

Inventory of lianas and their phorophytes in *Desa Serdang* village forest, Barusjahe, Karo, North Sumatera

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ABSTRAK

Sebagai negara megabiodiversitas, dan Sumatera sebagai pulau terbesar kedua di Indonesia, penting untuk memahami keanekaragaman hayati tumbuhan yang terus terancam, termasuk yang dikelola secara lokal sebagai hutan desa. Di Hutan Desa Serdang, Barusjahe, Karo, Sumatera Utara, kami mencoba mencatat semua jenis liana dan pohon inangnya. Kami melakukan analisis deskriptif kualitatif terhadap liana dan pohon inangnya di area studi dan menemukan 25 jenis liana dari 14 suku. Sebagian besar adalah pemanjat, diikuti oleh pemanjat berumbai, pemanjat akar, pemanjat kait, pemanjat berduri, dan pemanjat pemutar. Mereka memanjat pada 8 jenis pohon inang dari 8 suku, yang sebagian besar adalah pohon hutan tinggi. Studi ini meningkatkan pemahaman kita tentang liana dan pohon inangnya di Hutan Desa Serdang, yang dapat membantu upaya konservasi untuk melestarikan keanekaragaman hayati.

Kata Kunci : *Hutan Desa Serdang, Liana, Pohon inang*

ABSTRACT

As Indonesia is known as a megabiodiversity country, and Sumatera is its second largest island, it is important to understand its ever-threatened plant biodiversity, including those managed locally as village forests. In Serdang Village Forest, Barusjahe, Karo, North Sumatera, we tried to list all the liana species and their phorophytes. We conducted a qualitative descriptive analysis of the lianas and their phorophytes in the study area and found There are 25 species of lianas from 14 families Mostly are leaners, followed by tendril climbers, root climbers, hook climbers, thorn climbers and twiners. They climbed on 8 species of phorophyte from 8 families, most commonly tall forest trees. This study enhances our understanding of the lianas and their phorophytes in the Serdang Village Forest, which can aid conservation efforts to preserve biodiversity.

Keywords: *Liana, Phorophytes, Serdang Village Forest*

INTRODUCTION

Indonesia is a strategic tropical archipelago, located between the Asian and Australian continents and surrounded by the Pacific and Indian Oceans (Widjaja et al., 2014). Biogeographically, it is divided into seven main regions, including Sumatera,

known for diverse tropical flora (Abidin et al., 2020). Sumatera Island is the largest island in Indonesia that displays an extraordinary wealth of flora diversity, especially in its tropical forests (Nasution et al., 2015). Sumatera's tropical rainforests, characterized by high rainfall and humidity, support all trees, epiphytes and lianas (Assidqi, 2017).

Liana is a group of plants unable to grow independently in an upright position to support its crown (Asrianny et al., 2008) in competition for sunlight with other vegetation with wide crowns. Therefore, to reach high enough to photosynthesize, lianas need support to reach the light (Diana et al., 2021). Liana plants can be grouped based on how to climb their supports into leaner, thorn-climber, twinner and tendril-climber (Arisandy, 2015).

In North Sumatera, 27 liana species were found in Batang Gadis National Park (Siregar et al., 2021) on 3 species of phorophytes, which are *Ardisia* sp., *Eurya acuminata* and *Macaranga hypoleuka* (Novianti et al., 2024). It is interesting on whether in the neighbouring village of *Desa Serdang*, also in North Sumatera, the diversity of liana differs from what was found in Batang Gading National Park.

Desa Serdang in Barusjahe, Karo has a village forest, on which people utilize for medicine and building materials (Ginting et al., 2015). The use of natural resources of the village forest may contribute to the loss of phorophyte support for the lianas. Furthermore, as there had been no previous study on the liana diversity on *Desa Serdang* village forest, it is important to understand the diversity of the lianas and their phorophytes as a basis for conservation efforts of Sumateran liana and its phorophyte species diversity.

METHODOLOGY

Location dan time of research

This research was conducted in Serdang Village Forest, Barusjahe District, Karo Regency, North Sumatera in June-August 2024. The research was conducted by exploring tree trails along the eastern side of Serdang Village Forest. These paths were chosen to enable the collection of representative data on lianas and their supports (**Figure 1**).

