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Selaginella mayeri Hieron. (Selaginellaceae), a new record for Thailand

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Keywords: Indochina, Lycophytes, new record, *Selaginella*, South Thailand.

Summary. *Selaginella mayeri* is widely distributed in Southeast Asia and has not been reported in Thailand. We found two collections of it from Pattalung and Yala Provinces of Thailand, representing new records for this country. *Selaginella mayeri* could be distinguished from other long-creeping Southeast Asian species distributed in Thailand by the exauriculate axillary and ventral leaves and short flabellate lateral branchlets.

Selaginella mayeri Hieron. (Selaginellaceae) – новая находка для Таиланда

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Ключевые слова: Индокитай, новая находка, плауновые, Южный Таиланд, *Selaginella*.

Аннотация. *Selaginella mayeri* имеет широкое распространение в Юго-Восточной Азии, и до настоящего времени о находках этого вида из Таиланда не сообщалось. Мы нашли два гербарных сбора из провинций Патталунг и Яла (Таиланд), которые представляют собой новую находку для этой страны. *Selaginella mayeri* отличается от других длинноползучих юго-восточноазиатских видов, распространенных в Таиланде, отсутствием ушек в основании пазушных и брюшных листьев и наличием коротких веерообразных боковых веточек.

Introduction

A. H. G. Alston has made a great contribution to the study of the genus *Selaginella* P. Beauv. in different regions of the world, one of which is Southeast Asia. In Malay Peninsula, Ridley (1919) recorded 37 species of *Selaginella* for the first time. Several years later, Alston (1934) reduced list of the species to 25. Subsequently, Wong (1983, 2010) made a detail study of *Selaginella* in Malay Peninsular and recognized 29 species. Later, Zhang and Tan (2013) added *S. braunii* Baker and *S. siamensis* Hieron. as new records for Malaysia. The studies of *Selaginella* species for Indochina were initiated by Alston (1951). A total of 43 species were recorded, of which 16 species distributed in Thailand (Alston, 1951). Tagawa and Iwatsuki (1979) recorded 29 species in Flora of Thailand. Later, a new record of *S. ciliaris* (Retz.) Spring was added by Rachata and Boonkerd (2001) to Thailand flora.

Selaginella mayeri Hieron. is one of the interesting long-creeping species with short suberect and flabellate lateral branches, distributed in Malaysia, Singapore and Indonesia. This new record of it from

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Thailand is based on herbarium study by the senior author in herbaria of Naturalis Biodiversity Center (L) and examination of digital images from "Global Biodiversity Information Facility" source (GBIF. URL: https://www.gbif.org).

Material and methods

Digital images from online databases for the Selaginellaceae species from GBIF (*Selaginella mayeri* Hieron., 2023) including herbaria B, BM, DUKE, L, MICH, MO, NY, P, PE, PH, U, US (acronyms according to Thiers, 2023), were careful analyzed and studied. For confirmed identifications of the new occurrences of *Selaginella mayeri* by analyzing images, we carefully examined types in B, K, P (and visit these herbariums by the second author ZXC) and JSTOR, and consulted with relevant literature (Alston, 1951; Tagawa, Iwatsuki, 1979; Wong, 2010; Zhang et al., 2013). Measurements were done by D 3.10 (Nikon Instruments Inc. URL: http://www.nikoninstruments.com) based on digital images from different herbarium specimens represented in GBIF.

Description

Selaginella mayeri Hieron., 1901, Engler et Prantl, Nat. Pflan. 1, 4: 700.

Holotype: "Singapore, VIII 1895. Mayer 532" (B [B200147122]; iso – K [K000803526], P [P00523184], B [B200147121, probably isotype, but without coll. number]).

= *Selaginella calcarea* Ridl., 1919, J. Roy. As. Soc. Str. Br. 80: 149, no. 4.

Holotype: "Peninsular Malaysia, Selangor, Batu Caves, Ridley 8772" (K [K000803521]).

– *Selaginella merguina* auct. non Spring: Ridley, 1919, J. Roy. As. Soc. Str. Br. 80: 149.

