NEW SPECIES OF LICHTEN AND PIONEERING CLIMATE CHANGE RESEARCH STATION

In a pioneering venture, Dilmah Conservation and the University of Colombo have teamed up to establish Sri Lanka’s first ever private sector led Climate Change Research Station. The station lies atop a unique mountain on Queensberry Estate, alongside a forest inhabited by a rare species of lichen that Kahawatte Plantations PLC is protecting - *Heterodermia queensberryi*, named after the estate itself.
In early 2016, Queensberry Estate will add to its fame with the commissioning of Sri Lanka’s first ever private sector led Climate Change Research Station. The estate is already well known in scientific circles with the discovery of a rare species of lichen, *Heterodermia queensberryi*, in 2014 and named after the estate.

The discovery of this new species shortly before construction began on the research station, is particularly interesting. Lichens are known to be extremely sensitive to changes in the environment, and act as bio-indicators of air pollution, ozone depletion and metal contamination - a living means to measure climate change. A symbiotic organism comprising a fungus, and either an algae or cyanobacterium which are capable of photosynthesis, lichens can occur in various forms and are found all across Sri Lanka from coastal rocks to peak forests. Even though they are frequently encountered, the dearth of knowledge on the subject entails that they go unnoticed.

This particular species is classified as ‘very rare’ and is endemic to Sri Lanka. It grows on the bark of trees in forests at high elevations, and has so far been found only on Queensberry Estate and on the nearby Horton Plains, and also on the Kalupahana region of the Knuckles mountain range.

*Heterodermia queensberryi*, discovered by Dr. Gothamie Weerakoon, is featured as the cover photograph of her 2015 book ‘Fascinating Lichens of Sri Lanka’ published by Dilmah Conservation, the first comprehensive catalogue of the country’s vast range of colourful lichens.

Merrill I J. Fernando, Founder of Dilmah, says in his foreword to the book: “Having spent many years of my life in Sri Lanka’s tea fields, I have noticed the common presence of lichens upon the tree barks and rocks and even on manmade structures. However I did not pay attention to the unassuming presence of lichens in and around our environment until a new species of lichen *Heterodermia queensberryi* was discovered at the Dilmah Queensbury estate in Nawalapitiya. It is through that discovery that I learnt the valuable environmental contribution of these overlooked organisms. Lichens are an essential but often unnoticed part of nature. There is a dearth of knowledge about lichens which is hampering people’s opportunities to learn more about and appreciate their important role in eco systems. I hope that ‘The Fascinating Lichens of Sri Lanka’ will stir an interest in young people to observe the world around them with keener eyes and understand the vital part played even by its ignored and seemingly insignificant constituents.”
A unique location ideal for monitoring climate change

Sri Lanka, being an island, is especially sensitive to the vagaries of climate change and probable accompanying rising of sea levels. It is also perfectly located to monitor the effects of climate change on tropical monsoon seasons. The Climate Change Research Station at Queensberry Estate is therefore expected to play a vital role for research which will have immediate and long term practical implications, especially for agriculture.

Queensberry Estate is located on the border of the Kandy and Nuwara Eliya Districts of the Central Province. It is approximately 140 kilometres from Colombo, a 3-hour drive on the A4 highway, turning at Avissawella on to the A7 Hatton Road, turning again at Ginigathhena on to the Nawalapitiya Road, and then on to the Nawalapitiya-Talawakelle Road. The estate is approximately 17-20 km from the scenic towns of Hatton, Talawakelle and Nawalapitiya, with Kotagala being the nearest town just 10 km away. It’s about an hour’s drive from Kandy.

The station is expected to play a national role in recording and researching climate change in Sri Lanka, findings which could be of global importance. It is in itself a perfect example of teamwork between industry and science, being a joint venture between Dilmah Conservation and the University of Colombo. Construction commenced in early 2014, and the Research station is expected to begin operations in the very near future.
Research at the Station will be led by scientists from the Department of Zoology of the University of Colombo, and will no doubt also serve as a key focal point for climate change researchers from other global and local institutions.

The 40-perch site at the 1,640-metre (5,380 feet) summit of a mountain which stands out quite uniquely in the region, is not connected to the many adjacent mountain ranges. Being a single peak, it provides an extraordinary panoramic 360-degree view of the surrounding mountain ranges. Gazing clockwise beginning from the north, one can see the ancient hill capital of Kandy, the wild and pristine Knuckles mountain range, the town of Ramboda, Sri Lanka’s tallest mountain Pidurutalagala - the popular mountain resort of Nuwara Eliya, the mist-swathed Horton Plains National Park, the wild areas of Agarapatana, the bustling town of Hatton, the tea estates of Bogawantalawa and Maskeliya, and at a lower elevation the town of Mawanella.

Queensberry’s extraordinary physical location, in terms of elevation, being a single mountain, and experiencing both of Sri Lanka’s differing monsoon seasons, makes it an ideal location for a climate change research station. It experiences huge swings in rainfall, temperature and wind patterns, which vary quite widely from one year to the next. It is therefore ideal for measuring rainfall, drought, winds, etc. Between 2003 and 2015, this estate received rainfall on a minimum of 139 days and a maximum of 180 days per year, with a low of 2,524 mm in 2003 and a high of 4,715 mm in 2011. Highest rainfall is registered on average in the six-month period from June through November.
Directly adjoining the station is the forest, where *Heterodermia queensberryi* was discovered. In her book, Dr. Weerakoon notes of *Heterodermia queensberryi*: “This species has been spotted on branches of trees in shaded, humid interior regions. (It was) once observed on an open rock, growing among mosses. Found only in natural habitats above 1,000m. (They) mostly grow together with mosses and bryophytes.”

