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A preliminary account of the genera *Biscogniauxia* and *Hypoxylon* in the Chanthaburi and Chon Buri Provinces of South East Thailand

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Eight species of *Hypoxylon* and two species of *Biscogniauxia* are reported from Thailand and a key for their identification is given. The two species of *Biscogniauxia* are newly recorded in Thailand and *Hypoxylon archeri*, *H. crocopeplum*, *H. investiens*, *H. rubiginosum*, *H. stygium* and *H. subgilvum* are also reported from Thailand for the first time.

Keywords: mycobiota, taxonomy, Xylariaceae.

In spite of increased awareness of the need to catalogue the flora and fauna of the world few detailed accounts on the fungal species of the tropics and subtropics have been made and consequently their mycofloras are poorly known (Hawksworth, 1991; 1993). Thailand is no exception and according to Schumacher (1982) around 250 species were reported in early contributions by Rostrup (1902), Massee (1902), Heim (1962), Carroll (1963), Dissing (1963), Phanichapol (1968), Cansrikul (1977) and van Brummelen (1967; 1969; 1976a; 1976b). Additional records from Chiang Mai and Lamphun provinces in northern Thailand were subsequently published by Schumacher (1982), Hjørtstam & Ryvarden (1982), Høiland & Schumacher (1982) and Ellingsen (1982). Hjørtstam & Ryvarden (1982) recorded 154 species of Aphyllophorales, mostly Corticiaceae and Polyporaceae, and 116 of these were reported as new to Thailand. They also described 7 species new to science. Høiland & Schumacher (1982) listed 51 species of agaricoid, clavarioid, and heterobasidiomycetous fungi, including 40 species new to the area. In a study of the gasteromycetes of the area Ellingsen (1982) recognised 11 species with 8 being reported from Thailand for the first time whilst Sugiyama and

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Phanichapol (1984) provided an introduction to the Laboulbeniomycetes of Thailand.

Apart from this study of the Laboulbeniomyces (Sugiyama & Phanichapol, 1984) the only authors to have made significant contributions on ascomycetes of Thailand are Carroll (1963), Dissing (1963) and Schumacher (1982) and the majority of their records were from northern Thailand. It is apparent from the publications of Carroll (1963) and Schumacher (1982) that a range of Xylariaceae occur in northern Thailand. Carroll speculated that the relatively large number of records of Xylariaceae obtained in relation to other ascomycetes is possibly a result of their well developed and comparatively conspicuous stromata and as a consequence they are more readily observed (Carroll, 1963). It should, however, be noted that the family is very well represented in the tropics, including S.E. Asia (Joly, 1968; Rogers & al., 1987; Van der Gucht & Van der Veken, 1992; Van der Gucht, 1993; Whalley, 1993) and therefore a wide range of xylariaceous taxa could be expected to occur in Thailand. Carroll (1963) recorded species of *Xylaria* (10), *Hypoxylon* (2), *Daldinia* (2) and *Sarcoxylon* (1) whilst Schumacher (1982) noted the occurrence of 9 species of *Xylaria,* of which 4 had previously been recorded by Carroll (1963), plus *Daldinia concentrica* (Bolt. : Fr.) Ces. & De Not., not found by Carroll.

Following a survey of several localities during early March 1993 we now report on other members of the Xylariaceae from the Chanthaburi and Chon Buri provinces of Thailand, mainly species of *Hypoxylon* and *Biscogniauxia,* of which the majority are reported for the first time. A key to their identification is provided and comments given on their distribution, when known, in S.E. Asia and elsewhere.

Sites studied

Nam Tok Phliu, Chanthaburi Province. – This is part of the Khao Sabap hills to the north of Chanthaburi town in SE Thailand. The hill is part of a granite massif and has high rainfall which gives the area good evergreen forest approaching the rain forest of the Malay Peninsula. Much of the forest has been logged but is now regenerating. Collections were made mainly on the left bank of Phliu waterfall in an area dominated by old rubber trees.

Khao Kitchakut, Chanthaburi Province. – This is part of the same hill range that includes Khao Sabap and extends SE into Cambodia and it is a granite mountain rising to 1000 m. Sampling was along the river valley below step 4 of the 13 step Krathing Waterfall. Much of the forest here contained stands of bamboo reflecting the disturbed nature of the valley.

