Journal of Tropical Biodiversity and Biotechnology
Volume 09, Issue 04 (2024): jtbb90323
DOI: 10.22146/jtbb.90323

Review Article

Diversity Status of Bamboo in Sumatra: A Review

Muhammad Azli Ritonga[1], Syamsuardi[2]*, Nurainas[2], I Putu Gede P. Damayanto[3]
1)Doctoral Program, Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Andalas. Jl. Unand, Kampus Limau Manis, Padang, 25163, West Sumatra, Indonesia.
2)Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Andalas. Jl. Unand, Kampus Limau Manis, Padang, 25163, West Sumatra, Indonesia.
3)Herbarium Bogoriense, Research Center for Biosystematics and Evolution, National Research and Innovation Agency (BRIN), Indonesia. Jl. Raya Jakarta-Bogor, km 46, Cibinong, Bogor, 16911, West Java, Indonesia.
* Corresponding author, email: syamsuardi@sci.unand.ac.id

Keywords:
Bamboo
Conservation status
Diversity
Endemic
Sumatra
Submitted:
01 November 2023
Accepted:
29 April 2024
Published:
04 October 2024
Editor:
Miftahul Ilmi

ABSTRACT
Prior to initiating the conservation effort, conducting a bamboo species inventory in a specific area is crucial for obtaining information about the diversity status of the species in that region. Species inventorying is a fundamental step in ensuring that conservation efforts are targeted, effective, and based on sound scientific data. Regrettably, status of bamboo diversity in Sumatra is unavailable. Therefore, a study was conducted to determine the status of bamboo diversity in Sumatra. The study gathered data from literature review. It covered bamboo species, their statuses (endemic, introduced, ex-situ conservation, and threatened), and encompassed the main Sumatra Island and surrounding smaller islands. Species were re-identified and validated. Conservation status was assessed based on IUCN categories. There are 73 species of bamboo in the Sumatra region, representing 10 genera: *Bambusa* (11 species), *Chimonobambusa* (1 species), *Dendrocalamus* (10 species), *Dinochloa* (2 species), *Gigantochloa* (26 species), *Melocanna* (1 species), *Neololeba* (1 species), *Phyllostachys* (1 species), *Schizostachyum* (19 species), and *Thyrsostachys* (1 species). Eighteen species of Sumatran bamboo are known as introduced species, and 30 species are endemic to Sumatra, with the majority belonging to *Gigantochloa* (15 species). The least represented are *Bambusa* and *Dinochloa*, each having one endemic species. *Bambusa heterostachya*, *Dendrocalamus giganteus*, and *Dendrocalamus membranaceus* fall into the "least concern" (LC) category on the IUCN Red List, while the remaining 70 species have not been evaluated. A total of 44 species have been planted (conserved) in botanical gardens in Indonesia, while the remaining 29 species have not yet been conserved.

INTRODUCTION
Sumatra is an island in the western region of Indonesia, bordered by the Bay of Bengal to the north, the Malacca Strait to the east, the Sunda Strait to the south, and the Indian Ocean to the west (KBBID 2023). Astronomically, the island of Sumatra extends from 95°E to 105°E and from 6°N to 6°S. The island of Sumatra has an area of approximately 480,793.68 km² (Retnowati & Rugayah 2019) dan is surrounded by several small islands, such as the islands of Weh, Simeulue, Nias, Siberut, and Bengkalis. The mainland of Sumatra comprises 8 provinces, from north to south, namely Aceh, North Sumatra, West Sumatra, Riau, Jambi,

Bengkulu, South Sumatra, and Lampung (BPS 2023). Two additional provinces consist of archipelagos territories situated to the east of the primary Sumatran landmass, specifically the provinces of Kepulauan Bangka Belitung and Kepulauan Riau (BPS 2023). This means there are a total of 10 provinces in the Sumatra area.

Sumatra is well-known for its rich biodiversity, making it a significant repository of germplasm and a hub of endemism (Nursanti & Adriadi 2018). In 2017, it was reported that Sumatra harbors 10,259 plant and fungi species (Retnowati & Rugayah 2019). Widjaja et al. (2014) approximated that 23% or 1,891 species out of a total of 8,391 plant species in Sumatra in 2014 were endemic. For example, there are 39 (75%) endemic species of *Impatiens* (Balsaminaceae) in Sumatra from a total of 52 species of Indonesian *Impatiens* (Utami & Damayanto 2023). The mountainous forests of Sumatra harbor a diverse array of plant species (Ismaini et al. 2015; Sujarwanta & Zen 2020). Forest cover in Sumatra was reported to be 11.4 million hectares in 2013 (Purba et al. 2014). One plant species that displays high diversity in Sumatra is bamboo (*see* Widjaja 2019).

Bamboo belongs to the family Poaceae and sub-family Bambusoideae, which is related to grasses. Bamboo typically has a cylindrical, hollow, woody stem known as a culm that is fibrous and has nodes, with branches of leaves growing from each of the nodes. Some species, however, can be found to have rectangular culms, as seen in *Chimonobambusa quadrangularis* (Franceschi) Makino (Damayanto & Muhaimin 2017). Bamboo culms, for example in *Dendrocalamus*, have the potential to grow to significant diameters and heights (Widjaja 2001), reaching up to 25 cm in diameter near the base and 30 meters in height. Culm internodes of bamboo can be more than 1 m long, as seen in some of *Schizostachyum*. Generally, bamboo have erect culm, such as in *Schizostachyum* species (Damayanto & Widjaja 2016). However, bamboo can also be found scrambling in *Chloothamnus* species (Damayanto et al. 2020a) or as a climber in *Dinochloa* species (Damayanto 2018a).

There is an approximate total of 1,439 bamboo species globally (Widjaja et al. 2014), and within Indonesia, it is estimated that there are approximately 176 bamboo species (Widjaja 2019). Most of the bamboos in Indonesia are endemic, and more than half of these species have been used by local communities (Widjaja & Karsono 2005). For example, there are 10 endemic species of bamboo in the Lesser Sunda Islands, and seven among them are used for a variety of purposes, including as building materials, weaving, construction materials, walking sticks, charcoal, handicrafts, baskets, Balinese offerings, and musical instruments (Damayanto et al. 2023). The main issue with the utilization of endemic species of bamboo is the potential for them to become rare or even face the risk of extinction. To prevent extinction, botanical gardens play an important role by having a special responsibility for preserving plants and educating the public about their importance (Sanders et al. 2018).

Prior to initiating the conservation phase, conducting a species inventory in a specific area is crucial for obtaining information about the diversity status of the species in that region. Species inventorying is a fundamental step in ensuring that conservation efforts are targeted, effective, and based on sound scientific data. Regrettably, status of bamboo diversity in Sumatra is unavailable. According to Purba et al. (2014), approximately 1,530,156 hectares, equivalent to an annual rate of 382,539 hectares, were estimated to have been deforested in Sumatra from 2009 to 2013. However, some endemic bamboo species are found growing in the forests of Sumatra (*see* Widjaja 1997). Therefore, a study was conducted to determine the status of bamboo diversity in Sumatra. This re-

search is expected to be used as baseline data by stakeholders in bamboo resource management efforts in Indonesia. Furthermore, this research is also expected to clarify the presence of several bamboo species that are suspected to be questionable in Sumatra, such as *Bambusa lako* Widjaja (Sari 2011), *Bambusa ventricosa* McClure (Ervany et al. 2020), *Dinochloa scandens* (Blume ex Nees) Kuntze (Sujarwanta & Zen 2020), *Gigantochloa baliana* Widjaja & Astuti (Widjaja 2019), and *Schizostachyum blumei* Nees (Riastuti et al. 2019; Sujarwanta & Zen 2020).

MATERIALS AND METHODS

The research was conducted at Andalas University in September–October 2023. Data was gathered through an extensive review of reputable sources including scientific articles, research reports, and related publications focused on bamboo species in Sumatra. The acquired data encompassed bamboo species and their respective statuses, including endemism, introduction, ex-situ conservation, and IUCN Red List, within the region of Sumatra. The region of Sumatra in this study comprises not only the main plains of Sumatra Island but also the surrounding small islands, in accordance with the phytogeographic region outlined by Steenis-Kruseman (1950) (Figure 1). Bamboo species were validated by being re-identified based on the photos and descriptions shown in the references. The established validation criteria involved ensuring that morphological descriptions or photos matched the provided species names. In cases where this information was lacking, the author leaned on their experience from explorations in Sumatra to verify the existing species. All names of the bamboo species were validated using Vorontsova et al. (2016) and several online data sources (Damayanto et al. 2020b). Conservation status was determined based on categories and criteria listed in the International Union for Conservation of Nature's (IUCN) red list, such as not evaluated (NE), data deficient (DD), least concern (LC), near threatened (NT), vulnerable (VU), endangered (EN), critically endangered (CR), extinct in the wild (EW), and extinct (EX), which can be accessed through https://www.iucnredlist.org (IUCN 2023). We referred to the website https://makoyana.brin.go.id (Makoyana 2023) for information on the ex-situ conservation of bamboo species in each of Indonesia's botanical gardens. In order to determine endemic and introduced bamboo species, the information was gathered from the works of Widjaja (2019) and relevant publications. All data were analyzed and presented descriptively.

