A new species of *Puttemansia* (Tubeufiaceae, Pleosporales) and new records of further Ascomycota from Panama

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Kirschner R., Araúz V., Herbst F., Hofmann T. A., Ix S., Nozon Th. & Piepenbring M. (2010) A new species of *Puttemansia* (Pleosporales) and new records of further Ascomycota from Panama. – Sydowia 62 (2): 225–241.

A species of *Puttemansia* was collected on bamboo leaves in Panama, where the fungus was probably parasitic on a leaf-inhabiting discomycete. Macroscopical characteristics are similar to those of *Puttemansia albolanata*, but ascospore appendages are more similar to those of *Paranectriella* species. Since the species from Panama differs additionally by the verruculose ornamentation of ascospore walls from all known species of *Paranectriella* and *Puttemansia*, it is proposed here as new. We present 33 additional species belonging to other orders of Ascomycota recorded for Panama for the first time, including new records for the American continent and new hosts. The family Perisporiopsidaceae E. Müll. & Arx is validated in order to replace Parodiopsidaceae based on *Parodiopsis* which is a synonym of *Perisporiopsis* and not in current use.

Keywords: Dothideomycetes, Meliolales, plant parasitic fungi, taxonomy.

Panama with about 10,000 species of vascular plants known for this country is located within a megadiversity centre of plant diversity (Correa et al. 2004). In contrast, only about 2,000 species of Fungi are known for Panama, i. e. 4 % of the estimated fungal species richness of the country (Piepenbring 2006, 2007 and more recent records). This ratio of 0.2 fungal species per plant species in Panama is contradictory to the global ratio of 5.3 fungal species per plant (Hawksworth 1998). Obviously, the majority of fungi of Panama are not yet known and enormous collaborative efforts in collection and alpha-taxonomy is required in order to come up to the needs of inventorying the biodiversity of the country. Since the species diversity of Asco- and Basidiomycota (including anamorphs) comprises more than 90 % of all Fungi and fungal-like organisms, our collection activities concentrate on these

two groups. Collections of Ascomycota in Western Panama since 2003 reveal several species new to Panama and new to science. For Ascomycota in Panama, species were newly described or recorded mainly in anamorphic and/or teleomorphic Asterinaceae (inc. sed.), Capnodiales, Eurotiales, Laboulbeniales, Meliolales, Phyllachorales, Plectosphaerellaceae (inc. sed.), Rhytismatales, Sordariales, and Xylariales (Carmona et al. 2009, Hofmann & Piepenbring 2006, 2008, Hou & Piepenbring 2009, Hou et al. 2010, Kirschner & Piepenbring 2006, 2008, Piepenbring et al. 2007, Rodríguez & Piepenbring 2007, Stadler et al. 2008, Trampe & Piepenbring 2007, Villarreal et al. 2010, Weisenborn et al. 2010a, b). In addition to these new records and species known for Panama, considerably more species await detection. The systematic placement of several genera and families represented in this and previous publications has never been evaluated with DNA analyses. Even more fundamental data, such as geographical distribution and substrates, are far from being completely known for the described species. Due to the lack of data about native fungi, recognizing and evaluating the impact of introduced fungal species is possible only in exceptional cases (Vizzini et al. 2009). In this paper we propose a new species of *Puttemansia* Henn. (Tubeufiaceae, Pleosporales, Dothideomycetes) and 33 species of Ascomycota recorded for Panama for the first time.

Materials and Methods

Ascomycota were collected in Panama by the authors since 2003. The collection sites correspond to more or less disturbed forests and sites of open disturbed vegetation at altitudes ranging from sea level to almost 3,300 m in the provinces Bocas del Toro and Chiriquí in Western Panama, neighbouring to Costa Rica. Specimens were air-dried and deposited at the Herbario Nacional of the Universidad de Panamá (PMA), the Herbario of the Universidad Autónoma de Chiriquí (U. CH.), the Botanische Staatssammlung München, Germany (M) or U. S. National Fungal Collections, Beltsville, U. S. A. (BPI). For comparison with a new species, material was loaned from BPI (for details see "additional material examined").

Specimens were investigated with a dissecting microscope in the fresh or dried condition and a light microscope with oil immersion objective (100 x) using mountings with water, 5–10 % aqueous KOH, with and without staining with 1 % aqueous phloxine, or with an embedding medium based on polyvinyl alcohol, glycerol and lactic acid with and without staining with cotton blue (Hofmann & Piepenbring 2008). Measurements are given as (minimum) mean ± standard deviation (maximum). Substrates were identified based on own experience, literature, and help of botanists. Relevant literature used for species identification is cited. If not stated otherwise, two or more specimens

of the same species were identified by the same person. Systematic placement follows Kirk et al. (2008).

Results and Discussion

New species

Puttemansia verrucosa R. Kirschner, **sp. nov.** – Figs. 1–2.
MycoBank no.: MB 518545

Ascomata maximam partem epiphylla, 2–10 aggregata, e stromatibus internis oriunda. Stroma in fungo nutricio formans, 140–160 µm diam., e cellulis globosis, 5–8 µm diam., hyalinis vel pallide brunneis, tenuiter tunicatis compositum, cellulis marginalibus atratis circumcinctum. Stipes 290–340 µm latus, 150–200 µm altus, e cellulis angularibus, hyalinis, 7–17 µm diam., parietibus 1–5 µm crassis, compositus. Ascomata perithecioidea, alba, stellata, subglobosa, apice depresso, 280–520 µm alta, 320–600 µm lata, pilis densis, longis, fasciculatis, 3–5 µm latis, ad 300 µm longis, crassitunicatis vestita. Paries ascomatis 40–60 µm latus, e zona interna cellularum elongatarum delicatarum et zona externa cellularum rotundatarum vel angularium compositus. Centrum pallide aurantiacum, ascis bitunicatis, octosporis, clavatis, 150–175 × 13–18 µm, pseudoparaphysibus ramosis, anastomosantibus, 0.5–2 µm, spacium e basibus ascorum ad apicem ascomatis complentibus. Ascosporae hyalinae, fusiformes, 3 septis transversalibus, verruculosae, (25) 26–29 (32) × (8) 9–11 µm (sine appendicibus), appendicibus terminalibus, rigidis, acerosis, 7–9 × 1 µm.

Holotypus. – PANAMA, Chiriquí Province, Parque Internacional La Amistad, ca. 2,300 m, on living leaves of bamboo, probably parasitic on a discomycete with elongated, black ascocarps also present on the leaves, 3 Mar 2003, R. Kirschner & M. Piepenbring 1705 (BPI 844025).

Isotypus. – PMA.