New records. Thailand. Pattalung Province: "See Bahn Pote distr., Kao Boo-Kao Yah National Park, near Mat Cha Cave, Shaded area in a stream, on limestone rocks, primary evergreen forest, 50 m. 14 VI 1986. J. F. Maxwell 86-369" (L.3498172; P01410562); **Yala Province:** "Waterfall at Yala, 6°34'N, 101°18'E. 21 X 1970. C. Charoenphol et al. 4124" (NY 03865129).

Additional examined specimens. Malaysia. Kelantan: "Malay Penins.: (Kuala [Kwala] Aring. 23 VI 1899. R. Yapp 75" (US 01393016); "Jeli, G. Reng, Gunnung Reng, Batu Melintang, Limestone Hill. Lowland evergreen forest, terrestrial, shaded. 5°43'00"N, 101°44'55"E. 13 I 2020. K. Imin et al. FRI 66447" (L.3721980); **Negri Sembilan**: "Pautai. XII 1898. s. l. 9886" (P01410565); "Gunung Jampin. 16 I 1917. H. Ridley s. n." (US 01393011); **Pahang**: "Kuala Bertam, on rock, 700 ft. 25 VI 1930. Kiah and E. J. Strugnell Singapore field 23953" (US 01393014; P01410566; BM); "Tembeling. 24 IV 1931. R. E. Holttum Singapore Field 24728" (US 01393015; PE01622242); "Taman Negara, at Gua Telinga. Lowland rainforest. 2 IX 2006. P. Korall et al. 2006:60" (DUKE10152454; DUKE10152455); **Penang**: "Waterfall Botanic Garden, in dense evergreen forest. 13 X 1967. T. Shimizu et al. M-12959" (L.3498174; US 01393010); **Perak**: "between 19- & 20-mile Tapah – Tanah Rata Road, terrestrial. 19 VI 1966. E. A. Turnau 2336 (1139)" (PH00626088; U.1034788); "Hulu Perak, Temongor F. R., Sg. Enam, trek 3. Secondary. Hill mixed dipt. forest, 403 m. 5°30'68"N, 101°27'43"E. 5 X 2012. K. Imin et al. FRI 77951" (L.4403253); "Ipoh, G. Rapat, Gua Kek Lok Tong, G. Rapat. Secondary. Limestone Hill. lowland dipt. forest. Shade, slope, foothill of limestone, 86 m. 4°25'46"N, 101°09'53"E. 21 VII 2000. K. Imin et al. FRI 68135" (L.4420960); **Selangor**: "Nr. Kuala Lumpur. Limestone. 22 VI 1957. B. E. G. Molesworth-Allen 3472" (US 01393012); "Gombak, Bukit Anak Takun, Templer park golf course, Primary. Lowland dipt. forest. Limestone Hill. Slope, creeping on rocks, 183 m. 3°17'51"N, 101°38'18"E. 27 IV 2006. A. R. Rifadah FRI 51616" (L.4329010); "Gombak: Gua Batu: Serow cave and vicinity. Karst forest. GPS reading (WGS-84) and elevation approximated. 3.24250°N, 110.68750°E [3°14'33"N, 110°41'15" E]. 24 VIII 2006. E. Schuettpelz et al. 711A" (DUKE10152456); **Terengganu**: "Halu Terengganu, Tasik Kenyir, East face of Gua Bewah, by the stair leading to the cave entrance. Primary. Limestone Hill. Lowland dipt. forest. Creeping on limestone surface, stem reddish brown. Strobili dark green, 190 m. 4°51'04"N, 102°43'36"E. 6 VIII 2007. C. L. Lim et al. FRI 56447" (L.3721393); "Dungun, Jengai F. R., Kompatment 6, Lowland evergreen forest. Above the river bank, slope, on the rock face, 70 m. 4°39'60"N, 103°05'17"E. 16 VII 2010. K. Imin et al. FRI 71682" (L.3721995).

Singapore: "Singapore. VII 1896. s. l. 577" (P01410564); "Singapore Botanical Garden. 28 X 2010. X. C. Zhang 6542" (PE01870108).

