

Opegrapha Humb.
(ARTHONIALES: OPEGRAFACEAE)

After various authors

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THALLUS thin to thick, smooth or \pm rimose, sometimes partially or entirely immersed, white, gray, mauve-gray, gray-brown, dark brown or olive-green; prothallus often present and mosaic forming. Soralia occasionally present. In section without a differentiated cortex and with a cretaceous medulla (or medulla not differentiated). Photobiont Trentepohlia, a few species lichenicolous on lichens with other photobionts.

ASCOMATA lirellate apothecia, \pm elongate, rarely \pm rounded, sometimes branched or stellate, discrete or confluent, rarely densely clustered and contiguous, \pm sessile, rarely immersed. Thalline exciple absent (rarely with a thin pseudothalline margin); true exciple usually prominent from the beginning, black, closed or rarely open under the subhymenium, opaque, sometimes \pm swollen, composed of plectenchyma of conglutinated hyphae with the individual hyphae not easily discerned. Disc \pm exposed or remaining slit-like, K- or red-brown or \pm olive-green, occasionally yellow-green, orange or white-pruinose. Hymenium hyaline to pale green-yellowish or brown, I-, \pm reddish brown or \pm blue. Epihymenium colorless in species with a slit-like disc, or brown to black where exposed. Paraphysoids branched, often richly anastomosing, septate, apices not or rarely slightly swollen. Asci bitunicate with fissitunicate dehiscence, (4-)8-spored, clavate to cylindric-clavate or clavate-subglobose; endocascus 2-layered, with the inner layer hemiamyloid (K/I+ blue) and with a sometimes discernible, minute, hemiamyloid (or sometimes amyloid) apical ring around the apex of an ocular chamber; with or without an apical nasse. Ascospores fusiform or acicular, 3-15-septate, hyaline and smooth or becoming red-brown and ornamented when over-mature, I-; sometimes surrounded by a \pm thin gelatinous perispore; walls uniform in thickness, not forming lenticular cells.

PYCNIIDIA immersed to sessile, flask-shaped, black, rarely white pruinose; conidiogenous cells mainly elongate-ampulliform, arising singly, enteroblastic, acrogenous. Conidia very variable, simple, colorless, rarely septate, ellipsoid to bacilliform or sickle-shaped.

CHEMISTRY: No substances, unidentified pigments, or gyrophoric acid.

ECOLOGY: On wide range of substrates, including young and mature broad-leaved trees or shrubs, more rarely conifers and wood; also on often sheltered, acid, neutral or basic rocks, rarely on soil and dead herbs; a few species are lichenicolous.

Superficially similar to Graphis, which differs in having simple paraphyses, I+ purple ascospores with lenticular cells, and quite different non-fissitunicate asci. The non-lichenized genus Hysterium differs in the early browning of the ascospore walls before release from the asci.

The relationship of Opegrapha to other genera in the Arthoniales is still being clarified.

The size and shape of the conidia are an important diagnostic feature of many species. In section, the inner edge of the true exciple, and sometimes the epihymenium and hymenium, are tinged green-olive or red-brown, both colors K \pm intensified, according to the species. In species with red-brown pigmentation, the ascospores in degenerating asci often become red-brown with

age due to the uneven (often granular) deposition of a red-brown pigment on their outer wall. The number of septa of the spores is frequently diagnostic; sometimes one of the middle cells is \pm enlarged.

This is a large and difficult genus, especially for the corticolous and lignicolous species; there are a lot of contradictions in the literature, and some unresolved problems. This key is still far from complete or very useable.

I. On Rock.

1. **Thallus with soralia.** 2

1. **Thallus without soredia.** 3

2. Soralia with yellow or pinkish tinge, P-, K-, KC+ red, C+ red, UV± glaucous or pale yellow. Containing schizopeltic acid and satellites, or gyrophoric acid and trace of lecanoric acid, or both, unidentified xanthone. Thallus brownish or yellowish brown overall; soralia numerous, punctiform. Ascocarps absent or richly present, black, rounded; disc ± gyrose; spores 3-septate, (17-)20-25(-30) x (3-)4-5(-6) µm. On humid, often ± vertical or overhanging, neutral or acid rock faces, especially in old woodlands; scarce on deciduous or conifer bark. Queen Charlotte Islands and Nova Scotia. May belong in Lecanactis. O. gyrocarpa Flot.

2. Soralia dark brown to ± lilac-white, pale when abraded, P-, K-, KC-, C-, UV-, rarely UV± deep blue. Containing confluent, 2'O-methylmicro-phyllinic and 2'O-methylperlatolic acids. On steep, deeply shaded, overhanging, siliceous rocks in humid situations, rarely on shaded, smooth, deciduous bark. Nova Scotia. (Enterographa zonata)

3. **Spores 3(-4)-septate.** 4

3. **Spores more than 3(-4)-septate.** 5

4. Thallus C+ reddish (erythrin and lecanoric acid). Spores 13-17 x 3.5-4.5 µm, without a distinguishable gelatinous sheath. Asci 45-55 x 10-12 µm. Ascomata subimmersed to adnate. Excipulum K+ green. Hymenium 60-80 µm. Subhymenium 10-15 µm. Ascomata 0.3-1.3 mm long. Coastal, California, Baja California. O. brattiae Egea & Torrente

4. Thallus C- (no substances). Spores 21-25 x 6-8 µm, with thick gelatinous sheath. Asci 70-80 x 19-23 µm. Ascomata sessile. Excipulum K-. Hymenium 75-100 µm. Subhymenium 50-60 µm. Ascomata 0.5-2.3 mm long. Ascomata not furrowed or gnarled-subgyrose. Coastal, California. [Two species dubiously reported from California would also key here: O. calcarea, with spores 12-16 x 3.5-5 µm long; records of it from the Sonoran region appear to all be based on C. brattiae; O. rupestris, with ascomata usually longitudinally furrowed or gnarled-subgyrose, and ascospores ± clavate, with gelatinous sheath thin]. O. crassispora Egea & Torrente

5. Growing in Florida. On limestone. Lirellae sessile, fusiform to linear, not branched. Spores 5-6-celled, 20-22 x 4 µm. O. sp. (Harris)

5. Not growing in Florida. On siliceous rock (or at least not limestone). 6

6. Growing in the Northeast. Thallus thin, smooth, film-like, smooth, membranous, pale to dull gray, deep olive, rarely rusty brown. Ascocarps 0.1-1.5(-2) x 0.07-0.2(0.25) mm, 50-80 µm tall, scattered or becoming ± crowded-contiguous, sessile, delicate, serpentine-sinuate, simple, rarely branched or stellate, rarely contiguous; disc a persistent slit, rarely surrounded by pale pseudothalline exciple; exciple in section K+ dull green; hymenium 60-80 µm, I+ red. Spores 20-35 x 3-5 µm, 5-7-septate, slender, acicular, ends tapered. Pycnospores of two types: 10-14 x 0.5-0.7 µm, curved; and 3-5 x 1-1.2 µm, bacilliform. No substances. On deeply shaded siliceous rocks, often in deep clefts; sometimes also on adjacent trees. Massachusetts. O. lithyrga

