APPENDIX A

1.Subgenus *Lepidella* Section *Amidella* (E. J. Gilbert) Konrad & Maubl.

Figure A 1 ***Amanita avellaneosquamosa*** **(S. Imai) S. Imai**

Study site: Mae Orn, 16 July 2003

Basidiocarps medium-sized. Pileus 4.0-8.0 cm in diameter, convex to plane, slightly appressed at centre, margin striate(0.2-0.3R), non-appendiculate,whitish,volval remnants farinose or as floccose, small patches, cream to yellowish brown. Lamellae free, white to whitish, subcrowded; lamellulae truncate. Stipe 4.0–7.0 x 0.7–2.0 cm, slightly tapering upward, white to cream, farinose to floccose, white; trama white to whitish. Annulus fugacious. Volva 1.6-3.0 x 1.5–3.0 cm, yellowhish brown, saccate, membranous. Smell strong, unpleasant Spore print white.

Basidiospores (5.8-) 7.0-10.5 (-12.0) x (4.0-) 5.0-6.5 (-7.0) µm , ellipsoid to elongate, rarely cylindrical, amyloid, colorless, hyaline, thin–walled, smooth; apiculus small. Found solitary on ground in *Fagaceae* and Pinaceae forests. See further for general description in Tulloss and Yang (2004).

2 Subgenus *Lepidella* Section *Lepidella*

Figure A 2 ***Amanita castanopsis*** Hongo

Study site: Mae Rim, 7 June 2003

Basidiocarps medium to large. Pileus 5.0-12.0 cm in diameter, covex to applanate white, and covered with white to dirty white conical to conical to sub-pyramidal volva remnants 0.2-0.5 cm high and 0.2-0.8 cm wide at base,; margin non-striate, appendiculate. Lamellae free to subfree, crowded, white to cream; lamellulae attenuate. Stipe 7.5-13.0 x 1.2-2.8 cm, clavate-bulbous, 2.5-4.5 cm wide, dirty white, apex often brownish, with conic warts on upper bulbous base. Annulus fragile, with upper surface white. Trama white, unchanging.

Basidiospores (8.0-)9.0-11.0(-12.5) x (5.0-) 6.0 – 7.0 (-7.5) µm, ellipsoid to elongate, amyloid, colorless, hyaline, thin-walled, smooth. Found gregarious on ground in forest of *Fagaceae*. See further for general description in Tulloss (2004).

Figure A 3 ***Amanita cokeri***
Study site: San Kamphaeng, 6 September 2004

Basidiocarps medium to large. Pileus 8.0–15.0 cm in diameter, at first hemispherical, later covex to plano convex; margin non-striate, appendiculate, shite to ivory, shiny, viscid when wet; volval remnants as conic warts 1.5-4.0 cm high, 1.5-3.5 cm wide, whitish to dull yellowish to brownish, diminishing in size (with color paler) towards marfgin. Lamellae free, crowded, white with a slight yellowish or pinkish tinge, up to 0.9 cm wide; lamellulae subtruncate to attenuate. Stipe 8.0-18.0 x 1.2-2.2 cm, clavate-bulbous, 2.0-5.0 cm wide, dirty white, apex often brownish, floccose to squamulose, with conic warts on upper bulbous base. Annulus fragile, with upper surface white and radially striate, with lower surface white to dirty white, verrucose. Trama white, unchanging, solid.

Basidiospores (9.0-)10.5-13.0 x (5.0-)6.5–7.0 µm, ellipsoid to elongate, amyloid, colorless, hyaline, thin-walled, smooth. Found gregarious on ground in forest of *Fagaceae*. See further for general description in Tulloss (2004).

Figture A 4 ***Amanita hongoi*** **Bas**

Study site: Doi Saket, 3 July 2004

Basidiocarps medium to large. Pileus 4.5–9.0 cm in diameter, covex to plano convex; margin non-striate, appendiculate, white to brownish to dull yellowish over center, paler toward margin(whitish to pale brown), dry; volval remnants as conic warts 0.1– 0.3 cm high, 0.1-0.3 cm wide, whitish to dull yellowish to brownish, diminishing in size (with color paler) towards margin. Lamellae free, crowded, white to cream; lamellulae attenuate. Stipe 7.0–6.0 x 1.0–2.0 cm, clavate-bulbous, 2.7-4.8 cm wide, dirty white, apex often brownish, floccose to squamulose, with conic warts on upper bulbous base.

Basidiospores 7.5-9.5 x (6.5-) 7.0–7.5 (-9.0) µm, subglobose to broadly ellipsoid, sometimes globose, amyloid, colorless, hyaline, thin-walled, smooth. Found gregarious on ground in forest of *Fagaceae*. See further for general description in Tulloss (2004).

Figure A 5 ***Amanita gymnopus***
Study site: Mae Orn, 30 July 2005

Basidiocarps medium to large. Pileus 5.0-11.0 cm in diameter, covex to plano convex, and often subumbonate; margin non-striate, appendiculate, brownish to dull yellowish over centre, paler toward margin(whitish to pale brown), dry; volval remnants as thin, submembranous, scattered patches(white to brownish ochraceous).Lamellae free, rather crowded, 0.5-1.0 cm broad, thick, pale ochraceous cream to deep ochraceous; lamellulae rounded-attenuate. Stipe 6.0-14.0 x 0.7-1.2 cm, clavate-bulbous, 1.6-2.5 cm wide, often decorated with rhizoids, dirty white, apex often brownish, floccose to squamulose, with conic warts on upper bulbous base. Trama white, unchanging, solid.

Basidiospores 5.0-7.0 x (5.0-)6.5 µm, subglobose to broadly ellipsoid, sometimes globose, amyloid, colorless, hyaline, thin-walled, smooth. Found gregarious on ground in forest of *Fagaceae*. See further for general description in Tulloss (2004).

Figure A 6 ***Amanita*** **sp.**
Study site: Mae Wang, 11 September 2003

Basidiocarps medium–sized. Pileus 6.0-9.5 cm in diameter, convex to plane, greyish browin; margin non-striate, non-appendiculate; volva lacking. Lamellae free, crowded, 7-9 lamellae/cm, white; lamellulae attenuate. Stipe 7-12.5 x 0.5-1.5 cm slightly tapering upward, paler grey, covered with greyish black, fibrillose, subbulbous at base, 1.5-3.0 cm wide; upper part of bulb covered with blackish grey, floccose patches, ringed; trama white to whitish. Annulus lacking. Spore print white.

Basidiospores (6.5-) 7.0-9.0 (-10.0) x (5.0-) 5.5-7.0 (-8.5) µm, broadly ellipsoid, amyloid, colorless, hyaline, thin-walled, smooth. Found solitary or gregarious on ground in forests with *Fagaceae* and *Dipterocarpaceae*.

Figure A 7 ***Amanita thiersii*** Bas
Study site: Mae Wang, 28 July 2003

Basidiocarps medium–sized. Pileus 3.0-10.0 cm in diameter, convex to conico-convex to plano-convex, mostly with a low, broad umbo, white, dry, sometimes slightly viscid with age; margin non-sulcate, appendiculate; at first the pileus flesh up to 1.0 cm thick, covered by soft, subpulverulent,lanose-floccose, squamulose, white volva; later becoming more or less glabrous with scattered, floccose-fibrillose to felted, patch-or scale-like, at center sometimes wart-like remnants of volva. Lamellae free, crowded to subdistant, white to yellowish cream; lamellulae attenuate to subtruncate to rounded-truncate, of many lengths, unevenly distributed, and rather common to plentiful. Stipe 7.5-12.5 x 1.0-1.5 cm slightly tappering upward, paler brown, covered with yellowish brown, fibrillose, subbulbous at base, 1.5-2.0 cm wide.

Basidiospores (7.2-)7.8-9.8 (-10.0)x(7.0-) 7.5-9.0 (-10.0) µm, globose to subglobose, amyloid, colorless, hyaline, thin-walled, smooth.Found solitary or gregarious on ground in forests with *Fagaceae*, Dipterocarpaceae and Pinus. See further for general description in Horn *et al*.(1993)

Figture A 8 ***Amanita virgineoides*** **Bas**

Study site: Mae Orn, 1 July 2003

Basidiocarps medium to large. Pileus 7.0-15.5 cm in diameter, convex to plane, margin non-striate, appendiculate, white, densely covered with white conic to subconic warts, 0.1-0.3 cm high, easy falling when touched. Lamellae free, white crowded, 8-10 lamellae/cm, rather broad, approx. 0.9 cm wide; lamellulae attenuate. Stipe 10.0-20.0 x 1.5-2.0 cm, equal with bulbous base, 4.0-5.0 cm wide, white, covered with white squamules. Trama white, solid. Annulus white, membranous, descending, fragile, soon falling to pieces. Spore print white.

Basidiospores (7.0-) 8.0-10.0 (-12.0) x (5.0-) 6.0-7.0(-9.0) µm, broadly ellipsoid to ellipsoid, amyloid, colorless, hyaline, thin-walled, smooth. Found solitary or gregarious. Terrestrial in *Fagaceae* forest. See further for general description in Bas(1969).

Figure A 9 ***Amanita virginea***

Study site: Mae Orn, 12 June 2003

Basidiocarps medium to large. Pileus 10.0-16.0 cm in diameter, covex, then plane or slightly concave, dry, white, smooth, glabrous, margin non-striate, appendiculate; covered with a thin, soft, mealy, white layer, and set with hard, conical, white, separable warts. volval remnants as conic warts. Lamellae free, crowded, broad, and white to cream; lamellulae attenuate. Stipe 6.0-10.6 x 2.0-5.0 cm, clavate-bulbous, 2.4-4.8 cm wide, white, mealy, with small, transverse scales up to the apex.

Basidiospores 7.0-9.0 x (6.0-) 6.5 – 7.0 (-8.0) µm, broadly ellipsoid, amyloid. Found gregarious on ground in forest of *Fagaceae*. See further for general description in Bas(1969).

3. Subgenus *Lepidella* Section *Phalloideae* (Fr.) Quel.

Figture A 10 ***Amanita arocheae*** **Tulloss**

Study site: Mae Orn, 16 July 2003

Basidiocarps medium-sized. Pileus 6.0-10.0 cm in diameter, convex to plane, margin non-striate, slightly appendiculate, dark brown to blackish, innate fibrillose, broadly small umbo, glabrous. Lamellae free, white, subcrowded; lamellulae attenuate. Stipe 7.0-13.0 x 0.5-1.8 cm, equal, slightly tapering upward, apex slightly expanded, dirty white with grey, solid; trama white. Annulus lacking. Volva limbate, 3.0-4.5 x 2.5-3.5 cm, white, membranous.

Basidiospores 6.0-8.0 (-10.0) x (6.5-)7.0-8.0 (-9.5) µm , globose to subglobose, amyloid, colorless, hyaline, thin-walled, smooth. Found solitary on ground in *Fagaceae* forest. See further for general description in Tulloss and Yang (2004).

Figure A 11 ***Amanita phalloides*** # 1

Study site: San Kamphaeng, 1 July 2004

Basidiocarps medium to large. Pileus 5.5-14.5 cm in diameter, convex to plane, white, margin non-striate, appendiculate, no warts, yellowish-green to greenish-brown, paler toward margin, with flattened radiaing hairs, Lamellae free or attached to stalk by a line, white, 9 gills / cm; Stipe 7.5-15.0 x 0.8-2.0 cm., enlarging downward to basal bulb; annulus, superior, pendant, membranous, persistant, white. Volva, high, membranous persistent, saclike, white, white spore print.

Basidiospores 8.0-11.0 x 7.0-9.0 μm, with distanct apiculas subglobose, thin wall, amyloid. Found solitary or gregarious on ground in forests of *Dipterocarpaceae* or *Fagaceae*. See further for general description in Bresinsky and Besl, 1990.

Figure A 12 ***Amanita phalloides*** # 2
Study site: San Kamphaeng, 6 July 2004

Basidiocarps medium to large. Pileus 6.0-13.0 cm in diameter, convex to plane, white to cream, margin non-striate, appendiculate, no wart, greyish to brown. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-14.0 x 1.0-1.5 cm, white, slightly tapering upward, trama white. Annulus white, membranous, apical to subapical. Volva 4.0-6.0 x 2.5-5 cm, white, membranous, saccate. Spore print white to cream.

Basidiospores 9.0-11.0 (-13.0) x (7.0-) 8.0 –10.5 (-11.0) µm, globose, subglobose to broadly ellipsoid, amyloid, colorless, hyaline, thin-walled, smooth.
Found solitary or gregarious on ground in forests of *Dipterocarpaceae* or *Fagaceae.*
See further for general description in Bresinsky and Besl, 1990.

Figure A 13 ***Amanita phalloides*** # 3

Study site: San Kamphaeng, 30 July 2005

Basidiocarps medium to large. Pileus 4.5-14.0 cm in diameter, convex to plane, white to grey, margin non-striate, appendiculate, no warts, yellowish-green to greenish-brown, paler toward margin, with flattened radiaing hairs, Lamellae free or attached to stalk by a line, white, 9 gills / cm; Stipe 7.0-15.0 x 0.8-2.5 cm., enlarging downward to basal bulb; annulus, superior, pendant, membranous, persistant, white. Volva, high, membranous persistent, saclike, white, white spore print.

Basidiospores 8.0-10.0 x 7.0-9.5 µm, with distanct apiculas subglobose, thin walled, amyloid. Found solitary or gregarious on ground in forests of *Dipterocarpaceae* or *Fagaceae.* See further for general description in Bresinsky and Besl, 1990.

Figure A 14 ***Amanita phalloides*** # 4

Study site: Mae Orn, 6 July 2004

Basidiocarps medium to large. Pileus 5.5-13.5 cm in diameter, convex to plane, white, margin non-striate, appendiculate, no warts, whitish to cream, paler toward margin. Lamellae free or attached to stalk by a line, white, 9 gills / cm. Stipe 8.0-14.0 x 0.8-2.5 cm., enlarging downward to basal bulb; annulus, superior, pendant, membranous, persistant, white. Volva, high, membranous persistent, saclike, white, white spore print.

