

Project Update June 2021



Figure 1. Bird-eye view from the area with maximum *Cycas* plant to the settlements nears Dangmechu basin. Prayer flags hoisted in the area is evident of human activities.

Introduction

Cycads are one of the only four groups of extant ancient gymnosperms. Their long evolutionary history is of significance in studying and understanding the origin and evolution of other seed plants. Cycads, once distributed worldwide, are now restricted to highly isolated populations. *Cycas* is the lone genus in the Family Cycadaceae, one of the three families of cycads. All the 117 known species of *Cycas* are among the most threatened plant groups in the world. Current distribution of *Cycas* remain restricted to Indian Sub-Continent extending to parts of South East Asia. One species of *Cycas*, *Cycas pectinata*, is recorded from Bhutan, one of the small countries in Indian sub continent. Within Bhutan, deep gorges of the rivers experiences subtropical climatic conditions within which are found restricted populations of *Cycas pectinata*. Although known from few locations in the country, it is believed that there are few more population of the *Cycas pectinata* within Bhutan. Those known locations of *Cycas* populations are nearby roads or settlements, while others far from frequent human reach remains hidden. One known locations of *Cycas pectinata* is in Mongar district in eastern Bhutan. This report is based on the population status of *Cycas pectinata* from Mongar district.

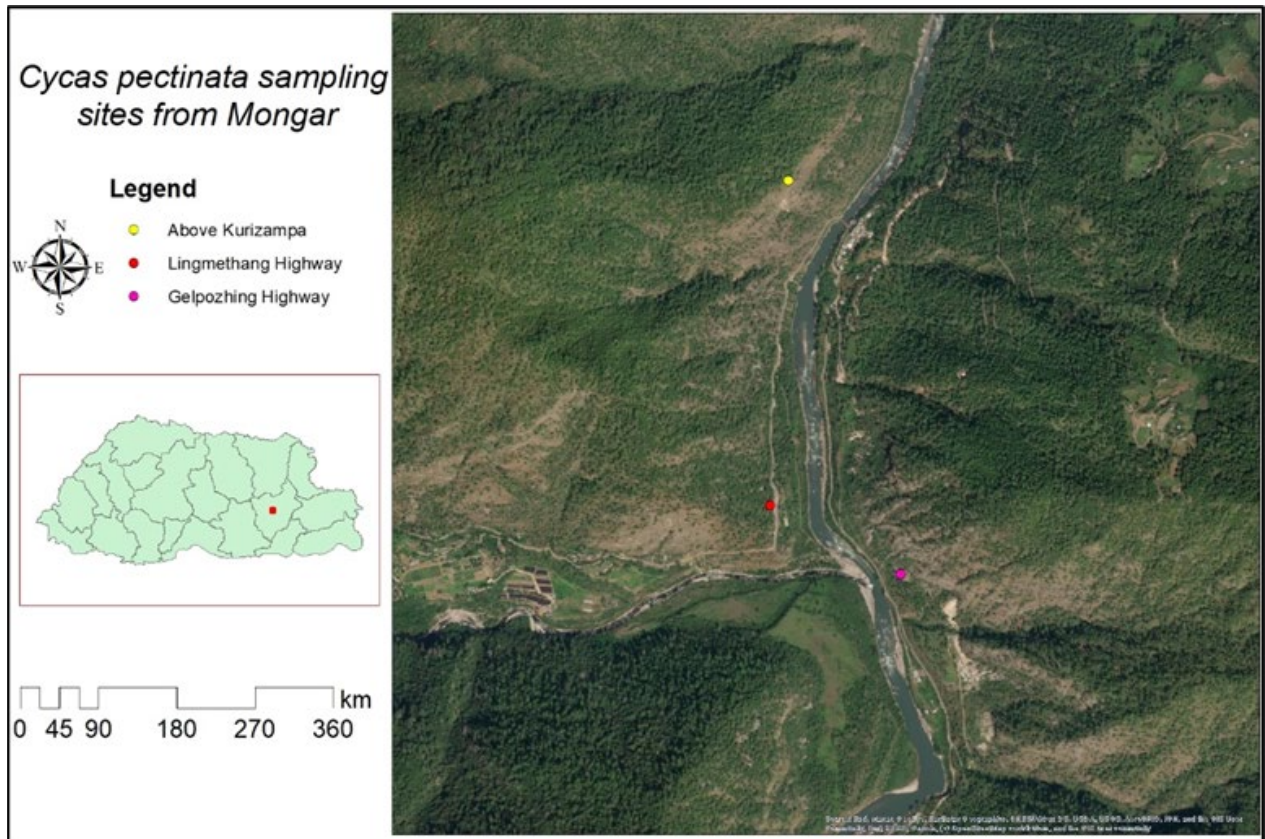


Figure 2. Location of three *Cycas* populations from different site in the region

Field visits and activities

Field visits to different locations in Mongar district were made from 10th to 15th November 2020. Three locations were visited based on prior information of the existence of the *Cycas* plant as well as information gathered from local people in the area. Three different sites include area above the national highway passing through Lingmethang (Figure 1. Lingmethang Highway), above highway leading to Gyelpozhing (Figure 1. Gyelpozhing Highway) and the third location include away from the roads (Figure 1. Above Kurizampa). The *Cycas* plants are located in the areas within the elevation range 597-871 m above sea level.

The area coverage in three locations of the plants in the area varies. The site above Lingmethang Highway is the area where some 10-15 years ago, *Cycas* plants were fairly abundant. But today, even after extensive survey by our team in the area, we could locate only one male plant. An information from the cow herder of another plant below road in the same area could not be located. We recorded three *Cycas* plant from the second location above Gyelpozhing Highway. Local informed that a year ago there were more than 20 plants in the area with female plants bearing cone. Our desperate look out for the plants could only find three small individuals.



