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運用背景資料取樣策略增進物種分布模型的預測效能

Improving the predictive performance of species distribution models using background data sampling strategies

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摘要

物種分布模型中，最大熵 (maximum entropy, MaxEnt) 的效能高度依賴輸入數據的質量，特別是物種出現紀錄的代表性，然而，實際研究中常因取樣偏差導致模型準確性和泛化能力下降。由於背景資料的選擇對於校正取樣偏差至關重要，本研究旨在比較不同背景資料取樣方法對 MaxEnt 模型性能的影響，並以

臺灣特有且易危的霧社櫻 (*Prunus taiwaniana*) 為研究對象，探討其分布預測的最佳策略。總共比較了五種背景資料取樣方法，包括目標群體密度、目標種密度、隨機取樣、受限距離及最小多邊範圍。結果顯示，目標群體密度和目標種密度方法表現佳，其 Boyce 指數都達到 0.9 以上，表示這兩種方法能有效校正取樣偏差並捕捉廣泛的環境條件。此外，從最佳模型的預測結果可知，霧社櫻偏好寒冷環境，並對特定的降水量與晝夜溫差等氣候條件具有高度敏感性，其高適宜棲地主要集中在臺灣中北部的中海拔山區。本研究強調合理選擇背景資料取樣策略的重要性，特別是對於稀有或受脅物種，適當的取樣方法不僅能顯著提升模型的準確性，還能為保育工作提供重要的科學依據。

關鍵詞：最大熵、取樣偏差、霧社櫻、目標群體密度、保育

Abstract

In species distribution models, the performance of maximum entropy (MaxEnt) highly depends on the quality of the input data, particularly the representativeness of species occurrence records. However, sampling bias in practical studies often leads to reduced model accuracy and generalization capabilities. Because the choice of background data is crucial for correcting sampling bias, this study aimed to compare the effects of different background data sampling methods on MaxEnt model performance, using the endemic and vulnerable plant species (*Prunus taiwaniana*) as the research subject to explore the best strategy for predicting its distribution. Five background data sampling methods were compared: target group density, target species density, random sampling, constrained distance, and minimum convex polygon. The results showed that target group density and target species density performed well, with Boyce index values exceeding 0.9, indicating that these two

methods effectively correct sampling bias and capture a wide range of environmental conditions. Furthermore, predictions from the best-performing model revealed that *P. taiwaniana* prefers cold environments and exhibits high sensitivity to specific climatic conditions, such as precipitation levels and diurnal temperature variation. The most suitable habitats are primarily concentrated in the mid-elevation mountainous regions of central and northern Taiwan. This study emphasizes the importance of selecting appropriate background data sampling strategies, particularly for rare or threatened species. Proper sampling methods not only significantly improve model accuracy but also provide crucial scientific support for conservation efforts.

Key words: maximum entropy, sampling bias, *Prunus taiwaniana*, target group density, conservation.

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緒言

物種分布模型 (species distribution models, SDMs) 是生態學和生物地理學中用於預測物種潛在分布範圍的重要工具，這些模型利用環境資料與物種出現紀錄，建構物種與棲息環境之間的複雜關係，並為生物多樣性推估、保護區規劃、入侵物種管理及氣候變遷影響等應用提供科學依據 (Araújo *et al*. 2019；Velazco *et al*. 2020；Franklin 2023；Lu and Huang 2023)。SDM 的類型繁多，其中，最大熵 (maximum entropy, MaxEnt) 是一種基於機器學習的演算法，因其具備高效和穩定性，尤其適合處理小樣本數據，成為目前使用最廣泛的工具之一 (Morales *et al*. 2017)。MaxEnt 的核心理論源自資訊理論中的 Shannon 資訊熵 (Shannon 1948)，其基本假設是物種的分布應滿足對環境條件的最大化利用，同時最小化分布的不確定性。具體來說，MaxEnt 利用物種出現紀錄所在的環境條件，以及與研究區內所有可能環境條件 (由背景資料定義) 之間的相似性，推導出最大化棲地適宜性的分布模型，從而生成最接近真實分布的預測結果 (Phillips *et al*. 2006)。

MaxEnt 的效能高度依賴於輸入數據的質量，特別是物種出現紀錄的代表性。在實際研究中，物種出現數據往往受到取樣偏差的影響，即可能過度集中在易於到達的地區，如道路或城市附近，忽略了偏遠或難以抵達的區域 (Kadmon *et al*. 2004)，這種偏差會導致模型對某些環境條件的過度擬合，從而降低預測的準確度和泛化力 (Phillips *et al*. 2009；Kramer-Schadt *et al*. 2013)。為減少取樣偏差對模型的影響，背景資料 (background data) 的選擇變得至關重要。在 MaxEnt 模型中，背景資料被用來定義研究區內所有可能的環境條件，從而構建一個環境空間的參照框架 (Phillips and Dudík 2008)，幫助區分目標物種的實際分布與隨機環境條件下的分布型態，故背景資料的合理選擇可以確保模型涵蓋更廣泛的環境條件，而不僅僅局限於物種出現點附近的環境特徵。

背景點的取樣方式本身也可能引入新的偏差，例如，背景資料過於集中在某些特定環境條件下，可能會進一步放大抽樣偏差的影響，導致模型低估或高估物種對某些環境因子的偏好 (Barbet-Massin *et al*. 2012)。因此，如何設計合理的背景資料取樣策略，以平衡取樣偏差和環境異質性，成為提升 SDM 預測效能的關鍵挑戰之一。目前已有許多背景資料取樣方法被提出，如目標種密度、目標群體密度、受限距離及最小多邊範圍等 (Barber *et al*. 2022；Ahmadi *et al*. 2023；Sorbe *et al*. 2023；Schartel and Cao 2024)，每種方法都有其獨特的優勢和局限性，但至今尚無一種普遍適用的最佳背景點取樣策略。因此，比較不同背景資料取樣方法對模型性能的影響，對於提升 MaxEnt 模型的預測能力具有重要意義。

霧社櫻 (*Prunus taiwaniana*) 為一種臺灣特有的植物物種，主要分布在中北部中海拔山區，被收錄於國際自然保育聯盟瀕危物種紅色名錄，並被評定為易危等級。本研究以霧社櫻為研究對象，探討不同背景資料取樣方法對 MaxEnt 模型性能與分布預測結果的影響，旨在尋找最適合該物種分布預測的背景資料取樣策略。目前國內針對此議題的研究相對較少，因此，本研究不僅有助於提升 MaxEnt 模型在特有物種分布預測中的應用效能，還能為其他類似物種的保育工作提供重要的科學依據。

材料與方法

一、物種出現紀錄與環境資料

本研究區範圍為臺灣本島，物種調查資料是來自全球生物多樣性資訊機構 (global biodiversity information facility, GBIF)，為與環境資料的時間間隔匹配，抽取 1993–2022 年間，霧社櫻的物種出現紀錄，共取得 69 筆，座標格式為經緯度，考量到地理座標的精確度，先刪除小數點不足 3 位的紀錄。由於蒐集方法多樣且非系統化，紀錄中可能存在空間偏差。為解決因調查點過於密集而可能產生的空間自相關

性問題，隨機選擇一個起始觀察點，並將其相鄰 1 km (符合預測變項之空間解析力) 的點移除，然後對剩餘的點重複此過程，使點的分布更加均勻，最終留下 44 個點做為建模的樣本 (圖 1)。

建模所使用之預測變項僅包含氣候、地形和土地覆蓋等 3 大類，氣候資料是從臺灣氣候變遷推估資訊與調適知識平台取得，本研究從平台上提取 1993–2022 年的溫度與降水量資料，進一步參考 Hijmans *et al*. (2005) 的計

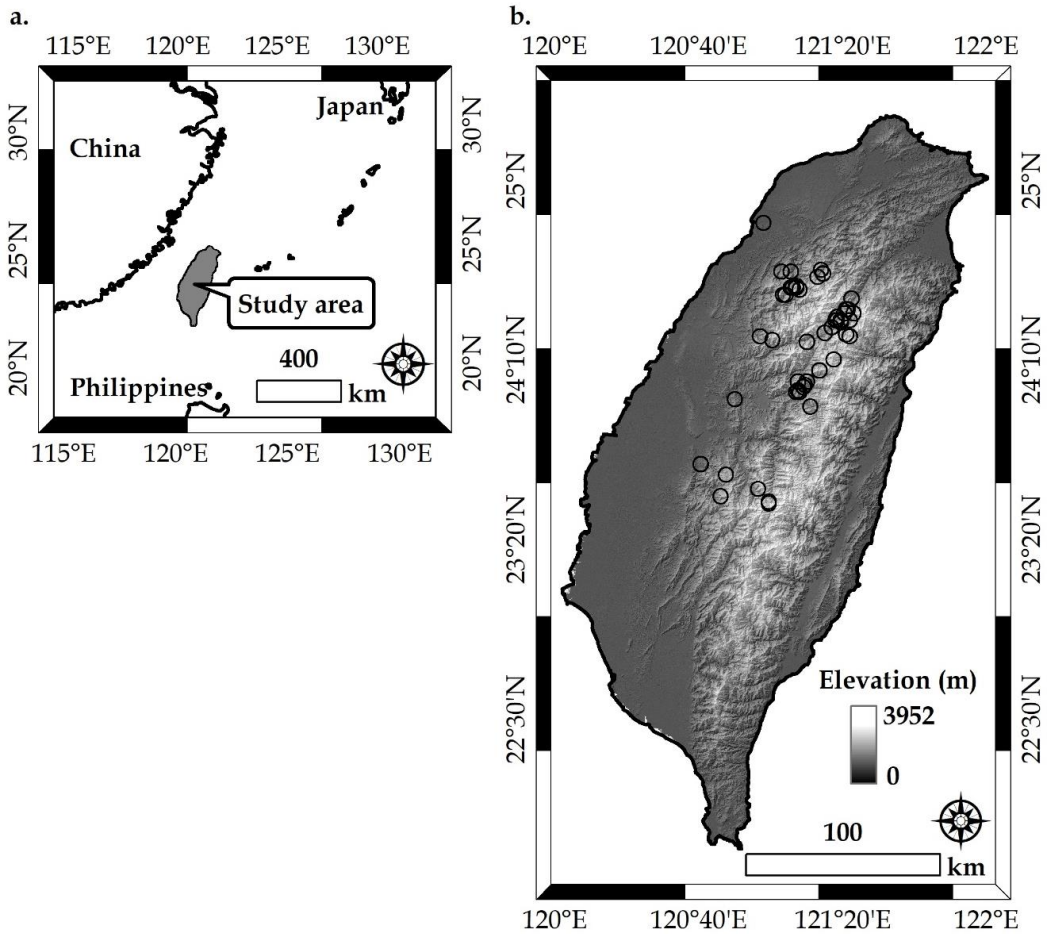

圖 1 (a) 研究區地理位置圖；(b) 物種出現點 (黑色標記；n = 44) 及數值高程模型 (digital elevation model)。

Fig. 1 (a) Geographical location of the study area; (b) Species occurrence records (black circle; n = 44) and digital elevation model.

算方法，產製 19 個空間解析力為 1 × 1 km的生物氣候變項 (BIO1-BIO19)，其源自每月的溫度 (℃) 和降水量 (mm)，包括年度趨勢、季節性變化及極端氣象特徵 (worldclim.org/data/bioclim.html)。地形方面，從內政部取得數值高程模型 (空間解析力為 20 m)，進一步利用 ArcGIS 10.6 軟體製作坡度與坡向，並將解析力重取樣為 1 × 1 km。土地覆蓋是取自 Zhang *et al*. (2023) 所建構的 2020 年全球土地覆蓋圖，包含森林、草地、農地、都市、荒地與水體等 6 種類型 (1 × 1 km 空間解析力)。總計共有 23 個預測變項 (附表 1)，為克服變項在統計上的多重共線性問題，以 R 軟件包「virtual species」執行 Pearson 相關分析 (Leroy *et al*. 2016)，排除相關性高的變項，當相關係數大於 0.7 以上時擇一保留 (Dormann *et al*. 2013)。

二、模型建構

利用 Phillips *et al*. (2006) 所開發的 MaxEnt 3.4.3k 建構 SDM，由於本研究透過不同的偏差校正方法進行比較，因此，所有的超參數皆使用軟體的預設值，以減少人為調整對模型性能的潛在影響，從而更客觀地比較不同背景取樣方法的效能。將各霧社櫻出現的紀錄逢機選取 80% 做為訓練資料集，過程中使用 k 折交叉驗證法 (k-fold cross-validation) 確保模型的穩定性，重複進行 10 次 (10 折)，並取平均得到最後結果。MaxEnt 會產生值域介於 0–1 的概率圖，概率愈大者愈有可能是物種適宜的棲地，故可表示棲地適宜性。另一方面，剩餘 20% 的紀錄不參與訓練，做為測試資料集，用於評估模型。評估方法為 Boyce 指數 (Boyce index, BI) 和接受者操作特徵 (receiver operating characteristic) 所產生之曲線面積 (area under the curve, AUC)。BI 的計算使用 R 軟件包「ecospat」(Di Cola *et al*. 2017)，其為一種專門用於評估僅有物種出現紀錄模型的指標，透過比較 MaxEnt 輸出的概率與物種出現紀錄的關係來計算，值域介於 -1 到 1 之間，正值表示模型表現良好，0 表示模型與隨機預測無異，負值則表明

模型表現不佳 (Boyce *et al*. 2002)。AUC 則為 MaxEnt 內建產生，其值域介於 0.5–1，當值愈高代表模式推估出來的準確性愈佳。此外，模型解釋力可參考 MaxEnt 額外產生的變項置換重要性與反應曲線等訊息。

三、背景資料取樣

取樣方式包括隨機、目標種密度、目標群體密度、受限距離及最小多邊範圍等共計 5 種 (圖 2)，所有方法均產生 10000 個背景點 (MaxEnt 的預設值)，由於各種方法的取樣邏輯和空間分布的先驗假設截然不同。具體方法分述如下：

(一) 隨機取樣

本法為最傳統且最簡單的方法，即直接從研究區域內，以完全隨機的方式取樣。此法假設物種的取樣過程在區內是均勻的，不對任何環境條件或地理位置進行預設偏好，確保客觀性和可重複性 (圖 2a)。

(二) 目標種密度

本法旨在校正物種出現點的空間聚集偏差，依循Elith *et al*. (2010) 的方法。首先，基於霧社櫻的訓練樣本，利用 ArcGIS 的核密度分析 (kernel density) 工具，推導表示「出現點密度」的空間圖層，該圖層的值越高，代表該區域的出現點越密集，並將網格值由小到大劃分成 20 個等距類別。隨後，以此密度圖層作為取樣的權重，利用 R 軟件包「terra」進行加權隨機取樣，在出現點密集的區域 (高密度)，被選為背景資料的機率也較高；反觀，在出現點稀疏的區域 (低密度)，被選中的機率較低 (圖 2b)。

(三) 目標群體密度

目標群體密度取樣法是上述目標種密度的擴展，旨在利用近緣物種的出現紀錄來定義一個更廣泛的生態相關環境，即假設梅屬 (*Prunus*) 物種的整體分布型，與霧社櫻具有相似生態需求的環境。與目標種密度不同，該法的密度分析基礎是從 GBIF 下載梅屬所有物種的出現紀錄，做為目標群體。接著，推導梅屬物種的核密度圖

