria faveolata* from Tasmania, and *Pseudonitschkia* (Dothideales) with type species *P. parmotrematis* on *Parmotrema tinctorum* and *P. pseudotinctorum* from South America (Paraguay, Venezuela), Africa (Ivory Coast, Malawi, South Africa) and Nepal, are described. Their placement and differences from similar genera are discussed.

INTRODUCTION

During a special study of lichenicolous fungi on *Pseudocyphellaria*, *Sticta* and *Lobaria* (Kondratyuk & Galloway, 1994; Kondratyuk et al., 1994) and comparative investigations of lichenicolous fungi from other lichens at BM and E, some new and rare lichenicolous fungi were found. Of these, two new genera of lichenicolous fungi (*Stygiomyces* and *Pseudonitschkia*) are here described.

Stygiomyces Coppins & Kondratyuk, **gen. nov.**

Genus lichenicola, ad Coelomycetes pertinens. Conidiomata pycnidia, pallida, pariete textura intricata composito. Cellulae conidiogenae phialidicae, breviter cylindricae vel ampulliformes; conidia hyalina, longe bacilliforme, septata ubi matura, apice proximali ± truncato.

Species holotypica: *Stygiomyces galliformis* Coppins & Kondratyuk.

Etymology: Named after the Styx River in Tasmania, from where the collection of the type species was gathered.

Stygiomyces galliformis Coppins & Kondratyuk, **sp. nov.**

Pycnidia 80–160μm diam., plerumque gallis hemisphaericis vel sphaericis consociata, immersa in contextum gallae vel plerumque superficiaria et aggregata, ostiolo vulgo hiante. Cellulae conidiogenae 4.8–6.7 × 1.9–3.6μm. Conidia 3-septata ubi matura, pagine laevi, (14.2–)16–25(–28.4) × 1.7–2(–2.5)μm. **Figs 1–2.**

Typus: Tasmania, Bank of Styx River, on *Pseudocyphellaria faveolata* (Delise) Malme, without date, *C. Bratt, M. H. Bratt & WST* (holo. HO 34310).

* Royal Botanic Garden Edinburgh, Inverleith Row, Edinburgh EH3 5LR, UK.
† N. G. Kholodny Institute of Botany, Tereshchenkivska 2, 252601 Kiev, Ukraine.

