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Urban Lichen Identification Guide

This Identification Key (ID) aims to allow any urban dwellers to identify common urban corticolous lichens and through their observation, asses the air quality of their surrounding habitat. Corticolous lichens are lichens found on the tree bark.

This ID guide can be used by anyone who has some basic knowledge on what a lichen is. If you are looking for more information on lichens, how they function and how they affect our world, check out the website lichenwalk.com created by the author. On this website, you will also find more indications on how to use an ID key.
This ID guide will enable you to identify 28 common urban lichen species that can be found in most cities.

What is a lichen?

A lichen is a stable lasting *mutualistic association* between fungi and one or more algae or cyanobacteria (Dobson, 2018). In a lichen, the algae or the cyanobacteria provide the nutrients, produced from photosynthesis, to the fungi. The fungi form the body of the lichen, and fix the organism onto the surface. The fungi also gather moisture from the rain and the humidity. Lichens live closer to us than we think: on benches, on trees and on rocks.
They are fantastic organisms and hide many mysteries…

What is the relationship between lichens and air pollution ?

Lichens are sensitive to changes in the gaseous composition of the atmosphere because of three main reasons:

- Lichens absorb water and solute substances from the air as they do not have roots.

- Lichens do not have a protective layer, a cuticle nor do they have stoma like plants. This means that pollutants can easily enter the fungal and algal cells.

- Lichens are perennial and grow slowly so that any injury cannot be easily repaired.

Lichen species are affected differently by air pollution. Some lichens favour polluted environments, whereas others would not survive under increased pollution levels. We can thus assess the quality of a habitat (1) by observing the presence or absence of lichen species which are more or less tolerant, or (2) by using standardised lichen-based indices (Asta et al., 2002). Lichens can thus be considered as bioindicators of air pollution levels.

In this ID guide, we will use a few criteria to identify the urban lichen species. You will find more information on these in the pages below :

All the scientific terms used in this ID key that are not defined in the text but are highlighted in *italic* can be found in the Glossary.

Beware, lichens have varied forms and shapes and can sometimes be surprisingly different from the pictures I provide. If this is the case, check out other identification books such as Dobson (2018).

Lichen Forms

FOLIOSE LICHENS (a)

These are leaf-shaped lichens. One of their characteristics is that they can be detached from their *substrate*. You can run a fingernail under the lobe to check. The lobe is the outer part of the lichen *thallus*, shaped like a leaf. The upper surface (cortex) has a different colour to the lower *cortex*. This is due to a different distribution of the alga layer. The lower surface does not have an algal layer.

(a)

FRUTICOSE LICHENS (b)

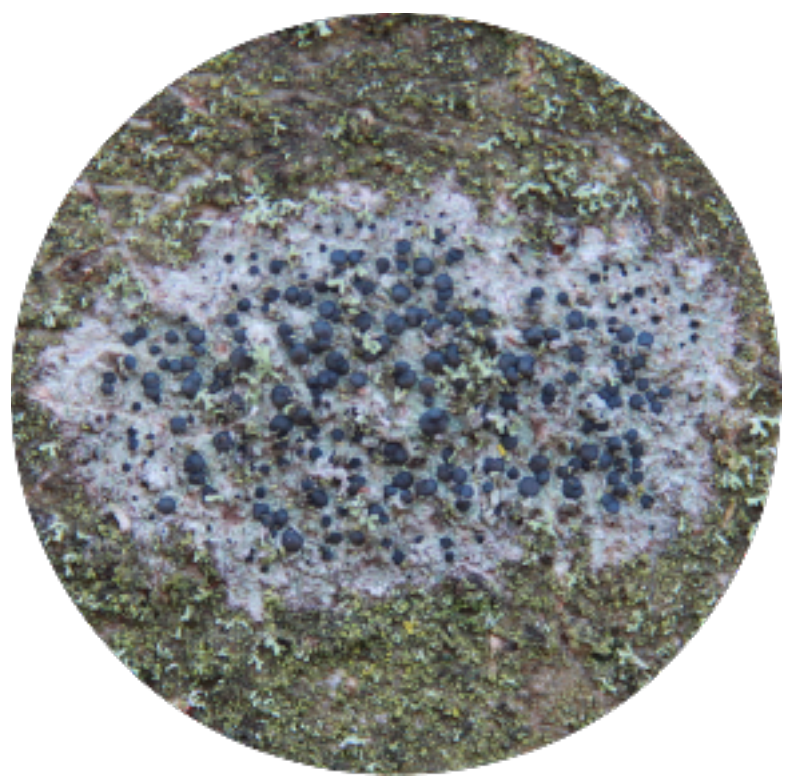
These are shrubby lichens and are attached to their surface by one point, called the holdfast. These lichens look the same from all side. Their radial symmetry is due to the homogeneous distribution of alga cells.

(b)

CRUSTOSE LICHENS (c)

These lichens form a crust on the substrate and can hardly be detached from it. This is because their *rhizines* are so deeply embedded.
Another type of crustose lichens is the leprose lichens. These lichens have their crust entirely formed of mealy granules, the soralia. These lichens form a kind of leprosy on the substrate and are characteristic of habitat sheltered from the rain.