Tools and materials

The tools used are secateurs, plant labels, collection sacks, camera, Global Positioning System (GPS), altimeter, meter-tape and stationery while the materials used are black cloth, 70% alcohol, newspaper, cardboard, tape, plastic rope, clear plastic, white paper, sewing needles, thread and brown folder.

Research procedures

Preparation

This stage includes determining the location in Serdang Village Forest, Barusjahe sub-district, Karo district, North Sumatera, based on initial observations to assess site conditions and the presence of lianas. In addition, a literature search related to lianas was conducted to deepen understanding of the species.

Data collection stage

Data collection was carried out using the exploration method, exploring the research area and collecting data according to the research objectives. Observations and documentation were carried out directly, followed by sampling of lianas and their phorophytes for identification and herbarium.

Herbarium making stage

This stage began by spraying the lianas and the phorophytes with 70% alcohol, then placing them in a folded newspaper, stacked between two sheets of cardboard, tied, and dried in the sun. After drying, the samples were stitched on white paper, labeled with identification labels, and put in a brown folder.

Data analysis techniques

Data analysis in this study used qualitative methods. Qualitative research is an approach that emphasizes the analysis of the subject's perspective, the process, and the meaning behind the phenomenon under study using a theoretical basis to support and provide an overview of the research (Fiantika et al., 2022) by observing the morphological characteristics of lianas and their supports including morphology and habitat characteristics of lianas and their supports. The data collected was then matched with identification books and botanical literature as well as online sources.



FIGURE 1. Map of research location and exploration route (ArcGIS Map)

RESULTS AND DISCUSSION

Liana species in Serdang Village Forest

Based on the results of exploration, 25 species of lianas were found, as follows:

Liana of Desa Serdang Village Forest identification key

- 1. a) plant herbaceous2
- b) plant woody4

2. a) stem surface purple-tinged	<i>Gynura procumbens</i> (Lour.) Merr.	
b) stem surface greenish		3
3. a) stem twining to the right.....	<i>Dioscorea alata</i> L.	
b) stem twining to the left.....	<i>Dioscorea pentaphylla</i> L.	
4. a) stem angular.....		5
b) stem terete		6
5. a) tendril climber	<i>Smilax zeylanica</i> L.	
b) hook climber.....	<i>Uncaria lanosa</i> Wall.	
6. a) leaves terminal whorl	<i>Freycinetia sumaterana</i> Hemsl.	
b) leaves scattered.....		7
7. a) leaf compound		8
b) leaf simple		10
8. a) trifoliolate	<i>Ampelocissus filipes</i> Planch.	
b) pentafoliolate.....		9
9. a) inflorescence corymbose	<i>Tetrastigma papillosum</i> (Blume) Planch.	
b) inflorescence umbellate.....	<i>Tetrastigma rafflesiae</i> (Miq.) Planch.	
10. a) venation curvinerved		11
b) venation penninerved		16
11. a) petiole pilose.....		12
b) petiole laevigate.....		13
12. a) corolla pink, stamens equal in length	<i>Dissochaeta fallax</i> (Jack) Blume	
b) corolla white, stamens unequal in length	<i>Dissochaeta gracilis</i> (Jack) Blume	
13. a) leaf cordate		14
b) leaf elliptic.....		15
14. a) leaf adaxially pilose.....	<i>Piper sintenense</i> Hatus.	
b) leaf adaxially laevigate.....	<i>Piper baccatum</i> Blume	
15. a) leaf base obtuse.....	<i>Smilax calophylla</i> Wall. ex A.DC.	
b) leaf base rounded.....	<i>Smilax setosa</i> Miq.	
16. a) leaf margin serrated		17
b) leaf margin entire		18
17. a) petals narrow, apex notched	<i>Rubus moluccanus</i> L.	
b) petals elliptic, apex rounded.....	<i>Rubus pyrifolius</i> Hook. f. & Thomson	
18. a) inflorescence terminal		19
b) inflorescence axillar		21
19. a) inflorescence panicle	<i>Psychotria sarmentosa</i> Blume	
b) inflorescence spadix		20
20. a) fruit red when ripe.....		
..... <i>Anadendrum microstachyum</i> (de Vriese & Miq.) Backer & Alderw.		
b) fruit dark green when ripe	<i>Rhaphidophora korthalsii</i> Schott	
21. a) leaf apex retuse	<i>Uvaria grandiflora</i> Roxb. ex Hornem.	
b) leaf apex acute.....		22
22. a) leaf abaxially lepidote.....	<i>Elaeagnus triflora</i> Roxb.	
b) leaf abaxially laevigate.....		23
23. a) false fruit in syconium.....	<i>Ficus punctata</i> Thunb.	