6. Growing in southern California to Baja California. (Lecanographa hypothallina)

ADD? [Usually on bark or wood]:

O. ochrocheila

probably various others (mostly temperate-boreal species)

II. Parasitic on other lichens

1. On Sphaerophorus globosus. Ascomata dispersed to aggregated-stromatic, rounded, not branched, strongly convex, sessile or immersed at base, base not constricted, black, to ca. 1 mm diam.; epithecium 5-10 µm high, brown-black; hymenium 60-70 µm high, hyaline; hypothecium brown-black, 50-60 µm high, pseudoparenchymatic, the cells rounded to angular, 6-8 µm diam.; exciple contiguous with hypothecium, when young almost covering the hymenium, later expanding; paraphyses branched and anastomosing, 2 µm thick; asci clavate to narrowly clavate; with a tholus with an internal apical beak, 50-65 x 13-16 µm, 8-spored; ascospores narrowly ellipsoid with rounded ends, 3-septate, at first hyaline, with age pigmented by an irregular deposition of a dark substance on surface, 19-22.5 x 5.5-6 µm. All tissues I- (Meltzer's reagent), also after pretreatment with KOH. British Columbia. O. sphaerophoricola Isbrand & Alstrup

1. On crustose (or umbilicate) lichens. 2

2. On corticolous lichens. 3

2. On saxicolous lichens. 4

3. On Pertusaria spp., S. California. Ascomata with slit-like disc, slightly widened when old, 0.4-0.7 x 0.3-0.4(-0.5) mm; excipulum K-. Spores 3-septate, 21-27(-29) x (7)-(8-10) µm. Conidia (5-)-6-7 x 1.5(-2) µm. Coastal. O. maculata Egea & Torrente

3. On Thelotrema lepadinum, British Columbia to Washington. In damp, often shaded sites in the coastal lowlands up to 140 m. O. thelotrematis Coppins

4. On the Lecanora rupicola group (or Protoparmelia badia). Ascomata with broad, exposed disc. Ascospores pale, 21-29 x 7-9 µm. Arizona, California. O. glaucomaria (Nyl.) Källsten

4. On Verrucariales. 5

5. On the Dermatocarpon miniatum group (or Staurothele). Ascospores soon dark brown. Ascomata 0.16-0.3 mm wide, 0.2-0.24 mm tall; excipulum K+ brown-yellow or brown-red. Spores 4-8 per ascus, 3-septate, (18-)-20-24(-26) x (4-)-6.5-7(-8) µm, with pigment in the wall rather than the sheath. Conidia 6.5-7 x 1-1.5 µm. Producing gall-like structures. Arizona, Chihuahua, Sonora. O. pulvinata Rehm

5. On Verrucaria. Ascospores long remaining hyaline, finally pale brown. Spores 18-28(-31) x 5-8 µm, ± clavate, usually with thin epispore. Apothecial tissues brown, K-. Apothecia usually longitudinally furrowed or gnarled-subgyrose, 0.5-1.8(-3) x 0.16-0.25(-0.35) mm, sessile to semi-immersed, scattered, infrequently furcate; disc slit-like. Epithecium brown. Hymenium 90-120 µm. Thallus thin or immersed, smooth or finely cracked, creamy white, gray, greenish to brown-red. Conidia 4-6 µm long, bacilliform. No substances. Baja California. O. rupestris Pers.

III. On Bark or Wood (or stems or leaves).

III-A. Thallus sorediate; often sterile.

1. Soralia dark brown to \pm lilac-white, pale when abraded, P-, K-, KC-, C-, UV-, rarely UV \pm deep blue. Containing confluent, 2'O-methylmicrophyllinic and 2'O-methylperlatolic acids. Rarely on shaded, smooth, deciduous bark. Nova Scotia.
(*Enterographa zonata*)

1. Soralia with yellow or pinkish tinge, or fawn dotted with brown, P-, K-, KC+ red, C+ red. 2

2. Thallus brown, dark brown, rarely pale, mosaic-forming; soralia 0.4-1.5 mm diam., becoming confluent, UV \pm glaucous or pale yellow. Ascocarps gyrose-contorted. Containing Schizopeltic acid and satellites, or gyrophoric acid and trace of lecanoric acid, or both, and unidentified xanthone. Scarce on deciduous or conifer bark. Queen Charlotte Islands and Nova Scotia. (*O. gyrocarpa* Flot.)

2. Thallus pale, often inconspicuous, not mosaic-forming; soralia small, punctiform or diffuse, UV-. 3

3. Soralia uniformly orange when fresh, \pm punctiform; soredia farinose, 12-26 μ m diam. Soralia UV-. Containing gyrophoric acid, \pm unidentified UV+ red pigments. Thallus thin, smooth or somewhat scurfy, occasionally evanescent with a narrow, dark prothallus, pale to medium brown. Soralia 0.4-1.2 mm wide, occasionally confluent to 3 mm diam., punctiform, pale orange-yellow or buff when fresh, fading to cream in herbarium; soredia farinose, 12-26 μ m diam. Apothecia not uncommon, 0.3-0.6(-1.4) x 0.12-0.3 mm, 60-140 μ m tall, scattered, semi-immersed to sessile, unbranched; disc a slit; exciple K+ olive-green; epithecium pale; hymenium 90-120 μ m tall, I+ red. Spores 30-40(-58) x 4-5 μ m, 10-14-septate, elongate-fusiform, with a distinct perispore. Pycnospores 4-6 x 0.6-0.8 μ m, bacilliform. On young, sometimes old, deciduous bark, especially *Acer* and *Salix*, in moist, shaded or open boggy woodland.
O. sorediifera P. James

2. Soralia fawn dotted with brown (x 20 lens) when fresh, diffuse, conspicuous; soredia finely granular, 20-50 μ m diam. On bark, especially alders, sea level to 30(-140) m, in humid areas, British Columbia to Washington. *O. fumosa* Coppins & P. James.

III-B Spores constantly 4-celled

1. Hypothecium hyaline. Thallus thin, smooth, finally and obscurely chinky, pale greenish gray to whitish, occurring in small roundish to irregular areas. Apothecia 0.4-0.8 x 0.15-0.25 mm, narrowly oblong, subsessile, commonly scattered, straight to curved or obscurely flexuous, sometimes branched; disk closed to open, concave to flat, dull black; exciple black, moderately thick; spores oblong-dactyloid, 12-15 x 3.5-4 μ m. On bark of *Umbellularia*, southern California. *O. umbellulariae*

1. Hypothecium brownish to brown or black. 2

2. Spores more than 20 μ m in length. 3

2. Spores less than 20 μ m in length. 7

3. Thallus C+ red, containing schizopeltic acid and protocetraric acid (in traces?--P-); disc

C-. Thallus epiphloedal, effuse, smooth or slightly rugose, epruinose, white or creamy white, 0.05-0.1 mm thick; prothallus when contiguous crust-like and black; calcium oxalate absent. Ascomata numerous, evenly dispersed over thallus surface, solitary, usually lirelliform to elongate or rarely circular, unbrnched, sessile with constricted base, 0.3-1 x 0.1-0.3 mm; disc usually hidden, concave, pruinose; disc tomentum absent; thalline margin absent but sometimes thalline tissue present in lower part of proper exciple; proper exciple usually pruinose, consisting of intertwined coalescent carbonaceous hyphae; hypothecium dark, carbonaceous, extending down to substrate; hymenium hyaline, 80-100 um; paraphysoids sparsely branched; epithecium brown; asci clavate; spores fusiform with one end tapering more than other, straight or slightly curved, smooth, 3-septate, cont constricted, hyaline, 24-28 x 3-4 um. Pycnidia solitary, occasionally numerous but restricted to certain areas of thallus, \pm immersed, pale to dark brown; microconidioid filiform, curved to neraly straight, 8-9 um long. On bark, Texas. O. ravenelii (Syn.: Lecanactis ravenelii)

