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Evaluating the species distribution patterns of the genus *Saurauia* Willd. in the Philippines using geospatial analysis

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Abstract. Understanding the species distribution patterns of endemic and threatened species is very useful for conservation planning and actions. However, research on the distribution of many important and often overlooked species in the country, such as the *Saurauia*, is extremely limited. This paper provided an overview of the distribution patterns of *Saurauia* species across the Philippine archipelago based solely on the existing digital checklist of vascular plants. Specifically, the study produced distribution maps of the 56 endemic *Saurauia* species and determined their climatic distribution ranges. The methods involved geospatial and geoprocessing analysis in a geographic information system (GIS) environment. The findings showed that 29 *Saurauia* species are currently distributed in a single province, whereas seven (7) species have only been recorded in a certain region. Furthermore, 35 species was found to have a single type of climate. The *Saurauia* species identified in this paper that have only a single provincial or regional distribution record and are restricted to a single type of climate are recommended for conservation because they are mostly likely to be affected by environmental and climatic changes. Finally, the information and data derived in this paper could serve as a baseline for assessing conservation status, habitat modelling studies, species-level conservation planning, and understanding climate change impacts.

Keywords: Climate change, conservation, geographic information system, *Saurauia*, species distribution, systematics, taxonomy.

INTRODUCTION

Saurauia Willd. is one of the three (3) genera included in the family Actinidiaceae Gilg & Werderm. (WFO, 2022), the other two being the *Actinidia* Lindl. and *Clematoclethra* (Franch.) Maxim. Based on the Plants of the World Online (POWO) (2022), there are currently about 391 accepted

Saurauia species worldwide, with the majority of them found in Asia and the Americas' tropical and subtropical countries. In the Philippines, the Co's Digital Flora of the Philippines (CDFP) website, a digital checklist of Philippine vascular plants, currently lists 56 species under this genus (Pelser et al. 2011), and all of these are endemic to the Philippines (POWO, 2022) or found nowhere else on the planet.

Many species of *Saurauia* have long been used to treat a wide range of ailments worldwide by the indigenous communities (Pasaribu et al. 2020), which includes digestive problems (Silalahi et al. 2015), asthma, boils, bronchitis, depression of the central nervous system, fever, hepatitis B, piles, rheumatism, skin problems, seizure disorders, and ulcers (Uddin and Rahman 2006; Ahmed et al. 2013). In the Philippines, the fruit of *S. bontocensis* is edible and used as raw materials for the food processing center that was built for enhancing livelihood opportunities for the Ikalahan Indigenous Peoples (Rice 2002). Other products that can be derived from these species include raisins from dried fruits, juice, jelly, spread, vinegar, and wine (Subilla and Baoanan 2020; Tacloy et al. 2021). Despite their significant economic potential and therapeutic properties, the *Saurauia* species in the country, if not in the world, have been understudied (Fabelico 2020), not only in terms of their medicinal properties but also in terms of their distribution, taxonomy, and conservation status.

At present, however, no studies have been conducted or published yet concerning the species distribution of all the *Saurauia* in the Philippines, which is also true for other frequently overlooked endemic and threatened floral species in the country. Typically, the most convenient way to determine the distribution of *Saurauia* or other plant species in the country is to use online plant databases and checklists like the CDFP. Although this digital checklist includes the general distribution data of different floral species from other countries down to the provincial level and some specific mountains in the country where the species occurred, one limitation of this digital database is that it does not show any spatially explicit distribution maps of these species unlike the other websites such as the Global Biodiversity Information Facility (GBIF), wherein the species distribution or occurrence was projected in a worldwide map. This lack of information and studies regarding the distribution of many plant species in the country, like the *Saurauia,* limits their conservation and protection strategies. Moreover, prior to engaging in any type of biological research that has the potential to bring limitless advantages and/or benefits to human development, one must first comprehend the taxonomy and systematics as well as distribution of the organism with which one would be working (Narendran 2000).

With the advent of Geographic Information System (GIS) technology in the early 80s', numerous studies relative to the species distribution have already been carried out (Corsi et al. 2000) worldwide. The GIS technology is a powerful tool that can handle, manipulate, and analyze huge amount of spatial and temporal data (Burrough et al. 2015), which is very relevant in species distribution studies. In the Philippines, numerous studies have examined the distribution of other floral species using GIS-assisted methodologies and related technologies such as the *Musa balbisiana* (Rabara et al. 2020), sago palm (Santillan and Makinano-Santillan 2016), *Shorea guiso* (Blanco) Blume and *Parashorea malaanonan* (Blanco) Merr. (Tumaneng et al. 2019), among others.

Mapping the distribution of the different species using the GIS, based on reliable dataset, could provide better understanding of species diversity and richness, which is a vital component in the forest functioning (Paquette and Messier 2011). In addition, a species diversity map database at different levels ranging from individual trees to entire communities has the potential to understand functional diversity, which can aid in determining forest ecosystem productivity and stability (Schneider et al. 2017). This may offer basic information needed in conservation planning as well as forecasting the impacts of global environmental changes on species and ecosystem level (Franklin 2010). Species distribution maps could serve as a baseline information in evaluating the impacts of climate change on this taxon as plants can only thrive in a specified temperature and moisture condition. In other words, climate factors influence species distributions in general, and thus climate change can result in changes in species distributions (Lawler et al. 2013).

The general objective of this paper is to evaluate the distribution patterns of *Saurauia* species across the Philippine archipelago. This paper specifically aimed at generating species distribution maps using geospatial analysis for all the accepted species at the provincial and regional scale. Also, this paper will analyze the ranges of climatic types optimal for *Saurauia* species as an aid to species conservation.

MATERIALS AND METHODS

Data gathering

In this study, the list of *Saurauia* species and their corresponding geographical distribution data were extracted from the CDFP webpage, particularly the names of provinces where these are mostly found. The

CDFP is a digital checklist of the Philippines' native, naturalized, and invasive vascular plant species. The basic occurrence information, conservation status information, and references to scientific literature are all included in this checklist (Pelser et al. 2011). Here, only the accepted *Saurauia* species were included and the species synonyms were excluded in the analysis. Since there are very limited information on the confusing or unresolved taxonomy of *Saurauia* species in the country, this paper solely relied on the checklist provided in the CDFP website.

