A Preliminary World-wide Key to the Lichen Genus *Pertusaria* (including *Lepra* species)

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The lichen genus *Pertusaria* (Pertusariaceae) is widely distributed throughout the world, from equatorial to polar regions (Dibben 1980; Lumbsch & Nash 2001). Species may grow on bark, rock, soil, plant débris and mosses and are differentiated by the apothecial structure (disciform or verruciform), the number and structure of the ascospores (1, 2, 4 or 8 per ascus, smooth- or rough-walled ascospores) and the chemistry (Dibben 1980; Archer 1997). Chemistry has been recognised as an important taxonomic tool in the identification of species in the genus *Pertusaria* (Lumbsch 1998).

The chemistry of the genus *Pertusaria* has been reported in many publications. Oshio (1968) reported the colour reactions of Japanese species and the compounds producing these colours were subsequently identified by Dibben (1975) who later published the chemistry of North American *Pertusaria* (1980). Similarly, Poelt and Vězda (1981) described the colour reactions of European species of *Pertusaria* and the identity of these compounds was later determined by Hanko (1983). Additional synonymy and chemical data for a range of European taxa was reported by Niebel-Lohmann and Feuerer (1992). Chemical data on many type specimens was reported by Archer (1993, 1995) and the chemistry of Australian *Pertusaria* published (Archer 1997). Additional type specimens hace since been examined and their chemistries determined. A current Key to European *Pertusaria* (Sipman, www.bgbm.org/BGBM/Staff/Wiss/Sipman/keys/perteuro.htm) contains much chemical information on European taxa, which has been included in this Key. Modern descriptions of new taxa in the genus would now be regarded as incomplete without a report of the chemistry.

The total number of species in the genus is not accurately known. Nash et al. (2001) suggest *ca.* 350 species and American Record Express (http://americanrecordexpress.com/fungi/p/) suggests *ca.* 920 species. Archer & Messuti (2009) calculated a possible 1550 species out of a theoretically possible 3500 chemical and morphological combinations (Archer 1997) while the Index Fungorum (www.indexfungorum.org) lists 1770 taxa, which, however, include many forms and varieties. For example, *P. coccodes* (Ach.) Nyl. has 17 forms and 10 varieties.

This Key includes 794 taxa, together with 316 synonyms or possible synonyms that are listed following the Key.

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Chemistry

The compounds found in the genus *Pertusaria* fall into 8 categories:

Xanthones such as lichexanthone, 4,5-dichlorolichexanthone and thiophaninic acid.

Orcinol *p*-depsides such as lecanoric and gyrophoric acid.

Homologues of orcinol *p*-depsides such as perlatolic acid and its derivatives.

Orcinol depsones such as picrolichenic acid and its homologues.

β-Orcinol *m*-depsides such as hypothamnolic and thamnolic acids.

β-Orcinol *p*-depsides such as squamatic and barbatic acids.

β-Orcinol depsidones such as stictic, norstictic, psoromic and protocetraric acids.

Aliphatic acids such as allopertusaric acid and lichesterinic acid.

In addition, some taxa lack lichen compounds.

Recently a number of *Pertusaria* species have been transferred to the genus *Lepra* Scop. (Scopoli 1777) by Hafellner & Türk (2016), Lendemer & Harris (2017), Buaruang *et al*. (2017) and Wei et al. (2017). This genus is characterised by disciform apothecia, asci with 1 (rarely 2) large or 8 small ascospores and the absence of chlorinated xanthones and orcinol *p*-depsides such as perlatolic acid and its derivatives. The published species are shown in the key with their authors; unpublished species are shown with *Lepra* only.

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Notes:

The key uses apothecial structure and number and type of ascospores to place specimens in appropriate Groups (*vide infra*). Within the Groups chemical constituents, and size and arrangement of ascospores, are used to distinguish species. Synomyms and possible synonyms are indicated by the symbol **O**

Only major chemical constituents are referred to and there remain species whose chemistry is unknown; these species are omitted until their chemistry is determined and published.

Where the results of chemical tests (K, C, etc.) are reported and give a strong indication of the substance(s) present, these species are tentatively included.

Rock includes species growing on soil and plant débris, and mosses.

Disciform species include species where the apothecia is disciform and either sessile or raised in protuberances.

Sterile sorediate or isidiate species include species that may also occur as fertile specimens; sorediate or isidiate species which are always fertile are included in the appropriate fertile Group. Taxa which are reported to occur on both wood and rock are included twice.

Species with 2-3, or 2-4 ascospores per ascus are included in the 4-spored species; species with 6, 7 or 8 ascospores are inclcuded in 8-spored species.

Many images of tropical species of *Pertusaria* can be found on the web site: www.tropicallichens.net/ and bibliographic data on each species is available fom the Index Fungorum.

Group 1. Apothecia absent; isidia present; on rock
Group 2. Apothecia absent; isidia present; on wood
Group 3. Apothecia absent; soredia present; on rock
Group 4. Apothecia absent; soredia present; on wood

Group 5. Apothecia present, verruciform; ascospores 1 per ascus; on rock
Group 6. Apothecia present, verruciform; ascospores 1 per ascus; on wood
Group 7. Apothecia present, disciform; ascospores 1 per ascus; on rock
Group 8. Apothecia present, disciform; ascospores 1 per ascus; on wood

Group 9. Apothecia present, disciform; ascospores 2 per ascus; on wood
Group 10 Apothecia, present disciform; ascospores 2 per ascus; on rock

Group 11. Apothecia present, verruciform; ascospores 2 per ascus, smooth; on rock
Group 12. Apothecia present, verruciform; ascospores 2 per ascus, rough; on rock
Group 13. Apothecia present, verruciform; ascospores 2 per ascus, smooth; on wood
Group 14. Apothecia present, verruciform; ascospores 2 per ascus, rough; on wood

Group 15. Apothecia present, verruciform; ascospores 4 per ascus, smooth; on rock

Group 16. Apothecia present, verruciform; ascospores 4 per ascus, rough; on rock
Group 17. Apothecia present, verruciform; ascospores 4 per ascus, smooth; on wood
Group 18. Apothecia present, verruciform; ascospores 4 per ascus, rough; on wood

Group 19. Apothecia present, disciform; ascospores 8 per ascus, on rock
Group 20. Apothecia present, disciform; ascospores 8 per ascus, on wood
Group 21. Apothecia present, verruciform; ascospores 8 per ascus, on rock
Group 22. Apothecia present, verruciform; ascospores 8 per ascus, on wood

Sterile, lacking isidia, soredia and apothecia.

P. lichexanthonoverrucosa Aptoot & M. Cáceres; corticolous; lichexanthone & norstictic acid; SAm
P. scepusiensis (Gyeln.) Erichs.; saxicolous; P-ve; Eur.
P. shenandoensis Hale & Dibben; saxicolous; norstictic acid present; N.Am

Group 1. Apothecia absent; isidia present; on rock or plant débris

1. Xanthones present 2
1a. Xanthones absent.....5

2. UV+ yellow; lichexanthone present; SAm. .....*P. subcorallina* Nyl.O
2a. UV+ orange or UV-ve; thiophaninic or thiophanic acid present.....3

3. UV-ve; thiophanic acid present; Qld.....*P. hiatensis* A.W.Archer & Elix
3a. UV+ve; thiophaninic acid present 4

4. Thiophaninic acid alone; UK, Sweden .....*P. flavocorallina* Coppins & Muhr
4b. Thiophaninic acid and stictic acid present; Mediterranean region .....
.....*P. rupicola* (Fr.) Harm. var. *coralloides* (Anzi) Croz.

5. Thallus K+ red or yellow.....6
5a. Thallus K-ve.....12

6. K+ yellow; thamnolic or baeomycesic acid present 7
6a. K+ red; norstictic or salazinic acid present 8

7. Thamnolic acid present; Eurasia; also fertile with 2 spored asci.....
.....*Lepra corallina* (L.) HafellnerO
.....[*P. corallina* (L.) Arn.]
7a. Baeomycesic and squamatic acids present; Aus.....
.....*P.* (*Lepra) nerrigensis* A.W.Archer & Elix

8. Norstictic acid present 9
8a. Salazinic acid present; Tasmania..*Lepra pseudodactylina* (A.W.Archer) A.W.Archer & Elix
[fertile in PNG;see Group 5] .....[*P. pseudodactylina* A.W.Archer]

9. Lacking apothecia and spores.....10
9a. Sometimes fertile.....11

10. East Asia.....*P. corallina* var. *minor* (Yas. ex Räs.) Oshio

10a. Tasmania .....*Lepra dactylinella* (Kantvilas & Elix) A.W.Archer & Elix
.....[*P. dactylinella* Kantvilas & Elix]

11b. N.Am, Eur; China; fertile in Eur. .....*P. pseudocorallina* (Lilj.) ArnoldO
11c. Bipolar; also on wood; also 1/ascus 120-130 µm.....*P. coccodes* (Ach.) Nyl.O

12(5a).Pd+ red; fumarprotocetraric or protocetraric acid present.....13
12a. Pd-ve 17

13. Protocetraric acid present 14
13a. Fumarprotocetraric acid present 16

14. Protocetraric acid present 15
14a. Protocetaric and hypothamnolic acids present; SAm. .....*P. pachythallina* (Räs.) Messuti

15. Isidia to 1 mm tall; Antarctic; also fertile, 1 per ascus .*Lepra corallophora* (Vain.) Hafellner .....[*P. corallophora* Vain.]
15a. Isidia coralloid, to 20 mm tall; SAm .....
.....*Lepra acroscyphoides* (Sipman) I. Schmitt, Hodkinson & Lumbsch .....[*P. acroscyphoides* Sipman]

16. Isidia 1-3 mm tall; N. hemisphere; also fertile, 8 per ascus..... *P. oculata* (Dickson) Th. Fr.
16a. Fumarprotocetraric and succinoprotocetraric acids present ..... *P. dealbata* (Ach.) Cromb.

17(12a). Confluentic or 2'-*O*-methylperlatolic acids present.....18
14a. Fatty acids present 19

18. Confluentic acid present; Aus; *Hafellner 15754a* .....*Pertusaria* sp.
18a. 2'-*O*-Methylperlatolic acid present; also fertile, 2 /ascus; Antarctic.....*P. signyae* Øvstedal

19. Isidia densely branched in upper parts; Antarctica..... *P. peudoculata* Øvstedal
19a. Isidia to 1 mm tall; bipolar..... *P. isidiodes* (Schaer.) Arnold

Group 2. Apothecia absent; isidia present; on wood

1. Xanthones present 2
1a. Xanthones absent.....18

2. Lichexanthone or derivatives present.....3
2a. Norlichexanthone derivatives or thiophaninic acid present.....15

3. Lichexanthone present.....4
3a. Chlorolichexanthones present 6

4. Lichexanthone present.....5
4a. Lichexanthone, 2-chlorolichexanthone and superlatolic acid present; Qld. .....
..... *P. glebulosa* A.W.Archer & Elix

5. Lichexanthone and salazinc acid present; PNG..... *P. parmatica* A.W.Archer & Elix
5a. Lichexanthone and stictic acid; Thailand; ..... *P. flavodigitata* Jariang.

6. 2-Chlorolichexanthone, stictic and 2'-*O*-methyl- and 2-*O*-methylperlatolic acids present; .....
Australia .....*P. bagoensis* Elix & A.W.Archer
6a. Polychlorolichexanthones present 7

7. 4,5-Dichloro- and 2,4,5-trichlorolichexanthone present; Aus. .....
.....*P. palumensis* Elix & A.W.Archer
7a. 4,5-Dichlorolichexanthone present.....8

8. 4,5-Dichlorolichexanthone and depsides or depsidones present 9
8a. 4,5-Dichlorolichexanthone and chiodectonic acid present; isidia red inside; Thailand.....
[Jariangprasert 4933.1] I am sure this is a Gassicurtia species – also in Australia"P. rufodigitata"

9. 4,5-Dichlorolichexanthone with various depsides; Aus. .....*P. georgeana* and varieties
2-*O*-Methylperlatolicacid. .....*P. georgeana* var. *georgeana* A.W.Archer & Elix

. 2-*O*-Methylperlatolic and 2-*O*-methylstenosporic acids .... *P. georgeana* var. *methylstenosporica* A.W.Archer & Elix
. 2,4-Di-*O*-methylolivetoric acid ..... *P. georgeana* var. *goonooensis* A.W.Archer & Elix
. planaic acid..... *P. georgeana* var. *victoriana* A.W.Archer & Elix
. 2-*O*-Methylconfluentic acid- ..... *P. georgeana* var. *occidentalis* Elix & A.W.Archer
9a. 4,5-Dichlorolichexanthone with depsidones or other depsides 10

10. 4,5-Dichlorolichexanthone and stictic acid present.....11
10a. 4,5-Dichlorolichexanthone and alectoronic acid present.....14

11. 4,5-Dichlorolichexanthone and stictic acid present.....12
11a. 4,5-Dichlorolichexanthone, stictic acid and depsides present 13

12. Sterile; isidia 0.4-1 mm tall, 0.25-0.5 mm diam; Aus., PNG .... *P. montpittensis* A.W.Archer
12a. Also fertile [Group 17]; isidia 0.1-0.5 mm tall; to 0.1 mm diam.; Eur..... ..... *P. coronata* (Ach.) Th.Fr.O

13. 4,5-Dichlorolichexanthone, stictic and 2'-*O*-methylperlatolic acid acids present; Aus. .... *P. pilosula* A.W.Archer & Elix
13. 4,5-Dichlorolichexanthone, stictic acid and methyl barbatate present; PNG .... *P. angabangensis* A.W.Archer & Elix

14. Alectoronic acid present; Aus. ..... *P. alectoronica* Elix & A.W.Archer
14a. Alectoronic and thiophanic acids present; Aus .... *P. alectoronica* var. *thiophanica* Kantvilas, Elix & A.W.Archer

15(2a).Thiophaninic and stictic acids present.....16
15a. Arthothelin or thiophanic acid present 17

16 Aus & PNG ..... *P. flavoisidiata* A.W.Archer & Elix
16a. Eur..: rarely fertile, spores 8/ascus ..... *P. flavida* (DC) J.R. Laundon

17. Arthothelin and 6-*O*-methylarthothelin present; New Caledonia..... ..... *P. simoneana* A.W.Archer & ElixO
17a. Thiophanic acid present; Qld..... *P. lumbschii* A.W.Archer & Elix

18 (1a).Lichesterinic acid present or lichen compounds absent 19
18a. Depsidones, depsides or depside esters present 20

19. Lichesterinic acid present; Aus. ..... *P. (Lepra) ambigua* A.W.Archer & Elix
19a. Lichen compounds absent; West Indies ..... *P. griseola* Vain.

20. Depsidones present [such as norstictic, protocetraric or psoromic acids] 21
20a. Depsides or depside esters present [such as perlatolic acid derivatives] 33

21. Stictic acid or derivatives present.....22
21a. Hypoprotocetraric, neotricone, norstictic, protocetraric, psoromic or salazinic acids present 28

22. Stictic acid present 23
22a. Hypostictic or norstictic acid present 25

23. Stictic acid alone 24
23a. Stictic and 2'-*O*-methylperlatolic acids present; Thailand, PNG..... .....*P. pilosula* var. *abditiva* Jariang.

24. On wood; isidia 0.2-0.8 mm tall, 0.05-0.1 mm diam., Mauritius, Aus..... .....*Lepra muricata(* J.C. David) A.W.Archer & Elix
..... [*P. muricata* J.C. David]

24a. On plant débris; isidia 0.5-1.5 mm tall, 0.15-0.25 mm diam.; NZ
..... *P. (Lepra) dennistonensis* Elix & A.W.Archer

25. Hypostictic and stictic acids present; Thailand ..... *P. (Lepra) hypostictica* Jariang.
25a. Norstictic acid present 26

26. Isidia to 3 mm tall; Hawai; PNG .....*P. (Lepra) ramulifera* H. Magn
26a. Isidia < 3mm tall. 27

27. Isidia 0.1-0.25 mm tall; Aus., PNG .....
.....*Lepra roseola (*A.W.Archer & Elix) A.W.Archer & Elix
..... [*P. roseola* A.W.Archer & Elix]
27a. Isidia 0.5-1.0 mm tall; bipolar; also on rock..... *P. (Lepra) coccodes* (Ach.) Nyl.

28(21a). Protocetraric or hypoprotocetraric acids present 29
28a. Neotricone, psoromic or salazinic and norstictic acids present 31

29. Hypoprotocetraric acid present; PNG.....*P. (Lepra) hypoprotocetrarica* A.W.Archer & Elix
29a. Protocetraric acid present 30

30. Protocetraric acid present; Aus...*Lepra umbricola (*A.W.Archer & Elix) A.W.Archer & Elix
.....[*P. umbricola* A.W.Archer & Elix]
30a. Protocetraric and norstictic acids present; Aus.....
..... *Lepra wallamanensis* (Elix & A.W.Archer) A.W.Archer & Elix
.....[*P. wallamanensis* Elix & A.W.Archer]

31(28a) Psoromic acid or neotricone present; 32
31a. Norstictic and salazinic acids present; PNG; [HS 19405; CANB] *Diorygma* sp.? . *Pertusaria* sp.

32. Psoromic acid present; PNG.....*P. (Lepra) wauensis* Elix & A.W.Archer
32a. Neotricone present; Aus. ..... *Lepra) neotriconica* (Elix & A.W.Archer) A.W.Archer & Elix
..... [*P. neotriconica* Elix & A.W.Archer]

33(20a).Methyl 3-α-hydroxy-4-*O*-demethylbarbatate present; PNG .....
..... *P. mankiensis* A.W.Archer & Elix
33a. Other depsides present.....34

34. Thamnolic acid present; Eur.; also fertile; 2 spores/ascus; isidia short and thick, ...
0.1-0.3 mm diam .....*Lepra corallina* (L.) Hafellner
.....[*P. corallina* (L.) Arn.]
Isidia very thin, 0.03-0.05 mm diam.; Aus.
.....*Lepra tricosa* (Elix & A.W.Archer) A.W.Archer & Elix
..... [*P. tricosa* Elix & A.W.Archer]
34a. 2'-*O*-Methylperlatolic, barbatic or divaricatic acids or derivatives or atranorin present 35

35. 2'-*O*-Methylperlatolic acid present; PNG, Aus.....*P. burburana* Elix & A.W.Archer
35a. Barbatic or divaricatic acid or atranorin and bourgeanic acid present.....36

36. Atranorin and bourgeanic acid present ..... *P. ochrodigitula* A.W.Archer & Elix
36a. Barbatic or divaricatic acid present 37

37. Barbatic acid present; Aus.....
.....*Lepra barbatica* (A.W.Archer & Elix) I. Schmitt, Hodkinson & Lumbsch
.....[*P. barbatica* A.W.Archer & Elix]
37a. Divaricatic acid ± stictic acid present; PNG, Aus .....*P. labuensis* A.W.Archer & Elix

Group 3. Apothecia absent; soredia present; on rock or plant débris.

1. Xanthones present 2
1a. Xanthones absent 17

2. Lichexanthone or chlorolichexanthones present 3
2a. Thiophaninic acid or thiophanic acids present 11

3. Chlorinated lichexanthones present 4
3a. Lichexanthone present 5

4. 2,4- and 2,5-Dichlorolichexanthone, 2,4,5-trichlorolichexanthone and stictic acid present ..... Australia; PNG ..... *P. puffina* A.W.Archer & Elix
4a. 4,5-Dichlorolichexanthone and stictic acid present; PNG; also corticolous .... *P. balekensis* A.W.Archer & Elix

5. Lichexanthone and depsides present 6
5a. Lichexanthone and picrolichenic acid present 8

6. Lichexanthone and methyl 2'-*O*-methylmicrophyllinate present; Aus. .... *P. variabilis* Elix & A.W.Archer ..... [Transfer to *Lepra* not accepted; depside present.]
6a. Lichexanthone and hypothamnolic or haemathamnolic acid present 7

7. Hypothamnolic acid present .... *Lepra amaroides* (H. Magn.) I. Schmitt, Hodkinson & Lumbsch ..... [*P. amaroides* H. Magn.]O Hypothamnolic and barbatic acids present; Uruguay; 7031 ..... *Pertusaria* sp.
7a. Haemathamnolic acid present; Brazil ..... *P. xantholeucoides* Müll. Arg.O

8. Lichexanthone and picrolichenic acid alone or with superpicrolichenic acid 9
8a. Lichexanthone, picrolichenic acid and β-orcinol *m*-depsides 10

9. Lichexanthone and picrolichenic acid present; Aus. and S.Am. ..... [rarely with additional norstictic acid] ..... *Lepra subventosa* var. *deficiens* (A.W.Archer & Elix) A.W.Archer & Elix ..... [*P. subventosa* var. *deficiens* A.W.Archer & Elix]
9a. Lichexanthone, picrolichenic and superpicrolichenic acids present; Norfolk Island, Aus. ..... *Lepra verdonii* (A.W.Archer) I. Schmitt, Hodkinson & Lumbsch ..... [*P. verdonii* A.W.Archer]

10. Lichexanthone, picrolichenic and thamnolic acid present; S.Am, Aus. and NZ; ..... very rarely fertile ..... *P. subventosa* var. *subventosa* MalmeO
10a. Lichexanthone, picrolichenic and hypothamnolic acid present; Aus., PNG .... *Lepra subventosa* var. *hypothamnolica (*A.W.Archer & Elix) A.W.Archer & Elix ..... *[P. subventosa* var. *hypothamnolica* A.W.Archer & Elix] [Lichexanthone, picrolichenic and barbatic acid present; S.Am; Ahti 31.i.1989 (H) ..... *Pertusaria* sp.]