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Bang Saen, Chon Buri Province. – Dry scrub forest close to the coast at Bang Saen.

Key to species of *Biscogniauxia* and *Hypoxylon*

1. Stromata mostly erumpent through bark, applanate and without perithecial outlines except occasionally at the margin, irregular orbicular to elliptic or widely effused, grey, dull brown or black; apical apparatus amyloid and cubical to broad band shaped, ascospores smooth walled, dark brown with dorsally situated germ slit ..... (*Biscogniauxia*) 2
1. Stromata subglobose, pulvinate to widely effused often with clear perithecial outlines, on bark, decorticated wood or erumpent through bark, ectostroma shades of orange, red, purple, or brown, apical apparatus if present amyloid, triangular in optical section, ascospores with hyaline loosening epispore, germ slit dorsal and usually clearly visible and full length of spore ..... (*Hypoxylon* s. str.) 3

2. Stromata irregular, orbicular, grey to grey brown and dark brown at maturity, ascospores lemon shaped, 15–19 x 7–11 µm..... *B. citriformis* var. *macrospora*
2. Stromata elliptical, elongate elliptical to slightly effused, black at maturity, ascospores inequilaterally ellipsoid, 9–14 x 5–8 µm..... *B. nummularia* var. *pseudopachyloma*

3. Perithecial ostioles umbilicate or punctate in age..... 4
3. Perithecial ostioles papillate..... 7

4. Stromal surface bright red, reddish-brown, brownish-orange to bright orange, never purple 5
4. Stromal surface never bright red, ascospores 7.5–11.5 x 4–5 µm.... *H. rubiginosum*

5. Stromal surface bright red, reddish brown, perithecia soft and tubular, separating readily, ascospores 12.5–15 x 5–7.5 µm..... *H. haematostroma*
5. Stromal surface bright orange, brownish orange to rusty red, perithecia globose or slightly elongate when crowded, never tubular and easily separating 6

6. Ascospores 13.5–16.5 x 6–7.5 µm..... *H. crocopeplum*
6. Ascospores 8.5–12(-13.5) x 5 µm..... *H. subgilvum*

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7. Ostioles papillate, not surrounded by an ostiolar disk, stromata widely effused, brown, red brown then dark purplish-red to black with age, ascospores 7–9.5 x 3.5–5 µm ..... *H. investiens*
7. Ostioles papillate and situated in the centre of a flattened disk.. 8

8. Ostiolar disk minute, 0.1–0.2 mm in diam 9
8. Ostiolar disk 0.3–0.6 mm in diam.; ascospores 9–12 x 3–4 µm ..... *H. truncatum*

9. Stromata widely effused with flat to concave disks; ascospores 5–7 x 2–3.5 µm ..... *H. stygium*
9. Stromata widely effused with convex disks; ascospores 9–11 x 3.5–5 µm..... *H. archeri*

Biscogniauxia citriformis var. ***macrospora*** Van der Gucht & Whalley, Mycological Research 96: 896. 1992. – Fig. 1f.

Stromata erumpent, applanate to convex, irregular orbicular to elliptic, grey, grey-brown, dull dark brown at maturity, carbonaceous, ostioles sunken and punctate with age. – Perithecia ovate, 0.4–0.5 mm. diam. – Asci cylindrical, sporing part 112–140 x 12 with stipe 20–40 µm long, apical apparatus staining blue in Melzer's iodine reagent, cubical with tapering base, 3–5 µm wide x 2–3 µm high. – Ascospores dark brown, lemon-shaped, smooth walled with inconspicuous germ slit running almost full length of spore, 15–19 x 7-11 µm.

Specimen examined. – THAILAND: Chanthaburi Province, Nam Tok Phliu, Khao Sabap, on wood, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW).

This taxon was previously only known from Papua New Guinea (Van der Gucht, 1993) although *B. citriformis* has recently been found in Malaysia (Whalley, unpublished).

Biscogniauxia nummularia var. ***pseudopachyloma*** (J.H. Miller) Whalley, A.J.S. comb. nov.

