Title: 'Vegetable cicada'

Description: *Isaria sinclairii* found in the Pukaka Valley

Photographer's name: Noelle Bennett

Where and when: Pukaka Valley, Tuamarina, Marlborough. August 2021.

Sustainability: Fungi and slime moulds race to decompose dead matter on the forest floor. Many spread by releasing spores - some at a rate of up to 30,000 per second. If just one of these spores lands in the right place and takes root, it can colonise a whole new area.

But not all fungi feed on the dead. The vegetable cicada fungi (*Isaria sinclairii*) attacks and infests cicada nymphs, as well as other insects, that spend a lot of their life underground. So why are they called vegetable cicada? Well, that would be because when they were first discovered and the infested nymphs were dug up, it was thought they were vegetables!

Cicadas actually spend most of their life underground as nymphs - in fact one American cicada species spends a mighty 17 years underground. In New Zealand, we have about 40 species of cicada but *Isaria* only seems to attack cicadas belonging to the genera *Amphipsalta* and *Melampsalta*.

Isaria feeds on the inside of the nymphs until it completely fills up their body cavities, essentially converting them into a fungus. The fungus produces white fruiting bodies that resemble white tufts (some people have described them as looking like popcorn!) which then proceed to grow up through the soil. Inside the fruiting bodies are thousands of spores which are then released and fall to the ground ready to take over the next cicada nymph and then history repeats itself over and over.

This particular fungi species has a certain derivative called myriocin which has powerful immuno-suppressive properties. That's logical when you think about it because the myriocin allows the fungus to attack living insects.

Myriocin itself is too toxic to be used in humans, but a synthetic derivative was developed in 1992 and called fingolimod. This became the first oral drug for treating multiple sclerosis, a nasty the autoimmune disease. It is thought that it may also have huge potential for cancer treatment.

So maybe we - as in the human race - need to learn to value nature far more than we currently do. There are various ways we can think of a forest that encourage us to conserve and restore it: The forest can be our medicine cabinet, as in this example; it can be our larder if we gather food from it; it can be our builders' warehouse if we harvest the timber for construction; and it can be our cathedral if we find spiritual nourishment and retreat from a busy world in the forest. We could start by learning more about what lives in our world including those things beneath our feet that we may not see, or that a photographer has spotted.

Photographer's notes: There are so many things in nature that we simply ignore probably because we simply seem to have lost our sense of curiosity. Maybe we're just too busy being busy! But if you simply take the time to look at these apparent non-entities, such a journey of discovery opens up to you. Slowing down and watching and more importantly seeing, meant I noticed this very strange fungus. And because of that I came across so much fascinating information.

Photo specs: This individual image was focus-stacked using 30 images taken at five unit increments to ensure the whole of the structure was in sharp focus. Technical specs: The image was taken using a Panasonic DC-G9 camera and a Panasonic Leica DG Macro-Elmarit 45mm f/2.8 macro lens. Exposure details - 1/80 sec at f5.6 with an ISO of 100 and a focal length of 45mm (90mm full frame equivalent).

Digital specs: 7066 x 5832 pixels (41.21MP) @ 300dpi

Key words: vegetable cicada, biomimicry, medicines, *Isaria sinclairii*, fungus, Pukaka Valley, Tuamarina, Noelle Bennett, Ecosystems Photography, sustainability.

Price: $150 (incl. GST) for use of the digital image. Visit www.ecosystemsphotography/sales for details & to order, or to get a quote if you would like a high-quality print.

Donation: The price includes a $100 donation to a sustainability organisation or project of your choice, or otherwise to *iNaturalist NZ – Mātaki Taiao* – https://inaturalist.nz.

We recommend that the donation goes to *iNaturalist NZ* because they are supporting a wide variety of community-led biodiversity monitoring programmes throughout New Zealand, including for the fungi featured in this series of photographs. iNaturalist receives species records from citizen scientists, maps the data, and shares the information so that it can be used by scientists, policy makers, and the public. They invite everyone to submit photographs and will find an expert to help by identify the plants and animals in the photographs. One day if we find some of those plants and animals have medicinal properties like the vegetable cicada, iNaturalist will tell us where we can find it.

Image ref: NB#028 (please use this reference in all orders and correspondence).

Noelle Bennett
19 December 2021