(c)



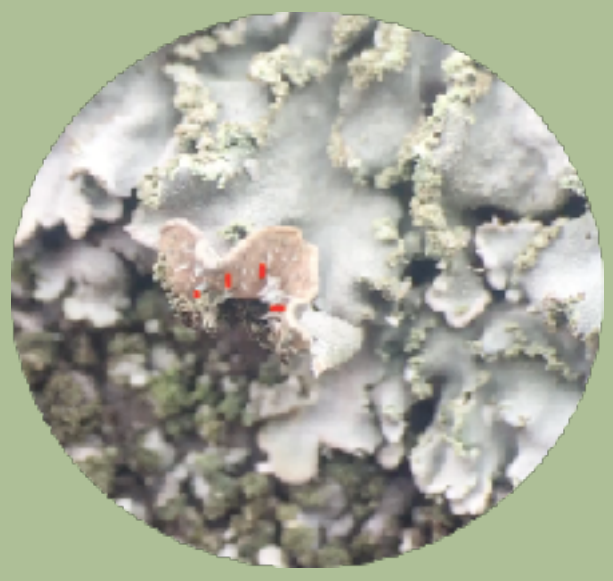
Morphological features

Pseudocyphellae are interruptions or thinning of the upper cortex which can be dotted (see *Punctelia*) or linear (see picture, *Parmelia*

Cilia are long-haired like structure at the lobe tip.

Pruina are little white dots on the lobes which are calcium oxalate crystals produced by the lichen. The function of the purina are unknown.

Rhizines are small root-like outgrowth on the under-surface of the lichen thallus made of fungal filaments.

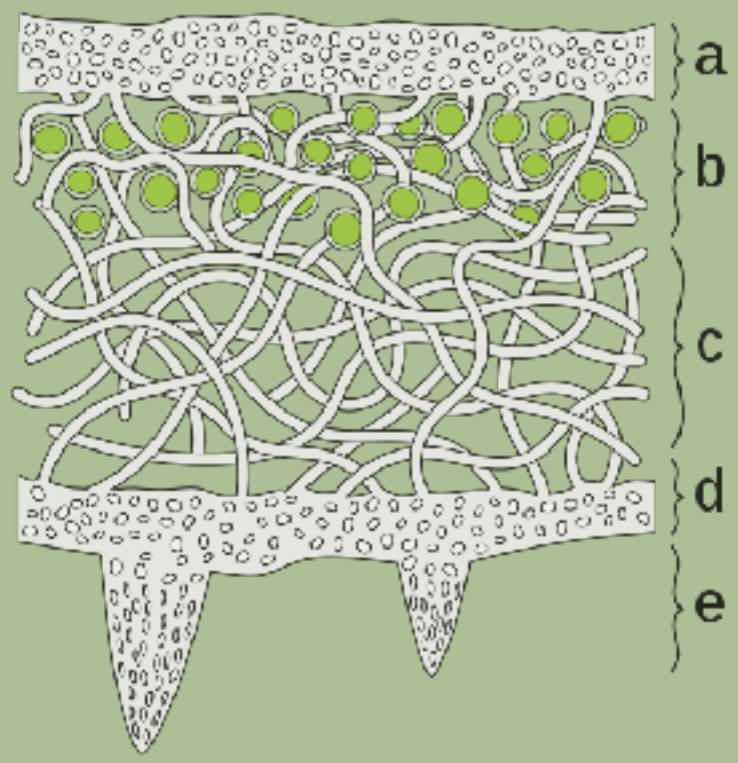


The pro-thallus is a layer of fungal tissues around the edge of the thallus. See the black line on the picture.

Pycnidia flask-shaped forms which look like black dots on the thallus which produces fungal spores in conidia.

Main parts of the lichen

The picture below represents a cross-section of the thallus. The **thallus** is the visible surface of the lichen and consists of several layers of cells. Credit for the picture below:



UPPER CORTEX

ALGAL LAYER

MEDULLA

LOWER CORTEX

RHIZINES

Most of the lichen is made of fungal cells, including the medulla which are filamentous fungal components (c). The **rhizines** (e) are also fungal components that help the lichen attach itself to the substrate. The lower and upper cortices protect the lichen from the external environment.

Chemical Test

To differentiate between different lichens, it is sometimes essential to use chemical components. In this ID key, we will point out to two chemicals: C (calcium or sodium hypochlorite such as bleach) and/or K (potassium hydroxide such as caustic soda).The application of such chemicals on the lichen parts (the thallus, soredia, or the medualla) will, for some lichens, generates a colour. Through these tests, we can differentiate two lichens that are morphologically similar but structurally different. Credit: *Phlyctis argena*, Northern Ireland. K+ blood-red spot test. Picture by Michael Simms used with permission, CC BY-SA 4.0

Reproductive Apparatuses

ASEXUAL REPRODUCTION

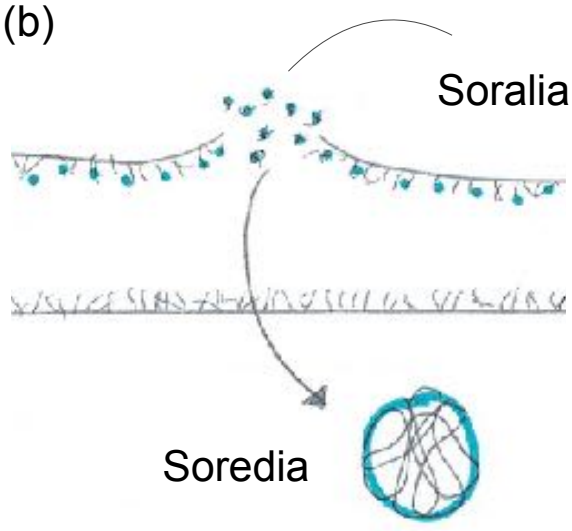
The photobiont (the photosynthetic partner) and the mycobiont (the fungal partner) together can reproduce asexually. This form of reproduction is done by the fragmentation or the breakage of specialised cells called soredia and/or isidia.

