frontiers | Frontiers in Ecology and Evolution

TYPE Editorial
PUBLISHED 11 January 2023
DOI 10.3389/fevo.2022.1080119



OPEN ACCESS

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SPECIALTY SECTION
This article was submitted to Biogeography and Macroecology, a section of the journal Frontiers in Ecology and Evolution

RECEIVED 25 October 2022
ACCEPTED 28 December 2022
PUBLISHED 11 January 2023

CITATION
Hořák D, Clark VR, Njabo KY and Fjeldså J (2023) Editorial: Biodiversity across Afromontane environments. *Front. Ecol. Evol.* 10:1080119. doi: 10.3389/fevo.2022.1080119



# Editorial: Biodiversity across Afromontane environments

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KEYWORDS

**forest, grassland, savanna, plants, animals, endemism, Afromontane, Afro-alpine**

Editorial on the Research Topic
Biodiversity across Afromontane environments

Mountains have always fascinated humans. Their remoteness, grandiosity, stability, and wilderness awake in most of us admiration, which motivates us to climb their steep slopes again and again. The pure biological perspective is fascinating, too. Over relatively small spatial scales, montane elevational gradients support a variety of environments, thus leading to biogeographical patterns with an elevated diversity of species. This is especially true in the tropics, where stable climatic conditions across different scales of time reinforce the effects of geographical isolation and thus support the origin and maintenance of biological diversity. In Africa, temperate and sub-tropical mountains hold as much local diversity and endemism as do the tropical mountains, such as the exceptional plant diversity in the Cape Fold Mountains of South Africa and the rich local endemism in the Atlas Mountains in northern Africa.

In the global context, African mountains are unique, most of them being fragmented systems, with overall intra African mountain isolation being higher than on other continents where extensive linear fold mountains and volcanic chains are "typical." This fragmentation has given rise to unusual patterns of endemism and diversity that have been the subject of much debate and research. Still, our knowledge of mountains in Africa is very limited, with large swathes of mountain systems partly, patchily, or wholly unexplored by biodiversity scientists. In addition, African mountain ecosystems are significantly altered through direct human impact. Montane cloud forests are disappearing at high rates, vast areas had already disappeared decades ago, and the conversion of natural montane grassland to tree plantations has dramatically increased threats to local endemics among plants and animal groups. This is currently coupled with the potential effects of climatic change on African mountain systems, leading also to the disappearance of specialized glacier ecosystems on the mountain tops.

This Research Topic aims to emphasize that African mountains continue to offer invaluable biological insights and material for ecological and evolutionary thinking. This holds true even though tropical mountains have already been studied for two centuries since Alexander von Humboldt. After such a long period, we can still miss significant pieces of information to understand mountain biological diversity comprehensively; knowledge of African mountains can help significantly in this regard. Such an understanding is crucial not only for pure scientific insights but also for the effective conservation of Afromontane environments and their endemic inhabitants, which are rapidly disappearing. Thus, this Research Topic also endeavors to promote conservation efforts in montane environments across the African continent.

The spectrum of potential research questions related to African mountains is wide. At the time of opening this Research Topic's call, we encouraged the potential authors to submit contributions focused on a variety of ecological and evolutionary topics, from community ecology and biogeography to evolutionary drivers of biodiversity patterns, including multidisciplinary research linking ecology, evolution, ecophysiology, geography, meteorology, and geology. Nineteen manuscripts were submitted, of which 12 were accepted; despite this expected attrition, the accepted papers adequately covered the intended scope of the Issue. Biodiversity hotspots and endemic species are the golden thread through this Research Topic. Clark et al. show that even large areas in the relatively well-studied region of South Africa remain overlooked regarding endemic species. Seifert et al. reveal how biodiversity hotspots can be modified by humans. Specifically, they found that natural ecosystems and transitions biotopes in the Taita Hills of East Africa contribute positively to ecosystem functions, which contrasts with human-modified landscapes. Even though restricted-range species are endangered, and many species are predicted to decline in the future, some climatic predictions suggest an increase in the availability of suitable habitats, as reported for the Walia Ibex by Gebremedhin et al.. Forecasted climate change influence on Afrotropical forest species richness seems to be different in comparison with data from Neotropics, which hampers the generalizations (Núñez et al.). However, the global changes and their regional idiosyncrasies can be tracked in the mountain systems by observing the C3-C4 "grass line" as proposed by de Deus Vidal et al., a valuable contextual readjustment in montane systems without an observable treeline. Sharp Afrotropical elevational gradients also offer unique study systems to test classical ecological questions. Komposch et al. show that deadwood biomass is highest at mid-elevations of Mount Kilimanjaro, which is especially a result of climatic gradients and anthropogenic disturbances. Ratier Backes et al. detected the effects of soil properties, temperature gradients, and disturbance on species richness of plant communities but not functional diversity in Tenerife. Temperature gradient has been proven responsible by Barshep et al. for body mass changes in birds across elevations in the Nigerian savanna. Surprisingly, some topics related to general ecological issues, such as environmental seasonality, remain largely unexplored in Afromontane environments, thus the description provided by Dinesen et al. of how seasonal changes affect the composition of bird communities serves as a valuable insight. African mountains are of course perfect model systems for investigating the role of geographical isolation in the evolution of new species and the phylogenetic structure of ecological communities. This Research Topic contains three papers touching on this field. Cuypers et al. highlight the biogeographical importance of the Livingstone Mountains in Tanzania as a crossroad for small non-volant mammals. The mammal assemblages tend to be phylogenetically and functionally less closely related toward high elevations on Mount Kenya, but the opposite pattern was found in the Chyulu Hills (Onditi et al.). "African biogeography" was founded in the Eastern African mountains, which form "sky islands" in the "sea" of the lowland savanna; still, many species are shared across locations. As a part of this collection, Fjeldså and Bowie analyzed the phylogeography of avian lineages to describe the historical relationships between lowland and montane faunas and provide an overall picture of historical changes in the geographical distributions of birds in this biodiversity hotspot.

## Conclusions

This Research Topic provides stimulating reading that enhances both the research value and biological value of Africa's mountains. Already, from this set of contributions, it is obvious that research effort is not equally distributed across the continent. Eastern African mountains have traditionally attracted more research than elsewhere on the continent. More recently, southern Africa has become a stronger contender, while the limited contributions from Western Africa may be due to generally fewer mountains and less topographical complexity. Northern Africa remains the least well-represented. Africa is a continent of dramatic environmental gradients and burning environmental issues. Detailed and extensive knowledge of how changing environments influence biodiversity is thus crucial for adequate and effective sustainable development, so that humanity and nature can co-exist in African mountains.

## Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note