臺灣新紀錄卷柏科植物—白毛卷柏

Selaginella albociliata P.S. Wang, a newly recorded species of Selaginellaceae from Taiwan

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摘要

本文報導一臺灣新紀錄之卷柏科卷柏屬植物 — 白毛卷柏 (*Selaginella albociliata* P. S. Wang)。內文記述該新紀錄種之形態特徵、地理分布範圍、棲地特性及分類註記等資訊，並提供其照片及臺產卷柏屬植物之檢索表為參。

關鍵詞：新紀錄種、卷柏科、卷柏屬、白毛卷柏、臺灣

Abstract

This paper reports a new record of a Selaginellaceae species in Taiwan, *Selaginella albociliata* P. S. Wang. The text describes the morphological characteristics, geographical distribution, habitat preferences, and taxonomic notes of this newly recorded species. Additionally, photographs and a key to the *Selaginella* species in Taiwan are provided for reference.

Key words: New record species, Selaginellaceae, *Selaginella*, *Selaginella albociliata*, Taiwan

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緒言

卷柏科 (Selaginellaceae) 植物為常綠或夏綠型的中小型草本植物，生態習性以土生或石生為主，鮮有著生者；在分類系統方面，隸屬於維管束植物 (Tracheophyta) 下的石松門 (Lycopodiophyta) 石松綱 (Lycopodiopsida) 卷柏目 (Selaginellales)，並與石松科 (Lycopodiaceae) 及水韭科 (Isoetaceae) 合稱為石松類植物 (lycophytes)。石松類植物和蕨類植物 (monilophytes；又稱鏈束植物)，是維管束植物中唯二以孢子為繁殖主體的類群。

卷柏科植物有別於其它石松類植物之最大辨識特徵，在於其植物體中、末段分枝之正面 (或可稱上表面) 通常具 4 行小葉 (microphylls；特指石松類植物的葉片，葉形小，僅具 1 條主脈，無葉隙)，且孢子有大、小之分。根據 1975 年臺灣植物誌第一卷的記載，臺灣原產的卷柏科植物計 14 種 (DeVol 1975)，外加後來報導的歸化種翠雲草 (又名藍地柏；*Selaginella uncinata* (Desv. ex Poir.) Spring) (DeVol and Kuo 1979)，共計 15 種。然而，隨著時序的推進，新物種的發現是必然的；依據 TPG (2019) 及其後續持續更新的資料，臺產的卷柏科植物已增加為 19 種 (TPG 2019)。

本文作者群在花蓮縣玉里鎮赤柯山區進行植物資源調查時，發現一種近似於 2009 年報導之臺灣新紀錄種琉球卷柏 (*Selaginella lutchuensis* Koidz.) 的植物 (Chang *et al.* 2009)，主要區別點在於其小葉邊緣，特別是中葉，具有細長的白色緣毛，明顯異於琉球卷柏。在檢視鄰近區域的卷柏科分類之相關文獻 (Alston 1935, Wang 1990, Chang *et al.* 2012, Tan 2013, Zhang *et al.* 2013, Ebihara 2016, Shalimov *et al.* 2019) 及標本 (HAST, PE, TAI, TAIF, TNM) 後，確認赤柯山所採集到的卷柏屬物種，為臺灣新紀錄種 — 白毛卷柏 (*Selaginella albociliata* P.S. Wang) (圖 1)。本文除了根據文獻、標本及野外調查資訊，報導該種之命名、形態特徵、分布範圍、生態特性等背景資料，也依據「國際自然與自然資源保育聯盟」(International Union for Conservation of Nature and Natural

Resources) 之紅色名錄類別及評估標準 (IUCN Standards and Petitions Committee 2024)，提出該種之瀕危等級建議。此外，本文也提供其彩色照片，以及含括臺灣地區所有卷柏屬植物之修正檢索表，供學界參考。

分類處理

卷柏科 SELAGINELLACEAE

Selaginella albociliata P.S. Wang, J. Arnold Arbor. 71(2): 269. 1990. 白毛卷柏 (圖 1)

模式資訊 (typus)：*P.S. Wang 77981*, 20 May 1988,CHINA, Guizhou, Libo County, on limestone surface along the Wujia River, alt. 530 m; holotype: HGAS. *P.S. Wang 76801*, CHINA, Guizhou, Libo County, on wet rock surface in forest, alt. 660 m; paratype: CDBI, HGAS, PE(PE 00405375! & PE00405377!).