Ascomata aggregated in groups of two to ten mostly on the adaxial bamboo leaf surface, sometimes also on the abaxial surface, connected with internal stromata. Stroma white, probably developing within young longitudinal apothecia of an unidentified discomycete inside living leaves, 140–160 µm diam. in transversal section, composed of hyaline to light brown, thin-walled, globose cells of 5–8 µm diam., at the outer margin surrounded by blackened cells that are visible as an elongated blackened area on both leaf surfaces, ca. 2400 × 800 µm. Stroma connected with an ascoma by a 290–340 µm wide and 150–200 µm high stalk composed of angular, hyaline pseudoparenchymatic cells, 7–17 µm diam., with 1–5 µm thick walls. Ascomata perithecioid, white, subglobose, with a flattened apex, 280–520 µm tall and 320–600 µm wide, ascoma margin densely covered with long, fasciculate, interwoven hairs giving the acoma a stellate appearance when seen from above, hairs hyaline, up to 300 µm long, 3–5 µm wide, thick-walled, ends obtusely rounded. Ascoma wall in longitudinal section 40–60 µm thick (in 5 % KOH), of two indistinct regions, cells rounded or angular, variable in size and shape, 5–20 × 3–11 µm, inner layer more intensely stained by phloxine, most inner cells elongate and delicate. Centrum pale orange in longitudinal sections, shining through

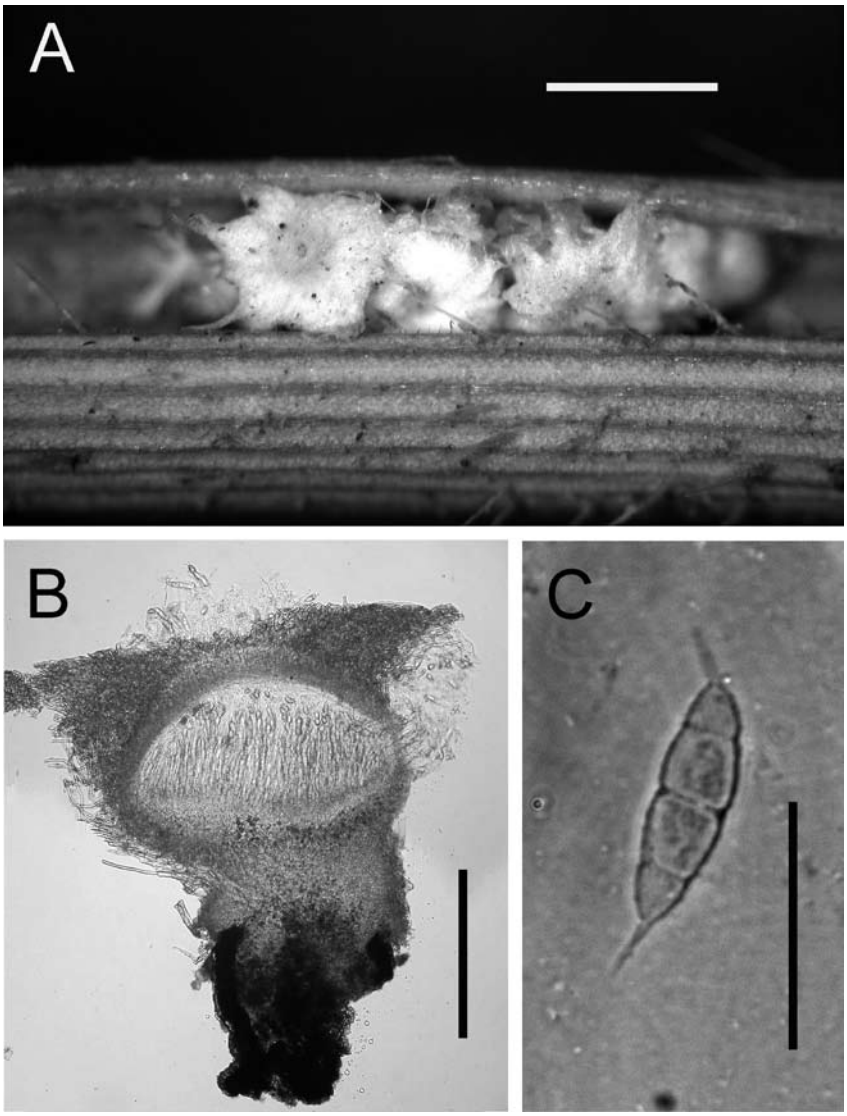

Fig. 1. Photographs of *Puttemansia verrucosa* (R. Kirschner & M. Piepenbring 1705; BPI 844025). **A.** Ascomata seen from above on the bamboo leaf. Scale bar = 500 µm. **B.** Longitudinal section of an ascoma. Scale bar = 250 µm. **C.** Ascospore (in 5 % KOH, phloxine). Scale bar = 25 µm.

the translucent apical ascoma wall and opening. Pseudoparaphyses branched and anastomosed with each other, 0.5-2 µm wide (in water), filling the locule of the ascoma between the bases of the asci and the apical ascoma wall. Asci bitunicate, clavate, straight, but slightly curved at the basal part, with a thickened area (ca. 10 µm) at