= *Hypoxylon pseudopachyloma* Speg. Bol. Acad. Nac. Cienc. Cordoba 11: 203. 1887.
= *Hypoxylon nummularium* var. *pseudopachyloma* (Speg.) J. H. Miller, A Monograph of the World Species of Hypoxylon: 125. 1961.

Stromata erumpent from bark, orbicular to elongate elliptic, dark brown when young becoming very dark black and carbonaceous at maturity, applanate, 0.5–1.0 mm thick, ostioles papillate. – Perithecia globose to oblong, 0.2–0.5 mm in diam. – Asci

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cylindric, sporing part 70–90 x 8–10 µm with stipe 20–30 µm, apical apparatus blue in Melzer's reagent appearing as a broad band in optical section. – Ascospores uniseriate, narrow ellipsoid, black with smooth wall, germ slit running full length of the spore, 9–14 x 5–8 µm.

Specimen examined. – THAILAND: Chanthaburi Province, Khao Kitchakut, on fallen corticated branch, 5 Mar. 1993, AJSW & NH-J, (Herb. AJSW).

This is one of the tropical variants which in the general region has been reported from China, Java, Malaysia, Ceylon and the Philippines (Miller, 1961). Van der Gucht (1993) and Rogers & al. (1987) however, failed to record it from either Papua New Guinea or North Sulawesi (Indonesia).

Hypoxylon archeri Berk., Fl. of Tasmania II, in Hook., Bot. Antartic Voy. II:280. 1860. – Fig. 1e.

Stromata pulvinate, sometimes applanate and widely effused, often with almost free perithecia, surface tuberculate from projecting perithecia, black and becoming brittle when old. – Perithecia ovoid or elongated ovoid, 0.3–0.4 mm in diam., papillate ostioles arising from centre of minute disk, 0.1–0.2 mm in diam. – Asci cylindric, sporing part 70–84 x 7–8 µm with stipe 30–40 µm long, apical apparatus iodine positive and triangular in optical section. – Ascospores diagonally uniseriate, inequilaterally ellipsoid, smooth, with a straight germ slit running full length of the spores, dark brown, 9–11 x 3.5–5 µm, filiform paraphyses present.

Specimens examined. – THAILAND: Chanthaburi Province, Nam Tok Phliu, Khao Sabap, on wood, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW), Khao Kitchakut, on wood, 5 Mar. 1993, AJSW & NH-J, (Herb. AJSW), on twig, 5 Mar. 1993, AJSW & NH-J, (Herb. AJSW).

In the region this species has also been reported from China (Miller, 1961), Japan (Katumoto, 1978; Abe, 1984), and Australia (Whalley, unpublished). The collection from Khao Kitchakut consists of almost free perithecia. Katumoto also noted that this species is "often composed of entirely free perithecia and that it seemed to be a tropical element of the genus *Hypoxylon*" (Katumoto, 1978).

Hypoxylon crocopeplum Berk. & Curt., Grevillea 4: 49. 1875.

Stromata bright orange red, widely effused, plain to convex, or pulvinate, or consisting of small bunches of almost free perithecia when on bark, perithecial elevations conspicuous, blood red around

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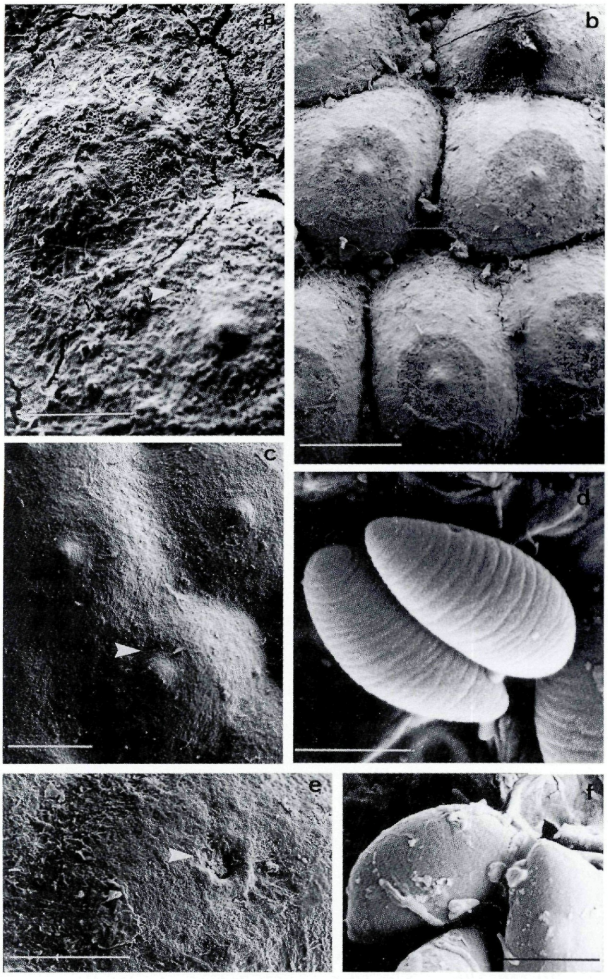