Species distribution mapping

A GIS software was used in this paper, specifically the Quantum GIS (QGIS) version 3.16 (Hannover long term released), in creating a distribution map of all the *Saurauia* species in the Philippines. The provincial boundary layer of the Philippines downloaded from IGISMAP website was used to reflect the occurrence information of the species. The extracted information from the CDFP (species list and their distribution) were processed and entered in the provincial boundary layer through the attribute table. The flowchart showing the data extraction and species distribution mapping using the GIS is presented in Figure 1. All the map layers were projected to Universal Transverse Mercator (UTM) with the coordinate system World Geodetic System (WGS) 84 Zone 51 North.

Species distribution of Saurauia species based on climatic types

This paper also determined the climatic types, based on the Modified Corona's Climatic Classification, where the *Saurauia* species are currently distributed. Knowing the type of climate in which the *Saurauia* species are found may provide relevant information in the species conservation efforts such as reforestation and plantation establishment. Proper species-level conservation planning takes into account the climatic distribution range of species because growing it outside of its natural climatic conditions may directly affect its growth and survival after outplanting. To determine the climatic classification of the *Saurauia* species, the climatic type layer and the species distribution layer were intersected in the QGIS environment using the intersection algorithm under the vector geoprocessing options (Figure 1). The species distribution map of the *Saurauia* was used as an input layer, whereas the climatic type map was used as the overlay layer.

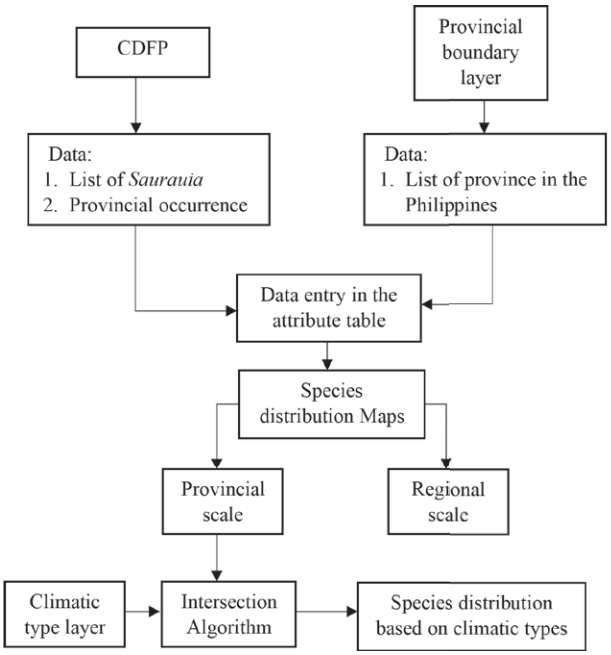


Figure 1. The flowchart of species distribution mapping of *Saurauia* species using Geographic Information System (GIS) platform.

RESULT AND DISCUSSION

Current distribution of Saurauia species at the provincial scale based on the CDFP

The current species distribution map of the *Saurauia* species based on existing data provided by CDFP website showed that *S. elegans* is the most widely distributed throughout the country, which can be found in 12 provinces mostly in Luzon (Figure 2a). This is followed by *S. clementis* with a total of nine (9) provincial occurrences mostly in Mindanao (Figure 2b). Both *S. latibractea* and *S. polysperma* had six (6) provincial distribution. In terms of the number of *Saurauia* species occurred per province (Table 1), the provinces of Agusan Del Norte, Quezon, and Zamboanga del Norte recorded the highest number of different *Saurauia* species, with a total of eight (8) different *Saurauia* species in each of these provinces. The species found in Quezon province include the *S. bakeri, S. bicolor, S. elmeri, S. luzoniensis, S. panduriformis, S. sparsiflora, S. whitfordii, and S. cinnamomea.* On the other hand, the *Saurauia* species found in Zamboanga del Norte include *S. clementis, S. confusa, S. denticulate, S. philippinensis, S. trunciflora, S. zamboangensis, S. longipedicellata*, and the new to science species, the *S. abbreviate*. Other provinces with more than five *Saurauia* species include Agusan del Norte (7 species), Lanao del Sur (6 species), Bukidnon, Benguet, and Cat-

Table 1. The provincial distribution of each *Saurauia* species in the Philippines based on the CDFP website.