Idisia are small detachable structures formed on the surface of the thallus. Both the algal and the fungal partners are present in the isidia (Figure a).

Soradia are small mealy or granular masses consisting of small clusters comprising of algal cells surrounded by fungal hyphae. These structures are produced by the soralia. Soralia can be diffused and found all over the thallus or delimited. They are laminal when they develop on the thallus, marginal when they are formed at the margin and terminal when they are located at the end of the lobes (Figure b)

(a)

(b)

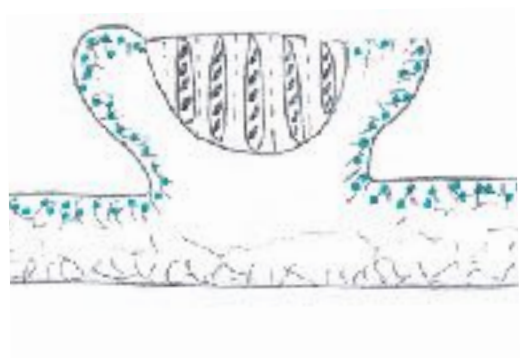


SEXUAL REPRODUCTION

The sexual structures produce spores in asci (plural, ascus in singular). When the spores are dispersed, they must find an algal partner in order to form a lichen. Indeed, only the fungal partner can reproduce sexually.

Apothecia are cups that can be concave, convex or flat. There are two types of apothecia. Those called lecanorine contain a layer of photobiont cells - the algae or the cyanobacteria. The apothecia lecideine do not have this layer of photobiont cells (Figure c).

(c)



Identification Key

1. The species is soft and green. With a hand lens, the structures look like stems and leaves (Photos a & b).

Moss sp.

- The species is powdery green and stays on your finger when you touch it (Photo c).

Algal sp.

- The species is dry and stiff

Lichen spp. 2

2. The lichen has *lobes l*ooking like leaves. You can run your fingernail under the lobe

Foliose lichen
Key A

- The lichen is embedded in the surface and forms a crust on the bark. You cannot detach it from the substrate. This category includes leprose lichens

Crustose lichen
Key B

- The lichen has a shrubby appearance and is fixed on the trunk by one point, called the holdfast

Fruticose lichen
Key C


(a)


(b)


(c)

Key A - Foliose lichens

1.Thallus and apothecia yellow and orange 2
- Thallus and apothecia green and/or brown 3
- Thallus grey blue 6

2. (1) Thallus minutely foliose when observed with a hand lens. Presence of soralia on the thallus

Candelaria concolor

- Presence of orange apothecia on the thallus (Photo d).

Xanthoria parietina

3. (1) Thallus isidiate and under-surface white to pale brown 4
- Thallus isidiate with dark under-surface 5

4.(3) Centre of the thallus covered with small, overlapping, flat or subtract folioles which are small leaf-like growths growing out from the thallus

Melanohalea laciniatula

- No folioles on the thallus but raised, wavy lobes. Isidia often cover the centre of the thallus

Melanohalea exasperatula

5. (3) Coarse, granular isidia and matt thallus

Melanelixia subaurifera

- Isidia are neat and regular in shapes, shiny thallus

Melanelixia glabratula

Credit: *Xanthoria parietina*, picture taken by the author (2020) under a CC BY-SA 4.0 license.

Foliose lichens

6. (1) Cilia present on the upper surface of the thallus. Apothecia rare 7

- No cilia on the upper surface of the thallus. Change colour when wetted 8

- No cilia on the upper surface of the thallus. Does not change colour when wetted 10

7. (6) Lobe tips inflated and have the shape of a hood or helmet. Exposed soredia (Photo e).

Physcia adscendens

- Lobe tips not inflated, lip-like, exposing the soredia

Physcia tenella

8. (6) Soradiate, presence of white dots on the surface of the lobe tips called *pruina*

Physconia grisea

- Absence of pruina, presence of soradia especially at the centre of the thallus 9

9. (8) *Rhizines* visible at the edges of the thallus. Soralia marginal. Thallus brown grey to almost black, adpressed to the surface

Phaeophyscia orbicularis

- No *rhizines* visible at the edge of the thallus. Thallus green to greenish brown adpressed to the surface, nearly crustose. Soralia laminal

Hyperphyscia adglutinata

10. (6) Presence of soralia 11
- Absence of soralia *see Dobson, 2018*

11. Soralia marginal, lobes inflated, cushion-like

Hypogymnia physodes

- Presence of soredia on other parts than the edges of the thallus 12

12. (11) Thallus grey to dark green. Presence of pseudocyphellae 13

- No pseudocyphellae, thallus apple green when wet and yellow when dry

Flavoparmelia caperata

13. (12) Pseudocyphellae punctiform all over the thallus, sometimes covered with soralia

Punctelia subrudecta/ borreri

- Pseudocyphellae coarse and white, in the forms of lines and forming ridges on the thallus from which soralia are coming out (Photo f).

