Newsletter

DFG Research Unit 816:
Biodiversity and Sustainable Management of a Megadiverse Mountain Ecosystem in Southern Ecuador

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Research Quality Approved!

Two researchers of the Research Unit (RU) were honored with German science awards on 4th November. The President of the Academy of Science and Literature in Mainz, Germany, Prof. Dr. med. Elke Lütjen-Drecoll, presented the Lauer-Award on Geoecology to Dr. Katja Trachte. Climatologist Trachte received the award which is endowed with 5.000 Euros for her PhD work conducted in the group of subproject D3. At the same event, Diploma Biologist Franca Marian was honored with the biodiversity advancement award from the Academy. Marian is PhD candidate in project A3 and was awarded for her Diploma thesis. Both young scientists introduce their work in the rubric *Science News* (pages 9 and 12). Images of both laureates are in the rubric *People and Staff* (page 20).

Speakers' Corner

Outreach and Future of Present Research

The 2011 Loja Symposium was wrapped in a very tight time schedule of different activities. Most of these efforts were related to the planning of a new research program beyond the second phase of our Research Unit (RU) starting in 2013, the platform for biodiversity and ecosystem research and monitoring in South Ecuador. To inform all members of the RU and other interested scientists in more detail, the scientific advisory board has decided to produce a special issue of the TMF Newsletter during the next weeks exclusively on this topic. Thus, the current issue only provides some information on the single events.

DFG and SENESCYT Discuss Joint Research Funding

The activities started with the visit of a high-level DFG delegation to Ecuador, again led by DFG Vice President Professor Dr. Elisabeth Knust. We are very grateful that she made it to Ecuador a second time this year. After a warming-up excursion in the surroundings of Quito, the delegation negotiated in the headquarters of SENESCYT (Secretaria Nacional de Educación Superior, Ciencia, Tecnología y Innovación) about a memorandum of understanding between SENESCYT and the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG) on the promotion and funding of joint German-Ecuadorian research activities. The text of the memorandum is recently under review in the law departments of both research funding agencies. It is expected to become signed within the next weeks. The memorandum will be an excellent basis to further

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strengthen the scientific collaboration of German and South Ecuadorian universities particularly in the framework of the platform which is specifically highlighted in the document as one example of cooperation.

First Transfer Project Outside Germany

Having arrived in Loja on 4th Oct, the delegation attended the inauguration of the first approved DFG Transfer project as an outreach from the present RU entitled *Nuevos bosques para Ecuador* in the Museo del Ministerio de Cultura (see following section in this issue). The well prepared and recepted inauguration ceremony constituted an appreciative frame for the beginning of the first DFG funded Transfer project outside Germany and what is particularly important with a remarkable number of private and non-commercial partners.

On the following morning, the second meeting of the initiator group for the platform took place. Completed by representatives of SENESCYT, SENPLADES Loja (Secretaría Nacional de Planificación y Desarrollo) and the University of Azuay (Cuenca) the meeting aimed at sorting out open questions regarding administrative, technical and funding issues for the platform. The meeting was concluded by a joint lunch after which the DFG Vice President had to leave Loja to return to Germany.

Successful Status Symposium

The 2011 Status Symposium on October 6th (with English presentations) and 7th (with Spanish presentations) was one of the largest we ever had in terms of the number of presentations and posters. It reflected the increasing interest of our Ecuadorian partners to

The third meeting of the initiator group was supported by guests from the various Ecuadorian partner organizations (f.l.t.r.): Renzo Paladines (NCI) Erwin Beck (RU), Bruno Paladines (NCI), Carlos Valarezo (UNL), Juan Pablo Suarez (UTPL), Joerg Bendix (RU), Thomas Knoke (RU), Reinhard Mosandl (RU), Alfredo Martinez (ETAPA, Cajas), Jan Faye (UC), Rodrigo Cisneros (UTPL). They discussed the general outline of the new research platform. Details will be published in a special edition of this Newsletter. Photo: Felix Matt.

Part of future research will be conducted in dry forests were trees regularly shed leaves in contrast to evergreen rainforests like in the dry forest in the Laipuna Reserve. Photo: Jörg Bendix.

contribute with oral presentations in both parts. Additional contributions came from the cooperating programs e.g. the DFG-Initiative "Acceleration of Biodiversity Assessment" (ABA Ecuador). With 27 talks in the English part, 28 poster presentations on both days and 13 oral presentations in the Spanish part, the RU could impressively demonstrate the extraordinary comprehensive knowledge gained during the last years. Fortunately, most PI's could attend the Symposium this year and hence, the discussions on our future plans in the subsequent member assembly were very efficient and fruitful.

On Saturday morning, the initiator group for the platform met a third time to discuss the general outline of the platform, the overall structure of the German and Ecuadorian research programs and individual project ideas. A forth meeting was agreed upon that will take place in Marburg, Germany, on December 16th and 17th this year.

Which Forest is the Best Choice?

The last and more relaxing duty was a three days excursion with representatives from Nature and Culture International (NCI) to inspect the NCI-owned reserves Laipuna, La Ceiba and Cazaderos in Southwest Ecuador, three potential candidates for the dry forest satellite of the platform. We are indebted to NCI for the excellent organization of the impressive and revealing trip and the competent and informative guidance by Renzo, Bruno and Pedro Paladines. It also deepened the personal relations between the leading representatives of NCI and our RU. After balancing pros and cons (accessibility, existing infrastructure, development potential, suitability for research in the framework of the platform etc.) it seems that Laipuna - where agricultural activities border the fenced reserve - could settle the race. In La Ceiba we had a very informative meeting with local farmers, who - organized and trained by NCI - have already started scientifically oriented monitoring activities which could be considered a forerunner of a citizen science program in the framework of the platform.

Jörg Bendix & Erwin Beck
Speaker & Deputy Speaker of the RU

To find out which dry forest will provide rewarding science grounds and will fit the needs best, the speakers compared the infrastructure of the three Reserves thanks to NCI's valuable organization: The building at the Reserva Laipuna (top, photo: Felix Matt), the visitor center at the La Ceiba Reserve (middle, photo: Jörg Bendix) and the building at Cazaderos (bottom, photo: Jörg Bendix).

Transfer Project

Inauguration Ceremony: "New Trees for Ecuador"

The first project to apply knowledge gained through the work of the scientists of the present and the preceding RU officially started. The project is entitled "Transfer project - Nuevos Bosques para Ecuador" and is funded by the German Science Foundation (DFG). It was officially inaugurated in the evening of October 4th in the Museum of the Ministry of Culture of Ecuador in the city of Loja. The event had the objective to merge Ecuadorian and German forces in the field of science, policy making and funding for the support of the new project. Leading authorities of governmental institutions, representatives of NGOs, private land owners and many scientists of the present RU attended the meeting.

Renzo Paladines, Executive Director of the Organization Nature and Culture International (NCI) mentioned in his introduction the importance of scientific cooperation between Germany and Ecuador in the past and expressed high expectations concerning the future results of the new project which addresses exactly the demands of Ecuadorian land owners.

Professor Reinhard Mosandl, Institute of Silviculture from Technical University of Munich (TUM), stressed the importance of transferring scientific knowledge developed in former DFG-projects into practice and expressed the hope that the transfer process will bring reversely empirical knowledge from Ecuadorian land owners into science.

The steering group of the project are from left: Professor Reinhard Mosandl, Sven Günter, Eduardo Cueva, Baltazar Calvas. Photo: Michael Weber.

Professor Elisabeth Knust, Vice President of the DFG, whished all collaborators success. Her speech was translated by Jörg Zeilinger. Photo: Felix Matt.

Professor Elisabeth Knust, Vice President of the DFG, explained the policy of Science Foundation concerning cooperation and funding scientific projects and technology transfer. For the start of the new project, which is the first Transfer Project in Ecuador approved by the DFG, she wished all participants success and good luck. **Dr. Janeth Torres** from National Secretary of Science and Technology (SENESCYT) announced the Ecuadorian state policy in the area of knowledge and human capacity building which has a high national priority and is currently supported by many programs.

Professor Franz Mackeschin from University of Dresden demonstrated the current threats of land degradation in his presentation about future challenges in land use. Increasing demands for food and biofuels will lead to a shortage of fertile agricultural soils and intact forest areas.

Professor Sven Günter initiated the first Transfer project. Photo: Reinhard Mosandl.

