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Research article

BAMBOOS OF THE BATU PUTU BIODIVERSITY PARK LAMPUNG

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ABSTRACT

Sumatra has a high diversity of bamboo (around 80 species of bamboo, and an unfinished record) in Indonesia. Lampung is one of the regions in Sumatra that has a great number of bamboo species and the endemic bamboos that has not been studied. The Batu Putu Biodiversity Park is an area designed by the local government to become Bamboo Education Tourism Center. Within a few years, the Batu Putu Biodiversity Park ecosystem can be changed effects a tourism activity. The exploratory study has been done to discover the bamboo species that originally grew in the Batu Putu Biodiversity Park, Lampung - Sumatra. The data that has been obtained from this study is important as a part of bamboo diversity data in Lampung, and Sumatra generally. Besides, it gave information about bamboo species that suitable to grow on the rocky soils. The result showed four genera, consisting of five species, namely Dendrocalamus asper, Gigantochloa atroviolacea, G. hasskarliana, Schizostachyum zollingeri, and Dinochloa sp. The last species is a candidate for a new record of Sumatran climbing bamboos, even new species candidates that we can not decide yet due to lack of samples and some particular conditions.

Keywords: ***bamboo, biodiversity, Dinochloa, Lampung, The Batu Putu village***

INTRODUCTION

Indonesia has more than 176 species from 1439 species of bamboo, and 24 genera out of 116 bamboo genera or about 12% of all bamboo species in the world. Indonesia also has a wealth of endemic bamboo species (88 species out of 124 species, and some cultivars) that are not owned by other countries (Widjaja, 2018; Clark *et al.,* 2012). Sumatra has a greater diversity of bamboo (around 80 species of bamboo, and an unfinished record) compared to other islands in Indonesia. Lampung is one of the regions in Sumatra that has a diversity of bamboo that has not been studied.

The Batu Putu Biodiversity Park is an area that is being launched by the government of Bandar Lampung to become education-based ecotourism. In this area, a bamboo education park will be built which will collect bamboo species from Indonesia archipelago, especially Sumatra, and various bamboo of the world (Bandar Lampung City Government, 2019, The Grand Design Development of Bamboo Education Tourism Center in Batu Putu Biodiversity Park which was delivered in a field visit on 3

September 2019). The Batu Putu Biodiversity Park has a strategic location (can be reached in less than 30 minutes from the downtown), ease of access to transportation and friendly locals, potential as an alternative place of field practice for students and researchers. The main attraction of the Batu Putu Biodiversity Park is a waterfall, located in the valley. Visitors can track down the slope to reach the waterfall. This area also has basic emergency facilities, such as parking lots, halls, prayer rooms, toilets, and shelters.

The ecosystems of this area can be divided into two types. First is the slopes area that is a remnant secondary forest, some part turned into mixed gardens. Second is the river and waterfall located in the valley, surrounded by little forests. The type of soil in this area tends to be rocky and the topsoil is thin.

The study aims to observe and inventory of the wild bamboo species that originally grew in Batu Putu Biodiversity Park. This is a part of the bamboo study in Lampung, and the data obtained is important as a part of basic information of bamboo diversity data in Lampung, and Sumatra generally. Moreover, the data obtained is unique because giving information about bamboo species that suitable to grow on the rocky soils. This study also useful for planning and developing a tourism program in Batu Putu Biodiversity Park Lampung.

METHODS

The study is an exploratory research. A morphological study of bamboo was carried out following method of taxonomical studies (Rugayah *et al,* 2004). The material observed in this research was collected from the Batu Putu Biodiversity Park, Lampung, Sumatra - Indonesia during December 2019. Data recorded were coordinates of the location, habitat, morphological characteristics that may be lost when making herbariums (hair of culms, the color of shoots, culm with branches, the culm sheath), vernacular names, and utilization. The samples were taken to the Sumatra Institute of Technology for further processing of herbarium and observation. The samples were identified refers to Dransfield & Widjaja (1995), Widjaja (1997), Widjaja (2001a), Widjaja (2001b) and Widjaja *et al.* (2005).