Figure 3. Team member taking morphometric characteristics of lone survival Cycas plant in the area above Lingmethang Highway Road.

Third population above Kurizampa, is located away from road and human settlements. We have counted all the individual plants in the area. A total of 62 established individuals and 74 saplings were recorded. Plants with well-formed above ground stem were recorded as established individuals and plant with less than two leaves and stem not seen above ground were categorized as sapling.

Population structure of Cycas plant from the site above Kurizampa.

The site above Kurizampa had the maximum number individual plants compared to other two locations in the nearby area. Entire plant population comprises of 62 established individuals and 74 saplings. Three plants were identified as female based on the numerous seedling recruitment around the matured plant - no plants with intact female cone were recorded from the site. Seven were identified as male from their cone and other cone remnants.



Figure 2. A-Matured tree with bulbils-main trunk lost, B-Seedling recruitment measured as sapling and C-matured trees measured as adult.

Cycas plants do not form regular annual growth rings like other gymnosperm and angiosperm plants. Thus, determination of the age of an individual Cycas tree is not possible, which otherwise is commonly used to estimate the age of the tree individuals. This report has grouped individual plants based on their height, where tall trees are considered older than those short trees (except, for those plants which have evidently lost the main trunk and the new plant is represented by side branches, which are short- Figure 4 A). Population structure shows few tall individual plants and population is generally represented by young individuals (Figure 5). Only two individuals were taller than 1 m. The smaller plants would be more susceptible to threats, such as being overtaken by fast-growing invasive species in the area competing for the resources. Right-skewed population indicates more young plants and fewer older plants. Thus, only few individual trees would bear cones for seeds.

Threats to the population

The Cycas population was very much thriving some 10-15 years ago in the locality of our study area, as locals would recall. Threats to the survival of the Cycas population in the study area are clearly from human population and developmental activities. Population re-settlement driven by developmental activities and associated economic activities in the area is identifiable as the serious and main threat to the study species from the locality. Activities like road widening can be attributed to leaving only one individual in the area through which Lingmethang Highway passes by. Other activities in the proximity of historical Cycas habitat include establishments of gravel grinding machineries and tunnel construction for hydropower plant (Figure 6). Such activities have contributed to direct habitat loss resulting in the loss of plants from the area.