No.	Saurauia Species	Provincial Distribution
1	*Saurauia abbreviata* K.R.Mazo	Zamboanga del Norte
2	*Saurauia alvarezii* Merr.	Lanao del Sur
3	*Saurauia ampla* Merr.	Samar, Agusan del Norte
4	*Saurauia avellana* Elmer	Negros Oriental, Lanao del Sur, Bukidnon
5	*Saurauia bakeri* Merr.	Quezon, Catanduanes
6	*Saurauia bicolor* Merr.	Quezon
7	*Saurauia bontocensis* Merr.	Mountain Province, Abra, Kalinga, Ifugao
8	*Saurauia cinnamomea* Merr.	Rizal, Quezon
9	*Saurauia clementis* Merr.	Lanao del Sur, Panay, Leyte, Camiguin, Zamboanga, Bukidnon, Davao, Agusan, Surigao del Norte
10	*Saurauia confusa* Merr.	Laguna, Camarines, Sorsogon, Catanduanes, Zamboanga
11	*Saurauia copelandii* Elmer	Davao, Camiguin, Bukidnon,
12	*Saurauia cordata* Quisumb.	Catanduanes
13	*Saurauia denticulata* C.B.Rob.	Zamboanga
14	*Saurauia elegans* (Choisy) Fern.	Benguet, Ilocos Norte, Mountain Province, Cagayan, Isabela, Nieva Viscaya, Nueva Ecija, Aurora, Bataan, Camarines, Albay, Oriental Mindoro,
15	*Saurauia elmeri* Merr.	Quezon,
16	*Saurauia erythrotricha* Elmer	Agusan Del Norte,
17	*Saurauia fasciculiflora* Merr.	Palawan
18	*Saurauia gigantifolia* Quisumb.	Agusan
19	*Saurauia glabrifolia* Merr.	Surigao Del Norte
20	*Saurauia gracilipes* Merr.	Lanao Del Sur, Agusan Del Norte, Surigao Del Norte,
21	*Saurauia involucrata* Merr.	Davao
22	*Saurauia klemmei* Merr.	Isabela, Cagayan, Apayao
23	*Saurauia knemifolia* Quisumb.	Palawan
24	*Saurauia lanaensis* Merr.	Lanao Del Sur, Misamis Occidental,
25	*Saurauia latibractea* Choisy in Zoll.	Albay, Catanduanes, Sorsogon, Mindoro, Cebu, Cagayan
26	*Saurauia leytensis* Merr.	Leyte
27	*Saurauia loheri* Merr.	Rizal
28	*Saurauia longipedicellata* Merr.	Zamboanga Del Sur, Zamboanga Del Norte,
29	*Saurauia longistyla* Merr.	Palawan
30	*Saurauia luzoniensis* Merr.	Rizal, Zambales, Laguna, Quezon,
31	*Saurauia macgregorii* Merr.	Nueva Viscaya
32	*Saurauia merrillii* Elmer	Leyte, Samar
33	*Saurauia mindorensis* Merr.	Oriental Mindoro,
34	*Saurauia negrosensis* Elmer	Panay, Negros
35	*Saurauia oblancilimba* Quisumb.	Zambales
36	*Saurauia oligantha* Merr.	Sorsogon,
37	*Saurauia oligophlebia* Merr.	Catanduanes
38	*Saurauia palawanensis* Merr.	Palawan
39	*Saurauia panayensis* Merr.	Capiz
40	*Saurauia panduriformis* Elmer	Quezon, Kalinga, Benguet, Laguna, Batangas
41	*Saurauia papillulosa* Merr.	Ifugao, Mountain Province
42	*Saurauia philippinensis* Merr.	Oriental Mindoro, Basilan, Zamboanga, Misamis Occidental,
43	*Saurauia polysperma* (Blanco) Merr.	Bataan, Ilocos Norte, Benguet, La Union, Nueva Viscaya, Pampanga, Bataan
44	*Saurauia samarensis* Merr.	Samar
45	*Saurauia sampad* Elmer	Agusan Del Norte
46	*Saurauia sibuyanensis* Elmer	Sibuyan
47	*Saurauia sorsogonensis* Merr.	Sorsogon
48	*Saurauia sparsiflora* Elmer	Benguet, Ilocos Norte, Nueva Ecija, Bulacan, Quezon
49	*Saurauia tayabensis* Quisumb.	Aurora

No.	Saurauia Species	Provincial Distribution
50	*Saurauia trichophora* Quisumb.	Aurora, Quirino
51	*Saurauia trunciflora* Merr.	Zamboanga, Lanao Del Sur, Bukidnon,
52	*Saurauia urdanetensis* Elmer	Agusan Del Norte, Bukidnon
53	*Saurauia vanoverberghii* Merr.	Mountain Province, Benguet
54	*Saurauia wenzelii* Merr.	Leyte, Samar
55	*Saurauia whitfordii* Merr.	Quezon
56	*Saurauia zamboangensis* Merr.	Zamboanga

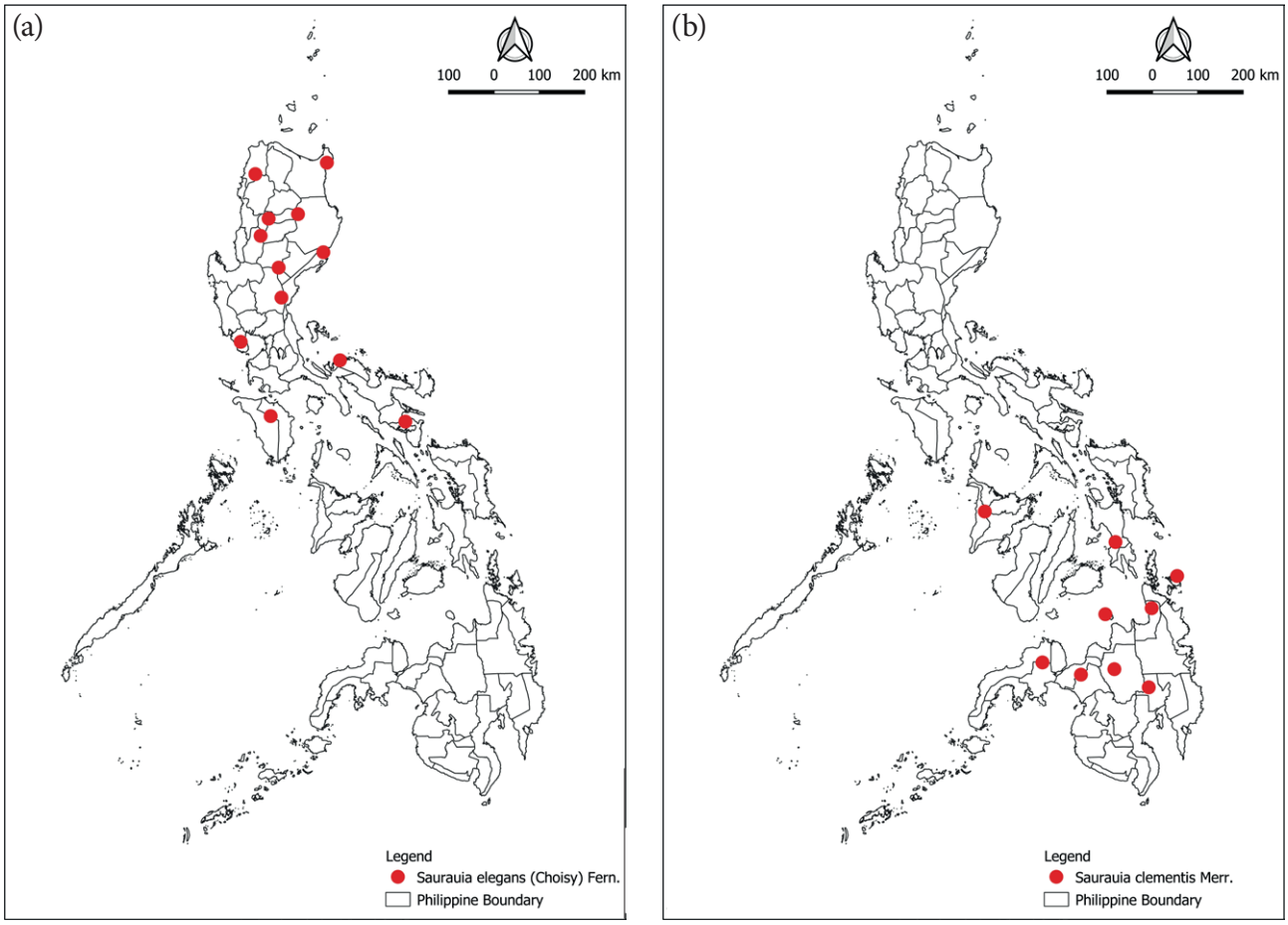


Figure 2. Species distribution maps of (a) *Saurauia elegans* and (b) *Saurauia clementis* based on the CDFP data.

anduanes, all of which have five (5) *Saurauia* species. In terms of species conservation prioritization on a provincial scale, the aforementioned provinces, as shown in the density map (Figure 3), should be given preference since they are home to numerous *Saurauia* species.