Basidiospores 8.0-11.5 x 7.5-10.0 µm, with distanct apiculas subglobose, thin walled, amyloid. Found solitary or gregarious on ground in forests of *Dipterocarpaceae* or *Fagaceae.* See further for general description in Bresinsky and Besl, 1990.

Figure A 15 ***Amanita phalloides*** # 5

Study site: Mae Wang, 1 July 2004

Basidiocarps medium to large. Pileus 5.0-14.5 cm in diameter, convex to plane, whitish to grey, margin non-striate, appendiculate, no warts, whitish-cream to greyish, paler toward margin. Lamellae free or attached to stalk by a line, white, 9 gills / cm. Stipe 7.0-15.0 x 0.8-3.0 cm., enlarging downward to basal bulb; annulus, superior, pendant, membranous, persistant, white. Volva, high, membranous persistent, saclike, white, white spore print.

Basidiospores 7.0-11.0 x 7.0-9.5 µm, with distanct apiculas subglobose, thin walled, amyloid. Found solitary or gregarious on ground in forests of *Dipterocarpaceae* or *Fagaceae.* See further for general description in Bresinsky and Besl, 1990.

Figure A 16 ***Amanita pseudoporphyria*** **Hongo**

Study site: Doi Saket, 11 June 2003

Basidiocarps medium-sized to large. Pileius 6.0 – 14.0 cm wide, convex to applanate, redish to brown, innately fibrillose, covered with dirty white to greyish, conical to verrucose warts, 1.0 - 4.0 mm high and wide; margin non-striate, appendiculate, white. Lamella free to subfree, white; lamellulae attenuate. Stipe is 10.0–16.0 x 1.0–2.5 cm, cylindric or attenuate upwards, with its surface white to dirty white, covered with white fibrillose squamules; Stipe's basal bulb 1.0 – 3.5 cm wide, conical volval remnants in a few concentric incomplete rings. Annulus apical to subapical, membranous, and white.

Basidiospores (7.0-)7.5-9.5(-11.0)x(5.5-)6.0-7.0 (-8.0) µm, broadly ellipsoid to ellipsoid, amyloid. Found gregarious on ground in *Dipterocarpaceae* and *Fagaceae.* See further for general description in Tulloss and Yang (2004).

Figure A 17 ***Amanita verna*** # 1

Study site: Mae Orn, 30 July 2005

Basidiocarps medium to large. Pileus 5.5-12.5 cm in diameter, convex to plane, white, margin non-striate, appendiculate, glabrous, dry. Lamellae free, white, crowded; lamellulae truncate. Stipe 7.5-15.0 x 0.8-2.0 cm, white, slightly tapering upward, apex slightly expanded, trama white. Annulus white, membranous, apical to subapical. Volva 4.0-6.0 x 2.5-5.0 cm, white, membranous, saccate. Spore print white to cream.

Basidiospores 8.0-11.0 x 7.0- 9.0 µm, globose, subglobose to broadly ellipsoid, rarely ellipsoid, amyloid, colorless, hyaline, thin-walled, smooth. Found solitary or gregarious on ground in forests of *Dipterocarpaceae* or *Fagaceae.*
See further for general description in Bresinsky and Besl, 1990.

Figure A 18 ***Amantia verna*** # 2
Study site: Mae Orn, 16 July 2003

Basidiocarps medium to large. Pileus 6.0-13.0 cm in diameter, convex to plane, white to lihgt brown, margin non-striate, appendiculate. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-14.0 x 1.0-2.5 cm, white, slightly tapering upward, apex slightly expanded; trama white. Annulus white, membranous, apical to subapical. Volva 4.0-6.0 x 2.5-5.0 cm, white, membranous, saccate. Spore print white.

Basidiospores 9.0-11.0 (-13.0) x (7.0-) 8.0 –10.5 (-11.0) µm, globose, subglobose to broadly ellipsoid, amyloid, hyaline, thin-walled, smooth, with large prominent apiculus. Found solitary or gregarious on ground in forests of *Dipterocarpaceae* or *Fagaceae.* See further for general description in Bresinsky and Besl, 1990.

Figure A 19 ***Amanita verna*** # 3
Study site: Mae Orn, 16 July 2003

Basidiocarps medium to large. Pileus 6.0-13.5 cm in diameter, convex to plane, white to grey, margin non-striate, appendiculate. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-14.5 x 1.5-2.5 cm, white, slightly tapering upward, apex slightly expanded, trama white. Annulus white, membranous, apical to subapical. Volva 4.0-6.0 x 2.5-4.5 cm, white, membranous, saccate. Spore print white.

Basidiospores 8.6-11.0 (-12.5) x (7.0-) 8.0 –10.5 (-11.0) µm, globose, subglobose to broadly ellipsoid, amyloid, colorless, thin-walled, smooth, with large prominent apiculus. Found solitary or gregarious on ground in forests of *Dipterocarpaceae* or *Fagaceae.* See further for general description in Bresinsky and Besl, 1990.

Figure A 20 ***Amanita virosa*** # 1

Study site: Mae Orn, 16 July 2003

Basidiocarps medium to large. Pileus 6.0-15.0 cm in diameter, convex to plane, white, margin non-striate, appendiculate, glabrous, dry. Lamellae free, white, crowded; lamellulae truncate. Stipe 7.5-15.0 x 0.8-2.5 cm, white, slightly tapering upward, apex slightly expanded bulb present; trama white. Annulus white, membranous, apical to subapical. Volva 4-6 x 2.5-4.5 cm, white, membranous, saccate. Spore print white to cream.

Basidiospores 7.5-9.0 x 9.0 -11.0 µm, globose, subglobose, amyloid, hyaline, thin-walled, smooth, with large prominent apiculus. Found solitary or gregarious on ground in forests of *Dipterocarpaceae* or *Fagaceae*. See further for general description in Bresinsky and Besl, 1990.

Figure A 21 ***Amanita virosa* # 2**
Study site: Mae Wang, 1 July 2004

Basidiocarps medium to large. Pileus 6.0-13.5 cm in diameter, convex to plane, white, margin non-striate, appendiculate. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0 -14.5 x 1.6 - 3.0 cm, white, slightly tapering upward, apex slightly expanded, stuffed with white cottony material; trama white. Annulus white, membranous, apical to subapical. Volva 4.0-6.0 x 2.5-4.5 cm, white, membranous, saccate. Spore print white.

Basidiospores 8.5-1.0(-12.5)x(7.0-)8.0–10.5 (-11.5) µm, globose, amyloid, colorless, hyaline, thin-walled, smooth, with large prominent apiculus. Found solitary or gregarious on ground in forests of *Dipterocarpaceae* or *Fagaceae.* See further for general description in Bresinsky and Besl, 1990.

Figure A 22 ***Amanita subjunquillea***

Study site: Mae Orn, 31 July 2005

Basidiocarps medium-sized. Pileus 4.0 x 6.0 cm in diameter, convex to plane, concave, margin non-striate, non-appendiculate, yellowish to orange over centre, paler toward margin, curry-yellow, glabrous, viscid when wet. Lamellae free, creamy to yellow, crowded (approx. 7 lamellae/cm); lamellulae truncate. Stipe 6.0-12.5 x 0.6-2.5 cm, equal, slightly tapering upwards, apex slightly expanded, yellow to pale yellow, fibrillose zones below annulus, pale orange, stuffed with white, yellowish cottony material to hollow ; trama white. Annulus yellow to pale orange, thin, membranous, apical, descending, easily collapsed. Volva 2.0-4.0 x 1.5-2.5 cm, white, saccate, membranous. Spore print white.

Basidiospores (6.5-) 6.8-8.8 (-9.6) x (5.5-) 6.0-7.9 (-9.2) µm, globose to subglobose to broadly ellipsoid, amyloid. Found gregarious on ground in *Dipterocarpaceae* and *Fagaceae* forests. See further for general description in Tulloss and Yang (2004).

4. Subgenus *Lepidella* Section *Validae* (Fr.)Quel.

Figure A 23 *Amanita brunnescens* G.F. Atk
Study site: Mae Wang, 1 July 2004

Basidocarps medium to large. Pileus 6.0-13.0 cm in diameter, at first bell-shaped, then convex, and finally planar with and umbo, reddish fawn or redish-brown, margin non-striate, appendiculate, glabrous, dry. Lamellae, white, free, subcrowded, 10 lamellae/cm, and with slightly fimbriate edges; lamellulae attenuate. Stipe 6.0-12.0 x 2.0-3.0 cm, white, cylindric or narrowing upward, apex slightly expanded, stuffed with white cottony material to hollow, bulb absent; trama white. Annulus white, membranous, apical. Volva 4.0-6.0 x 2.5-5.0 cm, white, membranous, saccate. Spore print white.

Basidiospores (7.0-)8.0-9.0(-10.0) x (6.0-) 7.0–8.5 (-9.0) µm, globose, subglobose to broadly ellipsoid, amyloid. Found subgregarius on ground in forest of *Fagaceae*. See further for general description in Tulloss and Yang (2004).

Figture A 24 ***Amanita fritillaria*** **(Berk.) Sacc**

Study site: San Kamphaeng, 19 May 2004

Basidiocarps small to medium–sized. Pileus 4.0-10.0 cm in diameter, convex to applanate, greyish brown; margin striate(0.1-0.2 R), non-appendiculate; volval remnants as floccose patches, dark brown to fuscous, diminishing toward margin. Lamellae free, crowded, approx. 10-12 lamellae/cm, white; lamellulae attenuate. Stipe 5.0-10.0 x 0.5-1.5 cm slightly tapering upward, paler brown, covered with greyish brown, fibrillose, subbulbous at base, 1.2-2.0 cm wide; upper part of bulb covered with blackish brown, floccose patches, ringed; trama white to whitish. Annulus greyish brown, membranous, apical. Spore print white.

Basidospores 7.0-9.0 (-12.0) x (5.0-) 6.0-7.0 (-8.0) µm, broadly ellipsoid, sometimes subglobose, amyloid, colorless, hyaline, thin-walled, smooth. Found solitary or gregarious on ground in forests with *Fagaceae* and *Dipterocarpaceae*. See further for general description in Sanmee(2004), Tulloss and Yang (2004).

Figure A 25 ***Amanita spissacea*** **Imai**

Study site: Mae Rim, 1 August 2004

Basidiocarps medium-sized. Pileus 4.0-8.0 cm in diameter, convex to plane, brown, striate margin (0.2-0.4 R), non-appendiculate, glabrous, viscid. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-10.5 x 1.2-1.8 cm, slightly tapering upward, with apex slightly expanded, brownish, fibrillose to floccose, hollow; trama white. Annulus lacking. Volva absent.

Basidiospores (8.0-) 9.0-10.5 (-12.5) x (6.0-) 7.0-9.0 (-10.0) µm, broadly ellipsoid to ellipsoid, rarely subglobose or elongate, amyloid, colorless hyaline, thin-walled, smooth. Found solitary or gregarious on ground in forests with *Fagaceae* and *Dipterocarpaceae*. See further for general description in Tulloss and Yang (2004).

Figture A 26 ***Amanita xanthella*** **Coner and Bas**

Study site: Mae Orn, 16 July 2003

Basidiocarps small-sized. Pileus 2.0-4.0 cm in diameter, plane with depressed centre, cinnamon-buff, paler toward margin, with margin striate (0.2 R), non-appendiculate, with volval remnants as yellowish pyramidal warts, 0.1 cm wide, 0.1 cm high. Lamellae free, subcrowded, white to whitish, thin; lamellulae truncate. Stipe 4.5-6.0 x 0.5–0.6 cm, cream, tapering upward, with apex slightly expanded, hollow, with 1.3 cm solid subbulous base, with yellow warts on upper bulbous base; trama white to whitish. Annulus lacking.

Basidiospores (6.0-) 8.0-9.0 x 7.0–8.0 (-9.0) µm , globose to subglobose, rarely broadly ellipsoid, amyloid, colorless, hyaline, thin-walled, smooth. Found solitary on ground in Fagaceae forest. See further for general description in Sanmee (2004), Tulloss and Yang (2004).

5. Subgenus *Amanita* Section *Amanita*

Figure A 27 *Amanita cecilliae*

Study site: Mae Wang, 8 July 2003

Basidiocarps medium–sized. Pileus 4.0-8.0 cm in diameter, convex to plane, greyish browin; margin striate(0.1-0.2 R), non-appendiculate; volval remnants as floccose patches, dark brown to fuscous, diminishing toward margin. Lamellae free, crowded, 8-10 lamellae/cm, white; lamellulae attenuate. Stipe 6.0-10.5 x 0.5-1.5 cm slightly tapering upward, brown, covered with greyish brown, fibrillose, subbulbous at base, 1.5-2.0 cm wide; upper part of bulb covered with blackish brown, floccose patches, ringed; trama white to whitish. Annulus greyish brown, membranous, apical. Spore print white.

Basidospores (6.5-) 7.0-9.0 (-10.0) x (5.0-) 5.5-7.0 (-8.5) µm, broadly ellipsoid, sometimes subglobose or ellipsoid, inamyloid, colorless, hyaline, thin-walled, smooth.Found solitary or gregarious on ground in forests with *Fagaceae, Dipterocarpaceae* and Pinus. See further for general description in Imazeki and Hongo (1998).

Figure A 28 ***Amanita concentrica***

Study site: Mae Wang, 8 July 2003

Basidiocarps medium to large-sized. Pileus up to 8.0 cm in diameter, convex, white to cream with its center; margin striate, non-appendiculate, pyramidal volval warts on the pileus white. Lamellae white to yellowish white with a minutely fibrillose edge.Stipe 8.0-10.0 × 0.7-1.2 cm, slender, narrowing upward, white, covered with creamy white flocculence. Annulus white.

Basidiospores (7.0-) 7.2-0.8 (-15.5) × (5.8-) 6.5-9.5 (-11.0) µm, subglobose to broadly ellipsoid and inamyloid. Found solitary or gregarious on ground in forests with *Fagaceae* and *Dipterocarpaceae.*See further for general description in Tulloss and Yang (2004).