RESULTS AND DISCUSSION

There are 73 species of bamboo in Sumatra region (Table S1, several photos of the species are in Figure 2), representing 10 genera, namely *Bambusa* Schreb, *Chimonobambusa* Makino, *Dendrocalamus* Nees, *Dinochloa* Buse, *Gigantochloa* Kurz ex Munro, *Melocanna* Trin, *Neololeba* Widjaja, *Phyllostachys* Siebold & Zucc, *Schizostachyum* Nees, and *Thyrsostachys* Gamble. Among these bamboo genera, the most abundant species were *Gigantochloa* (26 species), followed by *Schizostachyum* (19 species), *Bambusa* (11 species), and *Dendrocalamus* (10 species) (Figure 3). The remaining genera each had one to two species. Nine taxa were reported only as identified up to the genus level in Sumatra (Table 1) and several species of bamboo that reportedly found in Sumatra were not included in this study because they did not meet our validation criteria, namely *Bambusa lako* Widjaja, *Bambusa ventricosa* McClure, *Chloothamnus elegantissimus* (Hassk.) Henrard, *Dinochloa scandens* (Blume ex Nees) Kuntze, *Gigantochloa baliana* Widjaja & Astuti, and *Schizostachyum blumei* Nees.

Figure 1. Phytogeographic region of Sumatra (orange colour) based on Steenis-Kruseman (1950). km = kilometers. (Source: QGis Hannover v. 3.16).

Figure 2. Several bamboo species in Sumatra. A. *Bambusa spinosa*, B. *Bambusa tuldoides*, C. *Bambusa vulgaris*, D. *Dendrocalamus luteus*, E. *Dinochloa malayana*, F. *Gigantochloa scortechinii*, G. *Schizostachyum brachycladum*, H. *Schizostachyum silicatum*, I. *Thyrsostachys siamensis* (Photos: Muhammad Azli Ritonga [A, B, C, G, H, I], I Putu Gede P. Damayanto [D, E, F]).

Table 1. Taxa were identified up to the genus level in Sumatra.

Species	References						
	Saputri 2013	Widjaja 2019	Rahayu & Ervianti 2020	Fitmawati et al. 2020	Fitmawati et al. 2021a	Fitmawati et al. 2021b	Syauqi et al. 2023
Bambusa sp.				+			
Dinochloa sp.			+				
Dinochloa sp.3		+					
Schizostachyum sp.	+						
Schizostachyum sp.2		+					
Gigantochloa sp.				+	+	+	
Gigantochloa sp.1							+
Gigantochloa sp.2							+
Gigantochloa sp.3							+

Notes: + = presence/yes

Eighteen species of Sumatran bamboo were known as introduced species, namely *Bambusa* (*B. balcooa*, *B. bambos*, *B. farinacea*, *B. heterostachya*, *B. multiplex*, and *B. tuldoides*), *Chimonobambusa* (*C. quadrangularis*), *Dendrocalamus* (*D. asper*, *D. brandisii*, *D. giganteus*, *D. latiflorus*, *D. membranaceus*, and *D. strictus*), *Gigantochloa* (*G. apus*), *Melocanna* (*M. baccifera*), *Phyllostachys* (*P. aurea*), *Schizostachyum* (*S. pergracile*), and *Thyrsostachys* (*T. siamensis*) (Table S1, Figure 4). There are 30 endemic bamboo species in Sumatra, with the majority belonging to *Gigantochloa* (15 species), while the least represented are *Bambusa* and *Dinochloa*, each having one endemic species (Table S1, Figure 4). Among the 73 bamboo species in Sumatra, *B. heterostachya*, *D. giganteus*, and *D. membranaceus* fall into the least concern (LC) category on the IUCN Red List. The status of the remaining 70 species has not been evaluated (Figure 5). A total of 44 species have been planted (conserved) in botanical gardens in Indonesia, while the remaining 29 species have not yet been conserved (Table S1, Figure 6).

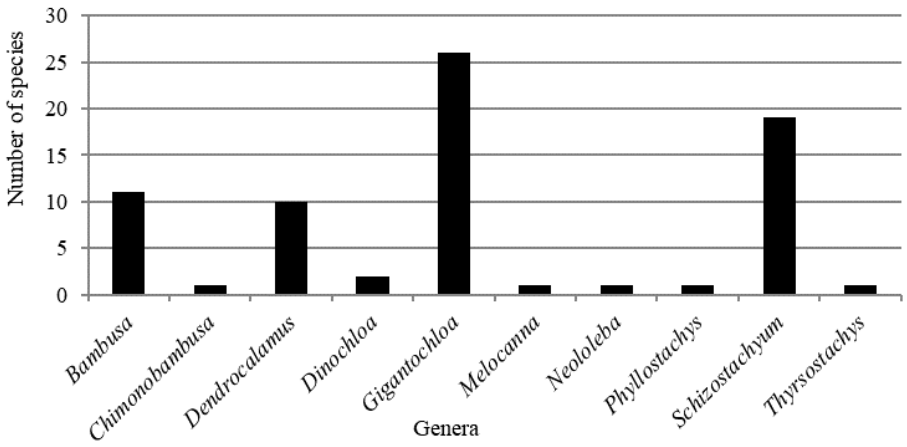

Figure 3. Number of bamboo species in Sumatra.

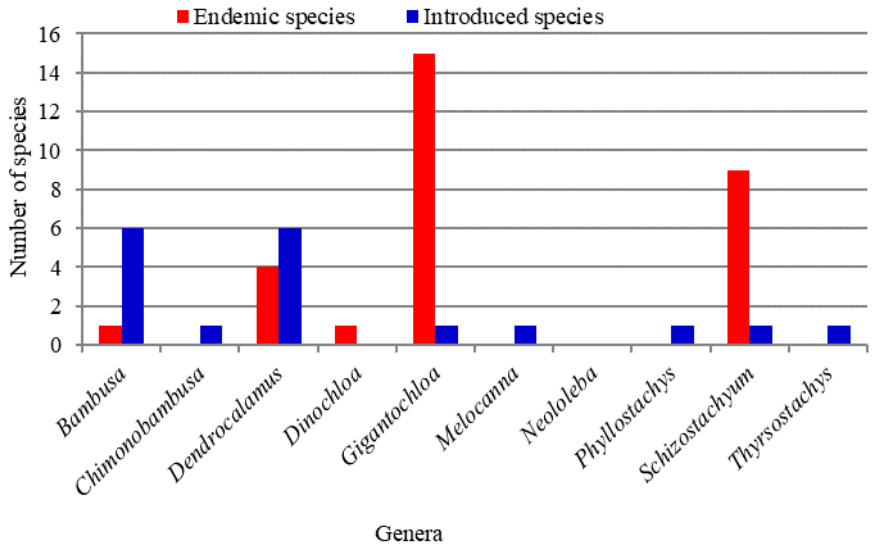

Figure 4. Number of introduced and endemic species of bamboo in Sumatra.

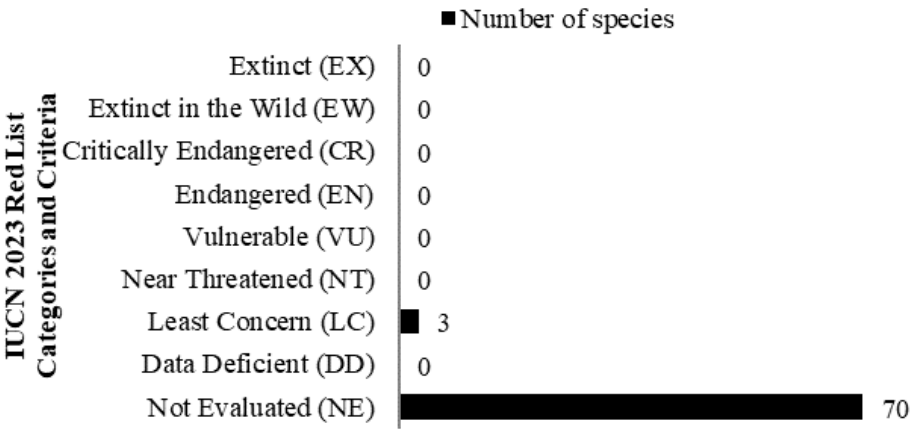

Figure 5. Conservation status of bamboo species in Sumatra based on IUCN 2023 red list.

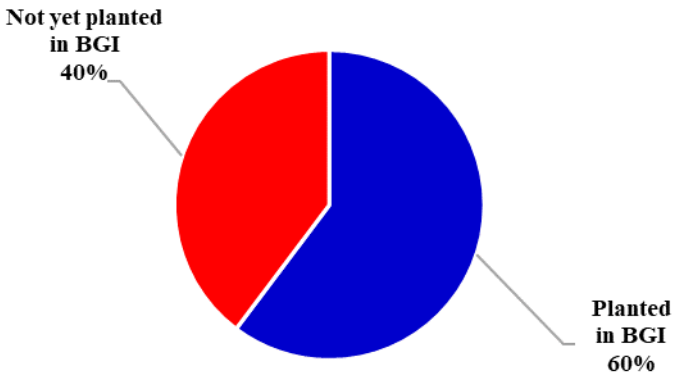

Figure 6. Percentage of ex-situ conservation of bamboo species in Botanical Gardens of Indonesia (BGI).