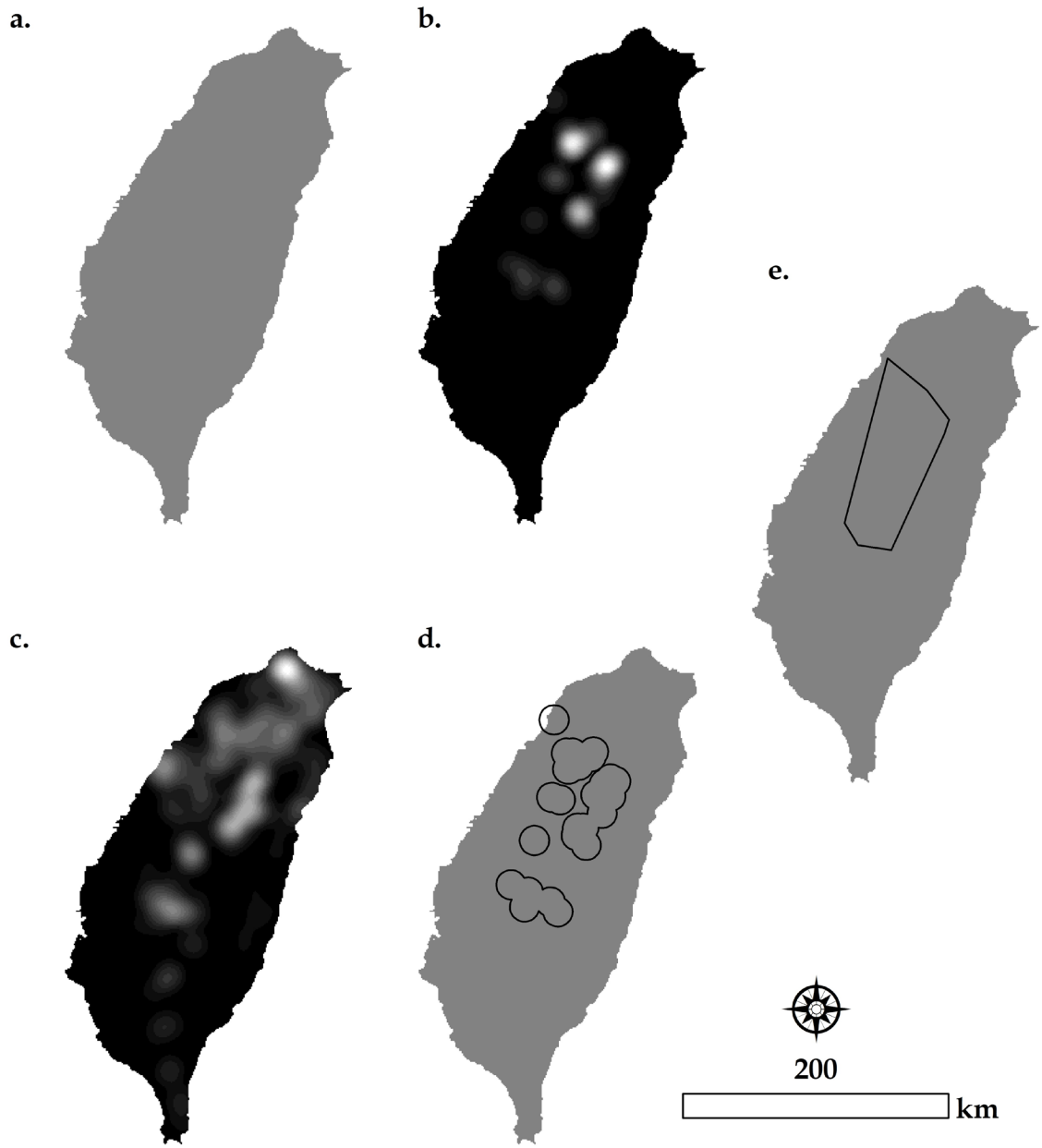

圖 2 不同背景資料的取樣方法，(a) 隨機取樣，(b) 目標種密度，(c) 目標群體密度，(d) 受限距離，(e) 最小多邊範圍。(b) 和 (c) 愈白處代表取樣強度愈高。

Fig. 2 Different background data sampling methods: (a) Random sampling, (b) Target species density, (c) Target group density, (d) Constrained distance and (e) Minimum convex polygon. (b) and (c): Whiter areas represent higher sampling intensity than other sampling sites.

層，再以此圖層作為權重，依循目標種密度的方法進行加權隨機取樣 (圖 2c)。

(四) 受限距離

本法將背景資料的取樣範圍限制在物種出現點的鄰近區域內，以避免涵蓋過多生態上不適宜的環境。具體而言，以每個用於訓練的霧社櫻出現點為圓心，畫出半徑為 10 km 的圓形緩衝區。所有背景資料的候選範圍被限定在這些緩衝區內，再進行完全隨機取樣。該法假設物種的潛在分布不會過度偏離其已知的出現地點 (圖 2d)。

(五) 最小多邊範圍

本法定義了一個由所有出現點所包圍的最小凸多邊形區域。首先，繪製霧社櫻訓練樣本的凸包 (convex hull)，形成一個涵蓋所有出現點的最小多邊形。所有背景資料的候選範圍被限定在此凸包範圍內，再進行完全隨機抽樣。該法假設物種的潛在分布不會超出其已知出現點所構成的最外圍邊界 (圖 2e)。

結果

各種背景資料取樣方法產生的模型，依據 BI 與 AUC 評估的結果顯示

表 1 不同樣本偏差校正方法的模型表現

Table 1 Model performance with different sample bias correction methods

Method	BI	AUC
Target group density	0.92	0.93
Target species density	0.91	0.91
Random sampling	0.89	0.91
Constrained distance	0.71	0.78
Minimum convex polygon	0.20	0.55

BI = Boyce index

AUC = Area under the receiver operating characteristic curve

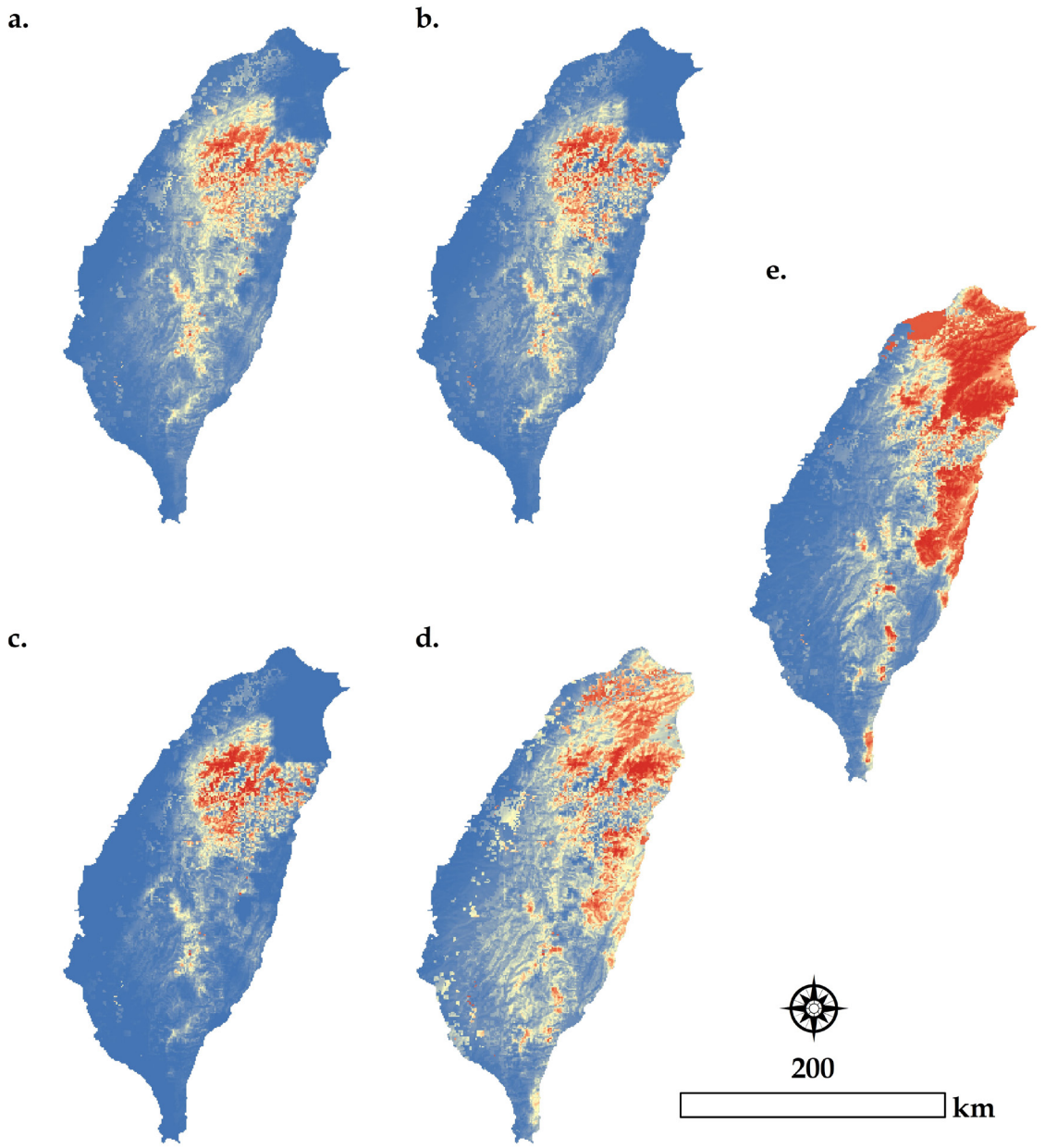

圖 3 不同背景資料取樣方法下霧社櫻 (*Prunus taiwaniana*) 的棲地適宜性預測結果，(a) 目標群體密度，(b) 目標種密度，(c) 隨機取樣，(d) 受限距離，(e) 最小多邊範圍。高適宜偏紅色，低適宜性偏藍色。

Fig. 3 Predicted habitat suitability for *Prunus taiwaniana* under different background data sampling methods: (a) target group density, (b) target species density, (c) random sampling, (d) constrained distance, and (e) minimum convex polygon. Higher and lower suitability is represented in red and blue, respectively.

(表 1)，不同取樣方法對模型預測能力有顯著差異，其中目標群體密度的效果最佳 (BI = 0.92；AUC = 0.93)，其次為目標種密度 (BI = 0.91；AUC = 0.91)，接續為隨機取樣 (BI = 0.89；AUC = 0.91)，而受限距離 (BI = 0.71；AUC = 0.78) 與最小多邊範圍的效果較不理想 (BI = 0.20；AUC = 0.55)。

從預測出的概率圖來看，目標群體、目標種密度與隨機取樣的空間分布型態較相似 (圖 3a、b 及 c)，高適宜性區域主要集中在臺灣中北部的中海拔山區，這與霧社櫻的實際分布範圍趨同，但隨機取樣與其他兩種方法仍有差異，隨機取樣的預測結果略顯集中，空間細緻度較低，導致高適宜性的分布稍窄。受限距離與最小多邊範圍都局限了背景資料範圍，似乎無法涵蓋足夠的環境異質性，導致預測結果嚴重偏離實際情況 (圖 3d 和 e)。

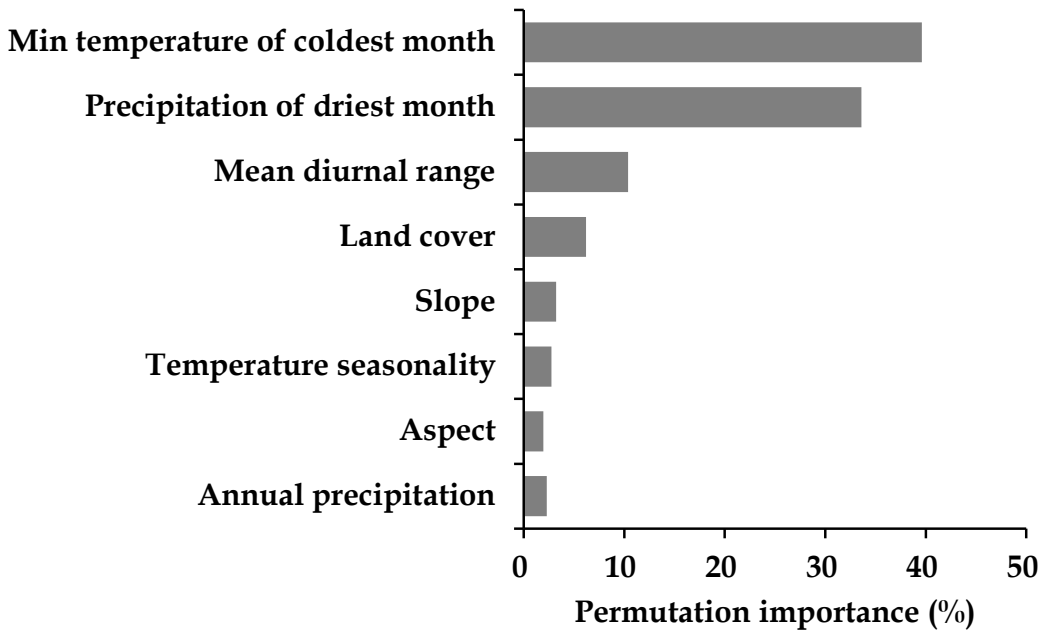

圖 4 MaxEnt 模型中環境變數對霧社櫻 (*Prunus taiwaniana*) 分布的重要性，基於目標群體密度取樣法。

Fig. 4 Importance of environmental variables in the MaxEnt model for *Prunus taiwaniana* distribution, based on the target group density sampling method.

由於目標群體密度的取樣方法可以獲得最佳模型性能，故以該法呈現最終結果。經相關分析篩選出的 8 個變項貢獻度分析顯示，霧社櫻的棲地適宜性主要受到少數幾個關鍵變項的影響。各變項中名列前三依序為最冷月最低溫、最乾月降水量與平均晝夜溫差，這些變項的重要性均高於 10%，合計貢獻了 84% 左右的模型解釋力，由此顯示，霧社櫻的分布型態主要由氣候條件決定。反觀，其他變項的重要性均低於 10%，對於模型的影響力相對有限，但仍可對模型的局部適宜性預測提供補充作用 (圖 4)。

圖 5 顯示主要影響霧社櫻分布變項的反應曲線，其中，最冷月最低溫度在 -5–5°C 間，棲地適宜性迅速上升並達到峰值，隨後隨著溫度升高，棲地適宜性逐漸下降圖 (5a)。最乾燥月降水量的最適範圍在 5–20 mm 的範圍內，隨後隨著降水量的進一步增加，棲地適宜性開始下降，超過 50 mm 明顯不適宜 (5b)。平均晝夜溫差在 8–10°C 為最適宜的環境條件，隨

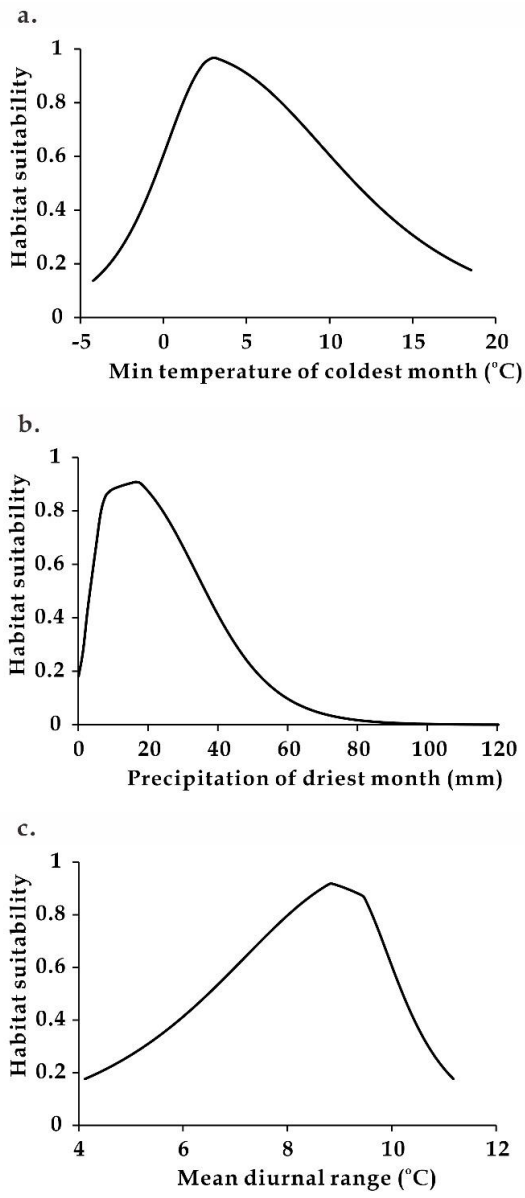

圖 5 MaxEnt 模型中霧社櫻 (*Prunus taiwaniana*) 對關鍵環境變數的反應曲線。

Fig. 5 Response curves of key environmental variables for *Prunus taiwaniana* in the MaxEnt model.