Parmelia sulacta

(f)

Key B - Crustose lichens

1. Powder-like thallus, leprose lichen 2
- Not leprose-like 3

2. (1) Green leprose lichen

Lepraria sp.

Note: *Lecanora expallens* and *Lecanora compallens* are sorediate and also have this powdery appearance.

- Leprose lichen but white with soredia coming out from blisters

Phlyctis argena

3. (1) Thallus orange or yellow 4
- Thallus is of another colour than orange or yellow 5

4. (3) When observed with a hand lens, the thallus is made of minute folioles

Candelaria concolor

- Crustose thallus scattered or continuous with yellow to green granules, covered with soredia

Candelariella reflexa

5. (3) White thallus with black linear apothecia 6

- White thallus with rounded apothecia 7
concave or convex

6. (5) Raised, elongated apothecia with hard black margins (*lirellate*)

Graphis scripta


(g)


(h)


(i)

Crustose lichens

- Radiating, sometimes star-shaped (*stellate*) black apothecia immersed in the thallus

Arthonia radiata

7. (5) Apothecia are lecanorine: disc-shaped with a margin of a different colour to the the colour of the thallus — 8
- Apothecia are lecideine: rounded and lack thalline margin. The apothecia margin is thus the same colour as the thallus — 9

8. (7) Apothecia abundant, puffed brown. The apothecia margin become excluded as the lichen grows, making the species looking like *Lecidella elaeochroma*

Lecania cyrtella

-

- Abundant lecanorine apothecia with various shapes. Species of this genus difficult to tell apart without microscopic analysis (Photo g & i).

Lecanora sp.

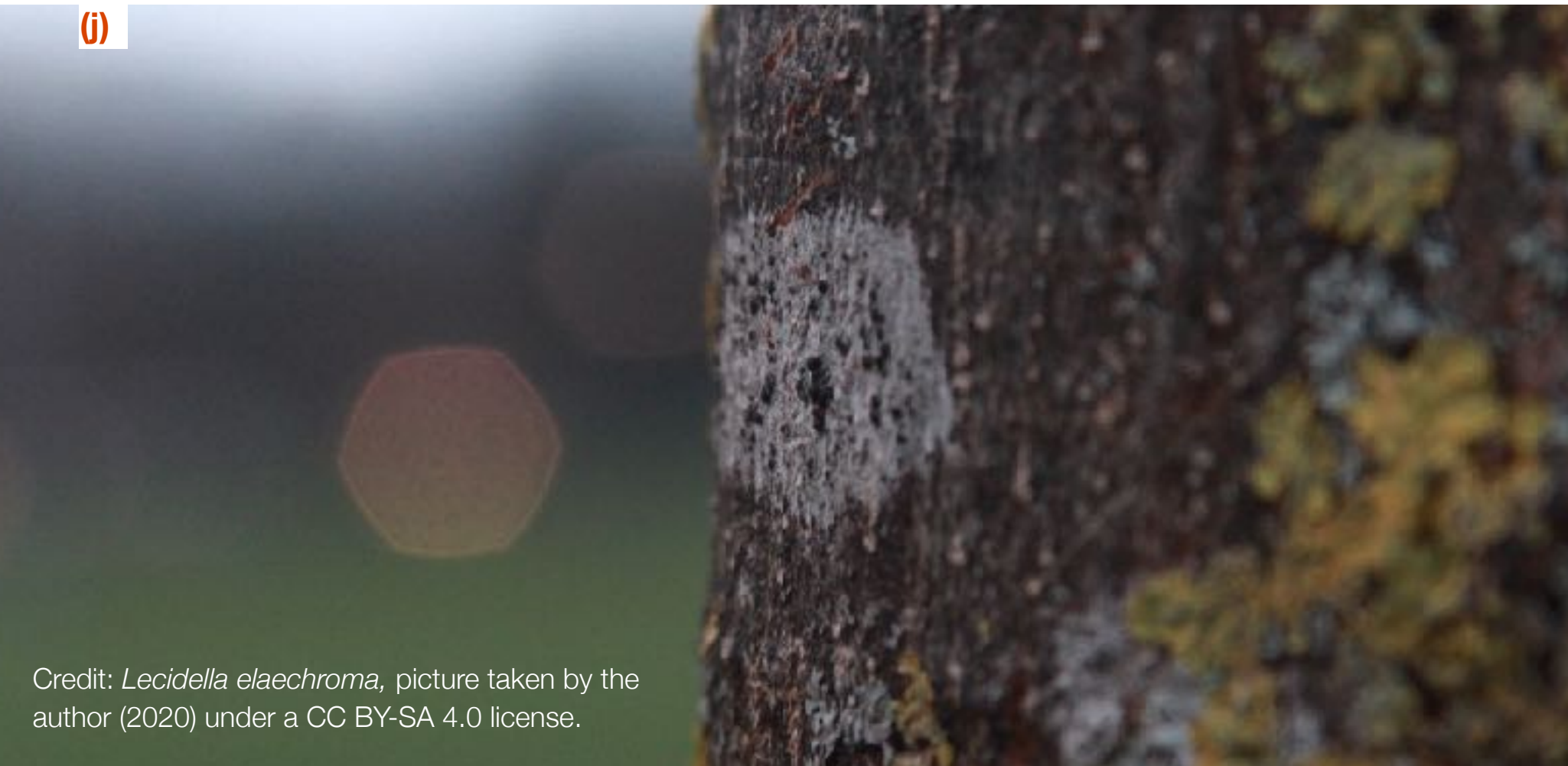
9. (7) No soredia. White, blue to transparent thallus with black apothecia. Pro-thallus around the edge of the thallus. C+ orange

Lecidella elaeochroma

- Looking like *Lecidella elaechroma* but the lichen does not react to the application of C (C-) (Photo h & j).