DISCUSSION

A total of 73 bamboo species and 10 genera were discovered in the Sumatra region. Compared to bamboo genera in Indonesia, the bamboo genera in Sumatra constitute approximately 42% of the total bamboo genera in Indonesia (24 genera) (Damayanto & Fefirenta 2021). Meanwhile, in

comparison to several major islands in Indonesia (Figure 7), the bamboo genera in Sumatra represent about 53% of all bamboo genera in Java (19 genera) (Widjaja 2019) and approximately 83% of all bamboo genera in Sulawesi and Papua respectively (each with 12 genera) (Damayanto et al. 2016b; Ervianti et al. 2019). The bamboo genera in Java are comparatively higher than in Sumatra due to the introduction of several bamboo species, including those from outside Indonesia, into the Botanical Gardens in Java, for instance, in Botanical Gardens of Bogor, Cibodas, Purwodadi, and several other regional botanical gardens (*see* Lestarini et al. 2012; Cahyanto et al. 2016; Ariati et al. 2019; Sujarwo et al. 2019; Wahidah et al. 2021; Kurniawan et al. 2022; Makoyana 2023). The comprehensive flora exploration conducted by botanical garden researchers across Indonesia also contributes to the continual increase in the number of bamboo genera.

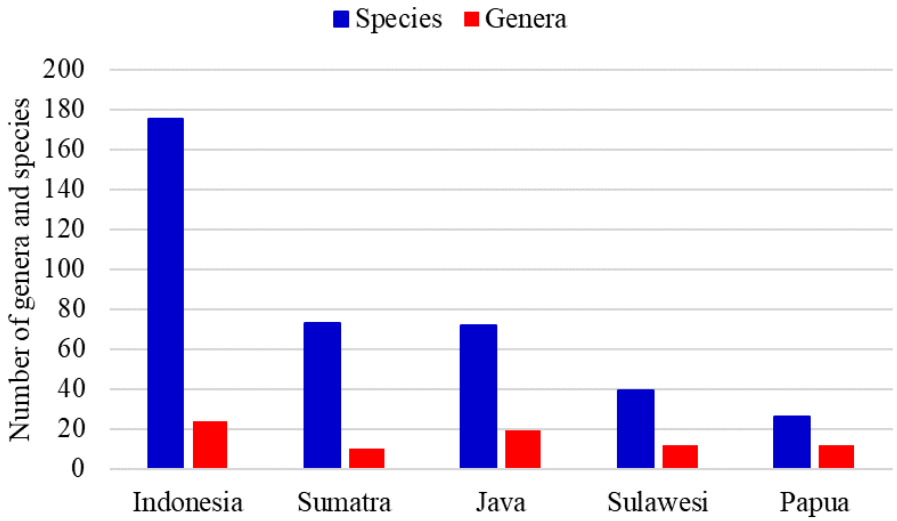

Figure 7. Comparison of bamboo genera and species on several major islands in Indonesia. The data for Indonesia were from Damayanto and Fefirenta (2021), the data for Java were processed from Widjaja (2019), the data for Sulawesi were from Ervianti et al. (2019), and the data for Papua were from Damayanto et al. (2016b).

The bamboo genera in Sumatra mostly (67%) consist of native Indonesian genera (*Bambusa*, *Dendrocalamus*, *Dinochloa*, *Gigantochloa*, *Neololeba*, and *Schizostachyum*), with only a portion (33%) being introduced genera from outside Indonesia (*Chimonobambusa*, *Melocanna*, *Phyllostachys*, and *Thyrsostachys*) (*see* Widjaja et al. 2014; Damayanto & Fefirenta 2021). Widjaja (2019) reported the presence of *Cephalostachyum* (*Cephalostachyum pergracile* Munro) in Sumatra. Additionally, both Widjaja (2001) and Liana (2020) mentioned this genus existence in Java. However, it is important to note that *Cephalostachyum pergracile* is a synonym of *Schizostachyum pergracile* (Munro) R.B.Majumdar (*see* Vorontsova et al. 2016). Consequently, the genus *Cephalostachyum* was not included in this study. *Neololeba* is known to be native to the eastern part of Indonesia, for instance, in Sulawesi, Maluku, and Papua (Widjaja 1997). It is possible that species within the *Neololeba* genus (*Neololeba atra*) and other genera such as *Melocanna* (*Melocanna baccifera*) have been introduced to Sumatra. For example, *Bambusa glaucophylla* has been introduced to Java from Singapore in the 1970s (Widjaja 1997). Later, this bamboo has also been introduced to Great Giant Pineapple Collection Garden in Lampung (Widjaja 1998). On the other hand, Damayanto and Muhaimin (2017) reported that *Chimonobambusa* (*Chimonobambusa quadrangularis*) was introduced

and has become an invasive species in Sumatra, particularly in Gunung Sibayak and Sibolangit Tourist Park, North Sumatra. In Java, this species has become invasive due to its use as a boundary plant between Cibodas Botanical Gardens and Gunung Gede-Pangrango National Parks (Mutaqien et al. 2011). *Chimonobambusa quadrangularis*, which originally comes from South China, was brought to the Cibodas Botanical Gardens in West Java from Japan (Damayanto & Muahimin 2017). Meanwhile, *Phyllostachys* (*Phyllostachys aurea*) and *Thyrsostachys* (*Thyrsostachys siamensis*) are genera that have been introduced in Indonesia for a long time and remain popular as ornamental plants to this day.

The genus which has the most abundant species in Sumatra is *Gigantochloa* (26 species), followed by *Schizostachyum* (19 species), *Bambusa* (11 species), *Dendrocalamus* (10 species), *Dinochloa* (2 species), *Chimonobambusa*, *Neololeba*, *Melocanna*, *Phyllostachys*, and *Thyrsostachys* (1 species respectively). Sumatra emerges as the focal point of *Gigantochloa* species diversity within Indonesia. Upon scrutinizing the bamboo genera's distribution across the archipelago of Indonesia, it becomes evident that *Gigantochloa* predominantly inhabits the western and central regions, gradually tapering in occurrence towards the eastern reaches (*see* Widjaja 2001; Damayanto et al. 2016a; Ervianti et al. 2019; Widjaja 2019; Damayanto & Rahmawati 2020; Robiah et al. 2022). *Gigantochloa* species are characterized by their predominantly erect culms, often featuring relatively substantial diameters. In contrast, Papua displays a scarcity of bamboos exhibiting such erect culms and large diameters (Widjaja et al. 2014). Instead, Papua is predominantly inhabited by scrambling bamboos, particularly of the *Racemobambos* (Damayanto et al. 2016b).

In Sumatra, there are around 42% of the total bamboo species found in Indonesia, which amounts to 175 species (Damayanto & Fefirenta 2021). Additionally, the number of bamboo species in Sumatra is slightly higher, totaling 73 species, compared to Java where there are 72 species (Widjaja 2019). Sumatra hosts almost twice the number of bamboo species as Sulawesi, which has a total of 39 species (Ervianti et al. 2019). Moreover, the bamboo species in Sumatra are nearly three times more numerous than those in Papua, which accounts for 26 species (Damayanto et al. 2016b) (Figure 7). The variation in the number of bamboo species across different regions can be attributed to a combination of factors.

At first, we hypothesized that variations in climate, soil types, and ecological niches in Sumatra and other regions in Indonesia could be factors contributing to the variation in the number of species in each region. However, bamboo is known to thrive in a diverse range of soil conditions, spanning from arid to waterlogged terrain and encompassing both fertile and less productive soils (Aristiatmoko et al. 2012). Its growth is particularly robust in regions characterized by a damp climate, coupled with low temperatures and high humidity, as bamboo has a pronounced need for ample water to support its vigorous development (Hamzah et al. 2016). Report indicate that bamboo demonstrates adaptability to temperatures ranging from 8.8 to 36°C, provided there is a minimum annual precipitation of 1,020 mm and humidity levels of at least 80% (Ediningtyas & Winarto 2012). Notably, bamboo can also flourish in natural settings, without human intervention (Wicaksono et al. 2023). Damayanto et al. (2023) stated that altitude seems to have a lesser impact on bamboo growth.

The diversity in species count across regions is thought to be contingent on the extent of bamboo exploration and the geographical expanse of the area. Varying levels of scientific exploration and documenta-

tion in different regions may contribute to the observed differences in species counts. Regions that have undergone limited flora inventorying, particularly when of considerable size, may lack comprehensive data concerning botanical diversity. This phenomenon is exemplified by the flora of Bali, as elucidated by van Balgooy and Widjaja (2014). Despite Bali's larger landmass compared to Singapore, it registers a lower tally of floral species. This discrepancy is attributed to the limited exploration and field -based inventory, including specimen collection, of its flora (van Balgooy & Widjaja 2014). Additionally, human activities, such as introductions, cultivation, and habitat modification, can also influence the distribution and abundance of bamboo species.