- b) true fruit.....24
 24. a) flower hermaphrodite *Artabotrys hexapetalus* Roxb.
 b) flower unisex *Kadsura scandens* Blume

Liana Species in Serdang Village Forest

TABLE 1. Liana species in Serdang Village Forest, Barusjahe District, Karo Regency, North Sumatera

No	Family	Species	Group	Altitude (M)
1	Annonaceae	<i>Artabotrys hexapetalus</i> (L.F.) Bhandari	Hook-Climber	1352
2	Annonaceae	<i>Uvaria grandiflora</i> Roxb. Ex Hornem.	Leaner	1358
3	Araceae	<i>Anadendrum microstachyum</i> (de Vriese & Miq.) Backer & Alderw.	Root-Climber	1345
4	Araceae	<i>Rhaphidophora korthalsii</i> Schott	Root-Climber	1358
5	Asteraceae	<i>Gynura procumbens</i> (Lour.) Merr.	Leaner	1341
6	Dioscoreaceae	<i>Dioscorea alata</i> L.	Twiner	1378
7	Dioscoreaceae	<i>Dioscorea pentaphylla</i> L.	Twiner	1366
8	Elaeagnaceae	<i>Elaeagnus triflora</i> Roxb.	Leaner	1353
9	Melastomataceae	<i>Dissochaeta fallax</i> (Jack) Blume	Leaner	1358
10	Melastomataceae	<i>Dissochaeta gracilis</i> (Jack) Blume	Leaner	1371
11	Moraceae	<i>Ficus punctata</i> Thunb.	Leaner	1374
12	Pandanaceae	<i>Freycinetia sumaterana</i> Hemsl.	Root-Climber	1358
13	Piperaceae	<i>Piper baccatum</i> Blume	Leaner	1357
14	Piperaceae	<i>Piper sintenense</i> Hatus.	Leaner	1373
15	Rosaceae	<i>Rubus moluccanus</i> L.	Thorn	1358
16	Rosaceae	<i>Rubus hexagynus</i> Roxb. ex Wall.	Thorn	1374
17	Rubiaceae	<i>Psychotria sarmentosa</i> Blume	Leaner	1400
18	Rubiaceae	<i>Uncaria lanosa</i> Wall.	Hook-Climber	1382
19	Schisandraceae	<i>Kadsura scandens</i> (Blume) Blume	Tendrill	1341
20	Smilacaceae	<i>Smilax calophylla</i> Wall. ex A.DC.	Tendrill	1368
21	Smilacaceae	<i>Smilax setosa</i> Miq.	Tendrill	1366
22	Smilacaceae	<i>Smilax zeylanica</i> L.	Tendrill	1341
23	Vitaceae	<i>Ampelocissus filipes</i> Planch.	Tendrill	1366
24	Vitaceae	<i>Tetrastigma papillosum</i> (Blume) Planch.	Tendrill	1371
25	Vitaceae	<i>Tetrastigma rafflesiae</i> (Miq.) Planch.	Tendrill	1357

Descriptions

Annonaceae

1. *Artabotrys hexapetalus* (L.F.) Bhandari

Stem woody, terete, greenish, bark smooth-haired, with hooks; leaf alternate, obovate to lanceolate, 3.5-14 x 2-3 cm, basal acute, margin entire, apex acute, venation pinnate, adaxially dark green, abaxially light green, glabrous

2. *Uvaria grandiflora* Roxb. ex Hornem.

Stem woody, terete, dark brown; leaf alternate, obovate, 14-17 x 7.5-8.5 cm, base rounded, margin entire, apex emarginate, venation pinnate, adaxially dark green, abaxially light green, densely pubescent.

Araceae

3. *Anadendrum microstachyum* (de Vriese & Miq.) Backer & Alderw.

Stem herbaceous, terete, light green, smooth, with climbing roots; leaf alternate, ovate-oblong, 16-18 x 6 cm, basal obtuse, margin entire, apex acuminate, venation pinnate, abaxially laevigate.