The estate’s management is now making great efforts to protect this species, and all species of fauna and flora in the forest, through a well-structured and detailed programme. The forest area has been declared out of bounds and workers do not enter to even collect firewood. The programme includes minimizing the use of chemicals in nearby tea fields and using manual labour for weeding, despite the higher cost of such a practice. The effort is all the more laudable when one considers the acute shortage of labour throughout Sri Lanka’s tea industry.

The 415 hectare estate is a haven for wildlife, and leopards are a common site in the evenings and early hours of the day for workers in the tea fields, as are barking deer and smaller species of mammals, lizards and birds, according to M.F.S. Marzookdeen, the Manager of Queensberry Estate. A significant portion of the estate is forested and shelters biodiversity, as tea accounts for 256.76 hectares. The estate’s fuelwood plantation is expanded every year, providing more forest cover.
Sri Lanka is an ideal environment for the growth of lichens, with nearly 1,000 having been identified throughout the island already. Globally, about 20,000 species of lichens have been identified. Often described as a ‘combined life form’, some species of lichens have the longest lifespans among all organisms, with several being estimated to be over 3,000 years old.

Lichens are found in almost every terrain and climate, from rocks on the seashore to some of the highest elevations. They have the ability to grow on a vast range of surfaces from tree bark to soil and even concrete. They are often found to be among the first species to grow on any newly introduced surfaces and are found across a vast temperature range, from the arctic to deserts. Two lichen species that were exposed to the complete vacuum of outer space for 15 days by the European Space Agency, were found to have suffered no ill effects when they were brought back to Earth.

They are also among the most colourful of organisms, and vary widely in size and shape. Like plants, lichens use photosynthesis to produce their own food by combining sunlight, carbon dioxide, water and minerals. While most species of lichens propagate themselves through sexual reproduction, there are some species which have been found to practice asexual reproduction.

Lichens and climate change

Heterodermia sp.
The Climate Change Research Station itself has been designed to be completely carbon neutral, drawing its power supply from a 2.5 kilowatt micro hydro power station set up especially for this purpose. The power station is located further down the hill, tapping several water sources which flow from Queensberry Estate. Needless to say, given the pristine surroundings, scientists at the station will be working in a very pleasant environment. Its design provides an extraordinary view, and it is equipped with a variety of laboratories, and adequate and comfortable living amenities for researchers.

On the estate, the station is known as “East 17”, as it is located on Field number 17 of the East Division of the estate (not to be confused with the well-known English pop band of the same name). The estate has three divisions – East, West, and Lower.

A part of the station’s research will be targeted at the correlation between current agricultural practices on tea plantations and their carbon footprints. This would enable the identification of better manufacturing processes, and is likely to result in the identification of more opportunities for labelling of various teas as eco-friendly products, which in turn would enable the industry to obtain premium prices by better positioning when marketing such products.

It is now globally accepted that the increase in greenhouse gasses which trap heat has led to a rapid warming of the atmosphere, especially over the past 50 years. Research on a global scale into this critical issue, which threatens the very existence of our species, is of extreme importance.

The station is a major component in the University of Colombo’s project to gather information on life cycle carbon footprint in the tea and rubber industries, two of Sri Lanka’s key export industries.
Blending high quality production with conservation

Climatic changes have been especially acute in recent years at Queensberry, which makes it a challenge to maintain productivity and high quality. This makes the station a dire need, both for the estate, and the tea industry as a whole, noted Marzookdeen.

Originally a coffee plantation, Queensberry Estate is now well known in the tea industry for the high quality of its tea leaf. Its small, compact factory has the distinction of winning the most number of awards in 2013 and 2014 in the Forbes List for Western High Grown category teas. The factory was set up in 1924, was closed for a period from 1994-2002, and re-opened following the MJF Group’s acquisition of Kahawatte Plantations PLC.

In keeping with the environmental protection philosophy of Dilmah and Kahawatte Plantations PLC, Queensberry Estate has adopted best practices in all its day to day activities. These include comprehensive experiments with Bio-char, which is a soil additive produced from biomass, which is widely believed to help mitigate climate change through ‘carbon sequestration’ or negative carbon dioxide emissions. Biochar increases the fertility of soil, absorbs fertilizers and releases them over long periods, and increases agricultural productivity. Key advantages for the tea industry, and indeed many other forms of agriculture, include sharply lower costs due to the reduced amounts and frequency of fertilizer application, and significantly increased crop productivity. The estate has also focused on the production of compost in large quantities, to reduce on the usage of synthetic fertilizers.

The commitment of Dilmah to environmental protection is quite legendary among Sri Lanka’s corporate sector. In the discovery of Heterodermia queensberryi and Queensberry Estate’s Climate Change Research Station, it is clearly taking these efforts to a higher level.

*Usnea sp.*