

Short Communication:

Decreased populations of *Scutellaria discolor* and *Plectranthus galeatus* (Lamiaceae) on Mount Gede, West Java, Indonesian and its surrounding

SUDARMONO

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Abstract. Sudarmono. 2018. Decreased populations of *Scutellaria discolor* and *Plectranthus galeatus* (Lamiaceae) on Mount Gede, West Java, Indonesian and its surrounding. *Biodiversitas* 19: 1866-1870. *Scutellaria discolor* Colebr. and *Plectranthus galeatus* Vahl. are herbs belonging to mint family (Lamiaceae) which have the potential to be used for medicinal purposes. However, their population is gradually declining. The population of the two species are now only found in the mountains or highlands or the edges of the forests that are still protected, i.e. Mount Gede and Telaga Warna protected forest. This research aimed to know the condition of parent and seedling population of *Scutellaria discolor* Colebr and *Plectranthus galeatus* Vahl. on Mount Gede and Telaga Warna vicinities, West Java Province, Indonesia. The research method used was parallel transect lines. Association of the existing plants in the vicinity of the area were also observed. In Mount Gede at altitudes about 1200 m above sea level there are 203 seedlings and 167 parents of *S. discolor* species, while there are 69 seedlings and 11 parents of *P. galeatus*. This is higher than the populations of 1100 m altitude, i.e. there are 76 seedlings and 45 parents of *S. discolor* and 12 seedlings and 9 parents of *P. galeatus*. In Telaga Warna, *S. discolor* exist only at altitudes about 1500 m asl., i.e.. 47 seedlings and 52 parents. While for *P. galeatus*, there are 37 seedlings and 31 parents at altitudes about 1500 m. At altitude below 1400 m, there are 18 seedlings and 8 parents, this is very rare. Populations of *S. discolor* and *P. galeatus* in Mount Gede at an altitude between 1100-1300 m asl is a balance between the seedlings and its parent population which is the same for seedling populations of *S. discolor* in Telaga Warna at an altitude of 1400-1500 m asl, but for *P. galeatus* seedling number decreases from an altitude of 1400 to 1500 m asl.

Keywords: Lamiaceae, Mount Gede, Telaga Warna, West Java

INTRODUCTION

Scutellaria discolor Colebr. and *Plectranthus galeatus* Vahl. are members of mint family (Family Lamiaceae) (Figure 1). These herbaceous terrestrial plants grow on Mount Gede and Telaga Warna Hill (commonly called Telaga Warna) of West Java Province at an altitude of 500-3,200 m, along with the grass, in shady and moist places in wet forest, forest paths, wet rock in the ravine, in the Mandalawangi forest, and dipterocarp plateau at about 1,700 m above sea level (asl). *S. discolor* is locally called Hamru Lemah, which is used as traditional medicinal herb for aphrodisiac treatment (Burkill 1966). This plant has the characteristics of small herb, having height of 20-50 cm, but rarely reach 100 cm. Compound flowers are located at the end of the stem, like a bunch of simple inflorescence of 10-15 cm long. The color of the flowers are blue crown, pale blue, light purple and dark purple. The flowers bloom sequentially in acropetal succession. Flowering occurs from January to December. *P. galeatus* or jawer kotok is an important medicinal plant. Some diseases like piles, diabetes, constipation, boils, abscesses and irregular menstruation can be treated with jawer kotok (Burkill 1966). Jawer kotok is a shrub, herbaceous and creeper with

erect stem height ranging from 30 cm to 150 cm. Leaves are heart shaped and on each edge, the leaf is adorned by oblong or oblong-thin contours which are continuous and supported by the petiole. The flowers appear at the top of the inflorescences shaft rod-shaped composite strands and verticillaster. Jawer kotok can flourish in the lowlands up to an altitude of 1,500 meters asl. (asl). This plant is very diverse in kinds and colors of the leaves. Jawer kotok is commonly found as wild plants around rivers or rice fields and the edges of rural roads.

