Graphina Müll. Arg.
(GRAPHIDALES: GRAPHIDACEAE)

After Fink, and Hale & Wirth, Harris, 1990, 1995, and others

Rev. 5/94

Thallus crustose, uniform, epi- or endo-phloic, effuse, ecorticate or with a cortex of longitudinal, interwoven hyphae; attached by medullary or prothallial hyphae.

Apothecia elongate, simple or often branched, immersed to adnate or prominent; disk narrow, slit-like or little exposed (labia connivent to open), black; thalline exciple absent; proper exciple black, opaque, usually well developed, entire to sulcate (longitudinally grooved-striate); hypothecium pale to black; hymenium colorless, I-; paraphyses unbranched and free; asci clavate or ± cylindrical, unitunicate (with single functional wall layer), the apex thickened, I-, to 8-spored (usually only 1-3 spored according to Rogers); spores oblong-ellipsoid to elongate-ellipsoid, large, septate, becoming submuriform or muriform, muriform, hyaline, thin walled, I+ violet.

Pycnidia rare, immersed, black; fulcrum exobasidial; pycnospores ellipsoid, oblong-cylindrical or bacilliform, colorless. Norstictic, stictic, atranorin, protocetraric, lichexanthone, salazinic, zeorin, unidentified xanthones, or no substances. Photobiont Trentepohlia. On wood and bark, or rarely rock. Mostly tropical to subtropical, or sometimes temperate.

Differs from Graphis mainly in having ± muriform spores.

A primarily tropical-subtropical genus. Reports from the Pacific Northwest are probably misidentifications, although a few species are definitely known from as far north as the British Isles. The following key is for species reported from the Pacific NW; my key to the genus as a whole in N. America still has some bugs in it.

I. Species Reported from Pacific NW

1. Spores 5-7-septate transversely. Labia carbonized (only on the upper half or less); disc narrow. Spores 3-5-septate longitudinally, (8-)10-15 x (13-)18-26 um. Disc usually not visible. Thallus K-, P- (no substances). Ascocarps black, rarely branched, 0.5-2(-3) mm long, slender, without powdery white covering; exciple open below; labia entire, convergent to spreading., Not actually reported for N. America according to Harris. My notes indicate it is reported for Oregon, but I'm not sure of the source off-hand--probably Pike's unpublished lists. ..... G. dimidiata

1. Spores more than 7-septate transversely. Labia not carbonized. 2

> **2. Ascocarps narrow, 2-5 x 0.3-1 mm,** immersed, simple or branched; disc slitlike, narrow, pale red-brown, pruinose or not; labia entire, margin white, patchily developed. Lirellae not carbonized. Thallus UV+ yellow (lichexanthone), K+ yellow or orange. Hypothecium hyaline, not very thick. Spores 30-75 x 15-20 um, 7-11-septate transversely, with total of more than 30 cells. Florida. Also reported from Washington state [identification needs to be checked!]. ..... G. anguina (Mont.) Müll. Arg.

2. Ascocarps broad, 3-6 x 3-4 mm, the disc sunken but flat to convex, pale; exciple pale and rudimentary; hypothecium hyaline. Spores 9-13-septate transversely, 3-5-septate longitudinally, 25-100 x 8-20 um. Louisiana. Also reported for Washington state [identification needs to be checked!]. ..... (Thelotrmea leprocarpum [Syn.: Graphina leprocarpa)

II-A. Southern Species.
Lirellae carbonized, at least at apices of exciple.

1. Spores 1(-2)/ascus. 2a
1. Spores 2-8/ascus. 2b

2a. No substances. Ascospores 65-90 x 20-30 um. Lirellae semi-immersed (immersed to emergent), disc narrow, not pruinose, margin shiny, not striate, open below. Lirellae black, flexuous, mostly unbranched; ; disk not exposed; hymenium not inspersed. Thallus white, ecorticate. Ascospores densely muriform. Florida. ..... G. xylophaga R. C. Harris
2a. Protocetraric acid. Ascospores 120-165 x 35-40 um. Lirellae immersed, disc broad, whitish pruinose; margin pruinose, often only patchily carbonized. Florida. ..... G. platyleuca (Nyl.) Zahlbr.