Indonesia: "Indonesia. H. F. Sun 23" (PE01622245); **West Java**: "Botanic Garden, Bogor, on bank of ditch near Fern Garden. Leaves bright green. Stem somewhat reddish. A. H. G. Alston 13509" (L.3498154); "Java, Bogor Botanical Garden. 7 IX 2013. X. C. Zhang 6910" (PE01962530);

Fig. Herbarium specimen of *Selaginella mayeri* Hieron. (J. F. Maxwell 86-369 – L.3498172; https://data.biodiversitydata.nl/naturalis/specimen/L.3498172).

Sumatra: "Sumatra. A. H. G. Alston 14478" (L.3498155); "Sumatra. P. W. Korthals s. n." (L.3498157); "Sumatra. s. l., s. n." (PE01622244); **Aceh Province**: "Poeloe Weh. VII 1915. P. Buitendijk s. n." (L.3498160); "Atjeh: en route from Bireuen tp Takingeun, Edge of forest along the road, on rather dry slopes in half shaded place, 200–600 m. 4 IX 1971. K. Iwatsuki et al. S. 1698" (L.3498166; MO-3394244); "Environs de Gadang, Sumatra, 1895–1896. J. Shild s. n." (US 01394130; PE01622241; P01271987; P01271988); **North Sumatra**: "Sumatra (East Coast), Between Soenggapa and Pargambiran, Asahan, 270–360 m. 22 V 1927. H. H. Bartlett 8155" (US 01394125; MICH 1578702); "Sumatra (East Coast), Vale of Tangga, Asahan. 12–21 V 1927. H. H. Bartlett 7739" (US 01394126; MICH 1578701); "N. E. Sumatra, Medan, introduced (with orchids) from Sibolangit, epiphytic, freely branching. Creeping, erect, handing. Usually rather light green, 25 m. 4 X 1929. J. A. Lörzing 16004" (L.3483621); "below the gardens, Sibolangit, bright green on bank. 17 III 1954. A. H. G. Alston 14458" (L.3498156; MICH 1578698; PE01622243); "Sumatra, ad rupes locis fol. Padangkocfis. P. W. Korthals s. n." (L.3498158); "Asahan, Sumatra, East Coast, 1918. H. H. Bartlett, C. D. La Rue 23" (L.3498159); "Vicinity of the rotan bridge over the Asahan River, near Oedjoeng Batoe, above Bandar Poeloe, Asahan, 21 II 1927. H. H. Bartlett 6671" (L.3498161); "Archipel. Ind. Sumatra, Bij Lan – Pakit, ten Z. v. Medan. 1 IV 1919. J. A. Lörzing 6352" (L.3498162); "Atrchipel. Ind. Sumatra, Sibolangit. 24 XI 1916. J. A. Lörzing 4515" (L.3498163); "Sumatra, Sumatera Utara: Sibolangit, Edge of forest along road, on grassy bank in half shaded place, 400–450 m. 11 VI 1971. K. Iwatsuki et al. S 12" (L.3498164); "Sumatra, Sumatera Utara: Sibolangit, In dense evergreen forest, terrestrial on grassy slope, ca. 450 m. 11 VI 1971. K. Iwatsuki et al. S. 82" (L.3498165; MO-3394245); "Serdang, Gunung-rinte estate near Laurakit (32 kilometers straight S. of Medan. Limestone rocks or calcareous soil, in shade or in cavities where no rain falls, 300 m. 13 IV 1930. J. A. Lörzing 16104" (L.3498168; US 01394128); "N. Sumatra, Serdang, Batu-rata estate. In Hevea plantations, mostly on good soil, in light shade, 100 m. 4 XI 1929. J. A. Lörzing 16043" (L.3498169; US 01394131); "Sibolangit, on bank in forest, slightly bluish metallic shade. 18 III 1954. A. H. G. Alston 14478" (L.3606268); "Sumatra (East Coast): Vicinity of the rotan bridge over the Asahan River, near Oedjoeng Batoe, above Bandar Poeloe, Asahan. 21 II 1927. H. H. Bartlett 6671" (MICH 1578699); "near Kampong Loendoelt (Loendoet Concessiom, Koealoe). 31 III 1927. H. H. Bartlett 7114" (MICH 1578700; US 01394127); **West Sumatra**: "Insula: Sumatra, West Coast. Umbilin. 400 m, terrestrial in shady. 7 XII 1953. J. van Borssum W., 2280" (L.3498170); **South Sumatra**: "Iter Indicum, Sumatra occid. prov. Pakang. 1894. V. F. Schiffner P 271" (L.3498171); "Sumatra, Pahang. 12/02. s. l., s. n" (P01271986).