Nine taxa were reported only as identified up to the genus level in Sumatra (Table 1). We were unable to re-identify them mainly because most of them do not provide clear descriptions and photos of the species. It is possible that the taxa reported may be candidates for new species in Sumatra. Widjaja (1991) once reported the existence of 19 bamboo species in Sumatra, which were only identified at the genus level, and one species whose genus was unknown. Widjaja (1991) stated that all 20 taxa were endemic to Sumatra. Many of these species are believed to have been formally described as new species in Widjaja's publication in 1997. Hence, we have omitted the information from Widjaja's (1991) study in this paper. We expected that Sumatra still harbors potential new species waiting to be discovered in the future. This belief is substantiated by Damayanto (2018a) who found *Dinochloa malayana* S.Dransf. in the Riau Islands, which had previously not been reported in Indonesia and was only found in Malay Peninsula (*see* Dransfield 1996a, 1996b; Turner 1995-1996; Chua et al. 2005; Neamsuvan & Tanthien 2015; Vorontsova et al. 2016). Additionally, Damayanto and Widjaja (2016) also published a new species, *Dendrocalamus luteus* Damayanto & Widjaja, discovered in the forest between Jambi and South Sumatra.

A total of six bamboo species (accepted names) that reportedly found in Sumatra were not included in this study because they did not meet our validation criteria, namely *Bambusa lako*, *Bambusa ventricosa*, *Chloothamnus elegantissimus*, *Dinochloa scandens*, *Gigantochloa baliana*, and *Schizostachyum blumei*. Detailed reasons for their exclusion from our list of Sumatran bamboo species in this study can be found in Table 2. Conversely, some bamboo species names that also reported to be found in Sumatra, such as *Bambusa arundinacea* (Retz.) Willd., *Bambusa blumeana* Schult.f., *Bambusa glaucescens* (Willd.) Merr., *Cephalostachyum pergracile* Munro, and *Gigantochloa pseudoarundinacea* (Steud.) Widjaja (*see* Yani 2014; Ami et al. 2017; Widjaja 2019; Ervany et al. 2020; Sujarwanta & Zen 2020; Fitmawati et al. 2021a), were found to be synonym names (Table 3).

Several species of bamboo reported in Sumatra are believed to have identification errors, with some lacking descriptions and/or images. After re-identifying based on the provided descriptions and/or images, we decided not to include that data in the species list for this study. For example, *Bambusa glaucophylla* reported by Sujarwanta and Zen (2020) is suspected to be *Thyrsostachys siamensis*. *Bambusa multiplex* reported by Ami et al. (2017) is suspected to be *Schizostachyum*. *Bambusa multiplex* reported by Sari (2011) does not provide an image. *Bambusa multiplex* reported by Sujarwanta and Zen (2020) is suspected to be *Gigantochloa*. *Bambusa vulgaris* reported by Ami et al. (2017) shows an image of *Gigantochloa apus*. Even Ervany et al. (2020) reported *Dracaena surculosa* Lindl. as a bamboo, which actually belongs to the family of Asparagaceae. The image provided by Ervany et al. (2020) for the species *Dracaena surculosa* resembles

Table 2. List of bamboo species not included in the study.

Species	References	Notes
Bambusa lako Widjaja	Sari 2011	Picture provided by Sari (2011) was similar to *Thyrsostachys siamensis*. *Bambusa lako* occurred in the Lesser Sunda Islands (*see* Widjaja 1997; Widjaja 2019).
Bambusa ventricosa McClure	Ervany et al. 2020	This species is distributed in Southeast China to Vietnam (*see* Vorontsova et al. 2016). Detailed descriptions of Ervany et al. (2020) were not clear. Based on the presented picture, it is suspected that the bamboo is either *Bambusa vulgaris* 'Wamin' or *Bambusa tuldoides*, due to the presence of a "belly" culm.
Chloothamnus elegantissimus (Hassk.) Henrard	Henrard 1936; Holttum 1955; Widjaja 2019	Wong and Dransfield (2016) and Damayanto et al. (2020a) still doubt the presence of this species in Sumatra. This species is reported to be endemic to West Java (Widjaja 2001; Damayanto et al. 2020a).
Dinochloa scandens (Blume ex Nees) Kuntze	Sujarwanta & Zen 2020	Picture provided by Sujarwanta and Zen (2020) was less clear and morphological description was also not very detailed. Damayanto et al. (2021) suspected that this species is *Dinochloa glabrescens*.
Gigantochloa baliana Widjaja & Astuti	Widjaja 2019	This species was endemic to Bali (Widjaja et al. 2004, 2005; Arinasa & Peneng 2013; Arinasa & Sujarwo 2015; Vorontsova et al. 2016; Damayanto et al. 2023).
Schizostachyum blumei Nees	Riastuti et al. 2019; Sujarwanta & Zen 2020	Picture provided by Riastuti et al. (2019) was less clear and morphological description was not provided. Picture provided by Sujarwanta and Zen (2020) was *Schizostachyum brachyladum*.

Table 3. List of synonym names of bamboo species in Sumatra.

Species	References	Notes
Bambusa arundinacea (Retz.) Willd.	Ervany et al. 2020	Synonym of *Bambusa bambos* (*see* Widjaja 2019).
Bambusa blumeana Schult.f.	Ami et al. 2017; Sujarwanta & Zen 2020; Fitmawati et al. 2021a	Synonym of *Bambusa spinosa* (*see* Widjaja 2019; Damayanto et al. 2020c; Ritonga et al. 2020a; Robiah et al. 2022; Ritonga et al. 2023a).
Bambusa glaucescens (Willd.) Merr.	Saputri 2013; Ami et al. 2017; Riastuti et al. 2019	Synonym of *Bambusa multiplex* (*see* Vorontsova et al. 2016).
Cephalostachyum pergracile Munro	Widjaja 2019	Synonym of *Schizostachyum pergracile* (Munro) R.B.Majumdar (*see* Vorontsova et al. 2016).
Gigantochloa pseudoarundinacea (Steud.) Widjaja	Yani 2014; Ami et al. 2017; Riastuti et al. 2019; Sujarwanta & Zen 2020; Sari et al. 2021	Synonym of *Gigantochloa verticillata* (*see* Widjaja 2019).

Thyrsostachys siamensis. *Schizostachyum brachycladum* reported by Ervany et al. (2020) is suspected to be *Bambusa*. *Schizostachyum brachyladum* mentioned by Ami et al. (2017) has an image of *Bambusa vulgaris*. On the other hand, Rahayu et al. (2023) reported the presence of *S. bamban*, *S. brachycladum*, and *S. caudatum* in Lampung, Sumatra. Unfortunately, the publication by Rahayu et al. (2023) only provides an abstract. Rahayu (2024, personal communication) stated that their full paper is currently under review. Therefore, we have not included the data from Rahayu et al. (2023) in Table S1 for the time being, pending the publication of the full paper. Nevertheless, the species mentioned by Rahayu et al. (2023) are indeed species that are distributed in Sumatra.

All bamboo species reported by Hastuti et al. (2018) have rather questionable morphological descriptions. Consequently, none of these species were included in this study. For instance, Hastuti et al. (2018) mentioned the presence of "Schyzotyum lima" (the correct spelling is

Schizostachyum lima) in Sumatra, describing it as having one branch larger than the others. However, in reality, *Schizostachyum* exhibits branches that are nearly uniform in size. On the other hand, certain species reported to occur in Sumatra by Riastuti et al. (2019), such as *Bambusa glaucescens* (now accepted as *Bambusa multiplex*), *Dendrocalamus asper*, *Gigantochloa apus*, *Gigantochloa pseudoarundinacea* (initially written as "Gigantochloa pseudoarundin" and currently accepted as *Gigantochloa verticillata*), and *Schizostachyum blumei*, were not included in the list of Sumatran bamboo species in Table S1. This exclusion was due to unclear provided pictures and the absence of a morphological description. Much like the previous situation, the majority of bamboo species documented by Sari et al. (2021) were omitted from the bamboo species list in Table S1 due to a potential identification mistake. For instance, the image intended for *Dendrocalamus asper* was identified as *Bambusa multiplex* by Sari et al. (2021).

Eighteen species of Sumatran bamboo were known as introduced species, namely *Bambusa* (*B. balcooa*, *B. bambos*, *B. farinacea*, *B. heterostachya*, *B. multiplex*, and *B. tuldoides*), *Chimonobambusa* (*C. quadrangularis*), *Dendrocalamus* (*D. asper*, *D. brandisii*, *D. giganteus*, *D. latiflorus*, *D. membranaceus*, and *D. strictus*), *Gigantochloa* (*G. apus*), *Melocanna* (*M. baccifera*), *Phyllostachys* (*P. aurea*), *Schizostachyum* (*S. pergracile*), and *Thyrsostachys* (*T. siamensis*). Species with introduced status are usually brought in as a result of material exchange by botanical gardens in Indonesia, for example, the addition of non-native bamboo collections, *Thyrsostachys oliveri* Gamble, in the "Eka Karya" Bali Botanical Gardens, which were imported from Thailand (*see* Kurniawan et al. 2022). This species has never been reported before occurring in Indonesia. From this garden, this species might eventually spread in various ways, one of which is with the assistance of humans. Humans play a role in bringing some species to Sumatra, where they then grow and even become naturalized or invaded. As an example case, *Chimonobambusa quadrangularis*, which was initially introduced to Cibodas Botanical Gardens, in Java then transported to Sibolangit, and is now invading that area (Damayanto & Muhaimin 2017). This invasive ability of this bamboo is supported by the bamboo's monopodial (running bamboo) root system. The young shoot can grow far from its clump in all directions and dominate the area.