Professor Sven Günter, who has initiated the transfer project, presented in detail the objectives and the methodological fundaments of the proposed project. He mentioned the sound scientific knowledge of reforestation with native species which was achieved in ten years of research in the tropical mountain rain forests of South Ecuador by the research groups RU401 and RU816. In the Transfer project this knowledge will be used to promote the establishment of mixed forests of native species by underplanting pine plantations and *Alnus* stands. By this means monocultures can be converted into mixed forests with higher ecological and economic stability. Using *Alnus* and Pine stands as shelter for native tree species could be a new instrument for forestry in Ecuador.

The realization of the Transfer project will be accomplished by the **Baltazar Calvas** and **Eduardo Cueva**, two Ecuadorian scientists who had gathered experience in former DFG-research projects in Ecuador. Both have organized the inauguration ceremony of the Transfer project with the support of NCI in an excellent manner.

People From Eleven Institutions Will Cooperate

At the end of the ceremony a Memorandum of Understanding of all cooperating institutions in the Transfer project was signed. Besides the representatives of DFG, SENESCYT, the local universities, the Municipality, the Provincial Government and the private land owners all involved scientists signed the contract: Sven Günter (Tropical Agricultural Research and Higher Education Center, CATIE, Costa Rica), Reinhard Mosandl (Technical University of Munich, TUM, Germany) and Nikolay Aguirre (National University of Loja, UNL, Ecuador), who are addressing silviculture and tree diversity, Ute Hamer (Technical University of Dresden, Germany) & Patricio Aguirre (UNL), who will investigate soils and nutrient cycling, Mark Maraun and Stefan Scheu (University of Göttingen, Germany) & Juan Pablo Suarez (Technical University of Loja, UTPL), who will study the soil fauna, Matthias Rillig (Freie Universität Berlin, Germany), who will investigate the mycorrhiza and Bernd Stimm (TUM), who is in charge of the seed management and the nursery techniques.

Professor Dr. Elisabeth Knust, Vice President of the German Research Foundation (DFG), signes the memorandum of understanding together with Professor Dr. Reinhard Mosandl. Photo: Michael Weber.

Sharing Ideas on Sustainability

The event was well received by about hundred people attending the inauguration ceremony. Afterwards the participants used the opportunity to discuss future cooperation and shared ideas on sustainability and proper management of natural resources in a nice atmosphere. At the end the guests enjoyed a glass of wine and snacks while listening Lojano music performances and watching a dance troupe of ethnic Saraguro.

Baltazar Calvas, Sven Günter, Reinhard Mosandl

The people who signed the Memorandum of Understanding to support this project represent more than ten different institutions from Ecuador and Germany. Photo: Michael Weber.

News from the ECSF

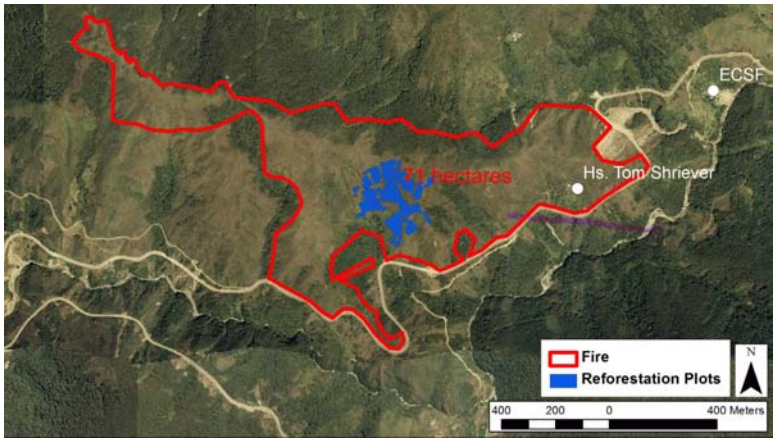
Fire Close to the Station

On Saturday 22nd of October around 9:00 AM a fire started some 600 meters away from the Research Station (ECSF) just above Tom Shriever's house. Due to wind and extremely dry conditions it reached Loma Chamusquin very fast, where it "overran" the fire-break established recently by the foresters. The fire destroyed parts of Loma Chamusquin which belongs to the Universidad Técnica Particular de Loja (UTPL). Several groups from the UTPL and some of the RU are working on there. The forester's reforestation plots in the sector were burnt. With help of the Secretaria Nacional de Gestion de Riesgos (SNGR), the firefighters from Zamora and Loja, as well as 170 soldiers from these provinces finally brought the fire under control on Monday. Approximately 71 hectares were burnt mainly consisting of scrubland, bracken fern and forest remains. We are analyzing possible reasons for the outbreak of the fire to be able to consider which actions can be taken.

We're very grateful to all of the public institutions mentioned above and the whole ECSF crew for their great work.

Ecuadorian National Science and Technology Plan

SENESCYT (Secretaría Nacional de Educación Superior, Ciencia, Tecnología y Innovación) and SENPLADES (Secretaría Nacional de Planificación y Desarrollo) are developing a national plan for science and technology. The MAE (Ministerio de Ambiente) is involved in the planning of environmental research activities. The local coordinators togehter with other institutions and actors related to science and investigation assisted in two meetings which were organized by SENESCYT and MAE, respectively.
More information is available at:
http://www.somosciencia.gob.ec



In the beginning the fire wasn't wide spread. The picture was taken about 35 minutes after its start near Tom Shriever's house above the street (top, Photo: Daniel Kübler). A short time afterwards it jumped over the fire break. The soldiers, fire fighters and station staff and residents not only had to fight the flames but also had to struggle with steep terrain and blazing hot sunshine (second from top, Photo: Kristin Roos). The fire was finally extinguished and spared Tom's house (above traffic sign, third from top, Photo: Felix Matt). The flames destroyed more than 70 hectares with reforestation plots in the middle (bottom, Graphic: Daniel Kübler).

Visit of German Military Attaché

Oberstleutnant i. G. Christoph Gambka ("im Generalstab") from the Joint Chiefs of Staff, visited the ECSF at 28th September. He is the German military attaché working at the German embassy in Santiago de Chile and he is also responsible for Ecuador. The objective of his visit was to introduce the work of the RU to Mr. Gambka and to discuss the LiDAR project. Laser scanning from a helicopter will generate very helpful data for several groups of the RU.

Closing of the Airport of Loja

Still there's no official date or time schedule for the construction of the new terminal building and the reinforcement of the runway. We will keep you informed.

Jörg Zeilinger & Felix Matt

News from NCI

NCI Gets Support for Conservation

Thanks to the generous support of different individuals and organizations, especially the Overbrook Foundation, NCI committed its institutional efforts which started in December 2007. Since then it helps Municipalities to conserve the watersheds through payments for environmental services (PES-mechanisms) and to help the Environmental Ministry on the implementation of the *Socio Bosque* program and on the development of the National Strategy to prevent deforestation and degradation (REDD+). In the *Socio Bosque* program the National Government provides economic incentives to indigenous communities and small landowners to preserve native forest. REDD+, the National Strategy for the Reduction of Emissions for Deforestation and Degradation, is a financial mechanism that aims to preserve the forest while reducing poverty through the forestry carbon markets.

One of the many of the organization's activities in Ecuador is the conservation of water sheds. Photo: NCI.

NCI has accomplished substantial achievements and gained a well-recognized position as a mentor and facilitator for the execution of these three conservation strategies in Southern Ecuador. Recent achievements include:

1 Conservation of Watersheds (FORAGUA, which is a trust fund for the conservation of natural ecosystems in the watersheds of Southern Ecuador, see also TMF Newsletter 3, http://dx.doi.org/10.5678/lcrs/for816.cit.1008)
   - Six Municipal Councils approved ordinances for the protection of watersheds with more than 93,000 acres declared as municipal reserves. Those fragile ecosystem supplies water for more than 250,000 people.
   - Technicians from the local municipalities have received basic training on: Geographic Information Systems (GIS), preparation of investment plans for conservation, mapping and land zoning, natural reserves management, and environmental education campaigns.
   - NCI has been the leader on fundraising assistance to complement local funds resulted in new investments totaling $ 933.900 USD to enlarge and strengthen municipal watersheds conservation programs.
2 Forest conservation incentive program (*Socio Bosque*)
   - NCI is the only non-governmental organization that maintains an official agreement with the Environment Ministry to support the implementation of the *Socio Bosque* National program in Southern Ecuador. 52% of the land surface inscribed under this program was achieved by NCI thanks to this agreement.
   - NCI is providing technical assistance to build the capacity of the beneficiaries in: investment planning, money management, communal organization and sustainable forest management to ensure the delivery of maximum benefit from the incentives.
3 Reduction of deforestation and degradation (REDD+)
   - We have collected most of the carbon stock data and land cover studies in Southern Ecuador, necessary for the design of the REDD+ project.