後曲線即呈現迅速下降 (5c)。綜合上述，霧社櫻對寒冷環境有高度的適應性，此外，特定的降水量與晝夜溫差表示，該物種對氣候條件的變化有高度敏感性。

討論

背景資料取樣策略的選擇會顯著影響 MaxEnt 模型的預測能力，從霧社櫻的棲地適宜性預測結果可知，目標群體密度和目標種密度方法的表現最佳，代表這兩種方法能夠涵蓋更廣泛的環境條件，有效校正取樣偏差，並建構高效的預測模型。目標群體與目標種密度都是基於物種本身的地理分布來構建參照框架，從而捕捉到與霧社櫻生態需求相似的環境特徵，本研究得到的結果與過往相關研究提出的論點一致，進一步驗證了這兩種方法在處理小樣本、空間偏差明顯的物種出現紀錄時的優勢 (Vollering *et al*. 2019；Barber *et al*. 2022；Ahmadi *et al*. 2023)，因此，目標群體密度和目標種密度是一種能有效抵消偏差的方法，尤其適用於稀有物種的分布預測。相比之下，背景資料隨機取樣代表沒有考慮到樣本有偏差的問題，縱使在本研究中仍有不錯表現，但也存在引入過多雜訊的隱憂 (Kramer-Schadt *et al*. 2013)，即其背景點涵蓋了過多非適宜的環境，降低了模型的泛化能力，造成邊緣棲地的判斷趨於保守，故顯示隨機取樣法的性能不如前兩種方法。

受限距離和最小多邊範圍方法的表現相較不理想，這主要是因為這兩種方法過度局限於局部區域，無法充分反映霧社櫻對更廣泛環境的適應性。受限距離方法將背景點限制在訓練樣本半徑 10 km 的範圍內可能過於偏頗，進一步放大了取樣偏差的影響。另一方面，最小多邊範圍方法所制訂的背景範圍，可能因涵蓋過多超出霧社櫻生態幅度的區域 (如平原地區)，導致模型的泛化能力大幅下降。這些結果 VanDerWal *et al*. (2009) 與 Barber *et al*. (2022) 的試驗結果相符，都顯示過度限制背景資料範圍會顯著

降低模型的預測效能。因此，在實際應用中，應謹慎選擇背景資料的範圍，以平衡取樣偏差和環境異質性。

從目標群體密度取樣方法所建構的 MaxEnt 模型來看，氣候類變項對模型的影響力最為顯著。其中，最冷月最低溫是決定霧社櫻在空間上存在與否的關鍵因子。詳細的偏好棲地特徵顯示，霧社櫻與其他梅屬植物物種相似，都偏好低溫的寒冷環境。這是因為其生理上需要累積一定程度的冷量來突破自然休眠，因此，維持一定的低溫水平對其生長發育週期至關重要 (Gao *et al*. 2012；Zhang *et al*. 2023；Huang 2024)。此外，降水量多寡與晝夜溫差也都是重要因子，冬季降水超過 50 mm 或晝夜溫差極端變化的情況均不利於霧社櫻的生存，可能會對其帶來負面影響。這些結果進一步揭示了霧社櫻對氣候條件的敏感性，也解釋了其潛在分布範圍受限的原因，並且更意味著其對氣候變遷和人類活動的干擾可能更加敏感。根據 MaxEnt 模型的預測結果，霧社櫻的高適宜棲地面積並不大，主要集中在臺灣北部的棲蘭山、雪山與太平山一帶，南部則較為零星分布，這與過去的植群調查報告基本一致 (歐 2009；林 2009；林 2013)，進一步驗證了模型的可靠性。

結論

本研究強調了背景資料取樣策略在 SDM 建模中的重要性，特別是對於像霧社櫻這樣的受脅物種，利用目標群體及目標物種密度的取樣方法，都能夠有效涵蓋更廣泛的環境條件，校正取樣偏差，並捕捉到與該物種生態需求相似的環境特徵，從而建構高效的預測模型。此外，最佳模型驗證了氣候條件在決定物種分布中的核心影響力，並揭示霧社櫻對寒冷環境的高度適應性，這為其保育和管理提供了重要的科學依據。

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附錄 1 模擬物種分布之預測變項

Appendix 1 Predictor variables used for the model species distributions

Variable
Annual mean temperature
Mean diurnal range (Mean of monthly (max temp - min temp))
Isothermality (BIO2/BIO7) (× 100)
Temperature seasonality (Standard deviation × 100)
Max temperature of warmest month
Min temperature of coldest month
Temperature annual range (BIO5-BIO6)
Mean temperature of wettest quarter
Mean temperature of driest quarter
Mean temperature of warmest quarter
Mean temperature of coldest quarter
Annual precipitation
Precipitation of wettest month
Precipitation of driest month
Precipitation seasonality (Coefficient of variation)
Precipitation of wettest quarter
Precipitation of driest quarter
Precipitation of warmest quarter
Precipitation of coldest quarter
Altitude
Slope
Aspect
Land cover

Three newly naturalized grasses (Poaceae) in Taiwan

三種臺灣新歸化禾草

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Abstract

Three new-naturalized Poaceae species, *Eragrostis tef* (Zuccagni) Trotter, *Megathyrsus trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga, and *Phalaris angusta* Nees ex Trin. in Taiwan are described herein. Line drawings, photos, and brief keys to these genera in Taiwan are provided to facilitate identification.

Key words: New-naturalized, Poaceae

摘要

本文描述三種臺灣新歸化禾本科植物：苔麩 (*Eragrostis tef* (Zuccagni) Trotter)、蔓生大黍 (*Megathyrsus trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga) 與尖鷸草 (*Phalaris angusta* Nees ex Trin.)，並提供線描圖、照片與臺灣產同屬植物檢索表以利鑑定。

關鍵詞：新歸化、禾本科

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Introduction

A checklist of the naturalized flora in Taiwan has been catalogued by Wu *et al.* (2004) and updated steadily, and 695 alien species belonging to 95 families have been listed by Chang-Yang *et al.* (2022). In the latest checklist by Chang-Yang *et al.* (2022), Poaceae comprises 95 species, with the main component of the Taiwanese naturalized flora. Chen *et al.* (2011) listed nineteen species of the genus *Eragrostis* Wolf. Among them, only two species, *E. ciliaris* (L.) R. Br. and *E. curvula* (Schrad.) Nees, are listed as alien species (Chang-Yang *et al.* 2022). Based on the vouchers and results of my surveys, I confirmed that *E. tef* (Zuccagni) Trotter has been naturalized in the plains in Taiwan (Fig. 1).

Megathyrsus species in Taiwan had been revised by Jung (2023), and

two species with one variety were listed as naturalized weeds in the plains and low elevations in Taiwan. Based on the vouchers and results of my surveys, I confirmed that *M. trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga has been naturalized at plains in Kinmen (Fig. 3), Lanyu, and Taiwan (Fig. 4).

In addition, Chen *et al.* (2011) recorded that three *Phalaris* spp. in Taiwan are aliens and locally naturalized in Taiwan. Herein, I report that *P. angusta* Nees ex Trin has been locally naturalized in the plains of northern Taiwan. The description, line drawing of these three weedy grasses, and brief keys to their genera in Taiwan are also attached below for identification.

Taxonomic treatment

1. *Eragrostis tef* (Zuccagni) Trotter, Boll. Soc. Bot. Ital. 1918: 62, 1918. Boulos, Fl. Egypt 4: 256, 2005; Quattrocchi, CRC World Dictionary of Grasses: 862, 2006; Peterson, In: Barkworth *et al.* Fl. North Amer. 24: 85, 2007. 苔麩 Fig. 1 & 2

Poa tef Zuccagni. Diss. Ditef 1775.

TYPE: RUSSIA, Astrachan, *Dolanker, s.n.* (K, MO 2967228, photo)

Annual. Culms erect; 20–90 cm long; nodes swollen, to 2 mm wide. Ligule a fringe of hairs, to 0.5 mm long; collar dominant, margin hairy, hairs 3–4 mm long. Leaf-blades 10–30 cm long; 2–4 mm wide. Inflorescence anapical spreading panicle, outline ovate, 10–40 cm long; lowermost panicle branches whorled at lower nodes, panicle branches flexuous, glabrous in axil, bearded near the pulvini (swollen bases) of branches near axils, hairs to 4 mm long. Spikelets are solitary and pedicelled, comprising 4–12 fertile florets, with diminished florets at the apex. Spikelets oblong in outline, laterally compressed, 5.5–9 mm long; 1.5–2 mm wide. Lower glume lanceolate; ca. 0.3 mm long, 1-keeled, 0-veined, apex acuminate. Upper glume

lanceolate, ca. 1 mm long, 1-veined, apex acuminate. Lemma elliptic, 1.5 mm long, membranous, keeled, 3-veined, apex acute, falling when caryopsis mature. Palea elliptic, 2-keeled, upper parts of keels scaberulous, apex truncate. Anthers 3, elliptic, ca. 0.2 mm long. Caryopsis oblong, ca. 0.5 mm long, dark brown.

Specimens examined: TAIWAN. Taipei City, Bei-Tou District, Ruan-Qiao, 18 Jun 2022, *M.-J. Jung 6592* (TAIF); Taichung City, Ho-Li District, Yue-Mei, 10 Nov 2021, *M.-J. Jung 6569* (TAIF); Chuan-Hua County, Tien-Chung Hsiang, Er-Shui, 31 Aug 2020, *M.-J. Jung 6255* (TAIF), 14 Sep 2021, *M.-J. Jung 6533* (TAIF); Yulin County, Da-Pi Hsiang, Da-Pi, 7 Jun 2022, *M.-J. Jung 6588* (TAIF), Lin-Nei Hsiang, Lin-Nei, 5 Jul 2021, *M.-J. Jung 6514* (TAIF); Nantou County, Chu-Shan Township, Ching-Shui-Shi, 5 Jul 2021, *M.-J. Jung 6516* (TAIF), Chi-Chi Township, Chi-Chi, 21 Aug 2023, *Ming-Jer Jung 6695* (TAIF); Kaohsiung City, Da-Sher District, Da-Sher, 17 Oct 2020, *M.-J. Jung 6339* (TAIF); Pingtung County, Gaushu Township, Gaushu, 25 Jan 2023, *Ming-Jer Jung 6613* (TAIF), Nei-Pu Hsiang, Nei-Pu, 17 Jun 2022, *M.-J. Jung 6590* (TAIF), Pingtung City, Pingtung, 7 Oct 2021, *M.-J. Jung 6559* (TAIF), Taiwu Township, Wuan-an, 10 Nov 2022, *Ming-Jer Jung 6602* (TAIF), Wuan-Dan Hsiang, Wuan-Dan, 27 Sep 2021, *M.-J. Jung 6549* (TAIF), Wuan-Luan Hsiang, Wu-Gou-Shui, 27 Sep 2021, *M.-J. Jung 6548* (TAIF).

Notes: The vernacular name of *Eragrostis tef* (Zuccagni) Trotter is tef (Peterson 2007). It is native to West Asia, central and eastern Africa, and naturalized to temperate and tropical Asia, Australia, Europe, South America, and southwestern Pacific islands (Peterson 2007; Quattrocchi 2006; POWO 2024). In Taiwan, this grass grows at roadsides and waste places, low elevations (Fig.1). Although it is an annual weed, I consider this alien grass has been naturalized in western Taiwan based on the vouchers

that I collected steadily in recent years.

Key to the *Eragrostis* species in Taiwan

1. Florets articulate from above downward, falling together with rachilla-joints.
2. Inflorescence a spike-like contracted panicle ……..... *E. ciliaris*
2. Inflorescence a more or less open panicle.
3. Cilia of lemma 1/2 as long as lemma; pulvini present ……..... ..... *E.tenella*
3. Cilia of lemma very short, scabrous, pulvini wanted …… ..... *E. japonica*

1. Florets falling off from below upwards, but leaving a continuous rachilla.
4. Plants glandular on the culms, leaf sheaths, and panicle.
5. Perennials; culm up to 110 cm; spikelet blackish purple ……..... ..... *E. ferruginea*
5. Annuals; culm 20–60 cm tall; spikelet green or dark green.
6. Spikelet 1.5–2 mm wide; lemmas 1.5–2 mm long …….. *E. minor*
6. Spikelet 2–3 mm wide; lemmas 2–2.8 mm long …….....*E. cilianensis*

4. Plants eglandular.
7. Panicle contracted and spikelike.
8. Spikelet 1–2 mm broad; lower panicle branches 3–8 cm ……..... *E. nutans*
8. Spikelet 2–3 mm broad; lower panicle branches 0.5–2.5 cm.
9. Palea apex acute, the keels ciliolate but not winged; panicle 2–8 cm, pilose in axils …….. *E. cylindrica*
9. Palea apex toothed, the keels winged, ciliolate along the wings; panicle 10–15 cm, glabrous in axils …… *E. nevinii*

7. Panicle open and spreading.
10. Leaf blades long pilose on both surfaces …… *E. pilosissima*
10. Leaf blades glabrous, pubescent,

or pilose in part.

11. Anthers longer than 0.7 mm.

12. Palea deciduous……
……..……..... *E. atrovirens*

12. Palea persistent.

13. Branchlets and pedicels distinctly or obscurely glandular; leaf blades flat, 2-6 mm wide; leaf sheath compressed ……..... *E. ferruginea*

13. Branchlets and pedicels eglandular; leaf blades involute, 1–2 mm wide, leaf sheath not compressed …….. *E. curvula*

11. Anthers shorter than 0.5 mm.

14. Tips of lemmas widely divergent, giving a serrate appearance to the spikelet ……
..... *E. tenuifolia*

14. Tips of lemmas slightly divergent or appressed to the lemmas above.

15. Spikelet ovoid, more than 2–4 mm wide…….....
..... *E. unioloides*

15. Spikelet lanceolate to linear, less than 2 mm wide.

16. Spikelet less than 1.5 mm wide; annuals.

17. Axils of panicle branches and mouth of sheath pilose ……..... *E. pilosa*

17. Axils of panicle and mouth of sheath not pilose.

18. Lowermost branches glabrous near their pulvini ……. *E. multicaulis*

18. Lowermost branches bearded near its pulvini …….. *E. tef*

16. Spikelet 2–2.5 mm wide; annuals or perennials.

19. Plant robust, up to 90 cm tall ……..... *E. fauriei*

19. Plant slender, up to 60 cm tall.

20. Keels of palea ciliolate; anther 0.3–0.4 mm long; leaf …….. *E. brownii*

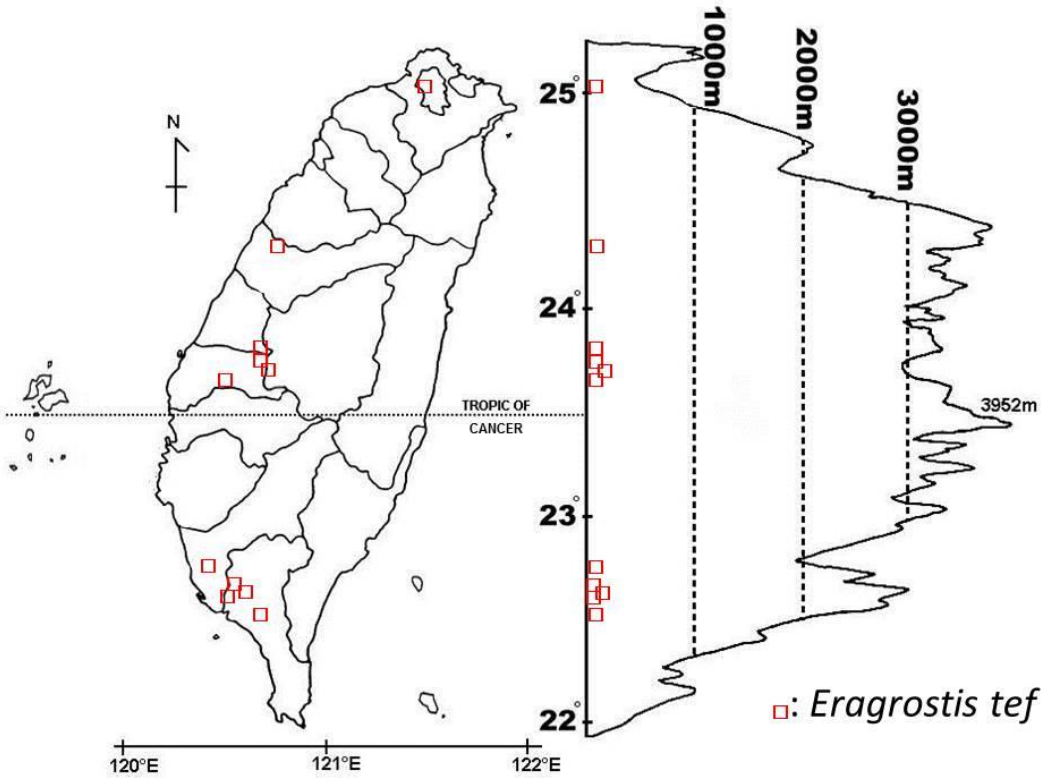

Fig. 1 Distribution map of *Eragrostis tef* (Zuccagni) Trotter in Taiwan.
圖 1 苔麩 (*Eragrostis tef* (Zuccagni) Trotter) 在臺灣的分布圖。

