

Project Update: June 2020

Introduction

Bhutan is a part of Eastern Himalayan global biodiversity hotspot known for species richness with more than 11,000 known species. Despite efforts from government, organisations and individuals towards conservation, Bhutan has faced threats to its biodiversity from anthropogenic related activities. At times of such increased threat to loss of biodiversity, the need for a better and more scientific study towards understanding the species is at its height. While some species are widely distributed, some are greatly threatened due to restricted geographical habitat. Cycads are one such group of ancient gymnosperms whose distributions are restricted in pockets of habitats in the Indian subcontinent extending to parts of South East Asia. From Bhutan, one of the 117 species of *Cycas* i.e. *Cycas pectinata* is known from restricted small areas. In the biodiversity rich area, presence of *Cycas pectinata* is a relic of regional biodiversity possessing great scientific and conservation value because of its long evolutionary history. The species once widely distributed is declining due habitat destruction and loss and has been pushed to verge of extinction. The IUCN now have listed *Cycas pectinata* as Vulnerable. In Bhutan *Cycas pectinata* is known from five different locations. One of the locations is in Ramjar Gewog, Trashiyangtse, where this study was carried out

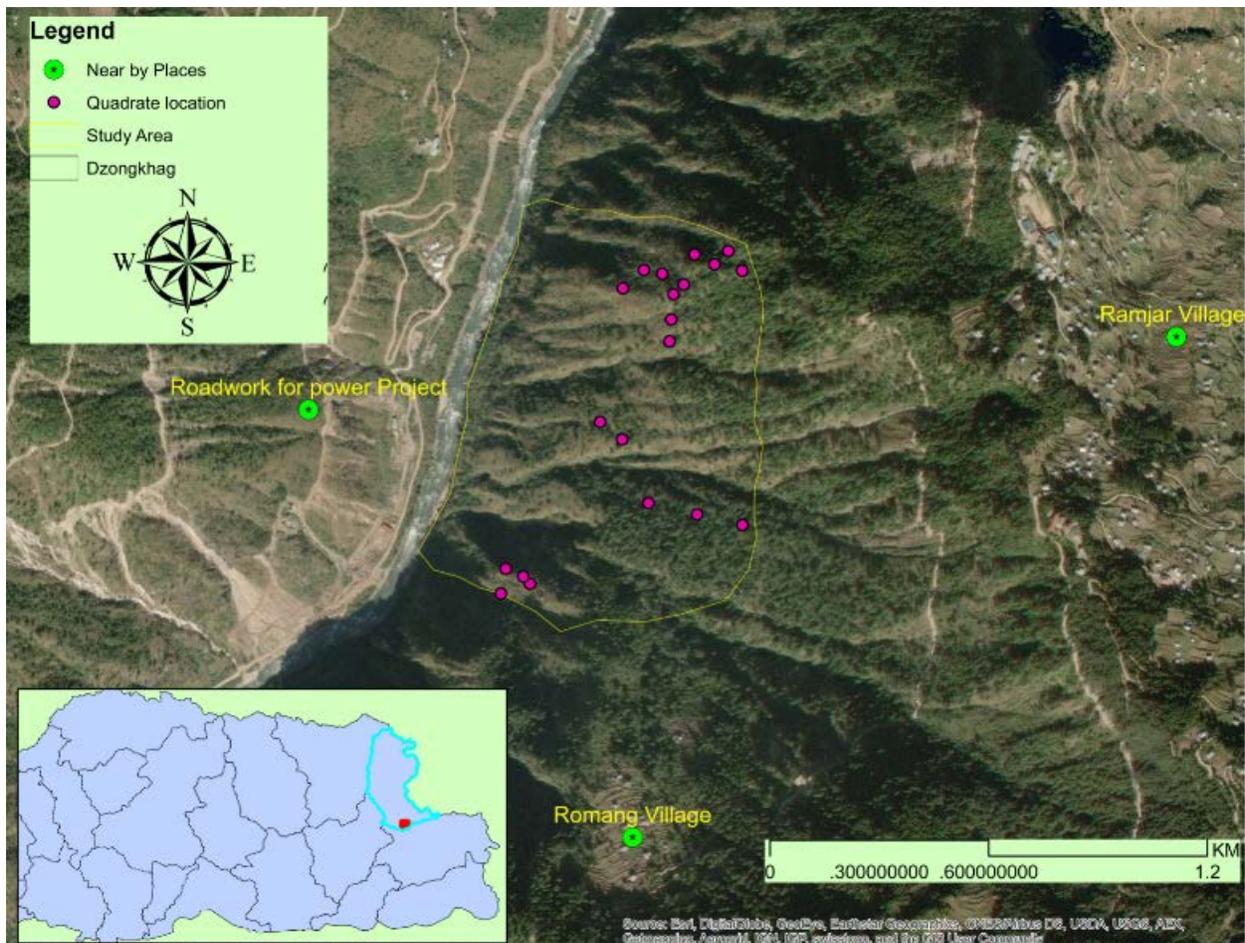


Figure 1. Demarcation of study area and quadrat locations

Field visits and activities