Amandinea punctata

(j)



Key C - Fruticose lichens

1. The lower cortex and the upper cortex have a different colours.

Evernia prunastri

Note: This lichen is often considered as a fruticose lichen because it is attached to the substrate by one point. However, it is a foliose lichen as it lacks an algal layer on the lower cortex.

- Both the lower and the upper surfaces of the lichen have the same colour 2

2. Apothecia are at the tip of the lobe (apical). No soralia nor isidia (Photo k).

Ramalina fastigiata

- Laminal soralia present on the edges of strap-shaped lobes. Apothecia rare

Ramalina farinacea

Note: When the specimens are young it is difficult to differentiate between the different species of the genus *Ramalina*.

(k)

Amandinea punctata (Hoffm.) Coppins & Scheid

Type: Crustose

Description

The thallus of this crustose lichen is relatively cracked, green grey to greener on nutrient-enriched sites. It is often found fertile and covered with black lecideine convex apothecia. The species is found on trees, posts and in nutrient-enriched environments.

This lichen is easily confused with *Lecidella elaechroma.* It can be differentiate from it using a chemical test with the application of K which gives an orange colour on *Lecidellae elaechroma* and is negative (no reaction) on *Amandinea punctata*.

Reaction to atmospheric pollution

The species is considered *neutrophytic* to nitrogen dioxide (NO_2) (Gombert *et al.*, 2004) but can live in environment with high levels of SO2 (Van Haluwyn and Lerond, 1986).

Credits: Candelaria concolor by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Arthonia radiata (Pers.) Ach.

Type: Crustose

Description

Crustose lichen thallus pale grey to brown incrusted in the bark. Often separated by a black pro-thallus. The apothecia are black, stellate and slightly raised. The lichen is common on smooth bark of trees and shrubs.

Chemical test: No reaction to chemicals.

Reaction to atmospheric pollution

This species can moderately tolerate an environment rich in nitorgen dioxide (Boucheron and Martin, 2019) but is however often seen in an urban environment,

Credit: Arthonia radiata by Richard Droker on Flickr, CC BY-NC-ND 2.0.

Candelaria concolor (Dickson) B. Stein.

Type: Foliose

Description

The lemon yellow to green thallus has a size of 0.5 to 2cm and is minutely foliose. The lobules - small lobes - are erect and produce dense clusters on the surface of the thallus ending with soredia on the margins. The under-surface is white with rhizines. Apothecia are rare. This species develops in dry well-lit environments.

Chemical test: K-. No reaction to chemicals

Reaction to atmospheric pollution

The species is nitrophytic and grows on nutrient-enriched environment as well as substrates impregnated by dusts. This species is considered part of the *Xanthorion* community. Its presence is increasing in urban environment with the decline of SO2 concentration levels.

Credits: *Candelaria concolor,* picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Candelariella reflexa (Nyl.) Lettau.

Type: Crustose

Description

The crustose thallus is scattered to continuous with yellow to yellow-green granules or **corticate squamules.** These structures become covered with soredia. Apothecia are rare.

Chemical test: No reaction to chemicals

Reaction to atmospheric pollution

The species is found on shaded nutrient-rich trees, especially at the base of the trunk up to the level of dog's legs. It is a nitrophyte species (Llewellyn *et al.*, 2020).

Credits: *Candelariella reflexa*, picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Evernia prunastri (L.) Ach.

Type: Foliose

Description

This species is often confused with fruticose lichens as it is attached at one point, however, the distribution of the algal layer makes it pertain to the group of foliose lichens. The thallus is strap-shaped and is yellow to green grey on the upper cortex. The lower part of the thallus is much paler with white patches due to the lack of algal layer underneath. *Evernia prunastri* often grows with *Ramalina* species which resemble it, however the texture of the former is softer and the lobes are flattened. The thallus can become sorediate in larger specimens. Pycnidia are immersed the thallus.

C*hemical test:* K+ yellow

Reaction to pollution levels

The species is more tolerant to pollution than the fruticose lichens from the genus *Ramalina.* It is however considered as neutrophyte (Gombert *et al.*, 2014) and nitrogen sensitive (Wolseley, 2015).

Credits: *Evernia prunastri*, picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Flavoparmelia caperata (L.) Hale.

Type: Foliose

Description

The thallus of this species is apple-green when wet and yellow-grey-green when dry. The mat thallus has a wrinkled surface and is contorted when mature. It is covered with coarse soredia. The lower surface is black with white simple and well-spaced rhizines. Apothecia are rare. It is found on acid-barked deciduous trees, on well-lit rocks and on roofs.

Chemical test: K- but P+ orange-red, KC ± red.