Based on the successful results obtained in the last four years, we have got a new grant to continue working on these conservation programs. With this NCI will complete the baseline studies and develop ordinances with two new municipalities for their integration to FORAGUA. It will also inscribe additional 12,000 acres into the *Socio-Bosque* Program and complete carbon stocks assessments in the upper Amazonian tropics.

Renzo Paladines, executive director of NCI, (left) hands over the Conservation Award of NCI to Professor Erwin Beck. The price honors Beck for his continuous commitment during the last 15 years and is featured by an Ovenbird on its nest. Ovenbirds are small songbirds from the News World warbler family. Photo: NCI.

NCI Awards Professor Erwin Beck

Every year NCI presents an annual report of the activities implemented along the year in Southern Ecuador. As central part of the program in October this year Professor Dr. Dr. h.c. Erwin Beck received the “Conservation Award” of NCI for his exceptional work on research and development of knowledge and for his support for the implementation of the “Biodiversity and Sustainable Management of a Megadiverse Mountain Ecosystem in South Ecuador” research programs implemented with base at the San Francisco Scientific Station, since 1997. NCI is deeply thankful to Professor Beck for his confidence and commitment to the research and conservation initiatives developed along the last 15 years.

Bruno Paladines,
is an ecologist who directs NCI’s
programs for community development

In this section Nature and Culture International (NCI, www.natureandculture.org) introduces its activities and reports recent progress. NCI is a non-governmental organization whose mission is to assist in the conservation of biological and cultural diversity.

Science News

Nocturnal Convective Clouds

The formation of nocturnal convective clouds at the eastern Andes of South Ecuador and the adjacent Peruvian Amazon basin was investigated in a numerical model study [1] in project D3. Clouds are part of the hydrological cycle, influencing water resources and the energy budget. Understanding cloud generation processes helps understanding the structure and functionality of an ecosystem and its biodiversity. The main objective of the study was to analyze the mechanism of an unidentified nocturnal cloud formation process. This mechanism is an interactive procedure of nocturnal downslope flows in the Andean terrain, which forms a concave drainage system in the target area. Cold drainage of air induces a surface cold front in the foothills of the eastern Andes, which initiates moisture convection due to compressional lifting by the terrain. Satellite imagerys (GOES) were used for both the identification of a sample case (12th October 2009 – 13th October 2009) with a nocturnal cold cloud appearance and for the verification of the simulated results. The cloud patterns were distinguished on the basis of brightness temperatures (Figure 1 a). The highland-lowland interactions in the lower troposphere were examined with the numerical model Advanced Regional Prediction System (ARPS). ARPS was used to confirm the presence and generation of the expected underlying processes, i.e. katabatic flows and their convergence due to the shape of the Andean terrain (Figure 1 b). Thus, the study demonstrated a new convective cloud development in the tropcis that is explicitly driven by local topographical features.

Katja Trachte

References

[1] Trachte, K., 2011: Cold air drainage flows and their relation to the formation of nocturnal convective clouds at the eastern Andes of South Ecuador. Philipps University Marburg. Ph.D. thesis.

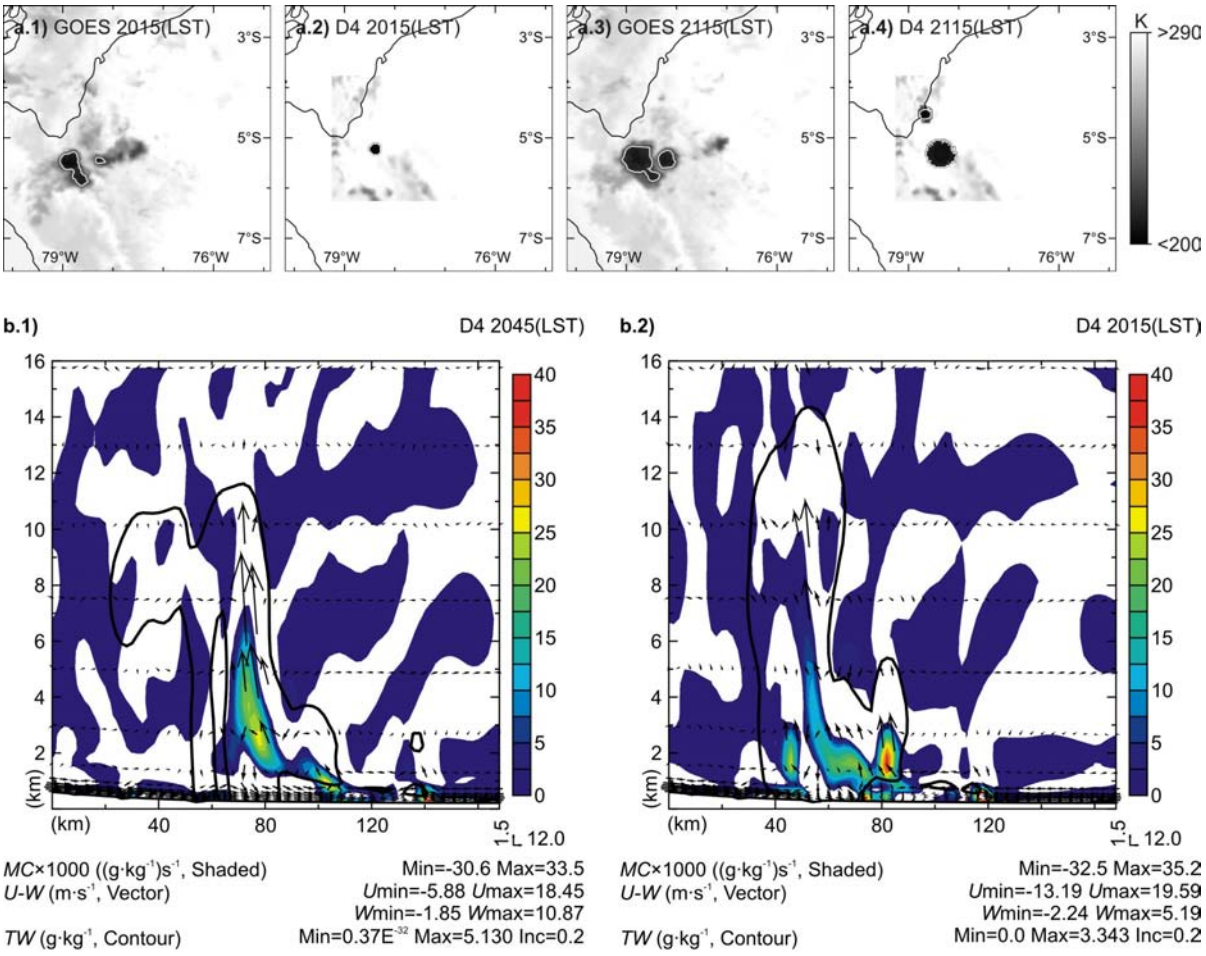


Figure 1: GOES-E brightness temperatures [10.2 - 11.2 µm, K] (a.1, a.3) and ARPS brightness temperatures [K] (a.2, a.4) with a white contour [220 K] for 2015 LST and 2115 LST and vertical cross-section of horizontal moisture convergence amplified by a factor of 1000 (MC, shaded, [(g/kg)/s]), the wind field in uw-direction (vectors [m/s]) and the total condensed water (TW, solid line [g/kg] at a) for 2000 LST and 2045 LST (b.1, b.2). Reproduced from [1].

Soil Microbial Structure and Function Disconnected

Land-use changes from forests via pastures to abandoned pastures can strongly alter soil processes like carbon (C) and nutrient cycling which are mediated by soil microorganisms. Such impacts on soil microbes have consequences for ecosystem production, long-term sustainability and C-sequestration. This can switch the soil balance form C source to C sink or vice versa. This may also alter function (microbial growth and metabolism) and structure of soil microorganisms.