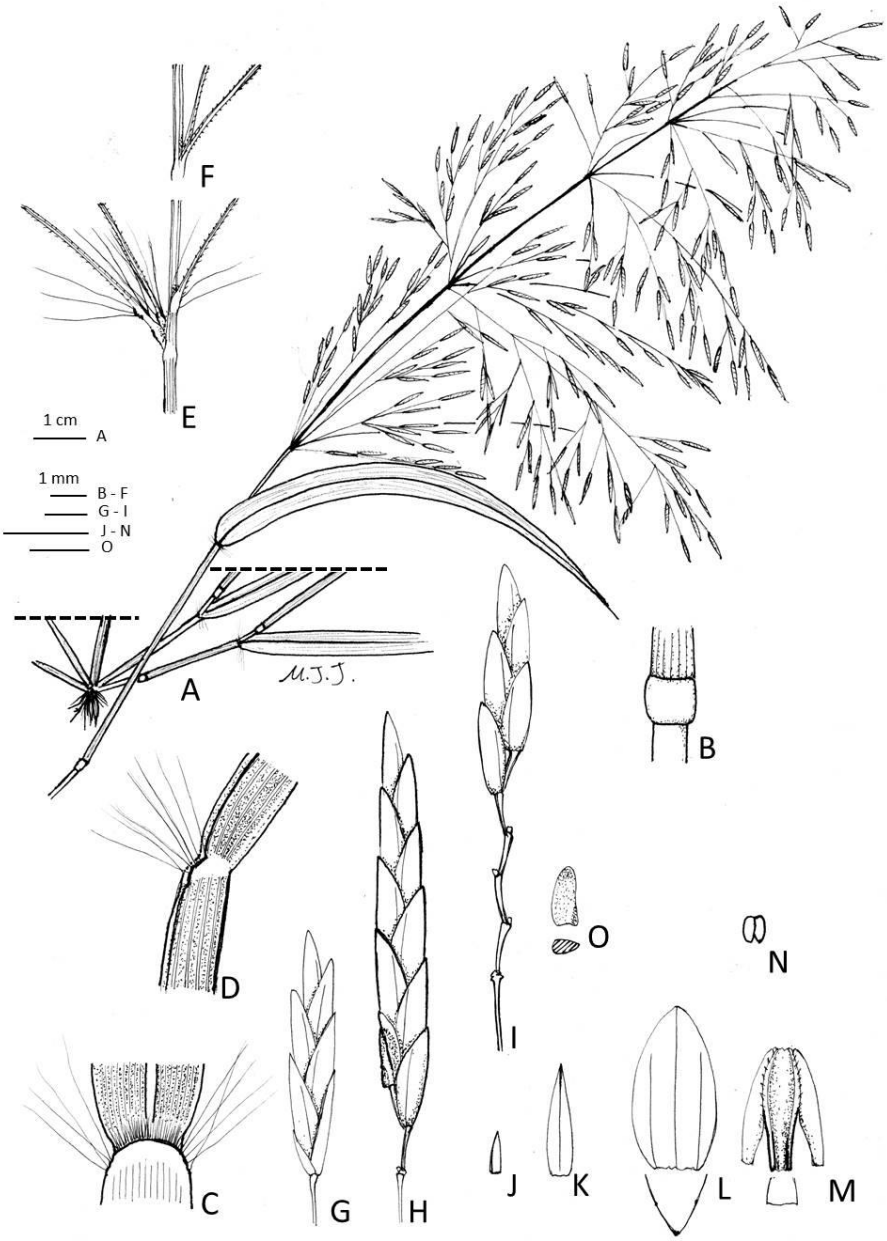

Fig. 2 *Eragrostis tef* (Zuccagni) Trotter. A: Habit. B: Node. C: Leaf blade base and ligule. D: Leaf collar and blade base, lateral view. E & F: Part of the panicle axis, showing the bearded pulvini and glabrous axils. G-I: Spikelets. J: Lower glume. K: Upper glume. L: Lemma. M: Palea. N: Anther. O: Caryopses.

圖 2 苔麩 (*Eragrostis tef* (Zuccagni) Trotter)。A：植株。B：節。C：葉片基部與葉舌。D：葉襟與葉片基部，側面觀。E & F：圓錐花序腋處，分支基部具膨大且主軸光滑。G-I：小穗。J：外穎。K：內穎。L：外稃。M：內稃。N：花葯。O：穎果。

20. Keels of palea hispidulous; anther 0.1-0.2 mm long; leaf base sparsely……..... *E. cumingii*

2. *Megathyrsus trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga, Plants 12(399): 11, 2003. 蔓生大黍 Figs. 3–5

Panicum trichocladum Hack. ex K. Schum., Pflanzenw. Ost-Afrikas 5c: 103, 1895.

TYPE: TANZANIA. Kilimanjaro, *H. Meyer 140* (B, photo).

A perennial grass, habit 0.2–1 m tall, with short rhizomes, culms much-branched, rambling, 20–230 cm long, and rooting from the lower nodes. Leaf sheath compressed, keeled, pilose or glabrous; ligule a ciliate membrane, ovate, to 2 mm long, adaxial surface pilose, margins scabrous; blades narrowly lanceolate to lanceolate, 5–30 cm long, 4–18 mm wide, rounded at the base, apex acuminate. Panicle open, ovate in outline, 6–20 cm long, moderately branched, glabrous or sparsely long-ciliate on the distal branches and pedicels, and densely hairy on the main axis around and immediately below the lowest branches, rarely glabrous; panicle branches pilose or glabrous. Spikelets 2.5–3 mm long, lower glume round to ovate, 1-3-veined, surface glabrous, apex round. Upper glume ellipse, 5-veined, surface glabrous, apex acute. Lower floret sterile, lower lemma similar to upper glume, outline ellipse, 5-veined, apex round; lower palea narrowly elliptic, 2-veined, scabrous on veins, apex truncate. Upper floret fertile, upper lemma elliptic in outline, 2.5–4 mm long, surface rugose, margins involute and enclosed at the basal part, 5-veined, apex acute and pointed. Upper palea ellipse in outline, margins with two involute lobes, rugose at intercostal region; lodicules 2, to 0.2 mm long, apex truncate; anthers 3, 1 mm long; ovary fusiform, to 0.4 mm long; caryopses obovoid, embryo and hilium

to 1/2 length of caryopses, apex truncate.

Specimens examined: TAIWAN. New Taipei City, Hsinchuang District, Hsinchuang, 5 Sep 2024, *Ming-Jer Jung 7051* (TAIF), Youth Park, 23 Jan 2021, *Ming-Jer Jung 6403* (TAIF); Taichung City, Beitun District, Dakung, 20 Jul 2024, *Ming-Jer Jung 6998* (TAIF); Nantou County, Minchien Township, Songbuokeng, 21 Aug 2024, *Ming-Jer Jung 7032* (TAIF); Tainan City, East District, Tungning Road, 29 Aug 2002, *Ming-Jer Jung 361* (TAIF); Hualien County, Shoufong Township, Shuhu, 4 Sep 2024, *Ming-Jer Jung 7047* (TAIF); Taitung County, Lanyu Township, Tungching, 27 Mar 2008, *Ming-Jer Jung 2614* (TAIF); Kinmen County, Jinning Township, Shuanli, 17 Jul 2024, *Ming-Jer Jung 6994* (TAIF), Kinsha Township, Mt. Wuhu, 16 Jul 2024, *Ming-Jer Jung 6984* (TAIF).

Notes: *Megathyrsus trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga is native to tropical Africa, and naturalized in Malaysia and South America (POWO 2024). In Kinmen and Taiwan, this grass is naturalized at roadsides or waste lands around forests (Figs. 3 and 4). In the past, I misapplied the vouchers cited in the previous as *Megathyrsus maximus* (Jacq.) B. K. Simon & S. W. L. Jacobs, but it could be determined by using the following key to the *Megathyrsus* species in Taiwan.

Key to the *Megathyrsus* species in Taiwan

1.Culms much-branched and rambling, lower nodes rooting ……..... ..... *M. trichocladus*

1.Culm usually solitary and erect, lower nodes not rooting…… ……..... 2

2. Rachis scabrous and sparsely pilose ……..... *M. infestus*

2.Rachis glabrous or scabrous..... 3

3. Intercostal regions of lower lemma glabrous ……..... ..... *M. maximus*

3. Intercostal regions of lower lemma hairy …… ……..... *M. maximus* var. *pubiglumis*

3. *Phalaris angusta* Nees ex Trin. Sp.

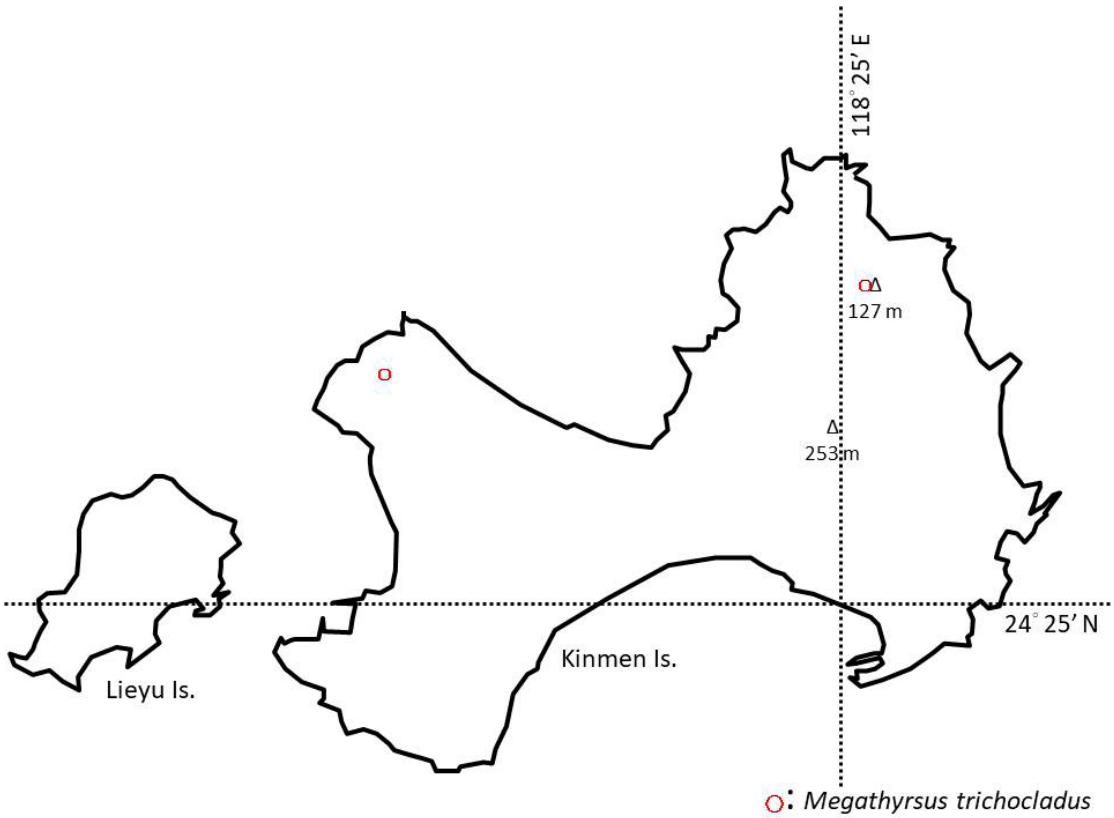

Fig. 3 Distribution map of *Megathyrsus trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga in Kinmen.

圖 3 蔓生大黍 (*Megathyrsus trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga) 在金門的分布圖。

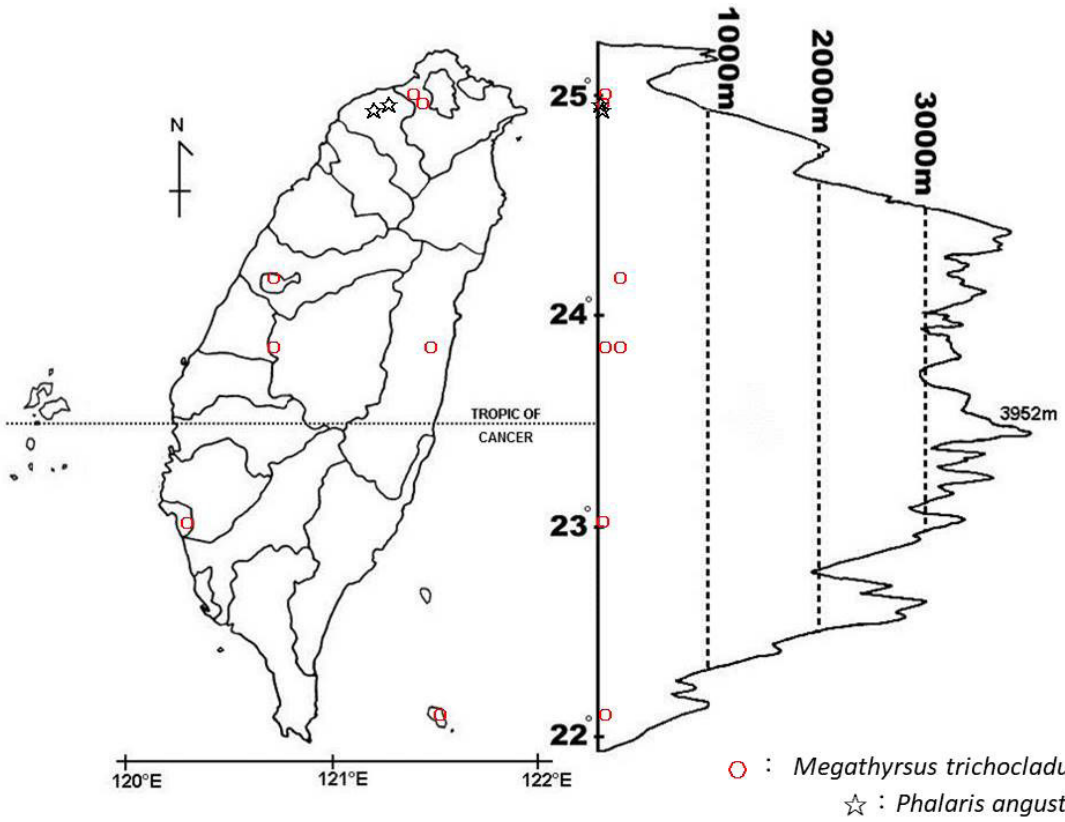

Fig. 4 Distribution map of *Megathyrsus trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga and *Phalaris angusta* Nees ex Trin. in Taiwan.

圖4 蔓生大黍 (*Megathyrsus trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga) 與尖鵝草 (*Phalaris angusta* Nees ex Trin.) 在臺灣的分布圖。

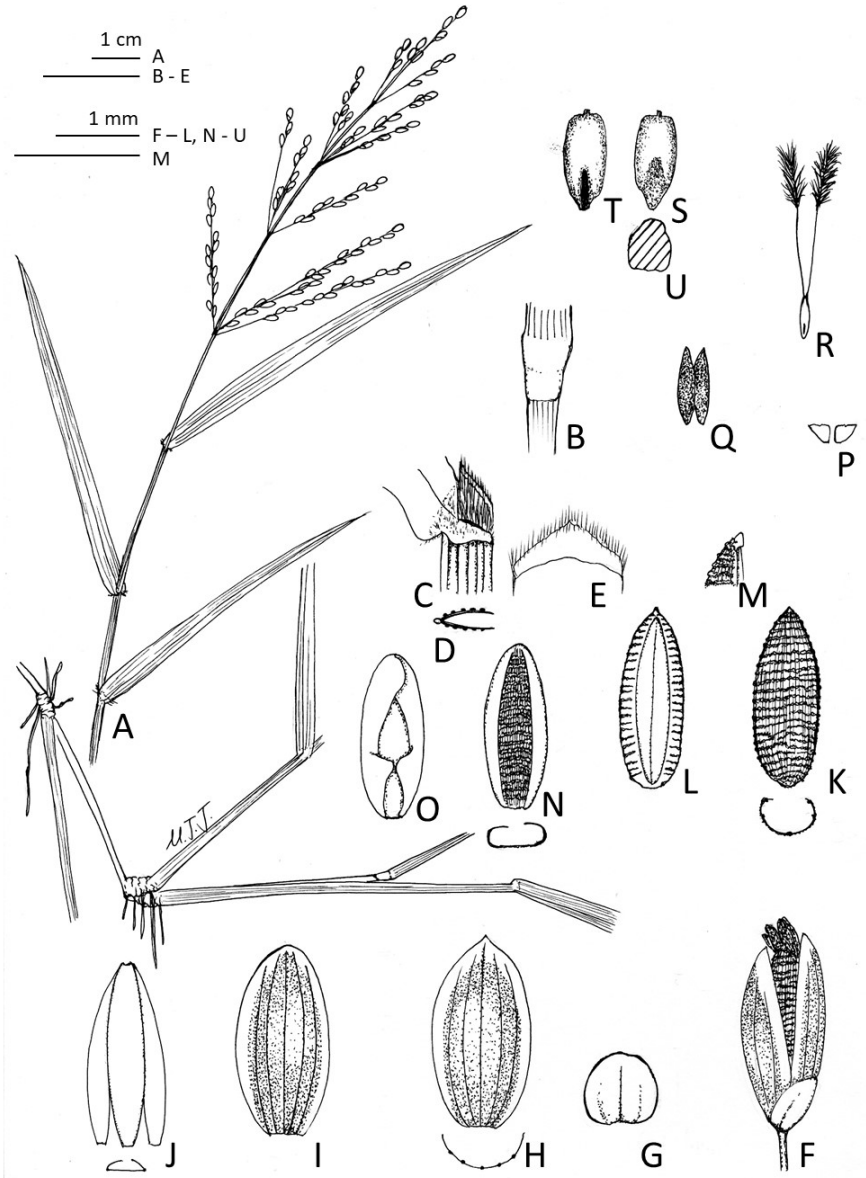

Fig. 5 *Megathyrsus trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga. A: Habit. B: Node. C: Leaf base, lateral view. D: Cross-section of leaf sheath. E: Ligule. F: Spikelet, lateral view. G: Lower glume. H: Upper glume. I: Lower lemma. J: Lower palea. K & L: Upper lemmas, K: abaxial view, L: adaxial view. M: Enlargement of upper lemma apex, lateral view. N & O: Upper palea, N: abaxial view, O: adaxial view. P: Lodicules. Q: Anther. R: Pistil. S–U: Caryopses, S: embryo side, T: hilium side, U: cross-section.