Both species are found on Mount Gede and Telaga Warna at altitudes above 1000 m asl. Mount Gede is one of the tropical mountain ecosystems in West Java Province with height range between 400 m up to 2210 m asl (Van Steenis 2007). Mount Gede is located inside Mount Gede National Park where a 400 km² conservation area is located in the province of West Java. It is located near Telaga Warna Ecotourism lake, not far from the location of Mount Gede-Mount Pangrango National Park (Wijaya 1999). Although many plant species with small ranges are classified as endangered or threatened at the federal or state level, our species selection process did not consider current listed status as a criterion; rather, we consider range size as an important correlation of future risk in the face of climate



Figure 1. *Scutellaria discolor* Colebr. (left) and *Plectranthus galeatus* Vahl. (right), members of mint family (Lamiaceae).

change, regardless of species' current legal status. We review what is known about the long-term, large-scale range dynamics of forest herbs in response to past climate change and present a new biogeographic analysis investigating how contemporary distribution and diversity patterns among a subset of rare forest herbs may relate to these past climate dynamics. We also discuss how forest herb species may be affected by contemporary climate change and consider options for species conservation.

This research study was aimed at understanding the status of plants *Scutellaria discolor* Colebr. and *Plectranthus galeatus* Vahl. (Figure 1) as well as their parent and seedling populations on Mount Gede and Telaga Warna, West Java Province, Indonesia.

MATERIALS AND METHODS

Study area

Population research was carried out in the Mount Gede-Pangrango National Park of Cibodas, Cianjur, West Java, Indonesia and an ecotourism area of Telaga Warna Nature Recreation Park (Telaga Warna NRP), Cianjur, West Java. Research was carried out for a month, i.e. in June 2016.

Data collection

Plot was built for size of 20 m x 20 m. At least three plots were built if both species of the Mint family existed. The largest of the research area was about a hectare (10000 m²). The seedling stage count was conducted for plants having height less than 5 cm for *Scutellaria discolor* and less than 25 cm for *Plectranthus galeatus*. The parents' stage count was conducted for plants having height more than 5 cm for *S. discolor* and more than 25 cm for *P. galeatus*. The height of the plot above sea level is also carried out data collection on every 100 meters of elevation, starting from 1100 m above sea level. At Mount Gede, sampling was conducted by making observations

based on altitude more than 1000 m asl as well as at Telaga Warna NRP. Data sampling was carried out with parallel systematic vegetation sampling methods (Cropper 1993) which fitted cut contours, in a number of plots that are built with rectilinear plot nesting along transect technique. Plant associations analysis of identified specimens was carried out in the Herbarium Bogoriense (BO), Research Centre for Biology, Cibinong, Bogor, Indonesia.

RESULTS AND DISCUSSION

Plant association

The national park consists of twin volcanoes: Gede 2,958 m asl. and Pangrango 3,019 m asl. The two summits are connected by a high saddle known as Kandang Badak, 2,400 m asl. The mountain slopes are very steep and are cut into rapidly flowing stream, which carve deep valleys and long ridges. For those fortunate enough to stand on the summit of Mount Gede in clear conditions the view is spectacular. The sub-montane ecosystem is characterized by many large, tall trees like jamuju (*Dacrycarpus imbricatus*) and puspa (*Schima wallichii*). The sub-alpine ecosystem, meanwhile, is characterized by grassy meadows of *Isachne pangerangensis*, edelweiss flower (*Anaphalis javanica*), violet (*Viola pilosa*), and sentigi (*Vaccinium varingaefolium*). Sub-montane zone in the area of Mount Gede is dominated by *Altingia excelsa*, *Castanopsis javanica* and *Lithocarpus indutus* stands (Sunaryo & Rugayah 1992). In this area, it is generally found where trees are large with a diameter of 50 cm, with a dense canopy cover, low light intensity and higher humidity. According to Wiharto (2009), tree stands having high important value index (IVI) on the Northern Slope of Mount Gede, West Java, i.e. *Villebrunea rubescens* (45.15%), *Altingia excelsa* (39.77%), *Schima wallichii* (21.92%), and others, which are common plant species in the northern slopes that have a diameter below 30 cm. Meanwhile, the tree that has a diameter of 51 cm is dominated by *Altingia excelsa* and *Schima wallichii*. Next research study was conducted in Telaga Warna, Sub-district Cisarua, District Bogor, West Java Province, Indonesia (6°702'S, 106°996'E). This study area is a Nature Reserve and Nature Recreational Park (Taman Wisata Alam). The Nature Reserve is a conservation area for 549.66 ha tropical rainforest with high plant diversity. The reserve has a hilly terrain with an altitude that ranges from 1097 m-1600 m above the sea level. Area of the Nature Recreational Park is about 5 ha. There is a lake in the middle of the Nature Recreational Park. The lake is surrounded by a steep cliff. In Telaga Warna, vegetation is almost the same, but there is a Telecommunication Tower on the hill which makes the surrounding area open. According to Nila et al. (2014), vegetation composition at Telaga Warna, is *Villebrunea rubescens*, *Caryota mitis*, *Lithocarpus sundaicus*, *Saurauia distasosa*, *Schima wallichii*, *Blumea lacera*, *Turpinia sphaerocarpa*, *Ficus ribes*, *Ficus fistulosa*, *Fagraea ceilanica*, *Musa acuminata*, *Ficus* sp., *Schefflera scandens*, *Homalanthus populneus*, *Poikilospermum suaveolens*, *Chromolaena odorata*,