Figure A 29 ***Amanita farinosa*** **Schwein**

Study site: Mae Wang, 19 July 2003

Basidiocarps small to medium-sized. Pileus 4.0-6.0 cm in diameter, convex to plane, brownish gray with the disc sometimes darker and browner than the rest, cover with brownish gray powder; margin striate, non-appendiculate. Volva absent. Lamellae narrowly adnate, close to subcrowded, white to off-white, 4.0-7.0 mm broad and, occasionally exhibit forking; lamellulae truncate to rounded truncate. Stipe is 4.5–6.0 x 0.5 – 0.8 cm., small bulb (1.5–1.8 x 0.8 –0.9 cm).

Basidiospores (6.0-)6.5-8.8(-10.5)x(5.0-)5.5-7.0 (-9.0) µm, subglobose to ellipsoid, inamyloid. Found solitary or gregarious on ground in forests with *Fagaceae*, *Dipterocarpaceae* and Pinus. See further for general description in Tulloss and Yang (2004).

Figture A 30 ***Amanita obsita*** **Corner & Bas**

Study site: San Kamphaeng , 27 July 2005

Basidocarps very small to small. Pileus 2.5-4.0 cm in diameter, convex to plane, concave, greyish brown, darker at disc, paler toward a striate margin (0.4-0.5 R), non appendiculate, slightly appressed at centre, volval remnants as farinose. Lamellae white, free, subcrowded, 0.3-0.4 cm wide; lamellulae truncate. Stipe 2.5-4.5 x 0.2-0.3 cm, brownish, equal, apex slightly expanded, subbulbous at base, 0.4-0.5 cm wide, upper part covered with greyish brown, farinose, ringed; trama white. Annulus lacking.

Basidiospores (5.0-) 6.5-7.0 x 5.5 –6.5 (-7.0) µm, globose to subglobose, inamyloid, colorless, hyaline, thin-walled, smooth.Found solitary on ground in forest dominated by Shorea. See further for general description in Tulloss and Yang (2004).

Figure A 31 ***Amanita siamensis***
Study site: Mae Orn, 16 July 2003

Basidiocarps small to medium-size. Pileus 4.5-7.5 cm in diameter, convex to plano-convex, with low broad umbo at disc, greenish yellow to olivaceous buff, with a greyish brown disc; volval remnants farinose or as floccose patches, cinnamon buff; margin striate (0.2-0.4R), slightly reflexed, non appendiculate. Lamellae free, white, crowded, farinose at edge; lamellulae truncate to subtruncate. Stipe 6.0-10.0 x 0.8-1.2 cm, subcylindrical or slightly tapering upward, with apex slightly expanded, greenish yellow to olivaceous, densely covered with cinnamon buff, farinose, squamules; trama white; bulb at stipe base subglobose, 0.8-1.8 cm in diameter. Annulus membranous, easily broken during expansion of pileus. spore print white.

Basidiospores (9.0-) 9.5-11.0 (-12.5) x (4.0-) 5.0-7.0 (-8.0) µm, elongate, inamyloid, colorless, hyaline, thin-walled, smooth; apiculus small. Found gregarious on ground in a forest dominated by fagaceous trees. Presently only known from the type locality. See further for general description in Sanmee (2004).

Figture A 32 ***Amanita sychnopyramis*** **Corner and Bas**

Study site: Mae Orn, 16 July 2003

Basidiocarps small-sized. Pileus 2.0-5.0 cm in diameter, convex to plane, yellow, subpyramidal warts, 0.1-0.2 cm wide, up to 1.5 mm high, dirty white to cram, scattered; margin tuberculate striate (0.1-0.2 R), non-appendiculate; trama white. Lamellae free, white; lamellulae truncate. Stipe 4.0-7.0 x 0.4-1.0 cm, white, equal, with apex slightly expanded, bulb at stipe base subglobose, 0.8-2.5 cm wide, upper part covered with whitish floccose, ringed. Annulus white, submembranous.

Basidiospores (6.0-)7.0 x (8.0-)-8.5 µm , globose to subglobose , inamyloid, colorless, hyaline, thin-walled, smooth. Found Solitary on ground in a forest with *Castanopsis*, *Quercus*, and species of *Dipterocarpaceae*. See further for general description in Tulloss and Yang (2004).

6. Subgenus *Amanita* Section *Vaginatae*

Figture A 33 ***Amanita angustilamellata*** **(Hohn) Boedijn**

Study site: Doi Saket, 23 July 2004

Basidiocarps medium-sized. Pileus 3.5-9.5 cm in diameter, convex, umbonate convex to plane, broady small umbo, margin long striate (0.4-0.5R), non-appendiculate, greyish brown, darker at disc, paler toward margin, glabrous. Lamellae free, white to whitish, subcrowded, thick; lamellulae truncate. Stipe 10.0-14.0 x 1.5-2.0 cm, slightly tapering upward, apex slightly expanded, white to brownish, innate fibrillose, grey to greyish; trama white, hollow. Annulus lacking. Volva 2.5-4.0 x 1.0-2.0 cm, white, with very pale greyish tinge, saccate, membranous.

Basidiospores (9.0-)9.5-11.0(-12.0)x(8.0-)9.0-11.0(-11.5) µm , globose to subglobose, inamyloid, colorless, hyaline, thin–walled, smooth. Found solitary or gregarious on ground in forests of Dipterocarpaceae or Fagaceae.

Figture A 34 ***Amanita battarae***

Study site: Doi Saket, 6 June 2004

Basidiocarps medium to large–sized . Pileus 2.0-6.0 (-12.0) cm in diameter, umbonate at maturity, margin striate(0.2-0.4R), non-appendiculate; dark yellowish-brown, paler at the margin, and dark brown in the center. Lamella free to very narrowly adnate, close to subdistant, white to whitish to buff in mass, and 0.4-0.8 cm broad, truncate. Stipe 7.0-15.0(-18.0)x0.4-1.40 (-2.0.) mm, predominantly white, and exannulate, with a membranous sack-like volva at the base. Both the internal and external surfaces of the up to 0.4 cm high volval sack commonly take on orange-brown or rusty stains.

Basidiospores (7.5-)8.5-11.5(-14.0)x(6.0-)8.0-11.0(-14.0) µm, globose to subglobose (occasionally broadly ellipsoid) and inamyloid. Found solitary or gregarious on ground in forests with *Fagaceae, Dipterocarpaceae* and Pinus. See further for general description in Lincoff(1994).

Figure A 35 ***Amanita caesarea***

Study site: Mae Orn, 16 July 2003

Basidiocarps medium-sized. Pileus 3.0-6.0 cm, convex to plane, concave, margin striate, non-appendiculate, orange-red over centre, paler toward margin, curry-yellow, glabrous, viscid when wet. Lamellae free, creamy to yellow, crowded (approx. 7 lamellae/cm); lamellulae truncate.

Stipe 6.0-12.0 x 0.6-1.8 cm, equal, slightly tapering upwards, apex slightly expanded, yellow to pale yellow, fibrillose zones below annulus, pale orange, stuffed with white, yellowish cottony material to hollow, bulb absent; trama white, creammy, yellowish. Annulus yellow to pale orange, thin, membranous, apical, descending, easily collapsed. Volva 2.0-5.0 x 1.5-2.5 cm, white, saccate, membranous. Spore print white.

Basidiospores (7.5-) 8.0-11.0 (-13.5) x (5. 5-) 6.0-7.0 (-9.0) µm, ellipsoid, sometimes broadly ellipsoid, rarely elongate, inamyloid, colorless, guttulate, hyaline, thin-walled, smooth. Found gregarious on ground in *Dipterocarpaceae* and *Fagaceae* forests. See further for general description in Lincoff (1994).

Figure A 36 ***Amanita calopus*** **Beeli**
Study site: Mae Orn, 16 July 2003

Basiciocarps medium–sized. Pileus 2.5 – 6.0 cm in diameter ,convex to plano-concave, and rather thin, context of the cap firm and white, margin long-striate, non-appendiculate, the remains of the volva on pileus friable- pyramidal to disordered warts. Lamella free, attenuate at both ends, white. Stipe 10.0–12.0 x 0.3–0. 9 cm, cylindric or narrows slightly upward, small bulb at the base, stuffed white, fibrous to pulverulent, white at the apex and darkening through pale smokey gray to smokey gray at base, and easily detached from the cap, no annulus, friable volva as rings at the base, small cuplike volval part at basal bulb.

Basidiospores 7.8-13.6(-15.1)x(5.5-)6.0-8.8(-9.0) µm, ellipsoid to elongate, inamyloid. Found solitary or gregarious on ground in forests with Fagaceae, Dipterocarpaceae and Pinus. See further for general description in Tulloss and Yang (2004).

Figure A 37 ***Amanita chepangiana*** **Tulloss & Bhandary**
Study site: Mae Orn, 16 July 2003

Basidiocarps medium to large. Pileus 6.0-13.0 cm in diameter, convex to plane, white, margin striate (0.2-0.4 R), non-appendiculate, glabrous, dry. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-14.0 x 1.0-1.5 cm, white, slightly tapering upward, apex slightly expanded, stuffed with white cottony material to hollow, bulb absent; trama white. Annulus white, membranous, apical to subapical. Volva 4.0-6.0 x 2.5-5.0 cm, white, membranous, saccate. Spore print white to cream.

Basidiospores 9.0-11.0 (-13.0) x (7.0-) 8.0 –10.5 (-11.0) µm, globose, subglobose to broadly ellipsoid, rarely ellipsoid, inamyloid, colorless, hyaline, thin-walled, smooth, with large prominent apiculus. Found solitary or gregarious on ground in forest comprising members of the *Fagaceae* or *Dipterocarpaceae*. See further for general description in Tulloss and Yang (2004).

Figure A 38 ***Amanita chepangiana*** **Tulloss & Bhandary**
Study site: Mae Orn, 16 July 2003

Basidiocarps medium to large. Pileus 6.0-10.3 cm in diameter, convex to plane, brown to tea-brown, margin striate (0.2-0.4 R), non-appendiculate, glabrous, dry. Lamellae free, white, crowded; lamellulae truncate. Stipe 8-12.5 x 1-1.5 cm, white, slightly tapering upward, apex slightly expanded, stuffed with white cottony material to hollow, bulb absent; trama white. Annulus white, membranous, apical to subapical. Volva 4.0-6.0x2.5-5.0 cm, white, membranous, saccate. Spore print white to cream.

Basidiospores 8.0-10.0 (-12.0) x (6.0-) 7.0 –10.0 (-11.0) µm globose, subglobose to broadly ellipsoid, rarely ellipsoid, inamyloid, colorless, hyaline, thin-walled, smooth, with large prominent apiculus. Found solitary or gregarious on ground in forest comprising members of the *Fagaceae* or *Dipterocarpaceae.*See further for general description in Tulloss and Yang (2004).

Figure A 39 ***Amanita chepangiana*** **Tulloss & Bhandary**
Study site: Mae Wang, 11 June 2005

Basidiocarps medium to large. Pileus 6.0-12.0 cm in diameter, convex to plane, yellow, paler white toward margin, margin striate (0.2-0.4 R), non-appendiculate, glabrous, dry. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-14.0 x 1.0-1.5 cm, white, slightly tapering upward, apex slightly expanded, stuffed with white cottony material to hollow, bulb absent; trama white. Annulus white, membranous, apical to subapical. Volva 4.0-6.0 x 2.5-5.0 cm, white, membranous, saccate. Spore print white to cream.

Basidiospores 9.0-11.0 (-13.0) x (7.0-) 8.0 –10.5 (-11.0) µm , globose, subglobose to broadly ellipsoid, rarely ellipsoid, inamyloid, colorless, hyaline, thin-walled, smooth, with large prominent apiculus. Found Solitary or gregarious on ground in forest comprising members of the *Fagaceae* or *Dipterocarpaceae.*See further for general description in Tulloss and Yang (2004).

Figure A 40 ***Amanita chepangiana*** **Tulloss & Bhandary**

Study site: Mae Orn, 1 July 2005

Basidiocarps medium to large. Pileus 6.0-13.0 cm in diameter, convex to plane, lemon yellow, paler white toward margin , margin striate (0.2-0.4 R), non-appendiculate, glabrous, dry. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-14.0 x 1.0-1.5 cm, white, slightly tapering upward, apex slightly expanded, stuffed with white cottony material to hollow, bulb absent; trama white. Annulus white, membranous, apical to subapical. Volva 4.0-6.0 x 2.5-5.0 cm, white, membranous, saccate. Spore print white.

Basidiospores 9.0-11.0 (-13.0) x (7.0-) 8.0 –10.5 (-11.0) µm , globose, subglobose to broadly ellipsoid, rarely ellipsoid, inamyloid, colorless, with guttulate contents, hyaline, thin-walled, smooth, with large prominent apiculus. Found solitary or gregarious on ground in forest comprising members of the *Fagaceae* or *Dipterocarpaceae.* See further for general description in Tulloss and Yang (2004).

Figture A 41 ***Amanita fuligineodisca*** **Tulloss, Ovrebo & Halling**

Study site: Mae Wang, 16 July 2003

Basidiocarps metium to large –sized. Pileus 2.0–7.0(-12.0) cm, convex to plane, dark orange-brown, paler at the margin, dark in center margin striate, appediculate, free of volval remnants, umbonate at maturity. Lamellae free to very narrowly adnate, close to subdistant, white to whitish, truncate.

Stipe 7.0–15.0(-18.0x 0.5-1.4 (-2.5) cm, predominantly white, and exannulate, with a membranous sack-like volva at the base, 4.0 cm high. Volva saccate, orange-brown or rusty stains.

Basidiospores (7.5-)9.0-12.0(-15.5)x(6.5-)8.4-1.2 (-15.0) µm, globose to subglobose (occasionally broadly ellipsoid), inamyloid. Found solitary or gregarious on ground in forests with Fagaceae, Dipterocarpaceae and Pinus.See further for general description in Lincoff (1994), Tulloss and Yang (2004).