3. Thallus C-, P-, K-, without substances (need to check on O. protuberans). 4

4. Spores 3-5 um wide; perispore indistinct. [The distinctions between the next two species are not very clear, due to lack of equivalent info.] 5

4. Spores 5-8 um wide; perispore (gelatinous halo) thin (to thickish) and distinct. Spores ellipsoid-fusiform to somewhat clavate, the third cell largest, the two end cells smaller than the two central; Exciple red-brown, K- in section (need to check on O. protuberans) [The distinctions between the next two taxa are dubious; in addition to the differences given below, some European keys also indicate that O. protuberans occurs on wood, whereas O. herbarum occurs on bark]. 6

5. On Taxodium. Thallus dull gray, "soft-looking", continuous or not evident. Lirellae initially immersed in bark; disc a stongly flexuose slit becoming quite broadly exposed, brown; margin thick, black or densely white pruinose (pruina lost in old ascomata), becoming broken into sections in age and reminiscent of Chiodecton; margin carbonized, open or closed below; hymenium not inspersed. Spores 4-celled, 25-28 x 4-5 um, becoming pale yellow-brown and ornamented, without obvious gelatinous sheath, the cells \pm equal. No substances. Florida. O. cypressi R. C. Harris

5. On broad-leaved trees. Thallus epiphloedal, reddish- to brown-gray or olivaceous, thin, smooth or finely cracked, sometimes delimited by dark prothallus and mosaic-forming. Lirellae immersed, sometimes \pm elevated on a thalline cushion; disc brownish black, fully exposed (according to Pentecost & James; slit-like according to Awasthi); proper margin very thin sometimes surrounded by a thin, persistent, pale, \pm raised, pseudothalline exciple; not becoming broken into sections (?). Spores (15-)17-27 x 3-5 um, hyaline to finally brownish, fusiform to ellipsoid-fusiform, often \pm curved; exciple K+ olive-green or brown in section (according to Pentacost & James' key, but K- according to their description!). Spores 4-(-8?)-celled, hyaline or pale yellow, fusiform, often \pm curved. Lirellae \pm equally divided, very variable in form, shortly rounded to oblong or slightly irregular and simple to forked, or striate and radiately-stellately branched and aggregated, sometimes curved, to (0.2-)0.32-0.5(-2) x 0.09-0.15(-0.3) mm, scattered or clustered, straight to curved; Hymenium 50-60 um, K-. Hypothecium medium to dark brown. Pycnosporos 4-8 x 0.8-2 um, straight or curved. Thallus thin, smooth to slightly rough, becoming finely cracked, greenish gray to dull olive or red-brown, rarely gray; limited and sometimes dissected by blackish lines and forming mosaics, becoming

powdery and sometimes disappearing. No substances. On smooth, shaded, nutrient-rich bark of broad-leaved trees. Florida ("v. subocellata"), but neither the species nor the variety were mentioned by Harris, 1990. [The distinction between "O. herpetica v. subocellata" and the typical variety ("apothecia sometimes 1 or 2 times branched") is dubious; Fink does not list the typical variety of "O. herpetica" ("reported from temperate regions") for the U.S.] O. rufescens (syn.: O. herpetica)

6. Apothecia partly immersed to adnate; disc very narrow, usually only a slit, scarcely visible. Epithecium black. Thallus whitish to sordid pale yellowish gray, very thin, in small oval patches, \pm immersed; hypothallus indistinct. Apothecia 0.5-2.0 x 0.1-0.2 mm, linear, oblong-ellipsoid or sometimes ovoid, rarely almost circular, usually irregularly ordered (not in rows), ornamented; disc black, proper margin black, broad and rounded; hypothecium pale to dark brown or black; epithecium subcontinuous, narrow; hymenium hyaline, 80 μ m high, I+ yellowish, to reddish above; paraphyses branching, loosely interwoven; asci clavate, 72 x 20 μ m. Spores (13.2-)20-26 x (4-)6-7(-8.3) μ m; perispore "broad". On wood or bark. Southern California; Washington. O. protuberans [probably a synonym of O. herbarum]

6. Apothecia sessile; disc at first a slit, but soon becoming \pm fully exposed. Epithecium brown. Thallus ash-gray, brown or dull olive-green, thin, sometimes inconspicuous or immersed, smooth, Ascocarps 0.5-1(-1.6) x 0.15-0.3 mm, scattered, simple or infrequently branched; disc occasionally \pm green-pruinose. Exciple K-; epithecium, K- or \pm red-brown; hymenium 70-90 μ m, I+ red. Spores (16-)18-24(-26) x (4-)5-7(-8) μ m, 3-septate, colorless, becoming \pm red-brown when overmature; perispore "thin" (0.5-1 μ m wide). Pycnidia very rare; pycnosporos 3-6 x 0.5-1 μ m, bacilliform, straight. Exciple and epithecium red-brown. No substances. On acid to basic, usually smooth bark, wood, rarely on other substrates, including sandstone, often in rather shaded situations. California; British Columbia. O. herbarum (synonym: O. betulina)

7. Lirellae encrusted with bright orange pigment, short, straight. 8

7. Lirellae black or white pruinose, not pigmented [?--need to check on non-Florida species]. 9

8. Growing in boreal-temperate areas, or in the west, S to California and Coahuila, Mexico. Apothecia 0.5-1.2(-2.5) x 0.25-4 mm, 60-100 μ m tall, sessile, sometimes \pm irregularly gnarled, simple, sinuate, or often branched, rarely stellate, scattered or contiguous; exciple, and sometimes the disc, \pm with a red-orange to orange-brown pruina of unknown composition, K+ magenta-red; disc a slit, frequently \pm widening to a broad disc with thin margin; epithecium reddish brown; hymenium 50-60 μ m tall, I+ blue; spores (12-)14-16(-22) x 3-4.5 μ m, ellipsoid or somewhat clavate, 3-septate. Thallus effuse, spreading, very thin or immersed, inconspicuous, white-gray, rarely tinged brownish or olive-green. Pycnosporos (10-)12-20 x 0.7-1.7 μ m, sometimes 1-3-septate, bacilliform. straight or only weakly curved. Thallus P-, K \pm purplish, KC-, C-, UV \pm orange or glaucous (\pm 2 UV+ pigments). On old, dry, shaded deciduous bark, especially oaks, often on wood, more rarely on sheltered siliceous rocks. British Columbia. O. ochrocheila

8. Growing in Florida. Spores 17-20 x 4 μ m. Lirellae encrusted with bright orange

pigment, short, straight. O. aurantiaca B. de Lesd.