圖 5 蔓生大黍 (*Megathyrsus trichocladus* (Hack. ex K. Schum.) Salariato & Zuloaga) 。A：植株。B：節。C：葉片基部，側面觀。D：葉鞘剖面。E：葉舌。F：小穗，側面觀。G：外穎。H：內穎。I：第一小花外稃。J：第一小花內稃。K&L：外稃，K：背側觀，L：腹側觀。M：第二小花外稃先端放大側面觀。N& O：第二小花內稃，N：背面觀，O：腹面觀。P：鱗被。Q：花葯。R：雌蕊。S–U：穎果，S：胚側觀，T：臍側觀，U：剖面觀。

Gram. 1(7): t. 78. 1827. Barkworth, In: Barkworth *et al.* (eds.) Fl. N. Amer., vol. 24. electronic version, 2020. 尖鷸草 Figs. 4 and 6

TYPE: Sp. Gram. 1(7): t. 78, 1827.

Annuals, culms to 150 cm tall; nodes enlarged, glabrous, leaf sheath glabrous, ligule ovate, membranous; blades 10–20 cm long, to 1 cm wide. Inflorescence an apical constricted panicle, outline linear, 2.5–17 cm long, 0.6–1.5 cm wide; spikelets and branches antrorse-appressed. Spikelets ellipticto narrowly ovate in outline, laterally appressed, solitary, comprising 2 basal sterile florets and an apical fertile floret; without rhachilla extension. Lower glume elliptic, 2.9–3.5 mm long, shorter than upper glume, 3-veined, intercostal regions glabrous, laterally compressed, keeled and winged on central vein, wing margin scabrous, apex acute to acuminate. Upper glume elliptic, 3–5.5 mm long, longer than lower glume; chartaceous, 3-veined, intercostal regions glabrous, keeled and winged on central vein, wing margin scabrous, apex obtuse. Basal florets 2, sterile, lemmas linear, 0.7–1.5 mm long, margins sparsely hairy. Third floret fertile, lemma laterally compressed, ovate, 2.2–3.8 mm long, cartilaginous, keeled, inconspicuously 5-veined, intercostal regions appressed hairy, apex acute; palea narrowly ovate, membranous, 2-veined, apex acute; anther 3, to 0.7 mm long.

Specimens examined: TAIWAN. Taoyuan City, Dayuan District, Dayuan, 2 Apr 2023, *Ming-Jer Jung 6622* (TAIF), Luchu District, Luchu, 11 Apr 2020, *Ming-Jer Jung 6228* (TAIF).

Notes: The vernacular name of *Phalaris angusta* Nees ex Trin. is narrow canarygrass (Barkworth *et al.* 2020). It is native to North and South America, and naturalized in Australia, Germany, Madagascar, and South Africa (Barkworth *et al.* 2020, POWO 2024). In Taiwan, this grass is naturalized at roadsides and resting farms in low elevation, northwestern Taiwan (Fig. 4).

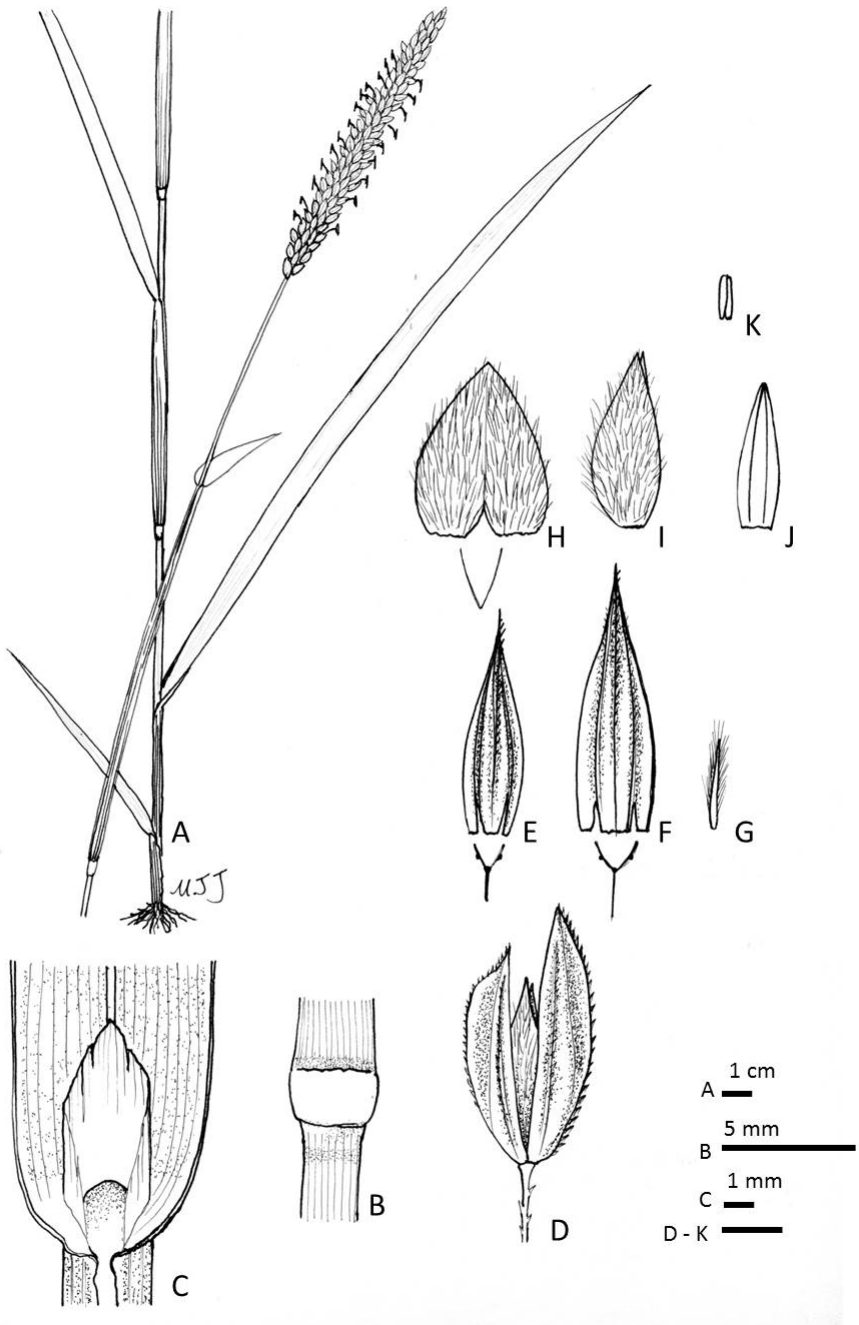

Fig. 6 *Phalaris angusta* Nees ex Trin. A: Habit. B: Node. C: Leaf base and ligule. D: Spikelet, lateral view. E: Lower glume. F: Upper glume. G: Lemma of sterile floret. H & I: Lemma of fertile floret, I: lateral view. J: Palea of fertile floret. K: Anther.

圖 6 尖鷸草 (*Phalaris angusta* Nees ex Trin.)。A：植株。B：節。C：葉片基部與葉舌。D：小穗，側面觀。E：外穎。F：內穎。G：不稔小花外稃。H& I：可稔小花外稃，I：側面觀。J：可稔小花內稃。K：花葯。

Key to the *Phalaris* species in Taiwan

1. Panicle spreading, lowest branches longer than 1.5 cm…… ……. *P. arundinacea*
1. Panicle constricted, lowest branches shorter than 1 cm.
2. Panicle outline linear…….. *P. angusta*
2. Panicle outline ovate to elliptic.
3. Margins of wings on glumes smooth ……..... *P. canariensis*
4. Margins of wings on glumes toothed ……... *P. minor*

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臺灣莎草植物誌新見

Additions to the sedge flora of Taiwan

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摘要

依據近期野外調查、標本及文獻比對之成果，本文提出臺灣莎草科植物分類及植物地理之新資料。閩北薹 (*Carex borealifujianica* Y.F. Lu & X.F. Jin)、鹿兒島薹 (*Carex kagoshimensis* Tak. Shimizu)、舌狀磚子苗 (*Cyperus ligularis* L.)、大井氏莎草 (*Cyperus ohwii* Kük.) 及鑽苞水蔥 (*Schoenoplectus subulatus* (Vahl) Lye) 在臺灣首次記載；白穗飄拂草 (*Fimbristylis shimadana* Ohwi) 被視為 *F. alboviridis* C.B. Clarke 之異名；並依據近期的野外觀察，重新探討墾丁扁莎 (*Cyperus sulcinux* C.B. Clarke) 、無翅莎草 (*Cyperus exaltatus* Retz.) 之鑑定及分布情況。

關鍵詞：薹屬、莎草屬、飄拂草屬、擬莞屬、分類學

Abstract

New taxonomic and biogeographic data for the sedges (Cyperaceae) in Taiwan are presented based on recent field, herbaria, and literature studies. *Carex borealifujianica* Y.F. Lu & X.F. Jin, *Carex kagoshimensis* Tak. Shimizu, *Cyperus ligularis* L., *Cyperus ohwii* Kük, and *Schoenoplectus subulatus* (Vahl) Lye are first documented in Taiwan. *Fimbristylis shimadana* Ohwi is treated as a later synonym of *F. alboviridis* C.B. Clarke. The identity and occurrence of *Cyperus sulcinux* C.B. Clarke and *Cyperus exaltatus* Retz. in Taiwan are also discussed.

Key words: *Carex*, *Cyperus*, *Fimbristylis*, *Schoenoplectus*, taxonomy.

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緒言

本文延續著者近年之研究 (Hsu and Chung 2017；Hsu 2022； 許 及 鐘 2017；許 2020)，提供臺灣莎草科植物誌之新資料。以下 5 種莎草首次在臺灣被記錄並於本文提供完整形態描述及生態、分類之概述：閩北薹 (*Carex borealifujianica* Y.F. Lu & X.F. Jin) 與鹿兒島薹 (*Carex kagoshimensis* Tak. Shimizu) 分布於西北部之淺山丘陵地及金門 (鹿兒島薹亦分布於馬祖) ；大井氏莎草 (*Cyperus ohwii* Kük.) 分布於北部平野池沼；舌狀磚子苗 (*Cyperus ligularis* L.) 被發現於高雄海岸；鑽苞水 蔥 (*Schoenoplectus subulatus* (Vahl) Lye) 在臺南、高雄近海濕地被記錄到。其中，僅有原產於熱帶美洲及非洲的舌狀磚子苗為歸化植物，其它物種在臺灣則推測是天然分布。值得注意的是，閩北薹、鹿兒島薹於日治時期即有標本紀錄，大井氏莎草為 1999

年，鑽苞水蔥則是 2008 年，顯示族群在臺灣均已建立一段時日，但因標本錯誤鑑定為已知物種而受到忽略。這些舊雨新知的發現除了作為莎草科植物鑑別困難之例證，也顯示在生物多樣性之研究領域，國內外標本館之典藏仍蘊含豐富資源等待發掘。

經由文獻及標本之比對，著者亦確認原為臺灣特有種的白穗飄拂草 (*Fimbristylis shimadana* Ohwi) 與分布於熱帶亞洲及非洲的 *F. alboviridis* C. B. Clarke 為相同物種而必須合併。此外，近期著者於本島觀察記錄無翅莎草 (*Cyperus exaltatus* Retz.) 及墾丁扁莎 (*Cyperus sulcinux* C. B. Clarke) 之野外族群；鑒於前者於過往文獻及標本存在頻繁的錯誤鑑定，而後者在臺灣之分布資訊極度缺乏，本文亦列入報導並探討其鑑別特徵與野外族群狀態。

材料與方法

本研究之臺灣莎草科材料主要來自著者 2008–2025 年野外調查成果及 TAI、TAIF、TNM 及 HAST 標本館之檢閱；模式及國外標本另查找 BM、C、K、KAG、KYP、LD、P、PE、US、TI、TNS 等標本館之電子資源。各類群形態變化範圍、鑑別特徵及地理分布參考原分布地之植物誌及專論，包含臺灣 (Koyama *et al.* 2000)、中國 (Dai *et al.* 2010)、日本 (Iwatsuki *et al.* 2020)、馬來區系 (Kern 1974)、泰　國 (Simpson and Koyama 1998)、新加坡 (Simpson 2019)、北美 (Ball *et al.* 2002)、熱帶非洲 (Hutchinson *et al.* 2014) 等地，以及其它相關分類文獻與網路資料庫。各物種形態、生態環境及物候之描述主要依據臺灣野外族群之觀察及標本之紀錄。

分類處理

Carex borealifujianica Y.F. Lu & X.F. Jin, PLoS ONE 17(3): e0264419 (9). 2022. Fig. 1.

Type: CHINA. Fujian Province: Wuyishan City, Mount Wuyi, Shuiliandong, near Huiyuan Temple, roadside under forest, 320 m, 24 May 2018, *Jin & Lu 4176* (holotype: ZM; isotypes: HTC,

PE, ZM, n. v.).

形態描述：多年生草本。根莖木質化，短橫走或斜上。稈簇生，高 35–80 cm，銳三稜形，基部由褐色鞘狀退化葉包覆。葉全數莖生，遠短於稈，寬 2.5–5 mm，兩面粗糙；葉鞘表面被疏毛，稜上被密毛，長 3–10 cm。苞片葉狀，基部具鞘。穗 4–10 枚，總狀排列，頂端 2–3 (–6) 枚為雄穗，其餘為雌穗 (先端或基部偶有少數雄花) ；雄穗棍棒狀，長 4–15 mm，寬 1–1.5 mm；雌穗圓筒狀，長 1–5 cm，寬 3.8–5 mm，穗柄短於或近等長於苞片之鞘，因此貌似無柄。雄花鱗片橢圓形，黃褐色，長 4–5.5 mm，先端鈍尖，具 0.5–1.7 mm 之芒，具 1 主脈。雌花鱗片卵形，淡黃褐色，長 2.5–3 mm，先端短突尖，具 3 主脈。果囊密生或略疏生，近直立或斜出，倒卵形，橫截面鈍三稜形，長 3.8–4.2 mm，基部漸縮，先端驟縮成 1–1.5 mm 長之喙，喙先端二齒狀；果囊表面密被白色短刺毛，中下部具 7–8 條脈。瘦果與果囊密合，倒卵形，橫截面三稜形，長 1.8–2.2 mm，基部漸縮，先端微凹入或圓鈍。花柱直立，基部略膨大；柱頭 3 裂。

臺灣俗名：「閩北薹」(新擬)，源自種尾名 "*borealifujianica*"，意指福建北部，即模式標本採集地。

地理分布：閩北薹原先僅知分布於福建武夷山一帶 (Lu *et al.* 2022) ；新紀錄於臺灣 (新竹、苗栗) 及金門。

生態環境與物候：生長於海拔 300 m 以下淺山丘陵地開闊至半遮蔭之草原、灌叢、林緣土坡或疏林內。開花期 3–4 月，結果期 4–6 月。

Additional specimens examined: TAIWAN. Hsinchu: Senkyakuseki (仙腳　石), 1 April 1940, *Simada 4269A* (HAST). Miaoli: Tunghsiao (通　霄；Tusyo), 380 m, 7 June 1940, *Suzuki 20059* (TAI); 100 m, 24 April 2017, *Hsu 9034* (TAIF; TNM); Tunghsiao Town Seventh Cemetery (通霄鎮第七公墓), 30 m, 16 March 2012, *Hsu 5492* (TAIF); Hsinpu (新　埔), 100 m, 2 April 2015, *Chen 1358* (TAIF); 22 March 2018, *Hsu 10280* (TAIF); 18 March 2021, *Hsu 13344* (TAIF). Kinmen: Mt. Taiwu

(太 武 山；Taiwushan), 27 May 2002, *Huang & Wang 00055* (TAIF; TNM); 200 m, 24 May 2017, *Hsu 9205* (TAIF; TNM); 11 May 2023, *Chang ZXC003616* (TAIF); Mt. Wuhu (五虎山), 100 m, 23 May 2017, *Hsu 9175* (TAIF); Kinmen Botanical Garden (金門植物園), 80 m, 26 May 2017, *Hsu 9241* (TAIF; TNM); 17 May 2022, *Chang ZXC002930* (TAIF); 30–50 m, 29 April 2023, *Wang 3216* (TAIF).