Fig. 1. – a. *Hypoxylon stygium*. Stroma with shallow disc arrowed. Bar 1.5 mm. – b. *Hypoxylon truncatum*. Stromata. Bar 5 mm. – c. *Hypoxylon archeri*. Stroma with small disc arrowed. Bar 3 mm. – d–e. *Hypoxylon investiens*. d. Ascospores. Bar 5 μm; e. Stroma with punctate ostiole arrowed. Bar 3 mm. – f. *Biscogniauxia citriformis* var. *macrospora*. Ascospores. Bar 10 μm.

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perithecial vertices but dark brown below. – Perithecia minute, 1.5–3 mm in diam., with umbilicate ostioles becoming punctate with age, semiglobose or elongated when compressed. – Asci cylindric, with amyloid apical apparatus triangular in outline, sporing part 75–90 x 8–14 µm with stipe 50–60 µm long. – Ascospores dark brown, inequilaterally ellipsoid with straight germ slit running full length of spore, 13.5–16.5 x 6.5–7.5 µm, by light microscopy smooth but examination by SEM reveals parallel to anastomosing rope-like ornamentation.

Specimen examined. – THAILAND: Chanthaburi Province, Khao Kitchakut, on wood and bark, 5 Mar. 1993, AJSW & NH-J, (Herb. AJSW).

Hypoxylon haematostroma Mont., Ramon de la Sagra, Fl. Cubana I: 344. 1842.

Stromata widely effused, orbicular plane to convex, surface smooth or with prominent perithecial elevations especially at the margin, bright red to yellow red, 2–5 mm thick. – Perithecia tubular, soft, easily separating, 0.3–0.5 mm wide and 1–2 mm high. – Asci cylindric sporing part 80–100 x 9–10 µm with stipe 30–50 µm long, apical apparatus iodine positive and triangular in shape. – Ascospores dark brown, obliquely uniseriate, inequilaterally ellipsoid with rounded ends and with straight germ slit running whole length of spore, smooth by light microscopy but by SEM seen to possess striate ornamentation running perpendicular to the long axis of the spore, 12.5–15 x 5–7.5 µm.

Specimens examined. – THAILAND: Chon Buri Province, Bang Saen, on wood, 4 Mar. 1993, EBGJ (Herb. AJSW), on wood, 4 Mar. 1993, EBGJ, (Herb. AJSW).

The ascospores of the Thai specimens are smaller than those given by Miller (1961) at 14–18 x 7–9 µm but correspond to the dimensions given by Martin (1969) and Van der Gucht & Van der Veken (1992). Carroll (1963) reported *H. haematostroma* from Doi Sutep, Chiang Mai Province with spore dimensions of 14.5–17.5 x 5.5–7.5 µm. Miller (1961) reported that this taxon occurs in most tropical countries.

Hypoxylon investiens (Schw.) Curt., Geol. & Nat. Hist. Survey, N.C. pt. III: 140. 1867. – Fig. 1d-e.