RESULT AND DISCUSSION

Based on the observation, the diversity of bamboo found in the Batu Putu Biodiversity Park (not a planted species) has been obtained four native genera, namely *Dendrocalamus, Dinochloa, Gigantochloa,* and *Schizostachyum*. They consist of four species that have been identified and one species has not yet been identified, namely *D. asper, G. hasskarliana, G. atroviolacea, S. zollingeri,* and *Dinochloa* sp (**TABLE 1**).

TABLE 1. The Bamboo Species Found in Batu Putu Biodiversity Park, Lampung

Genus	Scientific Name	Habit	Location
Dendrocalamus	*D. asper*	Clump erect	Riverside, mixed garden
Dinochloa	Unidentified	Climbing bamboo	Secondary Forest / mixed garden
Gigantochloa	*G. hasskarliana*	Clump erect	Riverside
	G. atroviolaceae	Clump erect	Riverside
Schizostachyum	*S. zollingeri*	Clump erect	Riverside

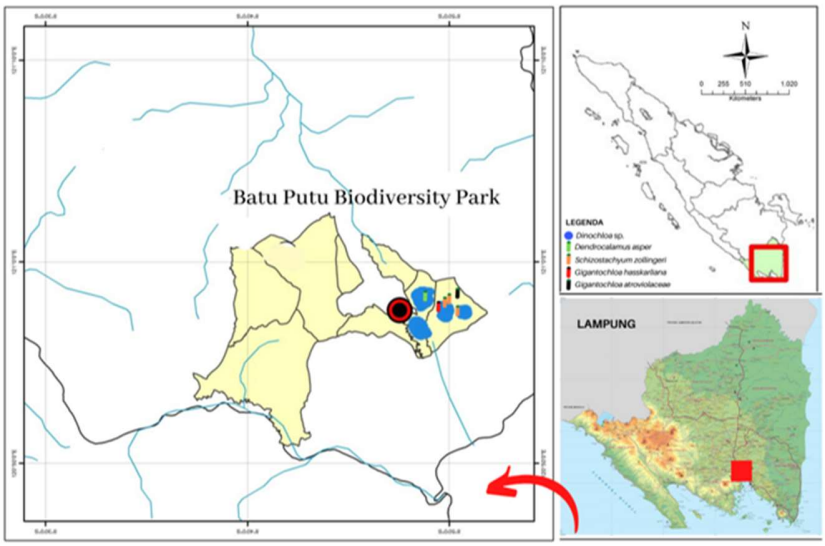

FIGURE 1. The location of the bamboos in Batu Putu Biodiversity Park, Lampung

The common area found bamboos is adjacent to the waterfall and watersheds of the river, except the *Dinochloa* sp. The only species of *Dinochloa* found on the remnant secondary forest of Batu Putu and in the trek path downward toward the waterfall. This species dominates the area, climb the trees, sometimes formed a gate between the trees. The location of the bamboo species that found in Batu Putu Biodiversity Park Lampung are shown in **FIGURE 1**.

Bamboos are classified into two major groups, running or climbing (leptomorph/monopodial) bamboos and clumping (sympodial). The climbing bamboos mostly distributed in the subtropical and temperate regions, but the clumping bamboos in the tropical and subtropical regions (Widjaja, 2001b). During this study, Dinochloa is the species of climbing bamboo, which characterized by its expanding underground rhizomes.

Key to the bamboo species in Batu Putu Biodiversity Park

1. a. Culm erect 2
   b. Culm climbing..... *Dinochloa* sp.
2. a. Branches with one dominant lateral branch.....3
   b. Branches subequal ..... *Schizostachyum zollingeri*

3. a. Mid culm longer than lower culm, aerial root only in lower culm, lower culm hairy 4
   b. Lower culm shorter than mid culm, aerial root in lower to mid culm, lower culm with velvety hair..... *Dendrocalamus asper*
4. a. Culm green, auricle rim-like have apendix ..... *Gigantochloa hasskarliana*
   b. Culm purplish green, auricle rounded ..... *Gigantochloa atroviolacea*

Description of each genus and species

Dendrocalamus Nees

Linnaea 9: 476 (1835)

Culms erect never climbing. Young culm covered with velvety brown hairs, some with white wax, *branches* with one dominant lateral branches and several smaller branches. *Culm sheath* with blades deflexed, triangular; culm sheath auricles rounded; leafsheath auricles rounded.