Saurauia species with single provincial distribution range

Out of the 56 *Saurauia* species, 29 of these have single provincial distribution at present or found only on a certain province as reported in the CDFP (Fig. 4). These are *S. abbreviate, S. alvarezii, S. bicolor, S. cordata, S. denticulate, S. elmeri, S. erythrotricha, S. fasciculiflora, S. gigantifolia, S. glabrifolia, S. involucrate, S. knemifolia, S. leytensis, S. loheri, S. longistyla, S. macgregorii, S. mindorensis, S. oblancilimba, S. oligantha, S. oligophlebia, S. palawanensis, S. panayensis, S. samarensis, S. sampad, S. sibuyanensis, S. sorsogonensis, S. tayabensis, S. whitfordii, and S. zamboangensis.* This may infer that these 29 species are more vulnerable to threats because they are

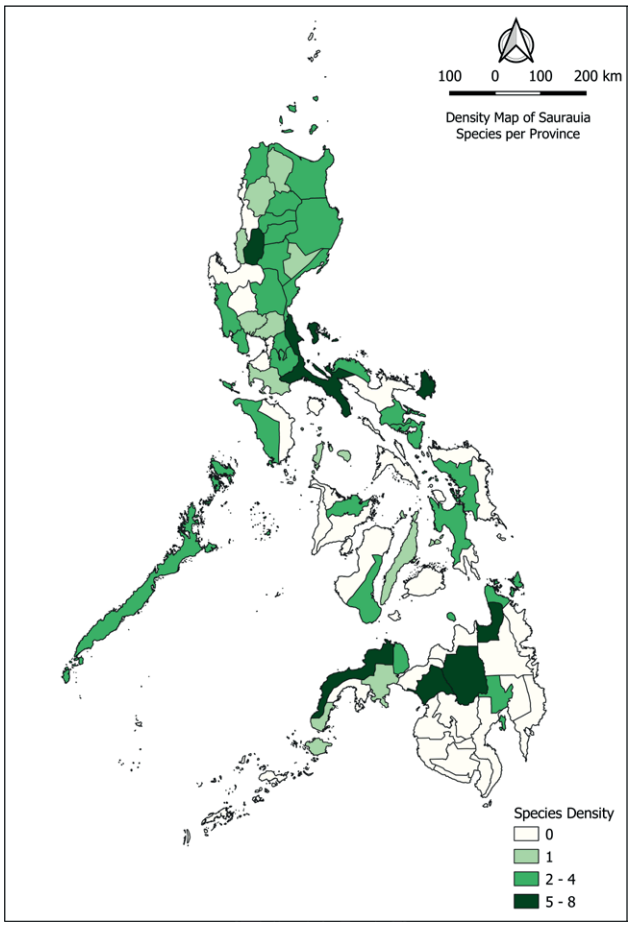


Figure 3. The generated density map of the occurrence of different *Saurauia* species in the Philippines based on the CDFP.

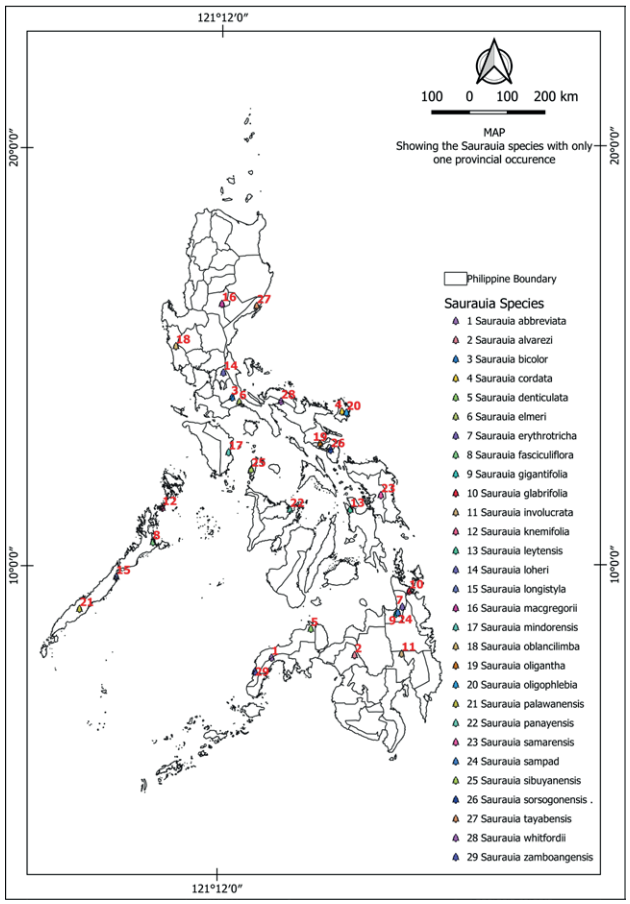


Figure 4. The *Saurauia* species with single provincial record based on the CDFP.

currently found nowhere else in the country (local endemism) other than their present occurrence. As pointed out by Howard et al. (2015), endemic taxa (at local or national level) are at greater risk than non-endemics and they are more vulnerable to extinction. This may be attributed to their narrow and sometimes single geographical range as presented in this paper. Hence, there is an urgent need to assess the conservation status of these 29 species, which may result in their inclusion on the national list of threatened floral species or even in the IUCN Red List. At present, only *S. longistyla*, one (1) of the 29 species, and *S. bontocensis* are categorized as Vulnerable under the DAO 2017-11. It should be noted, however, that *S. bontocensis* has a wider distribution compared to the aforementioned *Saurauia* species.