11(2a). Thiophanic acid and arthothelin present; on plant débris; Qld. ..... *P.* "*finniganensis*"
11a. Thiophaninic acid present 12

12. Thiophaninic acid, confluentic and planaic acids present; N.Am.; ± fertile .... *P. tejocotensis* de Lesd.O
12a. Thiophaninic acid and depsidones present 13

13. Thiophaninic acid and norstictic acid (major) and stictic acid (minor) present; Aus. ..... *P. rogersii* A.W.Archer & Elix
13a. Thiophaninic acid and stictic acid present 12

14. In Australia 15
14a. Elsewhere 16

15. Thallus bright yellow; hypostictic acid absent; E Australia, NZ & PNG; ± fertile .... *P. xanthoplaca* Müll. Arg.O
15a. Thallus dull yellow; hypostictic acid present; NW Aus. ..... *P. remota* A.W.Archer

16. Eur., Asia, Africa..... *P. amarescens* Nyl.O
Japan..... *P. leucosoroides* Nyl.
16a. N.Am.; ± fertile ..... *P. flavicunda* Nyl.

17. Lichen compounds absent 18
17a. Lichen compounds present 19

18. Canada..... *P. pruinifera* Erichs.
18a. Philippines..... *P. subvaginata* var. *orientalis* Räs.

19 Picrolichenic acid or depsides present [such as lecanoric or squamatic acids].....20
19a. Depsidones present [such as norstictic or protocetraric acids and derivatives] 24

20. Picrolichenic acid present..... *P. amara* (Ach.) Nyl.O
Additional protocetraric acid present; Eur..... *P. amara* var. *flotowiana* (Flörke) Erichs.
20a. Depsides present.....21

21. Lecanoric acid present.....22
21a. Other depsides present.....23

22. Lecanoric acid present, variolaric acid absent; Philippines .... *P. subvaginata* var. *orientalis* Räs.
22a. Lecanoric and variolaric acids present; Europe; ± fertile ..... *P. lactea* (L.) Arnold

23. Squamatic and baeomycesic acids present; Aus. .... *Lepra nerrigensis (*A.W.Archer & Elix) I. Schmitt, Hodkinson & Lumbsch ..... [*P. nerrigensis(*A.W.Archer & Elix]
23a. 2'-*O*-Methylisohyperlatolic and 2'-*O*-methylsuperlatolic acids present; Aus. .... *P. salebrosa* A.W.Archer & Elix

24(19a).Norstictic or stictic acid present 25
24a. Protocetraric or fumarprotocetraric acid present 28

25. Stictic acid present; soralia ochre coloured; S. Georgia ..... *Pertusaria* sp. A Øvstedal
25a. Norstictic acid present 26

26. Norstictic acid alone.....27
26a. Norstictic and picrolichenic acids present; Teneriffe .... *Lepra teneriffensis* (Vain.) Hafellner .....[*P. teneriffensis* Vain.

27. Thallus off-white; Europe, China, N.Am, ...*Lepra excludens* (Nyl.) Hafellner ..... [*P. excludens* Nyl.]O
27a. Thallus olive green; Aus., Lord Howe Is..... ..... *Lepra miniatescens* (A.W.Archer & Elix) A.W.Archer & Elix .....[*P. miniatescens* A.W.Archer & Elix]

28. Protocetraric acid present; Europe, N.Afr., Japan, Korea....*Lepra leucosora* (Nyl.) Hafellner ..... [*P. leucosora* Nyl.]O
Canary Islands .....*P. inconveniens* Vain.
28a. Fumarprotocetraric acid present 29

29a. Atranorin present; soralia off-white; subtropical; Aus. .... *Lepra sordida(* A.W.Archer) A.W.Archer & Elix .....[*P. sordida* A.W.Archer]

29a. Atranorin absent; ± succinprotocetraric acid present; Eur.....30

30. Thallus on limestone .....*P. gypsicola* Erichs.
30b. Thallus on siliceous rocks 31

31. Thallus with flattened, white soralia.....*Lepra aspergilla* (Ach.) Hafellner
.....[*P. aspergilla* (Ach.) J.R. Laundon]
31a. Thallus with sorediate papillae..... *Lepra mammosa* (Harm.) Hafellner
..... [*P. mammosa* Harm.]

Group 4. Apothecia absent; soredia present; on wood

1. Xanthones present 2
1a. Xanthones absent.....15

2. Arthothelin, thiophaninic acid or thuringione present.....3
2a. Lichexanthone or 4,5-dichlorolichexanthone present.....5

3. Arthothelin present.....4
3a. Thiophaninic acid and depsidones present 8

4. Arthothelin, thiophaninic acid and barbatic acid present;Thailand .*P. flavosorediata* Jariang.
4a. Arthothelin and thuringone present; Australia .....*P. flavopunctata* A.W.Archer & Elix

5(2a). 4,5-Dichlorolichexanthone present.....6
5a Lichexanthone present alone orwith depsone, depsidone, depside or fatty acid 9

6. 4,5-Dichlorolichexanthone present alone; PNG; also saxicolous.....
..... *P. balekensis* A.W.Archer & Elix
6a. 4,5-Dichlorolichexanthone with depside or depsidone present.....7

7. 4,5-Dichlorolichexanthone and stictic acid present; N.Am..... *P. expolita* Harris
7a. 4,5-Dichlorolichexanthone and planaic acid present; Aus .....
.....*P. puttyensis* A.W.Archer & Elix

8. .Thiophaninic acid and stictic acid present; Aus. ..... *P. maritima* A.W.Archer & Elix
8a. Thiophaninic acid and norstictic acid present; N.Am..... *P. azulensis* de Lesd.

9. Lichexanthone only present; SAm .....*P. lichexanthofarinosa* Aptroot & M. Cáceres
9a. Lichexanthone with other compounds.....10

10. Lichexanthone, picrolichenic and superpicrolichenic acids present; Norfolk Island, Aus.
.....*P. (Lepra) verdonii* (A.W.Archer) I. Schmitt, Hodkinson & Lumbsch
10a. Lichexanthone with other compounds present 11

11. Lichexanthone and confluentic or thamnolic acid present 12
11a. Lichexanthone and stictic or dihydropertusaric acid present.....14

12. Lichexanthone and confluentic acid present; Aus., Thailand.....
.....*P..confluentica* Jariang.
12a. Lichexanthone and thamnolic acid present.....13

13. Soralia flattened, inconspicuous; Sri Lanka .....
.....*Lepra leucosorodes (*Nyl.) I.Schmitt, Hodkinson & Lumbsch
.....[*P. leucosorodes* Nyl.]
13a. Soralia globular, conspicuous; Aus., PNG .....
..... *Lepra scaberula (*A.W.Archer) I. Schmitt, Hodkinson & Lumbsch
..... [*P. scaberula* A.W.Archer]

14. Lichexanthone and stictic acid present; Hawaii ..... *Lepra oahuensis* (H. Magn.) A.W.Archer & Elix
.....[*P. oahuensis* H. Magn.]
14a. Lichexanthone and dihydropertusaric acid; Fiji ..... *P. cisalbescens* Elix & A.W.Archer

15(1a). Fatty acids present 16
15a. Depsides or depsidones present or lichen compounds absent 19

16. Lichen compounds absent; Norfolk Island ..... *P. heinarii* A.W.Archer & Elix
16a. Fatty acids present 17

17. Allopertusaric acid present; Northern Hemisphere ..... *Lepra albescens* (Huds.) Hafellner
.....[*P. albescens* (Huds.) Choisy & Werner]
17a. Lichesterinic acid or isomyelochroic acid present 18

18. Lichesterinic acid present; Central Africa ..... *P. krogiae* A.W.Archer *et al*.
18a.. Isomyelochroic acid present ..... *Lepra ophthalmiza* (Nyl) Hafellner
..... [*P. ophthalmiza* (Nyl.) Nyl.]

19(15a).Depsidones present 20
19a. Depsides or picrolichenic acid present or lichen compounds absent 27

20. Norstictic, stictic or fumarprotocetraric acid present 21
20a. Psoromic acid present; Aus., NZ, PNG .....
..... *Lepra psoromica* (A.W.Archer & Elix) A.W.Archer & Elix
..... [*P. psoromica* A.W.Archer & Elix]

21. Stictic acid present; Aus. ..... *Lepra albopunctata* (A.W.Archer & Elix) A.W.Archer & Elix
..... [*P. albopunctata* A.W.Archer & Elix]
21a. Norstictic or fumarprotocetraric acid present 22

22. Fumarprotocetraric acid present; Eur, N.Am; also fertile .....
..... *Lepra borealis (*Erichs.) I.Schmitt, Hodkinson & Lumbsch
..... [*P. borealis* Erichs.]
22a. Norstictic acid present 23

23. Australia; soralia white or pale olive-green 24
23a. Elswhere 26

24. Soralia white; 25
24a. Soralia pale olive-green; soralia covering thallus surface, ± sekikaic acid .....
..... *P. scabrida* A.W.Archer & Elix

25. Soralia 0.5-1 mm diam., well-defined; stictic acid absent. .....
..... *Lepra erythrella* (Müll. Arg.) I.SChmitt, Hodkinson & Lumbsch
..... [*P. erythrella* Müll. Arg.]
25a. Soralia to 2 mm diam, ill-defined; with additional stictic acid; ..... *P." alloerythrella"*

26. India; soralia ochraceous to ochraceous red, 0.5-2 mm diam. .....
..... *P. colorata* Awasthi & Srivastava
26a.. West Indies; K+ red; soralia 0.4-2 mm diam. ..... *P. torulosa* Vain.

27(19a). Lichen compounds absent; Philippines ..... *P. amara* var. *philippinensis* Räs.

27a. Depsides or depsone present 28

28. Thamnolic or 2'-*O*-methylperlatolic or hypothamnolic acid or atranorin present 29
28a Lecanoric or picrolichenic acids present 33

29. 2'-*O*-Methylperlatolic acid or thamnolic acid present: 30

29a. Hypothamnolic acid or atranorin present 32

30. 2'-*O*-Methylperlatolic acid present; Thailand.....*P. uttaraditensis* Jariang.
30a. Thamnolic acid present 31

31. Thallus surface sorediate; Japan, Aus.....
.....*Lepra violacea* (Oshio) I. Schmitt, Hodkinson & Lumbsch
.....[*P. violacea* Oshio]
31a. Thallus surface granular; N.Am .....
.....*Lepra pustulata* (Brodo & W.L. Culb.) Lendemer & R.C. Harris
..... [*Haematomma pustulata* Brodo & W.L. Culb.]
32. Hypothamnolic and cryptothamnolic acids present.....
..... *Lepra subviolacea* (Q. Ren) I. Schmitt, Hodkinson & Lumbsch
..... [*P. subviolacea* Q. Ren]
32a.. Atranorin present; soralia flat; Hawaii and Aus. ..... *P. sellingii* H.Magn.

33.(28a) Lecanoric and variolaric acids present ..... *P. hemisphaerica* (Flörke) Erichs.O
33a. Picrolichenic acid present.....34

34. Picrolichenic acid only present; K-, C-, KC+ reddish; Hawaii ..... *P. molokaiensis* H. Magn.
34a. Picrolichenic and other acids present 35

35. Picrolichenic ± protocetraric acids present; ± fertile .....*Lepra amara* (Ach.) HafellnerO
..... [*P. amara* (Ach.) Nyl.]
35a. Picrolichenic and subpicrolichenic acids present; PNG .....
.....*Lepra buloloensis* (A.W.Archer, Elix & Streimann) Schmitt & Lumbsch
.....[*P. buloloensis* A.W.Archer, Elix & Streimann]

Group 5. Apothecia present, verruciform; ascospores 1 per ascus; on rock

1. 5-*O*-Methylhiasic acid present; spores 130-20 µm; Aus .... *P. flavoexpansa* Kantvilas & Elix
1a. Norstictic or protocetraric or salazinic acid present 2

2. Norstictic or protocetraric acid present 3
2a. Salazinic acid present; spores 180-200 µm long .....
.....*Lepra pseudodactylina* (A.W.Archer) A.W.Archer & Elix
[sterile in Tas; see Group 1] .....[*P. pseudodactylina* A.W.Archer]

3. Norstictic acid present; spores 170-395 µm long; NZ..... *P. otagoana* GallowayO
3a. Protocetraric acid present; spores ca. 140 µ long; Antarctic; also sterile .....
.....*P. corallophora* Vain.

Group 6. Apothecia present, verruciform; ascospores 1 per ascus; on wood

1. Xanthones absent; protocetraric or fumarprotocetraric acid present 2
1a. Xanthones present; protocetraric or fumarprotocetraric acid absent 3

2. Protocetraric acid present; thallus not isidiate; spores 220-225 µm long; Indonesia.....
..... *P. leeuwenii* Zahlbr.
2a. Fumarprotocetraric acid present; thallus isidiate; spores 160-280 µm long; Greece.....
..... *Lepra graeca* (Erichs.) Hafellner
..... [*P. graeca* Erichs.]

3. Thiophaninic acid present 4
3a. Lichexanthone or 4,5-dichlorolichexanthone present.....7

4. Thiophaninic acid only present; spores 142-187 µm long; ostioles black, disciform; Canary Is,
..... *P. calderae* Hern.-Padr *et al*.,

4a. Thiophaninic acid and 2'-*O*-methylperlatolic or confluentic acid present 5

5. Confluentic acid present; spores 150-250 µm long; Greece.....*P. corinthiaca* Erichs.
5a. 2'-*O*-Methylperlatolic acid present; spores 120-220 µm long 6

6. Spores 180-220 µm long; Eur .....*P. caesioalba* (Flot.) Nyl.
6a. Spores 120-150µm long; ± planaic acid; Spain, Turkey .... *P. paramerae* A.Crespo & Vězda

7. Lichexanthone present; spores 170-225 µm long; S.Am. [also 2/ascus].....
..... *P. tetrathalamia* var *major* Müll.Arg.
7a. 4,5-Dichlorolichexanthone and stictic acid present; spores rarely 1 per ascus, 262 x 45 µm, .
usually 4 per ascus (q.v.); West Indies .....*P. ascidioides* Vain.

Group 7. Apothecia present, disciform; ascospores 1 per ascus; on rock or moss or plant debris

1. Thallus isidiate 2
1a Thallus not isidiate 10

2. Fatty acids or 5-*O*-methylhiascic acid present; fumarprotocetraric acid absent.....3
2a. Fumarprotocetraric acid present.....7

3. Fatty acids present.....4
3a. 5-*O*-Methylhiascic acid present; spores 150-200 µm long; on soil or rock; Tas.....
[pseudodisciform; see Group 5] ..... *P. flavoexpansa* Kantvilas & Elix

4. On rock.....5
4a. On moss or plant débris.....6

5. Spores 200 µm long; Ireland ..... *P. polythecia* (Taylor) Erichs.
5a. Spores 122-183 µm long; Eurasia .....*Lepra ocellata* (Körb.) Hafellner
.....[*P. ocellata* Wallr. ex Körb.]

6. On moss; spores 80-165 µm long; Ireland .....*P. hutchinsiae* (Borrer) Leight.
6a. On plant débris; spores 80-165 µm long; N. hemisphere .....
.....*Lepra panyrga* (Ach.) Hafellner
.....[*P. panyrga* (Ach.) Massal.]

7 Isidia becoming sorediate; spores 180-200 µm long; France .....
..... *Lepra mammosa* (Harm.) Hafellner
..... [*P. mammosa* Harm.]
7a. Isidia well-defined 8

8. Apothecia terminal in isidia; spores 100-270 µm long; circumpolar .....
.....*Lepra dactylina* (Ach.) Hafellner
.....[*P. dactylina* (Ach.) Nyl.]
8a. Apothecia not terminal in isidia 9

9. Isidia short how many mm, blunt, crowded; ?spores; Eur... *Lepra stalactiza (*Nyl.) Hafellner
..... [*P. stalactiza* Nyl.]
9a. Isidia tall how tall?, scattered; spores 115-140 µm long; N.Am .....
..... *Lepra andersoniae* (Lendemer) Lendemer & R.C. Harris
.....[*P. andersoniae* Lendemer]

10(1a). Lichexanthone present.....11
10a. Lichexanthone absent.....16

11. Picrolichenic acid present.....12
11a Picrolichenic acid absent.....13

12. Lichexanthone and picrolichenic acid present; spores 125-180 µm long; N.Am, S.Am.....
.....*Lepra ventosa* (Malme) Lendemer & R.C. Harris
..... [*P. ventosa* Malme]
12a. Lichexanthone, picrolichenic and thamnolic acids present; spores 120-160 µm long, rare; ....
Aus., S.Am ..... *Lepra subventosa* (Malme) Schmitt & Lumbsch
.....[*P. subventosa* Malme]

13. Hypothamnolic acid present; spores 110-160 µm long; S.Am .....
.....*P. hossei* (Räs.) A.W.Archer & Osorio
13a. Hypothamnolic acid absent 14

14. Lecanoric acid present; spores 170-220 µm long; Juan Fernandez ... *P. skottsbergii* Zahlbr.
.....[also on wood]
14a. Lecanoric acid absent 15

15. Haemathamnolic acid present; spores not reported; Brazil .....
..... *Lepra xantholeucoides* (Müll.Arg.) I. Schmitt, A.W.Archer & Lumbsch
.....[*P. xantholeucoides* Müll.Arg.]
15a. Squamatic acid present; spores 100-130 µm long; Socotra.....
..... *Lepra xantholeuca (*Müll. Arg.) I. Schmitt, A.W.Archer & Lumbsch
..... [*P. xantholeuca* Müll. Arg.]

16(10a). Lichen compounds absent; spores 90-140 µm long; Lapland .....*P. tornensis* H.Magn.
16a. Lichen compounds present 17

17. Spores 150-180 µm; K-ve, C-ve [2 unidentified compounds, hplc] Mexico.....
..... *P. velata* f. *liebmannii* Vain.
17a. Other compounds present 18

18. Norstictic acid present 19
18a. Norstictic acid absent 21

19. Norstictic acid only present; spores 100-300 µm long; Eur .....
.....*Lepra monogona (*Nyl.) Hafellner
.....[*P. monogona* Nyl.]
19a. Norstictic and picrolichenic acids present 20

20. Spores 150-160 µm long [usually 2 per ascus]; disc dull fawn to brown; S.Am.....
.....*Lepra alterimosa* (Darb.) I. Schmitt, Hodkinson & Lumbsch
.....[*P. alterimosa* Darb.]
20a. Spores 100-150 µm long; disc black, white pruinose; Eur. .....*P. ludovicae* Werner

21(18a). Picrolichenic and protocetraric acids present; spores 180-250 µm long; [rarely on wood] ..
.....*Lepra melanochlora* (DC) Hafellner
..... [*P. melanochlora* (DC) Nyl.]
21a. Picrolichenic acid absent 22

22. Thamnolic, cryptothamnolic or hypothamnolic acids present 23
22a. Lecanoric, protocetraric or gyrophoric acids present 25

23. Thamnolic acid present 24
23a. Cryptothamnolic and hypothamnolic acids present; spores 153-204 µm long; China; .....
[also on wood].....*P. leptospora* Nitschke ex Lahm

24. Spores 95-175 µm long; S.Afr. .....
..... *Lepra wawreana* (A.Massal.) I. Schmitt, Hodkinson & Lumbsch
.....[*P. wawreana* A.Massal.]
24a. Spores "ca.200 µm long" [fide Müll. Arg.]; Eur. .....*P. clementiana* Müll. Arg.

25. Protocetraric acid present; 26
25a. Lecanoric or gyrophoric acid present 29

26. Southern Hemisphere 27
26a. Northern Hemisphere 28

27. Spores 145-185 µm long; S.Am,, NZ.....
.....*Lepra macloviana (*Müll. Arg.) I.Schmitt, Hodkinson & Lumbsch
..... [*P. macloviana* Müll. Arg.]
27a.. Spores 195-280 µm long; Tasmania
.....*Lepra parathalassica* (Kantvilas & Elix) A.W.Archer& Elix
..... [*P. parathalassica* Kantvilas & Elix]

28. Spores 135-240 µm long; Arctic Russia ..... *P. cribellata* Branth
28a. Spores 160-180 µm; China..... *P. setschwanica* Zahlbr.

29. Lecanoric acid present 30
29a. Gyrophoric acid present 32
.
30. Lecanoric and variolaric acids present; spores 180-240 µm long; Eur..... *P. lactea* (L.) Arn.
30a. Lecanoric acid only present.....31

31. Spores 100-200(-275) µm long; NZ.....*P. obvelata* Nyl.
31a. Spores 200-270 µm long; France .....*P. conglobata* (Ach.) Fr

32. Spores 135-150 µm long; S.Am.....*P. microcarpa* Nyl.
32a. Spores 150-230 µm long; circumarctic .....*P. bryontha* (Ach.) Nyl.

Group 8. Apothecia present, disciform; ascospores 1 per ascus; on wood

1. Xanthones present 2
1a. Xanthones absent.....14

2. Chloroxanthones present 3
2a. Lichexanthone present.....4

3. 5,7-Dichloro-3-*O*-methylnorlichexanthone present; spores 125-165 µm long; NZ .....
..... *P. glaucomopsis* Nyl.
3a. 2-Chlorolichexanthone and 2'-*O*-methylperlatolic acid present; spores 100-130 µm long; NZ
.....*P. circumcincta* Stirt.