Stromata widely effused, applanate to convex, sometimes with bunches of almost free perithecia, which are either free and rosellinioid or immersed depending on the texture of the wood, wood

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frequently blackened over a wide area and characteristically outside of the stromal region, when young red to rusty reddish-brown, later dark brown to purplish-brown, to black when old, becoming slightly carbonaceous. – Perithecia ellipsoid to globose with small, often inconspicuous papillate ostioles, 0.3–0.5 mm in diam. – Asci cylindrical without an amyloid apical apparatus, sporing part 60–83 x 5-6 µm with stipe 30–60 µm long. – Ascospores uniseriate or obliquely uniseriate, inequilaterally ellipsoid, dark brown, with sigmoid germ slit running full length of spore, smooth by light microscopy but by SEM clearly ornamented with subparallel ribs which are transversely oriented, 7–9.5 x 3.5–5 µm.

Specimens examined. – THAILAND: Chanthaburi Province, Nam Tok Phliu, Khao Sabap. on wood, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW); on bark, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW), on wood, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW).

A very common and widely distributed species in the tropics and subtropics. The wood surrounding the stroma is often blackened. The spore dimensions of the Thai material is in close agreement with those quoted by Rogers & al. (1987) for their collections from North Sulawesi and those given by Van der Gucht and Van der Veken (1992) for their Papua New Guinea material. They are therefore smaller than those reported by Miller for this species i.e 8–11 x 3.5–5 µm. As reported by both Rogers & al. (1987) and Van der Gucht & Van der Veken (1992) there is a strong possibility of a small spored *H. investiens* occurring in the tropics.

Hypoxylon rubiginosum (Pers.: Fr.) Fr., Summa Veg. Scand.I: 384. 1849.

Stromata vary variable in form and colour depending on the substratum and degree of moisture, mainly widely effused, but occasionally pulvinate when on bark, surface powdery when fresh, purple red, dull brown, often black when old, perithecial projections barely visible but maybe prominent at the margin; entostroma dark brown. – Perithecia semiglobose or elongate when crowded, ostioles umbilicate, sometimes punctate with age. – Asci cylindric, apical apparatus blue in Melzer's reagent, reduced triangular or discoid in outline, sporing part 62–70 x 8–9 µm with stipe 20–29 µm. – Ascospores obliquely uniseriate, dark brown, inequilaterally ellipsoid, 7.5–11.5 x 4–5 µm, with straight full length germ slit.

Specimens examined. – THAILAND: Chanthaburi Province; Nam Tok Phliu, Khao Sabap, on wood, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW), on branch, 4 Mar. 1993, AJSW & NH-J, (Herb, AJSW).

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Hypoxylon rubiginosum is very variable and widely distributed throughout the World although there is increasing evidence that the taxon consists of several elements (Petrini & Müller, 1986; Rogers & al., 1987; Granmo & al., 1989). The material from Nam Tok Phliu, with its characteristic short stipe of the ascus, corresponds to *H. rubiginosum* var. *perforatum* (Schw.) L.E. Petrini. Van der Gucht and Van der Veken (1992) made similar observations for their material from Papua New Guinea.

Hypoxylon stygium (Lev.) Sacc., Syll. F. 1: 379. 1882. – Fig. 1a.

Stromata erumpent, frequently appearing superficial, variable in form from being irregularly pulvinate to smooth and widely effused, sometimes composed of almost free perithecia, developing as a thin reddish to reddish-slate colour which darkens with age until eventually black and carbonaceous, often with polished surface. – Perithecia minute, ovoid to globose. 0.1–0.3 mm diam., with papillate ostioles in the centre of very small annulate disks, 0.1–0.2 mm in diam. – Asci cylindric with very reduced iodine positive apical apparatus appearing as a triangular disk in optical section, sporing part 40–60 x 3–4 µm with stipe 15–20 µm in length. – Ascospores uniseriate or diagonally uniseriate, oblong to navicular, light to dark brown, 5–7 x 2–3.5 µm, numerous filiform paraphyses present.

Specimens examined. – THAILAND: Chanthaburi Province: Nam Tok Phliu, Khao Sabap, on wood, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW); on fallen branch, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW); on wood, 4 Mar. AJSW & NH-J, (Herb. AJSW), on wood, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW), on branch, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW), on wood, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW), on wood, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW), on wood, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW), on wood, 4 Mar. 1993, (Herb. AJSW); on branch, Khao Kitchakut, 4 Mar. 1993, AJSW & NH-J, (Herb. AJSW).