Reaction to pollution levels

This species, along with *Flavoparmelia soredians* – which is similar to *F. caperata* but more adpressed and the lobes are narrower – are nitophytes but are sensitive to higher levels of SO2 (Van Haluwyn & Lerond, 1986). It is recolonizing urban areas with the decline in SO2.

Credits: *Flavoparmelia caperata* by Jason Hollinger, trouvée on Wikimédia, CC BY-SA 3.0

Graphis scripta (L.) Ach.

Type: Crustose

Description

The thallus of this species is white to grey and is wrinkled. The apothecia are variable but mainly raised from the thallus and **lirellate.** The species is found on smooth-barked trees and twigs. The name of the species recall the script aspect of the lichen.

C*hemical test:* P-, K-

Reaction to pollution levels

There is no information on the tolerance of *Graphis scripta* to air pollution. However, this species has already been seen in London (Llewellyn *et al.*, 2020).

Credits: *Graphis scripta,* picture taken by Richard Droker, on Flickr. CC BY-NC-ND 2.0

Hyperphyscia adglutinata (Flörke) H. Mayrhofer & Poelt.

Type: Foliose

Description

The thallus forms a rosette and is greenish brown and adpressed. The thallus of different individuals often merges to cover a large area of the substrate. The lobes are long and are often overlapping and palmate at the tips. The upper cortex can splits which lets green soredia fill the crated-shaped soralia. The under-surface is white with a few simple rhizinae. Apothecia uncommon. The species is found in nutrient-enriched environments on trees and rocks.

Chemical test: No reaction to chemicals

Reaction to pollution levels

This species is nitrophyte and lives in environment with heavy concentration in nitrogen dioxide (Gombert *et al.*, 2004; Boucheron and Martin, 2019).

Credits: *Hyperphyscia adglutinata.* Picture taken by Annelie Burghause, on Flickr, CC BY-NC-SA 2.0

Hypogymnia physodes (L.) Nyl.

Type: Foliose

Description

The orbicular thallus is shiny grey-green with narrow swollen, hollow and adpressed lobes. The thallus is frequently covered with pycnidia toward the tips of the lobes. The under-surface of the lichen is light brown at the margin and dark brown to black in the centre. The lobe ends are turned up and have farinose soredia on the underside. Apothecia present only in the most unpolluted sites. This genus is known to not have any rhizine and is thus attached directly to the substrate by patches of fungal hyphae. This species is common on trees, mosses, and rocks.

C*hemical test:* K+ yellow. The medulla and soralia are KC+ red, P+ orange-red.

Reaction to pollution levels

This species prefers acidic substrata (pH up to 4.5). It thus considered as an acidophyte and is nitrogen sensitive. It is the most resistant species to SO2.

Credits: *Hypogymnia physodes*, picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Lecania cyrtella (Ach.) Th. Fr.

Type: Crustose

Description

White to grey green thallus with small pink to brown apothecia. The grey thalline margin on the apothecia becomes excluded in mature apothecia where they are found to be convex. This species is frequent on nutrient-rich/ enriched bark.

C*hemical test:* No reaction to the chemicals

Reaction to pollution levels

This species has not been identified in any of the nitrophyte groups in current studies. It is thus considered as a species with low tolerance to pollution despite the fact that it is seen in environment rich in nitrogen dioxide.

Credits: *Lecania cyrtella*, picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Lecanora spp.

Type: Crustose

Description

This grouping regroups a variety of *Lecanora* species. These species are difficult to identify without microscopic observation of the crystals on the apothecia. Most of the specimens found in Edinburgh were *Lecanora chlarotera.* In urban environment, the species *Lecanora symmicta* and *Lecanora expallens* can also be found.

C*hemical test:* see more information on Dobson (2018) for each individual species.

Reaction to pollution levels

Species of this genus are considered as acidophyte species (Llewellyn *et al.*, 2020) and have various degrees of tolerance depending on the species (Gombert *et al*., 2004).

The species on the picture is *Lecanora chlarotera.*

Credits: *Lecanora chlarotera* picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Lecidella elaeochroma (Ach.) M. Choisy

Type: Crustose

Description

This crustose lichen as a smooth thallus which can be slightly granular. The thallus is not sorediate but is usually fertile with dark concave apothecia with a smooth black margin becoming excluded when the apothecia become convex. The lichen is often delimited by a black prothallus and found with other *Lecanora* species such as *Lecanora chlarotera*. The species is common on smooth-barked trees, shrubs and fences.

C*hemical test:* C+ Orange, KC+ yellow.

The species is easily confused with *Amandinea punctata* when no chemical tests are done.

Reaction to pollution levels

The species is considered resistant to heavy level of pollution based on the scale of Van Haluwyn and Lerond (1986) and considered as a neutophyte species (Gombart *et al*., 2004).

Credits: *Lecidella elaechroma,* picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Lepraria spp.

Type: Crustose

Description

This grouping regroups a variety of *Lepraria* species. These species are difficult to identify without the use of thin-layer chromatography.

The leprose thallus is made of a network of fungal hyphae with algal cells entangled among them. Fruiting bodies on these types of lichens are unknown. These lichens can be found in environment sheltered from the rain.

Reaction to pollution levels

This species is known to be highly tolerant to SO2 and acid rain. It is considered as an acidophyte (Llewellyn *et al.*, 2020) or neutrophyte species (Gombert *et al.*, 2004).

Credits: *Lepraria* picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Melanelixia glabratula (Lamy) Sandler & Arup.