分類註記：閩北薹隸屬於薹草亞屬 (subg. *Carex*) 之硬毛果薹草組 (sect. *Occlusae*)，依據發表文獻 (Lu *et al.* 2022)，其形態特徵與分子證據均顯示為舌葉薹 (*Carex ligulata* Nees) 之近緣物種，主要鑑別特徵在於花序頂端有 2–3 枚棒狀雄穗，葉寬 2.5–5 mm，葉鞘被毛，以及瘦果先端凹入；而舌葉薹花序頂端僅有 1 枚圓筒狀雄穗，葉寬 5–15 mm，葉鞘光滑，瘦果先端銳尖。著者觀察採自苗栗及金門之標本，發現部分形態特徵超出原始描述之範圍，如花序頂端之雄穗常超過 3 枚 (圖 1-E)，最多可達 6 枚，而瘦果先端有圓鈍狀至微凹入之變化 (圖 1-L–N)，但考量其它特徵均與原始文獻一致，而地理分布亦相當接近，仍視為同一物種。本種已知最早紀錄為 1930 年 (*Simada 4269A*, HAST)，但標本錯誤鑑定為石果珍珠茅 (*Scleria lithosperma* (L.) Sw.) 而受到忽略。臺灣本島近年僅在通霄一帶發現，族群極少；於金門主島則可見較大之族群數目。

Carex kagoshimensis Tak. Shimizu, Acta Phytotax. Geobot. 59(1): 67, F. 1, 2A–D, 3. 2008. Fig. 2.

Type: JAPAN. Kyushu, Kagoshima: Yoshitoshi, Hiyoshi-cho, Hioki-shi, ca. 20 m alt., 21 April 1983, *T. Shimizu 83-104* (holotype: KYO image!; isotypes: KAG063720 image!, KANA, KPM, OKAY, OSA, RYU, SHO, TI00010127 image!, TNS, TUS).

形態描述：多年生草本。根莖短橫走，堅韌，包覆根莖與葉簇基部之鞘狀退化葉通常撕裂呈纖維狀。稈中生及側生，長 20–85 cm，直立或斜出，三稜形，表面光滑無毛。葉多枚

基生，長 35–55 cm，寬 6–18mm，橫截面倒 W 形，邊緣粗糙，兩面光滑無毛。總苞具 0.5–1.5 cm 長之鞘，其葉身遠短於花序。穗 2–4 枚遠生，總狀排列；頂生穗棍棒狀，全為雄花，長 1–4 cm，徑 2–4 mm；側生穗圓筒狀，具短柄，全為雌花，或先端有少數雄花，長 2–5 cm，徑 8–10 mm，雌花密生。雄鱗片紅褐色，倒披針形，長 6–7 mm，先端凹入，具短芒；雌鱗片淡綠色，狹卵形，長 5–6.5 mm，先端漸尖，具 1–2 mm 之芒。柱頭 3 裂，基部膨大，通常宿存。果囊密生，斜出，略高於鱗片，菱狀卵形，橫截面鈍三稜形，紙質，長 5.5–7.5 mm，先端漸縮成長 2–3 mm 之喙，開孔處二齒狀，表面具顯著脈紋，脈上疏被短直毛。瘦果由果囊緊密包覆，菱狀卵形，紅褐色，長約 3 mm (不含喙)，橫截面三稜形，最寬處之稜上有顯著凹刻；先端具強烈扭轉之短喙。

臺灣俗名：「鹿兒島薹」(新擬)，譯自日本鹿兒島縣 (Kagoshima Prefecture)，為模式標本採集地，同時也是拉丁種尾名語源 (Shimizu 2008)。

地理分布：鹿兒島薹原被認定為日本特有 (Jin and Zheng 2013；Iwatsuki *et al.* 2020)；本研究新記錄於臺灣北部 (桃園、苗栗)，金門，馬祖，及中國東南部 (福建)。本種於臺灣本島相當罕見，著者僅於苗栗通霄發現一小族群；離島之金門及馬祖列島則較為普遍，推測於鄰近之中國東南沿海一帶可能有更廣泛之分布。

生態環境與物候：生長於海拔 300 m 以下淺山半開闊之林緣土坡或灌叢下。開花期 2–4 月，結果期 3–5 月。

Additional specimens examined: TAIWAN. Miaoli: Hsinpu (新埔), ca. 100 m, 19 February 2018, *Hsu 10211* (TAIF); 22 March 2018, *Hsu 10281* (TAIF); 25 May 2020, *Hsu 12588* (TAIF); 5 March 2021, *Hsu 13333* (TAIF). Taoyuan: Ryotan (龍潭), ca. 200 m, 11 May 1925, *Simada 4318A* (HAST). Kinmen: Kinmen Botanical Garden (金門植物園), ca. 80 m, 26 May 2017, *Hsu 9238* (TAIF); Mt. Wuhu (五虎山), ca. 100 m, 23 May 2017, *Hsu 9169* (TAIF); *Hsu*

9174 (TAIF); Mt. Taiwu (Taiwushan；太武山), 260 m, 11 March 2000, *Chiu 6059* (TNM); ca. 100 m, 20 March 2000, *Leong 1744* (HAST); ca. 50 m, 24 May 2017, *Hsu 9188* (TAIF); Shanhou (山后), ca. 20 m, 27 June 2020, *Hsu 12886* (TAIF). Lienchiang (Matzu Islands): Biyuan Park (碧園公園), ca. 80 m, 18 May 2019, *Hsu 11658* (TAIF); Dapu (大埔), ca. 40 m, 14 May 2019, *Hsu 11574* (TAIF); Jinsha (津沙), ca. 20 m, 25 April 2007, *Wang 10188* (TNM); ca. 50 m, 13 May 2019, *Hsu 11539* (TAIF); 18 March 2020, *Hsu 12547* (TAIF); Pishan Trail (壁山步道), 50–200 m, 5 May 2010, *Chen & Wang 10056* (TNM); ca. 30 m, 18 May 2019, *Hsu 11650* (TAIF); Qinbi (芹壁), ca. 100 m, 18 May 2019, *Hsu 11672* (TAIF); Qingfan (青帆), ca. 100 m, 14 May 2019, *Hsu 11557* (TAIF). CHINA. Fujian: Fuzhou, Wushishan (烏石山), 23 February 1910, *S. Nagasawa s.n.* (TAIF).

分類註記：鹿兒島薹隸屬於薹草亞屬 (subg. *Carex*) 之菱果薹節 (sect. *Rhomboidales*) (Global *Carex* Group 2021)，重要鑑別特徵包含葉及稈光滑無毛，穗 2–4 枚遠生，雄花鱗片先端凹入，雌花及果囊密生，斜出，果囊菱狀卵形，脈上疏被短直毛，瘦果稜上有顯著凹刻，先端具強烈扭轉之短喙 (圖 2)。形態上本種與彎柄薹草 (*Carex manca* Boott subsp. *manca*)、夢佳宿柱薹 (*C. manca* subsp. *takasagoana* (Akiyama) Koyama) 及彎喙薹 (*C. laticeps* C. B. Clarke ex Franch.) 較為接近，這些物種均分布於中國東南與臺灣一帶，標本之鑑定也時有混淆。本文綜合文獻描述 (Shimizu 2008；Dai *et al.* 2010；Hoshino and Masaki 2011；Jin and Zheng 2013；Katsuyama 2015；Iwatsuki *et al.* 2020) 及標本觀察，整理上述近緣物種間之形態區別於表 1。

Cyperus exaltatus Retz., Observ. Bot. 5: 11. 1788. Fig. 3.

Lectotype: INDIA. Tamil Nadu: Tharangambadi (“Tranquebaria”), *J. G. König s.n.* (LD1291907 image!), des-

ignated by Mallick *et al.* (2018: 188); isolectotypes: BM000958989 image!, BM000958990 image!, C1001075 image!, C1001076 image!, C1001077 image!.

形態描述：可參照 Kern (1952: Fig. 2；1974: 602)，Simpson and Koyama (1998: 349)，Koyama *et al.* (2000: 243–244，僅文字描述)，Dai *et al.* (2010: 230) 及 Iwatsuki *et al.* (2020: 390, "*Cyperus iwasakii*")。

臺灣俗名：「無翅莎草」(Koyama *et al.* 2000)。

地理分布：廣泛分布於亞洲、非洲及大洋洲一帶 (Dai *et al.* 2010)。在臺灣，目前紀錄於臺中、嘉義平野。

生態環境與物候：溪床及田邊短暫積水之開闊地，海拔低於 100 m。於 6–12 月均觀察到開花結果。

Additional specimens examined: TAIWAN. Taichung: Fatzu Stream (筏子 溪), ca. 80 m, 16 July 2024, *Hsu 15595* (TAIF); *Hsu 15596* (TAIF); Gaomei (高美), 6 August 2019, *Jung 6179* (TAIF). Chiayi: Sikou (溪 口), ca. 10 m, 29 July 2025, *Hsu 16346* (TAIF). JAPAN. Tokyo, September 1895, *Makino s.n.* (TAIF). Wakayama: Shingu, 1924, *Makino s.n.* (HAST). Saitama:Urawa, *Kawasaki 3960* (HAST).

分類註記：形態上，無翅莎草與覆瓦狀莎草 (*Cyperus imbricatus* Retz.) 十分接近。依據模式標本及相關文獻 (Kern 1952；1974；Koyama 1978；Simpson and Koyama 1998；Koyama *et al.* 2000；Dai *et al.* 2010；Mallick *et al.* 2018；Simpson 2019) 描述之比對，二種之主要差異在於無翅莎草至少有部分穗具長柄，呈聚繖狀排列，且小穗排列較疏鬆，與穗軸交角大，不遮蓋穗軸 (圖 3)；而覆瓦狀莎草所有穗均無柄或近無柄，呈指狀排列，且小穗排列緊密，與穗軸交角小，基部貼伏且幾近完全遮蓋穗軸。需特別指出的是，臺灣植物誌無翅莎草之線描圖 (Koyama 1978: pl. 1138；Koyama *et al.* 2000: pl. 94) 呈現穗無柄，小穗近貼伏之特徵，應屬於覆瓦狀莎草；而其引證標本，除一份 (*Matuda 91*) 著者未能檢閱外，其餘標本 (*Chuang 4623*,

TAI!; HAST!; *Morimoto 190*, TAI!; *Suzuki 6455*, TAI!; *Wang 12701*, TAI!) 皆為覆瓦狀莎草之錯誤鑑定。除此之外，近年出版之多種植物圖鑑，如林 (2000；2002；2005；2009)、李 (2005；2007) 以及許及鐘 (2017) 所示之無翅莎草照片，則是大井氏莎草 (*Cyperus ohwii* Kük.) 之錯誤鑑定，二者之區辨可參照大井氏莎草之分類註記及表2。著者檢視臺灣各大標本館材料，亦發現採自臺灣，鑑定為無翅莎草之標本幾為覆瓦狀莎草、大井氏莎草或其它同屬物種之錯誤鑑定，目前僅能確認本文引證之四份標本確為無翅莎草，採自臺中、嘉義一帶，顯示本種在臺灣可能並非常見物種，惟其實際分布範圍仍有待更詳盡的調查。

Dai *et al.* (2010) 依據小穗密集程度、長度及花朵數等特徵將無翅莎草區分為 4 個變種；惟依據著者之觀察，本種小穗長度及花朵數可在同一個體觀察到隨著花序發育而呈現顯著之變化 (圖 3-G–H)，對其是否為有意義之分類特徵感到存疑。此外，部分研究者認定東亞之族群為另一變種 *Cyperus exaltatus* var. *iwasakii* (Makino) T. Koyama (Koyama 1955) 或獨立物種 *C. iwasakii* Makino (Iwatsuki *et al.* 2020)，但 Kern (1974) 則認為東亞、東南亞、澳洲與印度 (模式標本產地) 之材料之間均無法找到顯著形態區隔。考量本種廣泛的世界分布，其變化範圍與種下分類或有待全球性的重新檢視，因此本研究暫時仍將臺灣族群處理為 *C. exaltatus* 且不作種下分類群之認定。

Cyperus ligularis L., Syst. Nat., ed. 10. 2: 867. 1759. Fig. 4.

Lectotype: JAMAICA. *P. Browne s.n.* (LINN 70.37 image!), designated by Tucker (1983: 49).

形態描述：多年生草本。根莖粗短。稈單生或簇生，直立，長 50–130 cm，徑 5–10 mm，橫截面鈍三稜形，表面灰綠色，無毛，密布細小乳突。葉簇生於稈基部，灰綠色，硬革質，長 30–100 cm，寬 5–16 mm，橫截面 V 形，邊緣及中肋下表面具鋒利之矽質糙齒。葉狀總苞 5–8 枚，基部近平

展或稍斜上，最長者達 50–90 cm。花序分枝 5–12 條，開展，最長者達 4–12 cm。穗 3–7 枚接近指狀排列，分枝頂端之穗圓筒狀，長 2–4 cm，直徑 8–15 mm，約有 40–80 枚小穗；側生之穗明顯較短，長橢球狀至近球形，約有 20–50 枚小穗。小穗密生，完全遮蔽穗軸，近先端者斜出，其餘近平展，長橢圓形，稍扁壓狀，長 3–7 mm，寬 1–2.2 mm，小穗軸基部具關節 (老熟時整個小穗一齊脫落)。鱗片 4–7 枚，二列互生，兩側半透明，常帶紅褐色暈 (生長於遮蔭環境者色澤較淡)，具 9–11 條顯著肋脈，中肋綠色，先端銳尖或短突尖，展平後為闊卵形，長 2–3.3 mm，寬 1.2–2.3 mm。雄蕊 3 枚，花葯長約 0.8 mm；花柱長 0.5–1 mm，柱頭 3 裂，長 1–2.3 mm。瘦果褐色，倒卵形至橢球狀，橫截面三稜形，長 1.4–1.7 mm，寬 0.6–0.8 mm，表面具細微刻點。

臺灣俗名：「舌狀磚子苗」(新擬)。「舌狀」為拉丁種尾名 "*ligularis*" 之直譯，命名者並未解釋緣由 (Linnaeus 1759)，著者推測其紅褐色圓筒狀之穗在壓製成腊葉標本後形似舌頭而成為命名依據。本種小穗基部具關節，而莎草屬中具此特徵之類群，中文常亦以「磚子苗」為名，例如莎草磚子苗 (*Cyperus cyperinus* (Retz.) Valck. Sur.) 及輻射磚子苗 (*C. radians* Nees & Meyen ex Kunth) 等 (許及鐘 2017)，故於本種沿用此稱呼。

地理分布：原生於北美東南部，中、南美洲及熱帶非洲 (Ball *et al.* 2002；Hutchinson *et al.* 2014)。臺灣目前僅發現於高雄旗津一帶，棲地鄰近高雄港第一及第二港口，因此推測為隨著進出船舶意外引入之歸化物種。

生態環境與物候：海岸附近之開闊荒地及木麻黃防風林下，5–10 月間皆可觀察到花、果序。

Additional specimens examined: TAIWAN. Kaohsiung: Chichin (旗津), near sea level, 11 September 2024, *Hsu 15719* (TAIF); *Hsu 15720* (TAIF); Second Entrance of Kaohsiung Port (高雄港第二港口), near sea level, 26 May 2025, *Hsu 16149* (TAIF).

分類註記：舌狀磚子苗在臺灣

最早之紀錄可追溯至 2019 年 iNaturalist 網站上之觀察 (www.inaturalist.org/observations/25423777)，2020 年在相距約 300 m 處尚有另一筆觀察紀　錄 (www.inaturalist.org/observations/50868245)，顯示野生族群在旗津一帶至少已穩定存在數年且有小幅度之擴散。本種重要鑑別特徵包含植物體呈灰綠色，稈密被細小乳突，葉身及總苞硬革質，邊緣及中肋下表面具鋒利之矽質糙齒；穗接近指狀排列，分枝最頂端之穗呈圓筒狀，側生之穗明顯較短，具短柄或近無柄；小穗數目多 (分枝頂端之穗通常有 40–80 枚) 且非常密集，近先端者斜出而其餘近平展，完全遮蔽穗軸，基部具關節 (圖 4) (Tucker 1983；Ball *et al.* 2002)。在臺灣的已知物種當中形態最接近者為同樣偏好生長於海岸環境的爪哇磚子苗 (*Cyperus javanicus* Houtt.)，但其小穗數目較少 (通常少於 30 枚)，未完全遮蔽穗軸，且部分小穗顯著反折。

Cyperus ohwii Kük., Repert. Spec. Nov. Regni Veg. 29: 197. 1931. Fig. 5.

