

The fly family genealogy

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Certain blackflies can cause river blindness in humans. But which ones? Wageningen University candidate Luis Miguel Hernandez systematized the relationships within the blackfly subgenus *Trichodagmia* and came up with some answers.

Blackflies are biting insects which grow to a maximum of half a centimetre. You can kill one easily with Hernandez's 550-page thesis. This chunky volume not only has a lot of written text, but also many photographs showing variations of legs, eyes, teeth, breastplates, gills, genitals and forewings of the larvae, pupae and adult blackfly. While the subtle differences among these would be lost on a layman, they are of great interest to the expert, says Hernandez's supervisor Prof. Marc Sosef of the Biosystematics Group at Wageningen University. 'The thesis also contains search keys which enable the expert to quickly find out which black flies are present in a certain area', adds Sosef.

Sosef is referring, for example, to experts at the World Health Organization who want to eradicate the river blindness disease. The blackfly can be categorized into 25 sex groups and more than 2000 species, of which less than a hundred fall within the subgenus *Trichodagmia*. A number of these are carriers of the [nematode](#) which causes river blindness in humans. Hernandez explains in his thesis how to tell a harmful fly from a harmless one by looking at external and genetic characteristics.

Hernandez, born in Cuba, has been working for many years as a researcher in the Natural History Museum in London. He began his PhD

study under Sozef seven years ago. His main area of study is Latin America and he carried out field work in different countries for about half a year in total, says Sosef. That entailed a lot of camping by the sides of rivers where larvae of the blackfly end up in. 'It's hard work collecting these flies', says Hernandez from London, 'because we have to go into the river to find the [larvae](#). At the same time, a female fly has to bite one of us before we can be certain that it is a biting fly. Afterwards, we carry out the analysis in improvised field labs. That requires a lot of time. However, nothing can beat the joy of being in the jungle and hearing the sounds of waterfalls and singing birds.'

The research itself consisted mainly of painstaking work. Hernandez meticulously examined thousands of museum specimens to look for variations and to make specimens. Most of the flies have already been collected by institutions in the United States, Costa Rica, Guatemala, Brazil, Argentina and England. He not only did the time-consuming taxonomy work of manually sorting the flies into species based on external characteristics, he also did a DNA barcoding. This means that the DNA of a standard piece of the fly is read in order to characterize its species. By doing this, Hernandez also determined the genetic relationship, which had led in certain cases to minor adjustments of the family genealogy of the subgenus. 'The beautiful thing is that his morphological classification almost always matches the DNA analysis carried out afterwards', says Sosef. 'He has therefore interpreted his morphological observations very well and accurately.'

Provided by Wageningen University

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