9. Spores tapering at both ends, 18-19 x 4-4.5 um; lirellae small; disk not exposed.

Florida. O. sp. (Harris, 1990)

9. Spores rounded at one or both ends (?--need to check on non-Florida spp.). 10

10. Growing in northern or western areas. 11

10. Growing in Florida or adjacent southeastern coastal plain. Lirellae sessile, black, shiny, not pruinose; spores rounded at one or both ends. 12

11. Thallus greenish gray to ashy or brownish gray, minutely granulose (the granules often heaped). Apothecia 0.15-0.25 mm across, or to 0.4 mm in one direction, round to slightly elongated, adnate, usually numerous, scattered or clustered; disc open, concave to flat, brownish black; exciple well developed and of same color as disc. Thallus rather thin. Hypothecium light to darker brown. Spores ovoid-dactyloid, 3-septate, 13-15 x 5-6 um. On trees, New Hampshire and Massachusetts. O. microcycilia

11. Thallus creamy- to silvery-white, sometimes ± tinged olivaceous, smooth, often ± immersed. Apothecia (0.3-)0.7-1.5(-2) x (0.09-)9.12-0.2(-0.3) mm, numerous, randomly distributed or in parallel or ± stellate clusters, variable, simple or frequently branched and often contiguous, sometimes forming dense contiguous black patches, usually sessile (but sometimes almost totally immersed), black, shiny; disc a slit, rarely opening, not pruinose. Thallus effuse or ± delimited, usually forming small, neat patches, occasionally mosaic-forming. Hymenium 60-90 um tall, I+ blue, not interspersed; Hymenium and edge of exciple olivaceous tinged. Epithecium brown or green-brown, K+ olive-green. Spores 13-18(-20) x 2.5-4(-5) um, 3-septate, ellipsoid or often ± clavate, rounded at one or both ends. Pycnosporos 4-5 x 0.7-1 um, straight or slightly curved, ends blunt, rounded, bacilliform. Thallus P-, K-, KC-, C-, UV- (no substances). On smooth bark of young or old trees, more rarely on wood. Widespread ("throughout the United States", to Florida. O. atra Pers.

12. Thallus pale greenish gray varying towards ashy or olivaceous, smooth to slightly rough. Apothecia 0.5-2.5 x 0.2-0.3 mm, with ends rather obtuse, slightly immersed to adnate, scattered to clustered, straight to curved or rarely and obscurely flexuous, very rarely branched; disk closed to narrowly open and black; margin dull black; hypothecium black; spores 3-septate, 14-18 x 5-7 um. On trees, Florida (but not mentioned by Harris). O. agelaea

12. Thallus whitish. 13

13. Lirellae coarse, elongate, 0.3-2.5 x 0.12-0.17 mm, infrequently and sparingly branched; spores (11-)13-15 x 4-5 um. Thallus white or whitish, thin, smooth, becoming powdery. Apothecia slightly immersed to adnate, scattered, straight to curved, the ends obtuse; disc closed; exciple black and moderately thick; hypothecium brownish black; spores ovoid-dactyliform, 3-septate, 11-13 x 4-5 um. On bark, Florida, Louisiana. O. candida Müll. Arg.

13. Lirellae mostly (at least in Florida material) shorter (to 1.5 mm or rarely more in the case of O. atra) and fusiform or once branched, rarely asteriform. 14

14. Hymenium not inspersed; disc a slit, rarely opening. Spores 13-18(-20) x 2.5-4(-5) um. Widespread, to Florida. (O. atra)

14. Hymenium inspersed; disk exposed. Spores 13-15 x 4-4.5 um. Florida. [Fink's report of "O. diaphoroides" (= Lecanactis grumosa) from Florida is apparently based on this unnamed species of Opegrapha according to Harris]. O. sp. (Harris, 1990)

III-C Spores 4-15- or more-celled

III-C-1. Spores (4-)6(-8)-celled.

1. Spores (5-)6-9 um wide. [Also see O. vulgata]. 2
1. Spores 2.5-4(-4.5) um wide. 4

2. Spores (18-)20-37 x 5-6(-9) um, 5-7-celled. Widespread, often in northern or western areas (but also south to Florida). Spores somewhat clavate, the middle cells somewhat enlarged, with thin perispore and rounded ends, becoming red-brown with age. Thallus thin or evanescent, smooth or finely cracked, pale to dark gray, occasionally tinged dull brown. Apothecia 0.7-2.5(-4) x (0.1-)0.2-0.5 mm, 80-120 um tall, mostly elongate, infrequently branched, rarely stellate, scattered or contiguous, sessile; disc very variable, a slit frequently becoming \pm exposed with age or fully exposed from the beginning. Exciple and/or disc sometimes \pm gray- or green-pruinose; exciple K- in section; epithecium brown, K-; hymenium 60-80 um, I+ red. Asci ca. 60 x 20 um, asymmetrical, with one side swollen towards the center, the other side straight, the base narrowed. Pycnidia often thinly white or greenish pruinose. Pycnosporos 3-5 x 0.5-1(-2) um, bacilliform or slightly dumbbell-shaped. No substacnes. On neutral, basic, rough, shaded bark, especially of deciduous trees, occasionally on wood or decaying ferns, rare on sheltered limestone or mortar. O. varia sensu lato

2. Spores 5-7 um wide, 7-8-celled. Florida. 3

3. Hymenium not inspersed. Disk becoming exposed. Lirellae small, fusiform to linear, rarely once branched. Spores 7-8-celled, 35-40 x 5-7 um. Florida. O. sp. (Harris, 1990)

3. Hymenium inspersed. Disk hidden. Lirellae coarse, simple to weakly asteriform. Spores 7-8-celled, 40-45 x 5-6.5 um. Florida. O. sp. (Harris, 1990)

4. Thallus white, with plainly marked margins, thick, matt, almost byssoid. Spores 18-24 x 3 um, 6-celled. Disk hidden, but not by dense white layer. Lirellae fusiform or once branched. Florida. O. leucoplaca Müll. Arg.

4. Thallus immersed, or whitish to grayish, greenish or brownish, thin to thick, not byssoid. [more info. needed on O. leucoplaca]. 5

5. Thallus immersed, visible only as a greenish, greenish gray or finally brownish colored stain. Usually on substrates other than bark or wood. Apothecia scattered to sometimes rather loosely grouped, adnate, straight to frequently curved or occasionally flexuous, rarely 1-2(-3) times branched, 0.2-1.5 x (0.1-)0.2-0.4 mm broad, the ends usually obtuse; disk closed, finally indicated by a very obscure, depressed, black line; excipuloid tissue rather thin, brown-black, carbonaceous; hypothecioid tissue hyaline to light brown; asci 4-8-spored. Spores cylindrical-ellipsoid to variously curved and rarely thicker in some regions between the two ends, (4-)6-celled, (14-)18-25(-30) x (2-)3-4 um (12-14 um wide according to Awasthi, obviously a lapsus!), not halonate; middle cell larger. Photobiont Phycopeltis. Growing "on trees" (according to Fink); on bamboo culms (according to Harris). Louisiana [usually on leaves in other areas of the world]. O. filicina Mont.

