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Difference in Plant Species Diversity in Burnt and Un Burnt Sites After 1994 Forest Fire on Mount Pohen Batukaru Nature Reerve Bali

Ni Kadek Erosi Undaharta[1] and Sutomo[1]

Technical Implementation Unit For Plant Conservation-Bali Botanic Garden

Candikuning, Baturiti, Tabanan, Bali, Indonesia, 82191

1. Technical Implementation Unit For Plant Conservation-Bali Botanic Garden Candikuning, Baturiti, Tabanan, Bali, Indonesia, 82191

* E-mail of the corresponding author: rosundaharta@gmail.com

Abstract

Pohen Mountain had undergone a forest fire in 1994 where it has caused as many as 30.4 ha of forest were burnt and destroyed. Method used for sampling purposes, chose two sites namely burnt and un burnt. Plant abundance was then recorded in each plot. Species diversity can be inferred by calculating Shannon - Wiener (H') diversity index. Species richness observed of burnt and un burnt sites on Mt. Pohen revealed that 80 species were recorded in the sampling sites. The difference in the configuration condition between the burnt and un burnt sites, were found. Shannon-Wiener species diversity index suggesting that both sites were in the medium level of diversity however the species diversity in the burnt site is much lower than in the un burnt site

Keywords: China insurance industry, Foreign fund, Challenge

1. Introduction

Pohen Mountain is derived from Balinese word '*poheng*' that means burnt. There is a clear picture that this mountain has endured several fires in its history. But the problem is that track record and written report about when, how and why these fires happen is still scarce. Even the latest fire that happens in 1994 also has received scant attention and studies.

In 1994 Indonesia had gone through extreme drought season with the occurrence ENSO (El Nino Southern Oscilation) phenomena. This resulted in the occurrence of wildfires across the country including Bali. Although Bali is not famous for its wildfires compare to Kalimantan and Sumatera, it has critical degraded land of 48.249,50 hectares. Conservation and Natural Resources Office of Bali (BKSDA) admitted that some of the major cause of these degraded lands is the occurrence of forest fire. In addition the BKSDA recorded that until the end of 2004 the forest fire had happened in 217,50 hectares of Bali's forested land. The 1994 fire in Pohen Mountain destroyed more than 30 hectares of forest vegetation (Adnyana, 2005). Pohen Mountain had undergone a forest fire in 1994 where it has caused as many as 30.4 ha of forest were burnt and destroyed. Forest fire also creates a disturbance to the ecosystem of Mt. Pohen. This disturbance would likely to cause more impact such as natural disaster, drought, flood, and landslides. Forest destruction demands the conservationist to conduct restoration programs. However, restoration is not gardening. Restoration requires scientific knowledge regarding aspects of restoration such as the use of knowledge of species diversity which can be used as one of the objectives of the restoration program such as returning the rate of biodiversity to its previous state before the disturbance.

2. Methodology

Research was conducted for about 1 month in December 2011. The location of the fieldwork is at Mt. Pohen, Batukahu Nature Reserve Bali. The mountain is located in Candikuning Village, District of Baturiti, Tabanan Regency Bali. It is approximately 54 km North of Denpasar and 30 km South of Singaraja. The geographic reference is 8° 10' - 8° 23' LS dan 115° 02' - 115° 15' BT. For sampling purposes, we chose two sites namely burnt and un burnt. In each of the sites, we established 25 observational nested plot of 20 x 20 m, for trees, 10 x 10 m for poles, 5 x 5 m for sapling and 2 x 2 m for seedlings and groundcovers randomly located. Plant abundance was then recorded in each plot.