4. Lichexanthone only present; spores 100-150 µm long; PNG.....*P. asterella* Aptroot
4a. Lichexanthone and picrolichenic acid or depsides present.....5

5. Lichexanthone and picrolichenic acid present.....6
5a. Lichexanthone and depsides present 7

6. Spores 160-195 µm long; picrolichenic acid present; PNG .....
.....*P. myola* A.W.Archer & Elix
6a. Spores 135-175 µm long; picrolichenic acid and homologues present; Aus.....
.....*Lepra clarkeana* (A.W.Archer) I.Schmitt, Hodkinson & Lumbsch
..... [*P. clarkeana* A.W.Archer]

7. Lecanoric acid present; spores 110-175 µm long [120-315 µm (Dibben)]; cosmopolitan.....
..... *Varicellaria velata* (Turner) I. Schmit & Lumbsch
..... [*P. velata* (Turner) Nyl.]
7a. Baeomycesic, thamnolic, hypothamnolic or haemathamnolic acid present 8

8. Baeomycesic or thamnolic acid present 9

8a. Hypothamnolic or haemathamnolic acid present 10

9. Baeomycesic acid present; spores 68-198 µm long; N.Am.....
.....*Lepra floridana* (Dibben) Lendemer & R.C. Harris
..... [*P. floridana* Dibben]
Baeomycesic and hypothamnolic acids present; spores 120-150 µm long; Brazil.....
.....*P. (Lepra) elizabethae* A.W.Archer & Elix
9a. Thamnolic acid present; spores 100-130 µm long; Aus .....
..... *Lepra miscella* (A.W.Archer) I. Schmitt, Hodkinson & Lumbsch
.....[*P. miscella* A.W.Archer]

10. Hypothamnolic acid present 11
10a. Haemathamnolic acid present.....13

11. Spores 115-150 µm long; Africa ..... *Lepra tropica* (Vain.) Lendemer & R.C. Harris
..... [*P. tropica* Vain.]
11a. Spores >150 µm long 12

12 Spores 153-204 µm; China; [Pd+ yellow!]; also on rock ..... *P. leptospora* Nitschke ex Lahm
12a. Spores 174-210 µm long; with additional salazinic acid; China .....
..... *Lepra paratropica* (Ren) I. Schmitt, Hodkinson & Lumbsch
..... [*P. paratropica* Ren]

13. Spores 100-150 µm long; circumtropical .....
June 12. 2017..... *Lepra commutata* (Müll.Arg.) Lendermer & R.C. Harris
July 11. 2017 ..... [*Lepra commutata* (Müll.Arg.) I. Schmitt, Hodkinson & Lumbsch]
..... [*P. commutata* Müll.Arg.]
13a. Spores 150-170 µm long; S.Am. .....
..... *Lepra superans* (Müll.Arg.) I. Schmitt, Hodkinson & Lumbsch
..... [*P. superans* Müll.Arg.]

14(1a). Fatty acids present; spores 100-200 µm long; N Eur & N.Am .....
..... *P. panyrga* (Ach.) Massal.
14a. Depsides, depsidones or picrolichenic acid present 15

15. Depsidones [fumarprotocetraric, physodalic, protocetraric or norstictic acids] present.....16
15a. Depsides [lecanoric, squamatic, barbatic, thamnolic, haemathamolic or hypothamnolic .....
acids present] or picrolichenic acid present.....27

16. Fumarprotocetraric or protocetraric accid present.....17
16a. Physodalic or norstictic acid acid present.....21

17. Fumarprotocetraric acid present 18
17a. Protocetraric acid present 19

18. Spores 110-160 µm long; N.Am, Eur.....
.....*Lepra multipunctoides* (Dibben) Lendemer & R.C. Harris
..... [*P. multipunctoides* Dibben]
18a. Spores145-198 µm long; China..... *P. multipuncta* Nyl. var. *colorata* Zahlbr.

19. Protocetraric acid and thamnolic acids present; spores 125-180 µm long; China .....
.....*P. huangshanensis* S.Yu & J.Wu ex Q. Ren
19a. Protocetraric acid present 20

20. Spores 210-250 µm long; China.....
.....*Lepra sejilaensis* (Q. Ren) I. Schmitt, Hodkinson & Lumbsch
.....[*P. sejilaensis* Q. Ren]
20a. Spores 170-180 µm long; Aus. .....*Lepra lacericans* (A.W.Archer) A.W.Archer & Elix
..... [*P. lacericans* A.W.Archer]

21. Physodalic acid present; spores 90-170 µm long [-242 µm, China]; Korea, Eur. ..... *Lepra multipuncta* (Turner) Hafellner ○ [*P. multipuncta* (Turner) Nyl.]
21a. Norstictic acid present 22

22. Norstictic and salazinic acids present; spores 120-150 µm long; S.Afr. ..... *P. casta* Zahlbr.
22a. Norstictic acid present; salazinic acid absent 23

23. Spores 200-300 µm long; thallus sorediate; Eur. ..... *P. monogoniza* Nyl.
23a. Spores <200 µm long 24

24. Spores 150-175 µm long; disc white pruinose; apothecia pustulate; Aus, PNG ..... *Lepra sublacerans (*A.W.Archer) A.W.Archer & Elix [*P. sublacerans* A.W.Archer]
24a. Spores < 160 µm long 25

25. Discs black, epruinose; spores 100-160 µm long; Japan; China, Korea..... *P. submultipuncta* Nyl. ○
25a. Spores 30-150 µm long 26

26. Discs black or pink, pruinose; spores 70-150 µm long; Eur and N.Am. ..... *Lepra waghornei* (Hult.) Lendemer & R.C. Harris [*P. waghornei* Hult.]
26a. Discs black; spores 30-80 µm long; Finland ..... *P. atropallida* Vain.

27(15a). Lecanoric or picrolichenic acid present..... 28
27a. Squamatic, barbatic, thamnolic, haemathamolic or hypothamnolic acids present 35

28. Lecanoric acid present..... 29
28a. Picrolichenic ± protocetraric acid present 31

29. South Africa; spores 125-160 µm long; ..... *P. subvelatula* Vain.
29a. Hawaii 30

30. Spores 300-325 µm; ..... *P. contraria* H.Magn.
30a. Spores 134-236 µm; ..... *P. hawaiiensis* Erichs.

31. Spores 130-150µm long; ± protocetraric acid; also saxicolous and/or sterile ..... *Lepra amara* (Ach.) Hafellner [*P. amara* (Ach.) Nyl.]
31a. Spores ca. >150 µm long..... 32

32. Atranorin present..... 33
32a. Atranorin absent 34

33. Spores 150-170 µm long; Aus; apothecia dish-shaped..... *Lepra patellifera* (A.W.Archer) Schmitt & Lumbsch [*P. patellifera* A.W.Archer]
33a. Spores 137-180 µm long; S.Am; apothecia hemispherical. *P. grassiae* Messuti & A.W.Archer

34. Epithecia yellow; spores 150-200 µm; NZ..... *Lepra flavovelata (*Elix & Malcolm) I.Schmitt, Hodkinson & Lumbsch [*P. flavovelata* Elix & Malcolm]
34a. Epithecia not yellow; spores 170-225 µm; Aus, PNG, Brazil, Fiji, Sri Lanka..... *Lepra lacerans* (Müll.Arg.) I. Schmitt, Hodkinson & Lumbsch [*P. lacerans* Müll.Arg.]

35(27a). Squamatic or barbatic acids present 36
35a. Thamnolic, haemathamolic or hypothamnolic acids present..... 37

36. Squamatic acid present; spores 112-140 µm long; Indonesia..... *P. gedehana* Zahlbr.
36a. Barbatic acid present; spores 200-24 µm long; NZ .....
.....*Lepra wirthii* (Elix & A.W.Archer) I. Schmitt, Hodkinson & Lumbsch
..... [*Pertusaria wirthii* Elix & A.W.Archer]

37. Thallus Pd-ve, K+ violet; hypothamnolic acid present; spores 140-170 µm long.....
Aus., NZ .....*Lepra novaezelandiae (*Szatala) I. Schmitt, A.W.Archer & Lumbsch
..... [*P. novaezelandiae* Szatala]
37a. Thallus Pd+ yellow, K+ yellow.....38

38. Haemathamnolic acid present.....39
38a. Thamnolic acid present 41

39. Spores 105-150 µm long; S.Am; Japan.....*P. aggregata* Müll.Arg.
39a. Spores140-200 µm long 40

40. Disc pale; spores 140-200 µm long; S.Am., Korea .....
.....*Lepra variolosa* (Kremp.) I. Schmitt, A.W.Archer & Lumbsch
..... [*P. variolosa* (Kremp.) Vain.]
40a. Disc black; spores 162-190 µm long; S,Am. .....
..... *Lepra ornatula* (Müll.Arg.) I. SChmitt, Hodkinson & Lumbsch
..... [P. *ornatula* Müll.Arg.]

41. Spores usually < 150 µm long.....42
41a. Spores usually ca. >150 µm long 44

42. Thallus esorediate; disc black, pruinose; spores 112-132 µm long PNG .....
..... *P. yupna* A.W.Archer & Elix
42a. Thallus sorediate; soredia yellow or white 43

43. Spores 100-150 µm long, soredia yellow; Lappland .....*P. efflorescens* Vain.
43a. Spores 100-140 µm long; soredia white; Japan.....*P. variolina* Nyl.

44. Disc orange, pruinose; spores 150-185 µm long; NZ.....
..... *Lepra scutellifera* (A.W.Archer & Elix) I. Schmitt, Hodkinson & Lumbsch
..... [*P. scutellifera* A.W.Archer & Elix]
44a. Disc black, epruinose; spores 140-230 µm long; Japan ..... *P. nigrodisca* Oshio

Group 9. Apothecia present, disciform; ascospores 2 per ascus; on wood

1. Xanthones present 2
1a. Xanthones absent.....4

2. 4,5-Dichlorolichexanthone and perlatolic acid derivs. present; N.Am..... *P. sulcata* Dibben
2a. Thiophaninic acid present 3

3. Thiophaninic acid only present; spores 125-182 µm long; Canary Islands.....
..... *P. aceroae* C.Hdez.-Padr. et al.
3a. Thiophaninic and norstictic acids present; spores 90-155 µm long; N.Am. *P. lecanina* Tuck.

4. Lichen compounds absent 5
4a. Lichen compounds present.....7

5. N. hemisphere, spores 70-115 µm long; ?boreal.....*P. stenhamerii* Helb.
5a. North and South America.....6

6. S. Am.; spores 75-90 µm long; epithecia K-ve .....*P. kalbii* A.W.Archer & Messuti
6a. N.Am.; spores 80-110 µm long; epithecia K+ violet; .....*P. rhexostoma* Nyl. ex Hue

7. Depsidones [protocetraric, norstictic or salazinic acids] present 8
7a. Depsides [2-*O*-methylconfluentic, gyrophoric, lecanoric, planaic, thamnolic acids] present 14

8. Protocetraric acid present; spores 70-156 µm long; Japan ..... *P. composita* Zahlbr. O
8a. Norstictic or salazinic acid present 9

9. Salazinic acid present 10
9a. Norstictic acid present 11

10. Spores 50-55 µm long; China ..... *P. bambusetorum* Zahlbr.
10a. Spores 80-100 µm long; Costa Rica ..... *Lepra amnicola* (Elix & A.W.Archer) I. Schmitt, Hodkinson & Lumbsch
[Note: norstictic acid in Aus.] ..... [*P. amnicola* Elix & A.W.Archer]

11. Spores to 120-300 µm long; disc black; Eur. ..... *P. rhodiensis* Erichs.
11a. Spores 80-145 mm long 12

12. Spores 80-100 µm long; Aus ..... *Lepra amnicola* (Elix & A.W.Archer) I. Schmitt, Hodkinson & Lumbsch
..... [*P. amnicola* Elix & A.W.Archer]
12a. Spores 110-145 µm long 13

13. Spores 120-145 µm long; discs 0.8-1.3 mm diam.; Aus., Thailand ..... *Lepra asiana (*Vain.) A.W.Archer & Elix
..... [*P. asiana* Vain.]
13a. Spores 110-135 µm long; discs 0.5-0.75 mm diam.; S.Am. ..... *P. purpurascens* Müll.Arg.

14. Lecanoric or gyrophoric acid present 15
14a. 2-*O*-Methylconfluentic, planaic or thamnolic acid present 16

15. Lecanoric acid; spores 105-125 µm long; Philippines; PNG ..... *P. philippina* Vain.
15a. Gyrophoric acid present; spores 130-162 µm long; NZ ..... *P. murrayi* Elix & A.W.Archer

16. Thamnolic acid present 17
16a. 2-*O*-Methylconfluentic or planaic acid present 18

17. Spores 100-140 µm long; Japan ..... *P. subcomposita* Oshio
17a Spores to 94 µm long; N. Am. ..... *Lepra trachythallina* (Erichs.) Lendermer & R.C. Harris
..... [*P. trachythallina* Erichs]
[Spores 130 µm long; OTA 61764; NZ; ..... *Pertusaria* sp.]

18. Planaic acid present; spores 100-180 µm long; China ..... *P. paraquilianensis* Q. Ren & Z.T. Zhao
18a. 2-*O*-Methylconfluentic acid present; spores 50-140 µm long; Arctic alpine ..... *P. saximontana* Wetmore O

Group 10 Apothecia, present disciform; ascospores 2 per ascus; on rock

1. Thiophaninic and stictic acids present 2
1a. Thiophaninic acid absent; depsidones or depsides present 4

2. Spores with rough inner walls ..... *P. pluripuncta* Nyl. O
2a. Spores with smooth inner walls 3

3. Spores 60-80 µm long; on moss; N.Am ..... *P. flavicunda* Tuck.
3a. Spores 48-60 µm long; on moss; N.Am Arctic ..... *P. atra* Lynge

4. Depsidones [norstictic, protocetraric or salazinic acids] present 5
4a. Depsides [lecanoric, 2'-*O*-methylperlatolic or thamnolic acids] present 20

5. Protocetraric acid present 6
5a. Norstictic or salazinic acid present 7

6. Spores 100-126 µm long; disc white pruinose; thallus esorediate; Eur. ..... *P. pseudoparotica* Sipman
6a. Spores 100-150 µm long; thallus sorediate; Eur ..... *P. digrediens* Nyl.

7. Salazinic acid present; spores 120-150 µm long; Greece ..... *P. parotica* Sipman
7a. Norstictic acid present 8

8. Norstictic acid only present 9
8a. Norstictic and protocetraric or picrolichenic acids present 14

9. Spores ≥110µm long 10
9a. Spores ≤110 µm long 12

10 Europe; spores 110-160 µm long. ..... *P. pentelici* J. Steiner
10a. South America 11

11. Spores 120-175 µm long. ..... *P. albidopallens* Nyl.
11a. Spores 110-115 µm long. ..... *P. scutellina* Nyl

12. Europe; spores 80-100 µm long, becoming grey brown; Eur ..... *P. lactescens* Mudd
12a. North or South America 13

13a. South America; spores 88-92 µm long ..... *P. lecanorina* Nyl.
13b. North America; spores 75-110 µm long ..... *P. brattiae* Lumbsch & T.H. Nash

14(8a). Norstictic and protocetraric acids present; spores 80-150 µm long; N.Afr ..... *P. fdoulesiana* Harm.
14a. Norstictic and picrolichenic acids present 15

15. Spores < 85 µm long 16
15a. Spores .> 85 µm long 18

16. Spores 70-85 µm long [110-115 µm long; S.Afr. ..... *Lepra leonina (*Stizenb.) I. Schmitt, Hodkinson & Lumbsch ..... [*P. leonina* Stizenb.]
16a. Spores ≤ 70 µm long 17

17. Spores 67-70 µm long; S.Afr. ..... *P. wawreanoides* Nyl.
17a. Spores 46-56 µm long; S.Afr., S.Am ..... *P. subdealbata* Nyl.

18 North Africa; spores 80-150 µm long ..... *P. fdoulesiana* Harm.
18a. South America 19

19. Spores 162-250 µm long ..... *Lepra rugifera (*Müll.Arg.) I. Schmitt, Hodkinson & Lumbsch ..... [*P. rugifera* Müll.Arg.]
19a. Spores 84-125(-150) µm long ..... *P. alterimosa* Darb.

20(4a) Thamnolic acid present; spores 80-110 µm long; N.Am, China, Eur. ..... *Lepra trachythallina* (Erichs.) Lendemer & R.C. Harris ..... [*P. trachythallina* Erichs.]
20a. Lecanoric acid or 2'-*O*-methylperlatolic acid present 21

21. Lecanoric acid present[?]C+red; spores 140-160 µm long; Asia *P. haematommoides* Zahlbr.
21a. 2'-*O*-Methylperlatolic acid present; also on soil, moss; spores 50-160 µm long; Arctic alpine

.....*Pertusaria christae* Dibben & Poelt

Group 11. Apothecia present, verruciform; ascospores 2 per ascus, with smooth walls; on rock

1. 4,5-Dichlorolichexanthone, thuringione or thiophaninic acid present.....2
1a. Chlorinated xanthones absent.....11

2. Thuringione or thiophaninic acid present.....3
2a. 4,5-Dichlorolichexanthone present.....4

3. Thuringione present; spores 110-150 µm long; Japan..... *P. astomoides* Nyl.
3a. Thiophaninic and norstictic acids present; spores 175–250 x 70–100 µm; SW Afr.....
.....*P. salax* Brusse

4. 4,5-Dichlorolichexanthone and 2'-*O*-methylperlatolic acid present; spores 63-135 µm long ..
China, on alpine moss over rock ..... *P. albiglobosa* Q.Ren
4a. 4,5-Dichlorolichexanthone and stictic or norstictic acids present 5

5. 4,5-Dichlorolichexanthone and norstictic acid present; spores 97-105 µm long;.....
ostioles black, conspicuous; West Indies ..... *P. praetervisa* var. *expallens* Vain
5a. 4,5-Dichlorolichexanthone and stictic acid present.....6

6. Thallus isidiate; spores 170-230 µm long; Eur..... *P. areolata* (Ach.) A.Massal.O
6a. Thallus not isidiate 7

7. Spores 100-230 µm long 8
7a. Spores 80-115 µm long .....
Spores 95-115 µm long; ostioles black; PNG ..... *P. atrospilota* A.W.Archer & Eli
Spores 82-112 µm long; ostioles translucent; West Indies *P. praetervisa* var. *pileolata* Vain.
Spores 92-102 µm long; ostioles black, punctiform; West Indies.....
..... *P. praetervisa* var. *straminea* Vain.

8. Spores 155-230 µm long 9
8a. Spores 100-175 µm long 10

9. Spores 155-230 µm long; ostioles black; Eur, Japan, Korea; also on wood.....
.....*P. pertusa* (L) Tuck.O
9a. Spores 170-215 µm; medulla I+ blue; Corsica.....*P. subrupestris* Zschacke

10. Spores 100-170 µm long; Russia.....*P. globulata* Oxner & A.M.Volkova
10a. Spores 140-175 µm long; ostioles black; Aus, PNG.....*P. vulpina* A.W.Archer

11. Thallus K-; 2'-*O*-methylperlatolic acid present 12
11a. Thallus K+ red and C- or K+ red and C+ red 13

12. Spores 130-150 µm long; thallus isidiate; Antarctic .....*P. signyae* Øvstedal
12a. Spores 100-150 µm long; thallus non-isidiate; with confluentic and planaic acids present .....
India.....*P. indica* Srivasrava & Awasthi
.....?syn:*P. kodaikanalensis* Choisy

13. Thallus K+ red, C+ red; alectorialic acid present; spores 22-40 µm; Arctic alpine .....
.....*P. geminipara* (Th.Fr.) C.Knight ex Brodo
13. Thallus K+ red, C-ve; norstictic acid present.....14

14(12). Norstictic acid only present.....15
14a. Norstictic and protocetraric acids present; spores 80-150 µ long; N.Afr.*P. fdoulesiana* Harm.

15. Spores 100-140 µm long; S.Am. ..... *P. tesselaria* Müll.Arg.O
15a. Spores 70-100 µm; Japan ..... *P. pachyplaca* Nyl.

Spores 110-150 µm; Japan ..... *P. rhagadoplaca* Nyl.
Spores 120-250 µm long 16

16. Thallus isidiate; spores 125-200 µm long; Eur..... *P. pseudocorallina* (Lilj.) Arnold
16a. Thallus not isidiate. 17

17. Thallus shiny; spores 145-270 µm long; US. ..... *P. californica* Dibben
17a. Thallus not shiny 18

18 Spores 150-250 µm long; Eur. ..... *P. apennina* Bagl.
. Spores 140-200 µm long; Hawaii..... *P. zahlbruckneri* H. Magn.
Spores 150-210 µm; India, with atranorin..... *Pertusaria* sp. Singh & Sinha
Spores120-200 µm long [85-245 µm, Dibben]; on moss; N.Am, Arctic .....
..... *P. coriacea* (Th.Fr.) Th.Fr.

Group 12. Apothecia present, verruciform; ascospores 2 per ascus, with rough walls; on rock

1. 4,5-Dichlorolichexanthone present..... 2
1a. 4,5-Dichlorolichexanthone absent 4

2. Divaricatic acid present; spores 120-192 µm long ..... *P. flindersiana* Kantvilas & Elix
2a. Norstictic or stictic acids present..... 3

3. Norstictic acid present; spores 140-200 µm long; Aus, NZ .....*P. knightiana* Müll.Arg.
3a. Stictic acid present; spores 150-180 µm long; Indonesia .....
..... *P. tjibodana* Zahlbr.