Distribution. Myanmar, Malaysia (Kelantan, Negri Sembilan, Pahang, Penang, Perak, Selangor, Terengganu); Singapore, Indonesia (West Java, Sumatra, Aceh Province, North Sumatra, West Sumatra, South Sumatra).

Habitat. In lowlands on shaded area in a stream or on limestone rocks, in forest.

Discussion

Selaginella mayeri is widely distributed species in Peninsular Malaysia and Indonesia and characterized by long creeping main stem with short and flabellate lateral branches. Unlike other long creeping species distributed in Indochina Peninsula, such as *S. willdenowii* (Desv. ex Poir.) Baker, *S. helferi* Warb., *S. pseudopaleifera* Hand.-Mazz., and *S. trichoclada* Alston, the axillary and ventral leaves of *S. mayeri* have no auricles at base. It is worth noting that *S. mayeri* can also be confused with *S. siamensis* by growth habit, from the latter different by having ventral leaves ciliolate along the margins (vs. entire), apex of dorsal leaves aristate (vs. acuminate to apiculate). Moreover, *S. mayeri* differs from those species in having ventral leaves slightly angled upward on main stem, and short flabellate lateral branches (with few dichotomies), are less than 10 cm. Morphological comparison of *S. mayeri* and most relevant species of *Selaginella* distributed in Thailand is summarized in Table.

Key for *Selaginella mayeri* and other isophylous species in Thailand

1. Main stems creeping or prostrate, erect, suberect, or ascending with short prostrate basal portion, not curling inward when dry 2

\+ Main stems forming rosettes, curling inward when dry…….. *S. tamariscina*

2. Stems and branches pubescent 3

\+ Stems and branches glabrous 4

3. Dorsal leaves ovate, base obliquely cordate, margin ciliolate, apex aristate; ventral leaves oblong-falcate or falcate, margin ciliolate to denticulate .... *S. biformis*

+ Dorsal leaves elliptic or falcate, base decurrent, margin entire, apex acuminate; ventral leaves oblong-ovate or falcate, margin entire or subentire . ..... *S. pubescens*

4. Main stems erect, suberect, or ascending from decumbent base, with creeping subterranean rhizome and stolons 8

+ Main stems creeping or prostrate (usually less than 1 m) or scandent (up to 1–2 m or longer 5

5. Axillary and ventral leaves with basal auricles 6

+ Axillary and ventral leaves without basal auricles 7

6. Axillary and ventral leaves with large basal auricles. Strobili 5–35 mm, sporophylls ovate, acute or cuspidate at apex ..... *S. willdenowii*

+ Axillary and ventral leaves with small basal auricles. Strobili 5–14 mm, sporophylls ovate-lanceolate, acuminate at apex ..... *S. helferi*

7. Primary leaf branches up to 10 cm long (slightly ascending); dorsal and ventral leaves entire at margin, axillary leaves obovate or orbicular .... ***S. mayeri***

+ Primary leaf branches up to 10 cm long or more (some primary lateral branches developing into long branch systems); dorsal and ventral leaves on main stems ciliolate, on branches entire or subentire (d. l.), entire to ciliolate (v. l.) ..... *S. siamensis*

8. Plants erect. Main stem in upper part dichotomous forked into two branches; ventral leaves oblong subquadrangular to falcate, margin more or less involute; dorsal leaves narrowly ovate, apex acuminate, base rounded or cuneate, margin ciliate ..... *S. ostenfeldii*

+ Plants erect, suberect, or ascending from decumbent base, or creeping. Main stems not dichotomous forked in upper part, branched formed from lower part, or middle to upwards 9