Distribution. India, Indochina, southern China, Southeast Asia (Malay Peninsula, Philippines, Sumatra, Jawa, Borneo, Sulawesi, Moluccas, New Guinea).
Habitat. Secondary forest or in cultivation.

1. *Dendrocalamus asper* (Schult.) Backer
Nutt. Pl. Ned.-Ind.ed. 2,1: 301 (1927)

Shoot brown purplish with velvety dark brown hairs. *Culm* erect with drooping tips, diameter 10 to 15 cm, thick walls. *Branches* one lateral dominant with several smaller branches, 4-7 branches on the middle culm. Lower young culm covered with velvety brown hairs or glabrous, aerial roots appear on the old culm. Upper young culm covered with white wax. *Culm sheath* deciduous, hairy, hairs brown to black; auricles rounded with bristles 5-10 mm long; ligules 8-10 mm high, dentate irregular; blade deflexed, lanceolate or narrowly triangular. *Leaves* glabrous, apex acuminate, base rounded and briefly constricted; *leafsheath* auricles rounded, bristles absent; ligules entire. Inflorescence not seen.

Habitat. Riverside and mixed garden.
Vernacular name. Bambu betung, petung.
Local uses. building material, the bridge.

***Dinochloa* Buse**
In Miquel, Pl. Junghuhn: 388 (1854)

Culms climbing, zigzag, smooth or rough when young, usually purplish, rarely green or green with white wax. Culm node with scar sheath and very rough base. *Branches* small, with the dominant branch dormant, when the main culm was cut off, the dormant and dominant branch is developed can be big as the main culm. *Culms sheath* with rugose base; with black hairs or whitish wax adaxially, auricles present or absent; blades erect, spreading or deflexed, triangular-broadly ovate. *Leafsheath* auricle present or absent; glabrous or hairy.

Distribution. Myanmar, Indochina, Hainan, Andaman, Nicobar Islands, Malay Peninsula, Sumatra, Java, Borneo, Sulawesi, Lesser Sunda Islands, Philippines, Moluccas.
Habitat. Primary and secondary forests, in the ultrabasic soil, limestone, volcanic soil, from the lowland up to 1200 m asl.

2. *Dinochloa sp.*

Shoot purplish green with white wax. *Culm* climbing, diameter 1-2.5 cm, rarely 3 cm in diameter, cover with white hairs and white wax, glabrous when old, branches small (the dominant branch dormant, when the main culm was cut off), nodes bases rough. *Culm sheath* persistent, without hairs, white waxy in young culm sheath; auricles absent; ligules laciniate, ligules short without bristles; blade first erect and deflexed when old, triangular with long acuminate tips, base cordate, 2.5-4.5 cm long, 0.8-1 cm wide near the base, about 0.2-0.5 cm wide at the junction with the sheath., *Leaves* 2-3 x 13-16 cm, apex acuminate, base rounded and briefly constricted, petioles short, up to 10 mm long, almost sessile; *Leaf sheath* with absent auricles; ligules dentate irregular. *Inflorescence* not seen.

Habitat. In the remnant secondary forest, mixed garden.
Vernacular name. -
Local uses. Not used by people yet. However, this bamboo is potential as an ornamental plant, to build a pergola in any landscape. Since its culm is thick and strong, it can be used as the main axis or frame of the pergola.

Gigantochloa Kurz ex Munro
Trans. Linn. Soc. 26: 133 (1868)

Culms erect, nodes with one dominant lateral branches and several smaller ones. *Culm sheath* with brown to black hairs; blade erect to deflexed, triangular to lanceolate; auricles rounded to inconspicuous. *Leaves* glabrous, leafsheath auricle rounded to inconspicuous. *Inflorescence* indeterminate.