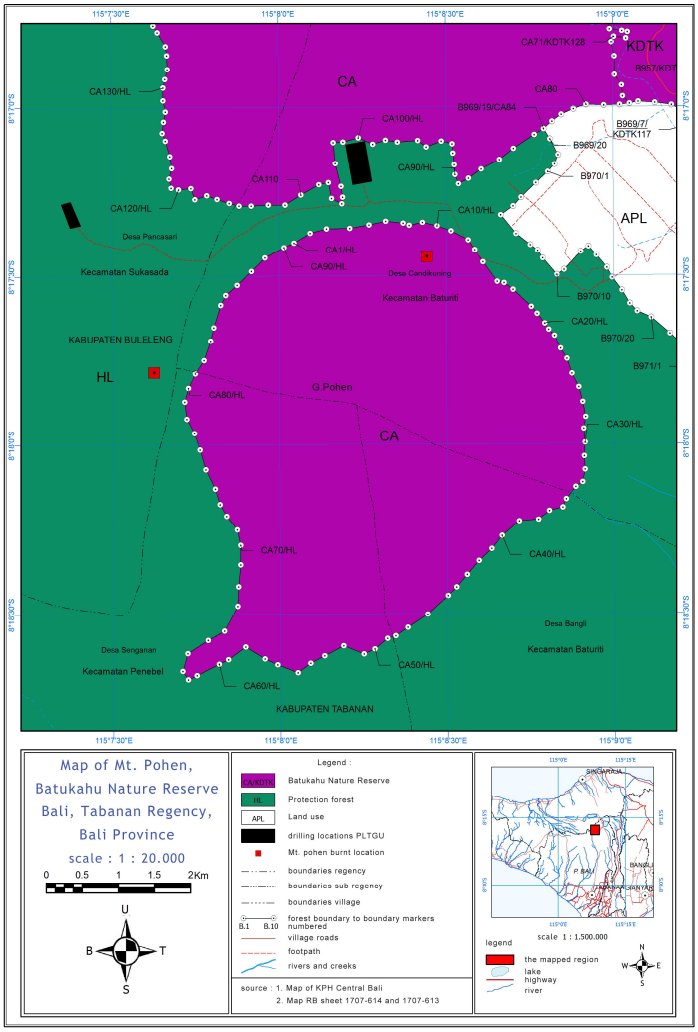
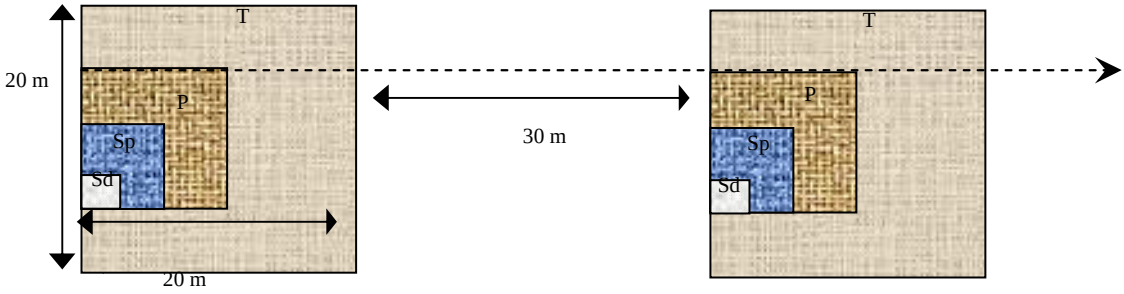


Figure 1. Location of the study site



Note :
T : *Trees*
P : *Poles*
Sp : *Sapling*
Sd : *Seedling*

Figure 2. Nested plots design for sampling purpose

Calculation of adequacy of samples of species was determined using Species Area-Curve (SAC) which was created using the help of PRIMER software (Clarke & Gorley, 2005). Species diversity can be inferred by calculating Shannon-Wiener (H') diversity index with the formula as follow:

Shannon-Wiener (H′) :

$$H' = -\sum_{i=1}^{R} p_i \ln p_i$$

Shannon – Wiener index result can be interpreted as follow:

1. H′ > 3 indicating high level species diversity in a given site
2. 1 ≤ H′≤ 3 indicating medium level species diversity in a given site
3. H′ < 1 indicating a low level of species diversity in a given site

3. Results And Discussion

Species-area curve (Figure 3) revealed that based on species observed in the sampling sites, there are approximately 80 species belonging to the burnt and un burnt plots on Mt. Pohen. The curve almost reaching asymptote, indicating that the addition of more sample plots would likely not have made much different for addition of more species to be found. It is also indicates that approximately 50 sample plots are closely adequate enough to represent the species in the sampling sites.

On Mt. Pohen burnt sites, the number of trees found were 10 species, and the groundcovers were 40 species. Whereas in the un burnt sites, the number of trees were 24 species and the groundcovers were 33 species (Figure 4). From the graph it is clear than that in the burnt site, the number of tree species was lower than in the un burnt site whereas the opposite was true for the groundcovers species.