In addition to introduced species, there are 30 endemic bamboo species in Sumatra, with the majority belonging to *Gigantochloa* (15 species), followed by *Dendrocalamus* (4 species), *Schizostachyum* (9 species), while the least represented are *Bambusa* and *Dinochloa*, each having one endemic species. In 1991, Widjaja (1991) reported that there were 25 endemic bamboo species in Sumatra, although for the most part, their taxonomic status was still unclear (only identified up to the genus level). It is suspected that most of these species were later published as new species in Widjaja's publication in 1997.

In Sumatra, there are 5 genera and 30 species of bamboo that are endemic to the area. This number is relatively high when compared to other areas in Indonesia, for instance, in Lesser Sunda Islands, where there are 6 genera and 10 species of bamboo endemic to the area (Damayanto et al. 2023). Endemic species are importance for various reasons. Firstly, they significantly contribute to the overall biodiversity of a specific region, offering unique adaptations to local conditions. Secondly, these species play vital roles within their respective ecosystems, often possessing specialized ecological functions that ensure balance and stability. Culturally, they can be of great significance to indigenous communities, carrying traditional uses and cultural connections, and may also hold

economic value for local industries and economies. Moreover, endemic species can serve as indicators of ecosystem health (Montefalcone 2009), offering early warnings of environmental changes.

Bambusa heterostachya, *Dendrocalamus giganteus*, and *Dendrocalamus membranaceus* fall into the "least concern" (LC) category on the IUCN Red List, indicating they have the lowest risk of being threatened. The status of the remaining 70 species has not been evaluated. It is necessary to conduct an evaluation of the IUCN Red List conservation status of bamboo species, especially for endemic species in Sumatra. Accessing conservation status is crucial for several reasons. It provides a standardized evaluation of extinction risk, guides resource allocation, influences policies, aids research and management, establishes baselines for monitoring, fosters global collaboration, and raises public awareness. The conservation status assessment for endemic bamboo species in Indonesia is rarely conducted. Nevertheless, Damayanto et al. (2023) and Damayanto (2024) have assessed several endemic bamboo species in Lesser Sunda Islands, and the results can serve as a database for stakeholders to initiate conservation efforts. On the other hand, ex-situ conservation efforts are also necessary as the next step after assessing the conservation status. Fortunately, the majority (44 species) of bamboo in Sumatra have been planted and conserved in botanical gardens in Indonesia, while the remaining 29 species have not yet been conserved. Ex-situ conservation helps preserve genetic diversity, preventing potential loss of genetic variations that may be crucial in the future. Additionally, ex-situ conservation provides an opportunity to safeguard bamboo species that are endangered or experiencing significant population declines in the wild, within a controlled and protected environment. Conservation facilities also enable research on the biology, ecology, and management of bamboo species, as well as the development of sustainable cultivation techniques and management practices. Ex-situ preserved bamboo can also serve as a resource for researchers, entrepreneurs, and artisans for scientific research, product development, and bamboo-related commercial activities.

CONCLUSIONS

There are 73 species of bamboo in the Sumatra region, representing 10 genera: *Bambusa* (11 species), *Chimonobambusa* (1 species), *Dendrocalamus* (10 species), *Dinochloa* (2 species), *Gigantochloa* (26 species), *Melocanna* (1 species), *Neololeba* (1 species), *Phyllostachys* (1 species), *Schizostachyum* (19 species), and *Thyrsostachys* (1 species). Eighteen species of Sumatran bamboo are known as introduced species, and 30 species are endemic to Sumatra, with the majority belonging to *Gigantochloa* (15 species). The least represented are *Bambusa* and *Dinochloa*, each having one endemic species. *Bambusa heterostachya*, *Dendrocalamus giganteus*, and *Dendrocalamus membranaceus* fall into the "least concern" (LC) category on the IUCN Red List, while the remaining 70 species have not been evaluated. A total of 44 species have been planted (conserved) in botanical gardens in Indonesia, while the remaining 29 species have not yet been conserved. Research on bamboo in Sumatra is still needed, especially for species not included in the study and several taxa were identified up to the genus level, to clarify their status. Additionally, an assessment of endemic species in Sumatra is necessary to understand their conservation status.

AUTHOR CONTRIBUTION

M.A.R. conducted the literature search and wrote the manuscript. I.P.G.P.D. wrote and contributed to improving the manuscript. S. and N. supervised the process.

ACKNOWLEDGMENTS

The authors expressed gratitude for the assistance provided by Mutia Muharani (Universitas Sumatera Utara, Indonesia) in sourcing references. The authors would also like to acknowledge the support received from Institute for Research and Community Services (*Lembaga Penelitian dan Pengabdian kepada Masyarakat* or LPPM) of Universitas Andalas. The authors sincerely appreciated the valuable comments and feedback provided by Dr. Chakkrapong Rattamanee (bamboo researcher in Thailand), Dr. Eka Setiawan (Universitas Sumatera Utara, Indonesia), and the anonymous blind reviewers.

CONFLICT OF INTEREST

The authors declare no conflicts of interest but are accountable for the article's content and composition.

REFERENCES

Ami, E. et al., 2017. Bamboo distribution in Musi Rawas District South Sumatera Province. *Science and Technology Indonesia*, 2(4), pp.105-109. doi: 10.26554/sti.2017.2.4.105-109.

Ariati, S.R. et al., 2019. *An Alphabetical List of Plant Species Cultivated in the Bogor Botanic Gardens*. Bogor: Indonesian Institute of Sciences, Center for Plant Conservation, Bogor Botanic Gardens.

Arinasa, I.B.K., & Peneng, I.N., 2013. *Jenis-jenis Bambu di Bali dan Potensinya*, Jakarta: LIPI Press.

Arinasa, I.B.K., & Sujarwo, W., 2015. The diversity of endemic bamboo in Bali and conservation efforts. *Bamboo Journal*, 29, pp.85-92.

Aristiatmoko, P. et al., 2011. Sebaran dan potensi pemanfaatan bambu di Desa Purwobinangun, Kecamatan Pakem, Kabupaten Sleman, Yogyakarta. *Prosiding Seminar Nasional Agroforestry*, 3(29), pp.289-294.

Backer, C., 1928. *Handboek voor de Flora van Java 2*. Batavia: Ruygrock & Co.

BPS (Badan Pusat Statistik)., 2023. *Statistik Indonesia 2023. Statistical Yearbook of Indonesia 2023*. Jakarta: Badan Pusat Statistik/BPS-Statistics Indonesia.

Cahyanto, T. et al., 2016. Keanekaragaman jenis bambu di Taman Bambu Siageung Kebun Raya Kuningan Jawa Barat. *Prosiding Seminar Nasional MIPA dan Pendidikan MIPA. Fakultas Ilmu Tarbiyah dan Keguruan IAIN Sulthan Thaha Saifuddin Jambi*, pp.161-168. doi: 10.24252/bio.v4i2.2513.

Chua, L.S.L. et al., 2005. A preliminary checklist of vascular plants at the Machinchang Range, Pulau Langkawi, Peninsular Malaysia. *Malayan Nature Journal*, 57(2), pp.155-172.

Damayanto, I.P.G.P. & Fefirenta, A.D., 2021. Pola persebaran marga bambu di Indonesia. *Prosiding Seminar Nasional Biologi*, 7(1), pp.24-41. doi: 10.24252/psb.v7i1.22233.

Damayanto, I.P.G.P. & Muhaimin, M., 2017. Notes on *Chimonobambusa quadrangularis* (Franceschi) Makino (Poaceae: Bambusoideae) as an invasive alien plant species in Indonesia. *Floribunda*, 5(7), pp.253-257. doi: 10.32556/floribunda.v5i7.2017.201.

Damayanto, I.P.G.P. & Widjaja, E.A., 2017. A noteworthy *Dendrocalamus* (Poaceae: Bambusoideae) from Sumatra, Indonesia. *The Gradens' Bulletin Singapore*, 69(1), pp.75-80. doi: 10.26492/GBS69%281%29.2017-04.

Damayanto, I.P.G.P. et al., 2016a. A new species of *Schizostachyum* (Poaceae: Bambusoideae) from Sumba Island, Indonesia. *Reinwardtia*, 15(2), pp.119-122. doi: 10.14203/reinwardtia.v15i2.2946.

Damayanto, I.P.G.P. et al., 2016b. Bamboos (Poaceae: Bambusoideae) of Papua, Indonesia. *Jurnal Biologi Papua*, 8(2), pp.57-61. doi: 10.31957/jbp.52.

Damayanto, I.P.G.P. et al., 2020a. A new record of *Chloothamnus* Buse (Poaceae: Bambusoideae) from Sumbawa Island and notes on the genus in Malesia. *Floribunda*, 6(4), pp.127-132. doi: 10.32556/floribunda.v6i4.2020.282.