Our investigations along the land-use gradient in project B3 [1] showed, that microbial activity and amount (total phospholipid fatty acids, PLFA) were mainly regulated by nutrient and substrate availability, whereby the microbial community structure was mainly driven by soil chemical properties. The input of alkaline ashes from forest burning increased the soil pH value significantly (Figure 2 A), which was the most important trigger for a changed microbial community structure after forest-to-pasture conversion. The higher quantity and quality of above- and below ground biomass input by the *Setaria*-grass resulted in a higher availability of organic substrates and nutrients (as can be seen in Figure 2 B by the lower C/N ratio in the pasture soil) to soil microbes in the pasture compared to forest soils. An increased amount of soil microbial biomass (Figure 2 C) was detected in the active pasture soil. Microbial activity significantly increased in the active pasture as indicated for example by a higher ratio of soil microbial biomass nitrogen to total nitrogen (MBN/TN [%], Figure 2 D). The displacement of *Setaria*-grass by bracken followed by pasture-abandonment induced a rapid decline in the beneficial effects of increased nutrient cycling to forest levels. This was shown e.g. by an increased soil C/N ratio and by a decreased ratio of MBN/TN (Figure 2 B, D). The number of soil microorganisms of the abandoned pasture declined. Their activity but not their community structure shifted distinctly due to remaining high soil pH levels. This indicates that microbial structure and function are disconnected. To find strategies for sustainable long-term pasture systems such relations have to be kept in mind since even an initial status of bracken-invasion can strongly influence the microbial amount and activity and thus carbon and nutrient cycling.

Karin Potthast & Ute Hamer

Reference

[1] Potthast K, Hamer U, Makeschin F (in print). Land-use change in a tropical mountain rainforest region of Southern Ecuador affects soil microorganisms and nutrient cycling. *Biogeochemistry*. doi: 10.1007/s10533-011-9626-7.

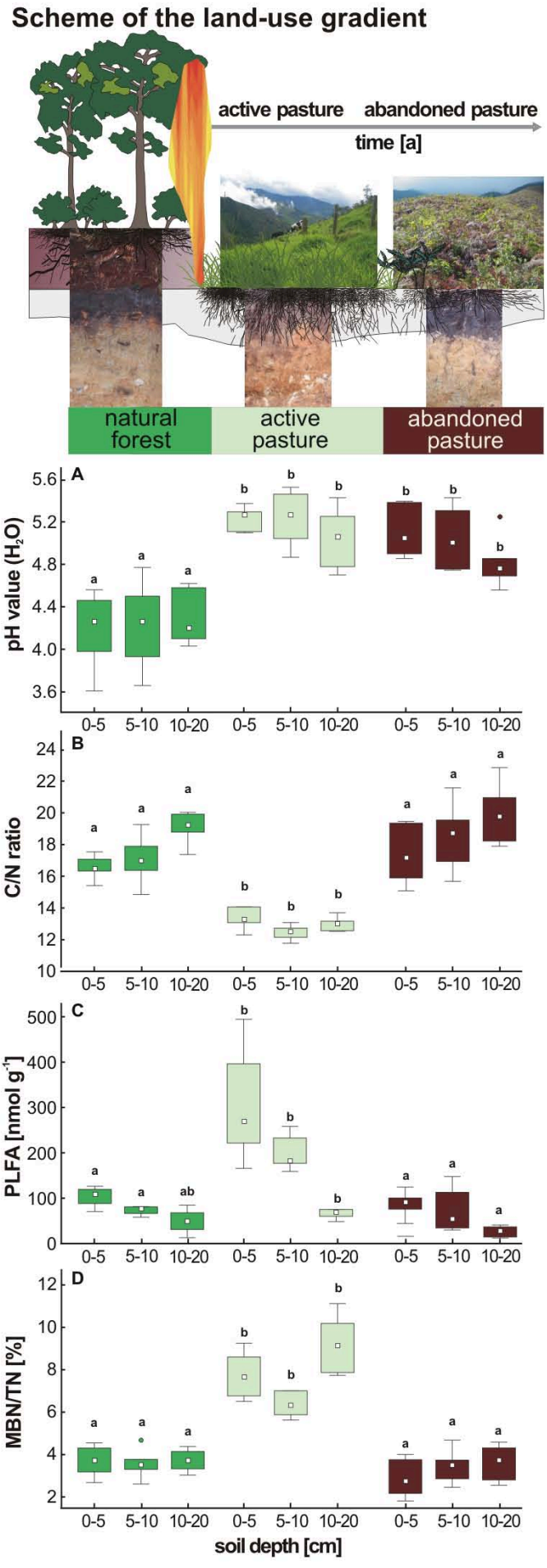


Figure 2: Relationships between land-use changes from forests via pastures to abandoned pastures on the pH value (**A**), the ratio of carbon and nitrogen (C/N in **B**), the amount of phospholipids fatty acids (PLFA in **C**), and the amount of microbial biomass nitrogen (MBN) related to the total nitrogen (TN) content (**D**) of mineral top soils 0-5, 5-10, and 10-20 cm depth, respectively. Significant differences between the medians (± quartile ranges) of land-use types are indicated by different letters (n=6, Tukey-test, $p<0.05$).

The Riddle of the Seasons

Precipitation in the South of Ecuador is a complex phenomenon and the most heterogeneous climate factor influencing ecology, geodynamics, culture and society. Precipitation shows a unique seasonal behavior for the eastern and western escarpment of the Andes. Its amount, intensity and daily cycle varies even from valley to valley.

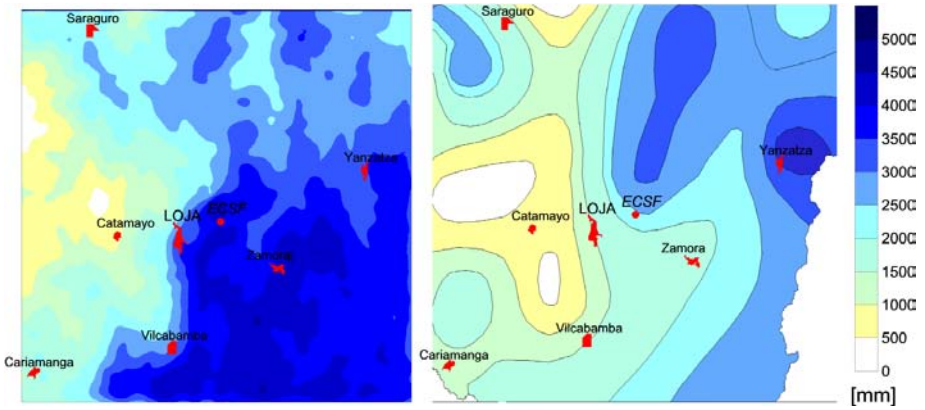


Figure 3: Precipitation in the study area. Blended product of radar and station data (left) vs. interpolated rainfall map from governmental station network (right) showing the large underestimation represented in the maps of the national weather service INAHMI. Figure redrawn from [1] with permission from Elsevier.

To understand the distribution in time and space and the processes and factors causing these patterns, a sophisticated instrumental setup was implemented, consisting of a horizontal scanning weather radar, a vertical rain profiler, a distributed network of rainfall- and fog-collectors and Present weather sensors, to register microphysical characteristics of precipitation. This ground base setup was complemented by satellite cloud observations and regional climate models.

Six years of data went into the final analysis. Specific methods had to be developed, to compensate for inherent measurement restrictions and to address problems of data collection.

The horizontal scanning radar captures a lot of background noise and suffers from strong geometric signal distortion. A novel approach allowed me to correct the images, in the absence of a reference network of precipitation gauges on the ground. Strong efforts also went into the data from the fog collectors, whose characteristics and performance is still a matter of discussion in the scientific community.

The main results are high-resolution maps of precipitation distribution on a small time step (1 hour). Synthesizing these data with satellite observations and the modeling approach enabled the identification of the most important precipitation generation mechanisms in the region. A much more realistic map of the annual totals of precipitation could be produced (Figure 3).

More interesting even was the detection of the complementary seasonality of the both sides of the main Andean ridge (Figure 4).

This seasonal behavior is coupled to specific precipitation types. The longtime assumption was, that the higher mountain regions receive advective rain and convective showers are restricted to mountain basins and the lowlands. However, the patterns observed in this study reveal a much more complex interaction of climatological and topographical features:

- During the rainy season of the eastern escarpment the whole region is dominated by advective events driven by the strong tropical easterlies blowing with great uniformity from NE to SE.
- In the shorter dry season from September to December, the whole region shows a much more „tropical“ behavior (Figure 5).