形態特徵 (morphology)：

常綠草本，多岩生，常見平鋪匍伏於岩石或附近之土坡上。植物 5–12 cm 長；主莖匍匐狀，圓柱體形，連同營養葉 (小葉) 之寬幅約 3 mm，常分支，並於不定距離處發根，多與其餘個體植株群集成綠色團墊。營養葉呈二形；腹葉於莖體腹面處完整可見 (側葉；於植株背面處無法見得葉基)，為卵狀橢圓形至卵狀披針形，1.5–2 mm × 0.6–1.2 mm，兩側幾乎對稱，基部圓形，頂端 (末端) 鈍尖或細尖，邊緣則有白邊 (軟骨質邊)，且長緣毛多數，緣毛長 0.05–0.1 mm；背葉於莖體背面完整可見 (中葉；於植株腹面處幾乎不可見或僅得見其葉尖處)，呈圓形至卵圓形，形體明顯小於腹葉，0.4–1.5 mm × 0.4–0.8 mm，與上下相鄰之背葉略有間隔 (間生)，彼此鮮少接觸，葉基圓形，葉頂端則常驟尖 (具長尾尖)，偶見鈍尖，葉緣有白邊，且長緣毛多數，緣毛長 0.05–0.1 mm。孢子囊穗位於莖體頂端，通常單一，結構緊密，6–12 mm × 2–2.5 mm，具背腹性。孢子葉亦二形，其背、腹葉之生長與營養葉相較呈轉置 (倒置) 狀態，葉緣亦具白邊；背葉較大，橢圓狀披針形，2–2.5 mm × 0.6–0.8 mm，葉緣毛短，長約 0.05 mm，然偶

見長毛 (可達 0.1 mm)，葉頂端漸尖；腹葉者較小，橢圓狀卵形，1.8–2 mm × 0.6–0.8 mm，葉片中央明顯具隆線，葉緣具長毛。孢子囊二形，大、小孢子囊生於孢子葉葉腋內的短梗上；小孢子橘紅色，大孢子灰白色。

Evergreen herb, predominantly epilithic, sprawling prostrate on rocks or nearby soil slopes. Plants 5–12 cm long; main stems creeping, terete, ca. 3 mm broad including vegetative leaves (microphylls, lycophylls), often branched, usually forming mats, rooting (bearing rhizophores) at intervals throughout. Vegetative leaves dimorphous; ventral leaves (lateral leaves) ovate-oblong to ovate-lanceolate, 1.5–2 mm × 0.6–1.2 mm, almost symmetrical, round at base, acute or apiculate at apex, margin white (cartilaginous) and with numerous long cilia, cilia 0.05–0.1 mm long; dorsal leaves (median leaves) round to ovate, apparently smaller than ventral ones, 0.4–1.5 mm × 0.4–0.8 mm, not approximate, round at base, cuspidate or sometimes acute at apex, margin white and with numerous long cilia, cilia 0.05–0.1 mm long. Strobili 6–12 mm × 2–2.5 mm, dorsiventral, compact, terminal, usually solitary. Sporophylls dimorphic, resupinate, white-margined; dorsal (upper) sporophylls oblong-lanceolate, 2–2.5 mm × 0.6–0.8 mm, margin usually short ciliolate, cilia ca. 0.05 mm long. but long hairs (up to 0.1 mm) are occasionally present, apex acuminate; ventral (lower) sporophylls oblong-ovate, 1.8–2 mm × 0.6–0.8 mm, apparently carinate, margin long ciliolate. Sporangia heterosporous; microsporangia and megasporangia occurring on short stalks in the axils of ligulate sporophylls; microspores tangerine, megaspores grayish white.

分布範圍：中國大陸 (廣西、貴州) 及臺灣 (花蓮)。

Distribution: Mainland China (Guangxi, Guizhou), and Taiwan (Hualien).

棲地環境：在臺灣，主要生長於

林緣近溪流處之石灰質岩塊或鄰近土坡上，海拔約 600–800 m。

Habitat: In Taiwan, the species primarily grow on calcareous rocks or nearby soil slopes near streams at the forest edge, at elevations of approximately 600–800 m.