Damayanto, I.P.G.P. et al., 2020b. Pemanfaatan portal basis data daring dalam validasi nama ilmiah jenis dan suku tumbuhan. *Berkala Ilmu Perpustakaan dan Informasi*, 16(2), pp.170-183. doi: 10.22146/bip.v16i2.770.

Damayanto, I.P.G.P. et al., 2020c. A synopsis of Bambusoideae (Poaceae) in Lombok, Indonesia. *Biodiversitas Journal of Biological Diversity*, 21 (10), pp.4489-4500. doi: 10.13057/biodiv/d211004.

Damayanto, I.P.G.P. et al., 2021. *Dinochloa scandens* (Poaceae-Bambusoideae): distribution, habitat preference, and notes on synonymy. *Jurnal Biodjati*, 6(2), pp.174-189. doi: 10.15575/biodjati.v6i2.12485.

Damayanto, I.P.G.P. et al., 2023. Endemic bamboo (Poaceae, Bambusoideae) of the Lesser Sunda Islands. *Jurnal Biodjati*, 8(1), pp.13-28. doi: 10.15575/biodjati.v8i1.25015.

Damayanto, I.P.G.P. & Rahmawati, K., 2020. Bamboos diversity in Banggai Kepulauan, Central Sulawesi, Indonesia. *Jurnal Biodjati*, 5(1), pp.1-14. doi: 10.15575/biodjati.v5i1.6230.

Damayanto, I.P.G.P., 2018a. *Dinochloa malayana* S.Dransf. (Poaceae: Bambusoideae), a new record for Indonesia. *Reinwardtia*, 17(1), pp.35-37. doi: 10.14203/reinwardtia.v17i1.3351.

Damayanto, I.P.G.P., 2018b. Koleksi bambu Taman Eden 100, Kabupaten Toba Samosir, Sumatera Utara dan perannya dalam taman. *Jurnal Arsitektur Lansekap*, 4(2), pp.210-218. doi: 10.24843/JAL.2018.v04.i02.p11.

Damayanto, I.P.G.P., 2024. *Keanekaragaman Jenis Bambu (Poaceae-Bambusoideae) Kepulauan Sunda Kecil*. IPB University.

Dransfield, S., 1983. Notes on *Schizostachyum* (Gramineae-Bambusoideae) from Borneo and Sumatra. *Kew Bulletin*, 38(2), pp.321-332. doi: 10.2307/4108116.

Dransfield, S., 1996a. New species of *Dinochloa* (Gramineae-Bambusoideae) in Malesia and notes on the genus. *Kew Bulletin*, 51 (1), pp.103-117. doi: 10.2307/4118748.

Dransfield, S., 1996b. Report on the fieldtrip to Southern Thailand 2 to 29 April 1996. *Thai Forest Bulletin (Botany)*, 24, pp.66-71.

Ediningtyas, D. & Winarto, V., 2012. *Want to Know on Bamboo*?. Jakarta: Forestry Extension Center, the Ministry of Forestry.

Ervany, H. et al., 2020. Etnobotani bambu di Kecamatan Darul Imarah Kabupaten Aceh Besar. *BIOTIK: Jurnal Ilmiah Biologi Teknologi dan Kependidikan*, 8(1), pp.24-36. doi: 10.22373/biotik.v8i1.5836.

Ervianti, D. et al., 2019. Bamboo diversity of Sulawesi, Indonesia. *Biodiversitas Journal of Biological Diversity*, 20(1), pp.91-109. doi: 10.13057/biodiv/d200112.

Fitmawati. et al., 2020. Diversity utilization of bamboo (Bambusoideae) in five islands around Riau Province, Indonesia. *Sabrao Journal of Breeding and Genetics*, 52(2), pp.177-190.

Fitmawati. et al., 2021a. Species diversity and environmental effects on bamboo (Bambusoideae) in estuaries along the east coast of Sumatra. *Sabrao Journal of Breeding and Genetics*, 53(3), pp.403-416.

Fitmawati. et al., 2021b. Inventarisasi keanekaragaman bambu (Poaceae: Bambusoideae) di Pulau Rupat, Kabupaten Bengkalis. *Majalah Ilmiah Biologi Biosfera: A Scientific Journal*, 38(2), pp.69-78. doi: 10.20884/1.mib.2021.38.2.1282.

Hamzah, T.N.T. et al., 2016. Proteomics of Bamboo, the Fast-growing Grass. In *Plant Omics: Trends and Applications*. Basel, Switzerland: Springer, pp.365. doi: 10.1007/978-3-319-31703-8_13.

Hasibuan, M., 2020. *Identifikasi dan Karakteristik Beberapa Jenis Bambu di Kabupaten Batu Bara dan Kabupaten Simalungun*. Universitas Sumatera Utara.

Hastuti, R.W. et al., 2018. Studi keanekaragaman jenis bambu di Desa Tanjung Terdana Bengkulu Tengah. *Diklabio: Jurnal Pendidikan dan Pembelajaran Biologi*, 2(1), pp.96-102. doi: 10.33369/diklabio.2.1.96-102.

Henrard, J.T., 1936. *Chloothamnus*, a neglected genus of Bambusaceae. *Blumea*, 11(2), pp.60-73.

Holttum, R.E., 1955. The bamboo-genera *Nastus* and *Chloothamnus*. *Kew Bulletin*, 10(4), pp.591-594. doi: 10.2307/4113771.

Ismaini, L. et al., 2015. Analisis komposisi dan keanekaragaman tumbuhan di Gunung Dempo, Sumatera Selatan. *Prosiding Seminar Nasional Biodiversitas Indonesia* (1)6, pp.13-18. doi: 10.13057/psnmbi/m010623.

IUCN (International Union for Conservation of Nature)., 2023, 'Guidelines for using the IUCN Red List categories and criteria. Version 15.1. Prepared by the standards and petitions committee' in *IUCN Red List*, viewed 19 November 2023, from https://www.iucnredlist.org/resources/redlistguidelines.

KBBID (Kamus Besar Bahasa Indonesia Daring)., 2023, 'Sumatra', in *Kamus Besar Bahasa Indonesia Daring*, viewed 19 November 2023, from https://kbbi.kemdikbud.go.id/entri/sumatra.

Kurnia, H.B., 2022. *Pemanfaatan Jenis-jenis Bambu (Bambusoideae) di Kecamatan Pangkalan Koto Baru Kabupaten Lima Puluh Kota Provinsi Sumatra Barat*. Universitas Riau.

Kurniawan, A. et al., 2022. *An Alphabetical List of Plant Species Cultivated in "Eka Karya" Bali Botanic Garden*. Jakarta: BRIN Pub.

Lestarini, W. et al., 2012. *An Alphabetical List of Plant Species Cultivated in Purwodadi Botanic Garden*. Purwodadi: Purwodadi Botanic Garden, Indonesian Institute of Sciences.

Liana, A., 2020. Keanekaragaman genus bambu (Poaceace: Bambusoideae) di Indonesia. *Prosiding Seminar Nasional Biologi*, 6(1), pp.54-57. doi: 10.24252/PSB.V6I1.15539.

Makoyana., 2023, *Makoyana*, viewed 19 November 2023, from https://makoyana.brin.go.id.

Montefalcone, M., 2009. Ecosystem health assessment using the Mediterranean seagrass *Posidonia oceanica*: A review. *Ecological Indicators*, 9(4), pp. 595-604. doi: 10.1016/j.ecolind.2008.09.013.

Mutaqien, Z. et al., 2011. Penyebaran tumbuhan asing di Hutan Wornojiwo Kebun Raya Cibodas, Cianjur, Jawa Barat. *Prosiding Seminar Nasional HUT Kebun Raya Cibodas ke-159*, pp.550-558.

Nasution, E.Z., 2018. *Keanekaragaman Jenis dan Pemanfaatan Bambu (Bambusa sp) oleh Masyarakat Sekitar Hutan Kawasan Taman Nasional Batang Gadis*. Universitas Sumatera Utara.

Neamsuvan, O. & Tanthien, S., 2015. Medicinal plants used for women's healthcare from Khao Phanom Bencha National Park, Krabi Province. *Burapha Science Journal*, 20(1), pp.118-132.

Nuraetin, E., 2014. *Invenarisasi dan Identifikasi Jenis Bambu di Kawasan Hutan Bambu Pagar Alam Provinsi Sumatera Selatan*. Universitas Sriwijaya.

Nursanti, & Adriadi, A., 2018. Keanekaragaman tumbuhan invasif di kawasan Taman Hutan Raya Sultan Thaha Saifuddin, Jambi. *Media Konservasi*, 23(1), pp.85-91.

Owen, Y.R., 2021. *Eksplorasi dan Inventarisasi Jenis-jenis Bambu (Poaceae-Bambusoidae) di Kabupaten Kampar*. Universitas Riau.

Purba, C.P.P. et al., 2014. *Potret Keadaan Hutan Indonesia Periode 2009-2013*, Bogor: Forest Watch Indonesia, pp. 129.

Rahayu, Y. et al., 2020. Bamboo in the area of Sumatra Institute of Technology and its potency in landscape gardens. *Biologica Samudra*, 2 (2), pp.79-86. doi: 10.33059/jbs.v2i2.2310.