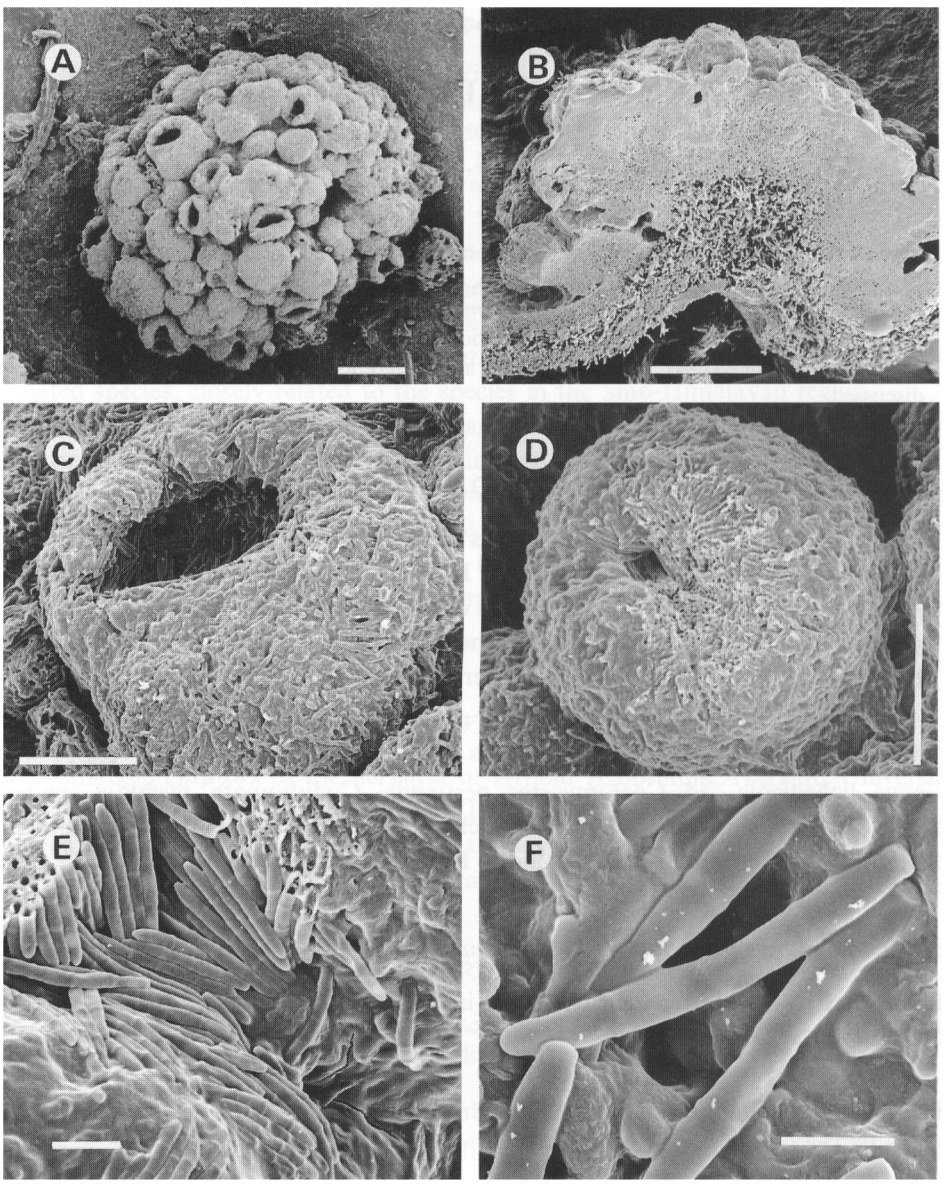

FIG. 1. *Stygiomyces galliformis* (HO 34310—holotype). A, gall with pycnidia; B, section of gall with pycnidia; C and D, pycnidia; E and F, conidia. Scale bars: A and B = 200μm; C and D = 50μm; E = 10μm; F = 5μm.

Lichenicolous fungus, parasymbiotic on the thallus of *Pseudocyphellaria faveolata*. *Conidiomata* pycnidial, usually associated with hemispherical to spherical galls (0.2–)0.4–1.0mm diam.; rarely entirely immersed in the gall tissue, mainly superficial and scattered or more usually very numerous and aggregated on the gall surface,

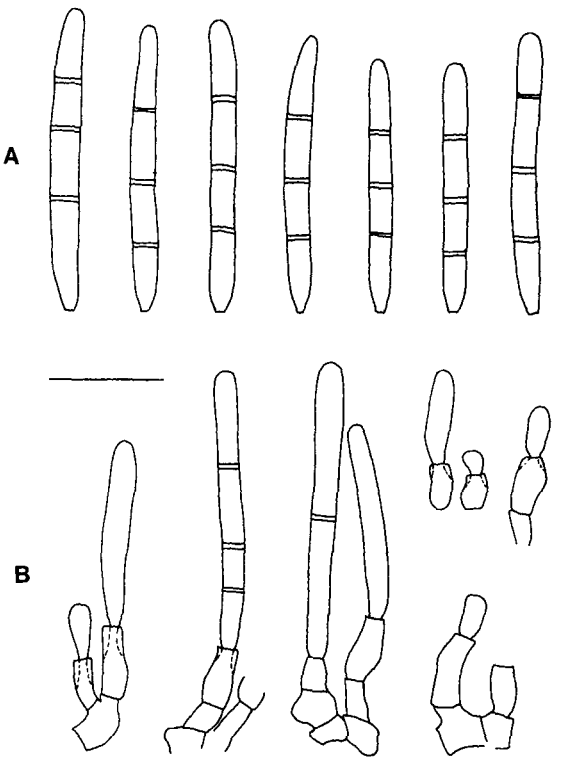

FIG. 2. *Stygiomyces galliformis* (HO 34310—holotype). A, conidia; B, conidiogenous cells and conidia. Scale bar = 10μm.

subglobose, creamy white, glabrous, 80–160μm diam., with an often gaping ostiole to 60μm diameter. *Pycnidial wall* c.24–33μm thick, hyaline to dilute yellowish brown, structure *textura intricata* with thin-walled hyphae 1.7–2μm diam. (in KOH). *Conidiogenous cells* lining the inner wall of the pycnidial cavity except near the apex (ostiolar region), shortly cylindrical to shortly ampulliform with swollen bases, 4.8–6.7 × 1.9–3.6μm, phialidic, apparently not percurrently proliferating, hyaline. *Conidia* abundantly produced and the base slightly to distinctly truncate, hyaline, smooth-walled, 3-septate at maturity, septa thin, (14.2–)16–25(–28.4) × 1.7–2(–2.5)μm.