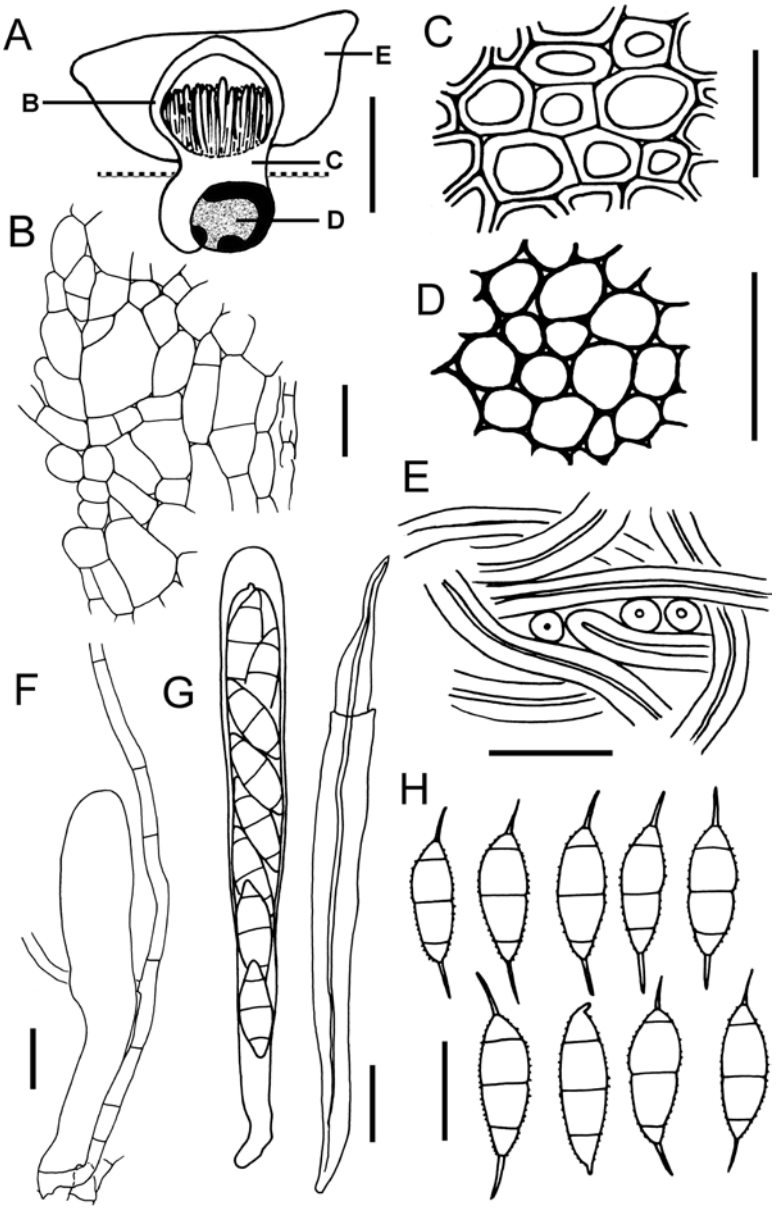

Fig. 2. Drawings of *Puttemansia verrucosa* (R. Kirschner & M. Piepenbring 1705; BPI 844025). **A.** Schematic sketch of a longitudinal section of an ascoma (B - E: indicating respective detailed illustrations). Scale bar = 400 µm. **B–E.** Details from the longitudinal section shown in A indicated with the respective letter. Scale bars: B = 10 µm, C–E: 20 µm. **B.** Lateral perithecial wall. **C.** Stalk stroma. **D.** Basal stroma embedded in the host tissues. **E.** Hairs extending from the perithecial wall. **F.** Young ascus with pseudoparaphyse. Scale bar = 10 µm. **G.** Mature ascus with spores on the left, emptied ascus on the right. Scale bar = 20 µm. **H.** Ascospores. Scale bar = 20 µm.

the apex, 150–175 × 13-18 µm (in water and 5 % KOH). Ascospores eight per ascus, hyaline, fusiform, with a stiff, needle-like appendage at each end, appendages 7–9 × 1 µm, tapering sharply to the apical end, rarely shorter and with obtuse ends (only when young), body of the ascospores (25) 26–29 (32) × (8) 9–11 µm (n = 25, in water, length without appendages), in all mounting media finely verruculose, with three transversal septa, slightly constricted at the medium septum, distal half slightly broader than the basal one.

Etymology. – Referring to the ornamentation of the ascospore wall.

Habitat. – Probably parasitic on discomycete in living bamboo leaves.

Distribution. – Hitherto only known from Panama.

Additional material examined. – ***Puttemansia albolanata*** (Speg.) Höhn.: COSTA RICA, San Pedro de San Ramon, on *Phyllachora phoebes* Syd. on *Nectandra* sp., 8 Oct 1926, A. M. Brenes 157 (BPI 632856); BRAZIL, Sao Paulo, Serra da Cantareira, on *Nectandra* sp., 19 Aug 1905, Puttemans (BPI 632861, paratype of *P. lanosa* Henn.): Ascospores (Fig. 3A, B, seen in embedding medium with lactic acid and cotton blue) smooth, appendages rarely separated from the supporting cells, mostly continuous, 2 µm wide, broadly rounded at the ends, basal appendage more conspicuous, 2-3 times longer than the upper one. – ***Paranectriella juruana*** (Henn.) Piroz.: HAITI, 44 km south of Roseaux, on leaves of *Miconia* sp., 14 Nov 1982, W. R. Buck 9169 (BPI 632134): Ascospores (Fig. 3C, seen in embedding medium with lactic acid and cotton blue) smooth, appendages max. 1 µm wide.

Notes: The type of ascospores, i. e. hyaline phragmospores with simple appendages at both ends, is known from *Paranectria* Sacc., *Paranectriella* (Henn. ex Sacc.) Höhn., and *Puttemansia* Henn. (Rossman 1987). Species of *Paranectria* have unitunicate asci, belong to the Hypocreales and are parasites of lichens (Rossman et al. 1999). *Paranectriella* and *Puttemansia* were placed in the Tubeufiaceae of the Pleosporales, Dothideomycetes, by Rossman (1987). Though among the Dothideomycetes the bitunicate ascus is not uniform, the term "bitunicate" is applied here in a wide sense for the specimen according to the illustrations given by Eriksson (1981). *Paranectriella* and *Puttemansia* were differentiated in the descriptions by Höhnel (1910) and Rossman (1987) because of differences of the appendages of the ascospores. Cytoplasm of the appendages is continuous with that of the two outer cells of the ascospores in species of *Puttemansia*, whereas the appendages appear to be disconnected from the two outer cells by cell-wall material. These characteristics were confirmed by re-examining specimens of *Puttemansia albolanata* and *Paranectriella juruana* (Fig. 3). In *Puttemansia albolanata*, the appendages were generally 2 µm wide and in only rare cases separated from the two outer spore cells by a septum. In the new species as well as in *Paranectriella juruana* the appendages do not exceed a width of max. 1 µm. It could,

therefore, not be clearly seen whether the appendages are separated from the supporting cells by septa or not. According to further descriptions (Rossman 1987), ascomata and/or stromata are superficial on the substrate in species of *Paranectriella*, whereas the stroma develops within the host tissues in species of *Puttemansia*. The ascoma wall is thinner in longitudinal section in species of *Paranectriella* (less than 20 µm) than in species of *Puttemansia* (more than 20 µm). Asci are longer (more than 90 µm) in species of *Puttemansia* than in those of *Paranectriella* (less than 90 µm). Pseudoparaphyses often extend beyond the asci in species *Puttemansia*, but rarely in species of *Paranectriella*. Besides of the different type of ascospore appendages, the new species has all characteristics of *Puttemansia* and is, therefore, placed in this genus. It is similar to *P. albolanata* with respect to almost all characteristics, such as sizes, presence of thick-walled, fasciculate hairs, three-septate ascospores, and development from stromata within living leaves. Seen with the dissecting microscope, both species are hardly distinguishable. *Puttemansia verrucosa*, however, differs from all species of *Paranectriella* and *Puttemansia* by its finely verruculose ornamentation of the ascospore wall.

Puttemansia itself could be divided into two groups: a group comprising the species *P. miakei* (I. Hino & Katum.) O. E. Erikss. & J. Z. Yue, *P. rickiana* (Sacc. & Syd.) Petr., *P. stromatica* (Cooke) Rossman, and *P. stromaticola* (Henn.) Rossman with glabrous ascocarps and ascospores without tapering or appendaged ends, and a group comprising of *P. albolanata* (the type species), *P. brachytricha* Syd., and *P. hyperparasitica* (Sivan. & J. Kranz) Piroz. having ascocarps covered with hairs and ascospores with appendaged or attenuated ends. The new species can be accommodated in this second group. In both groups, plant pathogenic as well as fungicolous species exist (Rossman 1987). Two species, *P. albolanata* and *P. miakei* are known from leaves of bamboo (Eriksson & Yue 1990, Rossman 1987). *Puttemansia albolanata*, however, might grow on a leaf-parasitic ascomycete (Rossman 1987). The ascomata of the closely related *P. hyperparasitica* arise from the stromata of an ascomycete in living leaves (Rossman 1987). According to the description and illustration of *P. hyperparasitica* by Sivanesan & Kranz (1975, as *Annajenkinsia hyperparasitica* Sivan. & J. Kranz), the fungus almost completely fills the ascoma of the *Phyllachora* host fungus and only leaves its ascostroma intact. In our specimen, an unidentified discomycete with elongated, black apothecia was also present on the leaves. The colour, size and shape of the apothecia were similar to those of the outer appearance of the stromata giving rise to the ascomata of *Puttemansia verrucosa*. *Puttemansia verrucosa*, therefore, probably grows parasitically in young ascomata of the discomycete causing a transformation of their contents so that structures of the host and the parasite cannot be distinguished in the mature stage. Since DNA sequences are lacking for species of *Paranectriella* and

Puttemansia, both genera are retained in Tubeufiaceae, Pleosporales, on morphological grounds (Kodsueb et al. 2006). In spite of repeated collecting activities each year since 2003 at the same locality, the new species could not been re-collected. Sufficient material for DNA analyses and cultivating experiments was, therefore, not available.