Rahayu, Y. et al., 2023. *Schizostachyum caudatum* Backer ex Heyne: a sacred bamboo from the foothills of Mt. Pesagi, West Lampung, Indonesia. *Current Trends in Biotechnology & Pharmacy*, 17(Suppl Issue 2023), pp.57.

Rahayu, Y. & Ervianti D., 2020. Bamboos of the Batu Putu Biodiversity Park Lampung. *Bioma*, 16(1), pp.14-20. doi: 10.21009/Bioma16 (1).2.

Retnowati, A. & Rugayah., 2019. Keanekaragaman Tumbuhan dan Jamur Indonesia. In *Status Keanekaragaman Hayati Indonesia: Kekayaan Jenis Tumbuhan dan Jamur Indonesia*. Jakarta: LIPI Press, pp.1-14.

Riastuti, R.D. et al., 2019. Eksplorasi jenis bambu di Kecamatan Rawas Ulu Kabupaten Muratara. *BIOEDUSAINS: Jurnal Pendidikan Biologi dan Sains*, 2(1), pp.13-25. doi: 10.31539/bioedusains.v2i1.641.

Rijaya, I. & Fitmawati., 2019. Jenis-jenis bambu (Bambusoideae) di Pulau Bengkalis, Provinsi Riau, Indonesia. *Floribunda*, 6(2), pp.41-52. doi: 10.32556/floribunda.v6i2.2019.229.

Ritonga, M.A. et al., 2020a. Keragaman jenis bambu di Kawasan Ekosistem Leuser, Kecamatan Tenggulun, Kabupaten Aceh Tamiang, Aceh. *Buletin Plasma Nutfah*, 26(2), pp.109-122. doi: 10.21082/ blpn.v26n2.2020.p109-122.

Ritonga, M.A. et al., 2020b. Penelusuran ragam jenis bambu di Kota Langsa, Aceh. *Al-Hayat: Journal of Biology and Applied Biology*, 3(1), pp.8-14. doi: 10.21580/ah.v3i1.6065.

Ritonga, M.A. et al., 2020c. Pemanfaatan bambu oleh masyarakat di Kecamatan Tenggulun, Kabupaten Aceh Tamiang. *Jurnal Biologica Samudra*, 2(1), pp.10-19. doi: 10.33059/jbs.v2i1.2232.

Ritonga, M.A. et al., 2023a. Bamboo diversity in Weh Island, Aceh, Indonesia. *Biodiversitas Journal of Biological Diversity*, 24(5), pp.2563-2576. doi: 10.13057/biodiv/d240508.

Ritonga, M.A. et al., 2023b. Ethnobotany of bamboo on Weh Island, Aceh, Indonesia. *Ethnobotany Research and Applications*, 26(75), pp.1-19. doi: 10.32859/era.26.75.1-19.

Robiah, Y. et al., 2022. Bamboo diversity in the Maluku Islands, Indonesia. *Jurnal Biodjati*, 7(2), pp. 292-308. doi: 10.15575/ biodjati.v7i2.18713.

Sanders, D.L. et al., 2018. Navigating nature, culture and education in contemporary botanic gardens. *Environmental Education Research*, 24(8), pp.1077-1084. doi: 10.1080/13504622.2018.1477122.

Saputri, A., 2013. *Biodiversitas Bambu di Sumatera Utara Bagian Timur*. Universitas Sumatera Utara.

Sari, N., 2011. *Inventarisasi dan Pemanfaatan Bambu di Desa Sekitar Tahura kabupaten Karo*. Universitas Sumatera Utara.

Sari, R.P. et al., 2021. Keanekaragaman bambu di Bukit Cogong Kabupaten Musi Rawas. *Borneo Journal of Biology Education (BJBE)*, 3(1), pp.8-17. doi: 10.35334/bjbe.v3i1.1886.

Sitepu, M.R., 2022. *Identifikasi dan Karakteristik Jenis Bambu (Studi Kasus di Desa Suka Makmur Kecamatan Sibolangit Kabupaten Deli Serdang)*. Universitas Sumatera Utara.

Steenis-Kruseman, M.J.V., 1950. Malaysian plant collectors and collections being a Cyclopaedia of botanical exploration in Malaysia and a guide to the concerned literature up to the year 1950. *Flora Malesiana*, 1(1), pp.1-639.

Sujarwanta, A. & Zen, S., 2020. Identifikasi jenis dan potensi bambu (*Bambusa* sp.) sebagai senyawa antimalaria. *BIOEDUKASI (Jurnal Pendidikan Biologi)*, 11(2), pp.131-151. doi: 10.24127/bioedukasi.v11i2.3423.

Sujarwo, W. et al., 2019. *List of Living Plants Collection Cultivated in Cibodas Botanic Gardens*, Cibodas: Cibodas Botanic Garden, Indonesian Institute of Sciences.

Syauqi, M.F. et al., 2023. Diversity, ecology and habitat suitability of *Gigantochloa* in Central Sumatra. *Agriculture and Natural Resources*, 57 (2), pp.343-352.

Tarigan, T.T., 2008. *Kajian Pemanfaatan Bambu di Kecamatan Sibolangit Kabupaten Deli Serdang*. Universitas Sumatera Utara.

Turner, I.M., 1995-1996. A catalogue of the vascular plants of Malaya. *The Gardens' Bulletin Singapore*, 47(1&2), pp.17-57.

Utami, N. & Damayanto, I.P.G.P., 2023. Annotated checklist of Indonesian *Impatiens* (Balsaminaceae). *Nordic Journal of Botany*, 2023 (e04088), pp.1-19. doi: 10.1111/njb.04088.

van Balgooy, M.M.J., & Widjaja, E.A., 2014. Flora of Bali: a provisional checklist. *Reinwardtia*, 14(1), pp.219-221. doi: 10.55981/reinwardtia.2014.418.

Vorontsova, M.S. et al., 2016. World checklist of bamboos and rattans. *INBAR Technical Report*, 37, pp.1-454.

Wahidah, B.F. et al., 2021. Bamboo diversity in Indrokilo Botanical Garden, Central Java. *Buletin Plasma Nutfah*, 27(1), pp.57-70. doi: 10.21082/blpn.v27n1.2021.57-70.

Wicaksono, D. et al., 2023. Identifikasi persebaran bambu pada daerah aliran sungai Pepe Desa Sawahan. *Nusantara Hasana Journal*, 2(8), pp.349-373.

Widjaja, E.A. & Karsono, K., 2005. Bamboo diversity in Sumba Island. *Biodiversitas Journal of Biological Diversity*, 6(2), pp.95-99. doi: 10.13057/biodiv/d060205.

Widjaja, E.A. et al., 2004. New species of bamboos (Poaceae-Bambusoideae) from Bali. *Reinwardtia*, 12(2), pp.199-204. doi: 10.14203/reinwardtia.v12i2.73.

Widjaja, E.A. et al., 2005. *Identikit Bambu di Bali*, Bogor: Puslit Biologi, LIPI.

Widjaja, E.A. et al., 2014. *Kekinian Keanekaragaman Hayati Indonesia, 2014*, Jakarta: LIPI Press.

Widjaja, E.A., 1987. A revision of Malesian *Gigantochloa* (Poaceae Bambusoideae). *Reinwardtia*, 10(3), pp.291-380. doi: 10.14203/reinwardtia.v10i3.274.

Widjaja, E.A., 1991. Endemic bamboos from Sumatra. *The IV International Bamboo Workshop, Chiangmai, Thailand*, pp.1-6.

Widjaja, E.A., 1997. New taxa in Indonesian bamboos. *Reinwardtia*, 11(2), pp.57-152. doi: 10.14203/reinwardtia.v11i2.588.

Widjaja, E.A., 1998. State of the art of Indonesian Bamboo. *Proceedings of Training Course Cum Workshop 10-17 May 1998, Kunming and Xishuanbanna, Yunnan, China*, pp.1-275.

Widjaja, E.A., 2001. *Identikit Jenis-jenis Bambu di Jawa*, Jakarta: LIPI Press.

Widjaja, E.A., 2019. *The Spectacular Indonesian Bamboos*, Jakarta: Polagrade.

Wong, K.M., & Dransfield, S., 2016. *Ruhooglandia* and *Widjajachloa*, two new genera of Malesian bamboos (Poaceae: Bambusoideae) and their distinction from *Nastus* and *Chloothamnus*. *Sandakania*, 22, pp.1-9.

Yani, A.P., 2014. Keanekaragaman bambu dan manfaatnya di Desa Tabalagan Bengkulu Tengah. *Jurnal Gradien*, 10(2), pp.987-991.

APPENDICES

Table S1. List of bamboo species in Sumatra including the source of refereRitongances, IUCN conservation status, introduced species, endemic species, and ex-situ conservation status.