A recent field visit was made to study site in Ramjar. The area where *Cycas pectinata* grows are known as *Bawungshig-pek* and other adjacent part is known as *Romang-juk*. Locals call *Cycas pectinata* *Bango-shing*. A total of 20 quadrats of 40m² were laid randomly (Figure 1). The even distribution of quadrats was not feasible due to the risk associated with steep slope and rugged terrain.

From the study site, a total of 566 individual plants were recorded. Of these 25 were identified as female, 44 male and rest could not be identified as to their sex. Most of the female plants recorded were with fully formed matured ovules (Figure 2) while only remnants of male cones (Figure 3) was observed. Others didn't have any male or female cones at the time of data collection. Although one study has shown that male and female plants of *Cycas revoluta* can be differentiated from alternate leaflet arrangement in the mid region in female oppose to opposite leaflet arrangement in male, for *Cycas pectinata* this consistency was not observed.

On average 28 plants were counted in each quadrat. Our estimation of total plants within the study site boundary is approximately 6000 individual plants within ~8 km² area. The distribution of plants is not uniform but shows a significant relationship with elevation (p value 0.045 and R² =0.51), with increasing density towards lower elevations (Figure 4). Similarly, more mature plants are observed from lower elevations compared to younger plants at higher elevations. Regeneration of young plants was equally observed from both seeds and bulbils (Figure 5).



Left: Figure 2 Female cone with still enclosed ovules. Right: Figure 3 Remnants of male cone from previous year.

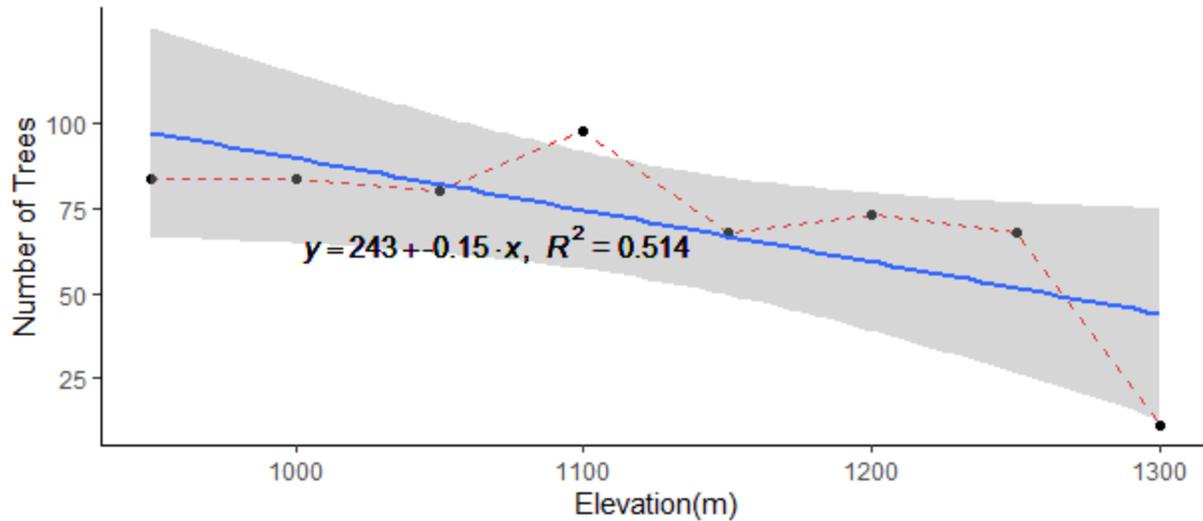


Figure 4 Correlation between number of trees counts and elevation from the study area