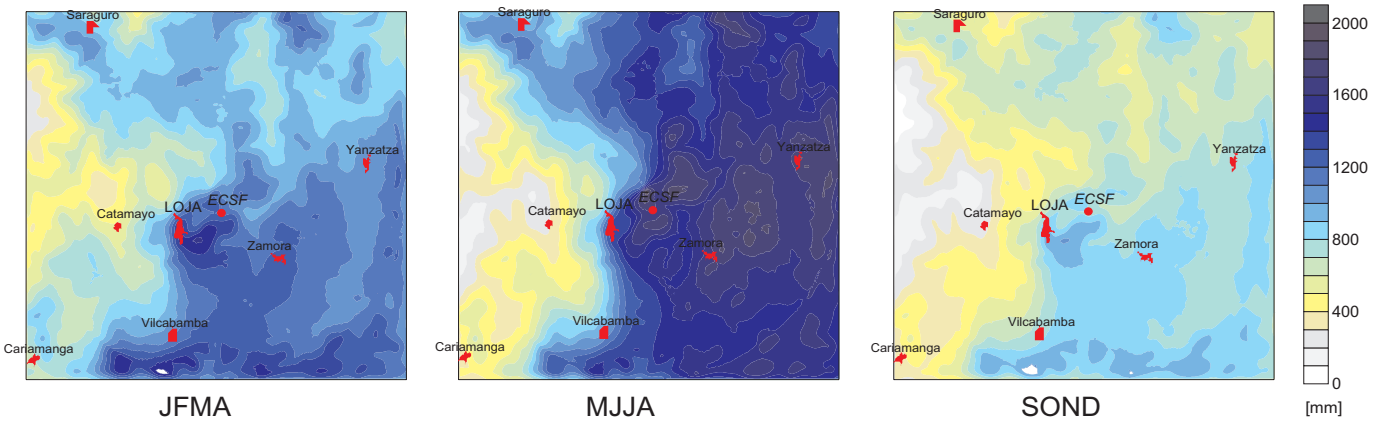


Figure 4: The typical three seasons in the region of Loja. The eastern escarpment follows a typical south hemispherical cycle with the rainy season from May to August (middle), the western part of the region exhibits a North-hemispherical (tropical) pattern, with a precipitation maximum in February / March (left) and the driest period in June to August. September to December (right) shows the typical dry season of the „veranillo del Niño“. Figure redrawn from [1] with permission from Elsevier.

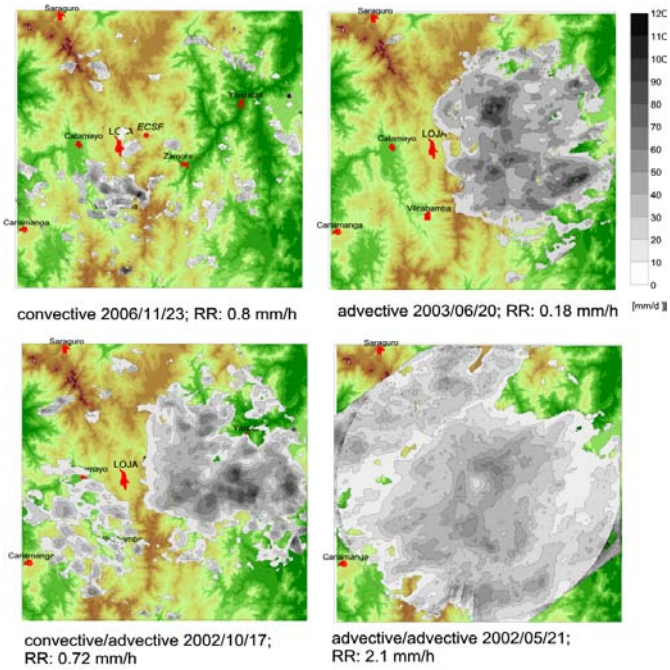


Figure 5: Four examples of daily precipitation distribution: convective events during „veranillo" (top left), mixture of conevection and advection (bottom left). Advective rainfalls only on the eastern escarpment (top right) or covering the whole region with strong rain rates (RR, bottom right). Figure redrawn from [1] with permission from Elsevier.

- A special phenomenon in the dry season of the eastern escarpment is the formation of cold air drainage to the eastern foot zone of the Andes. Those drainage flows converge with warm air masses from the Amazon basin and form a local coldfront, which leads to meso-scale cloud systems with strong rain fall. The decaying remnants of these cloud systems are later displaced westwards into the higher mountains, where they are registered as an unusual predawn precipitation maximum.

Precipitation formation is apparently governed by two main features of the region. The topographic pattern of the mountain ridges induces a strong east-west gradient. The temporal patterns are modified by the annual displacement of the intertropical convergence zone, perpendicular to the east-west gradient. Hence, the region of Loja represents an important mixing zone between Amazonian and Pacific ecosystem influences. These climatological patterns induce a heterogeneous spatial structure, which contribute to the high geo- and biodiversity of the region. Further variations are caused by long-term oscillations like the El Niño/ La Niña-Southern Oscillation (ENSO) and the Pacific decadal oscillation (PDO), which impose variations on the precipitation amounts and distribution.

Rütger Rollenbeck

Reference

[1] Rollenbeck, R. & Bendix, J. (2011): Rainfall distribution in the Andes of southern Ecuador derived from blending weather radar data and meteorological field observations. *Atmos. Res.* 99: 277-289. doi: http://dx.doi.org/10.1016/j.atmosres.2010.10.018

Decomposition and Microarthropod Colonization at Different Altitudes

The study in project A3 was conducted as a litterbag field experiment to investigate the effect of altitude and litter origin on the decomposition rate, litter quality, microbial community and microarthropod colonisation of leaf and root litter along an altitudinal gradient at 1000, 2000 and 3000 m in a tropical mountain rain forest in southern Ecuador. At these altitudes leaf litter from the three most abundant tree species and roots of three different sizes were collected and dried by 60°C. 10 g of dried leave and root material were placed in litterbags at each altitude. After 6 and 12 months the remaining dry mass, the C/N ratio, percentage of nitro-

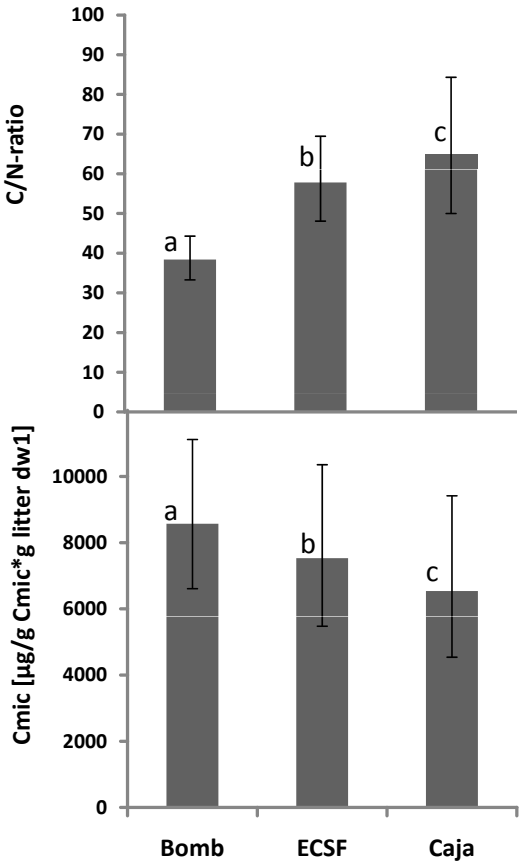


Figure 6: Effect of altitude on the C/N-ratio of the litter-material and the microbial biomass [Cmic] measured in the litter (Bomb = Bombuscaro at 1000 m a.s.l.; ECSF = at 2000 m a.s.l.; Caja = Cajanuma at 3000 m a.s.l.). Image: Franca Marian.