Saurauia species with regional geographic distribution

There are also seven (7) *Saurauia* species that have regional distribution or found only on a specific region. These are *S. bontocensis, S. papillulosa, S. vanoverberghii* (Figure 5a) found only in the Cordillera Administrative Region (CAR); the *S. cinnamomea* found only in the CALABARZON region (IV-A) (Figure 5b); *S. longipedicellata* distributed only in the Zamboanga Peninsula region (IX) (Figure 5c); and the *S. merrillii* and *S. wenzelii* found only in the Eastern Visayas Region (VIII) (Figure 5d). These *Saurauia* species should be considered for conservation as well because they are only found in specific range and well-defined habitats. According to Engler et al. (2011), plant taxa adapted to colder conditions such as in the mountainous regions, particularly the endemics, are at the highest risk of species extinction due to climate change. According to Rebollido-Jacob (2015), *S. bontocensis* are pioneer trees and often found in stream banks of mountains as well as in open areas. On the other hand, Pelser et al. (2011) stated in the CDFP webpage that this species can be found in thickets and forests. This was supported by the findings of Lumbres et al. (2014); Taguiling (2014); and Malabrigo

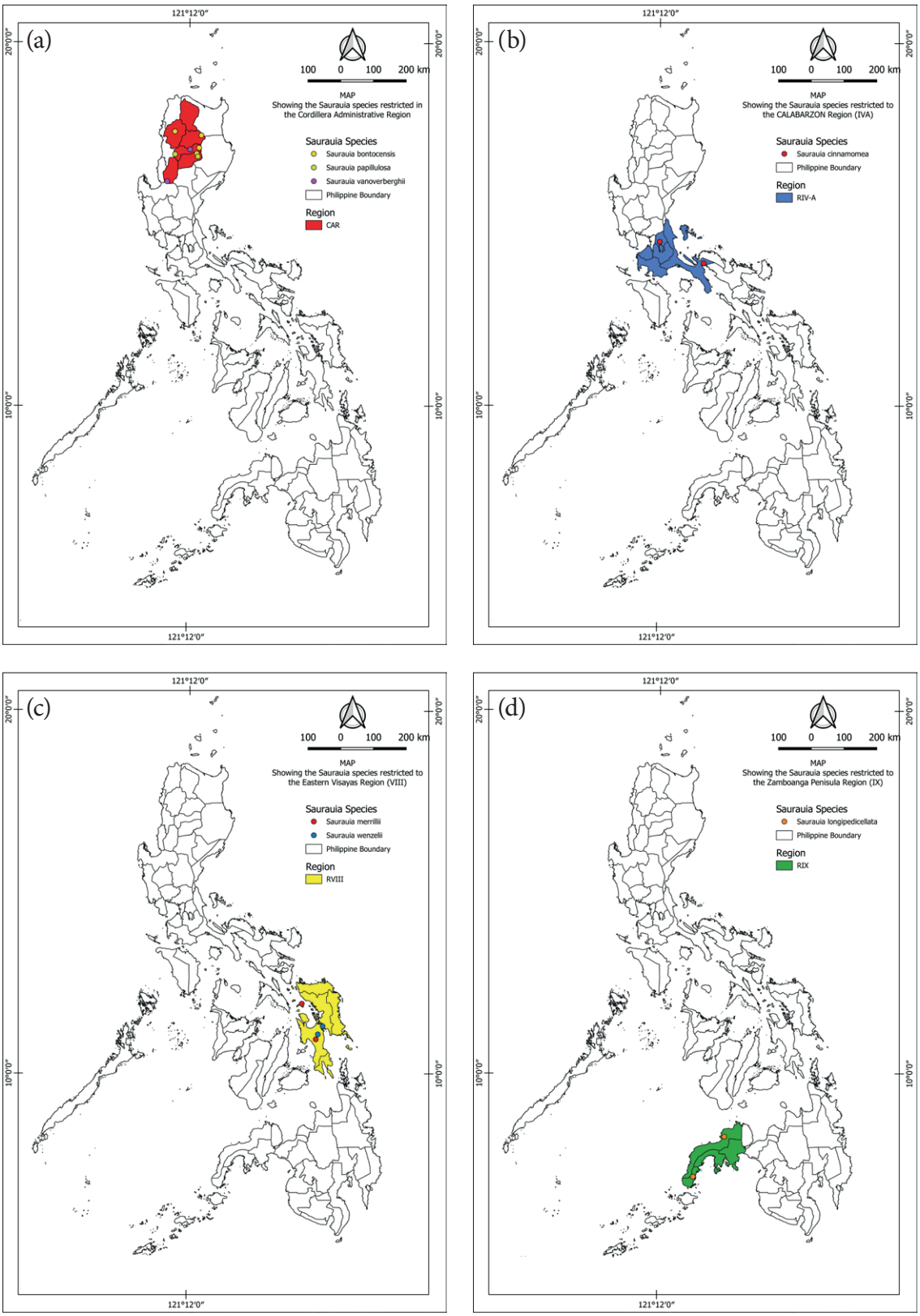


Figure 5. The Saurauia species destributed to a specific region based on the CDFP. (a) Cordillera Region, (b) CALABARZON (IV-A), (c) Eastern Visayas (VIII), (d) Zamboanga Peninsula (IX)