Persicaria chinensis, *Laportea stimulans*, *Datura metel*, *Castanea argentea*, *Vaccinium korthalsii*, *Tetrastigma laevigatum*, *Syzygium laxiflorum*, *Clidemia herta*, *Elaeocarpus floribundus* and *Castanea javanica*. At this location, the most common stand and the dominant species is *Villebrunea rubescens* with the largest diameter class of less than 20 cm. In general, the succession has not yet reached a climax. According to Rahayu et al (2011), habitat of *Hoya purpureofusca* in the sub montane zone of Cibodas is dominated by *Altingia excelsa*, *Castanopsis javanica* and *Lithocarpus indutus* stands.

Based on the association tests conducted, three species (*Antidesma tetrandrum*, *Pinanga coronata*, and *Castanopsis javanica*) were associated with *Saurauia bracteosa*. Significantly, while *Altingia excelsa* and *A. tetrandrum* were associated with *Symplocos costata*, as they had association indices of 0.3, based on Jaccard Index (Wihermanto 2004). Both locations, namely Mount Gede and Telaga Warna have a composition of similar plants, as stated by Whitten, et al. (1996). The implications of the association of plant species with large diameter timber is that they provide shade so that availability of sunlight that is required by shrub species is reduced. Shrub plants prefer the conditions that are exposed by the sun's radiation.. Associations consisting of large trees will reduce the growth of low canopy trees. Associations consisting of large trees will reduce the growth of low canopy trees. The association of translucent canopy trees will play a role in the growth of each plant. Association is very influential on the succession. Herbaceous plants will be grown on the slopes of the area of forest edge and spreading through the rain water and river water. Among the plant species characteristic of Temperate Deciduous Forest, forest herbs may be especially vulnerable to climate change for several reasons, i.e., many forest herbs have biological and ecological traits that may limit the rate at which they are capable of migrating in response to changing climate (e.g., species with seed dispersal mechanisms adapted primarily to local movement rather than long-distance dispersal; Van der Veken et al. 2007)

Mount Gede location

Scutellaria discolor Colebr.

At an altitude of 1200 m asl., 167 individuals parent population of *S. discolor* and 203 seedlings were found within 20x20 m² plot. However, at an altitude of 1100 m asl., *S. discolor* parent population consisted of s 45 individuals and seedling population consisted of 76 individuals. Condition at altitudes above 1100 m is highly expected to remain in a balanced state of parents and seedling, considering that the distance between the two plots is only 5 meters or tend to be flat so that seed dispersal is adjacent to its parent (Figure 2). However, at altitudes below 1100 m asl, only 21 and 24 individuals of *S. discolor* parent (1120 m and 1138 m asl respectively) were found. Seedling can still be expected to regenerate future populations (van Steenis 2007). Conditions on *S.*

discolor is still good to keep a balance between the parents and seedlings.

Plectranthus galeatus Vahl.