2b. Exciple only carbonized at apices, becoming striate. Thallus P+ orange. 3
2b. Exciple carbonized to base of hymenium. 4

3. Spores 2-4/ascus, 30-50 x 20-27 um. Thallus K+ red, with norstictic acid. Florida, Alabama. ..... G. antillarum
3. Spores 8/ascus, 30-40 x 15-17 um, 7-13-septate transversely (according to Harris, 1990; 12-20 septate transversely, 28-80 um long, only finally becoming muriform, according to ?). Thallus K+ yellow (stictic acid). Apothecia epruinose; labia lamellar, regular, ± free, black, embedded in the exciple, not composed of free individually carbonized hyphae, distinctly dentate, sulcate or striate, the sulcae many, deep, black; exciple carbonized laterally only (often the labial apices only), pale or light brown below. Louisiana. ..... G. parilis (Krempelh.) Müll. Arg.

4. Exciple becoming striate, bleeding purplish in K. Thallus K+ red, P+ orange, with norstictic acid. Spores 2-4 x 6-8-celled, 20-35 x 10-15 um. Florida. ..... G. sp. (Harris, 1990)
4. Exciple not striate. 5

5. Exciple covered by thin powdery white layer easily rubbed to expose black exciple. Spores 8/ascus, 1-2 x 4-5-celled, 12-16 x 5-8 um. Thallus K+ red, P+ orange, with salazinic acid. Labia ± convergent; exciples distinctly carbonized; disc narrow, not prominent in surface view. Florida. ..... G. marescens (Fée) Müll. Arg.
5. Exciple naked, black. Spores 2-4/ascus, 35-50 x 17-25 um. Thallus K-, P-, without substances. Lirellae elliptical to weakly elongate with broad red-brown disk. Florida. ..... G. sp. (Harris, 1990)

ADD?

Spores 18-23 x 9-14 um, (2-)3-septate transversely. Ascocarps very rarely and sparingly branched; disc closed to widely open and brownish black or whitish pruinose; exciple black; hypothecium hyaline. Missouri. ..... G. sophisticascens

Thallus K-, P+ red (protocetraric acid). Ascocarps 3-8(-10) x 0.2-0.4 mm, often richly radiately branched, the disc narrow or not visible; the exciple black, finally striate, covered laterally by a disappearing thalloid one; hypothecium hyaline. Spores 5-11-septate transversely, 1-7-septate longitudinally, 30-64 x 8-30 um. Reported from Florida; no material seen according to Harris, 1990. .....G. platycarpa

EXCLUDED? (HARRIS, 1990):

Disc usually not visible. Thallus K-, P- (no substances). Spores 5-7-septate transversely, 3-5-septate longitudinally, (8-)10-15 x (13-)18-26 um. Ascocarps black, rarely branched, 0.5-2(-3) mm long, slender, without powdery white covering; exciple open below; labia entire, convergent to spreading, carbonized only on the upper half or less; disc narrow. Not actually reported for N. America according to Harris. My notes indicate it is reported for Oregon, but I'm not sure of the source off-hand--probably Pike's unpublished lists. ..... G. dimidiata

Labia regularly 2-3 times striate, ± convergent; exciples thick, without yellowish areas, closed or nearly so, the base usually evenly carbonized; ascocarps without white powdery covering; disc narrow, not prominent in surface view. Spores usually 4 per ascus, over 64 um long, densely muriform throughout. Florida and Texas. (Probably a misidentification of G. xylophaga). ..... G. acharii

II-B. Southern Species:
Lirellae not carbonized.

1. Spores 1(rarely 2)/ascus. (if norstictic acid present and spores 80-115 x 24-38 um, = G. sp. of Harris 1995). 2
1. Spores 2-8/ascus. 4

> **2. Spores 3-5- or rarely 7-septate transversely, 85-105 x 20-28 um.** Thallus mealy, scaly, or roughly granulose, with a lumpy, scurfy look. Lirellae crowded, short and irregular; disk often exposed. No substances. Exciple thick. ..... G. cypressi Müll. Arg.
> **2. Spores 11-septate or more transversely.** 3

3. Disc whitish pruinose, soon open. Ascocarps 2-4 x 0.3-0.5 mm, usually branched and often dendroid; exciple pale; hypothecium hyaline. Spores 19-29-septate transversely, 5-7-septate longitudinally, 65-120 x 21-38 um. Reported from Louisiana, but probably a misidentification according to Harris, 1990. ..... G. mendax (Nyl.) Müll. Arg.
3. Disc reddish brown [not pruinose?]. Thallus relatively smooth, containing norstictic acid. Lirellae becoming elongate, flexuose and branched. Spores (35-)80-115 x (16-)24-38 um. 11-31-septate transversely, 3-11-septate longitudinally. Disc reaching 0.6-0.7 mm across; exciple rudimentary and pale brownish. Florida. [The variety is not mentioned by Harris, 1990, but based on the spore size Harris gives, the Florida material is this variety, not the typical one]. ..... G. subvirginalis (Nyl.) Müll. Arg. var. fulvescens