引證標本 (specimen cited): TAIWAN. Hualien County, Yuli Township, Chike Mountain (or Jinzhen Mountain), alt. 800 m, *P.F. Lu31816*, 1 Mar. 2019, TAIF.

保育等級評估：有關本種在臺灣的分布情形，目前僅知花蓮縣境內一處分布地，且於該區域內只有數個亞族群。考量花東縱谷兩側山脈範圍仍有許多地方鮮為人至，本種之真實分布狀況及族群數量仍然不明，因此本文作者群依據 IUCN Standards and Petitions Committee (2024) 的評估標準，建議本種之紅色名錄類別為「資料缺乏 (DD)」。

Conservation status: Currently, only one distribution site is known in Taiwan, with a small number of subpopulations in that area. However, the actual population size remains uncertain due to considering the region (East Longitudinal Valley), and many areas are rarely visited by people. Therefore, we recommend the category of Data Deficient (DD) is appropriate for *Selaginella albociliata* (IUCN 2024).

分類註記：白毛卷柏之外觀形態及棲地偏好與琉球卷柏十分類似，若非仔細觀察細部特徵，很難區辨。目前琉球卷柏在臺灣的分布地點，以東部及東南部 (含離島) 之近海淺山為主，概有花蓮縣豐濱鄉及臺東縣成功鎮、長濱鄉、蘭嶼鄉等境內 6 個地點，合理推測未來會有更多的族群被發現。本種與琉球卷柏的小葉葉緣，其實都可發現長 0.05–0.1 mm 之長毛，區別在於本種出現頻度高，尤其是營養葉之背葉，其長毛明顯且穩定呈現；反觀琉球卷柏，其長毛係偶爾出現，且數量稀少。以 Chang *et al.* 2012 所載之檢索表為基礎，新修訂之臺灣產卷柏屬植物物種檢索表刊載如後。

Taxonomic note: The morphology

and habitat preference of *Selaginella albociliata* are very similar to those of *S. lutchuensis*, so it is difficult to distinguish them without careful observation of the detailed features. Currently, the distribution of *S. lutchuensis* in Taiwan is primarily in the low coastal mountains of the eastern and southeastern regions (including offshore islands), with six known locations in Fengbin Township of Hualien County, Chenggong Township, Changbin Township, and Lanyu Township of Taitung County. It is reasonable to speculate that more populations will be discovered in the future. Both *S. albociliata* and *S. lutchuensis* have long hairs measuring 0.05–0.1 mm on the margins of their microphylls. However, the frequency of these long hairs is higher in *S. albociliata*, particularly on vegetative dorsal leaves, where they are prominent and consistently present. In contrast, *S. lutchuensis* exhibits these long hairs only occasionally and in sparse numbers. Based on the key reported by Chang *et al*. in 2012, the newly emended key to the species of *Selaginella* in Taiwan is provided as follows.

臺灣產卷柏屬植物物種檢索表 (Key to species of *Selaginella* in Taiwan) :

1. Stems and roots entangled forming treelike trunk..... .....***S. tamariscina*** 萬年松
1. Stems creeping, prostrate, ascending, or caulescent…..... 2
2. Stems caulescent; trophophylls on the basal part of erect stems monomorphic.....3
2. Stems creeping, prostrate, ascending, or caulescent; trophophylls dimorphic, or subdimorphic on the basal part of erect stems if plants caulescent ….....5
3. Trophophylls peltately attached on the basal part of erect stems …..... .....***S. stauntoniana*** 擬密葉卷柏
3. Trophophylls basally attached on the

basal part of erect stems ….....4

4. Leaves on main stems approximate; main stems circular in cross-section; dorsal trophophylls with two longitudinal grooves, and usually acuminate at apex; both dorsal and ventral trophophylls not white-margined .....***S. involvens*** 密葉卷柏

4. Leaves on main stems distant; main stems with distinct keels in cross-section; dorsal trophophylls with only one longitudinal groove, and usually long-tailed at apex; both dorsal and ventral trophophylls white-margined ….....***S. moellendorffii*** 異葉卷柏