This taxon has the distinction of possessing the smallest spores and perithecia in the section Annulata. Young material is readily identified by its unusual and typical slate red colour. This species is extremely common in the tropics and in the region has been recorded from Malaysia, Philippines, Singapore, Java, (Miller, 1961; Whalley, 1993), Sulawesi (Rogers & al., 1987) and Papua New Guinea (Van der Gucht & Van der Veken, 1992). In Thailand it was frequently associated with freshly fallen branches with little sign of decay and often occurred in dry conditions.

Hypoxylon subgilvum Berk. & Br., J. Linn. Soc., Bot. 14: 120. 1873.

Stromata widely effused and plane with inconspicuous perithecial elevations or orbicular and pulvinate with prominent

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elevations, stroma initially bright yellow, becoming reddish-yellow, then deep red or rusty red, surface powdery, blood-red immediately beneath surface and between perithecial apices, soft to leathery in texture. – Perithecia semiglobose or oblong when crowded and compressed, 0.2–0.4 mm in diam., with umbilicate ostioles which become punctate in age. – Asci cylindric, sp. pt. 60–80 x 8–12 µm with stipe 50–75 µm long, apical apparatus blue in Melzer's reagent, triangular in optical section. – Ascospores obliquely uniseriate, inequilaterally ellipsoid to navicular, with full length germ slit, dark brown, smooth by light microscopy but ornamented with transversely oriented ribs by SEM, 8.5–12 (–13.75) x 5 µm.

Specimen examined. – THAILAND: Chon Buri Province, Bang Saen, on wood, 4 Mar. 1993, EBGJ, (Herb. AJSW).

The spore dimensions are in agreement with those given by Van der Gucht & Van der Veken (1992) and we accept the argument of Abe (1986) in resurrecting *H. subgilvum*.

Hypoxylon truncatum (Schw.: Fr.) Mill., Trans. Brit. myc. Soc. 17 : 130. 1932. – Fig. 1b.

Stromata variable, erumpent and pulvinate, often large and hemispherical, to widely effused and applanate, initially with a yellowish-green conidial layer, later dark brown and then finally black and brittle. – Perithecia conspicuous or inconspicuous, ostioles papillate in the centre of a shallow disk, 0.3-0.6 mm in diam., in some forms disk absent. – Asci cylindric, sporing part 60–90 x 6–7 µm with stipe 30–50 µm long, apical apparatus a reduced triangle in optical section, turning blue in Melzer's reagent. – Ascospores uniseriate to obliquely uniseriate, inequilaterally ellipsoid with rounded ends, dark brown, 9–12 x 3–4 µm with straight germ slit running full length of the spore. – Filiform paraphyses numerous.

Specimens examined. – THAILAND: Chantaburi Province: Khao Kitchakut, on wood and bark, 5 Mar. 1993, AJSW & NH-J, (Herb. AJSW), on wood, 5 Mar. 1993, AJSW & NH-J, (Herb. AJSW).

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References

Abe, Y. (1984). The tissue types of stromata in *Hypoxylon* and allied genera. – Trans. Mycol. Soc. Japan 25: 399–412.

— (1986). Notes on some common xylariaceous and diatrypaceous fungi on hardwoods in Japan II. *Hypoxylon hypomiltum* and its small spored variety. – Trans. Mycol. Soc. Japan 27: 51–56.

Brummelen, J. van (1967). A world–monograph of the genera *Ascobolus* and *Saccobolus* (Ascomycetes, Pezizales). – Persoonia, Suppl. 1: 1–260.

— (1969). Studies on Discomycetes III. – Persoonia 5: 225–231.

— (1976a). Some new species of *Saccobolus*. – Persoonia 8: 421–430.

— (1976b). A new genus of Pezizales from Thailand. – Kew Bull. 31: 617–620.

Carroll, G. (1963). Studies in the Flora of Thailand 24. Pyrenomycetes. – Dansk Bot. Arkiv 23: 101–114.

Cansrikul, A. (1977). Mushrooms in Thailand. – Thai Watanaphanich, Bangkok, 125 pp.

Dissing, H. (1963). Studies in the Flora of Thailand 25. Discomycetes and Gasteromycetes. – Dansk Bot. Arkiv 23: 117–130.