Figture A 42 ***Amanita fulva*** **(Schaeff.) Fr.**

Study site: Mae Wang, 16 July 2003

Basidiocarps medium to large –sized . Pileus 2.0-7.0 (-10.0) cm in diameter, umbonate at maturity, margin striate(0.2 R), non-appendiculate; dark orange-brown, paler at the margin, and dark brown in the center. Lamellae free to very narrowly adnate, close to subdistant, white to whitish, truncate. Stipe 7.0-15.0(-18.0) x 0.3–1.4 (-2.5) cm, predominantly white, a membranous sack-like volva at the base. Volva saccate, white to orange-brown.

Basidiospores (7.0-)9.0-11.5(-15.0)x(6.5-)8.0-11.0(-12.0) µm, globose to subglobose (occasionally broadly ellipsoid) and inamyloid. Found solitary or gregarious on ground in forests with Fagaceae, Dipterocarpaceae and Pinus. See further for general description in Lincoff (1994).

Figure A 43 ***Amanita griseofolia***

Study site: Mae Rim, 12 July 2004

Basidiocarps medium-sized. Pileus 3.0-7.0 cm in diameter, convex to plane, brownish gray to gray-brown, dack over disc, striate margin (0.4-0.6 R), non-appendiculate. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-18.0 x 0.6-0.8 cm, slightly tapering upward, with apex slightly expanded, white, fibrillose to floccose, hollow; trama white. Annulus lacking. Volva saccate 2.5-3.0x1.5-2.0 cm. Membranous, white to dirty white.

Basidiospores (9.5-) 10.0 - 13.5 (-16.5) x (8.5-) 9.5 - 13.0 (-15.0) µm , globose to subglobose , inamyloid. Found solitary on ground in forest of *Fagaceae.* See further for general description in Tulloss and Yang (2004).

Figture A 44 ***Amanita hemibapha*** **(Berk. &Broome) Sacc**

Study site: Mae Orn, 16 July 2003

Basidiocarps medium-sized. Pileus 6.0-10.0 cm,convex to plane, concave, margin striate, non-appendiculate, orange-red over centre, paler toward margin, curry-yellow, glabrous, viscid when wet. Lamellae free, creamy to yellow, crowded (8 lamellae/cm); lamellulae truncate. Stipe 6-19 x 0.6-3 cm, equal, slightly tapering upwards, apex slightly expanded, yellow to pale yellow, fibrillose zones below annulus, pale orange, stuffed with white, yellowish cottony material to hollow, bulb absent; trama white, creammy, yellowish. Annulus yellow to pale orange, thin, membranous, apical, descending, easily collapsed. Volva 2-6 x 1.5-2.5 cm, white, saccate, membranous. Spore print white.

Basidiospores (7.5-) 8.0-11.0 (-13.5) x (5. 5-) 6.0-7.0 (-9.0) µm, ellipsoid, sometimes broadly ellipsoid, rarely elongate, inamyloid, colorless, thin-walled, smooth. Found gregarious on ground in *Dipterocarpaceae* and *Fagaceae* forests. See further for general description in Tulloss and Yang (2004).

Figture A 45 ***Amanita huijsmanii*** **F. Massart**

Study site: Doi Saket, 6 July 2005

Basidiocarps small to medium -sized. Pileus 4.5-6.0 cm in diameter, umbonate-convex to plane, white to cream, striate (0.1-0.2 R), non-appendiculate, volval remnants as floccose patches, white to cream, diminishing toward margin. Lamellae white to cream, free, subcrowded, 8.0-10.0 lamellae/cm; lamellulae attenuate. Stipe 4.0-6.0 x 0.5-1.0cm, whitish to cream, slightly tapering upward, floccose, covered with yellowish, floccose patches, ringed; tramma white to whitish. Annulus lacking. Volva 2.4-3.3 cm.

Basidiospores (6.5-)7.0-8.0(-9.0) x (5.0-)5.5-7.0(-8.0) µm, subglobose to ellipsoid, sometimes ellipsoid, inamyloid, colorless, hyaline, thin-walled, smooth.Found subgregarious on ground in forest of *Fagaceae.* See further for general description in Tulloss and Yang (2004).

Figure A 46 ***Amanita longistriata*** **Imai**

Study site: San Kamphaeng, 8 July 2005

Basidiocarps medium-sized. Pileus 3.5-7.5 cm in diameter, convex, umbonate convex to plane, broady small umbo, margin long striate (0.4-0.5R), non-appendiculate, greyish brown, darker at disc, paler toward margin, glabrous. Lamellae free, white to whitish, subcrowded, thick; lamellulae truncate. Stipe 10.0-14.0 x 0.5-1.0 cm, slightly tapering upward, apex slightly expanded, white to brownish, innate fibrillose, grey to greyish; trama white, hollow. Annulus lacking. Volva 2.5-4.0 x 1.0-2. cm, white, with very pale greyish tinge, saccate, membranous.

Basidiospores (9.0-)9.5-11.0(-12.0)x (8.0-) 9.0-11.0(-11.5) µm, globose to subglobose, inamyloid, colorless, hyaline, thin–walled, smooth. Found solitary or gregarious on ground in forests with *Fagaceae* and *Dipterocarpaceae*. See further for general description in Tulloss and Yang (2004).

Figure A 47 ***Amanita ovalispora*** **Boedijn**

Study site: Mae Orn, 16 July 2003

Basidiocarps medium-sized. Pileus 4.0-8.0 cm in diameter, convex to plane, dark brown at centre, paler as brown toward a striate margin (0.4-0.6 R), non-appendiculate. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-14.5 x 0.6-0.8 cm, slightly tapering upward, with apex slightly expanded, white, fibrillose to floccose, hollow; trama white. Annulus lacking. Volva saccate 2.5-3.5 x 1.5-2.0 cm. Membranous, white to dirty white.

Basidiospores (8.0-) 9.0-10.5 (-13.5) x (6.0-) 7.0-9.0 (-10.0) µm, broadly ellipsoid to ellipsoid, inamyloid, colorless, hyaline, thin-walled, smooth. Found solitary on ground in forest of *Fagaceae.* See further for general description in Sanmee(2004), Tulloss and Yang (2004).

Figure A 48 ***Amanita princeps***

Study site: Mae Orn, 16 July 2003

Basidiocarps medium to large. Pileus 6.0-14.0 cm in diameter, convex to plane, white to cream, paler toward margin, margin striate (0.2-0.4 R), non-appendiculate, glabrous, dry. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-16.0 x 1.0-1.5 cm, white, slightly tapering upward, apex slightly expanded, stuffed with white cottony material to hollow, bulb absent; trama white. Annulus white, membranous, apical to subapical. Volva 4.0-6.0 x 2.5-5.0 cm, white, membranous, saccate. Spore print white.

Basidiospores 9.0-11.0 (-13.0) x (7.0-) 8.0 –10.0 (-11.0) µm , globose, subglobose to broadly ellipsoid, rarely ellipsoid, inamyloid, colorless, hyaline, thin-walled, smooth, with large prominent apiculus. Found solitary or gregarious on ground in forest comprising members of the *Fagaceae* or *Dipterocarpaceae.*

Figure A 49 ***Amanita spreta***

Study site: Mae Rim, 6 July 2004

Basidiocarps medium-sized. Pileus 4.0-8.0 cm in diameter, convex to plane, dark brown at centre, paler as yellowish to red brown toward a striate margin (0.4-0.6 R), non-appendiculate, glabrous, viscid. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-10.5 x 0.6-0.8 cm, slightly tapering upware, with apex slightly expanded, white, fibrillose to floccose, hollow; trama white. Annulus lacking. Volva saccate 2.5-3.5 x 1.5-2.0 cm. Membranous, white to dirty white.

Basidiospores (6.0-) 8.0-10.0 (-12.5) x (6.5-) 7.0-9.0 (-10.0) μm, broadly ellipsoid to ellipsoid, inamyloid, colorless hyaline, thin-walled, smooth. Found solitary on ground in forest of *Fagaceae.* See further for general description in Tulloss and Yang(2004).

Figure A 50 ***Amanita*** **sp.1**

Study site: Mae Wang, 9 July 2004

Basidiocarps medium–sized. Pileus 6.0-9.5 cm in diameter, convex to plane, yellowish to brown; margin striate, non-appendiculate; volval remnants as floccose patches, white. Lamellae free, crowded, 8-10 lamellae/cm, white; lamellulae attenuate. Stipe 6.0-12.5 x 0.5-1.5 cm slightly tapering upward, white, covered with whitish, fibrillose, subbulbous at base, 1.5-2.5 cm wide; upper part of bulb covered with white, floccose patches, ringed; trama white to whitish. Annulus lacking, membranous, apical. Spore print white.

Basidospores (6.0-)7.0-9.0(-10.0) x (6.0-)7.0 (-8.5) μm, broadly ellipsoid, sometimes subglobose or ellipsoid, non-amyloid, colorless, hyaline, thin-walled, smooth. Found solitary or gregarious on ground in forests with *Fagaceae* and *Dipterocarpaceae*.

Figure A 51 ***Amanita vaginata***
Study site: Mae Orn, 16 July 2003

Basidiocarps medium-sized. Pileus 4.0-5.0 cm in diameter, convex to plane, dark grey at centre, paler as ash-grey toward a striate margin (0.2-0.4 R), non-appendiculate, glabrous, viscid. Lamellae free, white, crowded; lamellulae truncate. Stipe 8.0-10.5 x 0.6-1.0 cm, slightly tapering upward, with apex slightly expanded, white, fibrillose to floccose, hollow; trama white. Annulus lacking. Volva saccate 2.5-3 x 1.5-2.4 cm. Membranous, white to dirty white.

Basidiospores (8.0-) 9.0-10.5 (-13.5) x (6.0-) 7.0-9.0 (-10.0) µm, broadly ellipsoid, inamyloid, colorless, hyaline, thin-walled, smooth. Found solitary on ground in forest of *Fagaceae.*See further for general description in Tulloss and Yang (2004).

APPENDIX B

Key to the subgenus and sections of *AMANITA* (Bas, 1969)

1. Spore amyloid. Margin of cap rarely radially sucate. Short gill often attenuate.
Subgenus *Lepidella*……2

2. Volva pulverulent or breaking up into flocks, warts, scale, patches, belts or crusts on cap and stem; sometimes disappearing completes from base of stem. If bulb of stem marginate, then volva floccose or forming conical warts, at least at centre of cap, and never provided with (sub)membranous outer layer……..3

3. Margin of cap not appendiculate. Pileipellis often deeply coloured. Spores globose to ellipsoid, mostly < 10 micrometre, rarely up to 12 micrometre long. Ring membranous, rarely fugacious.
Section *Validae*

3*. Margin of cap appendiculate. Pileipelliss rarely deeply coloured. Spores globose to bacilliform, rather often > 10 micrometre. Ring membranous to friable. **Section** *Lepidella*

2*. Volva circumscissile, limbate or saccate……4

4. Volva circumscissle or limbate, breaking up into submembrnous, rarely pulverulet or floccose patches on cap and leaving a slight, (sub) membranous limb or fragments of a limb at base of stem, or else bulb distinctly marginate. Remnantas of volva never conical warts……5
5. Margin of cap appendiculate. Spore broadly ellipsoid to bacilliform. Ring membranous, friable or fugacious ……**Section** *Lepidella*

5*. Margin of cap not appendiculate. Spore globose to subglobose. Ring membranous…… **Section** *Phalloideae*

4*. Volva saccate, forming a membranous sac at base of stem and only occasionally one or a few membranous patches on cap; but sometimes inner layer of volva friable and forming scales, patches or powder on cap……..6

6. Pileipellis often distictly coloured. Spores globose to ellipsoid. Ring membranous Volva without friable inner layer. Gill not strongly darkening after drying……**Section** *Phalloideae*

6*. Pileipellis usually white to brownish. Spores broadly ellipsoid to bacilliform. Ring often friable. Volva sometimes with friable inner layer. Gills often darkening strongly after drying…… .**Section** *Amidella*

1*. Spores inamyloid. Margin of cap mostly radially sulcate. Short gills nearly always truncate…….. **Subgenus** *Amanita*……..7

7. Stem with bulose base. Volva usually friable, sometimes limbate
Section *Amanita*

7*. Stem without bulbose base. Volva usually saccate, rarely friable.
Section *Vaginatae*

Key to *Amanita* species in Northern Thailand (Sanmee, 2004)

1 Spore amyloid. Margin of pileus mostly smooth **…….**
……..…(*Amanita* subgenus *Lepidella)……2

2 Margin of pieus short striate(amanita sect. Amidella), pileus whitish covered with cream to yellowish brown farinose to flaccose patches**……*Amanita avellaneosquamosa***

2* Not as above . Margin of pileus non-striate**……3**

3 Margin of pileus appendiculate**……..*Amanita* section *Lepidella*……..4**

4 Volval remnants on pileus floccose to squamulose; trama of basidiocarp white, becoming yellow to lemon-chrome when cut
……..*Amanita alboflavescens*

4* Volval remnants on pileus as conical to subconical warts; trama of basidiocarp not becoming yellow or lemon-crome when cut**……...5**

5 Pileus reddish brown with chocolate colored conic volval remnants; lamellae white when young, turning pinkish to violet when mature; trama white, turning pinkish to purplish when cut
……..……...*Amanita sculpta*

5* Pileus and volval remnants not so deeply pigmented ;lamellae white to cream, unchanging; trama white, hanging**……..…...6**

6 Pileus white to brownsh, with brown or pinkish brown vovalremnants; basidiospores subglobose to broadly ellipsoid, sometimes globose, Q=(1.06-) 1.11-1.25 (-1.33); basal septa without clamps**……*Amanta hongoi***

6* Pileus white, with similar colored valval remnants; basidiospores broadly ellipsoid to ellipsoid, Q=(1.11-)1.25-1.47 (-1.69); basal septa often with clamps **……..……..*Amanita virgineoides***

3*Margin of pileus non-appendiculate **……..7**

7 Volval remnants limbate, membranous, mostly present on the base of stipe**…… *Amanita* section *Phalloideae*……....*8***

8 Pileus dark brown to blackish over μmbo, paler toward margin; annulus grey, persistent **…….. *Amanita fuliginea***

8 * Pileus greyish brown; annulus white, fragile**……**
……..*Amanita manginiana sensu* W. F. Chiu

7* Volval remnants floccose, subconical or granular, or patch-like, mostly present on pileus**……..(*Amanita* section *Validae*)…….. 9**

9 Stipe with marginate bulbose base; spores globose to subglobose **……..……...*Amanita sinocitrina***

9* Stipe without marginate bulbose base; spore mostly broadly ellipsoid**…….……..10**

10 pileus olivaceous buff to honey-yellow, paler toward margin, decorated with yellow floccose to patch-like volval remnants**…… *Amanita flavipes***

10* Pileus greyish brown(sometimes distinctly paler at margin) covered with dark brown to fuscous volval remnants as powder or small warts; volval remnants on upper surface of stipe bulb powdery in broken rings**…….*Amanita fritillaria***

1*Spoes inamyloid. Margin of pileus usually striate–at least at maturity**…..……..*Amanita* subgenus *Amanita*) …….……11**

11 Stipe with bulbous base, lacking saccate volva**……..**
……(*Amanita* section *Amanita*) ……12

12 Basidiocarps oftern small to mediμm-sized; clamps absent **……..…13**

13Annulus present**…….…….....14**

.

