Endangered Species Foundation

Protecting New Zealand's rarest of the rare

Fischer's Egg Fungus

Claustula fischeri

Moa fodder?

Fischer's egg fungus entire fruiting body (R) and internal structure (L). Ross Beever, Landcare

Quickfacts

Found in the South Island of New Zealand, and on Tasmania in Australia.

Appears when fruiting as a white egg on the ground.

On the International Union for Conservation's Red List.

Conservation Status: Nationally Critical

Connecting with people

As people spend more time exploring the visually stunning natural environment, they connect with nature, ignite their sense of adventure and encourage more people to experience the beauty of natural landscapes. While growing urban areas bring people and nature closer together, urban areas also slowly encroach on natural areas. Nelson city is closely connected to nature, with the community attempting to maintain a species rich and biodiverse environment, in unison with a growing urban centre. The local council is implementing a large conservation programme to sustain and improve environmental health and community knowledge. The new Brook Waimarama Sanctuary borders Fringed Hill and the Dun Mountain walkway, both popular mountain biking areas. The 14 km Brooke Waimarama Sanctuary fence surrounds over 715 ha area of primeval beech (*Fuscospora* and *Lophozonia*, previously named *Nothofagus*), some podocarp forest, outdoor classrooms and a network of walking tracks. This bush covered hillside overlooks Nelson city, encourages people to explore the wildlife sanctuary and ride their bikes along the many tracks, to facilitate a connection between people and New Zealand's unique wilderness.

TE KAUPAPA TIAKI KARAREHE, TIPU MŌREAREA O AOTEAROA

One rare fungus species, known as the Fischer's egg fungus, however, started to slip through the cracks. When exploring Nelson in 1926, Lady Rigg (formerly Kathleen Maisey Curtis), a founding member and mycologist at Nelson's Cawthron Institute and the first NZ woman to be awarded a Doctor of Science (DSc), discovered and subsequently named this puffball-like fungus. Fischer's Egg is now only known to grow on Fringed Hill and along the Dun Mountain trail in Nelson, at Croydon Bush near Gore where it has been seen once, and it was recently discovered in the Taieri Gorge near Dunedin. In 1997, Fischer's egg was rediscovered growing on Tasmania.

In Australian Aboriginal folklore, the fungus is known as the Bunyip Egg, as it resembles eggs of the mythical Bunyip creature. On Tasmania, the Bunyip Egg is known from six locations near Hobart, growing in Eucalyptus forests sometimes mixed with Beech (*Nothofagus*). In New Zealand, Fischer's egg fungus grows in forests dominated by beech, manuka (*Leptospermum*) and/or kanuka (*Kunzea*) trees. As yet, no-one has compared the New Zealand and Tasmanian collections using morphological or molecular analysis but they appear very similar and are likely to be the same species. With relatively few places where it is known, Fischer's egg fungus needs conservation action to save this unique species.

Fischer's egg fungus feeds on decaying plant material in the soil (i.e., is saprobic) and at Fringed Hill, it grows underneath beech and tea tree. This site is at risk of fires or extreme weather events brought about by climate change. One activity that could impact on this fungus is constructing trails for walkers and mountain bikers. Fortunately, the Nelson City Council is highly motivated to ensure new tracks are steered away from the Fischer's egg fungus habitat.

Fischer's egg fungus is the only member of the family Claustulaceae in the stinkhorn fungus order Phallales. It is likely long-lived, and unlike most stinkhorns that are insect-dispersed, it is odourless, leading researchers to question how it disperses spores. Spores are very small (microscopic) reproductive cells that can be carried by the wind, or eaten then pooed by animals away from the parent. If by chance, a Fischer's egg spore, for example, lands in a moist forest environment with appropriate food, it might germinate and grow as hidden threads (hyphae) in the soil. Forming the mature fruiting body – the egg - likely depends on mating with hyphae of another colony of Fischer's egg fungus. Mating occurs when the hyphae of two separate compatible colonies, by chance, grow together and start developing new hyphae with cells containing nuclei from each parent (forming a dikaryon). When the dikaryon becomes the dominant colony in the soil, a fruiting body might develop if the conditions are suitable.