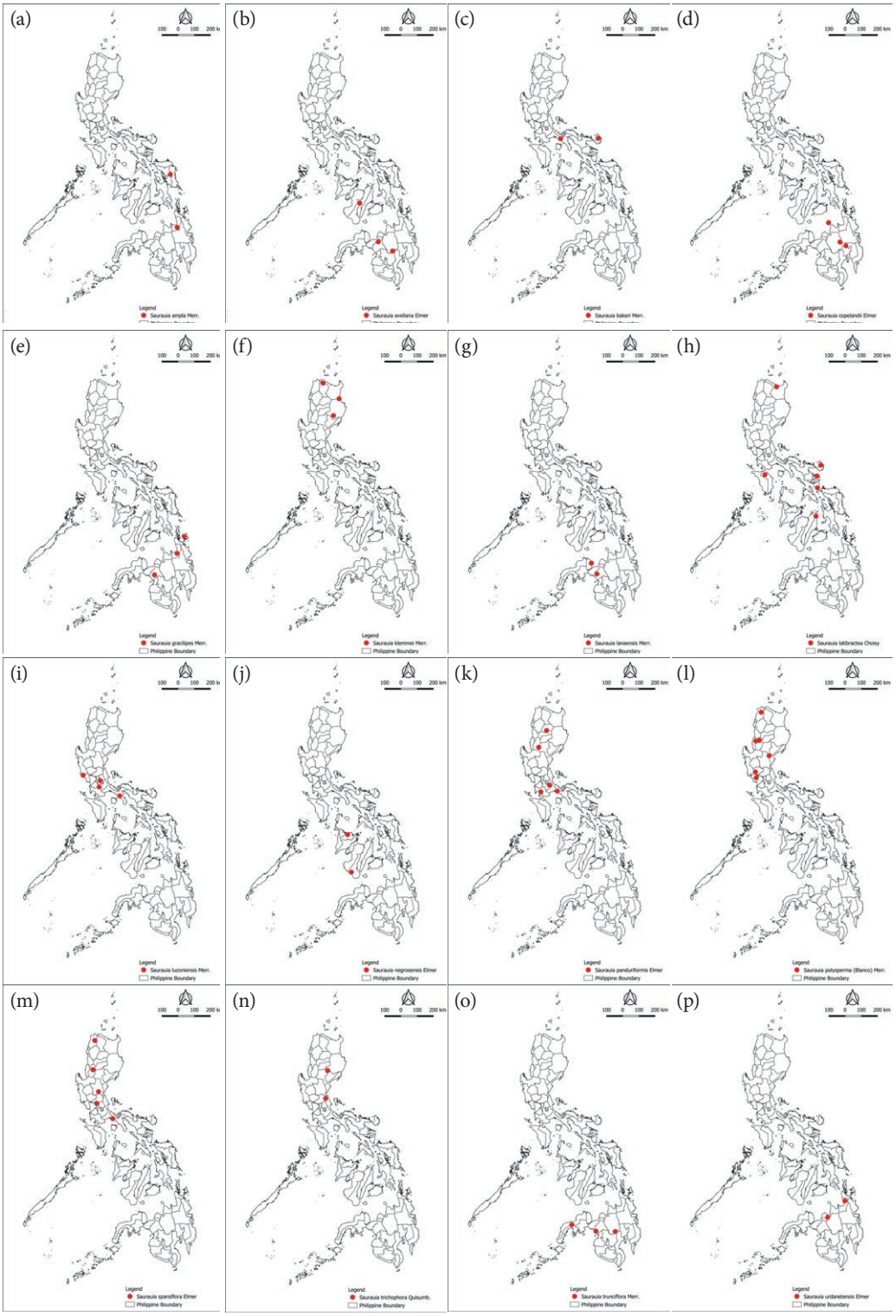


Figure 6. Species distribution map of selected species: (a) *S. ampla*, (b) *S. avellana*, (c) *S. bakeri*, (d) *S. copelandii*, (e) *S. gracilipes*, (f) *S. klemmei*, (g) *S. lanaensis*, (h) *S. latibractea*, (i) *S. luzoniensis*, (j) *S. negrosensis*, (k) *S. panduriformes*, (l) *S. polysperma*, (m) *S. sparsiflora*, (n) *S. trichophora*, (o) *S. trunciflora*, (p) *S. urdanetensis*, based on the CDFP.