14 Pileus reddish orange, paler towad margin; volval remnants red to orange to yellow; spores globose to subglobose, rarely broadly ellipsoid Q=(1.0- 1.06 (-1.24)**……..…..*Amanita rubrovolvta***

14* Pileus greenish yelow to olivaceous fuff, volval remnants cinnamol buff; spores elongate , sometime ellipsoid, Q=(1.38-)1.53-1.88(-1.93)**……..*Amanita siamensis***

13* Annulus lacking **…….……..…….15**

15 Pileus cinnamon buff with yellowish pyramidal warts, upper part of bulbous base scattered with yellow volval remnants**……...*Amanita* cf. *Mira***

15*Pileus greyish brown, paler toward margin; volval remnants farinose; upper part of bulbose base covered with greyish brown, farinose volval remnants **……... *Amanita obsita***

12* Basidiocarps usually mediμm –sized to large; occasionally small; clamps present and common **…….....…..16**

16 Volval remnants on pileus dirty white to cream; pileus brownish to tea-brown, darker at center; upper part of bulb on stipe base covered with whitish floccose volval remnants…..***Amanita subglobosa***

16* Volval remnants on pileus as dark grey; pileus brownish grey; upper part of bulb on stipe base covered with grey floccose volval remnants **…….…….*Amanita sinensis***

11* Stipe without bulbose base. Volva saccate **……..….17**

17 Membranous annulus present; clamps present and common **…… …….……(*Amanita* section *Caesareae*) ……..……18**

18 Pileus with bright orange – red over center, paler toward curry yellow margin; annulus yellow to pale orange; stipe covered with pale orange fibrillose zones**……..….*Amanita hemibapha***

18* Pileus lacking orange, red or yellow regions**……...19**

19 Pileus white; spores 9.0-11.0 (-13) x (7.0) 8.0-10.5 (-11.0) μm, Q=(1.0-) 1.04-1.02 (-1.33)……..…….. ***Amanita chepangiana***

19* Pileus off-white, brownish, darker over disc, paler toware margin; spore (9.0-) 9.5-11.0 (-13.)x9.0 –11.0 (-13.0) μm, Q= 1.0-1.08 (-1.22)**…….*Amanita princeps***

17* Annulus lacking; clamps absent **…….**(***Amanita* sect. *Vaginatae***)….20**

20 Pileus greyish brown; spores globose to subglobose, Q= 1.0-1.04 (-1.14)**…….** ***Amanita angustilamellata***

20* Pileus ash-grey; spores broadly ellipsoid to ellipsoid, Q=(1.09-) 1.15-1.37 (-1.70) ……**…*Amanita ovalispora***

2. CHEMICAL REAGENTS

2.1 Melzer' s Reagent (abbreviated as Melzer's) (Largent et al., 1977):

Formula: Add Iodine (1.5 g), Potassium-Iodide(5 g), and Chloral Hydrate(100 g) to H_2O (100ml). Warm but do not boil.

Procedure: Place the material to be studied in a drop of Melzer's then cover.

Warning: do not mix Melzer's with any type of alkali as a cloudy precipitate will develop immediately. A positive reaction usually occurs immediately but in doubful case it is beast to turn the light source of the microscope to high in order to enhance the contrast of the reaciton.

Use: Three color reactions of material mounted in Melzer's can occur. These are: 1) a blue to black reaction (positive) in which case the material is called Amyloid; 2) a browinish to reddish-brown recaction in which case the material is called Pseudoamyloid (or Dextrinoid); and 3) a yellow to hyaline reaction (negative) in which case the material called Inamyloid(Largent *et al*., 1977)

Potassium Hydroxide (KOH): 3 – 5 % aqueous solution (Largent *et al*., 1977)

Formula: Dissolve 3(-5) g of potassium hydroxide in 97(95) ml water.

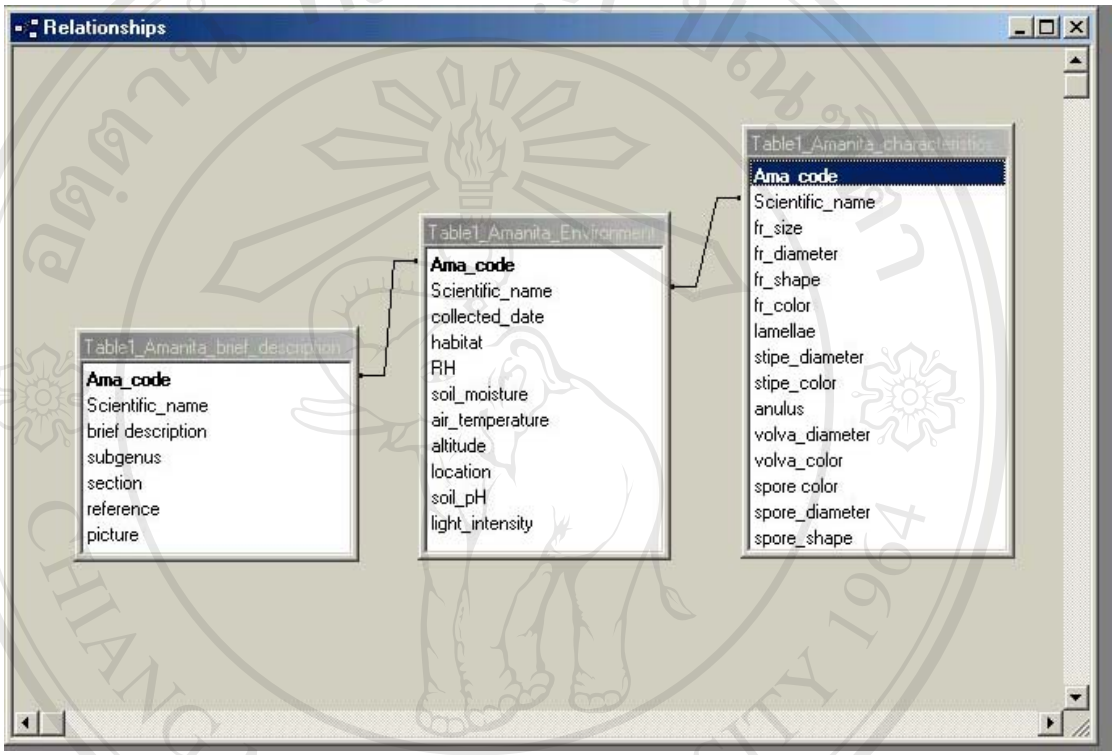
Procedure: Place the material to be studied in a drop of potassium hydroxide on a glass slide: and Congo Red if desired.

Use : 3 – 5 % KOH is the reagent used to revive the hyphae of dried basidomycarps.

APPENDIX C

Amanita database design

1. Database design



2. Table design

Table1_Amanita_brief_description

Field	data type	character	description
Ama_code	Text	5	code
Scientific_name	Text	50	scientific name
Brief_description	Text	255	characteristics description
Subgenus	Text	20	subgenus
Section	Text	20	section
Reference	Text	100	reference
Picture	OLE object	-	picture (*.bmp)

Table1_Amanita_Environment

Field	data type	character	description
Ama_code	Text	5	code
Collect_date	Date/Time	50	collect date
Habitat	Text	50	habitat
RH	Text	20	% relative humidity
Soil_moisture	Text	10	soil moisture
Soil_pH	Text	10	soil pH
Air_Temperature	Text	10	air temperature
Altitude	Text	4	altitude
Location	Text	50	study site
Light_intensity	Text	20	light intensity

Table1_Amanita_characteristics

Field	data type	character	description
Ama_code	Text	5	code
Fr_size	Text	50	fruiting bodies size
Fr_diameter	Text	50	fruiting bodies diameter
Fr_shape	Text	20	fruiting bodies shape
Fr_color	Text	10	fruiting bodies color
Lamellae	Text	10	gill attachment
Stipe_diameter	Text	10	stipe diameter
Stipe_color	Text	50	stipe color
Anulus	Text	50	Anulus
Volva_diameter	Text	50	volva_diameter
Volva_color	Text	50	volva_color
Spore print color	Text	50	spore print color
Spore diameter	Text	50	spore diameter
Spore shape	Text	50	spore shape

APPENDIX D

Analytical recovery α-amanitin assay

Note spiked – add α-amanitin standard in extract solution of sample(negative control).

Accuracy of standard α-amanitin assay

Method C:\HPCHEM\1\METHODS\AMINITIN.M

Calibration Table

Calib. Data Modified : 11 October 2005 9:03:45 PM

Calculate : External Standard
Based on : Peak Area

Rel. Reference Window : 5.000 %
Abs. Reference Window : 0.000 min
Rel. Non-ref. Window : 5.000 %
Abs. Non-ref. Window : 0.000 min
Use Multiplier & Dilution Factor with ISTDs
Uncalibrated Peaks : not reported
Partial Calibration : Yes, identified peaks are recalibrated
Correct All Ret. Times: No, only for identified peaks

Curve Type : Linear
Origin : Included
Weight : Equal

Recalibration Settings:
Average Response : Average all calibrations
Average Retention Time: Floating Average New 75%

Calibration Report Options :
Printout of recalibrations within a sequence:
Calibration Table after Recalibration
Normal Report after Recalibration
If the sequence is done with bracketing:
Results of first cycle (ending previous bracket)

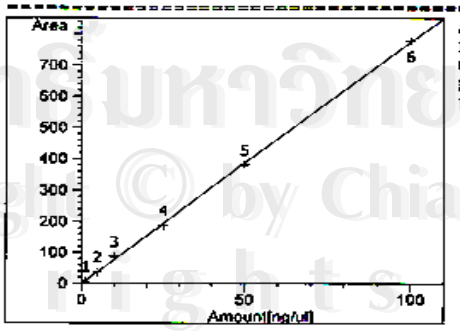
Signal 1: DAD1 B, Sig=305,4 Ref=360,100

RetTime [min]	Sig	Lvl	Amount [ng/ul]	Area	Amt/Area	Ref	Grp	Name
6.072	1	1	1.00000	6.63666	1.50678e-1			amanitin
		2	5.00000	36.71230	1.36194e-1			
		3	10.00000	86.56236	1.15524e-1			
		4	25.00000	185.73302	1.34602e-1			
		5	50.00000	380.67050	1.31347e-1			
		6	100.00000	779.50232	1.28287e-1			

Peak Sum Table

No Entries in table

Calibration Curves



amanitin at exp. RT: 6.072
DAD1 B, Sig=305,4 Ref=360,100
Correlation: 0.99978
Residual Std. Dev.: 6.54872
Formula: y = mx + b
m: 7.76351
b: -1.00187
x: Amount[ng/ul]
y: Area

Instrument 1 11/10/2005 9:04:12 PM supattra

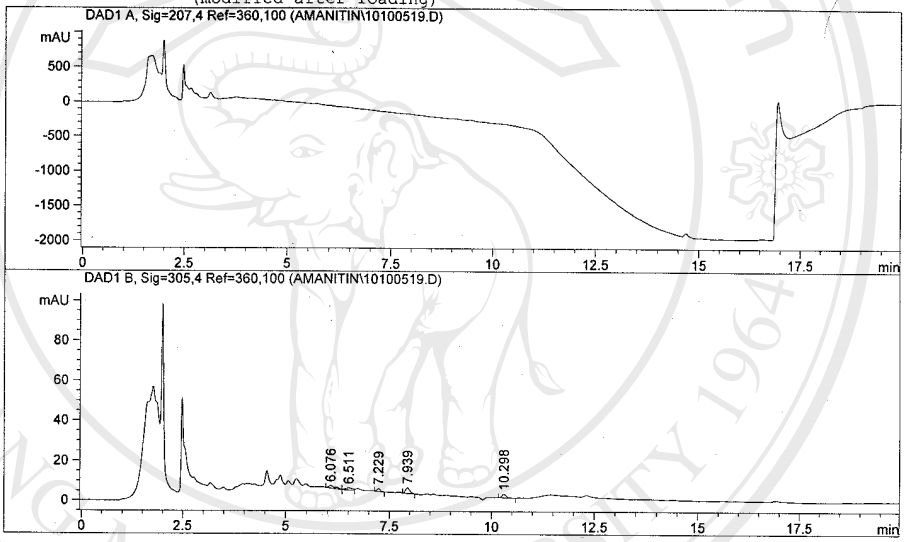
APPENDIX E

Amanitin content and calculation

A. cokeri

Data File C:\HPCHEM\1\DATA\AMANITIN\10100519.D Sample Name: B11

```
Injection Date  : 10/10/2005 18:12:30 PM        Seq. Line :  19
Sample Name     : B11                          Location : Vial 17
Acq. Operator   : sirisak                          Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 10 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AMI.M
Last changed    : 10/10/2005 11:34:11 PM by sirisak
Analysis Method : C:\HPCHEM\1\METHODS\AMINITIN.M
Last changed    : 11/10/2005 9:12:56 PM by supattra
                  (modified after loading)
```