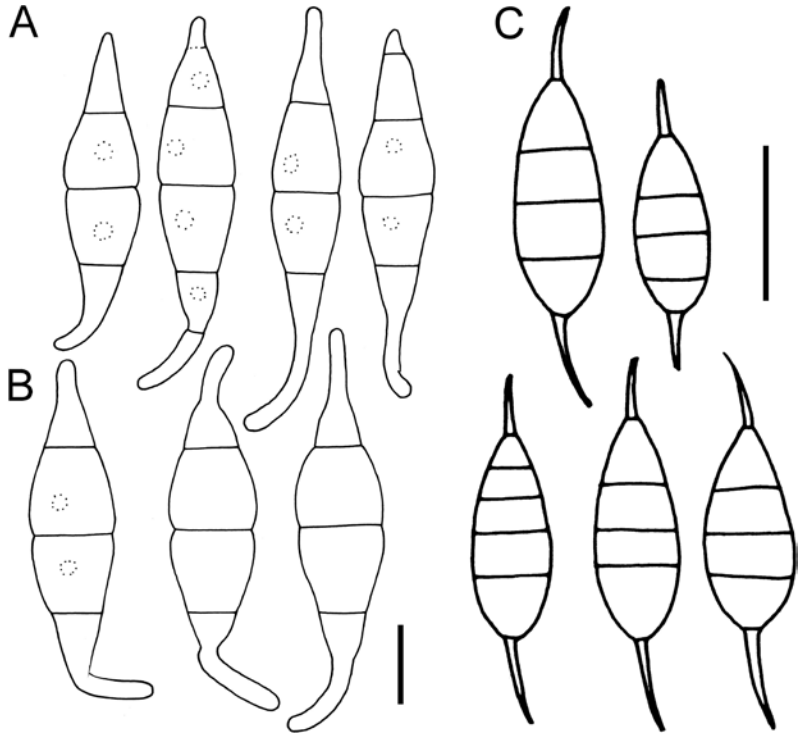

Fig. 3. Drawings of ascospores of *Puttemansia albolanata* (A: BPI 632856, B: BPI 632861; nuclei indicated with dots) and *Paranectriella juruana* (C: BPI 632134). Note the different lengths of the scale bars (each 10 µm).

New records of Ascomycota from Panama in alphabetical order

Aleuria aurantia (Pers.) Fuck., Pyronemataceae, Pezizales

On bare soil, Chiriquí Prov., Parque International La Amistad, path to La Cascada, N 08° 54,0' W 082° 37,2', ca. 2,180 m, 26 May 2009, M. Piepenbring together with students of the UNACHI 4783 (PMA, U.CH.). Det. M. Piepenbring.

Literature: Seaver (1961).

Amazonia psychotriae (Henn.) Theiss., Meliolaceae, Meliolales

On leaves of *Psychotria* sp. (Rubiaceae, det. M. Piepenbring), Chiriquí Prov., Gualaca District, road between Gualaca and Almirante, La Fortuna, Quijada del Diablo, ca. 1,278 m, 13 Oct 2007, T. A. Hofmann ppMP 1367 (M, PMA). Det. Th. Nozon.

Literature: Hansford (1961), Hosagoudar (1996).

Asteridiella anastomosans (G. Winter) Hansf. var. ***anastomosans***, Meliolaceae, Meliolales

On leaves of *Hyptis capitata* Jacq. (Lamiaceae, det. V. Araúz), Chiriquí Prov., Bongo, N 08° 35´ 28´´ W 82° 37´ 29´´, ca. 490 m, 27 Jan 2008, V. Araúz 13 (PMA). Det. V. Araúz.

Literature: Hansford (1961).

Asteridiella anastomosans (G. Winter) Hansf. var. ***macilenta*** (G. Winter) Hansf., Meliolaceae, Meliolales

On leaves of *Jacobinia* sp. (Acanthaceae, det. V. Araúz & R. Rincón), Chiriquí Prov., Bongo, N 08° 35´ 28´´ W 82° 37´ 29´´, ca. 490 m, 27 Jan 2008, V. Araúz 21 (PMA). Det. V. Araúz.

Literature: Hansford (1961).

Notes: This variety is reported for the first time on a species of *Jacobinia*.

Asteridiella ochnacearum (Cif.) Hansf., Meliolaceae, Meliolales

On leaves of *Sauvagesia erecta* L. (Ochnaceae, det. V. Araúz), Chiriquí Prov., Boquete, Finca Arco Iris, N 08° 46´ 33´´ W 82° 26´ 04´´, ca. 1,090 m, 15 Sep 2007, V. Araúz & M. Piepenbring 8 (PMA). Det. V. Araúz.

Literature: Hansford (1961).

Asteridiella perseae (F. Stevens) Hansf., Meliolaceae, Meliolales

On leaves of *Persea americana* Mill. (Lauraceae, det. V. Araúz), Chiriquí Prov., Bongo, N 08° 35´ 28´´ W 82° 37´ 29´´, ca. 490 m, 27 Jan 2008, V. Araúz 14 (PMA); Chiriquí Prov., Bocalatún, N 08° 35´ 12´´ W 82° 35´ 12´´, ca. 460 m, 5 Feb 2008, V. Araúz 27 (PMA). Det. V. Araúz.

Literature: Hansford (1961).

Balladynopsis urtiagae Sivan., Perisporiopsidaceae, Dothideomycetes incertae sedis

On leaves of *Genipa americana* L. (Rubiaceae, det. T. A. Hofmann), Chiriquí Prov., Dolega District, Corr. Los Algarrobos, path to Río Majagua, ca. 140 m, 6 Feb 2010, L. Saldaña & T. A. Hofmann M 829 (M, PMA). Det. T. A. Hofmann.

Literature: Sivanesan (1981).

Notes: The species contains a *Tretospora* anamorph.

Camarops scleroderma (Mont.) Nannf., Boliniaceae, Boliniales

On dead wood of an angiosperm tree, Panama Prov., Parque Nacional Soberania, Sendero del Charco, ca. 50 m, 5 Aug 2008, M. Piepenbring & C. Guerra 4464 (M 0141081, PMA, U.CH.). Det. J. Fournier, conf. M. Piepenbring.

Literature: Samuels & Rogers (1987).

Notes: The Panamanian specimen is similar to those described by Samuels & Rogers (1987) as *C. scleroderma* except for the colour of the surface of the fresh fruiting body, which is rose with brown spots in the Panamanian specimen, a soft, juicy consistency of the fresh fruiting body, and a thick layer of polystichous perithecia.