Type: Foliose

Description

Foliose thallus adpressed to the bark and more shiny than *Melanelixia subaurifera.* The under-surface is black in the centre with simple rhizines, light brown and bare at the apices. The isidia on the cortex are neater and more regular in shapes than the ones found in *M. subaurifera.* The apothecia are infrequent but have isidiate margins. This species is found on trees, fences and rarely on rocks.

Chemical test: C+ red, KC+. The test that differentiates it from *M. subaurifera* is the reaction K+ purple on the lower medulla and rhizines which contain a pigment different to what is found in *M. subaurifera.*

Reaction to pollution levels

Similarly to *M. subaurifera*, the species is considered as an intermediate tolerant to nitrogen dioxide and pollutants.

Credits: *Melanelixia glabratula.* Picture taken by Frédéric Mélantois, accessed on Préservons la Nature. Used with permission from the author. CC BY-NC-SA 2.0

Melanelixia subaurifera (Nyl.) O. Blanco et al.

Type: Foliose

Description

The thallus is foliose often adpressed to the bark and has a diameter of up to 15cm. The species does not have pseudocyphellae nor cilia. This species has a matt surface which makes is distinguishable from *Melanelixia glabratula*. However, some specimens found in exposed sunlight conditions can be glossy. The isidia emerge from a breakage on the lobe surface where soredia develop. This species is found on nutrient-enriched smoothed bark of trees, on fences and sometimes on rocks.

Chemical test: C+ red, KC+ red.

Reaction to pollution levels

According to Van Haluwyn and Lerond's scale (1986), the species is sensitive to SO2. It disappears when the concentration of SO2 go over 50 µg/m3 d'air (Boucheron et Martin, 2019). It has been seen on neutral - to acid – barked trees and other surfaces (Nimis *et al*., 2009).

Credits: *Melanelixia subaurifera.* Picture taken by Amadej Trnkoczy*, on* Flickr CC BY-NC-SA 2.0

Melanohalea exasperatula (Nyl.) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch.

Type: Foliose

Description

This lichen is very similar to *Melanelixia glabratula* but the main difference is its pale under-surface and the negative reactions. The thallus is olive-green or brown-green and has raised, wavy lobes. The rhizines in the lower cortex are scattered. No cilia, no pseudocyphellae, no pycnidia and apothecia are rare. The lichen has inflated isidia shaped like "the bowl of a spoon" and dense at the centre of the thallus. The lichen is found on trunk and branches on nutrient-rich wayside deciduous trees, on rocks and on walls.

Chemical test: No reaction to chemicals

Reaction to pollution levels

Similarly to the species of the genus *Melanelixia,* this lichen is considered an intermediate tolerant to pollutant.

Credits: *Melanohalea exasperatula,* picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Melanohalea laciniatula (H. Olivier) O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch.

Type: Foliose

Description

The thallus is green to brown and can form patches of up to 5cm diameter. The centre of the thallus is covered with small, overlapping, flat or suberect folioles – which are small leaf-like growths growing from the thallus. The lower surface is pale with simple rhizines. Apothecia unknown. The species is found on well-lit branches.

Chemical test: No reactions to chemicals

Reaction to pollution levels

Similarly to the species of the genus *Melanelixia,* this lichen is considered an intermediate tolerant to pollutant

Parmelia sulcata Taylor.

Type: Foliose

Description

White **orbicular** thallus with brownish tips and overlapping lobes. The thallus is covered of a faint coarse white network, the pseudocyphellae along which soralia develop. The pseudocyphellae can spread covering the centre of the thallus. The lower surface is black with simple or **squarrose** rhizines. Apothecia rare. This species is distinguished from the species *Parmelia saxatilis* by having soredia and not isidia. This species is common both on trees and rocks.

Chemical test: K+ orange-red, P+ orange, UV-

Reaction to pollution levels

This species can accumulate heavy metals and is also a bio-indicator of medium pollution in the Van Haluwyn and Lerond scale (1986). The species is considered as neutrophytic (Gombert *et al.*, 2004) and an in an intermediate tolerant to nitrogen dioxide (Wolseley, 2015).

Phaeophyscia orbicularis (Neck.) Moberg.

Type: Foliose

Description

The adpressed orbicular thallus of up to 3cm diameter of this foliose lichen is very variable and can be pale brownish grey to brown to black. The lobes are long and can be divided at the tips. The lower surface is black with dark rhizines. The apothecia are infrequent, but you will frequently see pycnidia. The soralia are laminal and marginal, white or cream to greenish. This lichen is common on nutrient-enriched bark, twigs and basic stones. It is especially common in urban areas on concrete and trunks.

Chemical test: K-, Orange-yellow patches on medulla or soredia K+ purple

Reaction to pollution levels

According to Van Haluwyn and Lerond (1986) scale, this species can withstand a sulphur dioxide concentration of 60 µg/m3 of air.

Punctelia subrudecta (Nyl.) Krog.

Type: Foliose

Description

Green orbicular thallus which can be up to about 7cm across. The thallus is adpressed to the substrate with smooth rounded lobes. The thallus is covered with dotted pseudocyphellae which soredia arise from. The lower surface is light brown to white and darker in the centre with simple rhizines. Apothecia very rare. The species is found on well-lit mosses and acid rocks.

Chemical test: C+ carmine-red, KC+ red, UV-.