5. Thallus \pm superficial. On bark or wood. 6

6. Growing in Florida or adjacent areas of southeastern coastal plain. 7

6. Growing in northern or western areas. Excipulum "complete" (presumably carbonized below hymenium), but hypothecium may be colorless. Lirellae very variable in size, shape, branching, and expansion of the disc. 11

7. Disc covered by a dense layer of white material; Apothecia often branched. Disk becoming broadly expanded; margin black, usually lacking at base. Excipulum or hypothecium (usually) not carbonized below hymenium. Discs becoming broadly expanded. Lirellae long, flexuous, branched. Spores rarely produced?, (4-)6-celled, ca. 24 x 5 μ m. Thallus smooth.

Florida. "O." astraeca Tuck. (= Graphidiales)

7. Disc not covered by dense white layer (but exciple in O. longissima often covered toward the base by a thalloid margin according to Fink). 8

8. Disc soon broadly expanded, red-brown (dull brownish black or often obscurely whitish pruinose according to Fink). Spores (5-)6(-8)-celled, 16-20 x 4-5 μ m, fusiform. Apothecia long, flexuous (straight to infrequently curved according to Fink), with obtuse ends, immersed or becoming partially superficial, branched, numerous, usually approximating parallel position and closely aggregated; disc flat, becoming several to many times transversely fissured; exciple black or obscurely white pruinose laterally. Excipulum not carbonized below hymenium. Hypothecium hyaline. Thallus thin, smooth, continuous to sparingly and obscurely chiky or rarely beoming irregularly areolate, pale greenish gray to whitish, rarely tending to disappear. On wood, Florida, Louisiana. O. longissima Müll. Arg.

8. Disc hidden, or if exposed, then black. 9

9. Spores 6-celled, under 30 μ m long, mostly over 3 μ m wide. Lirellae fusiform or once branched. 10

9. Spores 8-celled, 32-43 x 3 μ m. Thallus pale. Disk hidden; lirellae branched, flaring out at base. Florida. O. sp. (Harris, 1990)

10. Spores 24-30 x 3-4 μ m. Disk hidden. (O. vulgata)

10. Spores narrower, 20-27 x 4.5-5 μ m. Disk becoming exposed, black. hymenium inspersed; Florida. O. sp. (Harris, 1990)

11. Pycnospores curved, worm-like, 5-7(-8) x 1-1.2(1.5) μ m. Spores 4-7-septate, fusiform, straight or slightly curved, (18-)20-27(-30) x 2.5-3 μ m. Apothecia 0.4-1.5 x 0.2-0.25 mm, elongated, generally simple and \pm isolated; disc black, slitlike, partly exposed in age; exciple complete, somewhat uneven, K \pm olive in section, or coloration less pale in the center. Hymenium hyaline, 50-70 μ m, I+ red; subhymenium 12-25 μ m. Thallus smooth, continuous to rimose, white to gray. Pycnidia of Laeviomycetes opegraphae, producing brown simple conidia, often on thallus and in hymenium. No substances. On neutral and basic deciduous bark, in wayside and woodland situations, more rarely on conifers and woods. O. niveoatra

11. Pycnospores of three types: (a) sickle-shaped, 9-18 x 1-1.5 μ m, (b) 9-14(-17) x 0.5-0.7 μ m, (c) bacilliform, 3-5 x 1(-1.8) μ m. Pycnidia often numerous, intermixed with the lirellae;

Apothecia 0.4-5 x 0.16-0.2(-2.5) mm (to only 2 mm long according to Awasthi, to 3 mm according to Pentecost & James), 50-100 µm tall, very variable, sessile or semi-immersed, fusiform to elongate and serpentine-sinuate, simple or often once furcate, sometimes stellate or forming interlinking network, sometimes striate. Spores 5-8(-9)-celled, (15-)24-30(-40) x (2.5-)3-4(-4.5) µm (to 6-7 µm wide according to Awasthi), elongate-acicular, ± tapered at one end, straight or somewhat curved, thin-walled; disk usually persistently slitlike, hidden, but not by dense white layer. Excipuloid tissue complete, present also below ascigerous layer; hypothecoid tissue colorless. K-; epithecium dull chocolate brown; hymenium 45-60 µm, I+ red. Thallus white, gray, greenish gray, to pale or deep brown, often with an olive tinge, thin, smooth. No substances. On ± shaded, smooth, young bark or smooth areas on old trunks on a wide range of tree species. Widespread, to Florida. O. vulgata (Ach.) Ach., nom. illeg. (needs a typification with a protection status; synonym: O. cinerea; including O. vulgata [ssp.?] minor)

Key to O. varia s. lato

1. Apothecia to 2-4 mm long, with permanently crack-form discs, 0.2-0.3 mm wide, mostly simple, elongated,. Spores 20-27 x 6-9 um, 5- to 7-celled. Pycnospores straight, 4-5 x 0.5 um. On deciduous trees. Closely related to L. varia (synonomized under it by Pentecost and James). O. rimalis

1. Apothecia to 1 mm long. Disc becoming exposed. 2

2. Thallus smooth. Apothecia short and wide, 0.5-1 x 0.15-0.35 mm, not branched or rarely so. Spores (4-)6(-8)-celled. O. lichenoides
(synonomized under O. varia by Pentecost and James)

2. Thallus becoming chinky, scurfy, scaly or powdery. 3

3. Apothecia 0.3-1 x 0.1-0.25 mm, usually scattered; disc \pm widely open. Spores ellipsoid-dactyloid, 3-7-septate, 16-28 x 4.5-7 um. On trees. Massachusetts, Washington, California. O. diaphora (synonomized with O. varia by Pentecost & James)

3. Apothecia 0.4-2 x 0.16-0.4 mm, scattered or clustered, fusiform or once-branched. Disk becoming exposed, black, not covered by dense white layer. Spores 18-20 x 5-6 um, 6-celled. Hymenium not inspersed. Widespread, to Florida. O. varia Pers. s. str.

III-C-2. Spores (8-)16-celled.

1. Spores 9-12-celled, 38-50 x 4 um. Disk broadly expanded, red-brown. Lirellae short, orbicular or elongate and strongly flexuose. Exciple carbonized below hymenium.