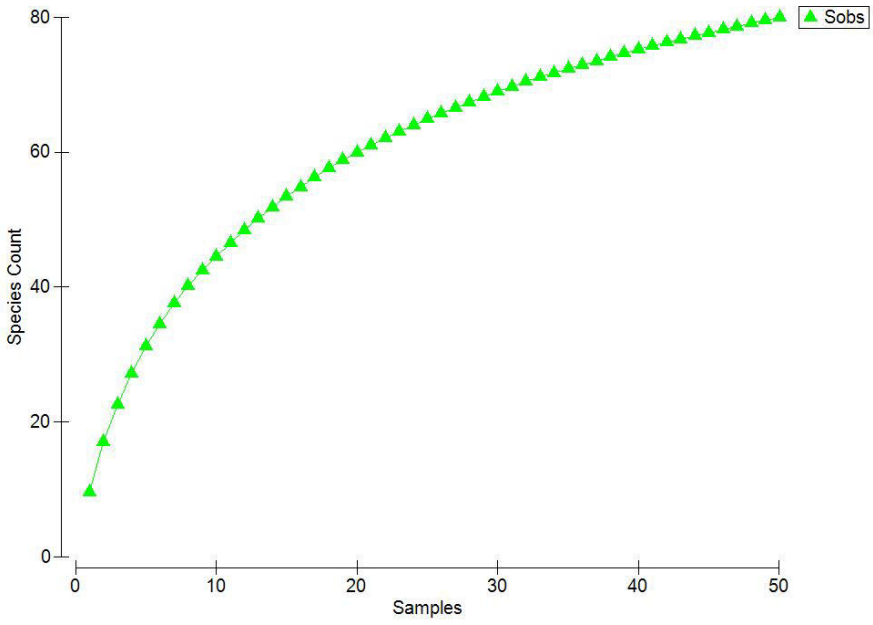


Figure 3. Species- area curve (SAC-Sobs) as observed in burnt and un burnt sites of Mt. Pohen Batukahu Nature Reserve Bali

The burnt site of Mt. Pohen located in the belt of *Podocarpus* zone, and the 1994 forest fires had destroyed most of the trees in the area, and this would explain the lower number of trees species found in the burnt site compare to the un burnt site. The forest fire were then creates an opening of the forest strata, with the destruction of most trees canopy. This gap in the forest would then creates a suitable condition for the growth of the groundcovers species including perhaps those in the soil as seed bank and various pioneer species were then established in the burnt site. This perhaps would explain the higher number of groundcovers in the burnt site compare to the un burnt one.

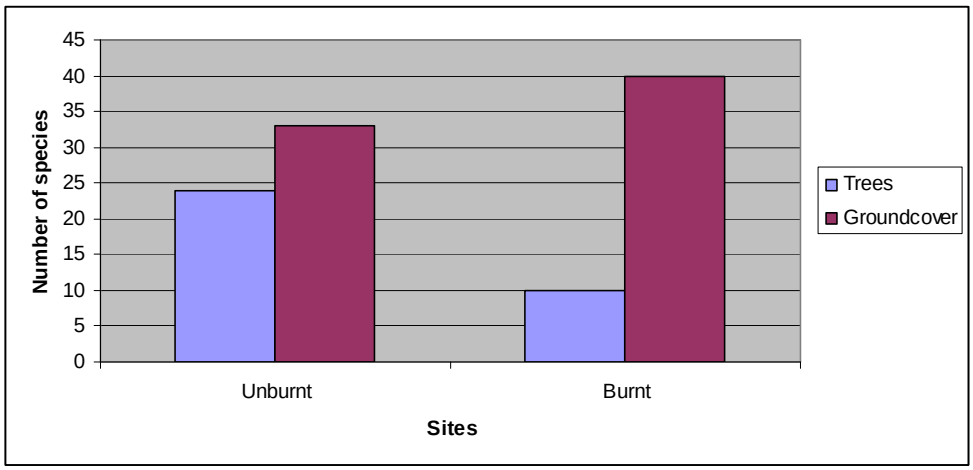


Figure 4. Differences in number of species for trees and groundcover species in burnt and un burnt sites of Mt. Pohen Batukahu Nature Reserve Bali

Diversity index showed the level of vegetation diversity in a community which determine by two factors such as its abundance and evenness. According to Shannon Wiener index ranging of $1 \leq H' \leq 3$ indicating medium level species diversity however, the un burnt site contain higher species diversity compare to the burnt site. The total number of species diversity index in the un burnt site (2.29) is higher than the species diversity in the burnt site (1.38). It is clear than that the forest fire had an impact in the decreased of the species diversity.