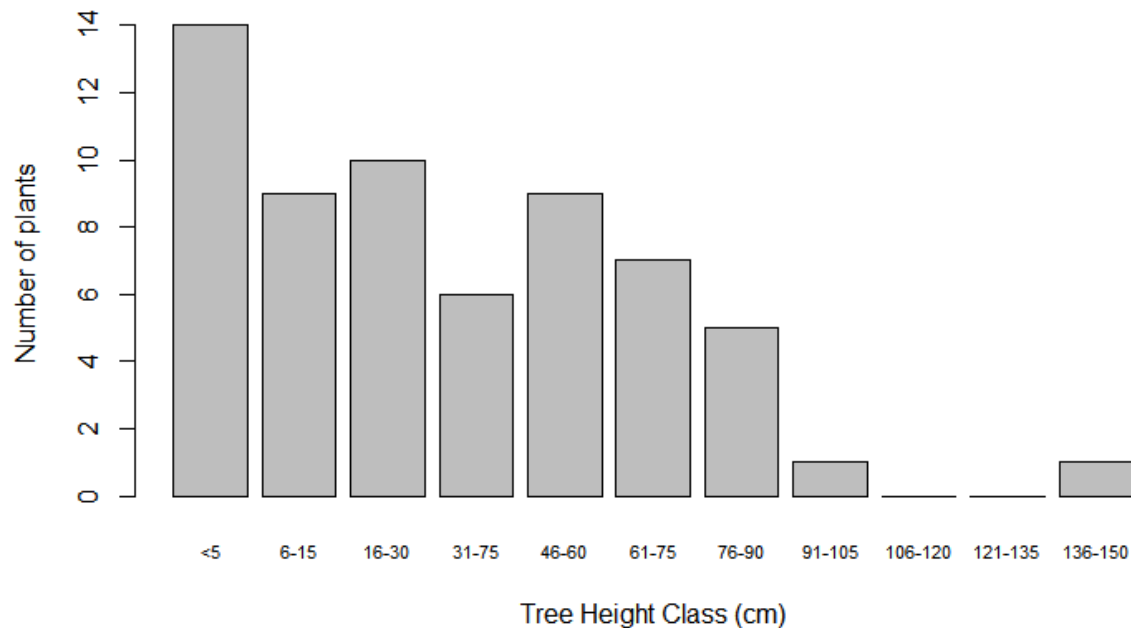


Figure 3. *Cycas pectinata* population structure based on the height class from the third area above Kurizampa. Graph includes only of those established plant individuals and seedlings recruitments are excluded.

Loss of *Cycas* plant population from other location near Gyelpozging Highway is a very recent event. The loss of plant from this location can be evidently attributed to human collection of the specimen for horticulture value. The area being easily accessible through roads, collections have been facilitated from the area. Locals have collected the specimen to be planted as ornamental plant (Figure 7).

The third area in which survives the maximum number of *Cycas* plants, the locality is distant from modern road facilities. However human activities in the area are not uncommon. Human presence in the area is evident from activities such as hoisting of prayer flag and herding of cattle. The area is accessible to humans via a footpath. Although the number of plants is much more than other locations, the population is also under long term threat. Habitat degradation and encroachment due to invasive species is at larger risk. *Chromolaena odorata* identified as invasive weeds is seen growing at aggressive scale and quantities (Fig. 8). This would outgrow the height of the *Cycas* plant competing for resources such as light and space. The extensive growth of the invasive species would inhabit the space for seedling recruitment and significantly reduce new plant growths in the area.