4. Norstictic acid absent; perlatolic and stenosporic acids present; spores 175-210 µm long; NZ [cf. corticolous *P. sorodes* Stirt]. .....*P. allanii* Zahlbr.
4a. Norstictic acid present 5

5. Norstictic and stenosporic acids present; spores 153-223 µm long; N.Am; China .....
..... *P. plittiana* Erichs.
5a. Norstictic acid only present 6

6. Spores 190-245(-280) µm long; epithecium K-ve; NZ ..... *P. subverrucosa* Nyl.
6a. Spores 150-250 µm long; epithecium K+ violet; Eur..... *P. appenina* Bagl. ex Massal.

Group 13. Apothecia present, verruciform; ascospores 2 per ascus, with smooth walls; on bark or wood

1. Xanthones present 2
1a. Xanthones absent..... 46

2. Lichexanthone or derivatives present 3
2a. Norlichexanthone derivatives or thiophaninic acid derivatives present 7

3. Lichexanthone and stictic or norstictic acid ± depsides present 4
3a. Chlorinated lichexanthones present..... 28

4. Thallus isidiate 5
4a. Thallus not isidiate; 6

5. Spores 100-112 µm long, 2'-*O*-methylperlatolic and stictic acids present; Aus; PNG. .....
..... *P. isidiosa* A.W.Archer
5a. Spores 110-190 µm long; stictic acid present; Thailand ..... *P. allomicrostoma* Jariang.

6. Lichexanthone & norstictic acid present; spores 30-36 µm long [probably immature]; SAm. ..... *P. lichexanthonoimmersa* Aptroot & M. Cáceres
6a. Lichexanthone & stictic acid present; spores 73-106 µm long; ostioles black; China ..... *P. chinensis* Müll.Arg.

7. Norlichexanthone derivatives [thiophanic acid, arthothelin, 6-*O*-methylarthothelin or asemone] present 8
7a. Thiophaninic acid and/or 2-chloro-6-*O*-methylnorlichexanthone present 9

8. Thiophanic acid, 6-*O*-methylarthothelin and stictic acid present; spores 90-100 µm long; LHI ..... *P. malabara* A.W.Archer & Elix
8a. Thiophanic acid, arthothelin and asemone present; spores 105-117 µm long; Aus. ..... *P. saltuensis* A.W.Archer & Elix

9. Thiophaninic acid present; 2-chloro-6-*O*-methylnorlichexanthone present or absent 10
9a. Thiophaninic acid absent; 2-chloro-6-*O*-methylnorlichexanthone present 27

10. Thiophaninic acid only or with 2'-*O*-methylperlatolic acid 11
10a. Thiophaninic acid and depsidones [norstictic, stictic acids] present 16

11. Thiophaninic acid and 2'-*O*-methylperlatolic acid present; spores 87-110 µm long; S.Am. ..... *P. cinerella* Müll.Arg.
11a. Thiophaninic acid only present 12

12. Canary Islands 13
12a. New Zealand, Aus or SAm. 14

13. Spores 100-180 µm long; also N.Afr, ... *P. tazzekensis* Werner
13a Spores 125-182 µm long; ..... *P. aceroae* Hern.-Padr.*et al.*

14. Ostioles pale; spores 75-95 µm; Aus. ..... *P. thiophaninica* A.W.Archer
14a. Ostioles black; NZ or SAm 15

15. Ostioles conspicuous; spores 87-102 µm long;; NZ ..... *P. alboatra* Zahlbr.
15a. Ostioles punctiform; spores 85 µm [Müll.Arg.]; SAm ..... *P. carneola* (Eschw.) Müll.Arg.

16(10a). Thiophaninic and norstictic acids present 17
16a. Thiophaninic and stictic acids present 19

17. Thiophaninic and norstictic acids ±depsides present; spores 70-110 µm; Aus. ..... [also 3-4 per ascus] ..... *P. trimera* (Müll.Arg.) A.W.Archer
17a. Thiophaninic and norstictic acids only present 18

18. Spores 70-95 µm long; Spain ..... *P. luteola* Boqueras
18a. Spores 86-118 µm long; N.Am ..... *P. neolecanina* Lumbsch & Nash

19. Spores 80-105 µm long; Aus, Galapagos, Korea ..... *P. thiospoda* C. Knight
19a. Spores otherwise 20

20. Spores 70-110 µm long; Japan ..... *P. subrugosa* Nyl.
20a. Spores >110 µm long 21

21. Spores 100-187 µm long 22
21a. Spores <100 µm or hypostictic acid present 24

22. Eur, Macaronesia; spores 140-145 µm long; ..... *P. ficorum* Zahlbr.
22a. Socotra 23

23. Spores 100-145 µm long; ..... *P. cicatricosa* Müll.Arg.O
23a. Spores 145-187 µm long; .....*P. schizostoma* Müll.Arg.

24. Thiophaninic and stictic acids; 25
24a. Thiophaninic and stictic acids with additional hypostictic acid present.....26

25. Spores 75-82 µm long; S.Am. .....*P. montevidensis* Zahlbr.
25a. Spores 125-150 µm long; Aus. ..... *P. epacrospora* A.W.Archer

26. Spores 87-125 µm long; S.Afr. ..... *P. dispersa* Vain. O
26a. Spores 60-90 µm long; West Indies .....*P. antillarum* Vain.O

27. 2-Chloro-6-*O*-methylnorlichexanthone and 2'-*O*-methylperlatolic acid present; .....
spores 80-100 µm; S.Am.....*P. cinerella* var. *pampeana* A.W.Archer & Messuti
27a. 2-Chloro-6-*O*-methylnorlichexanthone and stictic acid present; spores 87-100 µm long; .....
Eur. N.Am, S.Afr, Asia, Aus.....*P. pustulata* (Ach.) DubyO

28(3a) 2,4- & 2,5-Dichlorolichexanthones and 2,4,5-trichlorolichexanthone present.....29
28a. 4,5-Dichlorolichexanthone present.....34

29. Polychlorolichexanthones only present; spores 110-130 µm; Aus.....
..... *P. xanthonaria* A.W.Archer & Elix
29a. Polychlorolichexanthones with 2'-*O*-methylperlatolic acid and/or stictic acid.....30

30. 2'-*O*-Methylperlatolic acid present; spores 75-160 µm; Japan ..... *P. denotanda* Nyl.
30a. Stictic acid present.....31

31. Stictic acid and 2'-*O*-methylperlatolic acid present; spores 80-120 µm long; PNG .....
.....*P. damiensis* A.W.Archer & Elix
31a. Stictic acid present, 2'-*O*-methylperlatolic acid absent.....32

32. Thallus sorediate; spores 140-168 µm long; Thailand ....*P. pertusella* var. s*orediata* Jariang.
32a. Thallus esorediate.....33

33. Spores 100-150 µm long; pantropical? .....*P. pertusella* Müll.Arg.O
33a. Spores 90-110 µm; Cook Islands .....*P. homilocarpa* A.W.Acher & Elix

34(28a). 4,5-Dichlorolichexanthone only present; spores 120-155 µm long; Aus. .....
.....*P. irregularis* Müll.Arg.
34a. 4,5-Dichlorolichexanthone, norstictic acid, stictic acid ± depsides, or depsides present
.....35

35. 4,5-Dichlorolichexanthone and norstictic acid present; spores 86-122 µm long; Thailand ....
.....*P. neoknightiana* Jariang.
[cf. saxicolous *P. praetervisa* var. *expallescens* Vain. West Indies]
[with additional 2-*O*-methylstenosporic and 2-*O*-methylperlatolic acids; .....
spores 130-150 µm long; 53470 (M).....*P. "chiodectonoides*"]
35a. 4,5-Dichlorolichexanthone, depsides or stictic acid ± depsides present.....36

36. 4,5-Dichlorolichexanthone and depsides present 37
36a. 4,5-Dichlorolichexanthone and stictic acid ± depsides present 41

37. 4,5-Dichlorolichexanthone and 2'-*O*-methylstenosporic acid; spores 100-110 µm long; Aus.
..... *P. stenospora* A.W.Archer & Elix

37a. 4,5-Dichlorolichexanthone and 2'-*O*-methylperlatolic acid or 2-*O*-methylperlatolic acid
present 38

38. 4,5-Dichlorolichexanthone and 2-*O*-methylperlatolic acid present.....39
38a. 4,5-Dichlorolichexanthone and 2'-*O*-methylperlatolic acid present 40

39. Spores 105-135 µm long; ostioles translucent; Aus. .....*P. meeana* A.W.Archer & Elix
39a. Spores 105-137 µm long; ostioles black; Thailand .....*P. parameeana* Jariang.

40. Spores 110-135 µm long; Aus, PNG, New Cal., China .....*P. pycnothelia* Nyl.O
40a. Spores 65-95 µm long; Israel; ..... *P. carmelii* Reichert & Galun

41(36a).4,5-Dichlorolichexanthone, stictic acid and 2'-*O*-methylperlatolic acids present 42
41a. 4,5-Dichlorolichexanthone and stictic acid present.....43

42. Spores 137-160 µm long; Aus, Fiji ..... *Pertusaria queenslandica* Elix & A.W.Archer
42a. Spores 65-80 µm long; Philippines .....*P. striolata* Räsänen

43. Spores 145-230 µm long; Eur. ?widespread; also on rock .....*P. pertusa* (Weigel) Tuck.
43a. Spores shorter.....44

44. North America; spores 120-180 µm long;.....*P. consocians* Dibben
44a. Australia 45

45. Ostioles black; spores 82-112 µm long; Aus, PNG, Sri Lanka*P. pseudococcodes* Müll.Arg.O
45a. Ostioles pale; spores120-150 µm long; Aus.....*P. quadraginta* A.W.Archer & Elix

46(1a) Lichen compounds absent 47
46a. Lichen compounds present.....51

47. Spores <100 µm long 48
47a. Spores >100µm long 49

48. Spores 64-100 µm long; S.Am. .....*P. albidella* Nyl.
48a. Spores 50-60 µm long; S.Am. .....*P. cryptocarpoides* Vain.

49. Spores 210-250 µm long; NZ.....*P. hadrospora* A.W.Archer & Elix
49a. Spores < 200µm long 50

50. Spores 110-125 µm long; Aus, NZ.....*P. melaleucoides* Müll.Arg.O
50a. Spores 60-120 µm long; circumboreal .....*P. stenhammerii* Hellb.

51(46a). Depsides and/or depside methyl esters present 52
51a. Depsidones [fumarprotocetraric, norstictic, protocetraric, stictic acids] present.....56

52. Depside methyl esters present 53
52a. Depside methyl esters absent; depsides present 54

53. Methyl 2'-*O*-methylstenosporate present; spores 140-174 µm; Thailand.....
.....*P. archeri* Jariang.
53a. Divaricatic acid and methyl 2,2'-di-*O*-methyldivaricatate present; spores 90-105 µm long; ...
Taiwan.....*P. platycarpiza* Zahlbr.

54. Planaic acid present; spores 90-130 µm long; China. *P. paraquilianensis* Q.Ren & Z.T.Zhao
54a. Divaricatic acid derivatives or 2'-*O*-methylhyperphyllinic acid present 55

55. 2'-*O*-Methylstenosporic, 2'-*O*-methyldivaricatic and 2,2'-di-*O*-methyldivaricatic acids present;
spores 165-215 µm long; S.Am.....*P. velloziae* (Vain.) Erichs.O
55a. 2'-*O*-Methylhyperphyllinic acid present; spores 100-135 µm long; Japan... *P. yasudae* Vain.

56(51a).Protocetraric or fumarprotocetraric acid present;.....57
56a Norstictic or stictic acid present 59

57. Fumarprotocetraric acid present; spores 105-120 µm long; Japan .....*P. subpustulata* Nyl.
57. Protocetraric acid present 58

58. Spores 100-120 µm long; Aus. ..... *P. aphelospora* (A.W.Archer) A.W.Archer & Elix
58a. Spores 40-70 µm long [*fide* Nyl.]; Japan..... *P. diffidens* Nyl.

59(56a). Stictic acid present 60
59a. Norstictic acid present 61

60. Spores 80-120 µm long; Aus, Mexico..... *P. porinella* Nyl.O
60a. Stictic and 2'-*O*-methylperlatolic acids present; spores 100-170 µm long; Thailand .... *P. subcopelandii* Jariang.

61. Norstictic acid only present 62
61a. Norstictic acid and depsides present..... 66

62. Spores 200-360 µm long; Asia ..... *P. oshioi* WeiO
62a. Spores < 200 µm long 63

63. Asia 64
63a. Europe or South America 65

64. India; spores 70-157µm long; [+atranorin] ..... *P. hirtella* Singh & Sinha
64a. Japan; spores 130-145 µm long;..... *P. mendax* Müll.Arg.

65. Europe; spores 110-195 µm long; ..... *P. servitiana* Erichs.
65a. South America; spores 110-140 µm long; K+ red (*fide* Vainio 1900) .... *P. pycnothelioides* Vain.O

66(61a). Norstictic and 2-*O*-methylstenosporic or divaricatic acids present 67
66a. Norstictic and perlatolic, ±stenosporic acids present..... 68

67 Norstictic and 2-*O*-methylstenosporic present; spores 110-137 µm long; India .... *P. wattiana* Müll.Arg.
67a. Norstictic and divaricatic acids present; spores 75-100 µm long; China..... ..... *P. subrosacea* Zahlbr.O

68. Spores 120-170 µm long; Aus..... *P. hartmannii* Müll.Arg.O
68a. Spores 120-125 µm long; Japan, China, Korea; rarely ± perlatolic acid ..... cf. *P. mendax*, above ..... *P. subobductans* Nyl.O

Group 14. Apothecia present, verruciform; ascospores 2 per ascus, rough; on wood

1. Xanthones present 2
1a. Xanthones absent..... 13

2. Norlichexanthone derivatives present 3
2a. Lichexanthone and derivatives present..... 6

3. Arthothelin and 6-*O*-methylarthothelin present; spores 80-110 µm long; Eur. .... *P. dispar* J. Steiner
3a. Thiophaninic and stictic acids present..... 4

4. Socotr; spores 140-165 µm long; ..... *P. subflavens* Müll.Arg.
4a. Northern Hemisphere 5

5. Spores 70-150 µm long; N.Am, China, Korea ..... *P. xanthodes* Müll.Arg.
5a. Spores 90-120 µm long; Eur. ..... *P. heterochroa* (Müll.Arg.) Erichs.

6. Lichexanthone present; spores 170-225 µm long; S.Am. *P. tetrathalamia* var. *major* Müll.Arg. [also 1 per ascus]

6a. Chlorolichexanthones present 7

7. 4-Chlorolichexanthone and 2-*O*-methylperlatolic acid present; spores 190-250 µm long; NZ ..... *P.* "*communis*" sens. Knight (M)
7a. Polychlorolichexanthones present 8

8. 4,5-Dichlorolichexanthone present 9
8a.. Other polychlorolichexanthones present 10

9. 4,5-Dichlorolichexanthone and perlatolic and stenosporic acids present; ..... spores 160-240 µm long; NZ ..... *P. sorodes* Stirt. [cf. saxicolous *P. allani* Zahlbr.] .....
9a. 4,5-Dichlorolichexanthone and 2'-*O*-methylperlatolic acid present; spores 95-120 µm long. Aus; PNG ..... *P. trachyspora* A.W.Archer

10. 2,4- & 2,5-Dichlorolichexanthone, 2,4,5-trichlorolichexanthone and stictic acid present ... 11
10a. 2,5-Dichlorolichexanthone, 2,4,5-trichlorolichexanthone, 2'-*O*-methylperlatolic and ..... 2-*O*-methylperlatolic acids present; spores 140-175 µm long; Aus. .... *P. elliptica* Müll.Arg. var. *bispora* Elix & A.W.Archer
11. Thallus lacking isidia & soredia; spores 100-150 µm long; ?circumtropical .... *P. cicatricosa* Müll.Arg.
11a. Thallus with isidia or soralia 12

12. Thallus isidiate; spores 116-180 µm long; Thailand ..... *P. takensis* Jariang. & A.W.Archer
12a. Thallus sorediate; spores 126-204 µm long; Thailand .... *P. langsangensis* Jariang. & A.W.Archer

13(1a) Depsidones and ±depsides present 14
13a. Depsidones absent; depsides present 25

14. Depsidones [stictic or norstictic acid] and depsides present 15
14a. Depsidones only present 19

15. Stictic and 2'-*O*-methylperlatolic acids present; spores 150-175µm long; PNG .... *P. bundiensis* A.W.Archer & Elix
15a. Norstictic acid present 16

16. India 17
16a. Asia or North America 18

17. Norstictic and divaricatic acids present; spores 120-166 µm long; PNG, Thailand .... *P. allothwaitesii* Jariangpraseret & A.W.Archer
17a. Norstictic ±planaic acids present; spores 100-160 µm long; N.Am ..... *P. neoscotia* Lamb

18. Norstictic and 2-*O*-methylstenosporic acids present; spores 120-137 µm long, rough; India .. .. *P. wattiana* Müll.Arg.
18a. Norstictic acid and atranorin present; spores 70-157 µm long; India .... *P. hirtella* Singh & Sinha

19. Hypoprotocetraric, fumarprotocetraric or protocetraric acids present 20
19a. Stictic, norstictic acid or variolaric acids present 22

20. Hypoprotocetraric acid present; spores 125-175 µm long; NZ .. *P. vallicola* Elix & Malcolm
20a. Fumarprotocetraric or protocetraric acids present 21

21. Fumarprotocetraric acid present; spores 75-135 µm long; N.Am, China *P. subpertusa* Brodo
21a. Protocetraric acid present; spores 110-160 µm long; Aus, PNG, Korea, Asia .... *P. thwaitesii* Müll.Arg.

22. Variolaric acid present; spores 100-120 µm long; N.Am ..... *P. obruta* Harris

22a. Stictic or norstictic acids present 23

23. Stictic acid present 24
23a. Norstictic acid present; spores 150-200 µm long; PNG . *P. perthwaitesii* A.W.Archer & Elix

24. Stictic acid present; spores 110-125 µm long; PNG ..... *P. cicatricosa* Müll.Arg. var. *deficiens* A..W. Archer & Elix
24a. Stictic and menegazziaic acids present; spores 150-175 µm long; India ..... *P. neilgherrensis* (Müll.Arg.) Awasthi & Srivastava

25(13a). Methyl 2-*O*-methyldivaricatate and 2-*O*-methyldivaricatic acid present; spores 86-150 µm long; Thailand ..... *P. litchicola* Jariang. & A.W.Archer
25a. 2'-*O*-Methylperlatolic acid present; spores 185-250 µm long; PNG ..... *P. subsorodes* Elix & A.W.Archer

Group 15. Apothecia present, verruciform; ascospores 4 per ascus, with smooth walls; on rock or moss

1. Lichexanthone and stictic acid present; spores70-85 µm long; Central Afr. ..... *P. rhodesica* Vain.
1a. Lichexanthone absent 2

2. Chlorinated xanthones present 3
2a. Chlorinated xanthones absent 14

3. Thiophaninic acid present 4
3a. Chlorinated lichexanthones (such as 4,5-dichlorolichexanthone) present 6

4. Thiophaninic, confluentic and planaic acids present; spores 100-130 µm long; NAm ..... *P. tejocotensis* de Lesd.
4a. Thiophaninic and stictic acids present; Japan 5

5. Anthraquinone absent; spores 100-130 µm long ..... *P. boninensis* Shibuchi
5a. Anthraquinone present; spores 100-160 µm long ..... *P. kashiwadanii* Shibuchi

6. 2-Chlorolichexanthone, stictic and 2-*O*-methylsuperlatolic acids present; spores 108-125 µm long; PNG ..... *P. aptrootii* A.W.Archer & Elix

6a. 4,5-Dichlorolichexanthone or 4-chlorolichexanthone present 7

7. 4,5-Dichlorolichexanthone present 8
7a. 4-Chlorolichexanthone present; spores 100-120 µm long; Antarctic, Marion Is. [? not published; not in Index Fungorum 21.2.2018] ..... "*P. gremmenii* Øvstd."

8. Growing on moss 9
8a. Growing on rock 12

9. 4,5-Dichlorolichexanthone, stictic and 2-*O*-methylperlatolic acids present; spores 140-175 µm long; S.Am. ..... *P. tapadensis* Elix & A.W.Archer
9a. 4,5-Dichlorolichexanthone and stictic acid present 10

10. Spores (1-)2(-3)/ascus, 143 µm long; also on wood; N.Am, arctic ..... *P. subobducens* Nyl.
10a. Spores <143 µm long 11

11. Spores 93-104 µm long; Japan, China, Korea ..... *P. quartans* Nyl.
11a. Spores 42-96 µm long; Arctic ..... *P. trochisea* Norm.

12(8a) 4,5-Dichlorolichexanthone only present; spores 2-4 per ascus, 70-90 µm long; Cape Verde Is ..... *P. aleianta* Nyl.
12a. 4,5-Dichlorolichexanthone with stictic or norstictic acids 13

13. 4,5-Dichlorolichexanthone and norstictic acid present; spores 80-90 µm long; S.Am .... *P. rudecta* Müll. Arg.
13a. 4,5-Dichlorolichexanthone and stictic acid present; spores 80-105 µm long; Aus. ....*P. trevethensis* A.W.Archer

14(2a).On moss; norstictic acid present.....15
14a. On rock.....16

15. On moss; spores 50-180 µm long; circumpolar.....*P. glomerata* (Ach.) Schaer.
15a. On moss and rock; [also 2,3 or 5/ascus], 80-230 µm long; polar.....*P. alaskensis* Erichs.