This very distinctive lichenicolous fungus is easily distinguished from other genera of lichenicolous coelomycetes. Of those associated with galls, *Bachmanniomyces* D. Hawksw. and the poorly understood *Verrucaster* Tobler have much smaller, simple conidia, and *Keissleromyces* D. Hawksw., while having 3-septate conidia, has black conidiomata formed of *textura angularis* and conidia arising from polyphialides. Rather more similar is *Karsteniomyces* D. Hawksw. which, although having occasionally aggregated conidiomata with pale walls, differs in having the conidiomata formed of thick-walled pseudosclerenchymatous cells, and the 1-septate

conidia arising from holoblastic, non-phialidic conidiogenous cells. Species of *Epicladonia* D. Hawksw. are all parasites of *Cladonia*, but some are associated with galls and their pycnidial walls are composed of *textura intricata*. However, the walls are dark brown, the conidiogenous cells are frequently annellate (percurrently proliferating), and the 0–1-septate conidia are subcylindrical, ellipsoid or cymbiform, not exceeding 15μm in length (Hawksworth, 1981).

Pseudonitschkia Coppins & Kondratyuk, **gen. nov.**
Genus lichenicola, ad Dothideales pertinens. Ascomata perithecia, nigra, sphaerica vel collapsa et cupulata, rimosa et rugulosa; in sectione pariete pseudoparenchymato (textura angularis) cum cellulis extimis parietibus externis valde incrassatis. Ostiolum indistinctum. Fila hamathecii numerosa, persistentia, ramosa et anastomosantia, tenuia. Asci fissitunicati, clavati, J−. Ascosporae septatae, hyalinae et laeves, sed ubi vetae saepe brunneolae et subtiliter verruculosae, plus minusve fusiformes; ubi juniores saepe cum perispora hyalina gelatinosa.

Species holotypica: *Pseudonitschkia parmotrematis* Coppins & Kondratyuk.

Etymology: The generic name was chosen because of the close, but superficial, resemblance of the ascomata to those of species of the genus *Nitschkia* (Sordariales, Nitschkiaceae).

Pseudonitschkia parmotrematis Coppins & Kondratyuk, **sp. nov.**
Fungus lichenicola in thallo specierum *Parmotrematis*. Ascomata (160–)200–340μm diam.; in sectione pariete 19–34μm crasso, cellulis 4.8–7.7 × 3–4μm, parietibus externis cellularum extimorum cum projecturis brevibus incrustis. Asci 95–100 × 21.5–29μm, (2–4–6–)8-spori, late clavati sed versus apicem decrescentes. Ascosporae 1(–3)-septatae, (33.4–)40–49(–63.3) × 6.7–7.2(–8)μm, fusiformes sed ad septum medianum constrictae et cellula superna parum latiore quam cellula inferna. **Figs 3–5.**

Typus: Venezuela, Guamitas, Parque Nacional, alt. 760m, on rock, on *Parmotrema tinctorum*, 29 xii 1938, *A. H. G. Alston* 5836 (holo. BM).

Lichenicolous fungus, commensal on thallus of *Parmotrema tinctorum*. *Ascomata* superficial, scattered, perithecioid, black, spherical or collapsed above and appearing cupulate, (160–)200–340μm diam.; brownish black, surface deeply cracked and rugulose (with irregular warts c.10–17(–34)μm diam. and 10–17μm high). *Wall* 19–34μm thick, pseudoparenchymatous, with rounded to angular cells 4.8–7.7 × 3–4μm; outermost cells with strongly thickened walls, and some with conical to elongate projections up to 10μm long. *Ostiole* indistinct, apparently schizogenous. *Hamathecium* of persistent, very thin (c.0.7–1μm), richly branched and anastomosing filaments (?pseudoparaphyses); hymenial gel I−. *Asci* fissitunicate, (2–4–6–)8-spored, broadly clavate but narrowing towards apex, 95–100 × 21.5–29μm; apical dome (endotunica) markedly thickened but without any distinct internal structures (appearing uniform in Lugol's Iodine and Congo Red); I− except for I+ yellowish orange ascoplasm.