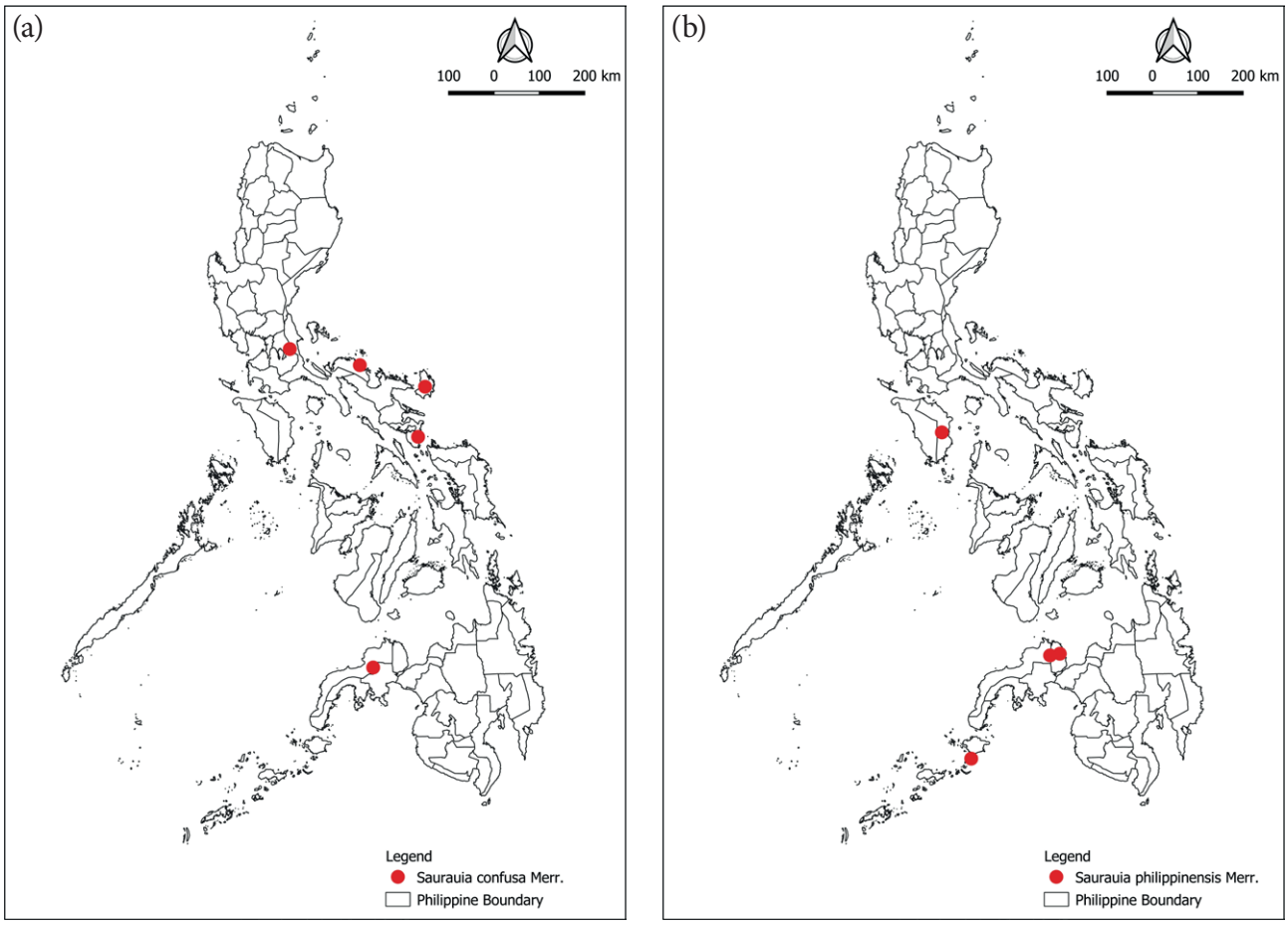


Figure 7. Species distribution map of (a) *Saurauia confusa*, and (b) *Saurauia philippinensis* based on the CDFP.

Jr. (2013) in their vegetation assessment studies, wherein they reported the occurrence of *S. bontocensis* in various forest areas across the Cordillera Mountains. Furthermore, Isaac et al. (2017) argued that the declining trend in species population sizes and suitable habitats, due to deforestation, increases the probability of extinction, especially for restricted endemic species. This suggests that the *Saurauia* species in the mountainous region of the Cordilleras are more vulnerable to climate and environmental changes due to the high deforestation rate in the region as recorded in the study of Daipan and Franco (2022).

Saurauia species with wider geographical distribution in the country

There are 20 *Saurauia* species with a wide distribution or found at least in two (2) or more regions in the country (Figure 6). These are *S. ampla, S. avellana, S. bakeri, S. clementis, S. confusa, S. copelandii, S. elegans, S. gracilipes, S. klemmei, S. lanaensis, S. latibractea, S. luzoniensis, S. negrosensis, S. panduriformis, S. philippinensis, S. polysperma, S. sparsiflora, S. trichophora, S. trunciflora, S. urdanetensis.* The result of the species distribution mapping could serve as an important input in the Red List (threatened species) assessments since they help determine some of the parameters for the inspections by allowing for the calculation of area and the extent of occurrence (IUCN 2014). Aside from that, the results of this study may provide insight into or answers to several taxonomic uncertainties in this genus. For example, the species distribution maps of *Saurauia* species generated in this study represent the known limits or occurrence of a specific *Saurauia* species' range as a provincial or regional boundary, or even islands – thus, any sites outside these range (islands) is unlikely to contain the species. According to Whittaker and Fernández-Palacios (2007) and Kier et al. (2009), islands are known as hotspots for range-restricted species, with high levels of endemism such as the *Saurauia* species in the coun-

try. This could indicate that the *Saurauia* species found in Mindanao has a low to zero chance of being discovered in the island of Luzon, or vice versa. As a result, the information presented in this work could be useful in other taxonomic and/or systematic research. However, proper plant systematic research such as comparative analysis of leaf architectural characters of *Saurauia* species should still be performed to delineate confusing species (Daipan et al. 2022). Examples of *Saurauia* species that are distributed in both the islands of Luzon and Mindanao are the *S. confusa* (Figure 7a) and *S. philippinensis* (Figure 7b). It is probable that *S. confusa* may not exist on the island of Mindanao, whereas *S. philippinensis* is only known to exist on the island of Mindoro. These are just a few examples of possible uses of this species distribution mapping in taxonomic investigations.

Climatic type of the different Saurauia species

There are four types of climate in the country according to the Corona's climatic classification (Figure 8). These are the Types I, II, III, and IV. Type I climate has two distinct seasons: dry from November to April and wet the rest of the year. The rainy season lasts from June to September. There is no dry season in Type II, with a very noticeable maximum rain period from December to February. There isn't a single dry month in the year. Type III has no clearly defined maximum rainy season, with a brief dry season lasting only one to three months, either from December to February or from March to May. The rainfall in Type IV is almost uniformly distributed year-round.

The findings of the overlay analysis between the species distribution of the genus *Saurauia* and the climatic type layer revealed that 16 *Saurauia* species occur in places with Type I climate, 22 species can be found in areas with Type II climate, while Type III and Type IV climates have 24 and 21 *Saurauia* species, respectively (Figure 9). *S. elegans* was observed to be distributed across all the four climatic types in the country. This may infer that this species is the most adaptable *Saurauia* to different climatic types. There are also species that are distributed or that occurred in areas with at most three (3) different climatic types, these are *S. clementis* (with climatic types II, III, and IV); *S. latibractea* (types II, III, and IV); *S. panduriformes* (types I, III, and IV); and *S. philippinensis* (types I, II, and III). It is plausible to conclude that these *Saurauia* species are less vulnerable to climate change compared to the *Saurauia* species with only one type of climate, since they can thrive in different habitats with different climatic types