Florida. O. sp. (Harris, 1990)

1. Spores mostly over 4 um wide. Discs slit-like. 2

2. Spores (5-)7-septate (to 11-septate according to Fink), (20-)30-42 x 9 um (3.5-7.5 um wide according to Fink), initially colorless, later dark. Thallus very thin to thin, smooth to slightly rough, pale greenish gray to ashy or brownish, often limited by a dark brown to black hypothalline line, frequently disappearing. Apothecia 0.5-4 x 0.2-0.4 mm, oblong to linear-oblong or more nrealy ellipsoid, adnate, usually scattered, straight to curved or rarely and obscurely flexuous, very rarely branched; disc closed to \pm open, flat to concave, dull black; exciple black; hypothecium hyaline to brownish black; spores narrowly fusiform. Texas to Florida (but not mentioned by Harris). O. bonplandii

2. Spores more than 11-septate, more narrow and elongated, often over 42 um long and often under 9 um wide. Apothecia simple to tri-radiate. Excipuloid tissue complete. 3

3. Apothecia short, \pm knot-like, 0.7-1(-2) x 0.2-0.4 mm. Hypothecioid tissue colorless. Excipuloid tissue thin below ascigerous layer, Spores in one level, 25-60 x 6-9 um [70-95 um long according to Awasthi; 3-4 um wide according to Harris]. Apothecia sessile, scattered, initially semi-immersed, short, rounded to fusiform, often elliptical or buttonlike, simple, seldom shortly furcate or tri-radiate, 80-100 um tall; disk a narrow slit. Spores (9-)12-14(-16)-celled, with a perispore. Thallus very thin or inconspicuous, usually in small (2-4 cm) patches, smooth or somewhat scurfy, dull olive or brown, usually rather dark. Excipuloid tissue K+ olive green (sometimes faint); epithecium pale; hymenium 70-80 um, I+ red. Pycnospores 3.5-6 x 0.5-1 um or (?) 15-18 x 1 um, bacilliform or slightly curved. No substances. On smooth, usually young, bark of deciduous trees. Florida; reports from northern areas (Massachusetts, Illinois, Missouri) doubtful according to Fink. O. viridis (Ach.) Behlen & Desberger

3. Apothecia elongate, serpentine, 0.5-2.3(-3) x 0.2-0.4(-0.6) mm. Hypothecioid tissue brown; excipuloid tissue extended and swollen downwards. Spores parallely arranged or in two tiers, (40-)50-70(-80) x 6-8 um (24-32 x 6-11 um according to Fink). Apothecia simple to tri-radiate, prominent, sessile, 100-200 um tall, scattered or \pm contgiuous, sometimes massed and interconnected, mostly curved or seprentine, ingrequently branched; discs persisently slit-like. Thallus somewhat thickish, smooth and somewhat membranous or minutely cracked, pale to dark gray, occasionally olive-green to \pm dull olive-brown. Spores elongate-fusiform with a narrow perispore, (8-)11-17-septate. Excipuloid tissue K+ greenish olive in section; epithecium pale brown; hymenium 90-100 um, I+ red. Pycnospores 4-6 x 0.5-1 um, straight. No substances. On dry, shaded rough bark of mature and over-mature trees, especially oaks. Minnesota; Texas to Florida (but not mentioned by Harris). O. prosodea

Detailed Descriptions

Opegrapha atra

THALLUS thin, creamy- to silvery-white, sometimes tinged olivaceous, smooth, often \pm immersed, effuse or delimited by blackish prothallus, usually forming small, neat patches, occasionally mosaic-forming. .

ASCOMATA (0.3-)0.7-1.5(-2.2) x (0.09-)0.12-0.2(-0.3) mm, usually numerous, randomly distributed or in parallel or \pm stellate clusters, variable, simple or frequently branched and often contiguous, sometimes forming dense contiguous black patches, usually sessile (but sometimes almost totally immersed), black, shiny; disc a slit, widening slightly when old, rarely opening, not pruinose. Hymenium 30-50 μ m tall (Egea & Torrente, Sonoran region) (60-90 μ m according to British flora), I+ blue, not inspersed; Hymenium and edge of exciple olivaceous tinged. Subhymenium pale brown, 12-25 μ m. Epithecium brown or green-brown, K+ olive-green. Paraphysoids to 1 μ m wide. Asci clavate-subglobose, 32-40 x 10-14 μ m (Calcareae-type). Spores 12-18(-20) x (2.5)3-4(-5) μ m, 3-septate, ellipsoid or often \pm clavate, rounded at one or both ends (Calcareae-type).

PYCNIDIA immersed; conidia 4-6 x 0.7-1 μ m, straight or slightly curved, ends blunt, rounded, bacilliform.

SPOT TESTS AND CHEMISTRY: Thallus P-, K-, KC-, C-, UV- (no substances).

ECOLOGY AND DISTRIBUTION: On smooth bark of young or old trees, more rarely on wood. Widespread ("throughout the United States"), to Florida; California, Baja California.

Opegrapha brattiae Egea & Torrente

THALLUS crustose, epilithic, creamy white to grayish, effuse, rimose to areolate, with smooth surface and with a thin black prothallus; in section up to 100 μ m thick, ecorticate and without a distinct medulla, I+ light blue in part.

ASCOMATA 0.3-1.3 x 0.2-0.3 mm, simple or slightly branched, numerous, subimmersed to adnate, scattered or aggregated, with a slit-line disc, becoming slightly widened when old, epruinose or, rarely, white-pruinose. Excipulum closed, 30-50 μ m laterally, 70-150 μ m at base, K+ green. Hymenium hyaline, 60-80 μ m, I+ blue/reddish. Subhymenium pale brown, 10-15 μ m tall. Paraphysoids to 1.5 μ m wide. Asci cylindric-clavate, 45-55 x 10-12 μ m (Vulgata-type). Ascospores 13-17 x 3.5-4.5 μ m, (2-)3-septate, fusiform, straight or slightly curved, without a distinguishable gelatinous sheath (Calcareae-type).

PYCNIDIA immersed to subimmersed, \pm globose; conidia 4-7 x 0.8-1 μ m, straight.

SPOT TESTS AND CHEMISTRY: Thallus K+ yellowish, C+ reddish, P-. With erythrin and lecanoric acid.

DISTRIBUTION AND ECOLOGY: California, Baja California. Coastal, in ombrophobous communities. On rock.

NOTES: Reports of O. calcarea from the Sonoran Desert region are based on this species.

Opegrapha corinneae Egea & Torrente

THALLUS crustose, white, effuse, continuous to rimose, with smooth or slightly farinose surface; in section, up to 120 μ m thick.

ASCOMATA 0.3-2 x 0.1-0.3 mm, adnate without constricted bases, scattered or aggregated, flexuous, simple or slightly branched, with a slit-line disc, epruinose. Exciple closed,

but open when immature, brown-black. Hymenium hyaline, 140-200 µm, I+ reddish, K/I+ pale blue. Subhymenium to 50 µm, pale brown. Paraphysoids to 1.5 µm wide. Asci clavate to cylindrical-clavate, 65-70 x 16-18 µm (Varia-type). Ascospores from oblong-ovoid to elongate-fusiform, the upper apex rounded and narrowing to the lower end, 21-24(-26) x 4-6 µm, 6-7-septate, dark brown when young, due to pigmentation in the perispore and the spore wall, constricted at one or more speta, thick walled, the cells more or less lenticular with thickened septa and with a gelatinous sheath (Parasitica-type).

PYCNIDIA conidia 10-17 x 1 µm, curved.

SPOT TESTS AND CHEMISTRY: Thallus K-, C+ reddish, KC-, P-; unidentified substance (arthoniaic acid?) of RF 3,3,2, gray after charring.

DISTRIBUTION AND ECOLOGY: Baja californica. On dry, rough bark, in coastal scrub.

NOTES:

Opegrapha crassispora Egea & Torrente

THALLUS crustose, continuous to rimose, whitish or grayish, effuse.

