

Population size, Threats and Conservation measures of *Lobaria pulmonaria* in Tanzania. A case study of forest lichens on Mount Kilimanjaro.

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Introduction

Lichens are mutualistic symbiotic organisms composed of a fungal partner (the mycobiont), and one or more photosynthetic partners (the photobiont), which are referred to either a green alga or cyanobacterium [6,7]. Our focus is on *Lobaria pulmonaria* also known as **Tree lungwort** which consists of a three-way or tripartite partnership. In addition to the fungus and alga, it also contains a cyanobacterium (blue-green alga).

Lobaria pulmonaria is an important component of the forest ecosystems because of the ability of its cyanobacterial symbiont to fix atmospheric nitrogen [6]. Also, it is an indicator of old growth forests and has been used to assess various types of environmental changes including air pollution, climate change and deforestation [2].



Lobaria pulmonaria

Studies show that African lichens knowledge is limited especially in tropical areas and the global estimates of the number of lichen species vary from 13500 [8] to approximately 17000 [4]. In Tanzania, several lichen species are known to exist on Mt. Kilimanjaro [1,5] including *Lobaria pulmonaria* around the altitude between 1700 m and 2800 m. However, the population size and threats of this species on Mt. Kilimanjaro is unknown.

Main Objective

To assess population size, threats and establish conservation measures of *Lobaria pulmonaria* on Mount Kilimanjaro.

Specific Objectives

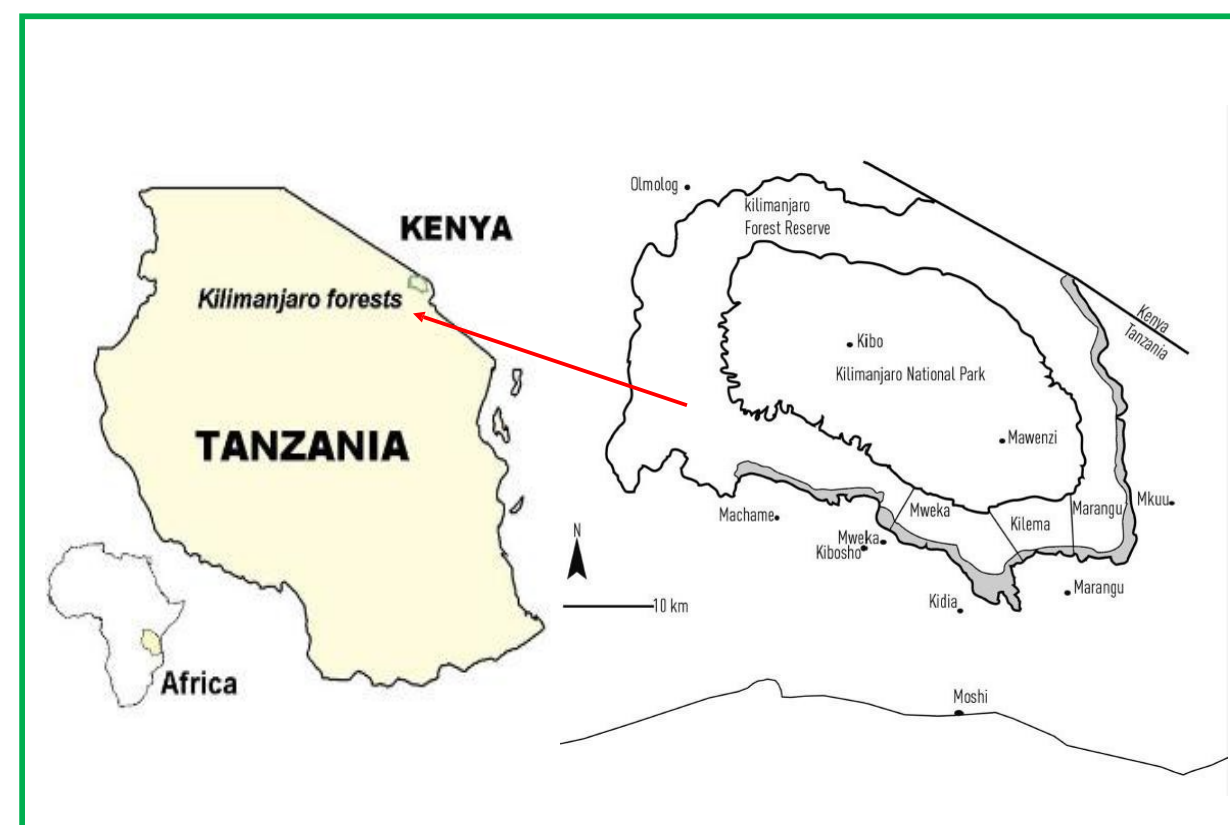
- To assess the influence of altitudinal ranges on the population size of *Lobaria pulmonaria*.
- To assess the influence of habitat variables on the population size of *Lobaria pulmonaria*.
- To assess the influence of disturbed habitats on the population size of *Lobaria pulmonaria*.
- To assess the genetic differentiation across different bio-climatic vegetation belts of *Lobaria pulmonaria*.
- To assess the general knowledge of local people around Mt. Kilimanjaro on lichens and their habitats.