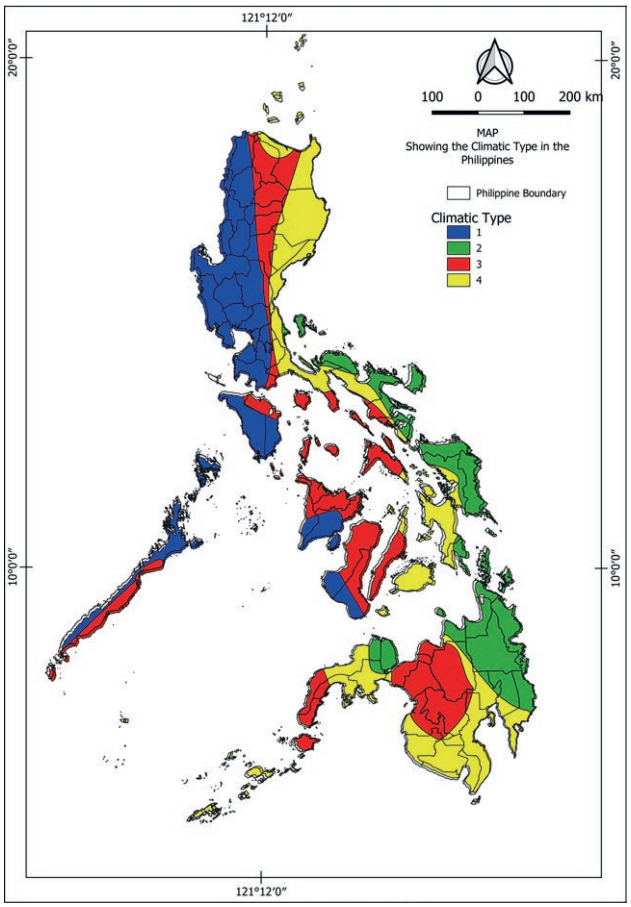
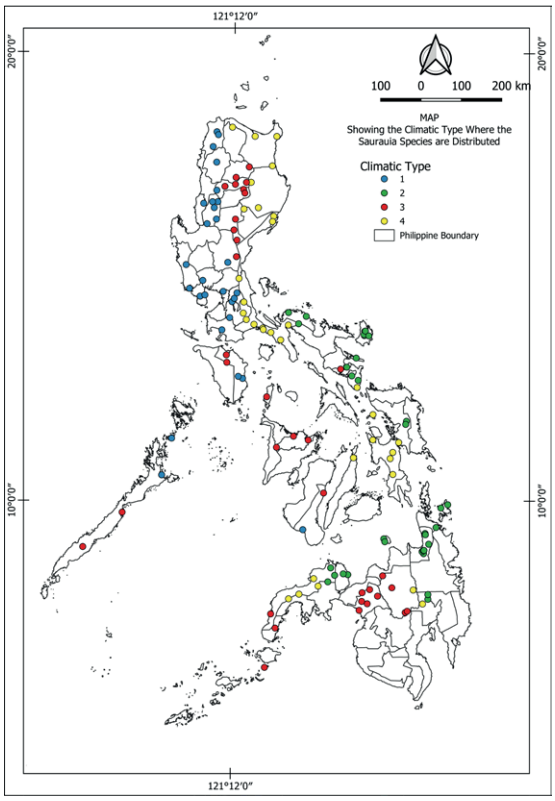


Figure 8. Climatic type in the Philippines based on the Modified Corona's Climatic Classification

in the country. There are 35 *Saurauia* species that are restrained in a single type of climate, these are the *S. abbreviata, S. alvarezii, S. ampla, S. avellana, S. bicolor , S. cordata, S. denticulata, S. elmeri, S. erythrotricha, S. fasciculiflora, S. gigantifolia, S. glabrifolia, S. involucrate, S. klemmei, S. knemifolia, S. leytensis, S. loheri, S. longistyla, S. macgregorii, S. merrillii, S. mindorensis, S. oblancilimba, S. oligantha, S. oligophlebia, S. palawanensis, S. panayensis, S. samarensis, S. sampad, S. sibuyanensis, S. sorsogonensis, S. tayabensis, S. trichophora, S. wenzelii, S. whitfordii,* and *S. zamboangensis.* These species should be given attention in the evaluation and/or updating of the list of threatened species in the country, if not in the IUCN red list.

The climatic data for each of the *Saurauia* species generated in this paper could serve as an important input in the habitat suitability studies and even in the species-level conservation planning. Although the current climatic assessment was based solely on the CDFP website at the time of reporting. Similar species may be



Species	I	II	III	IV
S. abbreviata				✓
S. alvarezii			✓	
S. ampla		✓		
S. avellana			✓	
S. bakeri		✓		✓
S. bicolor				✓
S. bontocensis	✓		✓	
S. cinnamomea	✓			✓
S. clementis		✓	✓	✓
S. confusa		✓		✓
S. copelandii		✓		✓
S. cordata		✓		
S. denticulata		✓		
S. elegans	✓	✓	✓	✓
S. elmeri				✓
S. erythrotricha		✓		
S. fasciculiflora	✓			
S. gigantifolia		✓		
S. glabrifolia		✓		
S. gracilipes		✓	✓	
S. involucrata		✓		
S. klemmei				✓
S. knemifolia	✓			
S. lanaensis		✓	✓	
S. latibractea		✓	✓	✓
S. leytensis				✓
S. loheri	✓			
S. longipedicellata			✓	✓

Species	I	II	III	IV
S. longistyla			✓	
S. luzoniensis	✓			✓
S. macgregorii			✓	
S. merrillii				✓
S. mindorensis	✓			
S. negrosensis	✓		✓	
S. oblancilimba	✓			
S. oligantha			✓	
S. oligophlebia		✓		
S. palawanensis			✓	
S. panayensis			✓	
S. panduriformis	✓		✓	✓
S. papillulosa	✓		✓	
S. philippinensis	✓	✓	✓	
S. polysperma	✓		✓	
S. samarensis		✓		
S. sampad		✓		
S. sibuyanensis			✓	
S. sorsogonensis		✓		
S. sparsiflora	✓			✓
S. tayabensis				✓
S. trichophora				✓
S. trunciflora			✓	✓
S. urdanetensis		✓	✓	
S. vanoverberghii	✓		✓	
S. wenzelii				✓
S. whitfordii		✓		
S. zamboangensis			✓	

Figure 9. Climatic type of the different *Saurauia* species in the Philippines.

found in other locations, extending the species' range. This may also increase the climate suitability of species. This information could also help in some taxonomic research in identifying confusing species based on their climatic type since climate is widely recognized as one of the most important factors of species distribution, and plants are sensitive to bioclimates, which dictate plant habitats (Kwon et al. 2012).

CONCLUSIONS

Species distribution mapping of *Saurauia* in the Philippines was conducted using the occurrence information from the checklist of vascular plants obtained from the CDFP. Although the distribution data was only based on the CDFP website, this paper provided a relevant information on the patterns of species distribution of the genus *Saurauia* in the country. The findings revealed that 29 species have limited distribution at the provincial level at present, while seven (7) species are only found in a specific region. It is plausible to conclude that these species are the most threatened *Saurauia* in the country on the basis of their endemicity or extent of occurrence. Furthermore, 35 *Saurauia* species are confined to a single type of climate, which may infer that they are the most vulnerable to climate change due to their inability to adapt to other climatic types. The *Saurauia* species identified in this study with a single provincial or regional distribution at present and restrained in only one type of climate should be prioritized and given special consideration in terms of species conservation. Finally, the information and data derived in this paper could serve as a baseline for assessing conservation status, habitat modelling studies, species-level conservation planning, and understanding climate change impacts.

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