Corynelia oreophila (Speg.) Starbäck, Coryneliaceae, Coryneliales

On leaves of *Podocarpus* sp. (Podocarpaceae, det. T. A. Hofmann), Chiriquí Prov., Parque Internacional La Amistad, Cerro Picacho, N 08° 53,401' W 082° 37,694', ca. 2,550 m, 6 Mar 2006, T. A. Hofmann, R. Mangelsdorff & M. Piepenbring ppMP 407 (M, PMA); same locality, 10 Apr 2006, T. A. Hofmann ppMP 569 (M, PMA); Chiriquí Prov., Parque Internacional La Amistad, Jurutungu, Cerro Panda, 7 May 2006, T. A. Hofmann & T. Trampe 453 (M, PMA). Det. T. A. Hofmann.

Literature: Fitzpatrick (1942).

Cycloschizon styracis (Petr.) Arx, Parmulariaceae, Dothideomycetes incertae sedis

On leaves of *Styrax argenteus* C. Pesl (Styracaceae, det. T. A. Hofmann), Chiriquí Prov., Parque Internacional La Amistad, Sendero Cerro Picacho, ca. 2,300 m, 19 Apr 2006, T. A. Hofmann 434 (M, PMA); same locality, ca. 2,100 m, 5 Jun 2006, T. A. Hofmann 459 (M, PMA); same locality, ca. 2,400 m, 13 Jul 2006, T. A. Hofmann 490 (M, PMA). Det. T. A. Hofmann.

Literature: Müller & Arx (1962).

Notes: The species occurred regularly on the same individual host plants together with *Rosenscheldiella styracis*, often on the same leaves, with ascomata of *C. styracis* predominantly on the adaxial side and *R. styracis* on the abaxial one.

Dysrhynchis amazonica (Höhn.) E. Müll., Perisporiopsidaceae, Dothideomycetes incertae sedis

On leaf of *Cecropia* sp. (Cecropiaceae), Chiriquí Prov., Parque Nacional Volcán Barú, Sendero los Quetzales, 1,920–2,450 m, 15 Feb 2003, R. Kirschner & M. Piepenbring 1633-B (M); Chiriquí Prov., Dolega District, Corr. Los Algarrobos, ca. 150 m, 12 Sep 2005, R. Kirschner et al. 2722-E (PMA). Det. R. Kirschner.

Literature: Müller & Arx (1962).

Irenopsis selaginellarum (Cif.) Hansf., Meliolaceae, Meliolales

On leaves of *Selaginella* sp., Chiriquí Prov., Fortuna, N 08° 43´ 53´´ W 82° 14´ 16´´, ca. 1,210 m, 22 Sep 2007, V. Araúz, G. Avendaño & M. Piepenbring 11 (PMA). Det. V. Araúz.

Literature: Hansford (1961).

Leotia atrovirens Pers., Leotiaceae, Leotiales

On soil and dead wood. Chiriquí Prov., Fortuna, Quebrada Honda, N 8,75262° W 82,23962, ca. 1,300 m, 20 Sep 2009, M. Piepenbring, R. Villarreal and Maestría students 4921 (PMA, U.CH.). Det. M. Piepenbring.

Literature: Breitenbach & Kränzlin (1984).

Meliola acanthacearum Hansf., Meliolaceae, Meliolales

On leaves of unidentified Acanthaceae (det. R. Mangelsdorff), Chiriquí Prov., road between Gualaca and Almirante, Fortuna, ca. 5 km of Lake Fortuna, ca. 1,240 m, 19 Feb 2007, T. A. Hofmann ppMP 1320 (M, PMA). Det. Th. Nozon. On leaves of *Justicia aurea* Schltdl. (Acanthaceae, det. V. Araúz), Chiriquí Prov., Bongo, N 08° 35´ 28´´ W 82° 37´ 29´´, ca. 490 m, 27 Jan 2008, V. Araúz 20 (PMA). Det. V. Araúz.

Literature: Hansford (1961).

Notes: *M. acanthacearum* var. *occidentalis* Hansf. known from the neotropics is morphologically very close to *M. acanthacearum* var. *acanthacearum* known from the paleotropics, so the two varieties might be synonyms and are not considered separate here. *M. acanthacearum* is reported on *J. aurea* for the first time.

Meliola anceps Syd., Meliolaceae, Meliolales

On leaves of *Posoqueria latifolia* (Rudge) Roem. & Schult. (Rubiaceae, det. M. Piepenbring), Bocas del Toro Prov., El Valle, Celestine, N 08° 47,183' W 082° 11,319', 25 Oct 2005, T. A. Hofmann ppMP 460 (M, PMA); same locality and host, 7 Apr 2006, T. Trampe ppMP 150 (M, PMA); same locality and host, 17 Jul 2006, T. A. Hofmann ppMP 0544 (M, PMA); same locality and host, 15 Feb 2007, T. A. Hofmann ppMP 1159 (M, PMA); same locality and host, 15 Feb 2007, R. Mangelsdorff ppMP 1480 (M, PMA). Det. Th. Nozon.

Literature: Hansford (1961), Hosagoudar (1996).

Notes: *Posoqueria* is a new host genus for Meliolales. *Meliola anceps* was collected several times on the same host species at the same locality several times during 2005–2007.

Meliola aequatoriensis Petr., Meliolaceae, Meliolales

On leaves of *Viburnum costaricanum* (Oerst.) Hemsl., Chiriquí Prov., Fortuna, N 08° 43´ 53´´ W 82° 14´ 16´´, ca. 1,210 m, 30 Mar 2009, V. Araúz & R. Sánchez 6 (PMA). Det. V. Araúz.

Literature: Hansford (1961).

Notes: The specimen from Panama differs from *M. aequatoriensis* as described by Hansford (1961) by larger appressoria (Hansford: 12–18 µm long, Araúz 6: 22–28 µm long), smaller perithecia (Hansford: to 160 µm diam., Araúz 6: to 100 µm), and larger ascospores (Hansford: 38–45 µm long, Araúz 6: 44–50 µm long). As other characteristics as well as the host genus are similar, the Panamanian specimen is identified as *Meliola aequatoriensis*. *M. aequatoriensis* is reported here for the first time on *V. costaricanum*.

Meliola capsicola F. Stevens, Meliolaceae, Meliolales

On leaves of *Capsicum frutescens* L. (Solanaceae, det. V. Araúz), Chiriquí Prov., Bongo, N 08° 35´ 28´´ W 82° 37´ 29´´, ca. 490 m, 27 Jan 2008, V. Araúz 15 (PMA). Det. V. Araúz.

Literature: Hansford (1961).

Meliola carludovicae Hansf. **var.** ***setosa*** M. L. Farr, Meliolaceae, Meliolales

On leaves of *Asplundia* sp. (Cyclanthaceae, det. T. Trampe), Chiriquí Prov., Boquete District, Alto Chiquero, near the office of ANAM, Sendero Quetzales, N 08° 50,6' W 082° 29,8', ca. 1,750 m, 27 Jun 2006, T. Trampe ppMP 884 (M, PMA). Det. S. Ix.

