Elitenetzwerk Bayern

Snippets of the research

MASTER THESIS

„Environment & Forest Structure“

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Elite Graduate Program „Global Change Ecology“

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The age structure of the pine forest

Moritz Stehmann studied in the Elite Graduate Program “Global Change Ecology” at the University of Bayreuth. There, as part of his master's thesis, supervised by Prof. Dr. Carl Beierkuhnlein, the ecologist investigated the influence of environmental variables on the demographic structure of the Canary Island pine forest. This gave him the opportunity to conduct independent research on La Palma.

The importance of the pine forest

Due to its special ecological characteristics, La Palma offers a unique real-world laboratory for ecological research. The high proportion of endemic species makes La Palma an exceptional location for deepening our understanding of evolutionary processes and discussing challenges for nature conservation.

The (western) Canary Islands are characterized by widespread pine forests that are subject to natural dynamics and consist almost exclusively of the pine species Pinus canariensis. Several characteristics make P. canariensis an outstanding subject for research. On the one hand, the Canary Island pine is able to regenerate very well after fires. Secondly, the Canary Island pine has an exceptionally wide ecological amplitude, found at altitudes ranging from 300 to over 2000 meters. This gradient encompasses a wide variety of climatic conditions, such as drought and frost.

In his master thesis, Moritz Stehmann combines field data with remote sensing data, such as digital elevation models, to comprehensively record the climatic factors influencing age structure. For example, he investigated the extent to which a signal from the last fire event can be found in the age structure.

By examining the relationship between environmental variables and the demographic structure of pine forests, regeneration mechanisms can be identified, thereby contributing to a better understanding of forest succession. Changes in fire intervals and the increasing influence of climate change are particularly important in this context. Furthermore, pine forests are important for La Palma's water balance, as Canary Island pine trees are able to collect condensation from the trade wind clouds above. Preserving this ecosystem is therefore also very important for the island's water supply and agriculture.

The role of disruptive events

In addition to basic climatic factors such as temperature and precipitation, Moritz Stehmann demonstrated the decisive influence of disruptive events (in this case, fires) on the regeneration of pine forests.

As disruptive events, fires create space, for example by opening up the canopy, which can then be used again by young trees. Given the Canary Island pine's high resistance to fire, it can be assumed that fires also serve to reduce competition from other plants. On the other hand, after a fire event, the forest stand initially ages, as existing young trees die due to a lack of mature fire resistance. An increasingly frequent fire regime jeopardizes the long-term regeneration of pine forests. It limits the ability to regenerate in a similar way to the complete absence of disturbances.

Formations of pine forest on La Palma under different climatic conditions: a) southern pine forest with recent rainfall, b) dry western location after a recent fire.

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