> **4. Ascospores longer than 40 um and/or wider than 20 um.** 5
> **4. Ascospores shorter than 40 um and/or narrower than 20 um.** 10

5. Thallus UV+ yellow (lichexanthone), K+ yellow or orange. Hypothecium hyaline, not very thick. Ascocarps 2-5 x 0.3-1 mm, immersed, simple or branched; disc slitlike, narrow, pale red-brown, pruinose or not; labia entire, margin white, patchily developed. Spores 30-75 x 15-20 um. Florida. Also reported from Washington state [identification needs to be checked!]. ..... G. anguina (Mont.) Müll. Arg.
5. Thallus UV-, without xanthones, K+ or K-. 6

> **6. Lichen substances present (usually P+).** 7
> **6. Lichen substances absent, P-.** Lirellae crowded, irregular with white crumbling exciple. Spores 35-78 x 18-36 um. Florida and Louisiana. (true G. leuconephala has spores 15-26 x 8-12 um). Florida, Louisiana. ..... G. leuconephela auct. Amer.

7. Protocetraric acid, unknown. Thallus K- or + yellowish, P+ red. Spores 2-4/ ascus, 19-31-septate transversely and 3-5-septate longitudinally, (58-)110-140 x (10-)15-17(-32) um. Ascocarps white, emergent, 1-3 x 0.4-0.8 mm, rarely branched; disc closed; labia obscurely striate; exciple pale; hypothecium pale. Florida. ..... G. abaphoides (Nyl. in Tuck.) Müll. Arg.
7. Norstictic acid or stictic acid satellites. Thallus K+ yellow or red. Spores at least initially 8/ascus. 8

8. Thallus K+ yellow then red. Norstictic acid. Lirellae concolorous with thallus, crowded, irregular. 8a
8. Thallus K+ yellow or K-. Stictic acid satellites. Lirellae paler than thallus. 9

8a. Ascospores (18-)40-55 x (6.5-)10-15 um. Thallus brownish yellow. Ascocarps 0.5-2 x 0.25-0.4 mm, often grouped, seldom branched; disc closed or slightly open and grayish white; exciple pale, open below. Spores 9-16-septate, Louisiana and Florida. Probably a synonym of G. subvirginalis according to Harris (1995). ..... G. intertexta (Müll. Arg.) R. C. Harris
8a. Ascospores 60-85 x 13-17 um. Spores 2-8 per ascus. Florida. ..... G. subvirginalis (Nyl.) Mull. Arg.

9. Thallus containing "quintaria" unknowns (hypostictic and hyposalazinic acids according to Harris, 1990). Thallus matt, pale green-gray. Lirellae white, immersed, elongate and branched. Spores 13-23 septate transversely, (40-)50-70(-150) x 13-17 um. Apothecia dendritically branched, never fissurine; entire, not striate; disc broad, easily seen in surface view. Florida. ..... G. virginea (Eschw. in Martius) Müll. Arg.
9. Thallus containing constictic acid. Lirellae "mealy" due to multiple crumbling layers of exciple. Spores 35-78 x 18-36 um [2-4/ ascus according to Wirth & Hale but U.S. material initially 8/ascus]. Florida. ..... G. peplophora Wirth & Hale

10. Spores 1-2 x 4(-6) celled, 15-20(-22) x (4-)7-9 um. 11
10. Spores more than 1-2 x 4-celled, over 20 um long. 12

11. Lirellae fissurine; disk not exposed. No substances. Disc whitish to brownish yellow. Thallus prosoplectenchymatous. Ascocarps fissurine, 0.8-3 x 0.25-0.5 mm; confluently ± branched; disc finally openened whidely, whitish to brownish yellow; exciples totally uncarbonized; hypothecium pale. Louisiana, Florida, Georgia, Alabama. ..... G. incrustans (Fée) Müll. Arg.
11. Lirellae long, regularly branched; disk exposed, reddish (or open and blackish?). Apothecia 1 or 2 times branched, 3-10 or more x 0.25-0.35 mm; exciple pale, open below. Thallus K+ yellow/red (norstictic acid). Spores 10-15 x 6.5-9 um. Florida. ..... G. floridana (Tuck.) R. C. Harris