Type: JAPAN. Fukuoka (cultivated in Kyoto Botanical Gardens), *Y. Doki s.n.* (not traced).

Heterotypic synonym: *Cyperus elatus* var. *macronux* C.B. Clarke, J. Linn. Soc., Bot. 21: 190. 1884. Lectotype: BANGLADISH. Ibrahimpur, Comilla, 4 September 1871, *C.B. Clarke 14188* (CAL image!; isolectotypes: K image!), designated by Prasad (2014: 105).

形態描述：多年生草本。根莖粗短。稈簇生，直立，長 60–150 cm，徑 5–10 mm，橫截面鈍三稜形，光滑。葉簇生於稈基部，長 30–100 cm，寬 8–18 mm，橫截面倒 W 形，邊緣具矽質糙齒；葉鞘淡紅褐色。葉狀總苞 4–6 枚，基部斜上，最長者達 30–60 cm。花序聚繖或複聚繖狀，分枝 5–9 條，斜上，最長者達 8–16 cm。穗 3–8 枚聚繖狀排列，圓筒狀，長 2–6 cm，直徑 6–12 mm，約有 30–100 枚小穗；穗軸具稜，光滑。小穗密生 (但未完全遮蔽穗軸)，斜出至近平展，線狀長橢圓形，扁壓狀，長 4–8 mm，寬約 1.5

mm。鱗片 10–16 枚，二列互生，中肋綠色，先端銳尖或短突尖，兩側淡黃褐色，老熟後常帶紅褐色脈紋，展平後近橢圓形，長 1.5–2 mm，寬 1–1.3 mm。雄蕊 3 枚，花葯長約 1 mm，葯隔顯著突出呈角狀；花柱長約 0.5 mm，柱頭 3 裂，長約 1.2 mm。瘦果灰褐色，卵狀長橢圓形，橫截面三稜形，長 1.2–1.8 mm，寬 0.4–0.5 mm。

臺灣俗名：「大井氏莎草」(新擬)，直譯自種小名 "*ohwii*"，著名日本植物學者大井次三郎 (Jisaburo Ohwi 1905–1977)。

地理分布：間斷分布於日本、越南、泰國、孟加拉、印度尼西亞 (爪哇) 及澳洲東北部 (Kern 1974；Prasad 2014；Iwatsuki *et al.* 2020)，新紀錄於臺灣北部及東北部 (臺北、桃園、宜蘭)。

生態環境與物候：大井氏莎草在臺灣多被發現於北部及東北部平野至淺山地帶水位較穩定之天然及人工淡水池沼，常生長於池畔草澤與淺水處。新鮮花序可見於 4–10 月，果序則全年可見。

Additional specimens examined: TAIWAN. Taipei: Kuantu Plain (Kuan-tu Champaign；關渡平原), 20 m, 18 October 2009, *Lu 19051* (HAST; TAIF); Linung Wetlands (立農濕地), 10 m, 12 November 2020, *Lu 34049* (TAIF); Neikou (內溝), 15 m, 6 May 2025, *Hsu 16076* (TAIF). New Taipei: Fuzhou (浮洲), 5 m, 11 October 2024, *Hsu 15764* (TAIF). Taoyuan: Hsiutsaiwo (秀才窩), 250 m, 10 September 1999, *Peng 17704* (HAST); Lungtan (龍潭), 29 September 2002, *Lin 534* (TAIF). Ilan: Shuanglienpi (Shuanglien Pond；雙連埤), 400–500 m, 23 May 2001, *Lin 241* (TAIF); 20 August 2005, *Chu CMK00024* (TAIF); 460 m, 18 December 2008, *Hsu 2105* (TAIF); 467 m, 15 September 2023, *Wang 3263* (TAIF); Yuanshan (員山), 0–50 m, 21 April 2002, *Lin 2052* (TAIF); Luodong Forestry Centre (羅東林場；宜蘭林場), 6 May 2006, *Lin s.n.* (TAIF); 21 May 2006, *Chiou s.n.* (TAIF); Wuchhieh (五結) to Tingliao (頂寮), 7 April 2009, *Chen 1210* (TAIF). JAPAN. Fukuoka

(cultivated in Kagoshima), *Hatusima 959* (BR, GH, H, NY, P, images).

分類註記：大井氏莎草於 1990 年代以降於臺灣北部及東北部已有多次採集紀錄，其照片也可見於各種圖鑑（參照無翅莎草之分類註記）以及自然觀察網站，但這些材料大多錯誤鑑定為無翅莎草。綜合文獻記述 (Kern 1952；1974；Simpson and Koyama 1998；Prasad 2014；Iwatsuki *et al.* 2020)，大井氏莎草與無翅莎草最明確的區辨特徵在於前者瘦果卵狀長橢圓形，長 1.2–1.8 mm (圖 5-K–M)，且花葯先端之葯隔明顯伸長呈角狀 (圖 5-I)；而後者瘦果為倒卵狀至橢球狀，長 0.6–0.8 mm (圖 3-K–N)，花葯先端之葯隔不顯著伸長 (圖 3-K)。此外，單就臺灣之野外族群及標本觀之，二種之外觀尚有下列差異：大井氏莎草小穗排列較為密集 (間隔少於 1 mm)，鱗片先端銳尖或短突尖狀，老熟後常有紅褐色脈紋而無鑲邊，不易脫落 (圖 5-G–H)；而無翅莎草小穗排列較為疏鬆 (間隔常超過 1 mm)，鱗片先端具短芒尖 (約 0.3 mm)，老熟後具褐色鑲邊而無脈紋，較易脫落，使小穗軸基部裸露，貌似柄狀 (圖 3-I–H)。唯無翅莎草為一分布廣泛之類群，而著者僅詳細檢閱過少量樣本，這些鑑別特徵是否穩定適用於所有材料仍有待後續確認。鑒於本種與無翅莎草、覆瓦狀莎草外觀接近，本文另整理三物種之形態比較於表 2。

Cyperus sulcinux C.B. Clarke, J. Linn. Soc., Bot. 21: 56. 1884. Fig. 6.

Lectotype: INDIA. Sikkim, Little Runjeet, 2 October 1875, *C. B. Clarke 24860* (K000592575 image!), designated by Bhandari *et al.* (2024: 123).

形態描述：可參照 Kern (1974: 650)，Koyama *et al.* (2000: 293–294, "*Pycreus sulcinux*")，Dai *et al.* (2010: 244–245, "*Pycreus sulcinux*") 及 Bhandari *et al.* (2024)。

臺灣俗名：「墾丁扁莎」(Koyama *et al.* 2000)。

地理分布：中國南部、印度、東南亞至澳洲東北 (Dai *et al.* 2010；Bhandari *et al.* 2024)。

生態環境與物候：低海拔之開闊荒地，常生長於擾動過後植被稀疏處，介質偏好濕潤但未積水之砂質壤土。花果期 7–11 月。

Additional specimens examined: TAIWAN. Chiayi: Neiwong Village (內甕村), 120 m, 25 September 2023, *Hsu 15267* (TAIF). Hualien: Shihmen (石門), ca. 1 m, 29 August 2024, *Hsu 15703* (TAIF).

分類註記：墾丁扁莎在臺灣首次記載於 Koyama (1978)，採用學名為 *Pycreus sulcinux* (C. B. Clarke) C. B. Clarke；爾後因扁莎屬 (*Pycreus*) 重新歸併入莎草屬 (*Cyperus*) (Larridon *et al.* 2014)，本種亦回復最初發表之學名。臺灣植物誌兩個版本 (Koyama 1978；Koyama *et al.* 2000) 均僅引證一份郭長生採自墾丁 (Kenting) 之標本 (*Kuoh 2151*)，但未註記存放位置及其它資訊，而著者也未能確認此份標本於今存放於何處。許及鐘 (2017) 曾記載墾丁扁莎可見於臺灣南部平野，但該書提供之照片後來確認為錯誤鑑定，實際上是斑鱗莎草 (*C. sphacelatus* Rottb.) (Hsu 2022)。此外，TAI 有一份採自雲林古坑農場之標本 (*Suzuki & Kamikoti 4741*) 標註為 "*Cyperus sulcinux*"，但著者鑑定該份標本應為疏鱗莎草 (*C. mitis* Steud.)；斑鱗莎草與疏鱗莎草皆柱頭 3 裂，瘦果三稜形，與柱頭 2 裂，瘦果扁平之墾丁扁莎可明確區辨。以上可知墾丁扁莎在臺灣自從首次被發現後，資料極度缺乏，著者直到 2023 及 2024 年方於嘉義與花蓮再次發現野外族群，從而確認其在臺灣有廣泛但零星之分布。本種植物體纖細，容易被誤認為近緣物種如球穗扁莎 (*Cyperus flavidus*Retz.) 發育不良之個體，且生長期較短，或因此容易受到忽視。

本種形態特徵包含：植物體一年生，不具根莖，稈纖細簇生，通常不超過 20 cm 高；小穗線形，寬約 1–1.5 mm；鱗片疏生，兩側薄膜質幾近透明，可見到內部之黃褐色瘦果 (圖 6)。最重要之鑑別依據在於瘦果長橢圓形，扁壓狀，兩面中央略為凹陷 (圖 6-E)，符合「槽果扁莎」之別稱 (Dai *et al.* 2010)。

Fimbristylis alboviridis C. B. Clarke in Hooker, Fl. Brit. India 6: 638. 1893. Fig. 7.

Lectotype: INDIA. Assam, *Jenkins 212* (K, two sheets), designated by Kern (1955: 140); second-step: K000974101!, designated by Kumar and Bharati (2020: 41); isolectotypes: CAL0000001754, CAL0000001757, K000974099!, L0042521 image!].

Heterotypic synonym: *Fimbristylis shimadana* Ohwi, Acta Phytotax. Geobot. 5: 184. 1936. ***syn. nov.*** Type: TAIWAN ("Formosa"). Kaohsiung: Dashu ("Daijusho"), June 1934, *S. Ito 5474B* (holotype: KYO00022203 image!).

形態描述：可參照 Kern (1974: 580；f. 46)，Simpson and Koyama (1998: 322)，Koyama *et al.* (2000: 276, "*Fimbristylis shimadana*")，Dai *et al.* (2010, "*Fimbristylis shimadana*") 以及許及鐘 (2017: 343, "*Fimbristylis shimadana*")

臺灣俗名：「白穗飄拂草」(Koyama *et al.* 2000)。由於 *Fimbristylis alboviridis* 未見其它中文俗名之紀載，因此建議繼續沿用 *F. shimadana* 之俗名。

地理分布：廣泛分布於東南亞、南亞至非洲中、西部 (Kern 1974；Hutchinson *et al.* 2014)；臺灣可見於全島海拔 700 m 以下之平野及淺山地帶。

生態環境與物候：本種多生長於平野及淺山地帶，海拔 700 m 以下夏季濕潤或短暫積水之開闊草原與荒地，亦能於公園綠地、花圃等人工環境被發現。常於梅雨季前後開始生長，花果期多集中於 6–11 月，至冬季植物體完全枯萎。

Additional specimens examined: TAIWAN. New Taipei: Kuanghsing (廣興), 50 m, 2 September 1996, *Wu 967* (TAIF); Tuchen Ammunition Depot (土城彈藥庫), 50 m, 3 August 2008, *Hsu 1505* (TAIF); Xiangshe Neighborhood (香社里), 5 m, 11 October 2024, *Hsu 15763* (TAIF). Ilan: Tsaonanshan (草湳山), 90–100 m, 5 October 2001, *Chung 4660* (TAIF). Nantou: Yuchih (魚池), 700 m, 29 June 2017, *Hsu 9326* (TAIF). Chiayi: Tuanchu Neighborhood (短竹

里), 100 m, 24 September 2007, *Hsu 986A* (TAIF); Neiweng Village (內 甕 村), 120 m, 25 September 2023, *Hsu 15265* (TAIF). Tainan: Southern Taiwan Science Park (南部科學工業園區), 50 m, 23 October 2007, *Hsu 1030* (TAIF); Syucuohu (許厝湖), 50–100 m, 27 September 2014, *Hsu 7275* (TAIF). Pingtung: Lungluan Lake (龍鑾潭), 10 m, 22 August 2008, *Hsu 1614* (TAIF); Yungching (永靖), 50–100 m, 17 September 2008, *Hsu 1725* (TAIF); Lungtsaipu (籠仔埔), 50–100 m, 17 September 2008, *Hsu 1739* (TAIF); Chufengpi (出 風 鼻), 50–150 m, 17 September 2011, *Hsu 4676* (TAIF); Wangsha (網紗), 100–200 m, 3 November 2010, *Hsu 3331* (TAIF); Chiupeng (九 棚), 0–10 m, 14 November 2011, *Hsu 5019* (TAIF); Baolishan (保力山), 60 m, 13 October 2010, *Hsu 13671* (TAIF).

分類註記：白穗飄拂草自發表後均被視為臺灣特有種 (Koyama 1978；Koyama *et al.* 2000；Dai *et al.* 2010)；然而經比對原始描述、模式標本及其它採自臺灣之材料顯示其形態特徵與 *Fimbristylis alboviridis* 一致，因此首次將二學名合併。本種與竹子飄拂草 (*F. dichotoma* (L.) Vahl) 相當接近，二種之主要鑑別特徵在於白穗飄拂草為一年生植物，瘦果表面約有 10–16 列網格狀之表皮細胞，並散生細小瘤突，不具顯著的縱向肋脊 (圖 7-E)；而竹子飄拂草通常為短多年生植物，瘦果表面約有 7–12 列網格狀之表皮細胞，且網格兩側邊緣邊隆起而相連形成縱向之肋脊 (Kern 1974；Koyama *et al.* 2000；Dai *et al.* 2010；Prasad 2017)。在野地觀察時，白穗飄拂草植物體通常較為細弱，無顯著根莖，花序甚開展，小穗略小，鱗片淡綠色或稍帶褐暈，可約略與竹子飄拂草分辨。過往臺灣罕有本種之報導，臺灣植物誌第二版 (Koyama *et al.* 2000) 甚至未列出任何引證標本；惟著者近年調查顯示，白穗飄拂草於嘉義以南之淺山平野分布尚稱廣泛，亦偶見於中、北部，推測因生長期較短，棲地較少獲得調查者關注，植物體與常見的竹子飄拂草不易分辨等原因而易受忽視。

Schoenoplectus subulatus (Vahl) Lye, Skr. Utg. Svensk Linné-Sällsk. 124: 290. 1971. Fig. 8.

Basionym: *Scirpus subulatus* Vahl, Enum. Pl. 2: 268. 1805.

Type: INDIA. Nicobar Islands, *Anonymous collector s.n.* (holotype: C10010636 image!).

形態描述：多年生草本，具橫走之短根莖及長走莖。稈直立，長 30–120 cm，圓柱狀，直徑 3–8 mm，光滑，基部由長 2–20 cm 之鞘狀退化葉包覆；最頂端之葉片具 1–8 cm，早凋之葉身，其餘無葉身。總苞 1 枚，直立，貌似稈之延伸，鑽形，短或長於花序。花序假側生，聚繖狀至複聚繖狀；分枝 3–7 條，長 1–7 cm，略柔軟，常彎垂，先端有 1–3 枚小穗。小穗卵形至卵狀長橢圓形，長 6–20 mm；鱗片覆瓦狀密生，淡褐色，邊緣半透明乾膜質，長 3–4 mm，先端凹入，具約 0.5 mm 之短芒。雄蕊 2 枚，花葯線形，長約 2 mm。柱頭 2 裂。瘦果闊倒卵形，栗褐色，長 1.9–2.7 mm，橫截面雙凸鏡形。下位剛毛 4–5 枚，近等長或略長於瘦果，具羽毛狀邊飾。

臺灣俗名：「鑽苞水蔥」，沿用 Dai *et al.* (2010)，源自種小名 "*subulatus*"，意指其鑽形之總苞片。

地理分布：廣泛分布於非洲、熱帶亞洲至大洋洲 (Iwatsuki *et al.* 2020)，臺灣新紀錄於臺南 (七股) 及高雄 (茄萣)。

生態環境與物候：本種生長於半鹹水濕地，在臺灣被發現於潟湖淤積形成之沼澤以及廢棄之魚塭內，主要伴生物種有蘆葦 (*Phragmites australis* (Cav.) Trin. ex Steud.)、彭佳嶼飄拂草 (*Fimbristylis sieboldii* Miq. ex Franch. & Sav.) 與海雀稗 (*Paspalum vaginatum* Sw.) 等。花、果序全年可見，但冬季有時因棲地缺水而致地上部分完全乾枯。

Additional specimens examined: TAIWAN. Tainan: Chiukuaitso (九塊厝), ca. 2 m, 29 February 2024, *Hsu 15404* (TAIF); 4 May 2024, *Hsu 15509* (TAIF). Kaohsiung: Chilou (崎漏), near sea level, 9 December 2008, *Hsu 2074* (TAIF).