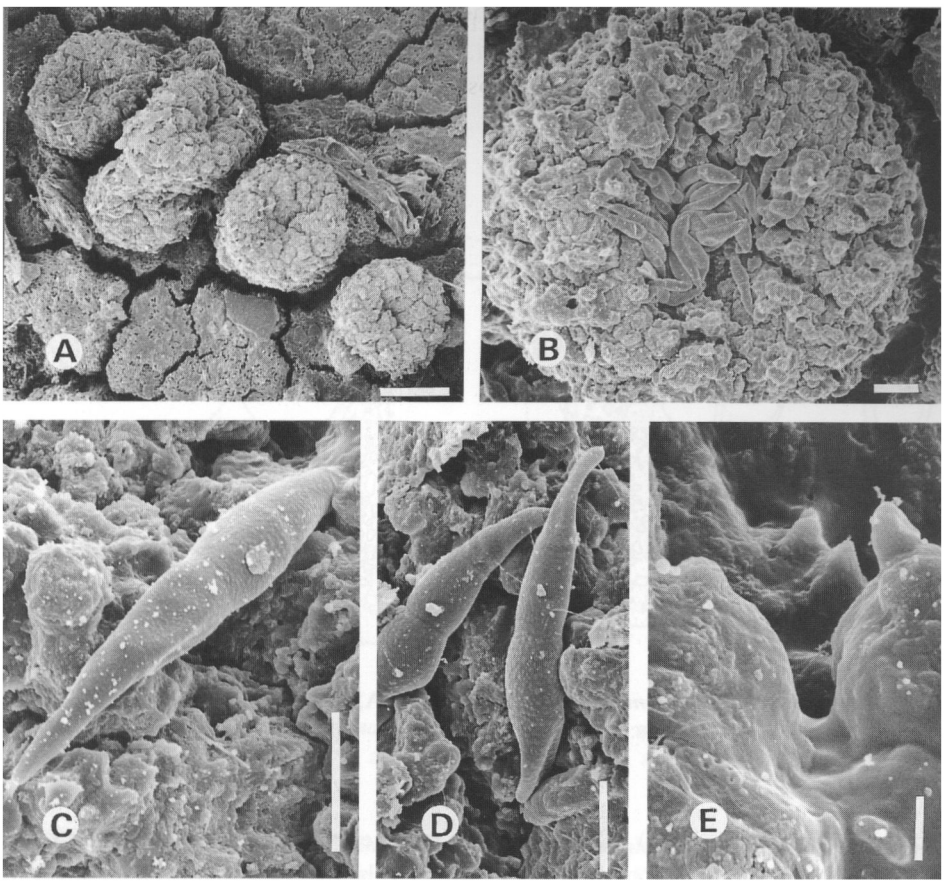

FIG. 3. *Pseudonitschkia parmotrematis* (holo. BM). A, ascomata on the host thallus; B, perithecium; C and D, ascospores; E, projections from cells of the perithecial wall. Scale bars: A = 100μm; B = 20μm; C and D = 10μm; E = 2μm.

Ascospores 1(–3)-septate, constricted at median septum, ±fusiform but upper half of cell slightly broader than the lower, hyaline; old spores occasionally (2–)3-septate and pale brown with a minutely warted surface, (33.4–)40.4–49(–63.3) × 6.7–7.2(–8)μm, but old, brownish spores up to 9.6μm wide; young spores often with a gelatinous perispore that becomes swollen and disrupted in KOH.

