Islands and their ecosystems

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Biologist Juliano Sarmento Cabral is an expert in ecological modelling, island geography and tropical ecology. Credit: Robert Emmerich

A few weeks ago, the biologist Juliano Sarmento Cabral (33) celebrated a handsome success. Together with former colleagues from the University of Göttingen, he published an article in the journal *Nature*.

One finding: In order to understand the diversity of species on islands such as Hawaii, Galapagos or the Canary Islands, you have to look far back into the past - at least as far as the last ice age 21,000 years ago.

During the ice ages, the sea level dropped by 120 metres. As a result, many islands became larger and better connected to each other or to the mainland. "The Seychelles, for example, were many times bigger," Cabral says. This promoted the diversity of species, especially of endemic species that occur exclusively on these islands: It is much higher than on islands whose size and isolation has remained more or less the same.

Simulating nature in virtual worlds

"Mountains on the mainland and on islands are very interesting for ecology research for a number of reasons," the new junior professor explains. "They often accommodate the development of new species unique in the world. And because these species are limited to a small geographical area, global change such as global warming and habitat loss can cause their extinction." Reason enough for the biologist to focus his research on the subject.

Anyone who wants to research ecosystems and their dynamics needs a thorough understanding of the processes inside the systems. Sarmento Cabral collects the required knowledge during field research but also using theoretical computer models and simulations. "In the simulation experiments, we create a virtual world inside the computer," he explains. The simulations are used to determine how varying temperatures, humidity or other environmental factors affect plants and animals.

Orchids and other epiphytes under the microscope

An example: Cabral's former doctoral student from Göttingen, Gunnar Petter, developed a model for epiphytic plants - including orchids, bromeliads and other plants that grow on trees in tropical rain forests. The model can be used to study the consequences of climate change, for example. When temperatures rise, forests will grow more quickly. This comes at a great cost for the epiphytes: Their number and diversity declines, because it spreads rather slowly and is therefore unable to keep pace with the forest.

Field research and computer modelling

The new junior professor will contribute to teaching by organising events about ecology and ecological modelling. Students wishing to join him in order to study such topics should take pleasure in ecological theories and in building computer-based models of ecosystems. They should also be willing to do field research.

Juliano Sarmento Cabral's career

Campina Grande is the second largest city in the state of Paraiba in the north-east of Brazil. Juliano Sarmento Cabral was born there in 1983. "In my country, even when you go for a short walk or hike, you already see many different plant and animal species," he says. Driven by a desire to understand this lush biodiversity, he studied biology at the Federal Rural University of Pernambuco in Recife, the capital of adjacent state Pernambuco.

How he ended up in Germany? "I was eager to learn about ecological modelling. But back then, this area was practised by very few Brazilian researchers." As an exchange student in the US, he heard of a research group at the University of Potsdam which was right up his alley.

So he relocated to Potsdam where he did his PhD in 2010. The universities of Göttingen and Leipzig were his next stops. At the start of the summer term 2016, Sarmento Cabral took on the newly created junior professorship for ecosystems modelling at the University of Würzburg. He is also a member of the new "Center for Computational and Theoretical Biology" (CCTB).

More information: Patrick Weigelt et al, Late Quaternary climate change shapes island biodiversity, *Nature* (2016). DOI: 10.1038/nature17443

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