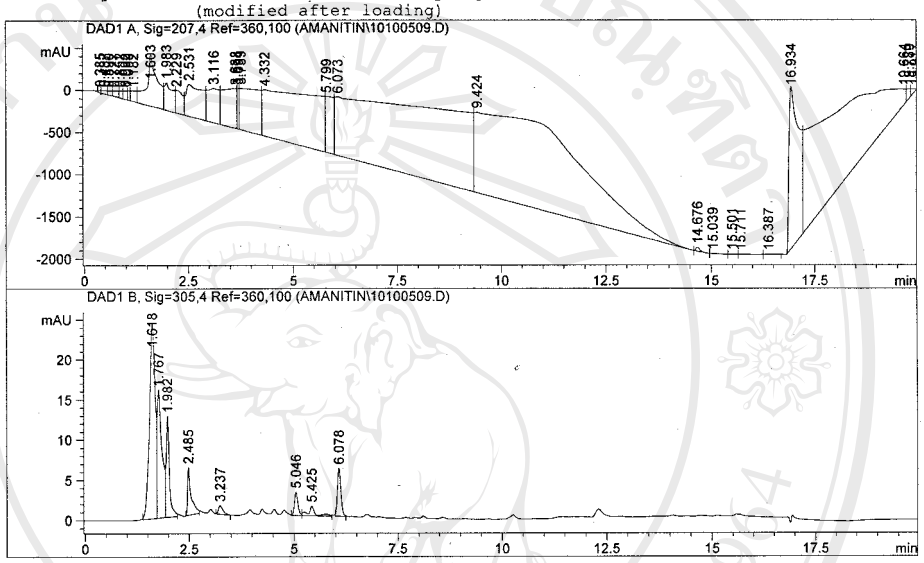



```
                    External Standard Report

Sorted By             :      Signal
Calib. Data Modified  :      11 October 2005 9:03:45 PM
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 2: DAD1 B, Sig=305,4 Ref=360,100

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [mAU*s]                [ng/ul]
-------|------|----------|----------|----------|--|-----------------
  6.076 BP       15.08864 1.37360e-1    2.07258    amanitin

Totals :                                2.07258

 Results obtained with enhanced integrator!
                        *** End of Report ***
```

*A. caesarea**

Data File C:\HPCHEM\1\DATA\AMANITIN\10100509.D Sample Name: B1

```
Injection Date  : 10/10/2005 14:39:54 PM        Seq. Line :   9
Sample Name     : B1                            Location : Vial 7
Acq. Operator   : sirisak                          Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 10 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AMI.M
Last changed    : 10/10/2005 11:34:11 PM by sirisak
Analysis Method : C:\HPCHEM\1\METHODS\AMINITIN.M
Last changed    : 11/10/2005 9:09:38 PM by supattra
                  (modified after loading)
```



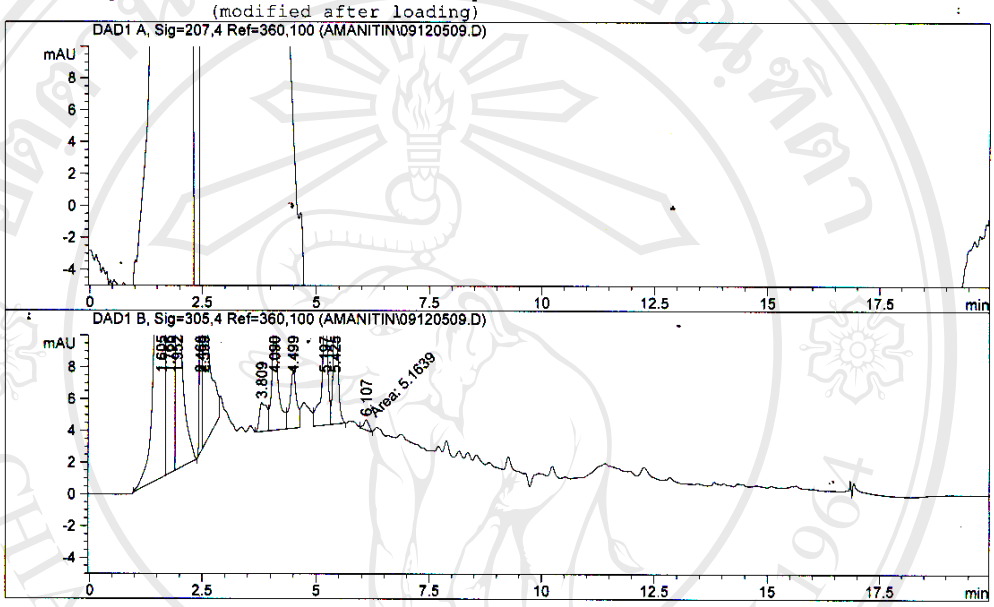
External Standard Report

```
Sorted By             :      Signal
Calib. Data Modified  :      11 October 2005 9:03:45 PM
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 2: DAD1 B, Sig=305,4 Ref=360,100

RetTime  Type     Area      Amt/Area    Amount    Grp   Name
 [min]          [mAU*s]                [ng/ul]
-------|------|----------|----------|----------|--|-------------------
  6.078 BB       34.45870 1.32553e-1    4.56760    amanitin

Totals :                                4.56760

 Results obtained with enhanced integrator!

                    *** End of Report ***
```

Amanita sp.1

Data File C:\HPCHEM\1\DATA\AMANITIN\09120509.D Sample Name: A4

```
Injection Date  : 12/9/2005 16:15:34 PM        Seq. Line :   9
Sample Name     : A4                           Location : Vial 13
Acq. Operator   : sirisak                      Inj :   1
Acq. Instrument : Instrument 1                 Inj Volume : 10 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AMANITIN.M
Last changed    : 12/9/2005 14:11:44 PM by sirisak
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\AMI.M
Last changed    : 13/9/2005 10:17:18 PM by sirisak
                  (modified after loading)
```



External Standard Report

```
Sorted By             :      Signal
Calib. Data Modified  :      12 September 2005 16:34:05 PM
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 2: DAD1 B, Sig=305,4 Ref=360,100
```

RetTime [min]	Type	Area [mAU*s]	Amt/Area	Amount [ng/ul]	Grp	Name
6.107	MM T	5.16390	1.68055e-1	8.67821e-1		amanitin

Totals : 8.67821e-1

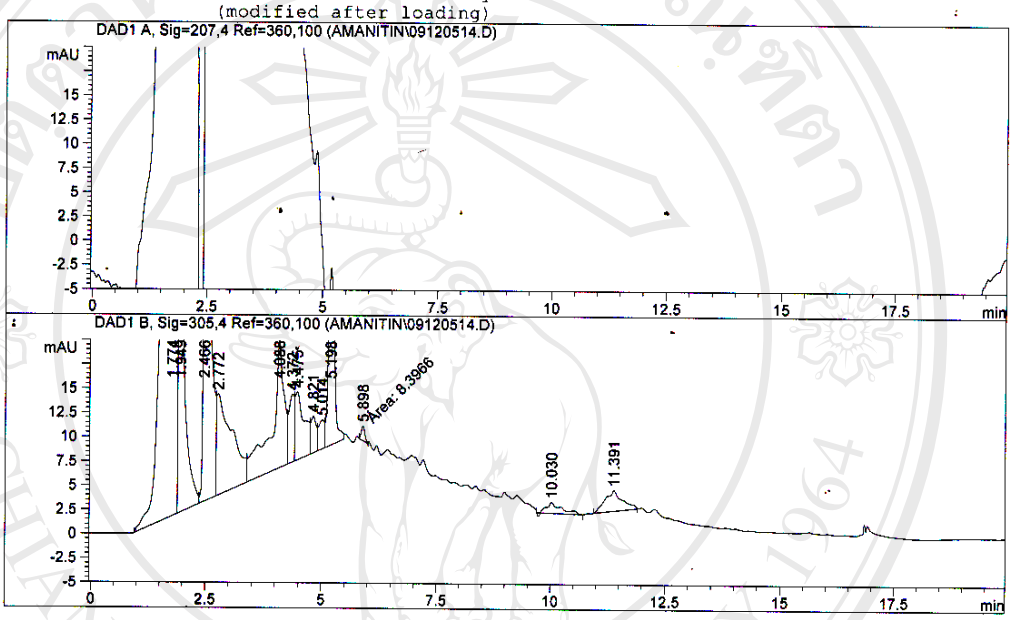
Results obtained with enhanced integrator!

*** End of Report ***

Amanita sp.2

Data File C:\HPCHEM\1\DATA\AMANITIN\09120514.D Sample Name: A1(

```
Injection Date  : 12/9/2005 18:01:52 PM        Seq. Line :  14
Sample Name     : A10                          Location : Vial 18
Acq. Operator   : sirisak                         Inj :  1
Acq. Instrument : Instrument 1                 Inj Volume : 10 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AMANITIN.M
Last changed    : 12/9/2005 14:11:44 PM by sirisak
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\AMI.M
Last changed    : 13/9/2005 10:30:42 PM by sirisak
                  (modified after loading)
```



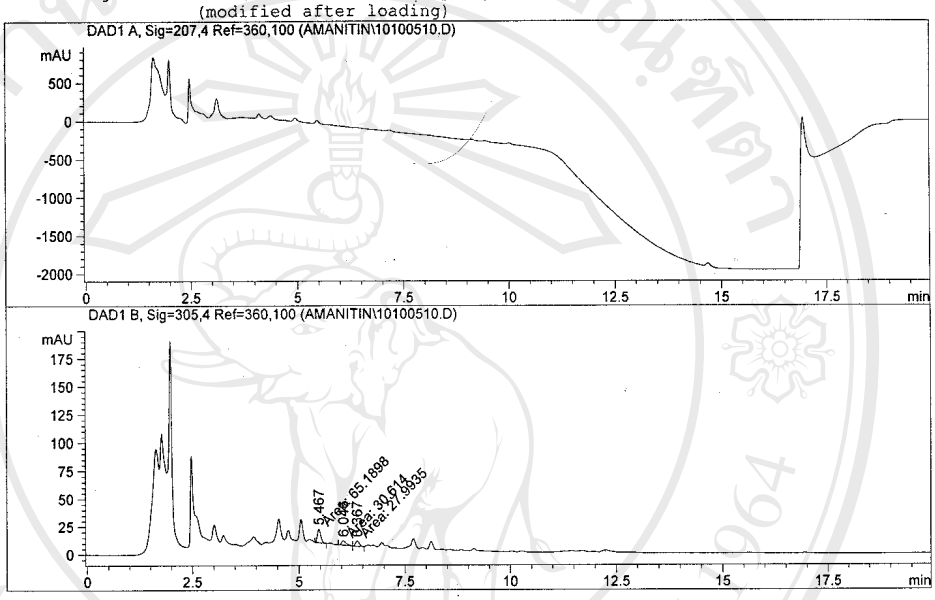
External Standard Report

```
Sorted By             :      Signal
Calib. Data Modified  :      12 September 2005 16:34:05 PM
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 2: DAD1 B, Sig=305,4 Ref=360,100

RetTime  Type     Area      Amt/Area    Amount   Grp   Name
 [min]          [mAU*s]                [ng/ul]
-------|------|----------|----------|----------|--|----------------
  5.898 MM T     8.39660 1.50735e-1    1.26566    amanitin

Totals :                              1.26566

 Results obtained with enhanced integrator!

                  *** End of Report ***
```

Amanita sp.3

Data File C:\HPCHEM\1\DATA\AMANITIN\10100510.D Sample Name: B2

```
Injection Date  : 10/10/2005 15:01:09 PM        Seq. Line :  10
Sample Name     : B2                            Location : Vial 8
Acq. Operator   : sirisak                          Inj :   1
Acq. Instrument : Instrument 1                  Inj Volume : 10 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AMI.M
Last changed    : 10/10/2005 11:34:11 PM by sirisak
Analysis Method : C:\HPCHEM\1\METHODS\AMINITIN.M
Last changed    : 11/10/2005 9:12:56 PM by supattra
                  (modified after loading)
```

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                    External Standard Report

Sorted By             :      Signal
Calib. Data Modified  :      11 October 2005 9:03:45 PM
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 2: DAD1 B, Sig=305,4 Ref=360,100

RetTime  Type      Area      Amt/Area    Amount   Grp   Name
 [min]           [mAU*s]                [ng/ul]
-------|------|----------|----------|----------|--|------------------
  6.046 MM T     30.61398 1.33023e-1    4.07237    amanitin

Totals :                                4.07237

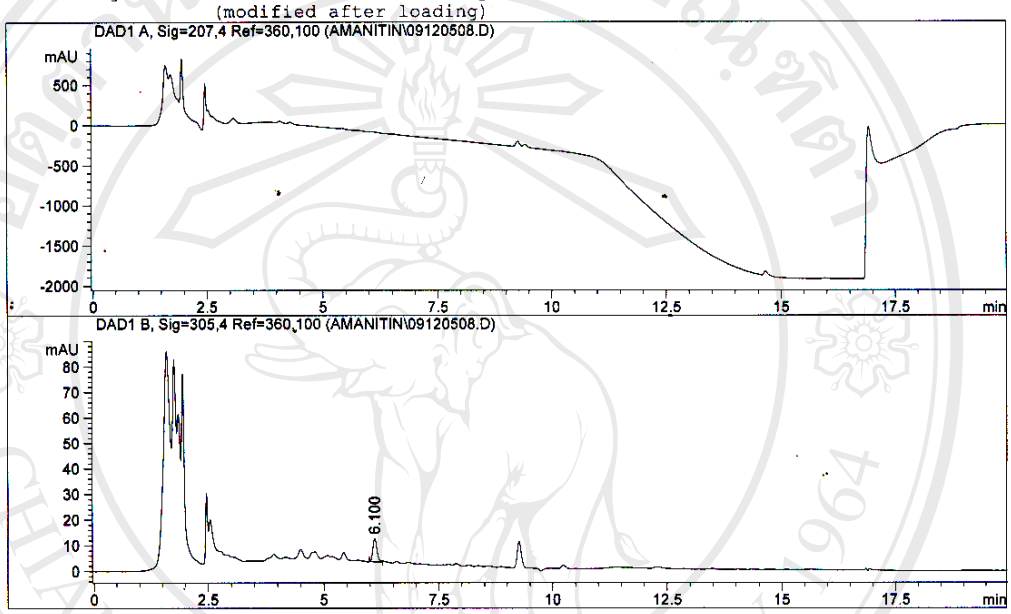
 Results obtained with enhanced integrator!