Literature: Hosagoudar et al. (1997).

Meliola gaillardiana F. Stevens, Meliolaceae, Meliolales

On leaves of Piperaceae indet., Chiriquí Prov., Fortuna, N 08° 43´ 53´´ W 82° 14´ 16´´, ca. 1,210 m, 30 Mar 2009, V. Araúz & R. Sánchez 1 (PMA). Det. V. Araúz.
Literature: Hansford (1961).

Meliola gymnanthicola F. Stevens var. ***manihot*** (F. Stevens & Tehon) F. Stevens, Meliolaceae, Meliolales

On leaves of *Manihot esculenta* Crantz (Euphorbiaceae, det. V. Araúz), Chiriquí Prov., Bongo, N 08° 35´ 28´´ W 82° 37´ 29´´, ca. 490 m, 27 Jan 2008, V. Araúz 28 (PMA). Det. V. Araúz.
Literature: Hansford (1961).

Meliola lictorea Cif., Meliolaceae, Meliolales

On leaves of *Palicourea chiriquina* Standl. (Rubiaceae, det. M. Piepenbring), Chiriquí Prov., near Las Nubes, Parque Internacional La Amistad, Sendero Cerro Picacho, N 08° 53,401' W 082° 37,694', ca. 2,555 m, 26 Jan 2007, T. A. Hofmann ppMP 1289 (M, PMA). Det. Th. Nozon.
Literature: Hansford (1961).
Notes: Previously only known for *Exostema* as host genus (Hansford 1961).

Meliola longiseta Höhn., Meliolaceae, Meliolales

On leaves of *Hoffmannia congesta* (Oerst.) Dwyer (Rubiaceae, det. M. Piepenbring & T. A. Hofmann), Chiriquí Prov., Gualaca District, road between Gualaca and Almirante, Fortuna, ca. 5 km of Lake Fortuna, N 08° 41,9' W 082° 13,7', ca. 1,240 m, 19 Feb 2007, T. A. Hofmann ppMP 1318 (M, PMA). Det. Th. Nozon.
Literature: Hansford (1961), Housagoudar et al. (1994).
Notes: First record for the host genus *Hoffmannia* and for the American continent.

Meliola mimosacearum Hansf., Meliolaceae, Meliolales

On leaves of *Mimosa pudica* L. (Fabaceae, det. T. Trampe), Chiriquí Prov., Dolega District, Corr. Los Algarrobos, trail from Los Algarrobos to Río Majagua, N 08° 29,7' W 082° 25,9', 140 m, 8 Jan 2007, T. Trampe ppMP 938 (M, PMA). Det. F. Herbst.
Literature: Hansford (1961).
Notes: Records are hitherto restricted to the neotropics, but expected to follow the pantropical distribution of its host.

Meliola ourouparíae F. Stevens, Meliolaceae, Meliolales

On leaves of *Coccocypselum hirsutum* Bartl. (Rubiaceae, det. R. Rincón), Chiriquí Prov., Fortuna, N 08° 43´ 53´´ W 82° 14´ 16´´, ca. 1,210 m, 20 Jan 2008, V. Araúz 12 (PMA). Det. V. Araúz.
Literature: Hansford (1961).
Notes: *Meliola ourouparíae* is reported here for the first time on *C. hirsutum*.

Meliola patouillardii Gaillard, Meliolaceae, Meliolales

On leaves of *Piper* sp. (Piperaceae, det. T. A. Hofmann), Chiriquí Prov., Gualaca District, road between Gualaca and Almirante, Fortuna, ca. 5 km of Lake Fortuna, N 08° 41,9' W 082° 13,7', ca. 1,240 m, 22 Sep 2007, T. A. Hofmann ppMP 1337 (M, PMA). Det. S. Ix.

Literature: Hansford (1961).

Notes: The species is closely related to *M. zetekii* F. Stevens which is already known from Panama (Hansford 1961).

Myriogenospora paspali G. F. Atk., Clavicipitaceae, Hypocreales

On leaves of sterile plants of *Paspalum conjugatum* P.J. Bergius (Poaceae, det. M. Piepenbring), Chiriquí Prov., Los Algarrobos, N 08° 29.60´ W 082° 25.51´, ca. 150 m, 3 Mar 2010, M. Piepenbring & T. Hofmann 4954 (M, PMA). On leaves of sterile plants of *Axonopus compressus* (Sw.) P. Beauv. (Poaceae, det. M. Piepenbring), Chiriquí Prov., border of road to Chiriquí Grande, before arriving at Fortuna, close to entrance La Suiza, N 8° 39,40´ W 82° 12,62´, ca. 1,150 m, M. Piepenbring & O. Cáceres 4955 (M, PMA, U.CH.). Det. M. Piepenbring.

Literature: Atkinson (1894), Dennis (1970).

Notes: The Panamanian specimens slightly differ from specimens described in literature by stromata on leaf blades up to 6 cm long and larger ascospores [Panamanian specimen MP 4954: 23–37 × 2 µm, Atkinson (1894): 15–25 × 0.5–0.8 µm]. As other characteristics of perithecia and asci (with slime cap and containing hundreds of ascospores) as well as the host plant species partly coincide, the Panamanian specimens are identified as *Myriogenospora paspali*.

Parodiella perisporioides (Berk. & M. A. Curtis) Speg., Parodiellaceae, Pleosporales

On leaves of unidentified Fabaceae (det. T. A. Hofmann), Chiriquí Prov., Dolega District, Corr. Los Algarrobos, Orillas del Río Cemeño, N 08° 30,089' W 082° 26,303', ca. 150 m, 1 Oct 2005, T. A. Hofmann et al. 340 (M, PMA); on leaves of cf. *Desmodium* sp. (Fabaceae, det. M. Piepenbring & T. A. Hofmann), Bocas del Toro Prov., at Rio Teribe, Bonyik, banana plantation, altitude not known, 24 Oct 2005 T. A. Hofmann et al. 402 (M, PMA); Bocas del Toro Prov., El Valle, Finca Celestine, roadside, N 08° 47,183' W 082° 11,319', ca. 600 m, 25 Oct 2005 T. A. Hofmann et al. 404 (M, PMA); on leaves of *Desmodium* sp. (det. T. A. Hofmann), Chiriquí Prov., Alanje District, Corr. Alanje, La Barqueta, pacific coast, ca. 5 m, 6 Sep 2007, T. A. Hofmann 517 (M, PMA); same locality and date, T. A. Hofmann 518 (M, PMA). Det. T. A. Hofmann.

Literature: Müller & Arx (1962).

In the following, two species of *Perisporiopsis* are recorded. The synonymy stated by Müller & Arx (1962) of *Parodiopsis* Maubl. with *Perisporiopsis* Henn. has generally been accepted. Müller & Arx (1962), therefore, proposed the family Perisporiopsidaceae, but without valid publication, because of lack of Latin description. For this reason, the valid family Parodiopsidaceae Toro has been preferred against the invalidly published Perisporiopsidaceae E. Müll. & Arx, though the ge-

nus *Parodiopsis* is not in use any more. Following the intention of Müller & Arx (1962) and the general use of genus-based names of higher taxa, we validate Perisporiopsidaceae by adding a Latin description. Though the ending -opsidaceae is linguistically incorrect with respect to classical language, it has been fixed in ICBN Art. 18.1 according to botanical Latin.