Distribution. South and Southeast Asia, Indochina, Myanmar.
Habitat. Lowland up to highland 1500 m asl.

3. *Gigantochloa atroviolacea* Widjaja
Reinwardtia 10: 323 (1987)

Shoots greenish black covered brown-black hairs. *Culms* erect up to 10 m tall, about 8 cm in diameter, branches grow far away from the ground, one dominant branches. Young culms with brown black hairs, when old glabrous and purplish. *Culms sheath* deciduous covered brown-black hairs, culm sheath auricles rounded 3-5 mm high with bristles up to 7 mm long, ligules short, glabrous, culm sheath blade deflexed. *Leaves* glabrous, *leafsheath* auricle small, about 3 mm long, glabrous; ligules 2 mm high, glabrous. *Inflorescence* not seen.

Habitat. Riverside.
Vernacular name. Bambu hitam.
Local uses. –

4. *Gigantochloa hasskarliana (*Kurz) Backer
Nutt. Pl. Ned.-Ind. ed. 2, 1: 299 1927.

Shoots green covered brown-black hairs. *Culms* erect, about 5-8 cm in diameter, branches grow far away from the ground, one dominant branches. Young culms with black hairs, when old glabrous and green. *Culms sheath* persistent, covered brown-black hairs, culm sheath auricles rim-like with curve inward apendix in the end of culm sheath, glabrous, ligules serrate, glabrous, culm sheath blade deflexed, triangular with narrow base. *Leaves* glabrous, *leafsheath* auricle small, 3-5 mm long, glabrous; ligules serrate, 2-3 mm high, glabrous. *Inflorescence* not seen.

Habitat. Riverside.
Vernacular name. -
Local uses. -

***Schizostachyum* Nees**
Agros. Bras.: 534 (1829)

Culm erect, pendulous tips. Branches subequal. *Culm sheath* covered by pale to brown hairs; auricles present, bristly or absent; ligule with or without bristles. *Leafsheath* auricles present or absent, with or without bristles. *Inflorescences* indeterminate, pseudospikelets slender.

Distribution. Southern China through Southeast Asia to the Pacific Islands.
Habitat. Lowland up to the highland, 1500 m asl., at the limestone and volcanic soil.

5. *Schizostachyum zollingeri* Steud
Syn. Pl. Glumac. 1: 332 1854.

Shoots green with brown tips covered brown-black hairs. *Culms* erect, 6-8 m tall, branches typically a cluster of slender subequal branches. Young culms with brown black hairs, green, glossy and glabrous when old. *Culms sheath* persistent covered brown-black hairs, culm sheath auricles rounded up to 7 mm long, with long bristles 10-13 mm long, ligules entire with bristle, culm sheath blade erect, triangular, base broadly. *Leaves* glabrous, *leafsheath* auricle small 7-10 mm long, with bristle up to 13 mm long; ligules short, glabrous. *Inflorescence* with 5-7 clusters of 1-several pseudospikelets, main axis glabrous. Pseudospikelets 8-15 mm long, glabrous.

Habitat. Riverside.
Vernacular name. -
Local uses. Galah (a pole to pick the fruits).

CONCLUSION

The diversity of wild Bamboo in the Batu Putu Biodiversity Park has recorded four genera, consisting of five species, namely *Dendrocalamus asper, Gigantochloa hasskarliana, Gigantochloa atroviolacea, Schizostachyum zollingeri* and *Dinochloa* sp. They found adjacent to the waterfall and watersheds of the river, except the *Dinochloa* sp. The last species mentioned was easily found and expanding on the remnant secondary forest of Batu Putu. Those species of bamboo in The Batu Putu Biodiversity Park have not been used intensively by the local people who lived nearby the area. The future study suggested is to explore the potential of bamboo species by their characteristics and continue the identification of unidentified species. It can be lead to a finding new species or the new record of Bamboo in Lampung or Sumatra, extensively.

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