                    *** End of Report ***
```

Amanita verna #1

Data File C:\HPCHEM\1\DATA\AMANITIN\09120508.D Sample Name: A3

```
Injection Date  : 12/9/2005 15:54:18 PM          Seq. Line :   8
Sample Name     : A3                           Location : Vial 12
Acq. Operator   : sirisak                         Inj :   1
Acq. Instrument : Instrument 1               Inj Volume : 10 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AMANITIN.M
Last changed    : 12/9/2005 14:11:44 PM by sirisak
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\AMI.M
Last changed    : 12/9/2005 16:34:05 PM by sirisak
                  (modified after loading)
```

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                    External Standard Report

Sorted By             :      Signal
Calib. Data Modified  :      12 September 2005 16:34:05 PM
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 2: DAD1 B, Sig=305,4 Ref=360,100
```

RetTime [min]	Type	Area [mAU*s]	Amt/Area	Amount [ng/ul]	Grp	Name
6.100	PB	56.23759	1.27200e-1	7.15339		amanitin
Totals :				7.15339		

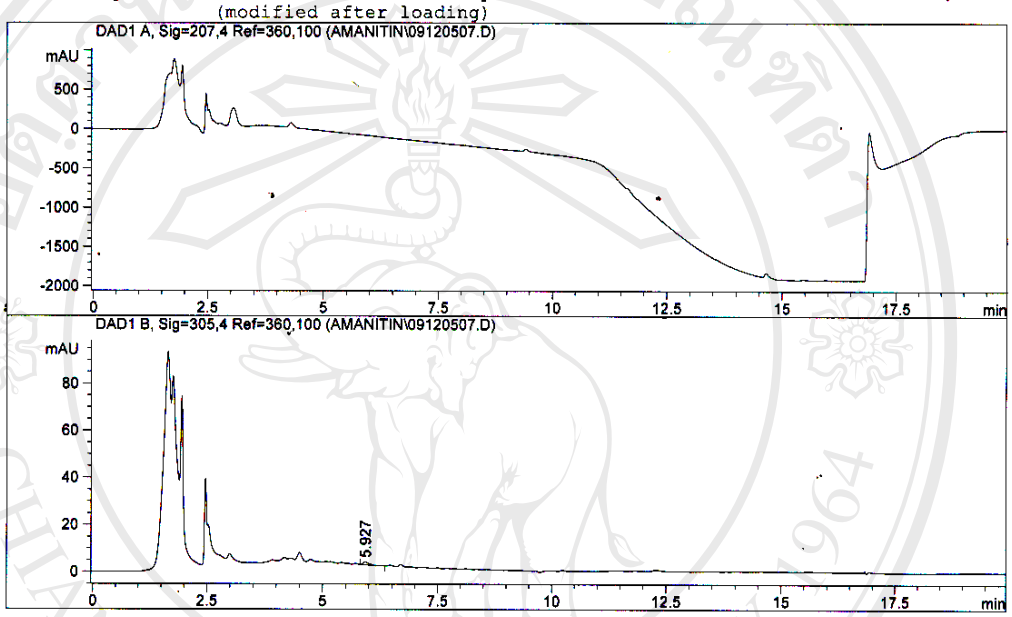
```
Results obtained with enhanced integrator!

                    *** End of Report ***
```

Amanita virosa #1

Data File C:\HPCHEM\1\DATA\AMANITIN\09120507.D Sample Name: A2

```
Injection Date  : 12/9/2005 15:33:04 PM        Seq. Line :   7
Sample Name     : A2                          Location : Vial 11
Acq. Operator   : sirisak                        Inj :   1
Acq. Instrument : Instrument 1               Inj Volume : 10 µl
Acq. Method     : C:\HPCHEM\1\METHODS\AMANITIN.M
Last changed    : 12/9/2005 14:11:44 PM by sirisak
                  (modified after loading)
Analysis Method : C:\HPCHEM\1\METHODS\AMI.M
Last changed    : 12/9/2005 16:34:05 PM by sirisak
                  (modified after loading)
```




```
External Standard Report

Sorted By             :      Signal
Calib. Data Modified  :      12 September 2005 16:34:05 PM
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs

Signal 2: DAD1 B, Sig=305,4 Ref=360,100
```

RetTime [min]	Type	Area [mAU*s]	Amt/Area	Amount [ng/ul]	Grp	Name
5.927	VB	10.37681	1.45456e-1	1.50937		amanitin
Totals :				1.50937		

```
Results obtained with enhanced integrator!

*** End of Report ***
```

Table Appendix E α-amantin content of *Amanita* mushroom and calculation

no	*Amanita* mushrooms	(A) α-amantin content (ng/µl)	(B) mushroom dried wt.(g)	(C) α-amantin content (ng/g. µl)	(D) final volume (ml)	(E) Total α-amantin content (µg/g. dry wt.)	(F) Total α-amantin content (mg/g. dry wt.)
1	**A. cokeri**	2.07	2.05	1.01	160	161.76	0.162
2	*A. caesarea**	4.58	-	4.58	80	-	-
3	*Amanita* sp.1	0.88	1.03	0.85	160	136.70	0.137
4	*Amanita* sp.2	1.27	1.14	1.11	160	178.25	0.178
5	*Amanita* sp.3	4.07	4.08	1.00	160	159.70	0.160
6	*Amanita verna* #1	7.15	1	7.15	160	1,144.00	1.144
7	*Amanita virosa* #1	1.51	1.02	1.48	160	236.86	0.237

Note; * add 100 (ng/µl) 2.5 ml

(A) = α-amantin content from HPLC analysis

(B) = mushroom dried weight (gram)

(C) = α-amantin content (ng/µl) / mushroom dried weight (gram)

(D) = final volume (ml) of dried mushroom sample extracts

(E) = Total α-amantin content (µg/g. dry wt.)

(F) = Total α-amantin content (mg/g. dry wt.)

CURRICULUM VITAE

Name	Mr. Sirisak Butkrachang
Date of Birth	April 3 , 1965
Place of Birth	Lampang, Thailand
Education Background	
1986	Certificate, Medical technology, Mahidol University, Department of Physiology, Faculty of Medicine
1991	Bachelor of Agriculture, Food technology and Industrial, Maejo Institute of Agricultural Technology Special project : Microbial quality of Drinking water of the primary schools in San Sai Districts, Chiang Mai
1992	Bachelor of Science (Health science) Chiang Mai Teacher Collegue
1994	Masters of Science (Post harvest Technology) Chiang Mai University Thesis: Effects of High Temperature and Ultraviolet Illumination on Anthracnose Disease and Postharvest Quality of Mango Fruits

Publications

1. Butkrachang, S., and Sardsud, U. 2004. Wild Mushrooms in Chiang Mai Community Forests and their Utilization. Abstracts of the IV Asia-Pacific Mycological Congress & The IX International Marine and Freshwater Mycology Symposium 14 –19 November, 2004. Chiang Mai University, Thailand.
2. Butkrachang, S., Boonchieng,E., Sukchotiratana, M., Plikomol, A., and Sardsud, U. 2004. Wild mushrooms database of Chiang Mai community forest. Abstracts of 20 th Biennial Conference of the ASIAN ASSOCIATION FOR BIOLOGY EDUCATION PROGRAMME AND ABSTRACTS. 27-30 December,Chiang Mai Thailand.
3. Butkrachang, S., Boonchieng, E., Sardsud, U., Sukchotiratana, M., Plikomol, A., Chairote, G., and Narongchai, P. 2005. Wild mushrooms database of Chiang Mai community forest. ***Asian Journal of Biology Education*** **2005.**

Biology Research in Thailand

Wild Mushroom Database of Chiang Mai Community Forest

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Abstract

The diversity of macrofungi at Chiang Mai community forests and Doi Suthep-Pui National Park was investigated during October 1996 – November 1998 and November 2003 – October 2004. Fungi were collected from 19 forest areas and identified. Two hundred and fifty eight species were found. They were ascomycetes of 30 species, 21 genera, 12 families, 5 orders, and basidiomycetes of 228 species, 89 genera, 35 families, 10 orders. The most prominent species of macrofungi found belonged to the families *Boletaceae*, *Agaricaceae* and *Russulaceae* comprising 43, 35 and 28 species respectively. A wild mushrooms database including its management program, Wild Mushroom Database Version 1.0, was developed by using the data related to the habitats and macroscopic and microscopic characteristics of wild mushrooms. This software will be used for managing the dried wild mushroom specimens in the Mushroom Herbarium, Biology Department, Faculty of Science, Chiang Mai University, Thailand.

Keywords: *Chiang Mai, community forest, database, wild mushrooms*

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Introduction

In Thailand, wild mushrooms are common only in the rainy season from June to October. All of the wild mushroom species are collected from community forests where they form symbiotic associations (ectomycorrhizae) and fruiting bodies with indigenous tree families, *Dipterocarpaceae*, *Fagaceae*, *Pinaceae* and *Ulmaceae*, in the region (Sanmee *et al*. 2003). They are collected by local people in remnant secondary stands of hillside forests and sold on the roadside at local, and at city markets. Although edible wild mushrooms were sold at higher prices than cultivated ones, Thai people prefer to consume them due to their flavour and texture (Sanmee *et al*. 2003).

Some poisonous wild mushrooms are

almost indistinguishable from edible species, so that the rate of illness and death from consuming the poisonous wild mushrooms increase every year (Bureau of Epidemiology, Department of Disease Control 2003) There are numerous well-known monographs on edible and poisonous species from Europe, North America and tropical Africa (Bas 1969, Jenkins 1986), but they provided little information for Thailand. So, most of the local people know very little about poisonous wild mushrooms, and some people willingly destroy them at once, which caused lacking of information and obstructed their distribution in nature.

The aims of this research were:

1. To investigate the diversity of wild mushrooms in Chiang Mai community forests and Doi Suthep-Pui National Park.
2. To create a wild mushroom database and its management software for using it as a reference in the local area and as a sources of knowledge on edible and poisonous mushrooms for students and interested people.

Materials and Methods

Nineteen forest areas in 5 community forests (San Kampheng, Mae Wang, Mae Rim, Mae Orn, and Doi Saket districts, Figure 1) and 14 forest areas in Doi Suthep-Pui National Park were surveyed from November 2003 to August 2004 and October 1996 to November 1998, respectively.

Wild mushroom collectors who were experienced in collecting wild mushrooms in each study site were invited to have an interview and answer questionnaires, both of which were served to find out the number of wild mushroom species in each study site, and how the mushrooms were utilised by the local people.

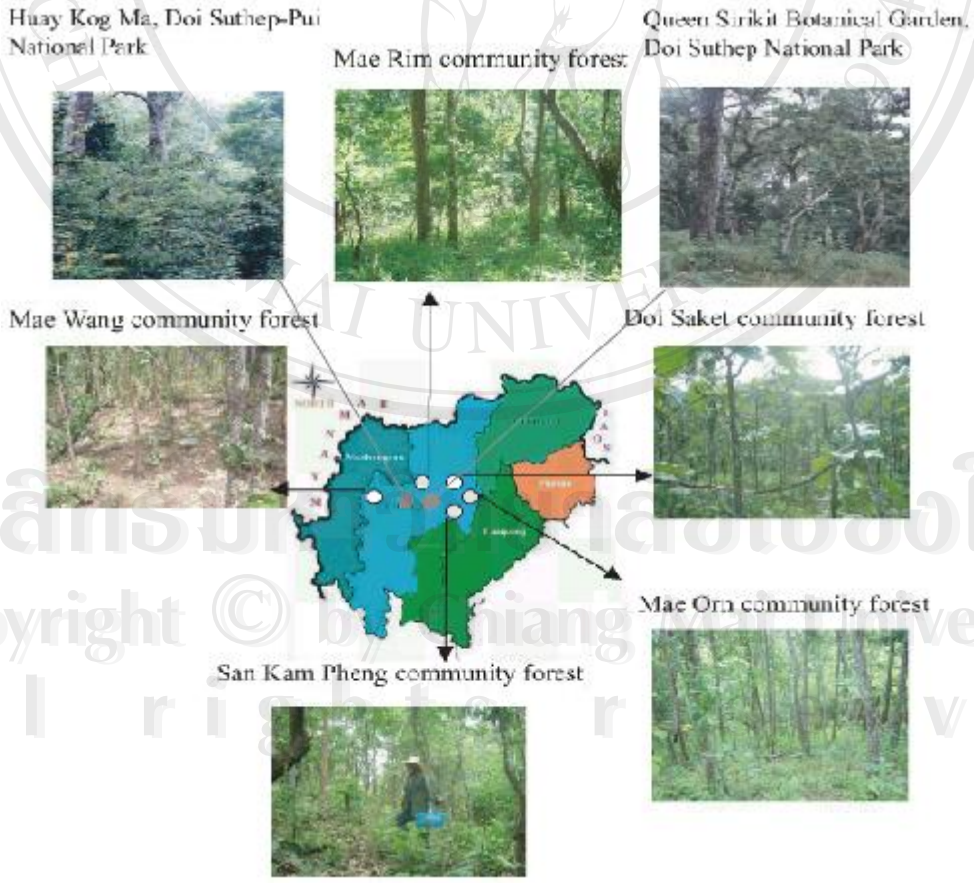


Figure 1 Chiang Mai community forests

Diversity of wild mushrooms in Chiang Mai community forests and Doi Suthep-Pui National Park in Chiang Mai, Thailand

Chiang Mai community forests and Doi Suthep–Pui National Park were selected as study areas according to the types of forest (mixed deciduous, dry dipterocarp, moist evergreen, hill evergreen, and dry evergreen/pine forest) and the sites recommended by the experienced mushroom collectors in each community. Each study site was investigated at least three times per month. Mature fruiting bodies of mushrooms were collected. The following information was recorded, *i.e.*, species names of mushrooms found in each site, macroscopic and microscopic characteristics of fruiting body of each species, collected date, substratum, habitat, relative air humidity, soil moisture, air temperature, altitude, location, soil pH and light intensity at the ground level (Pegler 1998). The collected specimens were identified and the classified by conventional morphological methods (Singer 1986).