On observation of *P. galeatus* in Mt. Gede, the parent population number is found to be lower than that of the seedling. At an altitude of 1200 m asl., there are 69 seedlings, while at an altitude of 1100 m there are 12 seedlings and at altitude 1300 m asl there are 14 seedlings (Figure 2). Substitution regeneration in *P. galeatus* also still going well because the number of seedlings is far more than its parent.

The tree with the diameter below 30 cm in five main tree species in the north part of the Gede Mountain totalling 61.7% (66 trees) showed the process of the plant succession proceeding smoothly (Sudarmono 2011). However the existence of the old tree or trees with the diameter more than 50 cm totaling 26% (28 trees) that was dominated by two species, namely *Altingia excelsa* and *Schima walichii*. Both of those trees tend to cover of understorey vegetation. These vegetation could not grow well without sunlight for photosynthesis. Therefore growing patterns can be followed by pruning the canopy so that the vegetation under the canopy-shaded getting sunlight. Wijaya (1999) recorded 789 trees or density of 394 trees/ha in an area of 2 hectares with a size 20 x 1000 m² in the same area. ². So for a duration of 10 years (1999-2011) in the north slope of the Gede Mountain had a two-fold density and the diversity increased with the increasing width of the observation plot.

Telaga Warna location

Scutellaria discolor Colebr.

Seedling of *S. discolor* (204 individuals) in Telaga Warna was found to be more than that of the parent (95 indiv.) at 1600 m asl. (47 indiv.; Figure 3). However seedling at 1500 m asl. was almost same to its parents (52 indiv.). This showed that the process of regeneration of populations of *S. discolor* in Telaga Warna is still good. In the future the parent population shows the population of *S. discolor* in Telaga Warna is getting fewer and its seedling are increasingly less resistant to life. The parent population at Telaga Warna shows that the population of *S. discolor* displays a declining trend in the future with its seeds being less resistant to environmental factors.

Plectranthus galeatus Vahl.

Regarding the species of *P. galeatus* in Telaga Warna at altitude below 1500 m asl., the seedlings (37 indiv.) are found to be more than the parents' number (31 indiv.) also at 1400 m asl., seedlings and parents are 18 indiv. and 8 indiv. respectively, but at 1600 m asl., the parents' number (59 indiv.) is more than that of the seedlings (34 indiv.; Figure 3). This shows habitat imbalance between parent and seedling populations at altitudes about 1600 m asl.

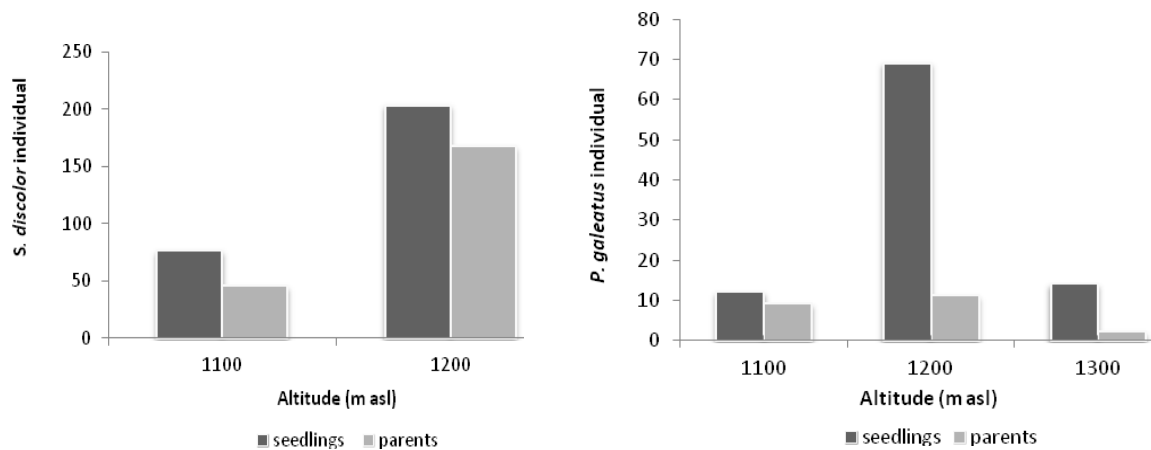


Figure 2. Individual number of *Scutellaria discolor* (left) and *Plectranthus galeatus* (right) at Mount Gede, West Java, Indonesia