9. Dorsal and ventral leaves glabrous 10

+ Dorsal and ventral leaves on adaxially surface with spinose 17

10. Leaves hyaline at margin 11

+ Margin not hyaline 12

11. Plants up to 16–35(65) cm. Dorsal leaves ovate-triangular or ovate-elliptic, base cuneate, margin denticulate; ventral leaves ovate to triangular, margin hyaline, denticulate; strobili 5–15 mm long ..... *S. involvens*

+ Plants more than 60 cm. Dorsal leaves ovate or elliptic-ovate, base rounded, margin ciliate, with distinct whitish membranous setae, apex acute or aristate; ventral leaves narrowly deltoid, margin hyaline and ciliolate; strobili 2–4 mm long .... *S. argentea*

12. Plants erect, suberect, or ascending 13

+ Plants suberect 16

13. Plants erect, 10–20 cm long, lateral branches many in upper part, close to each other .... *S. griffithii*

+ Plants erect, suberect, or ascending, near to 50 cm or more, lateral branches arranged along main stem from lower part upwards 14

14. Main stems in apical part black when dry .... *S. inaequalifolia*

+ Main stems in apical part not black 15

15. Lateral branches simple or forked, ventral leaves oblong-ovate or oblong, margin entire and denticulate at apex ..... *S. delicatula*

+ Lateral branches simple, ventral leaves oblong-falcate, margin subentire ..... *S. wallichii*

16. Plants suberect, to 25–30 cm or more, stems subdichotomoustly branching; all vegetative leaves denticulate at margin; axillary leaves ovate, obtuse at base; dorsal leaves ovate-oblong, acuminate to aristate (up to ¾ lamina length); ventral leaves oblong-falcate ..... *S. intermedia*

+ Plants suberect, to 10–40 cm high, stems pinnately branching; all vegetative leaves long ciliolate at margin; axillary leaves subcordate at base; dorsal leaves ovate to suborbiculate, aristate at apex (with arista $^{2}/_{3}$ to nearly the same length); ventral leaves with acroscopic base enlarged and broader ... . *S. roxburghii*

17. Main stems suberect or ascending from decumbent base, ventral leaves oblong-falcate, margin subentire or denticulate; dorsal leaves aristate at apex ..... *S. trachyphylla*

+ Main stems prostrate, ventral leaves oblong-ovate, margin dentate to ciliolate; dorsal leaves mucronate at apex ..... *S. strigosa*

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Table

Morphological comparison of *Selaginella helferi*, *S. mayeri*, *S. siamensis*, and *S. willdenowii*

Characters		*S. helferi*	*S. mayeri*	*S. siamensis*	*S. willdenowii*
Habit and size (cm)		terrestrial, evergreen, scandent, 50–200 cm or more	terrestrial, creeping or slightly ascending at lateral branches, 15–100 cm or more	terrestrial, long creeping or ascending from decumbent base or scandent, 20–45 cm	terrestrial, scandent, 100–200 cm or more
Branches system arrangement		pseudopinnate	flabellate	pseudopinnate	pseudopinnate
Length of primary lateral branches (cm)		up to 70	up to 10	up to 20	up to 20(30)
Axillary leaves on main stems	*shape*	orbicular or reniform	obovate or orbicular	oblong-elliptic or oblong-ovate	oblong
Axillary leaves on branches	*shape and size (mm)*	ovate-lanceolate or oblong, 1.4–2.5 × 0.8–1.2	obovate or orbicular, 0.2–3.1 × 0.2–2.7	ovate, 1.3–2.5 × 0.7–1.7	oblong or oblong-elliptic, 1.5–2.4 × 1–1.6
	base	biauriculate (auricles smaller than those of *S. willdenowii*)	cuneate to obtuse (not auriculate)	obtuse or subcordate	biauriculate (auricles larger than those of *S. helferi*)
	apex	acute	acuminate	acute and aristate	acute
	margin	entire	entire	ciliolate	entire
Dorsal leaves	*shape and size (mm)*	falcate, 1.2–2.5 × 0.3–1	ovate-elliptic, 0.9–3.3 × 0.3–1.4	ovate-elliptic or ovate-orbicular, 1.2–1.8 × 0.4–0.8 mm	falcate, 0.9–1.4 × 0.4–0.6
	margin	entire	entire	entire or subentire	entire
	apex	cuspidate	acuminate to apiculate	aristate, parallel to axis, arista ca. 1/3 as long as leaves	obtusely cuspidate
	base of dorsal leaves	oblique	oblique	obliquely subcordate	obliquely subcordate
Ventral leaves	*shape and size (mm)*	oblong-falcate, 2.3–4.2 × 0.9–1.8	oblong-falcate to slightly elliptic, 0.3–4.0 × 0.1–2.1	ovate or oblong-ovate, 1.8–2.6 × 0.8–1.4	oblong-falcate, 2.8–4 × 1–1.5
	margin	entire	entire or subentire	ciliolate	entire
	apex	acute or apiculate	acute or apiculate	acute and aristate	obtuse
Acroscopic margin of ventral leaves	*shape of auricle*	auriculate (with rounded auricle)	not auriculate (oblique to rounded)	not auriculate (rounded, overlapping stem and branches)	auriculate (with rounded auricle)
	margin	entire	entire	entire to ciliolate	entire
Strobili	*size (mm)*	tetragonal, 5–14 × 1.6–3.4	tetragonal, 6–25 × 1–3	tetragonal, 4–10 × 1.2–2.6	tetragonal, 5–35 × 1.8–3.8
Sporophylls	*shape*	ovate-lanceolate (white-margined)	ovate-lanceolate(white-margined)	ovate-triangular	broadly ovate
	margin	entire	entire	minutely ciliolate	entire
	apex	acuminate	acuminate	acuminate	acute or cuspidate