16. 2-*O*-Methylperlatolic or confluentic acid present.....17
16a. Norstictic acid present 18

17. 2-*O*-Methylperlatolic acid present; spores 145-185 µm long; S.Am..... .....*P. spegazzinii* Müll.Arg.
17a. Confluentic acid present; spores 108-130 µm long; S.Am..... ..... *P. malvinae* Messuti & A.W.Archer

18. Spores 55-75 µm long; Mauritius.....*P. hymenelioides* J.C.David
18a. Spores 60-90 µm long; NZ..... *P. graphica* C.Knight

Group 16. Apothecia present, verruciform; ascospores 4 per ascus, rough; on rock

So far, no taxa are known in this Group.

Group 17. Apothecia present, verruciform; ascospores 4 per ascus, smooth; on wood

1. Xanthones present 2
1a. Xanthones absent.....52

2. Lichexanthone or derivatives present 3
2a. Norlichexanthone derivatives present [including thiophaninic acid] 41

3. Lichexanthone present.....4
3a. Chlorinated lichexanthone derivatives present.....11

4. Lichexanthone only present; spores 80-120 µm long; N.Am, Central Afr..... .....*P. valliculata* Dibben
4a. Lichexanthone and stictic acid ± depsides or 2-chlorolichexanthone present 5

5. Lichexanthone and 2-chlorolichexanthone present 6
5a. Lichexanthone and stictic acid ± depsides present 7

6. With additional 2-*O*-methylsuperlatolic and 2-*O*-methylhyperlatolic acids; spores 90-115 µm long; Aus, S.Am, Cuba, PNG..... *P. depressa* (Fée) Müll.Arg.**O**
6a, With additional stictic acid; spores 85-120 µm long; Aus. .... *P. atromaculata* A.W.Archer & Elix

7. Lichexanthone, constictic and stictic acids present; spores 75-130 µm long; S.Am..... ..... *P. rhodiza* Nyl.
7a. Lichexanthone, stictic acid and depsides present 8

8. Lichexanthone, stictic and confluentic acids present.....9

8a. Lichexanthone, stictic acid and stenosporic acid derivatives present.....10

9. Spores 2-4/ascus, 80-176 µm long; Thailand.....*P. inthanonensis* Jariang.
9a. Spores 4-6-8/ascus, 87-110 µm long; S.Am.....*P. gracilis* var. *heteromera* Müll.Arg.

10. 2'-*O*-Methylstenosporic acid present; spores 90-110 µm long; Thailand.....
.....*P. elixii* Jariang.
10a. 2,2'-Di-*O*-methylstenosporic acid present; spores (3-)4/ascus 76-92 µm long; Thailand .....
..... *P. alboaspera* var. *tetraspora* Jariang.

11(3a). 2-Chlorolichexanthone, stictic, 2-*O*-methylisohyperlatolic and 2-*O*-methylsuperlatolic acids present; spores 105-125 µm long; Aus.....*P. follmanniana* A.W.Archer & Elix
11a. 4.5-Dichlorolichexanthone or 2,4,5-trichlorolichexanthone present.....12

12. 4,5-Dichlorolichexanthone present.....13
12a. 2,4,5-Trichlorolichexanthone present.....38

13. 4,5-Dichlorolichexanthone only present; 14
13a. 4,5-Dichlorolichexanthone and depsidones and/or depsides present 15

14. Spores 75-110 µm long; ostioles inconspicuous, pale brown, translucent; S.Am.....
.....*P. platystoma* Malme
14a. Spores 75-100 µm long; ostioles inconspicuous, black; S.Am .....*P. simulans* Malme

15. 4,5-Dichlorolichexanthone and norstictic acid present; spores 80-110 µm long; S.Am; .....
[H-NYL 3702 pm].....*P. "rhodiza"* Nyl.
14a. 4,5-Dichlorolichexanthone and stictic acid or depsides present.....15

15. 4,5-Dichlorolichexanthone and depsides or constictic acid present 16
15a. 4,5-Dichlorolichexanthone and stictic acid ± depsides present.....25

16. 4,5-Dichlorolichexanthone and depsides present 17
16a. 4,5-Dichlorolichexanthone and constictic acid present; spores 100-125 µm ; Brazil .....
.....*P. marcellii* A.W.Archer & Elix

17. 4,5-Dichlorolichexanthone and stenosporic acid derivatives present.....18
17a. 4,5-Dichlorolichexanthone and perlatolic acid derivatives present.....19

18. 4,5-Dichlorolichexanthone and 2,2'-di-*O*-methylstenosporic acid present; spores 2-3(-4)/ascus 84-142 µm long; Thailand.....
..... *P. subplanaica* var. *tetraspora* Jariang. & A.W.Archer
18a. 4,5-Dichlorolichexanthone and 2'-*O*-methylstenosporic acid; spores 80-100 µm;
Thailand.....*P. kansrii* Jariang.

19. Species present in Thailand.....20
19a. Species present elsewhere 22

20. 4,5-Dichlorolichexanthone and planaic acid or derivatives present 21
20a. 4,5-Dichlorolichexanthone and 2'-*O*-methylanziaic acid present; spores 84-146 µm long;.....
..... *P. phusoidaoensis* Jariang..

21. 4,5-Dichlorolichexanthone and planaic acid present; spores (1-)2-3/ascus 90-174 µm long;
Thailand..... *P. siamensis* Jariang.
21a. 4,5-Dichlorolichexanthone and 4-*O*-demethylplanaic acid present; spores 100-156 µm long;
.....*P. khuntanensis* Jariang.

22. Species present in Australia.....23
22a. Species present in Papua New Guinea or Vanuatu.....24

23. 4,5-Dichlorolichexanthone, planaic and 2-*O*-methylperlatolic acids present; spores 4/ascus,

95-125 µm long; Aus.....*P. doradorensis* Elix & A.W.Archer

23a. 4,5-Dichlorolichexanthone and 2-*O*-methylperlatolic acid present; spores 80-94 µm long; Aus, S.Am .....*P. malmeii* Elix & A.W.Archer

24a. Vanuatu; 4,5-dichlorolichexanthone and 2-*O*-methylperlatolic acid present; ..... spores 64-78 µm long; Vanuatu ..... *P. wilsoniana* A.W.Archer & Elix

24. Papua New Guinea; 4,5-dichlorolichexanthone and 2-*O*-methylisohyperlatolic present; spores 105-115 µm; PNG.....*P. streimannii* Elix & A.W.Archer

25. 4,5-Dichlorolichexanthone and stictic acid only present.....26

25a 4,5-Dichlorolichexanthone, stictic acid and depsides present 31

26. Thallus isidiate; spores 90-160 µm long; Eur..... *P. coronata* (Ach.) Th.Fr.

26a, Thallus not isidiate 20

27 Spores >100 µm long 28

27a. Spores <100 µm long 29

28. Spores 150-185 µm long, (2-)4(-5) per ascus; Japan.....*P. glauca* Zahlbr.

28a. Spores 112-142 µm long; Fiji..... *P. athrocarpar* var. *deficiens*.Elix & A.W.Archer

29. Spores 2-3(-4)/ascus; 75-100 µm long; Tahiti; verrucae confluent..... *P. hypochrysea* Vain.

29a. Species in the Northern Hemisphere 30

30. Spores 2-4/ascus, 51-140 µm long; pantemperate, N. hemisphere; Hawaii ..... verrucae flattened .....*P. leucostoma* (Bernh.) Massal.

30a.. Spores 60-90 µm; verrucae contricted at base; Eur .....*P. caesioumbrina* Eitner

31. 4,5-Dichlorolichexanthone, stictic acid and perlatolic or stenosporic acid derivatives present 33

31a. 4,5-Dichlorolichexanthone, stictic acid and confluentic acid or 2-*O*-methylconfluentic acid present; 32

32. 4,5-Dichlorolichexanthone, stictic acid and 2-*O*-methylconfluentic acid present; ..... spores (3-)4/ascus, 85-125 µm long; PNG .....*P. bogia* A.W.Archer & Elix .....

32a. 4,5-Dichlorolichexanthone, stictic acid and confluentic acid present; spores 75-90 µm long; India.....*P. cinchonae* Müll.Arg.

33. 4,5-Dichlorolichexanthone, stictic acid and perlatolic acid derivatives present.....23

33a. 4,5-Dichlorolichexanthone, stictic acid and 2'-*O*-methylstenosporic acid present;..... spores 3-4/ascus, 80-108 µm long.....*P. thailandica* Jariang.

34. 4,5-Dichlorolichexanthone, stictic acid and planaic acid present; spores 82-100 µm long; S.Am. ..... *P. bonariensis* Malme

34a. 4,5-Dichlorolichexanthone, stictic acid and 2-*O*-methylperlatolic or 2'-*O*-methylperlatolic acid present 35

35. 4,5-Dichlorolichexanthone, stictic acid and 2'-*O*-methylperlatolic acid pesent 36

35a. 4,5-Dichlorolichexanthone, stictic acid and 2-*O*-methylperlatolic acid present.....37

36. Spores 90-150 µm long; ostioles inconspicuous; Aus.....*P. hermaka* A.W.Archer

36a. Spores 130-152 µm; ostioles black, conspicuous; Fiji .....*P. athrocarpa* Elix & A.W.Archer

37. Spores (2-)4/ascus, 163-200 µm long; PNG, Philippines.....*P. copelandii* Vain.

37a. Spores 4/ascus, 100-120 µm long; PNG..... *P. laeana* A.W.Archer & Elix

38(12a) 2,4,5-Trichlorolichexanthone, 2-*O*-methylperlatolic and stictic acids; spores (2-)3(-4)/ascus, 70-100 µm long; Aus.....*P. tjaetabensis* A.W.Archer & Elix

38a. 2,4,5-Trichlorolichexanthone and 2,5-dichlorolichexanthone present 39

39. 2,4,5-Trichlorolichexanthone, 2,5-dichlorolichexanthone & 2-*O*-methylperlatolic acid present; spores 70-80 µm; Aus .....*P. aquilonia* A.W.Archer & Elix
39a. 2,4,5-Trichlorolichexanthone, 2,5-dichlorolichexanthone and stictic acid present 40

40. 2,4,5-Trichlorolichexanthone, 2,5-dichlorolichexanthone, stictic & confluentic acids present; spores (3-)4/ascus, 64-75 µm long; Aus..... *P. ewersii* A.W.Archer & Elix
40a. 2,4,5-Trichlorolichexanthone, 2,5-dichlorolichexanthone and stictic acid present spores 95-125 µm long; Sri Lanka, Java, PNG, Aus. .....*P. ceylonica* Müll.Arg.O

41(2a) Arthothelin and derivatives present.....42
41a. Thiophaninic acid present 43

42. 6-*O*-Methylarthothelin, arthothelin and stictic acid present; spores 117-125 µm long ..... circumtropical ?.....*P. quasiae* (Fée) Nyl.O
42a. 6-*O*-Methylarthothelin and arthothelin present; spores 45-62 µm long; PNG ....*P. inconspicua* A.W.Archer & Elix

43. Thiophaninic acid ± stictic or norstictic acid or despsides 44
43a. Thiophaninic acid, stictic acid and 4-*O*-methylisocryptochloropheaic acid or..... anthraquinone pigment present.....51

44. Thiophaninic and norstictic acids present 45
44a. Thiophaninic acid ± stictic acid or depsides.....46

45. Spores 68-110 µm long; N.Am .....*P. wulfenoides* de Lesd.
45a. Spores 85-120 µm long; Socotra..... *P. socotrana* Müll.Arg.

46. Thiophaninic acid and stictic acid present.....47
46a. Thiophaninic acid ± depsides 48

47. Spores (3-)4/ascus, 75-90 µm long; Aus, China.....*P. abberans* Müll.Arg.
47a. Spores 3(-4)/ascus,100-20 µm long; Aus. ..... *P. ternata* A.W.Archer & Elix

48. Thiophaninic acid only present; spores 4/ascus, 70-80 µm; New Caledonia, Thailand .... *P. endochroma* Müll.Arg.
48a. Thiophaninic acid and depsides present 49

49. Thiophaninic acid and 2'-*O*-methylperlatolic acid present; spores 4/ascus, 95-120 µm long: PNG.....*P. rechingeri* Zahlbr.
49a. Species present in Australia.....50

50. Thiophaninic acid and glomelliferic acid present; spores (2-)3/ascus, 80-120 µm long; Aus. .....*P. glomellerifica* Elix & A.W.Archer

50a. Thiophaninic acid with 2-*O*-methylperlatolic acid or 2,2'-di-*O*-methylstenosporic acid or confluentic acid present; spores 70-110 µm long; ostioles black, conspicuous; Aus .....*P. trimera* (Müll.Arg.) A.W.Archer

51(43a).Unknown anthraquinone present [K+violet]; spores 4/ascus, 100-160 µm long; Japan ..... also saxicolous.....*P. kashiwadanii* Shibuichi
51a. 4-*O*-Methylisocryptochloropheaic acid present; spores 4/ascus, 95-125(-145) µm long..... .....*P. paradoxica* A.W.Archer & Elix var. *tetraspora* A.W.Archer & Elix

52(1a)Stictic or norstictic acid present 53
52a. Stictic and norstictic acid absent 60

53. Stictic acid or stictic acid with depsides present 54
53a. Norstictic acid present.....58

54. Stictic acid present.....55
54a. Stictic acid and stenosporic or perlatolic acid derivatives.....56

55. Spores 75-82 µm long, Qld. .....*P. dayi* A.W.Archer & Elix
55a. Spores 140-160 µm; West Indies .....*P. dussii* Vain..

56. Methyl 2'-*O*-methylstenosporate present; spores 2-3/ascus 118-150 µm long; Thailand.....
.....*P. methylstenosporica* Jariang.
56a. Stictic acid and perlatolic acid derivatives present.....57

57. 2-*O*-Methylperlatolic acid present; spores 2-(3-4)/ascus, 84-130 µm long; Thailand; Aus ....
.....*P. loeiensis* Jariang.
57a. 2'-*O*-Methylperlatolic acid present; spores (3-)4/ascus, 115-150 µm long; PNG .....
.....*P. novaeguineae* A.W.Archer & Elix

58(53a).Spores 85-110 µm long; Hawaii [K++red].....*P. ruboreagens* H. Magn.
58a. Spores 62-85 µm long 59

59. Spores 62-85 µm; ostioles pale; S.Am, ...*P. cryptocarpa* Nyl.
59a. Spores 65-85 µm; ostioles black; PNG .....*P. naduriensis* A.W.Archer & Elix

60(52a).Lichen compounds present.....61
60a. Lichen compounds absent 68

61. Atranorin present; spores 88-104 µm long; Thailand.....*P. phukaensis* Jariang.
61a. Other depsides or protocetraric acid present 62

62. 2-*O*-Methylsuperlatolic, 2'-*O*-methylisohyperlatolic or protocetraric acid present.....63
45a. Confluentic or 2'-*O*-methylperlatolic acid present 66

63. Protocetraric acid present; spores 16-22 µm long; S.Am .....
.....*P. huanicola* Messuti & A.W.Archer
63a. Perlatolic acid or its derivatives present.....64

64. Perlatolic acid and fumarprotocetraric acid present; spores 90-150 µm long; Japan .....
.....*P. nakamurae* (Räs.) Dibben ❍
64a. Derivatives of perlatolic acid present 65

65. 2-*O*-Methylsuperlatolic acid present; spores 3-(4)/ascus, 80-100 µm long; PNG.....
.....*P. manamensis* A.W.Archer & Elix
65a. 2'-*O*-methylisohyperlatolic acid present; spores 65-69 µm long; Mexico.....
.....*P. polystictoides* Vain.

66. Confluentic acid present; spores 2-3(-4)/ascus, 72-134 µm long; Thailand.....
.....*P. orientalis* Jariang.
66a. 2'-*O*-Methylperlatolic acid present;.....67

67. Spores (2-)3/ascus, 140-168 µm long; China .....*P. parapycnothelia* Q. Ren & Z.T. Zhao
67a. Spores 90-120 µm long; Cook Islands .....*P. atroguttata* A.W.Archer & Elix

68(60a).In S.Am; spores 80-100 µm long; ..... *P. polita* var. *tetramera* Müll.Arg.
68a. In Australasia.....69

69. In PNG; spores 90-110 µm long; ostioles inconspicuous, translucent .....
..... *P. plethocarpa* A.W.Archer, Elix & Streimann
69a. In Norfolk Island; spores 95-115 µm long; ostioles black, lacking a hyaline margin .....
.....*P. nebulosa* A.W.Archer

Group 18. Apothecia present, verruciform; ascospores 4 per ascus, rough; on wood

1. Xanthones absent....2
1a, Xanthones present 8

2. Norstictic acid present;....3
2a. Atranorin or stictic acid present 4

3. Spores 84-144 µm long; S.Am. .... *P. reagens* (Zahlbr.) Redinger⭘
3a. Spores 90-120 µm long; ostioles black; West Indies.... *P. plana* Vain.

4. Atranorin only present; spores 88-104 µm long; Thailand.... *P. phukaensis* Jariang.
4a. Stictic acid present....5

5. Stictic acid only present; 6
5a. Stictic and 2'-*O*-methylperlatolic acid present; spores 70-80 x 36-40 µm; Qld.... .... *P. gadgarrensis* A.W.Archer & Elix

6. Spores 87-137(-165) µm long; ostioles punctiform; Java .... *P. javanica* Müll.Arg.
6a. Spores 100-160 µm long 7

7. Spores 140-160 µm long; ostioles becoming disciform; West Indies .... *P. dussii* Vain.
7a. Spores 100-150 µm long; Japan .... *P. radiata* Oshio

8. Lichexanthone present....9
8a. Chlorinated lichexanthones present....15

9. Lichexanthone and stictic or constictic acids present....10
9a. Fatty acids present or lichexanthone alone 14

10 Lichexanthone and stictic acid present....11
10a. Lichexanthone and constictic acid present; spores [sl. rough] 125-160 µm long; S.Am..... .... *P. ochrostoma* Müll.Arg.⭘

11. Lichexanthone and stictic acid present....12
11a Lichexanthone, stictic acid and confluentic acid or 2-*O*-methyl- and .... 2,4-di-*O*-methylolivetoric acids present....13

12. Spores 97-125 µm long; S.Am. .... *P. tenella* Müll.Arg.
12a. Spores 135-165 µm long; S.Am .... *P. tetrathalamia* var. *plicatula* Müll.Arg.

13. With additional confluentic acid; spores 70-90 µm long; Tahiti .... *P. trypetheliformis* Nyl.⭘
13a. With additional 2-*O*-methyl- and 2,4-di-*O*-methylolivetoric acid; spores 115-138 µm;..... S.Am.... *P. ochrotheliza* Nyl.

14. Lichexanthone and fatty acids present; spores 125-165(-200) µm long; S.Am..... .... *P. anisospora* Müll.Arg.⭘
14a. Lichexanthone alone; spores 90-95 µm long; Aus. .... *P. subcerussata* A.W.Archer
Spores 125-155 µm long; S.Am .... *P. tetrathalamia* var. *confirmans* Müll.Arg.

15(8a). 2-Chlorolichexanthone present....16
15a. Polychlorinated lichexanthones present 17

16. 2-Chlorolichexanthone with stictic acid present; spores 120-165 µm long; Java..... .... *P. placentiformis* (Mont. & Bosch) Müll.Arg.⭘
16a. 2-Chlorolichexanthone with stictic and 2'-*O*-methylperlatolic acids present; spores 115-125 µm long; Aus .... *P. pallida* A.W.Archer & Elix

17. 2,4-, 2,5- Dichlorolichexanthones and 2,4,5-trichlorolichexanthone present....18
17a. 4,5-Dichlorolichexanthone present....20

18. Thallus isidiate; with stictic acid; spores 80-95 µm long; Aus, NZ .... *P. subisidiosa* A.W.Archer
18a. Thallus not isidiate; 19

19. Additional 2-*O*- and 2'-*O*-methylperlatolic acids present;..... spores 80-110 µm long; Aus, PNG, New Caledonia [±stictic acid] .... *P. elliptica* Müll.Arg.
19a. Additional stictic acid present ; spores 55-75 µm long; Qld. .... *P. glabra* A.W.Archer & Elix

20. 4,5-Dichlorolichexanthone only present; spores 80-110 µm long; Aus. .... *P. leucophaea* Elix & A.W.Archer
20a 4,5-Dichlorolichexanthone and additional compounds present.....21

21. 4,5-Dichlorolichexanthone and planaic or confluentic acid present.....22
21a. 4,5-Dichlorolichexanthone and stictic acid present.....23

22. 4,5-Dichlorolichexanthone and planaic acid present; spores 75-97 µm long; Aus .... *P. leucothelia* Müll.Arg.
22a. 4,5-Dichlorolichexanthone and confluentic acid present; spores 74-100 µm; Cook Islands.... ..... *P. rarotongensis* A.W.Archer & Elix

23. 4,5-Dichlorolichexanthone and stictic acid present.....24
23a. 4,5-Dichlorolichexanthone, stictic acid and additional compounds present.....25

24. Spores 75-150 µm long; N.Am, S.Am. ..... *P. tetrathalamia* (Fée) Nyl.
24a. Spores 130-150 µm long; West Indies ..... *P. ascisidioides* Vain

25. 4,5-Dichlorolichexanthone, stictic acid, ±2-chlorolichexanthone ±4-chlorolichexanthone present; spores 100-135 µm long; S.Am. ..... *P. tetrathalamia* var. *decipiens* Müll.Arg.O
25a. 4,5-Dichlorolichexanthone, stictic acid and depsides present 26

26. 4,5-Dichlorolichexanthone, stictic and confluentic acids present; spores 105-130 µm; Cook Islands..... *P. rarotongensis* var. *stictica* A.W.Archer & Elix
26a. 4,5-Dichlorolichexanthone, stictic and 2'-*O*-methylperlatolic acids present; ..... spores 80-106 µm long.....27

27. Thallus isidiate; Thailand ..... *P. microstoma* Müll.Arg. var. *isidiata* Jariang.
27a. Thallus not isidiate; Aus, Java, PNG, New Caledonia .....*P. microstoma* Müll.Arg.