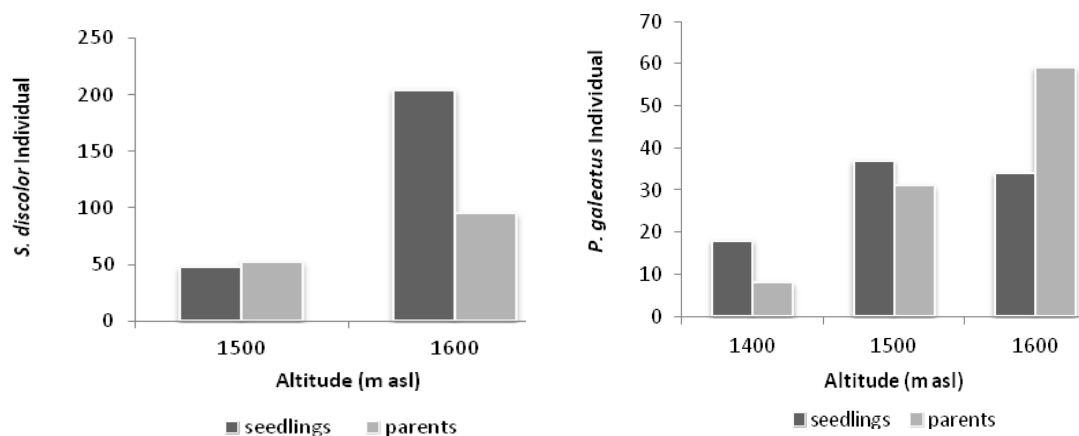


Figure 3. Individual number of *Scutellaria discolor* (left) and *Plectranthus galeatus* (right) at Telaga Warna, West Java, Indonesia

Harmer et al. (2005) studied the number of oak and ash seedlings and concluded that it was positively related to the number and proximity of parent trees. There were no consistent relationships between decreases in the sizes of the seedling populations and the type, amount and height of vegetation. The size of seedling populations generally declined with time with annual reductions varying from 0 to 90% depending on species and year; for most of the study, oak and ash populations fell by 40-50% each year. The study of *Impatiens capensis* by Waller (1985) indicated that the importance of the initial variables (seed weight, seed type, and parent) increased with decreasing average plant size. The increased risk of extinction for small-ranged species can be traced back to a number of ecological and biogeographical factors. For example, macroecological studies have frequently detected a positive correlation between range size and local abundance, such that small-ranged species are often characterized by lower abundances and smaller population sizes than widespread species (Gaston 2003), a result that has been apparent in several plant-focused studies. This characteristic, combined with

the geographic clustering of populations, may expose small-ranged species to greater risk of extinction due simply to stochastic population processes or to chance regional events (e.g., drought, introduction of novel pathogens; (Gaston 2003). In addition to risk factors that may be inherently linked to small range size, modern climate change poses a significant new threat to many small-ranged, endemic species (Thomas et al. 2004, 2011). Specifically, substantial geographic disjunctions are likely to develop between the locations of many small-ranged species' current ranges and the locations of climatically similar areas in the future (Thomas et al. 2004; Schwartz et al. 2006). Such disjunctions between present and future habitat areas are less likely for widespread species, where at least some portions of these broadly distributed species' ranges are likely to remain climatically suitable to the future, buffering against climate-driven threats (Thomas et al. 2004; Schwartz et al. 2006). Without successful long-distance dispersal to track shifting climate zones as they move poleward, populations of small-ranged species may soon be exposed to novel climatic regimes that fall outside

the range of climatic conditions they currently exist under; for some species this is likely to result in population declines or extinction (Thomas et al. 2004).

To conclude, populations of *Scutellaria discolor* and *Plectranthus galeatus* in Mount Gede at an altitude from 1100 m-1300 m asl. is a balance between the seedlings and its parent population. Likewise, populations of *S. discolor* in Telaga Warna is still going well between parent and seedling at an altitude of 1600 m asl., but for the species of *P. galeatus* (altitude 1400 to 1500 m asl), parents' number decreases.

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