ASCOMATA 0.5-2.3 x 0.2-0.3 mm, sessile, scattered or rarely aggregated, simple, occasionally branched, with a slit-line disc, epruinose. Excipulum closed, 40-50 µm laterally, 75-100 µm at base, K-. Hymenium 75-100 µm, I+ blue/reddish. Subhymenium brownish, 50-60 µm. Paraphysoids to 1.5 µm wide. Asci claviform, 70-80 x 19-23 (Varia-type). Ascospores ellipsoid to fusiform, 21-25 x 6-8 µm, 3-septate, with two enlarged middle cells, and a thick gelatinous sheath; cell wall thin and swollen at septa (Subelevata-type).

PYCNIDIA immersed. Conidia 5-7 x 1 µm, straight.

SPOT TESTS AND CHEMISTRY: Thallus K-, C-, KC-, P-; no substances.

DISTRIBUTION AND ECOLOGY: Coastal, SW California. On rock, ombrophobous.

NOTES:

Opegrapha erosa Egea & Torrente

THALLUS inconspicuous or immersed, indeterminate.

ASCOMATA 0.6-2.5 x 0.1-0.3 mm, simple or branched, adnate, scattered or aggregated, with a thin slit-line disc, becoming slightly widened when old, epruinose. Excipulum closed, 25-40 µm laterally, 40-70 µm at base, K-. Hymenium 55-75 µm, I+ reddish. Subhymenium pale brown, 25-40 µm. Paraphysoids to 1 µm. Asci cylindric-clavate, 45-50 x 11-13 µm (Vulgata-type). Ascospores fusiform to somewhat clavate, 15-18 x 4-4.5(-5) µm, 3(-4)-septate, straight to slightly curved, with a thin gelatinous sheath, wall thin and not swollen at septa (Calcarea-type).

PYCNIDIA immersed to subimmersed; conidia 5-6 x 0.8-1 µm, straight.

SPOT TESTS AND CHEMISTRY: Thallus K-, C-, KC-, P-; no substances.

DISTRIBUTION AND ECOLOGY: Coastal California. On bark and wood.

NOTES:

Opegrapha fumosa Coppins & P. James

Thallus thin, wide-spreading, effuse, immersed, inconspicuous, gray-brown. Soralia numerous, pale fawn, minutely mottled brown (never orange even when fresh), sometimes erumpent-punctiform or elliptical, 0.2-1 x 0.2-0.6 mm, ± flat or regularly convex with loosely heaped soredia, often confluent and diffuse (but never forming a continuous leprose crust); soredia finely granular, 20-50 µm diam., pale fawn, those on the surface often brown. Apothecia

and pycnidia unknown. Soralia P-, K-, KC+ pink, C+ red, UV- (gyrophoric acid).

Opegrapha herbarum Mont.

THALLUS ash-gray, brown or dull olive-green, thin, sometimes inconspicuous or immersed, smooth, continuous.

ASCOMATA sessile, 0.5-1(-1.6) x (0.15-)0.2-0.3(-0.4) mm, numerous, sessile, mostly scattered, simple or infrequently branched; disc occasionally green-pruinose, at first a slit, but soon becoming \pm fully exposed. Excipulum closed, red-brown, K-; epithecium brown or red-brown, K- or \pm red-brown; hymenium 50-70 μ m (Egea & Torrente, Sonoran region; 70-90 μ m according to British flora), I+ reddish. Subhymenium pale brown, 15-30 μ m, I+ pale blue. Paraphysoids to 1.5 μ m wide. Asci claviform, 45-60 x 15-17 μ m (*Varia*-type). Spores ellipsoid to fusiform, (16-)18-25(-26) x (4-)5-7(-8) μ m, 3-septate, straight or slightly curved, colorless, becoming \pm red-brown when overmature; wall not swollen at septa (*Subelevata*-type); perispore "thin" (0.5-1 μ m wide).

PYCNIIDIA very rare, immersed, punctiform; pycnospores (3-)4-5(-6) x (0.5-)1 μ m, bacilliform, straight.

SPOT TESTS AND CHEMISTRY: Thallus K-, C-, KC-, P-. No substances.

ECOLOGY AND DISTRIBUTION: On acid to basic, usually smooth bark, wood, rarely on other substrates, including sandstone, often in rather shaded situations. California; Baja California; British Columbia.

Opegrapha maculata Egea & Torrente

THALLUS not apparent.

ASCOMATA 0.4-0.7 x 0.3-0.4(-0.5) mm, elongate to rounded, simple, adnate, usually aggregated, with a thin slit-line disc, becoming slightly widened when old, epruinose. Excipulum closed, 30-40 μ m laterally, 40-60 μ m at base, K-. Hymenium hyaline, pale brown to dark purplish brown, 110-120 μ m, I+ persistent blue in upper and lower part, middle part sometimes I+ reddish only. Subhymenium pale brown, 20-30 μ m. Paraphysoids to 3 μ m. Asci clavate, 70-90 x 20-24 μ m (*Varia*-type). Ascospores ellipsoid to oblong-ovoid, with ends rounded, 21-27(-29) x (7-)8-10 μ m, 3-septate, straight, constricted at septa, surrounded by a thin gelatinous sheath, soon becoming covered in brownish granular warts (*Parasitica*-type).

PYCNIIDIA immersed to subimmersed. Conidia (5-)6-7 x 1.5(-2) μ m, straight.

SPOT TESTS AND CHEMISTRY: No substances. Coastal, S. California. Parasitic on thallus of corticolous *Pertusaria* spp. in oak, pine, and shrub communities.

DISTRIBUTION AND ECOLOGY:

NOTES:

Opegrapha niveoatra (Borrer) J. R. Laundon

THALLUS thin, smooth, continuous to rimose, white to gray or olive-brown, without distinct prothallus, sometimes inconspicuous.

ASCOMATA 0.3-1.5 x 0.1-0.2(-0.25) mm, sessile, scattered or contiguous, straight, curved or stellate, elongated, generally simple and \pm isolated; disc black, slitlike, partly slightly widened and exposed in age, epruinose; exciple closed, somewhat uneven, K \pm olive or dark green in section, or coloration less pale in the center. Hymenium hyaline, 50-70 μ m, I+ reddish; subhymenium brown, (12-)15-25 μ m. Paraphysoids to 1 μ m wide. Asci cylindric-clavate, 40-55 x 11-13 μ m (*Vulgata*-type). Spores 4-7(-8)-septate, acicular to fusiform, straight or slightly

curved, (18-)20-27(-30) x 2.5-4 μ m.

PYCNIDIA immersed or subimmersed; conidia curved, worm-like, (4-)5-7(-8) x 1-1.2(1.5) μ m.

SPOT TESTS AND CHEMISTRY: Thallus K-, C-, KC-, P-. No substances.

ECOLOGY AND DISTRIBUTION: On neutral and basic deciduous bark, in wayside and woodland situations, more rarely on conifers and woods, in moist areas. California, Baja California. Pycnidia of Laeviomycetes opegraphae, producing brown simple conidia, often on thallus and in hymenium.

Opegrapha ochrocheila Nyl.

THALLUS effuse, spreading, very thin or immersed, inconspicuous, smooth or cracked, white-gray, rarely tinged brownish or olive-green.