4. *Rhaphidophora korthalsii* Schott

Stem herbaceous, terete, light greenish brown, smooth, with climbing roots; leaf alternate, ovate, 3-6 x 4-5 cm, base emarginate, apex acute, coriaceous, abaxially glabrous; inflorescence spadix; flower hermaphrodite; fruit dark green to dull orange (Boyce, 1999).

Asteraceae

5. *Gynura procumbens* (Lour.) Merr.

Stem herbaceous, angular, bark purple-tinged; leaf alternate, elliptic 4-12 x 1-3.5 cm, base acute, margin serrate, apex acute, venation pinnate, adaxially laevigate, dark green, abaxially pilose, whitish light green.

Dioscoreaceae

6. *Dioscorea alata* L.

Stem herbaceous, angular, twisted to the right, green; leaf opposite, cordate, 4-10 x 3-4 cm. base emarginate, margin entire, apex acuminate, adaxially laevigate, green, abaxially slightly textured, pale green

7. *Dioscorea pentaphylla* L.

Stem herbaceous, terete, brownish green, twisted to the left; leaf tri-pentafoliate, oval 9-13 x 3-5 cm, base acute, margin entire, apex acute, acute tip and base, adaxially dark green, abaxially pale green.

Elaeagnaceae

8. *Elaeagnus triflora* Roxb.

Stem woody, terete, brownish, spiny; leaf alternate, oval, 4.5-9 x 1.5-3.5 cm, base obtuse, margin entire, apex acuminate, venation pinnate, adaxially dark green, abaxially scaly

Melastomataceae

9. *Dissochaeta fallax* (Jack) Blume

Stem woody, terete, dark green-brown, bark finely pubescent; leaf opposite, ovate, 7.5-18 x 4-8 cm, basal emarginate, margin entire, apex acuminate, curvined, adaxially

laevigate, dark green, abaxially velutinous, light green; inflorescence small; flower hermaphrodite, corolla pink, stamen 4-8, equal in length; fruit spherical, purple when ripe (Kartonegoro et al., 2018).

10. *Dissochaeta gracilis* (Jack) Blume

Stem woody, terete, bark finely pubescent, dark green-brown; petiole hairy; leaf opposite, ovate 8.5-12 x 3.5-6 cm, base obtuse, margin entire, apex acuminate, curvined, adaxially dark green, abaxially pale white; flower hermaphrodite, corolla tubular, white; stamen 8 unequal in length; fruit chunky, spherical, glabrous, green when young, purple when ripe (Kartonegoro et al., 2018).

Moraceae

11. *Ficus punctata* Thunb.

Stem woody, terete, greenish, with adventitious roots; leaf alternate, elongate-lanceolate, 6.5-9 x 1-1.5 cm, base obtuse, margin entire, apex acute, venation pinnate, adaxially shiny dark green, abaxially light green with white spots.

Pandanaceae

12. *Freycinetia sumaterana* Hemsl.

Stem woody, terete, climbing roots on leaf axil, leaf auricled, whorled, ligulate, 9-9.5 x 1.6-1.8 cm, base obtuse, margin entire, spiny, apex acuminate, adaxially dark green, abaxially pale green.

Piperaceae

13. *Piper baccatum* Blume

Stem woody, terete, brownish, with climbing roots; leaf alternate, cordate, 4.2-7.5 x 3.6-7.8 cm, curvined, adaxially laevigate, dark green, abaxially glabrous, light green.

14. *Piper sintenense* Hatus.

Stem woody, terete, brownish, with climbing roots; leaf alternate, cordate, 4-5.2 x 2-4.4 cm, curvined, margin entire, adaxially and abaxially pilose.

Rosaceae

15. *Rubus moluccanus* L.

Stem woody, terete, brownish, thorny; leaf alternate, ovate 3-5 lobed, 7-9 x 4-7.3 cm, base emarginate, margin serrated, apex acuminate, venation pinnate, adaxially hairy, green, abaxially hairy, brown-green.

16. *Rubus hexagynus* Roxb. ex Wall. syn. *Rubus pyrifolius* Hook..f. & Thomson

Stem woody, terete, green, thorny; leaf alternate, ovate to elliptic, 10-11.5 x 2-4 cm, base obtuse, margin serrated, apes acute, venation pinnate, adaxially glossy, dark green, abaxially pale green.

Rubiaceae

17. *Psychotria sarmentosa* Blume

Stem woody, terete, green to brownish, bark smooth with climbing roots; leaf opposite, ovate-oblong, 1.2-2.5 x 0.3-1 cm, base acute, margin entire, apex acute, venation pinnate, texture thick-smooth, adaxially dark green, abaxially pale green.