Pseudonitschkia parmotrematis is found mainly on the common, pantropical lichen, *Parmotrema tinctorum* (Nyl.) Hale. It would seem that the parasite accompanies this host through much of its range as we have seen material from South America (Paraguay, Venezuela), South Africa, Malawi and Nepal, and no doubt further finds await discovery. The parasite is also known from a single collection on *Parmotrema pseudotinctorum* (Abbayes) Hale. However, this species is only subtly different from *P. tinctorum* (Hale, 1965: 261) and is sometimes considered to be just a morphotype

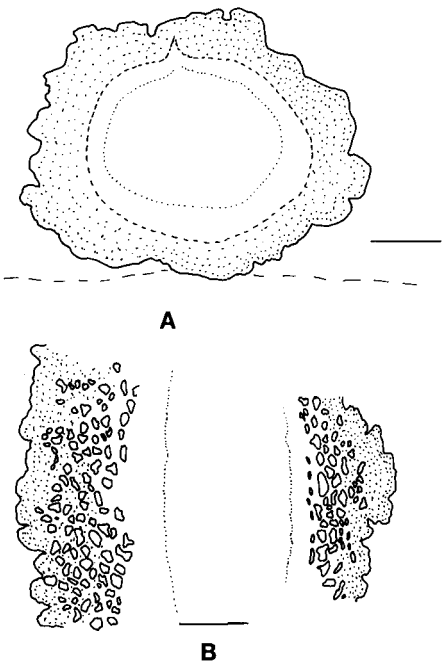

FIG. 4. *Pseudonitschkia parmotrematis* (holo. BM). A, section of perithecium; B, sections of perithecial walls. Scale bars: A = 25μm; B = 18μm.

(Krog & Swinscow, 1981). The fungus is quite easy to detect with a hand lens, although the ascomata are often hidden amongst the dense isidia of the host. It does not seem to cause any apparent harm to the host and we consider it to be commensalistic.

Pseudonitschkia parmotrematis is very distinctive among lichenicolous fungi. Its rough-walled, blackish ascomata are reminiscent of *Lasiosphaeriopsis* and *Rhagadostoma*, but both these genera have unitunicate asci, lack persistent hamathecial filaments, and possess 'Munk-pores' in the ascomatal wall; both are referable to the Nitschkiaceae in the Sordariales (Hawksworth, 1980; Eriksson & Hawksworth, 1993). This new fungus is a member of the large order Dothideales, although its exact position requires further consideration. However, it does share certain features with the Dacampiaceae (P. Cannon, pers. comm.). The rough-walled ascomata without well-defined ostiolar pore, as well as the large ascospores, exclude this species from other genera of lichenized and lichenicolous fungi in the Dothideales with predominantly 1-septate ascospores, e.g. *Didymellopsis* and *Zwackhiomyces* (see Grube & Hafellner, 1990).

Other specimens examined (on *Parmotrema tinctorum* unless otherwise stated). NEPAL. Trisuli River, Sabrubensi, 28°10′N, 85°20′E, alt. 5000ft, on rocks with *Parmelia reticulata* Tayl., 23 iv 1962, *J. D. A. Stainton* 3613 (BM).

