

## Afro-alpine “Sky Islands”: Biological dynamics, Speciation and Climate Change

Sileshi Nemomissa (Prof.)

Department of Plant Biology & Biodiversity Management

Addis Ababa University, Ethiopia

### Abstract

The East African high mountains protrude from the surrounding lowlands in Kenya, Uganda and Tanzania but are part of a continuous, elevated highlands in Ethiopia. They are separated by the East African Rift Valley and form different vegetation types, which form belts around these mountains. During Pleistocene glaciations, the vegetation of East African mountains had shifted about 1000 m downward due to extensive glaciation. The upper most vegetation, the Afro-alpine, of these mountains are isolated from each other and formed islands in the sky. The plant species of Afro-alpine vegetation are adapted to harsh weather conditions and exhibit different life forms. Mechanisms such as *in-situ* speciation resulting in vicariance and long-distance dispersal (LDD) have played key roles for the present-day diversity of Afro-alpine species. I will summarize our current knowledge on the Afro-alpine plants in this talk. Unlike oceanic islands, continental islands such as Afro-alpine may have been merged during past climates, enabling gradual migration. Modeling results of species range and ecological distance at the Last Glacial Maximum (LGM) and 1000 years until today show that most species had larger cold climate ranges and partially or fully bridging some mountains. Another interesting question is also the relationships between genetic and species diversity. Our study shows that ecological and genetic distance are weakly correlated but the correlations of geographical and genetic are strong pointing to the role of LDD. In the East African Afro-alpine, genetic diversity is equally important as species diversity in conservation biology. The intrapopulation genetic diversity was low and the species-genetic diversity relationships showed weak and insignificant positive and negative correlations. Factors such as frequent population size fluctuations, extinctions and colonizations during the Pleistocene glacial cycles may explain these correlations. Currently, the Afro-alpine environment is under human and natural threats. Climate change forces Afro-alpine species to shift upward and they may run out of space. Under such a climate change scenario, microrefugia may play key roles to ensure long-term persistence of the species. We have recently started to study the effects of nighttime temperature on the Afro-alpine species. I will briefly highlight on our search for microrefugia in selected mountains and Ethiopia.