Perisporiopsidaceae E. Müll. & Arx ex R. Kirschner & T. A. Hofm.

= Perisporiopsidaceae E. Müll. & Arx, Beitr. Kryptfl. Schweiz 11(2): 167 (1962), MycoBank no.: MB81129

Fungi parasitici in foliis vivis, ascomatibus brunneis, superficialibus, globosis, ampulliformibus vel lageniformibus, apicaliter aperientibus, ascis paucis, subglobosis, saccatis vel late clavatis, bitunicatis, apicaliter conspicue incrassatis, ascosporis unicellularibus ad pluricellularibus. Typus familiae: *Periosporiopsis* Henn. Hedwigia 43: 83 (1904).

Fungi parasitic on living leaves. Ascomata brown, superficial, globose to flask-shaped, wall composed of one to few layers of isodiametric or flattened cells, opening at the apex by more or less irregular break-down of wall cells. Asci few, subglobse to broadly clavate, bitunicate, with conspicuously thickened apex. Ascospores mostly 2-celled, rarely 1- or several-celled, hyaline, often becoming slightly brownish by age. Anamorph as far as known hyphomycetous, represented by simple, pigmented conidiophores producing pigmented, septate conidia, conidiogenesis monoblastic, annellidic or sympodial.

Perisporiopsis hurae (G. Arnaud) Arx, Perisporiopsidaceae, Dothideomycetes incertae sedis

On leaves of *Hura crepitans* L. (Euphorbiaceae, det. M. Piepenbring), Bocas del Toro Prov., Bonyik, path to Río Teribe, 5 Apr 2006, T. A. Hofmann 162 (M, PMA). Det. T. A. Hofmann.

Literature: Müller & Arx (1962, as "*Perisporiopsis urae*").

Perisporiopsis megalospora (Sacc. & Berl.) Arx, Perisporiopsidaceae, Dothideomycetes incertae sedis

On leaves of unidentified Malpighiaceae (det. T. A. Hofmann), Chiriquí Prov., Gualaca District, Fortuna, hill, N 08° 41,922' W 082° 13,751', ca. 1,280 m, 15 Oct 2005, T. A. Hofmann & R. Mangelsdorff 390 (M, PMA); Chiriquí Prov., Gualaca District, road from Gualaca to Almirante, reserve La Fortuna, Quijada del Diablo, N 08° 41 925' W 082° 13,75', ca. 1,270 m, 13 Oct 2007, M. Piepenbring & T. A. Hofmann ppMP 1057 (M, PMA). Det. T. A. Hofmann.

Literature: Müller & Arx (1962).

Rhynchomeliola pulchella Speg., Chaetothyriomycetidae? incertae sedis

On leaf of *Cecropia* sp. (Cecropiaceae), Chiriquí Prov., Dolega District, Corr. Los Algarrobos, ca. 150 m, 12 Sep 2005, R. Kirschner et al. 2722-E (M, PMA). Det. R. Kirschner.

Literature: Müller & Arx (1962).

Rhytidhysteron rufulum (Spreng.) Speg., Hysteriaceae, Hysteriales

On dead branch on ground, Chiriquí Prov., Dolega District, Corr. Los Algarrobos, ca. 150 m, 13 Sep 2005, R. Kirschner et al. 2734 (PMA); David, Jardín Botánico de la Universidad Autónoma de Chiriquí, 29 Aug 2009, R. Kirschner et al. 3346 (see below *Tremella rhytidhysteri*). Det. R. Kirschner.

Literature: Kutorga & Hawksworth (1997).

Notes: The genus has recently been transferred from Patellariales to Hysteriales (Boehm et al. 2009).

Rosenscheldiella styracis (Henn.) Theiss. & Syd., Venturiaceae, Pleosporales

On leaves of *Styrax argenteus* C. Pesl (Styracaceae, det. T. A. Hofmann), Chiriquí Prov., Parque Internacional La Amistad, Sendero Cerro Picacho, ca. 2,300 m, 19 Apr 2006, T. A. Hofmann 434 (M, PMA); same locality, ca. 2,400 m, 13 Jul 2006, T. A. Hofmann 490 (M, PMA). Det. T. A. Hofmann.

Literature: Müller & Arx (1962).

Notes: See *Cycloschizon styracis*.

Unguiculariopsis ravenelii (Berk. & M. A. Curtis) W. Y. Zhuang & Korf, Helotiaceae, Helotiales

On *Rhytidhysteron rufulum* (Spreng.) Speg. on dead branch on ground, Chiriquí Prov., Dolega District, Corr. Los Algarrobos, ca. 150 m, 13 Sep 2005, R. Kirschner et al. 2732 (PMA). Det. R. Kirschner.

Literature: Zhuang (1988).

Acknowledgments

We thank Amy Rossman (BPI) for confirming the novelty of the *Puttemansia* species, the curators of BPI for loan of specimens, O. Cáceres, C. Guerra, R. Mangelsdorff, T. Trampe, R. Villarreal, and other persons for help in collecting specimens and identifying host plants, J. Fournier for the identification of *Camarops scleroderma* and R. Rincón, A. Espinosa and J. A. Polanco for plant identification. We acknowledge permits of the Autoridad Nacional del Ambiente (ANAM) for our collection activities in Panama and export of specimens. This investigation was supported by the German Research Society (DFG) and the German Academic Exchange Service (DAAD).

References

Atkinson G. F. (1894) Steps toward a revision of the linosporous species of North American graminicolous Hypocreaceae. *Bulletin of the Torrey Botanical Club* **21**: 222–225.

Boehm E. W. A., Schoch C. L., Spatafora J. W. (2009) On the evolution of the Hysteriaceae and Mytilinidiaceae (Pleosporomycetidae, Dothideomycetes, Ascomycota) using four nuclear genes. Mycological Research **113**: 461–479.

Breitenbach J., Kränzlin F. (1984) *Pilze der Schweiz*. Beitrag zur Kenntnis der Pilzflora der Schweiz. Band 1. Ascomyceten (Schlauchpilze). Mycologia, Luzern, Switzerland.

Carmona A., Fournier J., Williams C., Piepenbring M. (2009) New records of Xylariaceae from Panama. *North American Fungi* **4**: 1–11.

Correa M., Galdames C., Stapf M. S. de (2004) *Catálogo de las plantas vasculares de Panamá*. Quebecor World Bogotá, Colombia.

Dennis R. W. G. (1970) *Fungus flora of Venezuela and adjacent countries*. Kew Bulletin add. Series 3, Royal Botanic Gardens, Kew, UK.

Eriksson O. (1981) The families of bitunicate ascomycetes. *Opera Botanica* **60**: 1–220.

Eriksson O. E., Yue J.-Z. (1990) Notes on bambusicolous pyrenomycetes. Nos. 1–10. *Mycotaxon* **38**: 201–220.

Fitzpatrick H. M. (1942) Revisionary studies in the Coryneliaceae. *Mycologia* **34**: 464-488.

