Lichens and Urban Air Pollution

Frequently Asked Questions

1. What is a lichen?

- Lichens are two or more different organisms (fungi, and algae or cyanobacteria), living together in a relationship where each partner derives some benefit from the other (a mutually beneficial symbiotic relationship);
- Fungi provide the structure or body of the lichen (protecting their associated algae from damaging UV rays, and reducing the risk of the algae from being eaten by herbivores);
- Algae are tiny plants and make food using energy from the sun, combined with air and water (photosynthesis);
- Together they support each other to live.

2. Do lichens damage on the trees they grow on?

- No, lichens do not have roots, just small attachment points which enable the lichen to hold on to the surface on which it lives;
- Sometimes you will see these attachment points as little root-like appendages on the underside of leafy lichens – these are called *rhizines*.

3. Are lichens the same as fungi?

- Not quite; lichens are made up of both a fungus AND an algae (and/or cyanobacteria) living together in one structure.

4. Do all lichens indicate clean air?

- No, but most lichens are very sensitive to air pollution and so won't grow if there are high levels of pollutants. A few lichens are able to tolerate pollution however, and some may even benefit from moderate levels of nitrogen pollution, for example.

5. How many lichens are there in the World/UK/Scotland?

- There are approximately:
  28,000 named lichen species worldwide;
  2,000 lichen species in the UK;
  1,500 lichen species in Scotland.

6. What is the difference between a lichen and a moss and free-living algae?

- The velvety green of moss and luminous greens and oranges of algae are regularly mistaken for lichens, especially because they often grow in the same places. However, after careful inspection, a moss has stems and leaves, which lichens do not, and algae has

no clear structural 'body' and is usually much brighter green than most lichens that may otherwise look similar.

7. Can I see lichens at any time of the year? Do they grow all through the year?

- Yes, lichens are not seasonal and you can find them at any time of the year.

8. Why are lichens important?

- Lichens are important contributors to local and global biodiversity, and so help our ecosystems to function healthily;
- They provide vital food and habitat (homes) for a whole range of animals, from tiny microorganisms to massive herds of reindeer. As such they play an important role in food webs;
- Some lichens can fix atmospheric nitrogen, making it available to other plants to grow;
- They are one of the first things to colonise rock, making essential vitamins and minerals available to other plants and animals;
- They are very good indicators of climate change, ancient woodland habitat, and air quality.

9. What do lichens do for me?

- Lichens are excellent indicators of air pollution. They can provide us with information about the health of our local environment which in turn affects our own well-being;
- Also see answer to ***Question 8*** **- Why are lichens important?**

10. Where can I find lichens?

- The symbiotic relationship between fungi and algae makes it possible for lichens to survive in an incredible range of environments – from sea level (e.g. coastal cliffs), to the tops of mountains (e.g. the Cairngorm plateau), in scorching deserts (e.g. in Namibia) and freezing tundra (e.g. the Arctic & Antarctic);
- They can also grow on a huge range of surfaces, including trees (trunks, twigs, leaves), rocks, soil, and even cut-wood, metal, plastic, glass and fabric!

11. Why are there not more common names for lichens?

- Although there are a few common names for lichens, they are mostly only known by their Latin names. The species with common names tend to be those that served a useful purpose to cottage industries, such as crottle (for dying) or lungwort (for herbal medicine);
- The Latin name is important for consistency in species identification among different countries.

12. Is the name of a lichen based on its fungi or its algae partner?

- The Latin name of the lichen refers to the fungal partner.

13. How many different growth forms of lichen are there?

- There are three main growth forms:
  Crustose – *crusty*
  Foliose – *leafy*
  Fruticose – *bushy*
- But you may also find:
  Leprose – *powdery*
  Squamulose – *scaly*

14. What conditions do lichens need to grow?

- Lichens need a relatively stable place to grow, with moisture, light and not too much competition from plants which might overgrow them.

15. How fast do lichens grow?

- Lichen growth can be very variable. In a severe environment such as Antarctica they may only grow tiny amounts, for example 0.1mm in a year;
- In temperate regions their growth rates can be faster, and they can double their weight in a year.

16. Where can I learn more about lichens?

- Information is available from the following websites:
  - Royal Botanic Garden – Lichens – www.rbge.org.uk/lichens
  - Lichen Urban Air Quality Survey - www.rbge.org.uk/lichen-survey
  - British Lichen Society (BLS) – www.britishlichensociety.org.uk/
  - Scottish Natural Heritage (SNH) – General information, links to lichen publications and management advice for protecting lichens - www.snh.gov.uk/about-scotlands-nature/species/lichens/
  - SNH Naturally Scottish Lichens booklet - www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=30
  - Plantlife booklet - www.plantlife.org.uk/publications/the_wild_and_wonderful_world_of_scottish_lichens/
  - Natural History Museum - A guide to lichens on twigs - www.nhm.ac.uk/take-part/identify-nature/lichen-id-guide/index.dsml
  - Field Studies Council (FSC) training courses - www.field-studies-council.org/individuals-and-families/partners/british-lichen-society.aspx

17. Do lichens make the air cleaner?

- Not as such. Lichens do absorb polluting substances that are in the atmosphere, or that are dissolved in liquid water, but they probably cannot process these substances or break them down.

18. Can I go out with a local lichen group to look at lichens?

- You can find out about lichen group or 'meets' through the British Lichen Society events page www.britishlichensociety.org.uk/the-society/events/events-calendar;
- Your local nature group or fungal or bryophyte (mosses, liverworts and hornworts) group may also have someone who knows about lichens who you could team-up with.

19. Where do lichens come from?

- The earliest lichen fossils are more than 400 million years old, from a time when the earliest plants were colonising the land;
- Lichens live on every continent and are a major contributor to global biodiversity, with 8% of the earth's surface having lichens as the dominant vegetation.

20. How do they get on to the surfaces they grow on?

- Lichens can reproduce and colonise new surfaces in two ways, via sexual and asexual reproduction.
    - **Sexual reproduction** involves the fungi producing microscopic spores which are released from cup or disc-like structures (*known as apothecia*) occurring over the structure (*known as the thallus*) of the lichen. These fungal spores are dispersed and blown through the air or transported via rain water.
    - The spores must find an appropriate alga with which they can combine to form a new lichen structure. Together they must recombine within a suitable habitat.
    - **Asexual reproduction** involves vegetative reproduction. This is where new lichen individuals are created via fragmentation. This often means a small piece of the lichen containing both the fungal and algal partners, breaks off. This broken-off piece is then transported to a new surface either by falling, being blown by the wind, or transported such as on the feet of invertebrates or birds. When the broken-off piece finds a suitable habitat it can grow into a mature lichen.
- Lichens can also reproduce asexually via the production of very small outgrowths which can look a bit like icing sugar on the edges or surfaces of the lichen body (*soredia*) or tiny peg-like structures (*isidia*). These break away or fall off and are transported to a new location by the wind, water or animals.

21. How can I help look after lichens?

- Lichens often grow very slowly, so it can take many years for them to establish in a new location. Lichens also generally need undisturbed surfaces to grow on, which means our ever changing urban and agricultural landscapes can be tricky places for lichens to survive. See Scottish Natural Heritage's web page for practical action on protecting lichens in your area. www.snh.gov.uk/about-scotlands-nature/species/lichens/.