





# Heaven sent?

A stroll through a suburban regional park uncovered a cyanobacterium that has been romanticised in mythology as the remains of fallen stars, is eaten in salads in some countries and has been brought back to life after 87 years of dormancy.

by John Huisman and Catherine Prideaux



Department of Parks and Wildlife (DPaW) biologists are a fortunate bunch, often finding themselves in remote and wild locations, places only a few ever get the opportunity to visit, and where you might expect to observe rare and unusual plants and animals. However, such things are not restricted to these areas, and occasionally the weird and wonderful can be encountered along a suburban pathway.

DPaW's Swan Region planning officer Catherine Prideaux recently had such an experience. During a site visit along the northern end of Lake Coogee, part of Beeliar Regional Park, south of Perth, Catherine noticed a strange growth among the grass next to the path, something that she had not seen before despite many visits to the area. This growth looked like a dark green jelly, spreading for many centimetres, sort of globular in shape but without any distinct form. She was understandably curious and took a photo, hoping that she might show it to someone able to identify the unusual organism. Catherine guessed that it might be a cyanobacterium (or 'blue-green alga'), and once back at work she sent the photo to the

herbarium's phycologist John Huisman, who agreed that it was indeed a cyanobacterium, but he needed a specimen to confirm the identity. This was collected and the organism identified as *Nostoc commune*, a species seemingly with a worldwide distribution, but one rarely reported in Western Australia.

## CRYPTIC GENETICS

Cyanobacteria, although traditionally called blue-green algae, are not algae, but are more accurately described as photosynthetic bacteria. While they do photosynthesise like plants and algae, they do not have the same cellular complexity and are more closely related to bacteria. They are found in virtually all habitats and are often toxic, perhaps the most well known in WA being *Anabaena* and *Microcystis*, which often bloom in the Swan-Canning Estuary.

*Nostoc commune* has been reported worldwide, from arid to polar regions, and is found in a wide range of habitats. In truth, this distribution pattern is misleading, as specimens from different countries, while looking identical to one another, have dissimilar genetics. Therefore *Nostoc*





Previous page

**Main** North Lake, Beelii Regional Park.

Photo – Jiri Lochman

**Inset** *Nostoc commune* growing by the path.

Photo – John Huisman

**Top** Blue-green algal bloom at Matilda Bay Reserve.

Photo – Dennis Sarson/Lochman Transparencies

**Above** The gelatinous colonies of *Nostoc commune* among the grass.

**Above right** *Nostoc* trichomes as seen under the microscope; the slightly larger spherical cells are nitrogen-fixing heterocysts.

Photos – John Huisman

*commune* is regarded as a ‘form species’, one that probably represents different genetic species that cannot be distinguished by their appearance.

### EVOCATIVE NAMING

Unusually for a cyanobacterium, *Nostoc commune* has several common names, including star-slime, star jelly, witch’s butter, and mare’s eggs, although these names are also used for several other gelatinous cyanobacteria and fungi with a similar appearance. The celestial names arose from the common belief in the British Isles that *Nostoc* was the remains of shooting stars, and dates back to the 15<sup>th</sup> Century. Early accounts describe quarry workers who, upon sighting a shooting star, “went to the spot

near which they supposed it to fall, and they generally found a hatful of this mucus”. This belief was still held in some areas until at least the early part of the 20<sup>th</sup> Century. Similar names have been recorded from Belgium, Denmark, Germany and Holland. ‘Witch’s butter’ is based on the belief that witches would milk cows at night, then scatter the unappetizing butter in the fields, while ‘mare’s eggs’ is generally applied to spherical forms that appear as clusters of eggs, perhaps thought to have come from nearby horses. The scientific name ‘*Nostoc*’ had an equally unusual genesis. It was based on ‘*Nostoch*’, a name coined by German philosopher Paracelsus (1493–1541 AD), and is thought to be an amalgamation of two words, both describing the human nostrils: the old

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English ‘Nosthryl’ and German ‘Nasenloch’. Paracelsus observed that *Nostoch* might be “excrement blown from the nostrils of some rheumatick planet”. Thus one other common name also used is: ‘snot’!

### TASTY SALAD

*Nostoc commune* is eaten as a salad in several Asian countries, including the Philippines, Indonesia, Japan and Taiwan, where it is known as ‘yu-lai gu’ (meaning post-rain mushroom). One variety is also eaten in China, where it is known as ‘facai’ and is traditionally served at the Lunar New Year.

In the mountains of Peru *Nostoc* is collected from highland lakes and is called ‘lullucha’; it is eaten as a salad or added to stews and thought to be highly nutritious. Unfortunately eating cyanobacteria can be sometimes risky, as many species produce toxins. *Nostoc commune* is thought to be non-toxic, but a recent analysis of specimens bought from a Peruvian market showed them to contain beta-N-methylamino-L-alanine (BMAA), a neurotoxic amino acid linked to neurodegenerative illness (such as Alzheimer’s). Given that there are seemingly many genetically distinct strains of *Nostoc commune*, whose toxicity is unknown, it would be prudent to avoid their consumption.

### NATURE’S SURVIVORS

What Catherine observed in the grass is actually a colonial organism. Short strings of



cells form filaments (known as trichomes), which are embedded in a gelatinous mass that is highly resistant to drying out. Within the trichomes are larger, specialised cells known as heterocytes, which can fix atmospheric nitrogen and the *Nostoc* can then grow in areas where no nitrogenous compounds are available in the soil. It is often found associated with limestone gravel. Following rain the colonies appear rapidly, seemingly out of nowhere, and are typically a dark green colour. When they dry out they turn brown and appear as a crust on the surface of the soil, described by one author as looking like “dried dog faeces”. This does not mean they are dead, far from it, they are merely dormant, and will pop back to life following the next rainfall. They can remain viable in this dormant phase for extremely long periods and are resistant to heat and repeated freezing and thawing. In one study a specimen dried onto a herbarium sheet was successfully revived 87 years after it was first collected; they are certainly one of nature’s survivors! Unfortunately this means they can also be a pest, popping up in gardens and on

pathways after rainfall, and are very difficult to deter. In WA our dry climate probably means this is unlikely and it was probably our unusually high mid-2013 rainfall that promoted the colonies that Catherine saw. The colonies have since dried and now do indeed resemble something unsavoury, but we will certainly pay a visit to Lake Coogee after next winter’s rain and see how they are faring. Or if we happen to see a shooting star.

**Above** Dark-field photography highlights the *Nostoc* trichomes embedded in a gelatinous mass. Photo – John Huisman

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