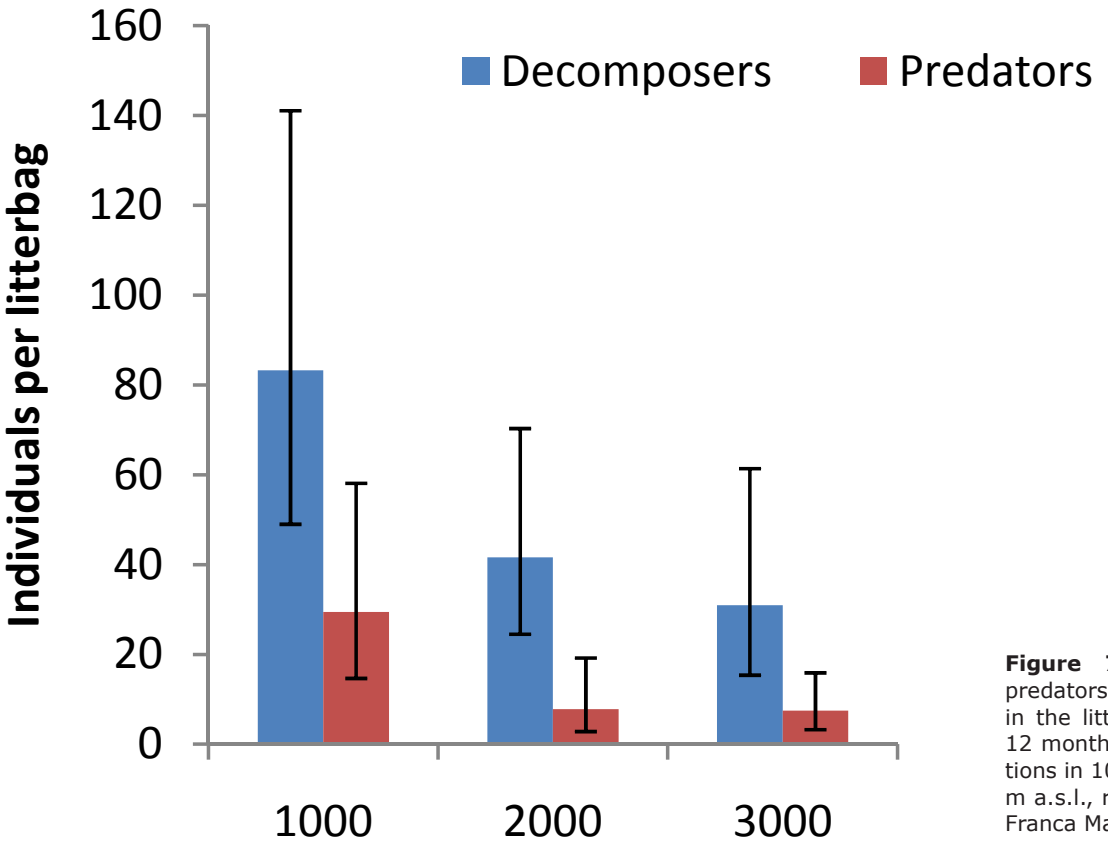


Figure 7: Distribution of predators and decomposer in the litterbags after 6 and 12 months at the three locations in 1000, 2000 and 3000 m a.s.l., respectively. Image: Franca Marian.

gen and carbon, ergosterol content, basal respiration, microbial biomass and colonisation by microarthropods were determined.

The quality of the litter material declined significantly with altitude. The microbial parameters were closely correlated with this pattern and therefore the quality of the litter and its origin (Figure 6). Surprisingly, the density of microarthropods correlated poorly with litter origin, and this was also true for the interrelationship between microarthropod decomposers and microorganisms. The density of microarhtropod decomposers and predators declined markedly with altitude (Figure 7), suggesting that they were driven by site-specific conditions.

It is therefore hypothesized that both litter quality and microorganisms are of minor importance as food substrate for decomposer mesofauna. Rather the mesofauna is likely to depend on root-derived resources. A similar pattern was found for the decomposition rate, with the main modifying factor being the altitude on which the litter material had been placed (Figure 8).

The origin of the litter and therefore its quality did not significantly affect the decomposition process, and microbial biomass also correlated poorly with decomposition rates indicating that microbial parameters and litter quality do not strongly affect decomposition. This suggests that site specific conditions, e.g. root derived resources, temperature, and humidity, are the dominant driving factors of decomposition processes.

Franca Marian

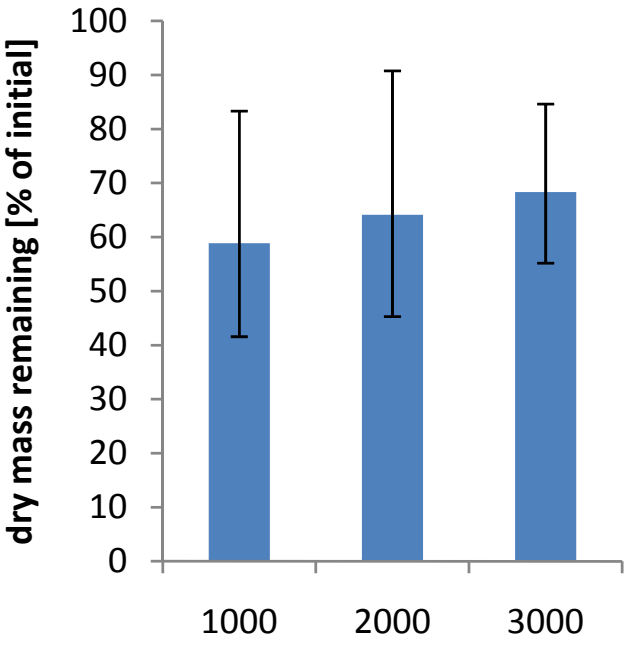


Figure 8: Remaining dry mass in the litterbags at 1000, 2000 and 3000 m a.s.l.. Image: Franca Marian

Cooperations

EDIT is a collective of 29 institutions which aims to provide accountable tools to taxonomists, to significantly accelerate global taxonomic knowledge. The RU cooperates with researchers from EDIT since 2009.

Biodiversity of Long-legged Flies: 200 Species Along the Altitudinal Gradient

Although long-legged flies (Dolichopodidae) are a speciose dipteran family, records from Ecuador are very rare. Hence our invertebrate survey situated in the frame of EDIT and conducted in and near Podocarpus National Park.

To achieve a representative sample of the dolichopodid fauna of the National Park and the Reserva Biológica San Francisco (RBSF), sites at Bombuscaro (1000 m), RBSF (2000 m) and Cajanuma (3000 m) were investigated. At each location, one primary and at least two supplementary sites were selected. The basic set-up in a primary site consisted of 1 Malaise trap (MT), and 4 units of 10 pan traps (PT) of 4 different colors (yellow, white, blue, red, see Figure 9). At each supplementary site, one single unit of 10 yellow pan traps was in operation. During a three weeks period between mid February and early March 2009, 3 Malaise traps and 200 pan traps were permanently operated, yielding 603 samples. Sweep-netting (SW) produced an additional 167 samples.

At present, all PT and MT samples, together with the SW samples gathered in the RBSF have been processed. A total of 3,252 specimens were identified to morphospecies level, resulting in 199 different species (= γ-diversity), many of them probably new to science. Thirty-six genera were represented, with 7 new to science (Figure 10) and 4 currently unplaced. Despite the larger number of RBSF samples included in the analysis, species turnover (β-diversity) between the faunas of the successive altitudes proved to be marginal (see Figure 11). Species richness estimates based on the combined MT-PT samples suggest that the overall dolichopodid diversity at the Cajanuma site is substantially lower (α =35) than that at the other sites (α=55-58). The estimate of the actual biodiversity (S*1 - Chao1) based on these combined samples indicates that at least about 230 species can be expected in the locations under investigation.

Marc Pollet,
Research associate RBINS,
Brussels, Belgium

Figure 9: The flies were caught with two types of traps: Malaise trap installed in the Reserva Biológica San Francisco (RBSF) site (left); yellow pan trap at the Cajanuma site (right). Images: Marc Pollet, EDIT.

Figure 10: This species of a new genus of Achalcinae (Dolichopodidae) collected at Cajanuma is one of the many species new to science. Image: Marc Pollet, EDIT.

More information:

http://www.naturalsciences.be/cb/ants/projects/andes-mountain-forests-dolicho.htm

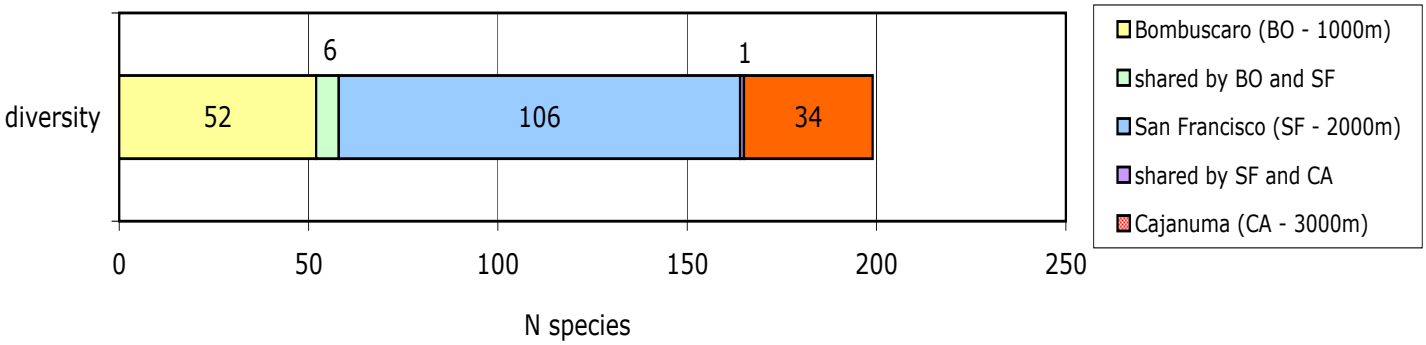


Figure 11: Dolichopodid species turnover between locations at three altitudes in Podocarpus National Park and RBSF. Both species unique to one single location (yellow, blue, orange) and species collected in two locations (green, violet) are indicated. The high number of species at RBSF is in part due to the inclusion of identifications from sweep-net samples only at this altitude. Image: Marc Pollet, EDIT.