Group 19. Apothecia present, disciform; ascospores 8 per ascus, on rock

1. 4,5-Dichlorolichexanthone and 2-*O*-methylperlatolic acid present; spores 45-55 µm long; ... on moss; NZ ..... *P. scottii* Elix & A.W.Archer
1a. Depsidones present.....2

2. Fumarprotocetraric or salazinic acid present.....3
2a. Norstictic or stictic acid present 4

3. Fumarprotocetraric acid present; spores 23-28 µm long; thallus isidiate; Eur .... *P. oculata* (Dickson) Th. Fr.
3a. Salazinic acid present; 24-39 µm long; thallus lacking isidia; Falkland Is..... .....*P. salacinifera* Messuti & A.W.Archer

4. Stictic acid present.....5
4a. Norstictic acid present 6

5. On moss; spores 80-120 µm long; NZ ..... *P. tyloplaca* Nyl.
5a. On rock; spores 25-42 µm long; Eur, N.Am. ..... *P. chiodectonoides* Bagl. ex Massal. O

6. Spores 18-24 µm long; NZ, S.Am. ..... *P. monticola* Messuti & A.W.Archer
6a. Spores 30-40(-47) µm long; S. Hemisphere .. *Lepra erubescens* (Taylor) A.W.Archer & Elix
..... [*P. erubescens* (Taylor) Nyl. ⭘]

Group 20. Apothecia present, disciform; ascospores 8 per ascus, on wood or bark

1. Lichen compounds absent 2
1a. Lichen compounds present 4

2. Spores 15-20 µm long; disc black, white pruinose; NZ ..... *P. sporellula* A.W.Archer & Elix
2a. Spores > 20 µm long 3

3. Spores 34-41 µm long; disc pale grey, epruinose; NZ *P. duppensis* A.W.Archer & Malcolm
3a. Spores 35 x 19 µm [chemistry unclear] ..... *P. diluta* C.Björk, G.Thor & T.Wheeler

4. Thiophaninic or picrolichenic acid present 5
4a. Depsidones or depsides present 6

5. Thiophaninic acid present; spores 60-110 µm long; Eur, N.Am. *P. hymenea* (Ach.) Schaer. ⭘
5a. Picrolichenic acid present; spores 19-27 µm long; Aus, NZ ..... *P. truncata* Kremp. ⭘

6. Depsidones [fumarprotocetraric, norstictic or psoromic acids] present 7
6a. Depsides present 14

7. Fumarprotcetraric acid present 8
7a. Norstictic or psoromic acid present 11

8. Fumarprotocetraric acid and gyrophoric acid or protocetraric present 9

8a. Fumarprotocetraric acid ± succinicprotocetraric acid present 10

9. Fumarprotocetraric and gyrophoric acid; spores 22-30 µm; N.Am. .....
..... *P. suboculata* Brodo & Dibben
9a. Fumarprotocetraric and protocetraric acid present; spores 18-20 µm long; .....
Eur, N.Am; also sterile and sorediate ..... *P. borealis* Erichs.

10. Fumarprotocetraric acid only present;spores 10-14 µm long; Eur . *P. pupillaris* (Nyl.) Th.Fr.
10a. Fumarprotocetraric and succinicprotocetraric acids present; spores 12-22 µm long; N.Am....
..... *P. subambigens* Dibben

11(7a). Psoromic acid present; spores 27-40 µm long; China .... *P. wulingensis* Z.T.Zhao & Z.S.Sun
11a. Norstictic acid present 12

12. Norstictic acid and lichexanthone present; spores 16-22 µm long; S.Am *P. phlyctaenula* Nyl.
12a. Norstictic acid only present; S.Af. 13

13. Spores 12-22 µm long ..... *P. ambigens* Nyl.
13a. Spores 20-32 µm long ..... *P. elatior* Stirt.

14(6a). Lecanoric or gyrophoric acid present 15
14a. Thamnolic acid or 5-*O*-methylhiascic acid present 18

15. Gyrophoric acid present; spores 20-40 µm long; N. Hemisphere, ...
..... *P. carneopallida* (Nyl.) Anzi ex Nyl. ⭘
15a. Lecanoric acid present 16

16. Lichexanthone present; spores 1-seriate, 30-47 µm; S.Am ..... *P. pycnophora* Nyl. ⭘

16a. Lecanoric acid ± gyrophoric acid present....17

17. Spores 58-75 µm long; PNG ....*P. kaindiensis* A.W.Archer, Elix & Streimann
17a. Spores 14-22 µm long; with additional gyrophoric acid; N.Am ..*P. glaucomela* (Tuck.) Nyl.

18. 5-*O*-Methylhiascic acid ± stictic acid present; spores 33-54 µm long; Alaska ....
....*P. mccroryae* Börk, Goward & Sprib.
18a. Thamnolic acid present 19

19 Spores globular, 20-25 µm diam.; PNG ....*P. gongylospora* Elix & A.W.Archer
19a. Spores ellipsoid 20

20. Spores 22-32 µm long; Aus, NZ ....*P. thamnolica* A.W.Archer
20a. Spores 30-50 µm long; Malaysia, PNG....*P. epitheciifera* Sipman

Group 21. Apothecia present, verruciform; ascospores 8 per ascus, on rock or moss

1. Xanthones present 2
1a. Xanthones absent....19

2. Lichexanthone or derivatives present 3
2a. Arthothelin, thiophanic or thiophaninic acids present 12

3. Lichexanthone present....4
3a. Chlorolichexanthones present 8

4. Lichexanthone and stictic acid present; spores 2-seriate, 115-150 µm long; Aus, Easter Island
.... *P. hadrocarpa* Zahlbr. O
4a. Lichexanthone and depsides ± protocetraric acid present 5

5. Lichexanthone, planaic and protocetraric acids present; spores rough walled, 1-seriate .....
80-125 µm long; Central Afr.... *P. lambionii* A.W.Archer *et al.*
5a. Lichexanthone and depsides present 6

6. Lichexanthone and 2-*O*-methylconfluentic acid present; spores 1-seriate, 60-70 µm long; ...
Central Afr....*P. clercii* Messuti & A.W.Archer
6a. Lichexanthone and 2-*O*-methylperlatolic acid present 7

7. On rock; spores 75-105 µm long; Aus, PNG, S.Am, Mexico .....
....*P. consanguinea* Müll.Arg.O
7a. On dead moss; spores 80-95 µm long; Japan ....*P. nagasakensis* Nyl.

8. 2-Chlorolichexanthone and 2'-*O*-methylperlatolic acid present; spores 75-90 µm; Brazil.....
....*P. saxatilis* A.W.Archer & Elix
8a. 4,5-Dichlorolichexanthone present....9

9. 4,5-Dichlorolichexanthone and 4-chlorolichexanthone present; on moss; spores 2-seriate,
150-185 µm long; S.Am....*P. confundens* Nyl.
9a. 4,5-Dichlorolichexanthone and norstictic acid or 2'-*O*-methylperlatolic acid present 10

10. Norstictic acid present; spores 70-85 µm long, irreg. 2-seriate; Ins. Rodrigues.....
.... *P. impallescens* Nyl.O
10a. 2'-*O*-Methylperlatolic acid present 11

11. Spores 2-seriate, 85-105 µm; Aus .... *P. lavata* Müll.Arg.
11a. Spores 1-seriate, 45-75 µm; Aus, NZ.... *P. lophocarpa* Körb.O

12(2a). Thiophaninic acid present 11
12a. Arthothelin or thiophanic acid present 17

11. Thiophaninic acid only present; spores 2-seriate, 62-75 µm long; S.Afr. .... *P. diaziana* A.Massal.
Spores 65 µm long; Eur, Asia .....*P. flavicans* Lamy
11a. Additional depsidones [norstictic or stictic acids] or 2-*O*-methylperlatolic acid present.....12

12. 2-*O*-Methylperlatolic acid present; spores 1-seriate, 60-85 µm long; .....
Aus, NZ, PNG, Zimbabwe. .....*P. petrophyes* C. Knight**O**
12a. Norstictic or stictic acids present.....13

13. Thiophaninic acid and norstictic acid present; spores 85-110 µm long; Eur;.....
.....*P. huneckiana* Feige & Lumbsch
13a. Thiophaninic acid and stictic acid present.....14

14. Thallus lacking isidia and soredia 15
14a. Thallus isidiate or sorediate.....16

15. Spores 2-seriate, 70-90 µm long; Aus .....*P. dissita* Elix & A.W.Archer
15a. Spores 1-seriate, 65-80 µm long; S.Am ..... *P. hypoxantha* Malme
15b. Spores ?seriate, 70-100 µm long; Eur. .....*P. rupicola* (Fr.) Harm.

16. Thallus isidiate; spores 1-seriate, 50-90 µm long; Aus .....
..... *P. xanthodactylina* A.W.Archer & Elix
16a. Thallus sorediate; spores 50-75 µm long, 1-seriate; Aus, NZ, PNG .....
.....*P. xanthoplaca* Müll.Arg.**O**

17(10a) Thiophanic acid present; spores 2-seriate, 60-85 µm long; Aus ..... *P. thula* A.W.Archer
17a. Arthothelin present.....18

18. Spores subglobose, hyaline to brown, 1-seriate, 12-30 µm long; SW US.....
.....*P. occidentalis* Bratt, Lumbsch & Schmitt
18a. Spores ellipsoid, hyaline to pale grey, 2-seriate, 60-75 µm long; Aus, NZ S.Afr. S.Am. .....
.....*P. melanospora* Nyl. **O**

19(1a) Lichen compounds absent; spores 2-seriate, 37-55 µm long; Aus. .... *P. paratropa* Müll.Arg.
Spores 1-seriate, 50-58 µm long; S.Afr. ..... *P. pseudomelanospora* V.Wirth & Elix

19a. Lichen compounds present.....20

20. 2'-*O*-Methylperlatolic acid present.....21
20a. Norstictic, stictic or virensic acid present.....22

21. Spores hyaline, 1-seriate, 65-85 µm long; S.Am.....*P. cerebrinula* Zahlbr.**O**
21a. Spores hyaline to brown, 2-seriate, 55-80 µm long; N.Am.....
.....*P. islandica* Bratt, Lumbsch & Schmitt

22. Stictic acid present; spores 2-seriate, 30-36 µm long; Aus .....*P. macra* Müll.Arg.
Spores 25-45 µm long; Eur. .....*P. eiteriana* Erichs.**O**
22a. Norstictic or virensic acid present.....23

23. Virensic acid present; spores 80-125 µm long; S.Am .....*P. rochae* Räsänen**O**
23a. Norstictic acid present.....24

24. Spores 1-seriate 25
24a. Spores 2-seriate 26

25. Spores 80-135 µm long; ± virensic acid; S.Am..... *P. patagonica* Müll.Arg.
25a. Spores 50-70µm long, N.Am, Arctic.....*P. octomela* (Norm.) Erichs

26. Spores 115-150 µm long; NZ, S.Am. ..... *P. perrimosa* Nyl.**O**

26a. Spores 87-112 µm long; S.Am ..... *P. colorans* Malme

Group 22 Apothecia present, verruciform; ascospores 8 per ascus, on wood or bark

1. Xanthones present ..... Subgroup 22A
1a. Xanthones absent ..... Subgroup 22B

Subgroup 22A Xanthones present

1. Lichexanthone or chlorolichexanthones present 2
1a. Norlichexanthone derivatives or thiophaninic acid or its derivatives present 82

2. Lichexanthone present 3
2a. Chlorolichexanthones present 27

3. Lichexanthone only present 4
3a. Lichexanthone with depsides and/or depsidones present 5

4. Spores 2-seriate, 120-140 µm; S.Am ..... *P. phaeostoma* Müll.Arg. ○
4a. Spores 1-seriate, 84-100 µm long; Aus ..... *P. albula* A.W.Archer & Elix

5. Lichexanthone and 2,2'-di-*O*-methylstenosporic acid ± 2-*O*-methylstenosporic acid present 6
5a. Lichexanthone and stictic or norstictic or protocetraric acid present 8

6. Lichexanthone and 2,2'-di-*O*-methylstenosporic acid ± 2-*O*-methylstenosporic acid present; spores 64-78 µm long; Thailand ..... *P. alboaspera* var. *deficiens* Jariang. & A.W.Archer
6a. Lichexanthone and 2,2'-di-*O*-methylstenosporic acid present; 2-*O*-methylstenosporic acid absent 7

7. Spores 52 x 27 µm [fide Müll.Arg.]; Central Afr. ..... *P. subareolata* Müll.Arg.
7a. Spores 100-125 µm long; Aus ..... *P. pinnaculata* A.W.Archer & Elix

8. Lichexanthone and norstictic acid ± stictic acid; spores 16-22 µm long; S.Am ..... *P. phlyctaenula* Nyl.
8a. Lichexanthone with stictic or protocetraric acid 9

9. Lichexanthone and protocetraric acid present 10
9a. Lichexanthone and stictic acid present 13

10. Depsides absent; spores 2-seriate, 70-80 µm long; S.Am ..... *P. rhodostomoides* Vain.
10a. Depsides [2'-*O*-methylperlatolic or 2,2'-di-*O*-methylstenosporic acids] present 11

11. 2,2'-Di-*O*-methylstenosporic acid present; spores 2-seriate, 60-100 µm long; Thailand ..... *P. nanensis* Jariang. & A.W.Archer
11a. 2'-*O*-Methylperlatolic acid present 12

12. Spores 1-seriate, 80-125 µm long, rough-walled, with additional planaic acid; Central Afr. ..... *P. lambionii* A.W.Archer *et al.*
12a. Spores 55-60 µm long, smooth-walled; S.Am ..... *P. curatellae* Malme

13. Lichexanthone and stictic acid present, depsides absent 14
13a. Lichexanthone, stictic acid and depsides present 17

14. Thallus sorediate or spores rough-walled 15
14a. Thallus esorediate and spores smooth-walled 16

15. Thallus sorediate; spores 98-111 µm long; Central Afr. ..... *P. fosseyae* A.W.Archer *et al*.
15a. Thallus esorediate; spores 125-175 µm long, with rough walls; West Indies ..... *P. parnassia* Vain.

16. Spores 2-seriate, 100-140 µm long; S.Am, India, Sri Lanka *P. dehiscens* Müll.Arg. ○
16a. Spores 1-seriate, 75-90 µm long; S.Am. ..... *P. nigrata* Kremp. ○

17.(13a) Sekikaic, confluentic or..... 2-*O*-methylperlatolic acids present 18
17a. Stenosporic acid derivatives present 21

18. Sekikaic or confluentic acids present 19
18a. 2-*O*-Methylperlatolic acid present 20

19. Sekikaic acid present; spores 2-seriate, 100-140 µm long; Aus..... *P. dehiscens* var. s*ekikaica* A.W.Archer & Elix
19a. Confluentic acid present; spores 2-seriate, 87-110 µm long; SAm..... *P. gracilis* f. *heteromera* Müll.Arg.

20. Spores 75-105 µm long; Aus ..... *P. leucostigma* Müll.Arg.
20a. Spores 60-90 µm long; N.Am ..... *P. paratuberculifera* Dibben

21. Lichexanthone, stictic and 2'-*O*-methylstenosporic acids present 22
21a. Lichexanthone, stictic and 2,2'-di-*O*-methylstenosporic acids present 23

22. Spores 2-seriate, 70-110 µm long; Thailand ..... *P. platycarpa* Jariang.
22a. Spores 1-seriate, 56-62 µm long; Aus.. ..... *P. montoensis* A.W.Archer & Elix

23. Spores 1-seriate 24
23a. Spores 2-seriate 25

24. Spores 50-67 µm long; Brazil ..... *P. verruculifera* Vain.
24a. Spores 60-84 µm long; Colombia ..... *P. leioplaca* var. *pycnocarpa* Nyl.

25. Ostioles black; spores 62-75 µm long; S.Afr ..... *P. congesta* Vain.
25a. Ostioles pale 26

26. Spores 90-100 µm long; Aus..... *P. alboaspera* A.W.Archer & Elix
26a. Spores 75-85 µm long; S.Afr. ..... *P. glaucocinerea* Vain.

27(2a) 4,5-Dichlorolichexanthone present 28
27a. 2-Chlorolichexanthone or 2,4- and 2,5-dichlorolichexanthones and..... 2,4,5-trichlorolichexanthone present 63

28. 4.5-Dichlorolichexanthone only present 29
28a. 4.5-Dichlorolichexanthone and depsidones and/or depsides present 34

29. Spores 150-200 µm long; [± 4-chlorolichexanthone]; S.Am ..... *P. confundens* Nyl.
29a. Spores <100 µm long 30

30. Spores 1-seriate, 30-37 µm long; NZ ..... *P. parvula* A.W.Archer & Elix
30a. Spores 2-seriate, >50 µm long 31

31-. Spores 60-90 µm long 32

31a. Spores 54-70 mm long 33

32. Spores 8/ascus; Aus, Asia, Central Afr. ..... *P. rigida* Müll.Arg.O
32a. Spores 6/ascus [also ± stictic acid]; Finland..... *P. raesaenenii* Erichs.

33. Spores 55-70 µm long; S.Am; ostioles conspicuous, black, 1-4, in translucent zones.. ..... *P. mundula* Müll.Arg.
33a. Spores 54-60 µm long; China; ostioles 2-4, black, punctiform..... ..... *P. subrosaceae* var. *octospora* Zahlbr.

34(28a). Depsidones [norstictic or stictic acids] present; depsides and 9-*O*-methylalternariol absent 35
34a. Depsides or 9-*O*-methylalternariol present, ±stictic acid 45

35. 4,5-Dichlorolichexanthone and norstictic acid present; spores 2-seriate, 67-85 µm long; Aus ..... *P. undulata* Müll.Arg.
35a. 4,5-Dichlorolichexanthone and stictic acid present..... 36

36. Spores 1-seriate 37
36a. Spores 2-seriate 42

37. Species circumboreal 38
37a. Species in Southern Hemisphere..... 41

38. Species predominantly circumboreal 39
38a. Species predominantly European 40

39. Spores 18-46 µm long; ..... *P. sommerfeltii* (Flörke) Fr.O
39a. Spores 40-70 µm long; also in Japan ..... *P. alpina* Hepp ex AhlesO

40. Spores 30-60 µm long; S Eur. ..... *P. constricta* Erichs.
40a. Spores 60-90 µm long; central Eur ..... *P. caesioumbrina* Eitner

41. Spores 65-70 µm long; ostioles white; Aus ..... *P. leucostomoides* Zahlbr.O
41a. Spores 48-72 µm long; ostioles black; S.Am..... *P. melanostoma* Kremp.

42(36a). Spores 55-80 µm long; Aus, PNG, China, Japan ..... *P. leiocarpella* Müll.Arg.O
42a. Spores > 100 µm long 43

43. Spores 180-270 µm long; Japan..... *P. akagiensis* Vain.O
43a. Spores < 150 µm long 44

44. Spores 100-130 µm long; West Indies ..... *P. polysticta* Vain.O
44a. Spores 130-140 µm long; Japan..... *P. laeviganda* Nyl.O

45. 4.5-Dichlorolichexanthone, stictic acid and stenosporic acid derivatives present.....46
45a. 4.5-Dichlorolichexanthone and depsides or 9-*O*-methylalternariol present; stictic acid absent 47

46. 2-*O*-Methylstenosporic acid present; spores 2-seriate, 80-94 µm long; Thailand..... ..... *P. kansriae* var. *stictica* Jariang.
46a. 2,2'-Di-*O*-methylstenosporic and 2,2'-di-*O*-methyldivaricatic acids present; ..... spores 64-102 µm long; Thailand..... *P. subplanaica* var. *stictica* Jariang.

47. 9-*O*-Methylalternariol present; spores 2-seriate, 75-87 µm long; PNG .... *P. praecipua* A.W.Archer & Elix
47a. Perlatolic or stenosporic acid derivatives present 48

48. Stenosporic acid derivatives present 49
48a. Perlatolic acid derivatives or confluentic, miriquidic or divaricatic acids present

.....52

49. *O*-Methylstenosporic acid derivatives present 50
49a. 2,2'-Di-*O*-methylstenosporic acid present.....51

50. 2-*O*-Methylstenosporic acid present; spores 2 seriate, 64-80 µm long; India.....
.....*P. rimosa* Awasti & Srivastava
50a. 2'-*O*-Methylstenosporic acid present; spores 1 seriate, 70-80 µm long; Aus.....
.....*P. praetermissa* A.W.Archer & Elix

51. Spores 1-seriate, 70-110 µm long; Aus, NZ; PNG.....
.....*P. subplanaica* A.W.Archer & Elix
51a. Spores 2-seriate, 60-78 µm long; Thailand .....*P. boklueaensis* Jariang.