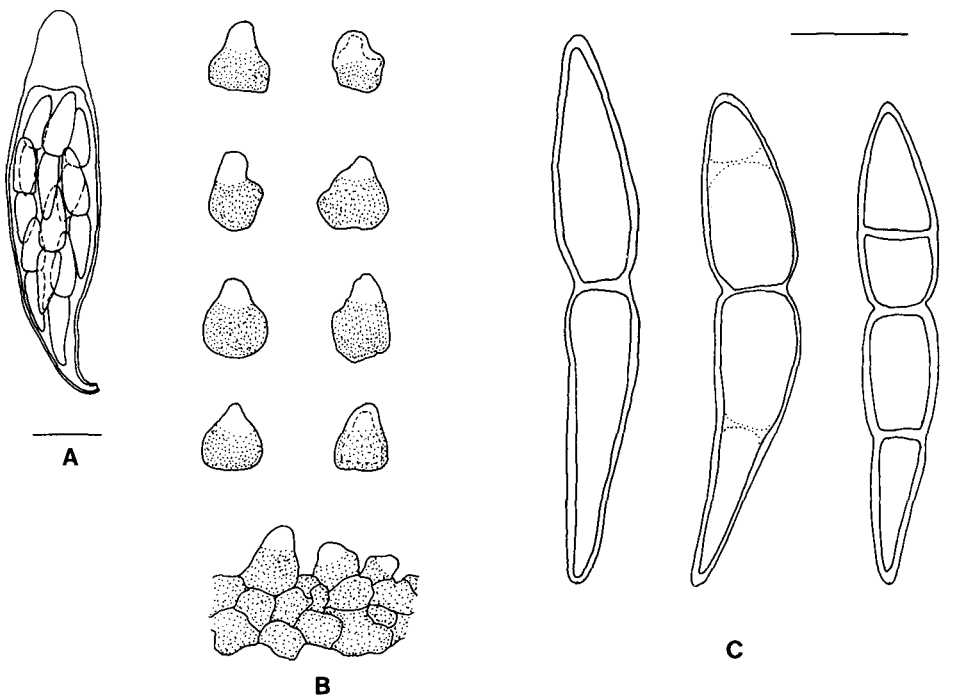

FIG. 5. *Pseudonitschkia parmotrematis* (holo. BM). A, ascus with ascospores; B, projections from cells of the perithecial wall; C, ascospores. Scale bars: A and B = 18μm; C = 10μm.

IVORY COAST. Cercle of Séguéla, 16km N of Séguéla, alt. 300–350m, on *Parmotrema pseudotinctorum* on open rocks in rainforest area, 17 viii 1954, *R. Santesson* 10691c (E, UPS).

MALAWI. Mt Mulanje, Sombani Path above Fort Lister, alt. 1120m, 19 vi 1986, *J. D. & E. C. G. Chapman* 7746D (E).

SOUTH AFRICA. Transvaal: Pilgrim's Rest District: along Treur River near Bourkes Luck, 24 30 DB, alt. 1400m, north-eastern mountain sourveld-dry, open forest with extensive quartzite and dolomite exposures, 14 i 1986, *R. C. Harris* 18847 (BM).

PARAGUAY. Valenzuela, Baum Flechten aus der Walde Terra Paciumi Velenzuele, 20 viii 1898, *Herman Grosse* (BM).

ACKNOWLEDGEMENTS

We are grateful to the curators and keepers of the cited herbaria for assistance with loan of specimens, and to Chris Jones, Louisa Jones, Sue Barnes and Vanessa Seaforth (BM) for expert EM and photographic assistance. K.S.Y. would like to express his deep thanks to Dr David Galloway (BM) for his invaluable help with getting the opportunity to work in BM, as well as to him and to Patricia Galloway for their hospitality during his stay in London. K.S.Y. is also extremely grateful to Mrs A. M. O'Dare and to the first author for their warm hospitality and generous help during his stay in Edinburgh. He further acknowledges the help and kindness

of other staff of the Department of Botany (BM) during his stay there in 1994, with special thanks to William Purvis, Pat Wolseley and Peter James, as well as to Gintaras Kantvilas (Hobart) and Professor P. M. Jørgensen (Bergen). K.S.Y. is grateful to the Royal Society for financial support.

REFERENCES

ERIKSSON, O. E. & HAWKSWORTH, D. L. (1993). Outline of the Ascomycetes—1993. *Syst. Ascomycetum* 12: 51–257.

GRUBE, M. & HAFELLNER, J. (1990). Studien an flechtenbewohnenden Pilzen der Sammelgattung *Didymella* (Ascomycetes, Dothideales). *Nova Hedwigia* 51: 283–360.

HALE, M. E. (1965). A monograph of *Parmelia* subgenus *Amphygymnia*. *Contr. U.S. Natl. Herb.* 36(5): 193–358.

HAWKSWORTH, D. L. (1980). Notes on some fungi occurring on *Peltigera*, with a key to accepted species. *Trans. Brit. Mycol. Soc.* 74: 363–386.

HAWKSWORTH, D. L. (1981). The lichenicolous Coelomycetes. *Bull. Brit. Mus. (Nat. Hist.), Bot.* 9: 1–98.

KONDRATYUK, S. & GALLOWAY, D. J. (1994). Lichenicolous fungi and chemical patterns in *Pseudocyphellaria*. Leuckert Festschrift (in press).

KONDRATYUK, S. Y., GALLOWAY, D. J. & HAWKSWORTH, D. L. (1994). *Unguiculariopsis ahtii*, and some other new lichenicolous fungi from *Pseudocyphellaria*. *Acta Bot. Fenn.* 150: 93–97.

KROG, H. & SWINSCOW, T. D. V. (1981). *Parmelia* subgenus *Amphygymnia* (lichens) in East Africa. *Bull. Brit. Mus. (Nat. Hist.), Bot.* 9: 143–231.