18. *Uncaria lanosa* Wall.

Stem woody, angular, brownish, bark laevigate, hooks on nodes; leaf opposite, sessile, ovate, 9-9.5 x 1.6-1.8 cm, base obtuse, margin entire, apex acuminate, adaxially dark green, abaxially paler green.

Schisandraceae

19. *Kadsura scandens* Blume

Stem woody, terete, brownish red, laevigate; leaf alternate, ovate-elliptic 9.2-10 x 4.8-6.3 cm, base obtuse, margin entire, apex acuminate, venation pinnate, adaxially green, abaxially brownish red.

Smilacaceae

20. *Smilax calophylla* Wall. ex A. DC.

Stem woody, terete, green, sparsely spiny; leaf alternate, oval, 5.5-11 x 2-3.7 cm, base obtuse, margin entire, apex acuminate, adaxially dark green, abaxially light green, texture leathery.

21. *Smilax setosa* Miq.

Stem; woody, terete, green; leaf alternate, ovate, 36.4 x 17.4 cm, base obtuse, margin entire, apex obtuse, venation recurved, adaxially green, abaxially paler green.

22. *Smilax zeylanica* L.

Stem woody, angular, sparsely spiny, tendrillate, green; leaf alternate, ovate, laevigate, base emarginate, margin entire, apex acuminate, venation recurved, adaxially dark green above, abaxially pale green,

Vitaceae

23. *Ampelocissus filipes* Planch.

Stem woody, terete, green, hairy; leaf 3 foliolate, ovate, 13-22 x 7.5-13 cm, base acuminate, margin dentate, apex acuminate, adaxially green, abaxially whitish, hairy.

24. *Tetrastigma papillosum* (Blume) Planch.

Stem; woody, terete, green, bark slightly rough; leaf tendrillate, 5 foliolate, oval, 5-11 x 2.3-5 cm, base obtuse, margin serrate, apex acuminate, adaxially green, abaxially paler, texture smooth and glossy; inflorescence corymbose; flower dioecious; fruit 0.6 x 0.7 cm (Latif, 1983).

25. *Tetrastigma rafflesiae* (Miq.) Planch.

Stem woody, terete, green, bark laevigate; leaf tendrilate, 5 foliolate, elliptic, 6-14 x 3.5-5.5 cm, base obtuse, margin serrate, apex acuminate, green above, paler below, laevigate; inflorescences umbellate; flower dioecious; fruit spherical, red to dark red when ripe (Rahayu et al., 2018).



FIGURE 2. Liana plants: **A.** *Ficus punctata* Thunb., **B.** *Rhapsidophora korthalsii* Schott, **C.** *Tetrastigma rafflesiae* (Miq.) Planch., **D.** *Rubus moluccanus* L.

This study reveals 25 species of liana, compared to 34 liana species from 22 families in Hutan Desa Bukum, Deli Serdang (Novianti et al., 2024). A primary forest of Gunung Leuser National Park, Langkat Regency, recorded 32 liana species (Wati & Manurung, 2016). Our fewer number of lianas found in *Desa Serdang Village Forest* may be due to smaller forest area compared to *Desa Bukum* and *Leuser NP*. However, the liana composition of our study area is comparable to both *Bukum* and *Leuser*.