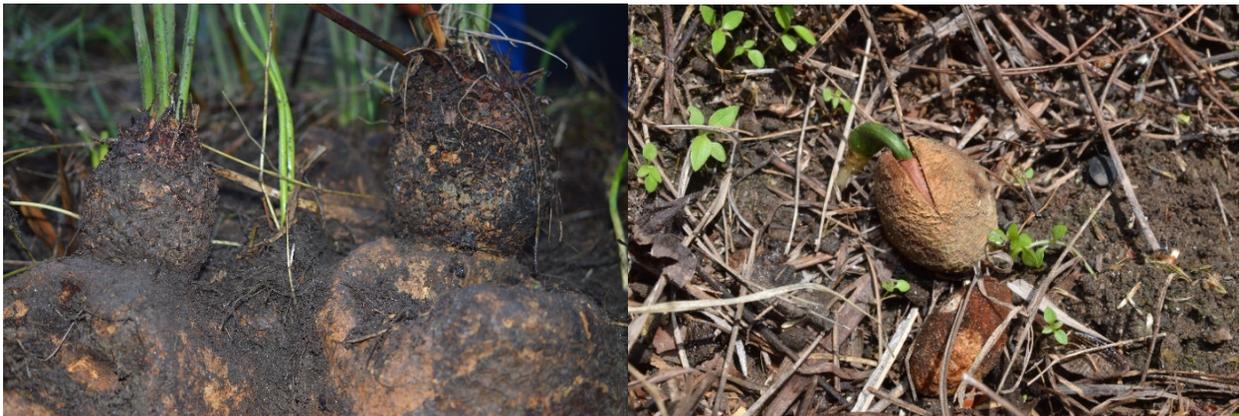


Figure 5 Sprout of young stem developing from bulbils (Left) and seed germination (Right)

Vegetation in study area

The vegetation in the study area is mostly dominated by large chirpine trees (*Pinus roxburghii*). Other commonly associated shrubs include *Rhus paniculata*, *Phyllanthus emblica*, *Ficus bengalensis* *Asparagus racemosus* (wild asparagus), *Xanthoxylum* sp. and *Gerwia* sp. Predominantly, the forest floor is covered by *Cymbopogon flexuosus* (lemon grass). Other associated ground vegetation includes, *Artemisia vulgaris* and *Chromolena odorata*.

Threats to the population

Despite the study site being prone to forest fire, the last time forest fire occurred was more than two decades ago. A thick layer of leaf litter and an increased fuel load in the area affirms a rare fire event in the area. In the event of possible fire in the future, this would contribute to high fire intensity thereby increasing damage to young and newly recruited plants in the area. A long gap in forest fires in the area probably has enabled wider distribution of seeds, particularly in the higher elevation area. The density and average

height of plants were less with estimated age of less than 20 years (This requires more detail data analysis to confirm which could not done for this report).

The presence of humans in the study site is not common. However, seasonally, people have collected wild asparagus for consumption. In areas adjacent to villages, there has been the presence of cattle and casual cutting of *Cycas foliar* leaves. Cattle can do the least damage to mature plants, but locals told us new leaves are fed on by cows, and could be a threat to smaller plants.

Local treasure *Cycas pectinata* in their area being not observed in any of the adjacent area could be a sign of local peoples' willingness to protect the plant. Local people know that the plant is of economic importance to them although they do not make use of in any way for now. Ancestors have the messages passed down through generations that in times of famine, locals can resort to the plant as a source of food supply. They believe the seeds and trunk, after removing outer cover, can be dried, pounded to flour and use as a source of nutrition. Local also do share in the earlier days, the starch rich pith of the trunk was used as bait for fishing

The young leaves of small plants were observed to have been nibbled by herbivore-like Himalayan goral in the area. In addition, young leaves were frequently observed to have destroyed by larva from Lepidoptera group of insects (Figure 6). The damage in some cases were seen to the extent of all leaves being eaten. The humid and damp area at the base of crown leaves was inhabited by a millipede (Figure 7) but could not confirm if they feed on tender leaves of *Cycas*. Wild boar are present in the area, according to a recent observation. Wild boar in the area have extensively dug-up soil feeding on chirpine roots. Doing so, have also uprooted small *Cycas* plant in the area (Figure 8). Some female cones, particularly those born on shorter plants, were observed to have been damaged by wild boar (Figure 9). In some plants matured leaves were observed drying up (Figure 10) and in some cases the number of leaves were fewer and looking not healthy.





Figure 6 Tender leaves were bored and eaten by larva rom *Lepidoptera* insect group



Left: Figure 7 Millipede inhabiting at the base crown of leaves. Right: Figure 8 Young plants were uprooted by wild boar

Socio-economic developmental activities are common in the nearby areas, but do not possess direct threat to *Cycas* population in the area. Activities for hydropower project on the other side of the river, Dangmechu (Figure 1) are completely cut off by the river. Other activities like road construction was away from the area where *Cycas* plant was recorded.



Left: Figure 9 Seeds damaged by wild boar. Right: Figure 10 Tree with leaves drying for no obvious reasons

Conclusion

It was privilege for being able to visit such place with presence of rare species. Most importantly from preliminary observation and data analysis, the current population of *Cycas pectinata* in Ramjar site is thriving relatively well. I am looking forward to further analysis of population structure and regeneration number over a timeframe which would give more insight towards understanding the stability of population in long term. Contribution of detail information regarding uncommon species would only provide correct and appropriate information towards conservation planning and management practice.