12. Thallus and lirellae P+ yellow (psoromic acid). Ascospores elliptical, IKI+ dark violet, 20-30(-40) x 13-19 um; often sterile but combination of fissurinae lirellae and psoromic acid is diagnostic. Disc pale flesh-colored to brownish. Apothecia K- or pale, often fissurine, short, ± unbranched, gaping, never intricately intertwined; labia dark brown or ashy brown, ± divergent, entire (not striate); exciples brown or pale, discrete. Florida. ..... G. columbina (Tuck.) Wirth & Hale
12. Thallus P- (no substances). 12a

12a. Exciple well developed, yellow to orange, darker in K; lirellae raised, elongate, flexuose. Spores 2-3 x (4-)6-8-celled, (14-)22-25(-32) x (6-)10-11 um. Ascocarps 2-6 mm in length, long, slender, branched, often fissurine, never intricately intertwined, usually not gaping, K+ purple to black; labia pale or reddish, ± convergent, entire (not

striate); exciples discrete. Thallus smooth. Florida and Alabama. ..... G. scolecitis (Tuck.) Fink

12a. Exciple not evident. Lirellae short, crowded; disk becoming exposed, white pruinose. Spores 2-4 x 6-8-celled, 22-24 x 7-9 um. Florida. ..... G. sp. (Harris, 1990)

Spores 36-64 x 4-8 um, 13-27-septate transversely, 3-7-septate longitudinally. Ascocarps 1-4 x 0.12-0.3 mm, becoming 1-several times branched; disc closed to open and brownish black; exciple brownish; hypothecium hyaline. Florida. ..... G. subvirginalis (Nyl.) Müll. Arg. var. subvirginalis

ADD?

Spores 11-16 x 5-7 um, (2-)3-septate transversely. Ascocarps commonly branched; disc sometimes prominently displayed as a red-brown line, sometimes completely covered by the concolorous thalline margin; labia convergent or divergent, ± entire or appearing internally striate. Thallus smooth, K+ yellow/red (salazinic acid). ..... G. colliculosa

Ascocarps 2-5 x 0.15-0.25 mm, becoming sparingly branched, the disc becoming open and whitish; exciples brownish, covered by raised thalloid one; hypothecium hyaline; spores 7-9-septate transversely. Florida and Louisiana. ..... (Graphis subnitidula)

ADD?:

Spores 30-40 x 10-15 um, 9-13-septate transversely, 1-5-septate longitudinally. Ascocarps 1-5 x 0.2-0.35 mm, rarely branched; disc closed; exciple black or whitish pruninose, sometimes obscurely straite; hypothecium hyaline. Florida (but not mentioned by Harris, 1990). ..... G. substriatula

ADD?:

G. babingtonii (See Wirth & Hale, 1978; no material matching this concept seen, according to Harris, 1990)

Thallus K-, P-; ascocarps K-, P+. Thallus greenish gray to olive-green. Ascocarps 0.5-1 x 0.2-0.3 mm; disc partly closed to open and whitish powdery; exciple pale (at least below), rudimentary; hypothecium pale. Spores 4-8 per ascus, 13-20-septate transversely. Florida (probably immature according Harris, 1990; type not seen yet). ..... G. leucopepla

EXCLUDED? (ACCORDING TO HARRIS, 1990):

Ascocarps 3-8 x 0.4-0.9 mm, rarely branched, the disc closed or slightly open and yellowish brown; exciples brown, obscurely striate, mostly covered by thalloid exciple; hypothecium hyaline. Spores 6-7-septate transversely, 2-septate longitudinally, 21-28 x 8-10 um. Reported from Florida, but N. American material under this name is G. scolecitis according to Harris, 1990). ..... G. adscribens

Ascocarps 0.5-2 x 0.2-0.5 mm, sometimes branched or confluent, the disc closed or narrowly open, whitish; exciple pale, covered by thalloid layer; hypothecium hyaline. Spores 3-5-septate transversely, 1-2-septate longitudinally, 15-26 x 8-12 um. ..... G. leuconephala (true)

Spores 9-13-septate transversely, 3-5-septate longitudinally, 25-100 x 8-20 um. Ascocarps 3-6 x 3-4 mm, the disc sunken but flat to convex, pale; exciple pale and rudimentary; hypothecium hyaline. Louisiana. Also reported for Washington state [identification needs to be checked!]. ..... (Thelotrmea leprocarpum)

Disc whitish. Ascocarps 1-3 x 0.15-0.25 mm, immersed, sometimes branched, often clustered; exciple pale brown; hypothecium hyaline. Spores 5-7-septate transversely, 1-3-septate longitudinally, 25-40 x 12-18 um. Louisiana. ..... G. subnitida

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