5. Stems caulescent or nearly so (with short prostrate basal portion) ….....6

5. Stems creeping, prostrate, or ascending, but not caulescent.....7

6. Margins of all trophophylls loosely serrulate; strobili complanate ....***S. labordei*** 玉山卷柏

6. Margins of all trophophylls entire; strobili tetragonal …..... ..... ***S. delicatula*** 全緣卷柏

7. Sporophylls laxly arranged, hence forming unobvious strobili….....8

7. Sporophylls compactly arranged, hence forming distinct strobili ….....9

8. Margins of both trophophylls and sporophylls loosely serrulate..... .....***S. nipponica*** 日本卷柏

8. Margins of both trophophylls and sporophylls loosely laciniate ……. .....***S. helvetica*** **subsp.** ***pseudonipponica*** 擬日本卷柏

9. Strobili tetragonal, sporophylls monomorphic ….....10

9. Strobili complanate, sporophylls dimorphic.....14

10. Stems always creeping.....11

10. Stems creeping at basal to middle portions, but ascending at middle to distal portion.....12

11. Margins of both trophophylls and sporophylls distinctly white cartilaginous, usually iridescent, entire, but sometimes very minutely serrulate at apex ....***S. uncinata*** 翠雲草

11. Margins of both trophophylls and sporophylls not cartilaginous, not iridescent, usually loosely serrulate, sometimes entire…..
.....***S. remotifolia*** 疏葉卷柏
12. Margins of trophophylls minutely serrulate at apical half part, but fimbriate at basal half part; strobili loosely tetragonal ……
.....***S. repanda*** 高雄卷柏
12. Margins of trophophylls loosely and minutely serrulate; strobili strictly tetragonal 13
13. Upper surface of ventral trophophylls smooth ….....***S. doederleinii*** **subsp.** ***doederleinii*** 生根卷柏
13. Upper surface of ventral trophophylls muricate ……***S. doederleinii*** **subsp.** ***trachyphylla*** 粗葉卷柏
14. Apices of dorsal trophophylls rounded to acuminate.....15
14. Apices of dorsal trophophylls apparently aristate to caudate.....18
15. Apices of dorsal trophophylls rounded to obtuse, occasionally acute; margins of all trophophylls minutely serrulate ……
……***S. devolii*** 棣氏卷柏
15. Apices of dorsal trophophylls apparently acuminate to attenuate…
.....16
16. Margins of both trophophylls and sporophylls loosely laciniate at basal half part and often with few cilia; dorsal trophophylls without white cartilaginous margin ……
……***S. ciliaris*** 緣毛卷柏
16. Margins of both trophophylls and sporophylls subentire to minutely serrulate, but never laciniate and without cilia 17
17. Stems 4.5–9.0 mm wide (including leaves); axillary trophophylls ovate to narrowly triangular at creeping branches….
.....***S. boninensis*** 小笠原卷柏
17. Stems 3.5–6.5 mm wide (including leaves); axillary trophophylls lanceolate to broadly lanceolate at creeping branches….

.....***S. heterostachys*** 姬卷柏

18. Plants mostly ascending; apex of ventral trophophylls obtuse to acute; margins of both ventral trophophylls and sporophylls without cilia .....***S. aristata*** 膜葉卷柏

18. Plants usually creeping and repeatedly branching, and hence forming a dense mat; margins of both ventral trophophylls and sporophylls usually with cilia.....19

19. Dorsal trophophylls denticulate at margin, occasionally bearing 1–2 long cilia at basal part ....***S. lutchuensis*** 琉球卷柏