Pseudoscorpiones and Opilionida on Tree Barks

In the course of our MACAG-Project ("Monitoring of Arthropods along Climate and Altitude Gradients", see TMF Newsletter no. 8: http://dx.doi.org/10.5678/lcrs/for816.cit.1003) 339 tree bark arthropod samples (2007-2009, 29 plots in Podocarpus NP at 1000-3000 m a.s.l.) have been analyzed for ecological aspects like altitudinal turnover of composition and diversity on basis of morphospecies sorting. Meanwhile, for different arthropod orders progress is also made towards taxonomic diversity, amongst the pseudoscorpions and opilionids.

First Record in South America

In cooperation with V. Mahnert (Muséum d'histoire naturelle Genève), 333 pseudoscorpion specimens were sorted to 15 different species, most of them probably new to science. *Leptocheiridium pfeiferae* [1] (see Figure 14) is a new species and genus within the Cheiridiidae: Pycnocheiridiinae. This new species from the 2000-m-level represents the first record of this subfamily for South America. R. Pinto da Rocha (Museum Sao Paulo) assigned 238 specimens of opilionids to 15 almost unknown species out of four families of "Laniatores". "Palpatores" (only Sclerosomatidae: Gagrellinae) still have to be analyzed.

Figure 14: Pseudoscorpions are arachnid predators, only a few millimeters in size. The photographed species recently has been named *Leptocheiridium pfeiferae* [1]. Image: Jürgen Schmidl, EDIT.

The taxonomic results show that these two arachnid groups do not reach the diversity found amongst beetles from the same samples (Coleoptera: 3908 specimens, 878 morphospecies, 58 families). Nevertheless the proportion of new/unknown taxa is very high, indicating the overall diversity and uniqueness of the Podocarpus NP area as well as the high taxonomic output of the bark spray sampling method which yields predominantly small arthropod species ("microarthropods") almost unknown to science so far.

Dr. Jürgen Schmidl, Department of Biology, Univ. Erlangen-Nuremberg, Germany, Research associate RBINS Brussels, Belgium

Reference

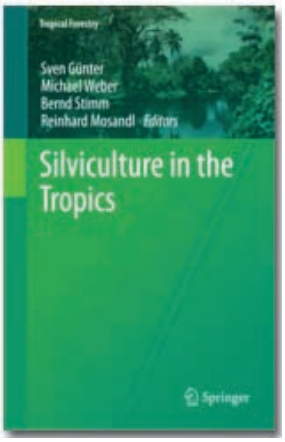
[1] Mahnert V. & J. Schmidl (2011): First record of the cheiridiid subfamily Pycnocheiridiinae from South America, with the description of Leptocheiridium gen. n. (Pseudoscorpiones: Cheiridiidae). Revue suisse de Zoologie 118 (4): 1-8, in Press.

Event Calendar

16-17 Dec. 2011	Next Meeting of the Initiator Group to construct the new re search platform at Marburg, Ger many .
22-25 Feb. 2012	The next conference of the Society for Tropical Ecology (*gtö*) is entitled "Islands in land- and seascapes - The challenges of fragmentation" and will take at the University of Erlangen, Germany. See program in the rubric miscellaneous.
25 Feb. 2012	Member Assembly of the RU after the *gtö* conference, University of Erlangen, Germany: 4 - 7 p.m.

Publications

Silviculture in the Tropics



The authors and editors of this volume report about case studies and offer review chapters about latest global developments in forestry science and practice with special emphasis on tropical forests. They also put forward possible silvicultural contributions towards sustainability in a changing world. Social dimensions on the development of silvicultural concepts are another spotlight. The volume covers ecology and silvicultural options form all tropical continents, and forest formations ranging from dry to moist forests and from lowland to mountain forests.

More information:

Günter, S.; Weber, M.; Stimm, B.; Mosandl, R. (Eds.)
Silviculture in the Tropics, Tropical Forestry Series, 1st Edition, 2011, 559 p. ISBN: 978-3-642-19985-1. Details:
http://www.springer.com/life+sciences/forestry/book/978-3-642-19985-1

Data Warehouse News

The Screenshot summarizes the new features for users of the FOR816dw presented on or inspired by the Data Warehouse Workshop in Loja. The text below provides information about circled elements. Screenshot: Thomas Lotz.

Find Datasets! New Search Features

To be able to browse the continuously growing data stock of the Data Warehouse (FOR816dw) a new search module has been developed additionally to the existing quick search. This "**Extended Search**" (see Figure) allows to specify your search interest by choosing various criteria: Temporal, spatial, content-related, personnel- or project-related filter settings can be choosen. The spatial area of interest can be graphically selected by the MapViewer module (it has been described in the Data Warehouse News in TMF Newsletter no. 11: http://dx.doi.org/10.5678/lcrs/for816.cit.1000 p. 12).

To search content-related you are able to set a filter on attribute level. Attributes define the characteristic of the values that are stored in the datasets. This are the columns of a table or the content of a spatial raster. To easily browse the about 800 defined attributes in the FOR816dw, a categorization into discipline specific

and descriptive sub categories has been realized in collaboration with the users. You can browse through those categories in our new module "**Attribute Category Tree**". It contains all information of all attributes and provides a quick search to find your sub category or attribute of interest.

Select one or more attributes in the "Attribute Category Tree" to add it as criteria to the "Extended Search" and find those datasets that contain corresponding values. By the way: The "**Attribute Categories Tree**" can also be used to browse directly for datasets, because it contains links to show all datasets belonging to a sub category or attribute.

Maintain Datasets! New Structuring and Editing Features

Uploaded datasets and their values can now be edited via a new user-friendly web page. Access to the "**Edit Dataset Page**" is restricted to the dataset creator and the corresponding project leader. They are able to revise the full metadata description and might also add or correct data values whereby a snapshot of the old version is archived on the server. All editing possibilities are described in detail on the help page "Help > Data Services > Upload and maintenance".

Another important feature to maintain and structure data in a dataset is the recently implemented "**Concept of Entities**". An entity is a set of data presented in a table, spatial raster or any other type of data format (e.g. photograph, text document, sketch). If technically necessary one entity may contain more than one data file. But the great advance is, that one dataset can contain more than one entity. The advantage is that you can combine the information of different **data types** in one dataset and create an individually structured dataset containing and describing a wide range of research data.

Data Warehouse Workshop in Loja

Next to the annual symposium of the RU the data manager invited all interested members to a Data Warehouse Workshop on 5th of October 2011 at the UTPL in Loja. On this workshop basic usage, new implemented features (see above) and the future developments of the FOR816dw were presented and discussed. 19 scientists (3 PIs, 1 post doc, 13 Ph.D. students, 2 diploma students) attended the half-day workshop and gave constructive feedback to the development team to assess the relevant user requirements.

Some Outcomes of the Meeting

- During every dataset download the users are reminded to fundamental points of the FOR816dw "**Data User Agreement**", which is the basic for data sharing in the collaborative RU.
- In near future we will implement a view for the dataset owner to keep track who downloaded his/her dataset.
- RU members are able to **upload** their **posters and oral presentations** to the stock of FOR816 publications to make them available for other researchers.
- The frequently asked datasets of high-resolution climatic time series will be additionally available as temporal aggregated (daily, monthly) derivatives.
- A "**User feedback field**" is now available on the webpage, accessible after login in the left column on every page. The user can enter a question, problem or idea and send it directly to webmaster and data manager. Automatically the logs of the last user actions are appended, to enable the debugging of the problem.

