A worm with five faces

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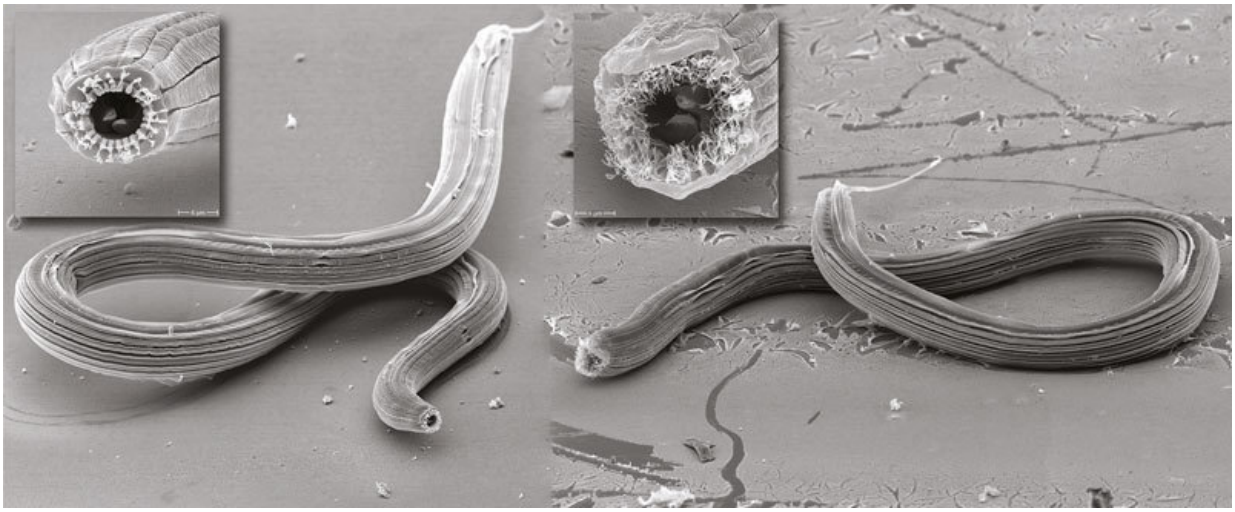

Two of five different morphs of Pristionchus borbonicus, heads magnified as inserts. Credit: MPI f. Devolopmental Biology

For eight years, a research team headed by Ralf Sommer and Matthias Herrmann travel to Réunion Island in the Indian Ocean. The scientists from the Max Planck Institute of Developmental Biology have now discovered a new nematode species on the island. The discovered nematodes live inside of fig plants and at first sight they look totally different. Much to their surprise, the scientists found that all the worms belong to a single species, which can develop five different mouth forms. The nematodes are genetically identical, however their food source decides on the mouth form. They are an extreme example of evolutionary divergence within a species.

The discovered roundworms, so-called nematodes, live inside of wild figs and hitch hike on tiny pollinating fig wasps to reach new fig flowers. Ralf Sommer's team called the new species Pristionchus borbonicus after the Île Bourbon, the old name of Réunion Island until 1848.

Much to their surprise, the scientists found that the tiny worms had five distinct mouth forms, differing so much from each other in their appearance that they were initially considered to belong to separate species. Conventional morphology, that is the study of the form and structure of organisms, examines organisms under the microscope and describes them as accurately as possible. Only by sequencing the nematodes' genomes, the Max Planck scientists managed to assign the five distinct mouth forms to a single species, namely the recently described Pristionchus borbonicus.

This is an extreme example of evolutionary divergence within one species and of variation in shape and form in the context of genetic identity. Interestingly, the researchers found similar roundworms of the same type in figs from Vietnam and South Africa. It is evident that the association with figs is a widespread phenomenon. "The different mouth forms of Pristionchus borbonicus, that we have found now, are specialized for the preferred intake of bacteria, yeasts or other roundworms. So, obviously they occupy different ecological niches within the fig", explains Ralf Sommer, Director of the Department for Evolutionary Biology. "With this team of specialists the species can exploit a large food spectrum and efficiently buffer fluctuations in the availability of a certain resource by changing the proportion of mouth forms."

Figs of Ficus mauritiana can be found growing on runners on the ground. Credit: MPI f. Devolopmental Biology

Until now Sommer and his team knew that the Pristionchus species, with which they have already been working for a long time, live on beetles and develop two different mouth forms, depending on the food supply and on the environment. Thus, Pristionchus develops either a short wide mouth or a long narrow one. The wide-mouthed variant, which has a single, characteristic tooth, is suitable for carrying out predatory attacks. The narrow version, in contrast, is mainly used for grazing on bacterial food sources.

Thus, the tiny fig fruit has once again proven its reputation as a highly complex, co-evolved ecosystem with the fig wasp as the transmitter that reliably colonizes each generation of figs with a large number of different bacteria, yeasts, other microbes and roundworms. To understand the role that Pristionchus borbonicus plays in this intricate system is an exciting new subject of research for the MPI scientists. They already plan their next journey to Réunion to find new types of figs and nematodes.

More information: Susoy et al. Large-scale diversification without genetic isolation in nematode symbionts of figs, *Science Advances* 2016;2:e1501031 (1 January, 2016)

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