Wild mushrooms database of Chiang Mai community forests and Doi Suthep-Pui National Park

The recorded information of the diversity of wild mushrooms in Chiang Mai community forests and Doi Suthep–Pui National Park mentioned above for each species, such as the data related to its species, habitat, macroscopic and microscopic characteristics of fruiting body, was used to create the relational database (Figure 2 and 3) by using database management software, such as Microsoft Access, Microsoft Visual Foxpro and Microsoft SQL. The database management system program was developed and the end-user interface was designed by using Microsoft Visual Basic (Figure 3).

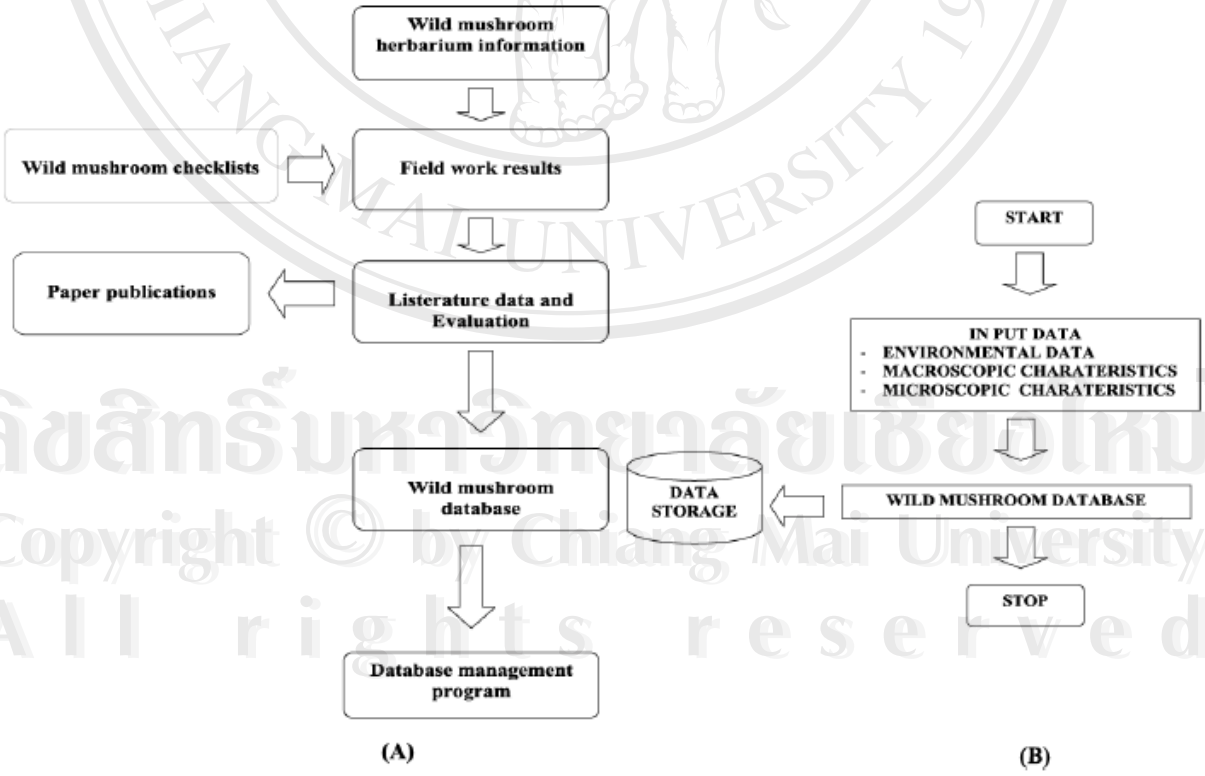
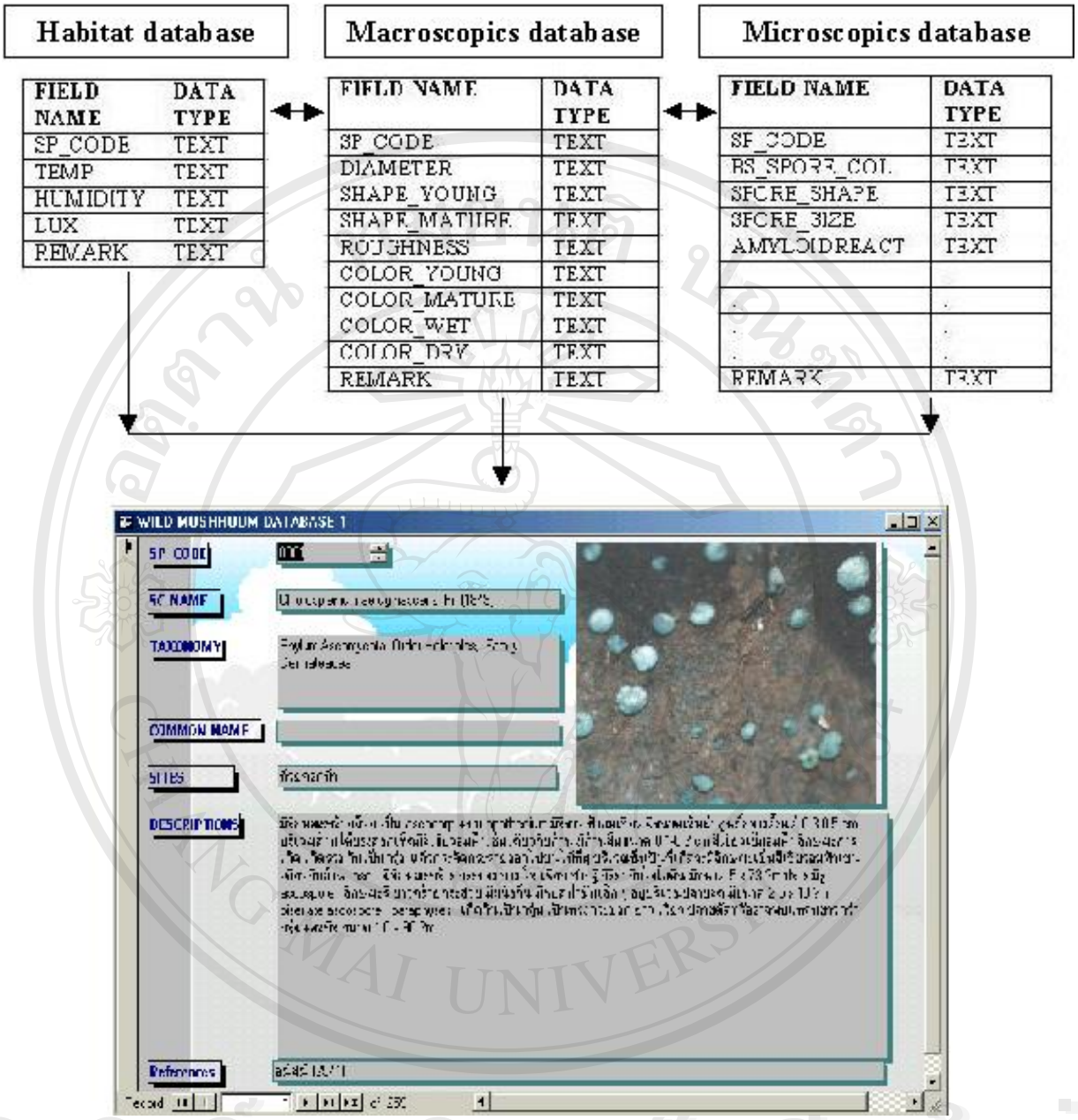


Figure 2 (A) A simple schema of information flow in the on-line wild mushroom database of Chiang Mai community forests; (B) A flowchart showing the procedure for input a mushroom data

into wild mushroom database.



(Data input form)

Figure 3 Relationship-diagram of relational data field (SP_CODE, in each database) for linking to raw data of wild mushroom database and the data input form for inputting raw data into the wild mushroom database.

Results and Discussion

Table 1 shows common edible wild mushroom species in each local community forest which were served as food, and some others which were used to decorate the wood handicraft for home decoration.

The information obtained by questionnaires showed that most of the people who were interviewed were the members of community forests. They played an important role in forestry conservation. The forest served them with food resources (bamboo shoot, edible wild mushrooms

and herbs) for daily survival. Most of them knew edible, non-edible and poisonous mushroom species up to 40, 8 and 10, respectively. The local mushroom collectors avoided from collecting the poisonous species. They learnt these poisonous ones from their parents or from experienced senior neighbors. However, there are some reports in each year that people get sick or die by consuming the poisonous species. These people mistakenly collected the poisonous mushrooms since they look similar to the edible ones.

Table 1 Prices of common edible and non-edible wild mushrooms in Chiang Mai community forests during June to September 2004

Scientific name	Local name	Prices(baht)		Yield / kg/ day	Ultilization
		Local wholesaler	Local market		
1. common edible mushroom					
Astraeus hygrometrius	Hed Throp	20-60	100-150	10-20	Curry, soup and canning
Russula virescens	Hed Lorm (mature)	30-40	80-100	10	Curry, Nam Pic
Russula virescens	Hed Lorm (young)	40-80	120-200	10	Curry
Russula xerampelina	Hed Dang Luang	40-60	60-100	6	Curry
Phaeogyroporus portentosus	Hed Har	40-80	60-100	4	Curry
Russula cyanoxantha	Hed Nar Moi	30-40	50-100	6	Curry
Russula nigricans	Hed Than Yai	30-40	50-100	3	Curry
Russula densifolia	Hed Than Lek	30-40	50-100	3	Curry
Termitomycetes sp.	Hed Korn	40-100	100-240	1	Curry
Lactarius volemus Fr.	Hed Farn	20-40	60-80	2	Curry
Craterellus aureus	Hed Kamin Luang	30-40	50-80	2	Curry
Clitocybe sp.	Hed Chang Phi	30-40	50-80	5	Curry
Craterellus odoratus	Hed Kamin lak	30-40	60-80	1	Curry
Heimiella sp.	Hed Pod Ma	40-60	60-100	2	Curry
Lactarius glaucescens	Hed Khar	20-40	40-60	2	Curry
Russula alboareolata	Hed Nam Paeng	30-40	60-100	4	Curry
Amanita princeps	Hed Kai Kao	60-80	80-150	2	Curry
Amanita hemibapha	Hed Kai Leang	60-80	80-150	2	Curry
2. non-edible wild mushroom					
Amauroderma sp.	Hed Pak, Hed Ja Vak	100-200	-	1-2	Home decoration
Ganoderma sp.	Hed Kra dang	100-200	-	1-2	Home decoration

Diversity of wild mushroom in Chiang Mai community forests and Doi Suthep – Pui National Park

Fifty-eight species of wild mushrooms were found and commonly known in the collected areas of Chiang Mai community forest during November 2003 to October 2004. The most prominent species of macrofungi found belonged to the families Agaricaceae and Russulaceae comprising 8 and 12 species respectively. In Doi Suthep-Pui National Park, there were 258 species of wild mushrooms found during October 1996 to November 1998. The most prominent species of macrofungi found belonged to the families *Boletaceae, Agaricaceae* and *Russulaceae* comprising 43, 35 and 28 species, respectively. All of them were the members of the basidiomycetous group.

The common species were *Amanita hemibapha, Amanita princeps, Astrareus hygrometrius, Craterellus aureus, Craterellus odoratus, Heimiella* sp., *Lactarius glaucescens, Lactarius* sp., *Phaeogyroporus portentosus, Russula alboareolata, Russula cyanoxantha, Russula densifolia, Russula nigricans, Russula virescens, Russula xerampelina, and Termitomycetes* sp.

In Doi Suthep-Pui National Park, wild

mushrooms were found in mixed deciduous forest (76 %), dipterocarp forest (25 %) and dry evergreen/pine forest (12 %). For in Chiang Mai community forests, most (86 %) of wild mushrooms were found in the mixed deciduous or dry dipterocarp forest.

Wild mushrooms database of Chiang Mai community forests and Doi Suthep-Pui National Park

The wild mushrooms database (Figure 3) was created by combing the data on habitat and macroscopic and microscopic characteristics of each mushroom from the field study on the diversity of wild mushrooms in Chiang Mai community forests and Doi Suthep-Pui National Park. After inputting the raw data of each mushroom into the disk storage, a database management program was developed for managing the dried wild mushrooms in the mushroom herbarium. At present, this database has more than three hundred records of wild mushrooms: 58 records in Chiang Mai community forests and 258 records in Doi Suthep-Pui National Park.

As mentioned above, in Thailand, the information related wild mushrooms is insufficient and most of the local people know very little about the poisonous wild mushrooms so that the outputs from this research, such as the wild mushroom database software and reference book, will be distributed to the knowledge-based learning centers, schools and local libraries for preventing the local people from consuming the poisonous wild mushrooms. For the further work, we have a plan to set a training program related to wild mushroom conservation for Thai people.

Acknowledgement

We thank the local wild mushroom collectors in Sankampheng, Mae Wang, Mae Rim, Mae Orn, Doi Saket and Doi Suthep-Pui National Park for helping us to collect wild mushrooms in each community forest.

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