Thomas Lotz (Data Manager),
Maik Dobbermann (Developer and Webmaster)

Miscellaneous

Presentation of Projects

The exhibition entitled Land*schafft*Ressourcen meanwhile arrived in the capital of Berlin. The topics focus on research projects funded by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG). The work of some of the groups of the RU are displayed in the themes "water" and "functions of landscape". There will be a parliamentary evening soon (dates, places, opening hours: www.landschafftressourcen.de).

Lutz Breuer & esw

Each of the five topics (soils, water, renewable raw materials, global change and functions of landscape) are displayed with ample hands-on experiments. Images: Albia Consul.

Forestry students from the Universidad Nacional de Loja (UNL) analyze wood slices from trees. They trained basics skills like sampling and analyzing methods as well as sophisticated modelling practices. The workshop in which they participated was conducted by Achim Bräuning and his team. Photo: Achim Bräuning.

Workshop: Wood Anatomy and Dendroecology

During a week, from September 30th to October 4th, a workshop was offered at the laboratory for dendrochronology and wood anatomy at the Universidad Nacional de Loja (UNL). Fifteen forestry students trained field methods like how to collect wood samples from living trees with the help of increment borers, and how to prepare microscopic thin sections for qualitative and quantitative wood anatomical analysis.

Furthermore, the week in the laboratory included measurements of ring-width series by using measurement tables and a high-resolution scanner. Synchronisation of ring-width curves, standardization and modelling of climate-tree growth functions rounded off the program. The practical work was mainly carried out with equipment that was implemented with the help of the DFG in the project “Tree growth and wood anatomy along elevational and nutritional gradients in tropical forests in southern Ecuador” (subproject D2).

Achim Bräuning, Hector Maza, Darwin Pucha & Oswaldo Ganzhi

Conference of the Society for Tropical Ecology (*gtö*)

The annual conference of the society for Tropical Ecology (gtö) will take place in February 2012 in Erlangen, Germany. It will focus on islands in land- and seascape and will address the challenges of fragmentation. The congress is organized by Professor Dr. Achim Bräuning, Professor Dr. Michael Richter, and Dr. Thorsten Peters, who are members of the RU. The conference offers the following sessions:

- Effects of Fragmentation on Ecosystem Functioning and Services of Biodiversity Hotspot Islands in Tropical High Mountains. Chairs: Jörg Bendix, Erwin Beck
- Tropical Dendroecology. Chair: Achim Bräuning, Ute Sass-Klaassen
- Fragmentation, Movements and Diseases. Chairs: Fred de Boer, Heribert Hofer
- The Roles of Agroforestry in Managing Fragmented Multifunctional Landscape. Chairs: Aster Gebrekirstos, Sonya Dewi
- Plant-Animal Interactions in Disturbed and Fragmented Landscapes. Chairs: Eckhard W. Heymann, Nina Farwig
- Deforestation in Amazonia and its Consequences for Ecosystems and Biodiversity. Chairs: Erlei Cassiano Keppeler, Beatriz Machado Gomes
- Fragmentation Genetics in the Tropics. Chairs: Chris J Kettle, Aline Finger
- Importance of Microhabitats for Tropical Biodiversity and Functional Ecology. Chair: Lakatos, Michael
- Fragmentation in Wetlands and Artificial Lakes. Chair: Pia Parolin
- Human Dimensions of Tropical Deforestation, Forest Fragmentation and Forest Management. Chair: Perdita Pohle, María Fernanda López
- Biogeographic Patterns of Tropical Mountain Ecosystems. Chair: Michael Richter
- Trophic Simplifications and Functional Downgrading of Fragmented / Human-modified Tropical Forests. Chairs: Rainer Wirth, Inara leal
- Free Topics. Chair: Thorsten Peters

Thorsten Peters & Achrim Bräuning

More information:

http://www.gtoe-conference.de

People and Staff

Photo: Astrid Bendix

Dr. Katja Trachte received the Wilhelm-Lauer Award 2011 of the Academy of Sciences and Literature in Mainz, Germany, for her PhD thesis "Cold air drainage flows and their relation to the formation of mesoscale convective clouds at the eastern Andes of South Ecuador" conducted in the subproject D3. She received the award which is endowed with 5,000 Euro for her ground breaking analysis of the genesis of mesoscale convective clouds in the research area. Thanks to Trachte is now is possible to explain the origin of local cold fronts which derive out a special atmospheric interference between the Andean highlands and the Amazonian lowlands. This interference unknown so far finally leads to precipitation during the night. „Her research is a milestone in climatology of tropical high mountain regions", states the laudation. The award was handed over to Dr. Trachte by the President of the Academy Prof. Dr. med. Elke Lütjen-Drecoll at the annual celebration assembly of the Academy in Mainz at 4th November (see also *Science News*, page 9).

Photo: private

Diploma Biologist **Franca Marian** was honored with the "Biodiversity Advancement Award" from the Academy of Sciences and Literature in Mainz, Germany. The work which she conducted in her diploma thesis in subproject A3 was awarded since it is "of outstanding importance for the field 'relationship between biodiversity and ecosystemfunction'", as the laudation stated. In her detailed study she correlated data on decomposition of plant litter with the diversity of soil fauna and microbial parameters. The thesis is an innovative contribution to the analysis of functional diversity in a tropical mountain ecosystem. Marian who now is doing a PhD thesis in subproject A3 is also praised for her commitment during her thesis entitled "Decomposition rates and microarthropod colonization of litter and roots along an altitudinal gradient in a tropical mountain rain forest in Southern Ecuador". The award is endowed with 500 Euros (see also rubric *Science News*, page 12).

Photo: Ingo Voss

Johannes Knüsting (left) and **Michael Schorsch** are students from the University of Osnabrück, who at present perform field research in Project B1 (Beck/Bendix/Scheibe). Having been introduced to the measurements by Renate Scheibe and Ingo Voss they now spend three months at the ECSF to collect parameters for the modeling of growth and competition of bracken, *Setaria* and *Baccharis*. The model originally considered only light intensity as resource for which plants compete. In a further step of refinement temperature may turn out as a more efficient factor influencing biomass production. If the weather allows, a final burning experiment on the selected area will be conducted. The students will also investigate carbon and water relations of the three plant species as well as their nutrient requirements and content; in particular nitrogen as an indicator for protein content. The major protein is RubisCO, an enzyme catalyzing the first major step of carbon fixation, for which an analytical procedure has been set up in the lab in Osnabrück. RubisCO will be used as a proxi for carboxylation capacity. The studies by Johannes and Michael are part of their Master theses supervised by Professor Scheibe and Dr. Voss. Both students hold a B.Sc. degree in Cell Biology and have already worked in the group of Professor Scheibe.

Photo: private

Caroline Fries from the Justus-Liebig Universität Giessen, Germany, (JLU) subproject D4 (Breuer, Frede) visited the ECSF from May until August 2011 for a pedological field campaign. In her Master thesis she will explore the topic of regionalizing soil parameters (especially carbon), which is needed to parameterize a hydro-geochemical model. She now spends another four months at the station to finish her MSc thesis and to support sampling program of D4.

Photo: private

Sirkka Rausche will finish her bachelor studies with the thesis on testing water quality by biological indicators in the Zamora catchment. Her project (work group D4, Breuer, Frede) is a cooperation of the JLU Gießen, the UTPL in Loja and SENESCYT.

By using litter bags she will determine the community of macroinvertebrates and functional feeding groups which are responsible for litter decompositions. These results will help to get a better understanding about the interaction of biological and chemical indicators in tropical freshwater streams under different land uses.

Photo: private

Juliane Menz is a student at the JLU Giessen. As part of her Bachelor thesis she joined the subproject D4 (Breuer, Frede). During her stay on the ECSF (September till December 2011) she will conduct extensive sampling campaigns investigating hydro-geochemical fluxes of trace elements with regard to precipitation events in the Rio San Francisco catchment.

Photo: private

Theresa Ehmann has started her master thesis in the group D4 (Breuer, Frede) in October 2011. She is going to compare different statistical downscaling methods of Global Climate Models and their impact on hydrological fluxes for the San Francisco River basin. She will stay in the study area from February to April 2012 to better understand catchment functioning and to support field sampling.

Deadline

The editorial deadline for the forthcoming issue of the TMF Newsletter is:

March 8th 2012.

Please send your ideas, manuscripts and images to the editorial office (see contact box).

Credits and Contact

DFG Research Unit 816

More information about the Research Unit (RU 816) investigating Tropical Mountain Forests (TMF) is available at: www.tropicalmountainforest.org

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