The dispersal mechanism for Fischer's Egg is unknown as no opening appears in the puffball-like fruiting body to release spores. But as with other New Zealand truffle-like (truffleoid) species, researchers speculate that invertebrates or native-ground feeding birds disperse spores. As many of these potential dispersers are now rare or extinct (e.g. moa), other birds may have partly filled this role. Given the rarity of the species,

dispersal mechanisms are only speculative. For example, it is unlikely Fischer's egg fungus evolved to attract foraging mammalian species as the Fischer's egg fungus occupies only a limited range in a few small pockets of New Zealand forests where native foraging mammals are bsent, and only few locations in Tasmanian forest where native mammals are widespread.

Fischer's egg fungus

The Fisher's Egg is phylogenetically isolated as the only member in the genus *Claustula* of the Claustulaceae family.

When spores land on suitable soil, they may germinate and grow to form many long, thin branched threads (hyphae) forming a web or network (mycelium) throughout the soil that grows and feeds on dead plant material underground. Fungi are very important in breaking down dead organic matter in soils. This living tangle of threads grows hidden in the soil underground year-round until it may be triggered to produce a fruiting body; however, the mechanism that triggers production of a fruiting body is unknown. The fruiting body is a puff-ball structure that emerges just above the soil's surface. This visible part of the fungus, has an outer brown jelly-like shell, which splits to expose a white inner sphere, giving the appearance of an egg. This fruiting body encloses the spores and does not open further. Spores are likely dispersed via animal ingestion, however, the dispersal mechanism is unknown. This final, egg-like appearance, gives the Fisher's egg fungus its common name.

If you think you see a Fisher's egg fungus, take a photo and send it to us together with notes on the location where it was seen (a map grid reference would be ideal). It is similar to the common puffball fungus, but this has noticeable holes in the top when mature through which puffs of dust-like spores erupt if the body is tapped and it and most types do not have the dark base of Fischer's egg fungus.

What next?

The threats to the survival of the species are:
1. Habitat degradation or change.
2. Possible reduced dispersal.
3. Unknown relationship between New Zealand and Tasmanian specimens.

Successfully protecting the Fischer's egg fungus from these threats must be achieved in order for the conservation programme to succeed. Ideally, this should be done by:

1. Surveying known locations of Fischer's egg fungus to ensure exact sites are known.
Because the exact sites of the fungi are mostly unknown, by finding and GPS recording locations, any potential developments (e.g. mountain bike tracks), can be built in areas away from growing fungal colonies. This will help to prevent degradation and loss of habitat. An assessment of preferred habitat should, therefore, be carried out to ensure any habitat restorations in the area will benefit the fungus.

Conducting six two day surveys for Fischer's egg fungus is likely to cost $25,000.

2. Further research into the dispersal mechanism exhibited by Fischer's egg fungus.
By identifying the dispersal mechanisms of the Fischer's egg fungus, dispersal can be facilitated to promote spreading of the fungus. If animal dispersed, preferred habitats for dispersing animals can be promoted in areas where Fischer's egg fungus is known to grow to promote successful dispersal.

This research is likely to cost c. $150,000.

3. Conduct molecular analysis on individuals from New Zealand and Tasmanian sites.
By assessing the genetic differences between the fungus growing in different locations, the level of similarity can be assessed and perhaps the dispersal mechanism can be inferred. The origin of the species (New Zealand or Australia) could be identified and it can be assessed whether these are the same, or separate, species.

This research is likely to cost c. $75,000.

More information

Website: Landcare Research – *Claustula fischeri*. Link
Website: The Brook Waimarama Sanctuary. Link
Report: *Claustula fischeri*, Fischer's egg. By P. Buchanan and T. May. The IUCN Red List of Threatened Species, IUCN, 2015. PDF
Scientific paper: Conservation of New Zealand and Australian fungi. By Peter K. Buchanan and Tom W. May. New Zealand Journal of Botany, No. 41, 2003. PDF
Scientific paper: *Claustula*: the forgotten phalloid. By A.K. Mills, T.W. May, B.A. Fuhrer, D.A. Ratkowsky, A.V. Ratkowsky. Mycologist, No. 1. 1997. PDF

Photos

Fruiting bodies (top) and internal view (bottom) (scale in mm). Ross Beever, Landcare Research.

This webpage represents the views of the Endangered Species Foundation of New Zealand and not necessarily those of other individuals or organisations involved in the conservation of this species.

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