Hansford C. G. (1961) The Meliolinae. A Monograph. *Sydowia Beihefte* **2**: 1–750.

Hawksworth D. L. (1998) The consequences of plant extinctions for their dependent biotas: an overlooked aspect of conservation science. In: *Rare, threatened, and endangered floras of Asia and the Pacific rim*. Peng C.-I., Lowry P. P. (eds.), Institute of Botany, Academia Sinica Monograph Series No. 16, Taipei: 1–15.

Hofmann T. A., Piepenbring M. (2006) New records and host plants of fly-speck fungi from Panama. *Fungal Diversity* **22**: 55–70.

Hofmann T. A., Piepenbring M. (2008) New species and records of *Asterina* from Panama. *Mycological Progress* **7**: 87–98.

Höhnel F. von (1910) Fragmente zur Mykologie (XII. Mitteilung, Nr. 574 bis 641). *Sitzungsberichte der Akademie der Wissenschaften in Wien, Mathematisch-naturwissenschaftliche Klasse*, Abteilung 1, **119**: 877–958.

Hosagoudar V. B. (1996) *Meliolales of India*. Botanical Survey of India, vol. 2, Calcutta.

Hosagoudar V. B., Abraham T. K., Pushpangadan P. (1997) *The Meliolinae • A Supplement*. Tropical Botanic Garden and Research Institute, Thiruvanathapuram, India.

Hosagoudar V. B., Kaveriappa K. M., Raghu P. A., Goos R. D. (1994) Meliolaceae of Southern India - XVI. *Mycotaxon* **51**: 107-118.

Hou C.-L., Piepenbring M. (2009) New species and records of Rhytismatales from Panama. *Mycologia* **101**: 565-572.

Hou C.-L., Trampe T., Piepenbring M. (2010) A new species of *Rhytisma* causes tar spot on *Comarostaphylis arbutoides* (Ericaceae) in Panama. *Mycopathologia* **169**: 225-229.

Kirk P. M., Cannon P. F., Minter D. W., Stalpers J. A. (2008) *Dictionary of the Fungi*, 10th ed. CABI, Wallingford, UK.

Kirschner R., Piepenbring M. (2006) New species and records of cercosporoid hyphomycetes from Panama. *Mycological Progress* **5**: 207-219.

Kirschner R., Piepenbring M. (2008) Two new hyphomycetes parasitic on leaves of *Maianthemum* species in Panama. *Mycological Progress* **7**: 21-29.

Kodsueb R., Jeewon R., Vijaykrishna D., McKenzie E. H. C., Lumyong P., Lumyong S., Hyde K. D. (2006) Systematic revision of Tubeufiaceae based on morphological and molecular data. *Fungal Diversity* **21**: 105–130.

Kutorga E., Hawksworth D. L. (1997) A reassessment of the genera referred to the family Patellariaceae (Ascomycota). *Systema Ascomycetum* **15**: 1–110.

Müller E., Arx J. A. von (1962) *Die Gattungen der didymosporen Pyrenomyceten*. Beiträge zur Kryptogamenflora der Schweiz 11 (2), Kommissionsverlag Büchler & Co., Wabern, Bern, Switzerland.

Piepenbring M. (2006) Checklist of fungi in Panama. *Puente Biológico (Revista Científica de la Universidad Autónoma de Chiriquí)* **1**: 1–190 + 5 plates.
Piepenbring M. (2007) Inventoring the fungi of Panama. *Biodiversity and Conservation* **16**: 73–84.
Piepenbring M., Cáceres Mendez O. A., Espino Espinoza A. A., Kirschner R., Schöfer H. (2007) Chromoblastomycosis caused by *Chaetomium funicola*: a case report from Panama. *British Journal of Dermatology* **157**: 1025–1029.
Rodríguez D., Piepenbring M. (2007) Two new species of *Appendiculella* from Panama. *Mycologia* **99**: 544–552.
Rossman A. Y. (1987) The Tubeufiaceae and similar loculoascomycetes. *Mycological Papers* **157**: 1–71.
Rossman A. Y., Samuels G. J., Rogerson C. T., Lowen R. (1999) Genera of Bionectriaceae, Hypocreaceae and Nectriaceae (Hypocreales, Ascomycetes). *Studies in Mycology* **42**: 1–248.
Samuels G. J., Rogers J. D. (1987) *Camarops flava* sp. nov., *Apiocamarops alba* gen. et sp. nov., and notes on *Camarops scleroderma* and *C. ustulinoides*. *Mycotaxon* **28**: 45–59.
Seaver F. J. (1961) The North American cup-fungi (Operculates). Hafner, New York.
Sivanesan A. (1981) *Balladynopsis*, *Balladynocallia* and *Aldina*. *Mycological Papers* **146**: 1–38.
Sivanesan A., Kranz J. (1975) A new *Phyllachora* hyperparasitized by a new *Annajenkinsia*. *Transactions of the British Mycological Society* **64**: 9–14.
Stadler M., Fournier J., Læssøe T., Lechat C., Tichy H.-V., Piepenbring M. (2008) Recognition of hypoxyloid and xylarioid *Entonaema* species and allied *Xylaria* species from a comparison of holomorphic morphology, HPLC profiles, and ribosomal DNA sequences. *Mycological Progress* **7**: 53–73.
Trampe T., Piepenbring M. (2007) Tropische Teerfleckenpilze in Panama. *Zeitschrift für Mykologie* **73**: 37–60.
Villarreal S. R. V., Valdés R. L. A., Bernal V. J. A., Piepenbring M., Kirschner R. (2010) A new species of *Laboulbenia* and new records from Panama. *Mycological Progress* **9**: 57–67.
Vizzini A., Zotti M., Mello A. (2009) Alien fungal species distribution: the study case of *Favolaschia calocera*. *Biological Invasions* **11**: 417–429.
Weisenborn J. L. F., Kirschner R., Piepenbring M. (2010) A new darkly pigmented and keratinolytic species of *Acremonium* (hyphomycetes) with relationship to the Plectosphaerellaceae from human skin and nail lesions in Panama. *Nova Hedwigia* **90**: 457–468.
Weisenborn J. L. F., Kirschner R., Piepenbring M. (2010) *Talaromyces indigoticus* Takada & Udagawa: first record from Panama and the American continent. *Mycopathologia* **169** (in press, published online: DOI 10.1007/s11046-010-9305-6).
Zhuang W.-Y. (1988) A monograph of the genus *Unguiculariopsis* (Leotiaceae, Encoelioideae). *Mycotaxon* **32**: 1–83.

(Manuscript accepted 5 Nov 2010; Corresponding Editor: M. Kirchmair)

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Digitale Literatur/Digital Literature

Zeitschrift/Journal: Sydowia

Jahr/Year: 2010

Band/Volume: 062

Autor(en)/Author(s): Kirschner Roland, Arauz Velkis, Herbst Frederic, Hofmann Tina Antje, Ix Sascha, Nozon Thomas, Piepenbring Meike

Artikel/Article: A new species of Puttemansia (Tubeufiaceae, Pleosporales) and new records of further Ascomycota from Panama 225-241