TABLE 2. Phorophyte species in *Desa Serdang Village Forest*

No	Family	Phorophyte Species	Liana Species
1	Anacardiaceae	<i>Mangifera</i> sp.	<i>Rhapsidophora korthalsii</i> Schott <i>Freycinetia sumaterana</i> Hemsl.
2	Arecaceae	<i>Arenga pinnata</i> (Wurmb) Merr.	<i>Uvaria grandiflora</i> Roxb. ex Hornem.
3	Cornaceae	<i>Alangium</i> sp.	<i>Kadsura scandens</i> (Blume) Blume
4	Moraceae	<i>Ficus asperiuscula</i> Kunth & C.D.Bouche	<i>Smilax zeylanica</i> L. <i>Piper baccatum</i> Blume <i>Rubus moluccanus</i> L. <i>Tetrastigma rafflesiae</i> (Miq.) Planch.
5	Poaceae	<i>Gigantochloa pruriens</i> Widjaja	<i>Dissochaeta fallax</i> (Jack) Blume
6	Protaceae	<i>Helicia robusta</i> (Roxb.) R.Br. ex Blume	<i>Anadendrum microstachyum</i> (de Vriese & Miq.) Backer & Alderw.
7	Styraceae	<i>Styrax paralleloneurus</i> Perkins syn. <i>Styrax sumateranus</i> J.J.Sm.	<i>Ampelocissus filipes</i> Planch. <i>Dioscorea alata</i> L. <i>Elaeagnus triflora</i> Roxb. <i>Dissochaeta gracilis</i> (Jack) Blume <i>Rubus hexagynus</i> Roxb. ex Wall. <i>Ficus punctata</i> Thunb.
8	Theaceae	<i>Schima wallichii</i> (DC.) Korth.	<i>Artabotrys hexapetalus</i> (L.F.) Bhandari <i>Dioscorea pentaphylla</i> L. <i>Smilax setosa</i> Miq. <i>Smilax calophylla</i> Wall. ex A.DC.

The most common families are Smilacaceae (3 sp.) and Vitaceae (3 sp.). Both families comprise common forest species, and climbing with similar means, tendrils. In forest, tendril climbing perhaps is more suitable in clinging to tree leaves and twigs compared to root climbing, which is more adaptive on slopes and on larger diameter trees. Five families (Asteraceae, Elaeagnaceae, Moraceae, Pandanaceae and Schisandraceae) each contains one species of liana, while seven families (Annonaceae, Araceae, Dioscoreaceae, Melastomataceae, Piperaceae, Rosaceae, and Rubiaceae) contains each two species of liana (**Table 1**).

Nine species are climbing as leaners, which means they pose their stem, branches and twigs on the phorophytes. This is the most common method of climbing in our research area. The second most common method is by tendril (7 sp.), followed by root climbers (3 sp.), hook climbers (2 sp.), thorn climbers (2 sp.) and twiners (2 sp.) (**Table 1**).

Phorophyte species in Serdang Village Forest



FIGURE 3. Phorophytes: **A.** *Mangifera* sp., **B.** *Arenga pinnata* (Wurmb) Merr., **C.** *Alangium* sp., **D.** *Ficus asperiuscula* Kunth & C.D.Bouche, **E.** *Gigantochloa pruriens* Widjaja, **F.** *Helicia robusta* (Roxb.) R.Br. ex Blume **G.** *Styrax paralleloneurus* Perkins., **H.** *Schima wallichii* (DC.) Korth.

Based on the results of the research conducted, 8 species of phorophytes consisting of 8 families (**Table 2**). The most used phorophytes is *Styrax paralleloneurus*, with six liana species. *Styrax paralleloneurus* (**Figure 3G**) is a common benzoin producing tree, planted mainly in Northern Sumatera. It is possible that the village forest in *Desa Serdang* is a suitable place for the *Styrax paralleloneurus* as silviculture tree species. This species, being planted and managed, may perhaps attain a higher posture compared to the neighbouring trees. Tall posture is beneficial for the lianas. Second common phorophytes are *Ficus asperiuscula* (**Figure 3D**) and *Schima wallichii* (**Figure 3H**). Both are tall forest trees, with the latter may also be planted as timber trees. Again, tall posture of both species is needed by lianas to attain higher ground in their search for better sunlight exposure.

CONCLUSIONS

There are 25 species of lianas from 14 families in *Desa Serdang Village Forest*, Barusjahe, Karo, North Sumatera. Mostly are leaners, followed by tendril climbers, root climbers, hook climbers, thorn climbers and twiners. They climbed on 8 species of phorophyte from 8 families, most commonly tall forest trees.

AUTHOR CONTRIBUTIONS

R.A.W.L. formulated and conducted the research, made the herbarium, and wrote the manuscript. W.D.P.S. contributed as thesis supervisor, providing direction and input in study design, analysis of research results, and preparation of manuscripts. Y.E.R. assist in field data collection and species identification.

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CONFLICTS OF INTEREST STATEMENT

There are no conflicts to declare

DISCLOSURES AND ETHICS

As a requirement of publication author(s) have provided to the publisher signed confirmation of compliance with legal and ethical obligations including but not limited to the following: authorship and contributorship, conflicts of interest, privacy and confidentiality and (where applicable) protection of human and animal research subjects.

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