

Unravelling an unexpected lichen diversity in Seychelles

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The study of lichens in Seychelles is relatively recent compared with many taxonomic groups (see Box on p. 12) and as such there are many new things to be learnt about this important but often neglected group (see Kapisen 10 p. 13-15).

In 2015, I decided to visit Seychelles with my wife Doris and my son Cédric. Although our main aim was to explore the natural richness of this wonderful country and to learn about the people and their culture, as a lichenologist I could not resist linking tourism with lichen exploration, and I asked for an official permit to collect lichens. I came into contact with Katy Beaver from the Plant Conservation Action group (PCA) and she encouraged me to collect lichens from all taxonomic and ecological groups, not only from those on which I am personally working. She also helped me to get the necessary permits, a task which is made easier with the support of local scientists. Katy explained that, although much has already been done, the lichen diversity in Seychelles is still poorly known, and that the help of foreign taxonomists is required until there is a trained Seychellois lichenologist. Therefore it is important that visiting lichenologists share their knowledge with local biologists.

We visited Mahé for one week (including a small excursion to Thérèse island), and Praslin and La Digue during the second week. The best places where I was able to collect lichen samples were the Jardin du Roi in Mahé where the owner, Mrs. Michelline Georges, kindly allowed me to collect; Morne Blanc (Mahé) where I had the privilege to be accompanied and guided by Katy; Glacis Noir in Praslin; and Veuve Reserve in La Digue. We had a bad experience when we visited Sauzier Waterfall in Mahé: local young men are waiting for tourists, guide them to the waterfall, and then request an exaggerated amount of money that we had no other choice than to pay.

Although this was not a full time collecting trip, the results are extraordinary. I was able to collect a total of 323 specimens, of which all identified material is deposited in the herbarium of the Seychelles Natural History Museum (SEY), with duplicates in



The beautiful new species *Coenogonium beaverae* Lücking & Diederich was collected near Sauzier waterfall, Mahé. It has been dedicated to Katy Beaver (PCA), a particularly active environmentalist in Seychelles. Scale bar = 0.5 mm.

my private herbarium, and a selection of duplicates in other large herbaria (mainly B, BR, DUKE, HAL and LG - see list of acronyms below). Most scientific results have recently been published in the journal *Herzogia* (Diederich et al. 2017). A total of 16 species collected in Seychelles were described as new, including *Coenogonium beaverae* Lücking & Diederich, *Graphis lindsayana* Lücking & Diederich and *Porina morelii* Aptroot & Diederich, dedicated with great thanks and recognition to Katy Beaver and two other PCA members: Lindsay Chong-Seng (long associated with management and protection of biodiversity in Seychelles) and Charles Morel (Curator of the Seychelles National Herbarium (SEY) in Victoria). An additional 49 species were new records for Seychelles, of which 29 were even new to Africa. All in all, this brings the Seychelles lichen flora to over 500 recorded species!

Yet, the Seychelles lichen flora is still poorly known and many additional taxa surely await discovery. The identification of many specimens and species needs critical re-evaluation based on new scientific knowledge. The ecological affinities and geographical distribution of many taxa are hardly known and it is only now becoming possible to consider using lichen diversity and richness as a key factor in assessing natural habitat protection.

List of herbarium acronyms

B = Botanic Garden and Museum, Berlin, Germany; **BR** = Botanic Garden Meise, Belgium; **DUKE** = Duke University, Durham, North Carolina, USA; **HAL** = Martin Luther University of Halle-Wittenburg, Germany; **LG** = University of Liège, Belgium

What is urgently needed in Seychelles is for young people to get interested in lichens, youth who will learn to know the different species and build up a much larger reference collection in their national herbarium, who will have the courage to become

experienced in lichen taxonomy, and who will guide people engaged in nature protection to use lichens in future monitoring and conservation projects.