52. Miriquidic or confluentic acid present 53
52a. Perlatolic acid, perlatolic acid derivatives or divaricatic acid present.....55

53. Miriquidic acid present; spores 1-seriate, 75-95 µm long; Aus .....
.....*P. novaehollandiae* A.W.Archer
53a. Confluentic acid present.....54

54. Confluentic acid only present; spores 1-seriate, 60-75 µm long; PNG .....
.....*P. weberi* A.W.Archer & Elix
54b. Confluentic and 2'-*O*-methylperlatolic acids present; spores 50-60 µm long; Eur.....
.....*P. werneriana* Boqueras

55. Perlatolic acid or divaricatic acid present.....56
55a. 2'-*O*-Methylperlatolic, 2-*O*-methylperlatolic or planaic acid present 57

56. Perlatolic acid present; spores 1-seriate, 50-60 µm long; Aus .....

.....*P. minispora* A.W.Archer & Elix
56a. Divaricatic acid present; spores 2-seriate, 75-82 µm long; Aus.....
.....*P. pseudothwaitesii* A.W.Archer & Elix

57. 2'-*O*-Methylperlatolic or 2-*O*-methylperlatolic acid present.....58
57a. Planaic acid present.....61

58. 2-*O*-Methylperlatolic acid and methyl 2-*O*-methylperlatolate present; .....
spores 1-seriate, 50-60 µm long; Aus.....*P. xenismota* A.W.Archer & Elix
58a. 2'-*O*-Methylperlatolic acid present.....59

59. Spores 2-seriate, 55-110 µm long; Aus, PNG, Sri Lanka, N.Am.....
.....*P. mesotropa* Müll.Arg.**O**
59a. Spores 1-seriate 60

60. Spores 32-65 µm long; Aus.....*P. pertractata* Stirt.**O**
60a. Spores 55-65 µm long; with additional 2,4,5-trichlorolichexanthone; PNG.....
.....*P. allogiberosa* A.W.Archer & Elix

61. Planaic acid and 2-*O*-methylperlatolic acid present; spores 45-55 µm long; Aus.....
.....*P. placocarpa* A.W.Archer & Elix
61a. Planaic acid only present.....62

62. Spores 80-100 µm; E.Aus .....*P. planaica* A.W.Archer & Elix
62a. Spores 40-65 µm; W.Aus.....*P. subarida* A.W.Archer & Elix

63(27a) 2-Chlorolichexanthone present; dichloro- and trichlorolichexanthones absent 64
63a. 2,4- and 2,5-Dichlorolichexanthone and 2,4,5-trichlorolichexanthone present 68

64. 2-Chlorolichexanthone only present; spores 45-50 µm long; S.Am .... *P. torquatella* Müll.Arg.
64a. 2-Chlorolichexanthone and depsides or depsidones present 65

65. 2-Chlorolichexanthone and depsidones [stictic, constictic acids] present.....66
65a. 2-Chlorolichexanthone and depsides [divaricatic, 2'-*O*-methylstenosporic acids] present 67

66. Stictic acid (major) and constictic acid (minor) present; spores..... 65-80 µm long; S.Afr ..... *P. cryptostoma* Müll.Arg.O
66a. Constictic acid (major) and stictic acid (minor) present; spores ..... 55-66 µm long; S.Am..... *P. delicatula* Müll.Arg.

67. 2'-*O*-Methylstenosporic acid present; spores 1-seriate, 60-70 µm long: Aus..... ..... *P. boweniana* A.W.Archer & Elix
67a. Divaricatic acid present; spores 2-seriate, 70-92 µm long: Aus..... ..... *P. orarensis* A.W.Archer & Elix

68(63a). Chloroxanthones only present.....69
68a. Chloroxanthones and stictic acid and/or depsides present 73

69. Spores 105-135 µm long; rough-walled; PNG..... ..... *P. anomalospora* A.W.Archer, Elix & Streimann
69a. Spores <100 µm long 70

70. Spores 50-75 µm long 71
70a. Spores 40-100 µm long 72

71. Spores 62-75 µm long; ostioles brown, conspicuous; S.Am..... ..... *P. paraguayensis* Müll.Arg.
71a. Spores 48-60 µm long; ostioles pale grey, translucent; West Indies..... ..... *P. glaucopunctata* Vain.

72a. Spores 70-100 µm long; N.Am .....*P. ostiolata* Dibben
72b. Spores 40-54 µm long: S.Am. ..... *P. ferax* (Müll.Arg.) A.W.Archer & Elix .....[basionym: *P. torquatella* var. *ferax* Müll.Arg.]

73(68a). Stictic acid present 74
73a. Stictic acid absent.....75

74. Spores 2-seriate, 50-75 µm long; Aus.....*P. lordhowensis* A.W.Archer & Elix;
74a. Spores 1-seriate, 45-50 µm long; additional 2-*O*-methylperlatolic acid present; Aus .. ..*P. gundermanica* A.W.Archer & Elix,

75. Spores 1-seriate, 45-50 µm long; 2-*O*-Methyl- and 2'-*O*-methylperlatolic acids present; Aus ..... *P. complanata* A.W.Archer & Elix
75a. Spores 2-seriate, 85-112 µm long; 2-*O*-methylperlatolic acid present; S.Am..... .[syntype, leg. Schenk 1891] .....*P.* "*polita*" Müll.Arg

76(1a). Arthothelin, 6-*O*-methylarthothelin or thiophanic acid present 77
76a. Thiophaninic acid or 4-chloro-6-*O*-methylnorlichexanthone present 82

77. Arthothelin and thiophanic acid present; spores ?-seriate 78
77a. 6-*O*-Methylarthothelin and/or arthothelin present; spores 2-seriate.....79

78. Spores 60-75 µm long; NZ.....*P. bartlettii* A.W.Archer & Elix
78a. Spores 80-95µm long; PNG..... *P. karkarensis* A.W.Archer & Elix

79. Spores 100-125 µm long; S.Am..... *P. papillulata* Nyl.O

79a. Spores <100 µm long 80

80. Spores 60-87 µm long; 6-*O*-methylarthothelin and arthothelin; S.Am, Aus, PNG..... ..... *P. oblongata* Müll.Arg.
80a. Spores 55-80 µm long; with 6-*O*-methylarthothelin or arthothelin..... 81

81. Spores 55-60 µm; 6-*O*-methylarthothelin only; S.Am. ..... *P. candida* Müll.Arg.
81a. Spores 56-80 µm long; arthothelin only; N.Am. ..... *P. appalachensis* Lendemer

82(76a). 4-Chloro-6-*O*-methylnorlichexanthone present; spores 1-seriate, 70-87 µm long; Sri Lanka ..... *P. subdepressa* Müll.Arg.
82a. Thiophaninic acid present 83

83. Thiophaninic acid only present 84
83a. Thiophaninic acid and depsides and/or depsidones present 90

84. Spores 1-seriate, 50-70 µm long; ostioles black; NZ ..... *P. laevis* C.Knight
84a. Spores 2-seriate 85

85. Spores 85-115 µm long; ostioles black; NZ..... *P. theochroa* Kremp.
85a. Spores 50-95 µm long 86

86. Spores 75-95 µm long; ostioles brown; Aus ..... *P. thiophaninica* A.W.Archer
86a. Spores ≤ 70 µm long 87

87. French Antilles and Eur. 88
87a. New Caledonia and S.Am. 89

88. Spores 52-65 µm long; ?-seriate; French Antilles..... *P. flavens* Nyl.
88a. Spores 30-70 µm long; 1-2 seriate; Eur. ..... *P. plombii* B.deLesd.

89. Spores 8/ascus; S.Am..... *P. meridionalis* var *ochrostoma* Müll.Arg.
89a. Spores 4 or 8? /ascus; New Caledonia ..... *P. endochroma* Müll.Arg.

90(83a).Depsidones ± depsides present..... 91
90a. Depsides present, stictic acid absent 104

91. Depsidones [norstictic, protocetraric, stictic, virensic or variolaric acids] present; ..... depsides absent..... 92
91a. Stictic acid and depsides present 109

92. Norstictic or protocetraric acid present 93
92a. Stictic or variolaric or virensic acid present 95

93. Norstictic acid present:
Spores 55-110 µm long; N.Am ..... *P. rubefacta* Erichs.
[Spores 52-68 µm; N.Africa..... *P. praelutescens* Werner (nom. inval.)]
93a. Protocetraric acid present 94

94. Protocetraric acid present, stictic acid absent; spores 1-seriate, 55-85 µm long; S.Am ..... *P. glaziovii* Müll.Arg.
94a. Protocetraric and stictic acids present; spores 1-seriate, 50-62 µm long; S.Am ..... *P. lignicola* Malme

95(92a).Stictic acid present 96
95a. Variolaric or virensic acid present 103

96. Thallus sorediate or isidiate..... 97
96a. Thallus lacking soredia and isidia 98

97. Thallus sorediate; spores 2-seriate, 60-65 µm long; Aus .... *P. xanthosorediata* A.W.Archer
97a. Thallus isidiate; spores 1-seriate, 60-100 µm long; widespread; ± 2'-*O*-methylperlatolic acid; rarely fertile ..... *P. flavida* (DC.) Laundon

98. Additional constictic acid present; spores 1-seriate 99
98a. Additional constictic acid absent; spores 1- or 2-seriate 100

99. Spores 50-75 µm long; S.Am..... *P. rhodostoma* Nyl.
99a. Spores 70 x 28 µm [*fide* Müll.Arg.]; E.Afr. .....*P. cinctula* Müll.Arg.

100. Spores 1-seriate 101
100a. Spores 2-seriate 102

101. Spores 52-72 µm long; S.Hemisphere.....*P. leioplacella* Nyl.
101a. Spores 48-80 µm long; Japan..... *P. obsolescens* Nyl.

102. Spores 50-80 µm long; ostioles not mammiform; N.Am, Aus, Seychelles..... ..... *P. texana* Müll.Arg.
102a. Spores 56-80 µm long; ostioles mammiform, pale yellow; E.Afr..... ..... *P. xanthothelia* Müll.Arg.

103(95a). Variolaric acid present; spores 65-90 µm long; N.Am ..... *P. epixantha* R.C.Harris
103a. Virensic acid present; spores 60-70 µm long; Aus., N.Am..... *P. virensica* R.C.Harris

104(90a). Gyrophoric acid present; spores 2-seriate, 60-130 µm long; N.Am, Eur..... .....*P. hymenea* (Ach.) Schaer.
104a. Perlatolic or stenosporic acid derivatives present 105

105. 2-*O*-Methylstenosporic acid present; spores 2-seriate, 70-80 µm long; S.Am..... .....*P. araucariae* Müll.Arg.
105a. Perlatolic acid or its derivatives present.....106

106. Perlatolic acid present; spores 1-seriate, 60-70 µm long.....107
106a. 2'-*O*-Methylperlatolic or 2-*O*-methylperlatolic acid present 108

107. Apothecia scattered; Aus.....*P. injuneana* A.W.Archer & Elix
107a. Apothecia confluent; Korea ..... *P. jogyeensis* J.S.Park & J.-S.Hur

108. 2'-*O*-Methylperlatolic acid present; spores 2-seriate, 40-80 µm long; Argentina ....*P. formosensis* Messuti & A.W.Archer
108a. 2-*O*-Methylperlatolic acid present; spores 1-seriate, 60-82 µm long; Aus ....*P. xylophyes* A.W.Archer
[Spores 52-72 µm long, 1-seriate; India; 2-*O*-methylperlatolic acid and traces..... thiophaninic acid present; India .....?syn: *P. amarkantakana* Srivastava & Awasthi]

109(91a)Spores 2-seriate, 64-90 µm long;; perlatolic and hyperlatolic acids present; ..... Thailand ..... *P. hylocola* Jariang. & A.W.Archer
109a Spores 1-seriate 110

110. 4-*O*-Methylisocryptochlorophaeic acid present; spores 75-100 µm long; Aus..... .....*P. paradoxica* A.W.Archer & Elix
110a. 2,2'-Di-*O*-methylstenosporic acid present; spores 80-105 µm long; Aus. .... *P. dharugensis* A.W.Archer & Elix

Subgroup 22B Xanthones absent

1a. Lichen compounds absent 2
1a. Lichen compounds present.....13

2. Spores 2-seriate 3
2a. Spores 1-seriate 8

3. Spores ≥70 µm long 4
3a. Spores ≤ 70 µm long 5

4. Spores 120-150 µm; rough; Cook Islands ..... *P. megacarpa* A.W.Archer & Elix
4a. Spores 70-110 µm long; smooth; Aus., S.Am, Cent. Afr. ..... *P. subrigida* Müll.Arg. ○

5. Spores 35-55 µm; China ..... *P. subochracea* Stirton ○
5a. Spores 45-70 µm long 6

6. Spores 48-70 µm long; ostioles red-black; NZ, Chile ..... *P. leucodes* C. Knight ○
6a. Spores 45-56 µm long 7

7. Spores 45-50 µm long; ostioles small, black, conspicuous; S.Am ..... *P. melaleuca* var. *octospora* Müll.Arg.

7a. Spores 45-56 µm long; ostioles large, black, conspicuous; ?N.Am. ..... *P. gonolobina* Müll.Arg.

8. Spores 70-105 µm long 9
8a. Spores 50-75 µm long 10

9. Spores 70-100 µm long; ostioles conspicuous, black; NZ ..... *P. micropora* Kremp.
9a. Spores 75-105 µm long; ostioles inconspicuous, black; S.Am ... *P. dilatata* Müll.Arg.

10. Apothecia flattened 11
10a. Apothecia flattened hemispherical 12

11. Ostioles black, inconspicuous; S.Am, S.Afr, NZ ..... *P. cryptocarpoides* Vain. ○
11a. Ostioles conspicuous, black; S.Am ..... *P. brasiliana* Zahlbr. ○

12. Ostioles translucent; NZ ..... *P. albissima* Müll.Arg.
12a. Ostioles conspicuous, black; S.Am ..... *P. acromelana* Müll.Arg.

13(1a). Depsidones and depsides present 14
13a. Depsides present 35

14. Depsidones [stictic, constictic, norstictic, salazinic, protocetraric] present, depsides absent 15
14a. Stictic acid and depsides present 31

15. Stictic, constictic or norstictic acid present 16
15a. Salazinic or protocetraric acid present 17

16. Stictic or constictic acid present; spores 2-seriate 18
16a. Norstictic acid present 22

17. Salazinic acid present; spores 2-seriate, 90-120 µm long; NZ ..... *P. celata* A.W.Archer & Elix
17a. Protocetraric acid present; spores 2-seriate, 70-95 µm long; Aus ..... *P. errinundrensis* A.W.Archer

18. Constictic acid present; spores 80 x 30 µm [*fide* Müll.Arg.]; E. Afr. ..... *P. aspera* Müll.Arg.
18a. Stictic acid present 19

19. Stictic and 5-*O*-methylhiasic acids present; spores 43 x 18 µm; US .....

.....*P. mccroryae* C.R. Björk, Goward & T. Sprib.
19a. Stictic acid alone present.....20

20. Spores 1-seriate, 67-84 µm long; WAfr.....*P. guinea-bissauensis, sp. nov*.
20a. Spores 2-seriate.....21

21. Spores 37-48 µm long; Marquesas Is.....*P. dermatodes* Nyl.
21a. Spores 145-170 µm long; Guadalupe.....*P. gibberosula* Nyl.

22(16a)Spores 2-seriate.....23
22a. Spores 1-seriate.....26

23. Spores 180-210 µm long; PNG.....*P. sipmanii* A.W.Archer & Elix
23a. Spores <150 µm.....23

24. Spores 45-55 µm long; Norfolk Is .....*P. norfolkensis* A.W.Archer
24a. Spores >55 µ long.....25

25. Spores 80-105 µm; ostioles becoming pseudolecanorine; N.Am, S.Am. .....
.....*P. propinqua* Müll.Arg.O
25a. Spores 75-88 µm long; India, China .....*P. himalayensis* Awasti & Srivastava

26. Spores 95-115 µm long; S.Am.....*P. patagonica* Müll.Arg.
26a. Spores <100 µm long.....27

27. Spores 17-20 µm diam; [?not *Pertusaria*]; Norfolk Is..... *P. globospora* A.W.Archer,
27a. Spores 50-95 µm long; 28

28. Spores 60-95 µm long.....29
28a. Spores 50-75 mm long.....30

29. Spores 60-95 µm long; ostioles inconspicuous; E.Afr..... *P. endoxantha* Vain.O
29a Spores 60 µm long; ostioles, black, conspicuous; W.Afr..... *P. personata* Müll.Arg.

30. Spores 50-70 µm long; Arctic.....*P. octomela* (Norm.) Erichs.
30a. Spores 50-75 µm long; India; +unidentified spot ?depside*P. maculata* Singh & Sinha

31(14a). 2,2'-Di-*O*-methylstenosporic acid present; spores 2-seriate, 68-85 µm long; Thailand
.....*P. alboaspera* var. *disflavens* Jariang.
31a. Perlatolic acid derivatives or divaricatic acid present.....32

32. Divaricatic acid present; spores 2-seriate, 75-100 µm long; Aus.....
.....*P. sydneyensis* A.W.Archer & Elix
32a. Perlatolic acid derivatives present.....33

33. 2-*O*-Methylsuperlatolic acid present; spores 1-seriate, 60-100 µm long; Thailand .....
..... *P. krabiensis* Jariang.
33a. 2'-*O*-Methylperlatolic acid present.....34

34. Spores 1-seriate, 74-110 µm long; Thailand .....
.....*P. phulhuangensis* Jariang.
34a. Spores 2-seriate, 70-80 µm long; Java .....*P. minor* Müll.Arg.

35(13a). Stenosporic acid derivatives present 36
35a. Perlatolic acid or other compounds present 38

36. 2,2'-Di-*O*-methylstenosporic acid present; spores 2-seriate, 100-120 µm long; S.Am.
[cf. syntype with chloroxanthones, *supra*] .....*P. polita* Müll.Arg.
36a. 2-*O*-Methylstenosporic acid present 37

37. Spores 1-seriate, 60-75 µm long; PNG ..... *P. kagamugana* Elix & A.W.Archer
37a. Spores 2-seriate, 70-90 µm long; Aus, S.Am, NZ, India ... *P. leucoplaca* Müll.Arg.O

38. Gyrophoric or divaricatic acid present; spores 2-seriate 39
38a. Perlatolic acid derivatives present.....41

39. Gyrophoric acid present; spores 40-64 µm; N.Am ..... *P. papillata* (Ach.) Tuck
39a. Divaricatic acid present.....40

40. Spores 65-75µm; ostioles inconspicuous, pale brown, translucent; PNG.....
.....*P. papuana* A.W.Archer & Elix
40a. Spores 56-85 µm; ostioles conspicuous, black; Sri Lanka.....*P. melastomella* Nyl.

41. Confluentic acid present.....42
41a. Perlatolic acid derivatives present; spores 2-seriate.....43

42. Confluentic acid and atranorin present; spores 2-seriate, 50-60 µm long.....
PNG.....*P. gorokorana* Elix & A.W.Archer
42a. Confluentic and 2'-*O*-methylperlatolic acids present; spores 2-seriate, 40-50 µm long:
S.Am ..... *P. nana* Müll.Arg.

43. Glomellerific acid present; spores 80-90 µm long; S.Am..... *P. corrugata* Kremp.
43a. 2'-*O*-Methylperlatolic or 2-*O*-methylperlatolic acid present.....44

44. 2'-*O*-Methylperlatolic acid present.....45
44a. 2-*O*-Methylperlatolic acid present 47

45. 2'-*O*-Methylperlatolic acid present with additional stictic acid; spores 92-120 µm long;
S.Am ..... *P. ampliata* Erichs.O
45a. 2'-*O*-Methylperlatolic acid present alone 46

46. Spores 62-90 µm long; S.Am.....*P. cerussata* MalmeO
46a. Spores 85-102 µm long; Central Afr.....*P. kigomensis* Dodge

47. 2-*O*-Methylperlatolic acid present; spores 92-120 µm long; S.Am .....
.....*P. tuberculifera* Nyl.O
47a. Spores ≤ 100 µm long 47

48. Spores 75-100 µm long; S.Am..... *P. achroiza* Nyl.
48a. Spores 65-85 µm long; S.Am; Aus ..... *P. mattogrossensis* Malme

SYNONYMS

P. akagiensis Vain.
syn: *P. conformis* Vain.

P. alaskensis Erichs
syn: *P. aleutensis* Erichs.

P. albescens (Huds.) Choisy & Werner
syn: *P. globulifera* (Turner) Massal.
syn: *P. discoidea* (Pers.) Malme
syn: *P. orbiculata* (Schreber) Zahlbr.
syn: *P. tuberculata* (Erichs.) Erichs
syn: *P. deschatresii* Werner
syn: *P. henrici* Erichs.
?syn: var. *corallina (*Zahlbr.) Laundon

P. allanii Zahlbr.
syn: *P. aucklandica* Zahlbr. *nom. nud.*

P. alpina Hepp ex Ahles
syn: *P. laevigata* (Th.Fr.) Anzi
[non *P. laevigata* Müll.Arg.]

P. amara (Ach.) Nyl.
syn: *P. slesvicensis* Erichs
syn: *P. slesvicensis* var. *levior* Erichs.
syn: *P. pulvinata* Erichs.
syn: *P. amara* var. *verrucigera* Erichs.
syn: *P. amara* var. *macrosora* Erichs.
syn: *P. slesvicensis* var. *deformis* Erichs.
syn: *P. commutata* Müll.Arg. sensu Oshio

P. amarescens Nyl
syn: *P. flavicans* Lamy
syn: *P. flavosulphurea* Vain.
syn: *P. affinis* Erichs.
syn: *P. leucosoroides* Nyl.

P. amaroides H. Magn.
syn: *P. amara* var. *tucumanensis* Räs.

P. ampliata Erichs.
syn: *P. tuberculifera* var. *virens* Müll.Arg.
syn: *P. tetrathalamia* var. *virens*(Müll.Arg.) Zahlbr.