REFERENCES / ЛИТЕРАТУРА

Alston A. H. G. 1934. The Genus *Selaginella* in the Malay Peninsula (with index). *Gard. Bull. Straits Settlem.* 8(1): 41–62.

Alston A. H. G. 1951. Selaginellaceae. In: H. Lecomte (ed.). *Flore generale de I'Indo-Chine*. Paris: Masson. Pp. 555–594.

Rachata P., Boonkerd T. 2001. *Selaginella ciliaris* (Retz.) Spring (Selaginellaceae), a new record for Thailand. *Thai. For. Bull. (Bot.)* 29: 38–39.

Ridley H. N. 1919. The fern-allies and Characeae of the Malay Peninsula. *J. Straits Branch Roy. Asiat. Soc.* 80: 139–164.

Selaginella mayeri Hieron. 2023. In: *GBIF Secretariat* [2022]. *GBIF Backbone Taxonomy*. Checklist dataset https://doi.org/10.15468/dl.3c2fye accessed via GBIF.org URL: https://www.gbif.org/species/7362431 (Accessed 9 March 2023).

Tagawa M., Iwatsuki K. 1979. Selaginellaceae. In: *Flora of Thailand*. Vol. 3(1). Pteridophytes. Bangkok: The TistrPress. Pp. 14–32.

Thiers B. [2023]. *Index herbariorum: a global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. URL: http://sweetgum.nybg.org/science/ih/ (Accessed 9 March 2023).

Wong K. M. 1983. Critical observations on Peninsular Malaysian *Selaginella*. *The Garden's bulletin, Singapore* 35(4): 107–135.

Wong K. M. 2010. Selaginellaceae. In: B. S. Parris, R. Kiew, R. C. K. Chung, L. G. Saw, E. Soepadmo (eds.). *Flora of Peninsular Malaysia*. Series I: Ferns and lycophytes. Vol. 1 (Malayan Forest Records No. 48). Kepong: Forest Research Institute Malaysia. Pp. 50–86.

Zhang X.-C., Nooteboom H. P., Kato M. 2013. Selaginellaceae. In: Z. Y. Wu, P. H. Raven, D. Y. Hong (eds.). *Flora of China*. Vol. 2–3. Beijing: Science Press, St. Louis: Missouri Botanical Garden Press. Pp. 37–66.

Zhang X.-C., Tan C. B. 2013. Two new records of *Selaginella* from Malaysia. *Guihaia* 33(5): 588–590. DOI: 10.3969/j.issn.1000-3142.2013.05.002