The new salmon coloured *Opegrapha salmonea* Ertz & Diederich has been described from La Digue, Mahé and Praslin, where it grows on coastal trees, frequently on coconut trunks. As it is always sterile, the inclusion in *Opegrapha* is provisional: freshly collected specimens will be needed for DNA sequencing, allowing phylogenetic analyses to place the species in the right genus. To our knowledge, this beautiful and eye-catching species has never been collected in other countries and might be endemic to Seychelles.

The new lichenicolous (= lichen inhabiting) fungus *Abrothallus ramalinae* Diederich, described from Glacis Noir, Praslin, has black spore-bearing apothecia developing on the body (thallus) of a lichen belonging to the genus *Ramalina*. We know the species also from Australia, New Guinea and New Zealand. Although lichenicolous fungi are not lichens themselves, they are usually studied by lichenologists, and are frequently included in lichen checklists. Scale bar = 0.2 mm.



History of lichen taxonomy in Seychelles

Serious lichen exploration in Seychelles started only in the early 1990s, although a number of scientists had made small collections prior to that. Following the website *Recent Literature on Lichens* (nhm2.uio.no/lichens/rl.html), the first published references to lichens from the archipelago go back to Eriksson (1992) who reported *Psoroglaena cubensis* Müll. Arg. from Mahé, and Henssen & Thor (1994) who described the new *Dichosporidium latisporum* Thor & Henssen from Vallée de Mai in Praslin. Shortly after, Mark Seaward and André Aptroot started important projects with a view to enlarging knowledge about Seychelles lichens: Seaward et al. (1996, 2002) reported 45 species from Aldabra; Seaward & Aptroot (2003) studied 141 species (of which 129 were identified to species level) on Silhouette Island; and Seaward & Aptroot (2004) described four new species from Mahé and Silhouette. The first checklist (Seaward & Aptroot 2006) included 241 lichen taxa (incl. 219 determined to species level). A second checklist (Seaward & Aptroot 2009) reached a total of 376 species recorded from 28 islands (mainly Aldabra, Mahé, Praslin and Silhouette). Schumm & Aptroot (2010) published a *Seychelles Lichen Guide* with beautiful macroscopical and microscopical photographs of 218 lichen species (of which many were collected, however, in other tropical countries, and some, such as *Dictyonema glabratum* certainly do not occur in Seychelles). All these papers encouraged further lichenologists to publish additional notes on Seychelles lichens, and following M. Seaward (pers. comm.), the number of species known in 2014 reached 440.

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Exciting results from a Coco de Mer PhD project

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The extraordinary Coco de Mer palm stands out in the plant world for many reasons. Its huge green leaves, each spanning up to 10 m across and with petioles up to 10 m long, form a dense crown in the canopy, where the palm towers above other plants. It is the dominant species in the ancient palm forests of Praslin and Curieuse. The male palms produce huge catkins with up to 170 individual sweet-smelling flowers that provide an important food source for a number of endemic animals such as the Giant bronze gecko (*Ailuronyx trachygaster*). The Coco de Mer's giant fruits contain usually a single bilobed seed (nut) - the largest in the world (sometimes weighing up to 18 kg). These nuts have been treasured for centuries and their unique shape makes them popular with tourists - as a result they fetch a high market value (up to €450). The Coco de Mer has traditionally been shrouded in myth and legend, and many aspects of its biology and ecology have remained elusive.

Why is it important to understand the ecology of the Coco de Mer?

Coco de Mer was only ever found growing naturally on two islands in Seychelles and one islet, but forest fires and extensive timber and nut harvesting have caused serious decline. Today, only a few substantial populations remain and there is very little natural regeneration. As a result, the species is classified as 'Endangered'. To effectively conserve this



De-husked Coco de Mer nut (E Morgan)

ecologically, economically and culturally important palm, we need to uncover more of its mysteries.

The aim of my PhD project, based at ETH Zurich, Switzerland, was to study the genetic and demographic processes that underlie reproduction in the Coco de Mer. In partnership with Seychelles Islands Foundation, and in collaboration with Seychelles National Parks Authority, Ravine de Fond Ferdinand Nature Reserve and Global Vision International, I spent almost four years using a suite of molecular tools to answer questions about this iconic species that might otherwise have taken decades using other methods.