The burnt sites is mainly dominated by tree species *Homalanthus giganteus* Z.& M., whereas for the poles and sapling-sedling are characterized by *Cyathea contaminans* (Hook.) Copel., *Caliandra* sp. and *Dicranopteris linearis* (Burm. f.). *Homalanthus* is common tree species that usually emerge following disturbance and usually can be found in a secondary succession sites. *Homalanthus* is common in the secondary forest in East Java such as in Nongkojajar area (van Steenis, 1972). *Caliandra* is also a common pioneer plant. In Mt. Merapi, this species is dominating the succession sites following pyroclastic flows such as described by Sutomo (2010). *Caliandra* is a legume member and its role is facilitating the subsequent species by improving the soil conditions following the disturbance. *Dicranopteris linearis* is also can be found in the secondary succession sites after wildfires on Mt. Papandayan West Java (Sutomo, 2012).

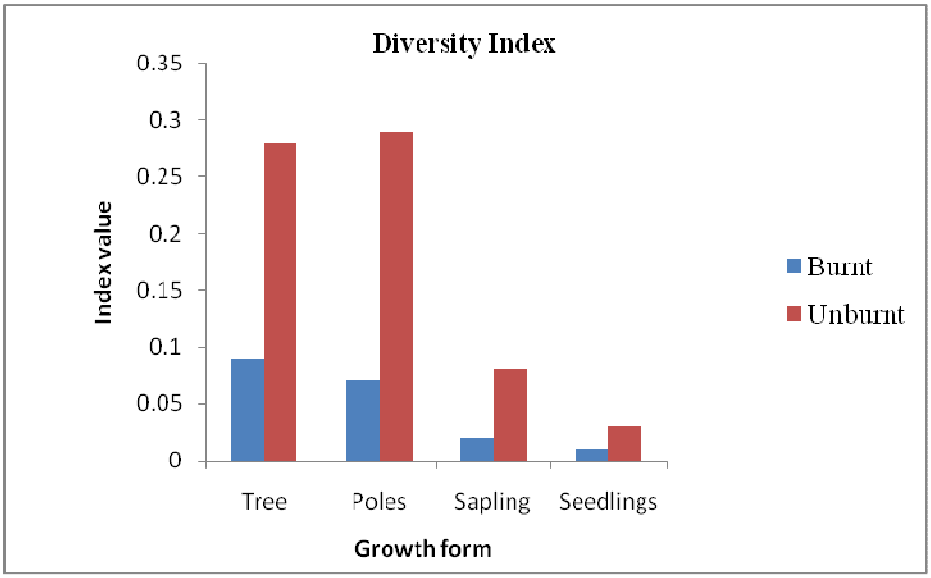


Figure 5. Differences in species diversity index for each growth form in burnt and un burnt sites of Mt. Pohen Bali

Different species however, dominated in the un burnt site such as tree species *Podocarpus imbricatus* Bl. In the poles, sapling and seedling layer, it is characterized by the presence of *Crypteronia paniculata* Bl., *Pinanga coronata* (Bl. ex Mart.) Bl. and *Selaginella* sp. *Selaginella* is commonly found in the forest floor which has closed canopy, and therefore it can be found in an undisturbed forest, such as in the un burnt site of Mt. Pohen.

Although many Podocarpus was burnt there are still some species dominated in the un burnt site. According to the IUCN, this species is included in the red list in 2011, in the category of least concern; therefore ex-situ conservation of this species is also needed to support the following reintroduction program.

4. Conclusion

Species richness observed of burnt and un burnt sites on Mt. Pohen revealed that 80 species were recorded in the sampling sites. The difference in the configuration of trees-and groundcovers may have suggesting that there was a different microclimatic condition between the burnt and un burnt sites. Shannon-Wiener species diversity index suggesting that both sites were in the medium level of diversity however the species diversity in the burnt site is much lower than in the un burnt site. These results are of important value as one of the not many literature and plant community studies on Mt. Pohen especially in the 1994 *Podocarpus* zone burnt site.

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