Species	Dransfield 1983	Widjaja 1987	Backer 1928	Widjaja 1997	Tarigan 2008	Sari 2011	Saputri 2013	Nuraeim 2014	Yani 2014	Ami et al. 2017	Damayanto & Widjaja 2017	Damayanto 2018a	Damayanto 2018b	Nasution 2018	Riastuti et al. 2019	Rijaya & Fitmawati 2019	Widjaja 2019	Ervany et al. 2020	Fitmawati et al. 2020	Hasibuan 2020	Rahayu & Ervianti 2020	Rahayu et al. 2020	Ritonga et al. 2020a, 2020c	Ritonga et al. 2020b	Sujarwanta & Zen 2020	Togatorop et al. 2020	Fitmawati et al. 2021a	Fitmawati et al. 2021b	Owen 2021	Sari et al. 2021	Tampubolo 2021	Kurnia 2022	Sitepu 2022	Ritonga et al. 2023a, 2023b	Syauqi et al. 2023	IUCN conservation status (IUCN 2023)	Introduced species	Endemic species	Cultivated in BGI (Makoyama 2023)
Bambusa balcooa Roxb.																	+																			NE	+		+
Bambusa bambos (L.) Voss																	+																			NE	+		+
Bambusa farinacea K.M.Wong																	+																			NE	+		
Bambusa glaucophylla Widjaja							+									+	+		+			+						+	+							NE			+
Bambusa heterostachya (Munro) Holttum																+	+		+				+				+	+								LC	+		+
Bambusa maculata Widjaja																	+								+											NE			+
Bambusa multiplex (Lour.) Raeusch. ex Schult.f.							+		+	+			+			+	+		+	+		+	+	+			+	+	+			+			+	NE	+		+
Bambusa riauensis Widjaja				+													+																			NE		+	
Bambusa spinosa Roxb.							+										+						+		+				+			+		+		NE			+
Bambusa tuldoides Munro																	+																	+		NE	+		+
Bambusa vulgaris Schrad. ex J.C.Wendl.						+	+	+	+	+			+		+	+	+	+	+	+		+	+	+	+		+	+	+	+		+	+	+		NE			+
Chimonobambusa quadrangularis (Franceschi) Makino																	+																			NE	+		+
Dendrocalamus asper (Schult. & Schult.f.) Backer					+	+	+	+	+		+		+	+		+	+	+	+	+	+	+	+		+	+		+				+		+		NE	+		+
Dendrocalamus bengkalisensis Widjaja				+							+						+																			NE		+	
Dendrocalamus brandisii (Munro) Kurz											+						+																			NE	+		+
Dendrocalamus buar Widjaja				+							+						+																			NE		+	
Dendrocalamus giganteus Munro											+						+																			LC	+		+
Dendrocalamus hait Widjaja				+							+						+																			NE		+	
Dendrocalamus latiflorus Munro											+						+																			NE	+		+
Dendrocalamus luteus Damayanto & Widjaja											+						+																			NE		+	
Dendrocalamus membranaceus Munro											+						+																			LC	+		
Dendrocalamus strictus (Roxb.) Nees																	+			+					+											NE	+		+
Dinochloa glabrescens Widjaja				+								+					+																			NE		+	
Dinochloa malayana S.Dransf.												+					+																			NE			

Table S1. Contd.

Species	Dransfield 1983	Widjaja 1987	Backer 1928	Widjaja 1997	Tarigan 2008	Sari 2011	Saputri 2013	Nuraetin 2014	Yani 2014	Ami et al. 2017	Damayanto & Widjaja 2017	Damayanto 2018a	Damayanto 2018b	Nasution 2018	Riastuti et al. 2019	Rijaya & Fitmawati 2019	Widjaja 2019	Ervany et al. 2020	Fitmawati et al. 2020	Hasibuan 2020	Rahayu & Erviani 2020	Rahayu et al. 2020	Rironga et al. 2020a, 2020c	Rironga et al. 2020b	Sujarwanta & Zen 2020	Togatorop et al. 2020	Fitmawati et al. 2021a	Fitmawati et al. 2021b	Owen 2021	Sari et al. 2021	Tampubolo 2021	Kurnia 2022	Sitepu 2022	Rironga et al. 2023a, 2023b	Syauqi et al. 2023	IUCN conservation status (IUCN 2023)	Introduced species	Endemic species	Cultivated in BGI (Makoyana 2023)
Gigantochloa achmadii **Widjaja**		+		+			+										+																	+	NE		+	
Gigantochloa apus **(Schult.f.) Kurz ex Munro**					+	+											+		+	+		+	+	+	+		+			+		+		+	NE	+		+
Gigantochloa atter **(Hassk.) Kurz ex Munro**							+										+		+	+		+	+		+									+	NE			+
Gigantochloa atroviolacea **Widjaja**							+			+							+				+				+									+	NE			+
Gigantochloa calcicola **Widjaja**				+													+																		NE		+	
Gigantochloa hasskarliana **(Kurz) Backer**																+	+		+		+						+	+				+		+	NE			+
Gigantochloa hirtinoda **Widjaja**				+													+																		NE		+	
Gigantochloa kuring **Widjaja**				+													+		+															+	NE		+	+
Gigantochloa levis **(Blanco) Merr.**																	+		+															+	NE			+
Gigantochloa longiprophylla **Widjaja**				+													+																		NE		+	
Gigantochloa luteostriata **Widjaja**																	+																		NE		+	+
Gigantochloa magentea **Widjaja**				+													+																		NE		+	
Gigantochloa membranoidea **Widjaja**				+													+																		NE		+	
Gigantochloa nigrociliata **(Buse) Kurz**																	+																	+	NE			+
Gigantochloa papyracea **Widjaja**				+													+																		NE		+	
Gigantochloa pruriens **Widjaja**		+					+										+		+													+	+	+	NE		+	+
Gigantochloa pubinervis **Widjaja**				+													+																		NE		+	+
Gigantochloa pubipetiolata **Widjaja**				+													+																		NE		+	+
Gigantochloa robusta **Kurz**							+	+	+	+							+																		NE			+
Gigantochloa scortechinii **Gamble**								+	+								+																	+	NE			+
Gigantochloa serik **Widjaja**				+										+			+			+								+						+	NE		+	+
Gigantochloa thoi **K.M.Wong**																	+																		NE			+
Gigantochloa tomentosa **Widjaja**				+													+																		NE		+	
Gigantochloa velutina **Widjaja**				+													+																		NE		+	+
Gigantochloa verticillata **(Willd.) Munro**									+	+							+								+	+									NE			+
Gigantochloa wrayi **Gamble**								+									+																		NE			
Melocanna baccifera **(Roxb.) Kurz**																	+																		NE	+		+

Table S1. Contd.

Species	Dransfield 1983	Widjaja 1987	Backer 1928	Widjaja 1997	Tarigan 2008	Sari 2011	Saputri 2013	Nurzetin 2014	Yani 2014	Ani et al. 2017	Damayanto & Widjaja 2017	Damayanto 2018a	Damayanto 2018b	Nasution 2018	Riastuti et al. 2019	Rijaya & Fitmawati 2019	Widjaja 2019	Ervany et al. 2020	Fitmawati et al. 2020	Hasibuan 2020	Rahayu & Ervianti 2020	Rahayu et al. 2020	Ritonga et al. 2020a, 2020c	Ritonga et al. 2020b	Sujarwanta & Zen 2020	Togatorop et al. 2020	Fitmawati et al. 2021a	Fitmawati et al. 2021b	Owen 2021	Sari et al. 2021	Tampubolo 2021	Kurnia 2022	Sitepu 2022	Ritonga et al. 2023a, 2023b	Syauqi et al. 2023	IUCN conservation status (IUCN 2023)	Introduced species	Endemic species	Cultivated in BGI (Makoyana 2023)
Neololeba atra (Lindl.) Widjaja																	+																			NE			+
Phyllostachys aurea (André) Rivière & C.Rivière																	+																			NE	+		+
Schizostachyum aciculare Gamble								+																												NE			
Schizostachyum atrocingulare Widjaja				+													+																			NE		+	+
Schizostachyum bamban Widjaja				+													+																			NE		+	+
Schizostachyum brachycladum (Kurz ex Munro) Kurz					+		+			+				+		+	+		+	+				+	+		+				+			+	NE			+
Schizostachyum caudatum Backer ex K.Heyne			+														+																			NE		+	+
Schizostachyum cornutum Widjaja				+													+																			NE		+	
Schizostachyum cuspidatum Widjaja				+													+																			NE		+	+
Schizostachyum grande Ridl.																	+																			NE			+
Schizostachyum iraten Steud.																	+																			NE			+
Schizostachyum latifolium Gamble																+	+															+				NE			+
Schizostachyum lengguanii K.M.Wong																	+																			NE			+
Schizostachyum lutescens Widjaja				+													+																			NE		+	
Schizostachyum mampouw Widjaja				+													+																			NE		+	+
Schizostachyum pergracile (Munro) R.B.Majumdar																	+																			NE	+		
Schizostachyum pleianthemum S.Dransf.	+																+																			NE		+	+
Schizostachyum silicatum Widjaja				+									+				+		+															+		NE			
Schizostachyum terminale Holttum																	+																			NE			+
Schizostachyum undulatum S.Dransf.	+																+																			NE		+	
Schizostachyum zollingeri Steud.					+		+										+				+		+				+				+	+				NE			
Thyrsostachys siamensis Gamble							+									+	+		+					+			+				+		+		NE	+		+
Neololeba atra (Lindl.) Widjaja																	+																			NE			
Phyllostachys aurea (André) Rivière & C.Rivière																	+																			NE	+		

Notes: + = presence/yes, BGI = Botanical Gardens of Indonesia, LC = least concern, NE = not evaluated