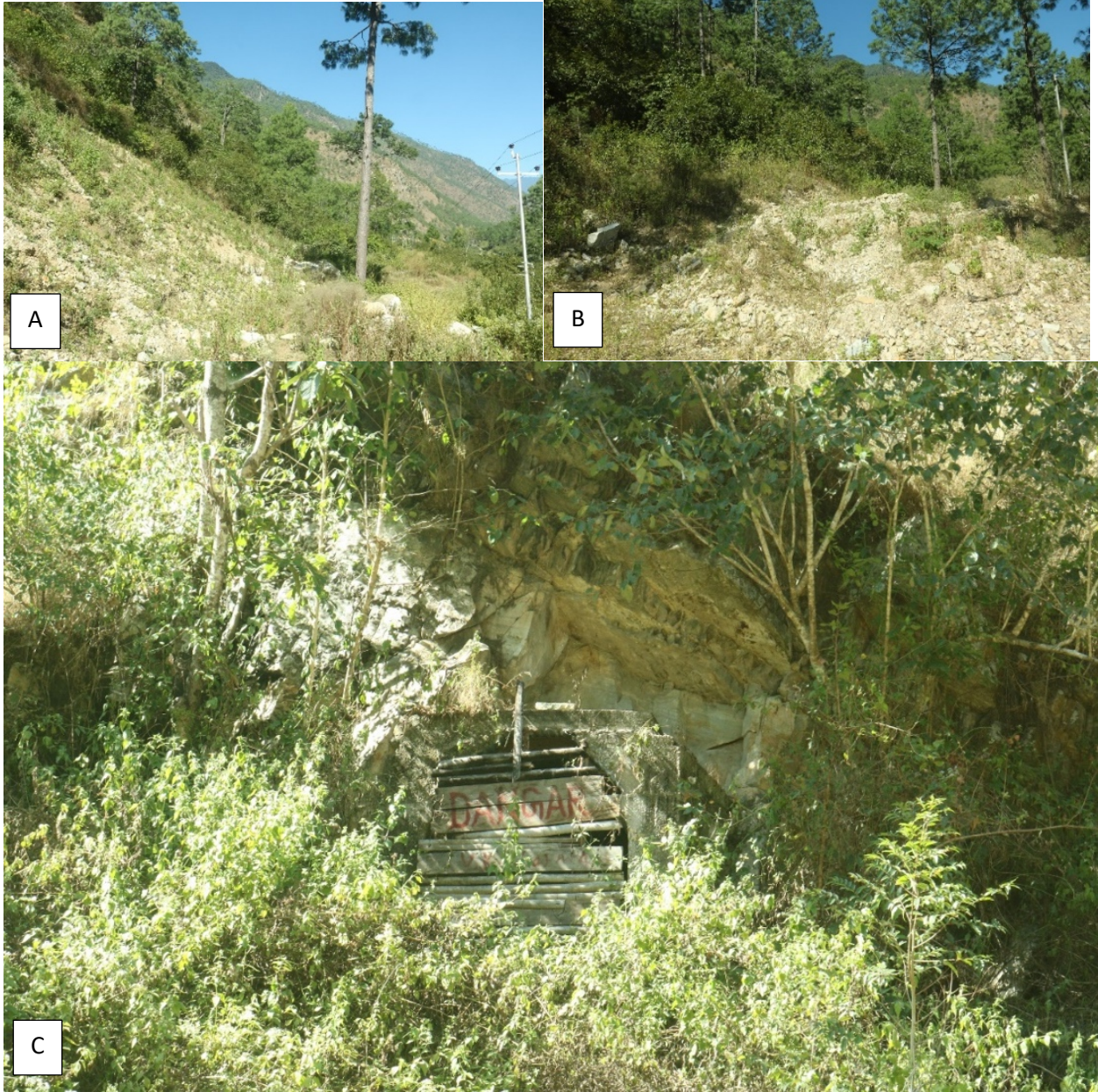


Figure 4. Developmental activities in the area near Lingmethang Highway, an area with historical *Cycas* plant record. A-new road construction, B-stone grinding establishment area and C-tunnel outlet for hydropower plant.



Figure 5. Some of the *Cycas pectinata* collected and planted as ornamental plant



Figure 6. Extensive growth of invasive species *Chromolaena odorata* in the *Cycas* inhabitant.