19. Dorsal trophophylls apparently ciliolate at margin ....***S. albociliata*** 白毛卷柏

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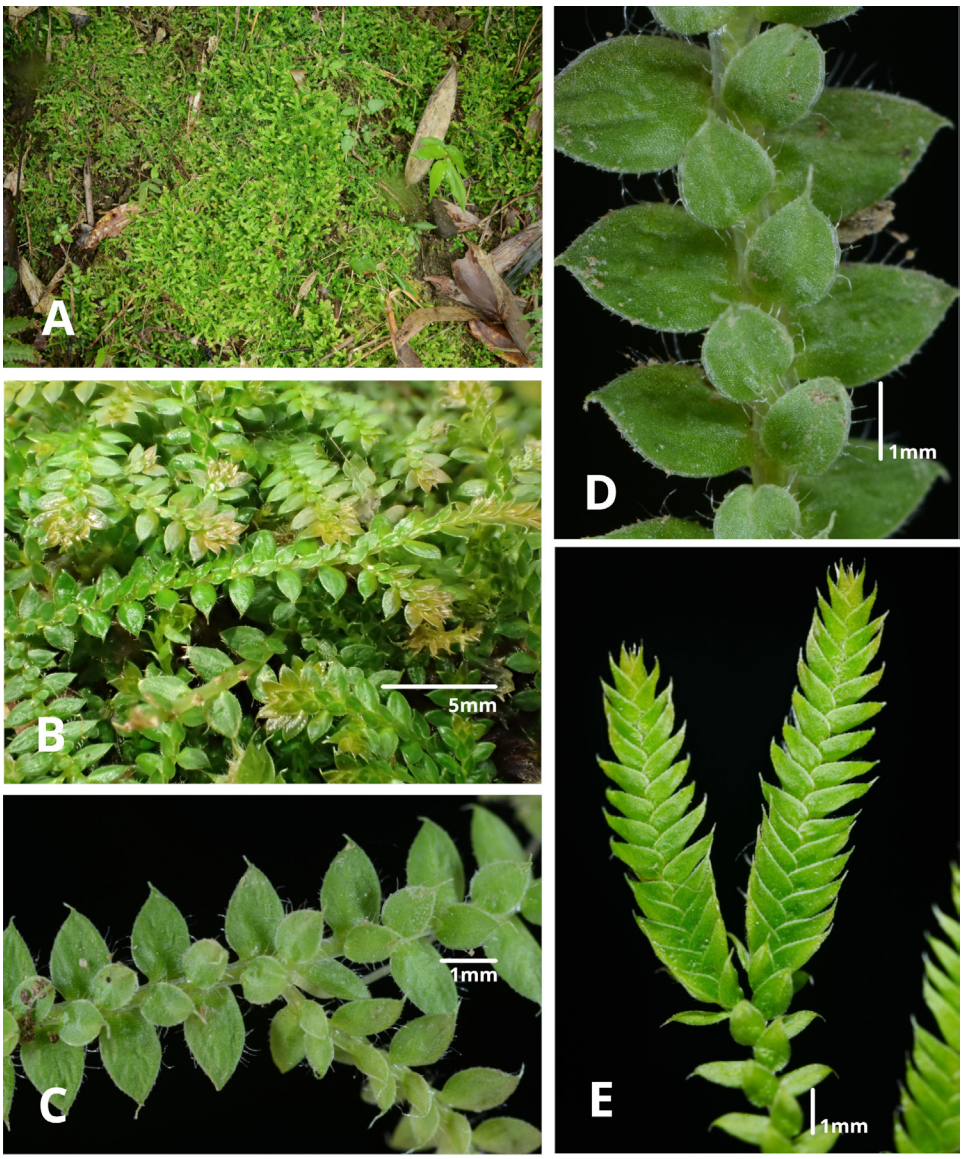

圖 1 白毛卷柏之生育地及外部形態。A. 生育地及棲生於上之白毛卷柏族群。B. 植株近照，莖體常分叉。C 及 D. 植株上表面 (背面) 近照；側葉較大，自莖部下表面 (腹面) 橫生而出；中葉較小，生自莖部之上表面，其葉片頂端驟出之尾尖及葉緣之長毛相當明顯。E. 孢子囊穗；側葉在營養莖及孢子囊穗之主軸上的生長位置明顯不同，轉置現象清楚可見。

Fig. 1 Habitat and external morphology of *Selaginella albociliata*. A. Habitat and population of *S. albociliata* thriving on it. B. Close-up of the plant, showing frequently branching stems. C & D. Close-up of the dorsal surface of the plant; the larger lateral leaves (ventral leaves) extend horizontally from the ventral side of the stem, while the smaller median leaves (dorsal leaves) arise from the dorsal side. The abruptly pointed tips of the median leaves and the prominent long hairs on the leaf margins are clearly visible. E. Strobili (cones); the growth position of the lateral leaves on the vegetative stem and the main axis of the strobili are completely opposite, with the phenomenon of resupination clearly visible.

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