P. anisospora Müll.Arg.
syn: var. *subflavens* Müll.Arg.
syn: var. *major* Müll.Arg.

P. antillarum *Vain.*
syn: *P. intermedia* Vain.

P. areolata (Ach.) A. Massal.
syn: *P. chionea* DC. in Lam. & DC.

P. brasiliana Zahlbr.
syn: *P. laevigata* Müll.Arg. *nom. inval.,* non *P. laevigata* (Th.Fr.) Anzi

P. carneola (Eschw.) Müll.Arg.
syn: *P. communis* var. *carneola* Eschw.

P. carneopallida (Nyl.) Anzi ex Nyl.
syn: *P. protuberans* (Sommerf.) Th. Fr.
?syn: *P. perfida* Nyl. sensu Oshio
syn: *P. leptocarpa* Anzi
syn: *P. phlyctidia* Norm.

P. cerebrinula Zahlbr.
syn: *P. alta* Zahlbr
syn: *P. elatior* Müll.Arg. *nom.inval*, non *P. elatior* Stirt.

P. cerussata Malme
syn: *P. cerussata* var. *dispersa* Malme

P. ceylonica Müll.Arg.
syn:*P. blumeana* Müll.Arg.
syn: *P. impressula* Müll.Arg.
syn: *P. trisperma* Müll.Arg.

P. chiodectonoides Bagl. ex Massal.
syn: *P. nolens* Nyl.
syn: *P. inquinata* (Ach.) Th.Fr.

P. cicatricosa Müll.Arg.
?syn: *P. communis* var. *neocaledonica* Nyl.
syn: *P. subtruncata* Müll.Arg.
?syn: *P. goniostoma* Müll.Arg.
syn: *P. schiffneri* Zahlbr.

P. circumcincta Stirt.
syn: *P. creberrima* Stirt.
syn: *P. krempelhuberi* Müll.Arg.
syn: *P. subverrucosa* Kremp. *nom. inval.*, non. Nylander

P. clarkeana A.W.Archer
syn: *P. confusa* A.W.Archer, *nom. inval*. non. Zahlbr

P. coccodes (Ach.) Nyl.
syn: *P. polycarpiza* Choisy & Werner
syn: *P. coccodes* (Ach.) Nyl. var. *petraea* Erichs.

P. commutata Müll.Arg.
syn: *P. vaginatula* Vain.
syn: P. *copiosa* Erichs.

P. composita Zahlbr.
syn; *P. petrophyes* Knight var. *hokiensis* Vain.

P. consanguinea Müll.Arg.
syn: *P. rudis* Müll.Arg.
syn: *P. mariae* de Lesd.

P. corallina (L.) Arn.
syn: *P. chionea* DC
syn: *P. dubia* Nyl.
syn: *P. communis* f. *sorediata* Nyl.
?syn: *P. microthelia* Vain. [K++ yellow; SW Africa]

P. coriacea (Th.Fr.) Th.Fr.
syn: *P. obducens* Nyl.

P. coronata (Ach.) Th.Fr.
syn: *P. isidiifera* Erichs.
syn: *P. subdubia* Nyl. var. *hungarica* Erichs.

P. cribellata Branth
syn: *P. solitaria* H. Magn. *nom. inval.* non *P. solitaria* Darb.

P. cryptocarpoides Vain
syn: *P. spilota* A.W.Archer & Malcolm

P. cryptostoma Müll.Arg.
syn*: P. limbata* Vain.
syn *P. spaniostoma* Vain.
syn: *P. simpl*ex Vain.
syn: *P. robsonii* Dodge

P. dealbata (Ach.) Cromb.

syn: *P. dealbescens* Erichs.

P. dehiscens Müll.Arg.
syn: *P. dehiscens* Müll.Arg.
syn: *P. dehiscens* var. *alba* Müll.Arg.
syn: *P. dehiscens* var. *depressior* Müll.Arg.
syn: *P. sulphurescens* Müll.Arg.
syn: *P. major* Müll.Arg.
syn: *P. leioplaca* (Ach.) Shaer. var. *turgida* Müll.Arg.
syn: *P. splendens* Awasti & Srivastava

P. depressa (Fée) Müll.Arg.
syn: *P. modesta* Müll.Arg.
syn: *P. leioplaca* (Ach.) DC in Lamy & DC var. *depressula* Müll.Arg.
syn: *P. melaleuca* (Smith & Sow.) Duby var. *tetramera* Müll.Arg.
?syn: *P. sinusmexicani* Dibben [chemistry unclear]

P. dispersa Vain.
syn: *P. multiplicans* Vain.

P. eiteriana Erichs.
syn: *P. polycarpa* Eitner; *nom. inval.* non Krempel.

P. endoxantha Vain.
syn: *P. norstictica* A.W.Archer
syn: *P. macrostomoides* Dodge
syn: *P. prolifera* Dodge
syn: *P. sanguinescens* Zahlbr.

P. erubescens (Taylor) Nyl.
syn: *P. perfida* Nyl.
syn: *P. vepallida* Nyl.
syn: *P. concava* Müll.Arg.
syn: *P. solitaria* Darb.
syn: *P. darbishireana* Zahlbr.
syn: *P. corrugata* Darb. [*nom. inval.* non *P. corrugata* Kremp.]

P. excludens Nyl.
syn: *P. inopinata* Erichs.

P. flavida (DC.) J.R. Laundon
syn: *P. lutesecens* (Hoffm.) Lamy
syn: *P. lutescens* f. *fagicola* Høeg

P. glaziovii Müll.Arg.
syn: P. *subsulphurescens* Malme

P. glomerata (Ach.) Schaer.
syn: *P. diffusilis* Erichs.

P. graphica C. Knight
syn: *P. graphica* f. *tardiva* Zahlbr.
syn: *P. dinota* Stirt.
syn: *P. thomsoniana* Zahlbr.

P. hadrocarpa Zahlbr.
syn: *P. asperata* A.W.Archer

P. hartmannii Müll.Arg.
syn: *P. trypetheliiformis* (Nyl.) Nyl. var. *hartmannii* (Müll.Arg.) Müll.Arg.
syn: *P. muelleriana* Zahlbr.
syn: *P. albinea* Müll.Arg., *nom. inval.* non *P. albinea* Tuck.

P. hemisphaerica (Flörke) Erichs.
syn: *P. speciosa* Høeg

P. heterochroa (Müll.Arg.) Erichs.
syn: *P. pustulata* (Ach.) Duby var. *heterochroa* Müll.Arg.
syn: *P. maximiliana* Klem.

P. hossei (Räs.) A.W.Archer & Osorio
syn: *P. reducta* Stirt. var *hossei* Räs

P. huangshanensis S.Yu & J.Wu ex Q. Ren
cf. *P. variolosa* (Kremp.) Vain. *sensu* Singh &Sinha [but spores 80-90 µm]
cf. *P. sphaeophora* Oshio *sensu* Zhao et al. [spores 167-204 µm]

P. hymenea (Ach.) Schaerer
syn: *P. wulfenii* DC.
syn: *P. lecanorodes* Erichs.

P. impallescens Nyl.
?syn: *P. chapadensis* Malme

P. irregularis Müll.Arg.
non *P. irregularis* Magn.

P. knightiana Müll.Arg.
syn: *P. ceuthocarpa* [var.] *crenulata* Stirt.
syn: *P. whinrayii* A.W.Archer

P. laeviganda Nyl
syn: *P. deplanata* Müll.Arg.
syn: *P. deplanata* var. *ferruginea* Müll.Arg.
syn: *P. kotsukensis* Vain.
syn: *P. laeviganda* Nyl. var. *obscurior* Vain.
syn: *P. cinereo-obscurata* Vain.
syn: *P. inabensis* Vain.

P. leiocarpella Müll.Arg.
syn: *P. stenostoma* Vain.

P. leioplacella Nyl.
syn: *P. amblygona* Müll.Arg.
syn:*P. confluens* Müll.Arg.
syn: *P. mesoxantha* Müll.Arg.

P. leucodes C. Knight
syn: *P. cretacea* Müll.Arg.
syn: *P. fernandeziana* Messuti

P. leucoplaca Müll.Arg.
syn: *P. acuta* Müll.Arg.

P. leucosora Nyl.
syn?; *P. albescens* var. *subflotowiana* Erichs.
syn?: *P. soralifera* (J. Steiner) Erichs.

P. leucostoma (Bernh.) Massal.
syn: *P. leioplaca* (Ach.) DC
syn: *P. leucostoma* var. *dehiscens* Erichs.
syn: *P. plena* Anzi
syn: *P. tabuliformis* Erichs.
?syn: sub "*P. quassiae*" H-NYL 3699 pm pp ex Sri Lanka

P. leucostomoides Zahlbr.
syn: *P. leucostoma* Müll.Arg.
[*nom inval*. non *P. leucostoma* (Bernh.) Mass.]

P. lophocarpa Körber
syn: *P. glebosa* Müll.Arg.
syn: *P. arenacea* Müll.Arg.
syn: *P. diffracta* Müll.Arg.
syn: *P. superba* Zahlbr.
syn: *P. dunedina* Zahlbr.

P. malmeii Elix & A.W.Archer
syn: *P. quassiae* (Fée) Nyl. var. *sordida* Malme

P. melaleucoides Müll.Arg.
syn: *P.galactina* Zahlbr.
syn: *P. atropunctata* A.W.Archer

P. melanospora Nyl.
syn: *P. crassilabra* Müll.Arg.
syn: *P. amaurospora* Hellbom

P. meridionalis var ***ochrostoma*** Müll.Arg.
syn: *P. meridionalis* var *cinerascens* Müll.Arg.
syn: *P. ochrostoma* (Müll.Arg.) Vain.
[*nom. inval.* non *P. ochrostoma* Müll.Arg.]

P. mesotropa Müll.Arg.
syn: *P. paragibberosa* A.W.Archer

P. miscella A.W.Archer
syn: *P. velatoides* A.L. Sm. *p.p.*
P. melanospora Nyl.

P. multipuncta (Turner) Nyl.
syn: *P. multipuncta* var. *macrospora* A.L. Sm.
syn: *P. sorediata* (Fr.) Fr.
syn: *P. faginea* (L.) Tuck.

P. neilgherrensis (Müll.Arg.) Awasthi & Srivastava
syn: *P. leioplacoides* var. *neilgherrensis* Müll.Arg.

P. nakamurae (Räsänen) Dibben
syn: *P. tuberculifera* Nyl. var. *nakamurae* Räs.

P. neolecanina Lumbsch & Nash
syn: *P. alloluteola* A.W.Archer & Elix

P. nigrata Kremp.
syn: *P. tuberculifera* var. *ferax* Müll.Arg.

P. nigrodisca Oshio
syn: *P. sphaerophora* Oshio

P. novaezelandiae Szatala
?syn: *P. bengalensis* Vain.

P. oblongata Müll.Arg.
syn: *P. howeana* A.W.Archer & Elix

P. ochrostoma Müll.Arg.
syn: *P. ochrostomoides* Vainio *nom. superfl.*

P. oshioi Wei
syn: *P. oshioi* Dibben, *nom. inval.*
syn: *P. macrospora* Oshio, *nom. inval.*

P. otagoana Galloway
syn: *P. simulans* Zahlbr., *nom. inval.* non *P. simulans* Malme

P. pachythallina (Räsänen) Messuti
syn: *P. grisea* var. *pachythallina* Räs.

P. papillulata Nyl.
syn: *P. pustulata* var. *erythrina* Räs.
syn: *P. polycarpa* Kremp. var. *monospora* Zahlbr.
?syn: *P. idukkiensis* Awasti & Srivastava

P. perrimosa Nyl.
syn: *P. subperrimosa* Nyl.
syn: *P. basaltica* Zahlbr.

P. pertracta Stirt.
syn: *P. gibberosa* Müll.Arg.
syn: *P. woollsiana* Müll.Arg.
syn: *P. virginea* Müll.Arg.
syn: *P. moffatiana* Müll.Arg.
syn: *P. nitidula* Müll.Arg.
syn: *P. graphidioides* Müll.Arg.
syn: *P. microspora* Müll.Arg.
syn: *P. microsporella* Zahlbr. *nom. superfl.*

P. pertusa (L) Tuck.
syn: *P. rupestris* (DC.) Schaer.
syn: *P. pallidoflava* Erichs.
syn: *P. leioterella* Erichs.
syn: *P. colliculosa* Körb.
syn: *P. communis* DC.

P. pertusella Müll.Arg.
syn: *P. plicatula* Müll.Arg.
syn: *P. straminea* Müll.Arg.
syn: *P. communis* var. *pertusella* Nyl.
syn: "*P. albidella* Nyl." s*ensu* Müll.Arg.
syn: *P. nigrescens* Awasthi & Srivastava

P. petrophyes C. Knight
syn: *P. leucoxantha* Müll.Arg.

P. phaeostoma Müll.Arg.
syn: *P. valdiviana* Messuti & A.W.Archer

P. placentiformis (Mont. & Bosch) Müll.Arg.
syn: *P. communis* var. *placentiformis* Mont. & Bosch
syn: *P. leioplaca* var. *placentiformis* Müll.Arg.

P. pluripuncta Nyl.
syn: *P. gallica* B. de Lesd.
syn: *P. gallica* var. *dealbata* Llimona
syn: *P. rupicola* (Fr.) Harm. var. *bispora* Werner

P. polysticta Vain.
syn: *P. ochrocarpa* Vain.

P. porinella Nyl.
syn: "*P. albidella* Nyl."[H-NYL 3826 pm, spores 95-112 µm; Sri Lanka]
syn: *P. ramuensis* A.W. Archer & Elix

P. propinqua Müll.Arg.
syn: *P. torquata* Müll.Arg.
syn: *P. marginata* Nyl. ex Nyl.
syn: *P. rubescens* Erichs.

P. pseudococcodes Müll.Arg.
syn: *P. subradians* Müll.Arg.

P. pseudocorallina (Lilj.) Arnold
syn: *P. concreta* Nyl.
syn: *P. ceuthocarpoides* Zahlbr.
syn: *P. microsticta* (Sm.) Erichs.

P. pustulata (Ach.) Duby
syn: *P. melaleuca* (Sm.& Sowerby) Duby
syn: *P. canadensis* Stirt.
syn: *P. limosa* Zahlbr.

P. pycnophora Nyl.
?syn: *P. scrobicularis* Kremp.

P. pycnothelia Nyl.
syn: *P. leioplaca* Schaer. var. *dispora* Müll.Arg.

P. pycnothelioides Vain.
syn: *P.* "*pycnothelia* Nyl". *sensu* Müll.Arg.

P. quartans Nyl.
syn: *P. ikomae* Yasuda ex Räs.

P. quasiae (Fée) Nyl.
syn: *P. leioplaca* var. *quassiae* Nyl.

P. reagens (Zahlbr.) Redinger
syn: *P. reagens* var. *vegetior* Redinger
syn: *P. tuberculifera* Nyl. var. *reagens* Zahlbr.

P. rhexostoma Nyl. ex Hue
syn: *P. finkii* Zahlbr. ex Fink

P. rhodiza Nyl.
syn: *P. gracilis* Müll.Arg.
syn: *P. albidella* Nyl. var *tetramera* Müll.Arg.

P. rigida Müll.Arg.
syn: *P. aberdarensis* Dodge
syn: *P. rosacea* var. *octospora* Zahlbr.

P. rochae Räsänen
?syn: *gibbosa* H. Magn. ?nom inval.
syn: *P. glebosa* Räs. *nom.inval.* non *P. glebosa* Müll.Arg.

P saximontana Wetmore
syn: *P. christae* Dibben & Poelt

P. simoneana A.W.Archer & Elix
?syn: *Hämet-Ahti 3291a* (H) *Pertusaria* sp. ex Argentina

P. sommerfeltii (Flörke) Fr.
syn: *P. melastoma* Nyl., *Flora* **47**: 489 (1864)
[not in Zahlbruckner's Catalogue]

P. sorodes Stirt.
syn: *P. subcommunis* Nyl.

P. subcorallina Nyl.
?syn: *P. arsenei* de Lesd.

P. submultipuncta Nyl.
?syn: *P. sanguinulenta* Zahlbr

P. subobducens Nyl.
syn: *P. tuckermanii* Erichs.

P. subobductans Nyl.
syn: *P. glauconitens* Müll.Arg.
syn: *P. platypora* Müll.Arg.
syn: *P. fuscella* Zahlbr.
syn: *P. kurohiensis* Vain.
syn: *P. subobductans* var. *cinereoglauca* Vain.
syn: *P. commixta* Vain.
syn: *P. conferta* Vain.
syn: *P. rugulosa* Vain.
syn: *P. sublaeviganda* var. *pauperior* Vain.
syn: *P. subrugulosa* Zahlbr.
syn: *P. pachyplacoides* Räs.

P. subochracea Stirton
syn: *P. hakkodensis* Yasuda ex Räsänen

P. subrigida Müll.Arg.
syn: *P. depressa* (Fée) Mont. & Bosch var. *octomera* Müll.Arg.
syn: *P. leioplaca* var. *octomera* Müll.Arg.

P. subrosacea Zahlbr.
syn: *P. subrosacea* var. *evolutior* Zahlbr.

P. subventosa var. ***ventosa*** Malme
syn: *P. paeminosa* A.W.Archer

P. subverrucosa Nyl.;
syn: *P. callispora* Zahlbr.

P. tazzekensis Werner
?syn: *P. aceroae* C.Hdez.-Padr, Etayo, I. Perez-Vargas & Elix

P. tejocotensis de Lesd.
syn: *P. arizonica* Dibben

P. tesselaria Müll.Arg.
syn: P. columnaris Malme
syn: *P. victoriana* Lamb

P. tetrathalamia var. *decipiens* Müll.Arg.
syn: *P. leioplacoides* var. *decipiens* Müll.Arg.
syn: P. *leioplacoides* var. *enucleans* Müll.Arg.
syn: *P. tetrathalamia* var. *enucleans* Müll.Arg.

P. texana Müll.Arg.
syn: *P. disticha* Erichs.
syn: *P. obsolescens* Nyl.
syn: *P. matsuzawae* Yasuda ex Räs.

P. thiospoda C. Knight
syn: *P. leiotera* Müll.Arg.
syn: *P. minuta* C. Knight
syn: *P. subrugosa* Nyl.
syn: *P. schizostomella* Müll.Arg.
syn: *P. antillarum* Vain.
syn: *P. stramineocarnea* Vain.
syn: *P. intermedia* Vain.
syn: *P. simplicata* Vain.
syn: *P. xanthodes* var. Vain.
syn: *P. xanthodes* var. *stramineoalbida* Vain.
syn: *P. megapotamica* H. Magn.
syn: *P. montevidensis* Zahlbr.
syn: *P. straminella* Malme

P. thwaitesii Müll.Arg.
syn: *P. wilsonii* A.W.Archer

. ***P. trachythallina*** Erichs.
syn: *P. laevigata* (Nyl.) Arn. var. *discrepans* Erichs.

P. trimera (Müll.Arg.) A.W.Archer
syn: *P. pustulata* (Ach.) Duby var. *trimera* Müll.Arg.
syn: *P. melaleuca* (Sm. & Sowerby) Duby var. *trispora* Müll.Arg.

P. tropica Vain.
syn: *P. pulchretincta* Zahlbr. Indonesia;
?syn: *Lepra hypothamnolica* (Dibben) Lendemer & R.C. Harris
[*P. hypothamnolica* Dibben]

P. truncata Kremp.
syn: *P. ascripta* Stirt.
syn: *P. fumosa* C. Knight
syn: *P. cupularis* C. Knight,
syn: *P. subglobulifera* Nyl.
syn: *P. nothofagi* Zahlbr.

P. trypetheliformi*s* Nyl
syn: *P. leioplaca* var. *trypetheliformis* Nyl.

P. tuberculifera Nyl.
syn: *P. tuberculifera* statu *isidiomorpha* Nyl.

P. variolosa (Kremp.) Vain.
syn: *P. subvaginata* f. *variolosa* Kremp.
syn: *P. subfallens* Vain.
syn: *P. velatula* Vain.

P. velata (Turner) Nyl.
syn: *P. chilena* Zahlbr.
syn: *P. pulchella* Malme;
syn: *P. skotsbergii* Zahlbr.
syn. *P. commutans* Vain.
syn. *P. subvaginata* Nyl
syn. *P. albovelata* Zahlbr.
syn: *P. chilena* Zahlbr.
syn: *P. santamonicae* Dibben
syn: *P. secedens* Zahlbr.
syn: *P. velatoides* A.L. Sm. *p.p.*
syn: *P. multipunctata* var. *colorata* Zahlbr.
?syn: *P. velata* subsp. *sublaevata* Nyl. [thallus K-ve, C+red, KC+red;]
syn: *P. speciosa* Høeg

P. velloziae (Vain.) Erichs.
syn: *P. velloziae* (Vain.) A.W.Archer & Elix , *nom. inval.*
syn: *P. tuberculifera* Nyl. var. *velloziae* Vain.

P. wattiana Müll.Arg.
syn: *P. wattiana* var. *fulvescens* Müll.Arg.

P. xantholeucoides Müll.Arg.
syn: *P. moreliensis* de Lesd. US
syn: *P. coccopoda* Vain.; Philippines
syn: *P. kinigiensis* A.W.Archer *et al.* Africa

P. xanthoplaca Müll.Arg.
syn: *P. persulphurata* Müll.Arg.
syn: *P. sulphurata* Müll.Arg. (1893) non *P. sulphurata* Müll.Arg. (1889)
syn: *P. citrina* A.L. Sm.