Ellingsen, H.–J. (1982). Some gasteromycetes from Northern Thailand. – Nordic J. Bot. 2: 283–285.

Granmo, A., D. Hammelev, H. Knudsen, T. Laessoe, M. Sasa & A. J. S. Whalley (1989). The genera *Biscogniauxia* and *Hypoxylon* (Sphaeriales) in the Nordic countries. – Opera Bot. 100: 59–84.

Hawksworth, D. L. (1991). The fungal dimension of biodiversity: magnitude, significance, and conservation. – Mycol. Res. 95: 641–655.

— (1993). The tropical fungal biota: census, pertinence, prophylaxis and prognosis. – In: Isaac, S., J. C. Frankland, R. Watling & A. J. S. Whalley (eds). Aspects of Tropical Mycology. Cambridge University Press. Cambridge. UK: 265–293.

Heim, R. (1962). Contribution a la flore mycologique de la Thailande (1ère partie). – Rev. Mycol. (Paris) 27: 123–158.

Høiland, K. & T. Schumacher (1982). Agarics, clavarioid and some heterobasidiomycetous fungi from Northern Thailand. – Nordic J. Bot. 2: 265–271.

Hjørtstam, K. & L. Ryvarden (1982). Aphyllophorales from Northern Thailand. – Nordic J. Bot. 2: 273–281.

Joly, P. (1968). Eléments de la flore mycologique du Viet–Nam, (Troisième contribution: A propos de quelques Xylarias). – Rev. Mycol. (Paris) 33: 155–207.

Katumoto, K. (1978). Notes on some *Hypoxylon* species from Japan. – Bull. Fac. Agric. Yamaguti University No.29: 47–64.

Massee, G. (1902). Fungi. Agaricinaceae. – In Schmidt, J. (ed.). Flora of Koh Chang. Contribution to the knowledge of the vegetation in the Gulf of Siam, Part 6. Bot. Tidsskr. 24: 363–367.

Martin, P. (1969). Studies in the Xylariaceae. V. *Euhypoxylon*. – S. Afr. J. Bot. 35: 149–206.

Miller, J. H. (1961). A monograph of the world species of *Hypoxylon*. – University of Georgia Press, Athens, USA.

Petrini, L. E. & E. Müller (1986). Haupt– und Nebenfruchtformen europaischer *Hypoxylon*–arten (Xylariaceae, Sphaeriales) und verwandter Pilze. – Mycologia Helvetica 1: 501–627.

Phanichapol, D. (1968). Check–list of fungi in the Forest Herbarium. – Nat. Hist. Bull. Siam Soc. 22: 263–269.

Rogers, J. D., B. E. Callan & G. J. Samuels (1987). The Xylariaceae of the rain forests of North Sulawesi (Indonesia). – Mycotaxon 22: 367–374.

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Rostrup, E. (1902). Fungi. – In: Schmidt, J. (ed.), Flora of Koh Chang. Contribution to the knowledge of the vegetation in the Gulf of Siam, Part 6. Bot. Tidsskr. 24: 355–363.

Schumacher, T. (1982). Ascomycetes from Northern Thailand. – Nordic J. Bot. 2: 257–263.

Sugiyama, K. & D. Phanichapol (1984). Laboulbeniomyces (Ascomycotina) in Thailand. 1. – Nat. Hist. Bull. Siam Soc. 32: 47–88.

Van der Gucht, K. (1993). Contribution towards a revision of the genera *Camillea* and *Biscogniauxia* (Xylariaceae, Ascomycetes) from Papua New Guinea. – Mycotaxon 45: 259–273.

Van der Gucht, K. & P. Van der Veken (1992). Contribution towards a revision of the genus *Hypoxylon* s. str. (Xylariaceae, ascomycetes) from Papua New Guinea. – Mycotaxon 44: 275–299.

Whalley, A. J. S. (1993). Tropical Xylariaceae: their distribution and ecological situation. – In: Isaac, S., J. C. Frankland, R. Watling & A. J. S. Whalley (eds). Aspects of Tropical Mycology. Cambridge University Press. Cambridge. UK. pp. 103–119.

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