Upcoming activities

- Mapping the population distribution of *Lobaria pulmonaria* and related species of the genera *Lobaria*
- Sampling and Data collection
- Data analyses
- Awareness and Sensitization programs
- Report writing
- Publication

Methods

Study Location



Southern part of Mt. Kilimanjaro above Machame, Kibosho, Marangu and Kidia (Moshi rural district) is selected for this study because it receives much higher annual rainfall than any other parts of the mountain [3]. Five transects will be situated by the aid of GPS across different altitudinal ranges (1800 m, 2100 m, 2400 m, 2700 m, 3000 m and 3300 m) following the distribution of bio-climatic vegetation belts. In each transect, host trees greater than 35 cm in diameter will be searched for *L. pulmonaria* in a plot of one hectare. A random 30 thalli of *L. pulmonaria* will be collected from the trunk of different host trees and if there will be less than 30 colonized trees per transect, multiple thalli will be sampled from the same tree [10]. For molecular studies, only fragments (lobe tips) of 5-10cm² will be collected from the thallus of *L. pulmonaria* and stored at -20°C to avoid DNA degeneration [9].

For assessment of threats, a survey will be conducted purposively to search for disturbed areas by fire and logging. Then, five plots of similar size 10 m x 10 m (100 m²) in each transect along altitudinal ranges will be established for investigating the incidence of *L. pulmonaria* and related species of the genera *Lobaria* on host trees. Habitat variables such as Diameter at Breast Height (DBH), surface texture, pH, tree height, host tree species and tree cores will be recorded.

In order to assess the knowledge of local people on forest lichens, a survey will be conducted in 3 villages at Machame, Kibosho and Kidia divisions respectively. The villages are selected purposively based on the proximity to forest on Mt. Kilimanjaro. Data will be collected through questionnaires which will be administered to 30 heads of families randomly selected in each village. For publicity purpose, the project will initiate local school conservation clubs around the forest reserve and conduct forest tour study among the school children. Only if we reach school children can enhance our lichen conservation message to be heard and implemented for the coming decades. Additionally, various competitions will be conducted among the school clubs including traditional dancing, best lichen photo taking, drama and essay writing with the themes related to conservation of lichens species and their habitats.

Brochures, flyers, video clips and posters will be prepared with a preliminary title "**Lichens – the tree clothes in our forests**". Subsequently, the research results will be disseminated through local TVs such as SUA TV, Abood TV. Furthermore, public presentation will be conducted to different stakeholders such as Sokoine University of Agriculture (SUA), Commission for Science and Technology (COSTECH). New data will be added to Tanzanian national node of the Global Biodiversity Information Facility (TanBIF) and some findings will be published on the peer-reviewed international journals.

Preliminary Results

Preliminary survey which was conducted through Marangu route on Mt. Kilimanjaro has revealed very interesting results.

- Most of the *Lobaria pulmonaria* species were found between 2549 m and 2740 m.
- The number of lobes per population on host trees at the lower elevation were smaller and fewer comparing to higher elevation.
- Most of the dominant host trees were *Erica*, *Ocotea* and *Podocarpus* species.
- Generally, the thalli of *L. pulmonaria* species were dry and brownish in colour which is an indicator of low moisture in the montane forests.



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