ASCOMATA (0.3-)0.5-1.2(-2.5) x 0.2-0.4(-0.5) mm, 60-100 μ m tall, sessile, sometimes \pm irregularly gnarled, simple, sinuate, or rarely to often branched, rarely stellate, scattered or contiguous; exciple, and sometimes the disc, \pm with a red-orange to orange-brown pruina of unknown composition, K+ magenta-red or purplish; disc a slit, frequently \pm widening to a broad disc with thin margin; excipulum closed, K+ purplish; epithecium reddish brown; hymenium 50-60 μ m tall, I+ blue; subhymenium pale brown, 15-25 μ m; paraphysoids to 1.5 μ m; asci claviform, 45-50(-55) x (13-)15-18 μ m (Varia-type); spores (12-)14-16(-22) x 3-4.5 μ m [according to British flora; 17-21 x 4-5 μ m according to Egea & Torrente, Sonoran region], ellipsoid or somewhat clavate, 3-septate (Calcarea-type).

PYCNIDIA subimmersed; conidia (10-)12-14(-20) x (0.7-)1.5(-1.7) μ m, sometimes 1(-3)-septate, bacilliform, straight or only weakly curved (sinuate).

SPOT TESTS AND CHEMISTRY: Thallus P-, K \pm purplish, KC-, C-, UV \pm orange or glaucous (\pm 2 UV+ pigments).

ECOLOGY AND DISTRIBUTION: On old, dry, shaded deciduous bark, especially oaks, often on wood, more rarely on sheltered siliceous rocks. British Columbia; California; Coahuila, Mexico.

Opegrapha rupestris (Syn. O. saxicola)

Thallus C-. Spores 18-28(-31) x 5-8 μ m, \pm clavate, usually with thin episore. Apothecial tissues brown, K-. Apothecia usually longitudinally furrowed or gnarled-subgyrose, 0.5-1.8(-3) x 0.16-0.25(-0.35) mm, sessile to semi-immersed, scattered, infrequently furcate; disc slit-like. Epithecium brown. Hymenium 90-120 μ m. Thallus thin or immersed, smooth or finely cracked, creamy white, gray, greenish to brown-red. Pycnospores 4-6 μ m long, bacilliform. No substances. On sheltered, moist limestone or calcareous schists (especially in underhangs), also on mortar or associated base-enriched siliceous rocks. Baja California.

Opegrapha thelotrematis Coppins

Apothecia 0.1-0.14 mm wide, 0.1-0.12 mm tall; exciple in section K+ greenish. Asci (6-)8-spored. Ascospores 3-septate, 13.5-17 x (4-)4.5-5.5(-6) μ m, pigment in perispore. Conidia 3.5-5 x 1 μ m. Lichenicolous on Thelotrema lepadinum.

Opegrapha umbellulariae Zahlbr.

THALLUS thin, smooth, finally obscurely chinky, pale greenish gray to whitish, occurring in small roundish to irregular areas, often immersed.

ASCOMATA 0.3-0.8 x 0.1-0.25 mm, narrowly oblong, subimmersed to adnate, commonly scattered, straight to curved or obscurely flexuous, simple, sometimes branched; disk slit-like, slightly widening when old, concave to flat, dull black, epruinose; exciple black, moderately thick, open below subhymenium. Hymenium 60-75 μ m, I+ blue. Subhymenium pale brown, 35-50 μ m. Paraphysoids to 1.5 μ m. Asci claviform, 45-50 x 12-14 μ m (Vulgata-type); spores oblong-dactyloid, (12-)14-16 x (3.5-)4-5 μ m, 3-septate (Calcarea-type).

SPOT TESTS AND CHEMISTRY: Thallus K-, C-, KC-, P-. No substances.

ECOLOGY AND DISTRIBUTION: On bark of Umbellularia, southern California.

Opegrapha varia Pers.

Opegrapha vulgata Ach.

THALLUS Thallus white, gray, greenish gray, to pale or deep brown, often with an olive or greenish tinge, thin, smooth and continuous to \pm rimose.

ASCOMATA (0.3-)0.5-2(-3) x 0.1-0.2(-0.25) mm, 50-100 μ m tall, very variable, sub-immersed to adnate or sessile, scattered to clustered, fusiform to elongate and serpentine-sinuate, simple or often once furcate, sometimes stellate or forming interlinking network, sometimes striate; disc slit-like, slightly widening when old. Excipuloid tissue complete, present also below ascigerous layer (closed), K-; subhymenium (hypothecoid tissue) colorless, K-, 15-30 μ m; epithecium dull chocolate brown; hymenium (45-)50-60(-65) μ m, I+ reddish. Paraphysoids to 1 μ m wide. Asci cylindric-clavate, 43-55 x 11-12 μ m (Vulgata-type). Spores 4-7(-8)-septate, (15-)19-30(-40) x (2.5-)3-4(-4.5) μ m (to 6-7 μ m wide according to Awasthi), narrowly fusiform to elongate-acicular, \pm tapered at one end, straight or somewhat curved, thin-walled (Vulgata-type).

PYCNIDIA often numerous, immersed, intermixed with the lirellae; conidia of three types: (a) sickle-shaped, 9-18 x 1-1.5 μ m, (b) 9-14(-17) x 0.5-0.7 μ m, (c) bacilliform, 3-5 x 1(-1.8) μ m [types b and c not found in Sonoran Desert material].

SPOT TESTS AND CHEMISTRY: Thallus K-, C-, KC-, P-. No substances.

DISTRIBUTION AND ECOLOGY: On \pm shaded, smooth, young bark or smooth areas on old trunks on a wide range of tree species, in humid situations. Widespread, to Florida and southern California.

Opegrapha xerica Egea & Torrente

THALLUS crustose, whitish or grayish, thin, effuse, granulose to inconspicuous.

ASCOMATA 0.5-1.2 x 0.15-0.35 mm, scattered, simple, with a thin slit-line, widening with age, \pm white-pruinose. Excipulum closed, K+ dark green. Hymenium 50-75 μ m, I+ reddish. Subhymenium pale brown, 15-30 μ m tall. Paraphysoids to 1.5 μ m. Asci cylindric-clavate, 42-65 x 12-14 μ m, with large ocular chamber and an incipient apical nose (between Calcarea-type and Vulgata-type). Ascospores oblong-ellipsoid, (12-)14-20 x (-3)4-5.5 μ m, 3-5-septate (Calcarea-type).

PYCNIDIA immersed. Conidia 4-6 x 1-1.2 μ m, straight.

SPOT TESTS AND CHEMISTRY: Thallus K-, C-, KC-, P-; no substances.

DISTRIBUTION AND ECOLOGY: Central coast of California, on Cupressus macrocarpa.

NOTES:

Excluded Species

O. astraea Tuck. = Graphidaceae

Opegrapha calcarea

Spores 12-16 x 3.5-5 um, ellipsoid. Thallus thin to moderately thick, smooth to slightly rough, scurfy or chinky, pale greenish gray to whitish or yellow, sometimes breaking into powdery conditions and finally disappearing, K-. Apothecia 0.5-2 x 0.2-0.3 mm, oblong-ellipsoid, adnate, scattered to radiately clustered, soon curved or flexuous, infrequently branched; disc closed to open, flat, black; exciple moderately thick and black; hypothecium brownish black; hymenium I+ deep orange; spores hyaline to brownish. On rocks, southern California. Misidentifications.

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