Reaction to pollution levels

The species is found mainly on acid substrate but has also been found growing with tolerant species such as *Physconia grisea.*

Phlyctis argena (Spreng.) Flot.

Type: Crustose

Description

White grey to greenish and usually smooth crustose lichen. The thallus is covered with bright green soredia. The soralia arise from punctiform blisters (Dobson, 2018). The thallus can cover extensive areas. Apothecia rare. The species is found on well-lit nutrient-rich trees.

Chemical test: On the soralia and on the thallus: K+ yellow becoming red.

Reaction to pollution levels

The species is sensitive to SO2 (Van Haluwyn and Lerond, 1986). It is an acidophytic species (Gombert *et al.*, 2004).

Credits: *Phlyctis argena,* Picture taken by Frédéric Mélantois, accessed on Préservons la Nature. Used with permission from the author. CC BY-NC-SA 2.0

Physcia spp.

Physcia tenella (Scop.) DC.
Physcia adscendens H. Olivier.

Type: Foliose

Description

The two species, *Physcia tenella* and *Physcia adscendens*, belonging to the genus *Physcia*, can easily be confused. Indeed, young individuals of *Physcia tenella* that are not yet complete can strongly resemble old individuals of *Physcia adscendens* that have been eroded. Both species have a blue grey thallus with erect cilia at the lobe tips. Maculae can often been observed on the thallus. These are white patches on the thallus formed by the uneven distribution of the algal layer.

Reaction to pollution levels

Both species are bioindicators of pollution and develop in environment rich in nitrogen dioxide (Gombert *et al.,* 2004). *Physcia tenella* can live in environment with high levels of SO_2 and *Physcia adscendens* can develop in environment where the level is medium (Van Haluwyn and Lerond, 1986).

Credits: *Physcia spp.,* picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Physconia grisea (Lam.) Poelt.

Type: Foliose

Description

Larger thallus than lichens of the genus *Physcia.* The thallus is grey when dry and green when wet. The characteristic of this genus *Physconia* is the pruina on the lobe tips. The lobes are short overlapping and **palmate** at the tips. The lower surface is white with pale simple rhizines. The soralia are coarsly granular and can appear isidiate. The soralia are initially on the lobes and cover the centre of the thallus. Apothecia rare. The species is found on nutrient-rich and dust-impregnated trees, cement, rocks and overgrowing mosses.

Chemical test: The medulla is K-.

Reaction to pollution levels

The species does not develop in environment with a concentration of SO2 over 60 µg/m3 of air (Boucheron & Martin, 2019). The species develops well in environment with nitrogen dioxide.

Credits: *Physconia grisea,* picture taken by Christian Thirion used with permission (2021), CC BY-SA 2.0

Ramalina farinacea (L.) Ach.

Type: Fruticose

Description

Pale grey-green to yellow green thallus but variable. The thallus has the shape of flattened narrow branches to about 7cm long arising from a compact holdfast. Soredia found along the margin of the branches in oval sorelia. Apothecia are rare but when present, are marginal or laminal. It is found on nutrient-rich bark and sometimes rock.

Chemical test: On the medulla and the soredia, K- or dirty orange.

Reaction to pollution levels

This species is more tolerant to pollution than *R. fastigiata.* It is considered as a neutrophyte species (Gombert *et al.*, 2004).

Credit: *Ramalina farinacea,* by Richard Droker on Flickr, CC BY-NC-ND 2.0

Ramalina fastigiata (Pers.) Ach.

Type: Fruticose

Description

This pendant fruticose species has a more or less erect greenish grey to yellowish thallus. As it is for fruticose species, the lower and upper cortexes are similar. The lobes are branches and wrinkled and bear apical apothecia - found on the tip of the lobes. Species common on well-lit nutrient-rich bark.

Chemical test: No reaction to chemicals.

Reaction to pollution levels

This species is considered as nitrogen-sensitive species (Wolseley, 2015).

Credits: *Ramalina fastigiata,* picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Xanthoria parietina (L.) Th. Fr.

Type: Foliose

Description

Thallus up 15cm diameter, the species can be blueish when it is in the shade to bright yellow when it has access to sunlight. It forms orbicular patches. Older specimens die off in the middle when it gets older. The under-surface is white with a few pale rhizines. The lobes are long, imbricated and wrinkled. Often found with orange apothecia. Very common on wayside trees and on rocks and in cities.

Chemical test: No reaction to chemicals.

Reaction to pollution levels

Xanthoria parietina is a nitrophytic species which strives in environment rich in nitgrogen. This is one of the most resistant species to SO2 and NO2 (Dobson, 2007).

Credits: *Xanthoria parietina,* picture taken by the author, Lucie Pestiaux (2020), CC BY-SA 2.0

Glossary

The definition below are inspired by Dobson's key (2018).

Cortex: the surfaces (bottom and top) made of fungal hyphae, protecting the lichen

Lirellate: Elongate fruits with a carbonised and black often friable margin

Lobe: rounded and pointy part of the thallus.

Mutualistic association: a relationship where both organisms benefit from the association.

Orbicular: circular in outline

Rhizines: Outgrowths of fungal filament coming out from the lower cortex. Enable the lichen to attach itself on the substrate.

Squarrose: bottle-brush shaped.

Stellate: Star-shaped, radiating.

Substrate: the surface on which the lichen is.

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