分類註記：鑽苞水蔥重要鑑別特徵包含稈圓柱狀 (圖 8-B–C) 以及瘦果下位剛毛具羽毛狀附屬物 (圖 8-J–K) (Dai *et al.* 2010；Iwatsuki *et al.* 2020)。其外觀與同屬之莞 (*Schoenoplectus tabernaemontani* (C. C. Gmel.) Palla) 較為接近，但莞之小穗較小 (長 4–10 mm)，且瘦果下位剛毛具倒刺狀附屬物。本種天然分布於臺灣周邊的呂宋島、海南島及琉球群島 (Kern 1974；Dai *et al.* 2010； Iwatsuki *et al.* 2020)，而在臺灣新發現之生育地鄰近曾文溪口濕地及茄萣濕地，均為大量候鳥之棲息地，因此推測野外族群可能藉由鳥類攜帶而自然引入。

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表 1 鹿兒島薹 (*Carex kagoshimensis*) 與近緣類群形態特徵比較
Table 1 Morphological comparison between *Carex kagoshimensis* and allied taxa

	C. kagoshimensis	*C. laticeps*	*C. manca* subsp. *manca*	*C. manca* subsp. *takasagoana*
Culm and leaf surface	glabrous	pubescent	glabrous	glabrous
Leaf width	6–18 mm	3–6(–13) mm	4–10 mm	3–5 mm
Apex of staminate scales	emarginate	rounded to acuminate	acuminate	obtuse to acuminate
Pistillate spike width	8–10 mm	8–10 mm	6–7 mm	5–6 mm
Perigynium arrangement and posture	dense, ascending	dense, spreading	lax, ascending	lax, ascending
Beak of achene	curled	curled	curled	straight

表 2 無翅莎草 (*Cyperus exaltatus*) 與近緣物種形態特徵比較
Table 2 Morphological comparison between *Cyperus exaltatus* and allied taxa

	C. exaltatus	*C. imbricatus*	*C. ohwii*
Spike arrangement	corymbose; at least some spikes apparently stalked	digitate; all spikes sessile or subsessile	corymbose; at least some spikes apparently stalked
Spikelet posture	spreading, not covering rachis	appressed to and covering rachis	spreading, not covering rachis
Mucro at scale apex	short but distinct (ca. 0.3 mm long)	short but distinct (ca. 0.3 mm long)	obscure (< 0.1 mm long)
Connective of anther	slightly prominent, rounded	slightly prominent, rounded	distinctly prominent, horn-like
Achene shape	obovoid to ellipsoid	obovoid to ellipsoid	ovate-oblong
Achene length	0.6–0.8 mm	0.6–0.8 mm	1.2–1.8 mm

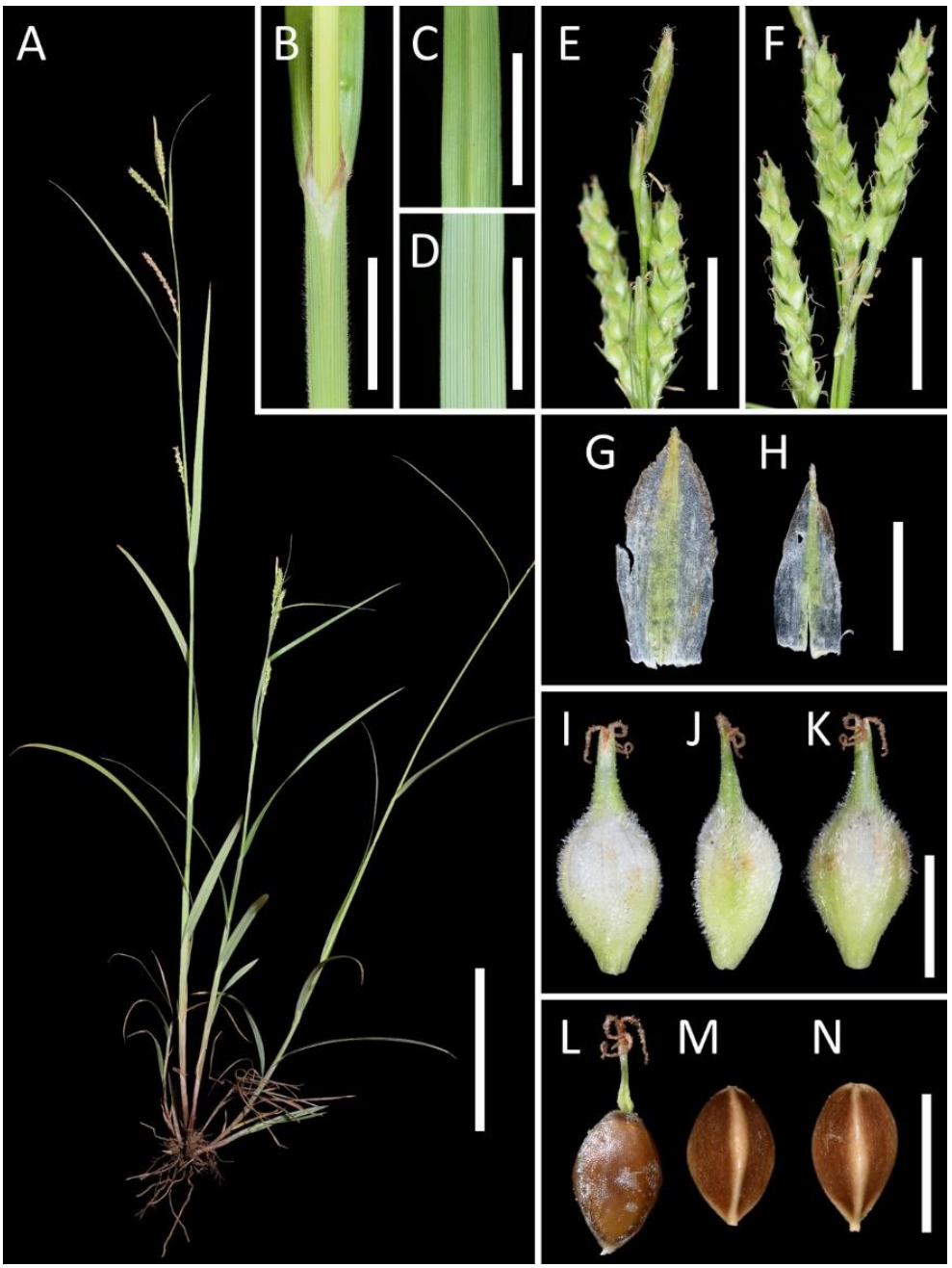

圖 1 閩北薹 (*Carex borealifujianica*) 之形態特徵，基於 *Hsu 9034* (TAIF)。A. 植物體。B. 稈及葉鞘。C. 葉近軸面。D. 葉遠軸面。E. 頂生雄穗。F. 側生雌穗。G. 雄花鱗片 。H. 雌花鱗片 。I–K. 果囊。L–M. 瘦果。

Fig. 1 Morphology of *Carex borealifujianica*, from *Hsu 9034* (TAIF). A. Habit. B. Culm and leaf sheath. C. Adaxial surface of leaf blade. D. Abaxial surface of leaf blade. E. Terminal staminate spikes. F. Lateral pistillate spikes. G. Staminate scale. H. Pistillate scale. I–K. Perigynia. L–N. Achenes. Scale bars: A = 10 cm; B–F = 1 cm; G–N = 2 mm.

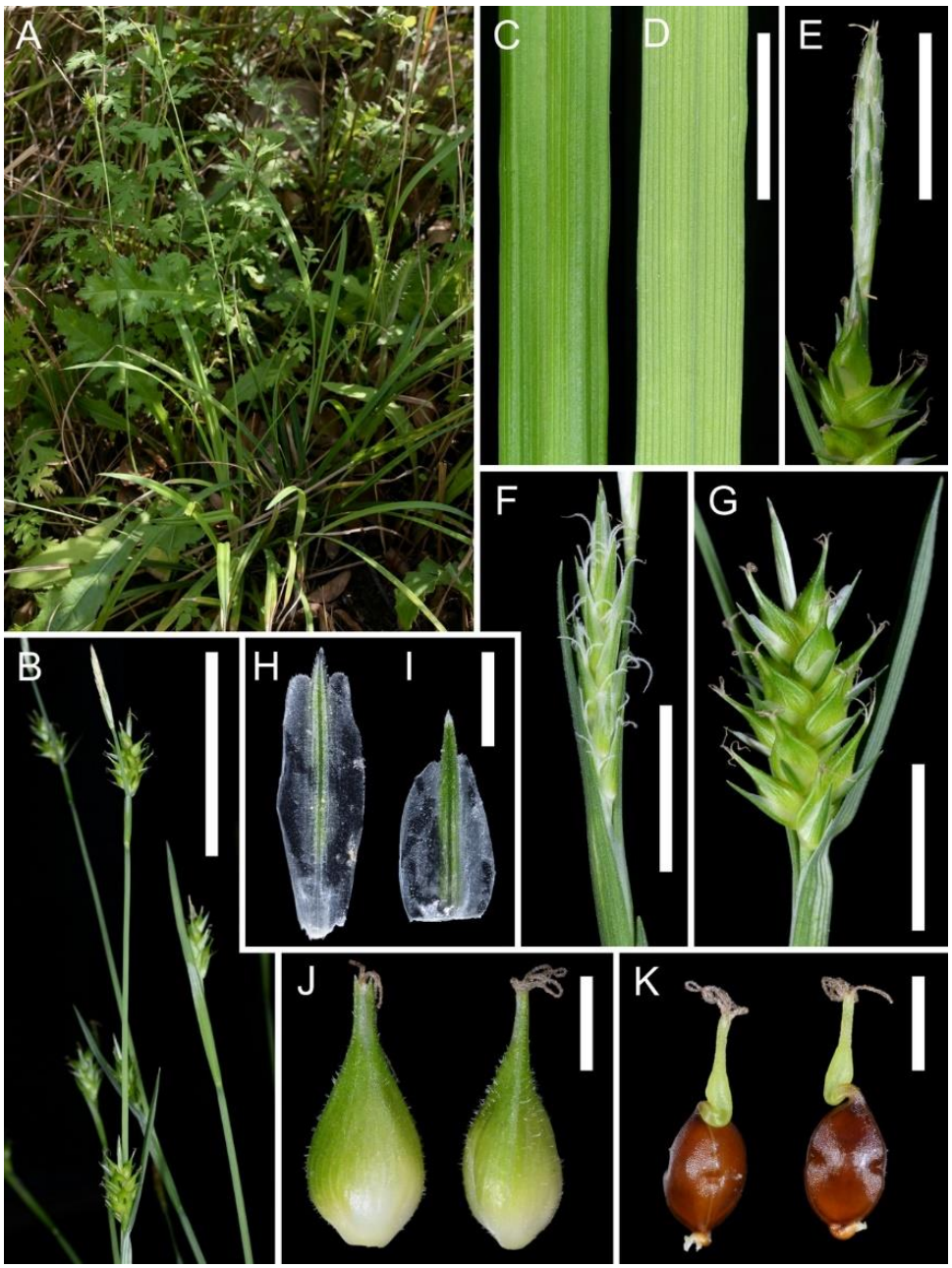

圖 2 鹿兒島薹 (*Carex kagoshimensis*) 之形態特徵，基於 *Hsu 10281* (TAIF)。A. 棲地與植物體。B. 花序。C. 葉近軸面。D. 葉遠軸面。E. 頂生穗 (雄)。F. 開花期之側生穗 (雌為主)。G. 結果期之側生穗 (雄為主) 。H. 雄鱗片 。I. 雌鱗片 。J. 果囊。K. 瘦果。

Fig. 2 Morphology of *Carex kagoshimensis*, from *Hsu 10281* (TAIF). A. Habitat and habit. B. Inflorescences. C. Adaxial surface of leaf blade. D. Abaxial surface of leaf blade. E. Terminal spike (male). F. Flowering lateral spike (mainly female). G. Fruiting lateral spike (mainly female). H. Staminate scale. I. Pistillate scale. J. Perigynia. K. Achenes. Scale bars: B = 5 cm; C–G = 1 cm; H–K = 2 mm.

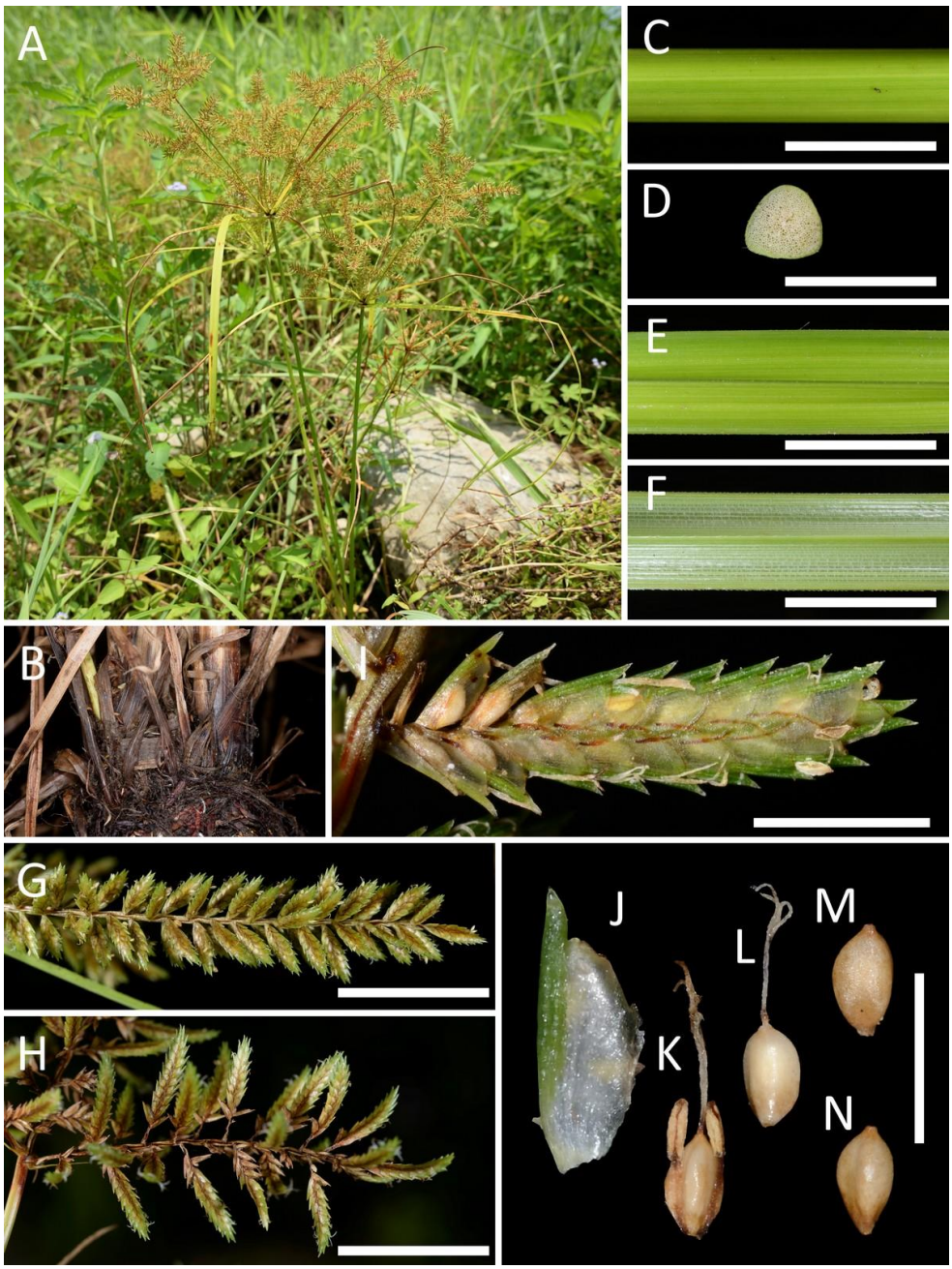

圖 3 無翅莎草 (*Cyperus exaltatus*) 之形態特徵，基於 *Hsu 15595* (TAIF)。A. 棲地與植物體。B. 植物體基部。C. 稈表面。D. 稈橫截面。E. 葉近軸面。F. 葉遠軸面。G. 發育較早期之穗。H. 發育較晚期之穗。I. 小穗。J. 鱗片 。K–N. 瘦果 (K 含兩枚雄蕊)。

Fig. 3 Morphology of *Cyperus exaltatus*, from *Hsu 15595* (TAIF). A. Habitat and habits. B. Plant base. C. Culm surface. D. Cross section of culm. E. Adaxial surface of leaf blade. F. Abaxial surface of leaf blade. G. Spike in earlier growing stage. H. Spike in later growing stage. I. Spikelet. J. Scale. K–N. Achenes (K with two attached stamens). Scale bars: C–I = 1 cm; J–N = 1 mm.

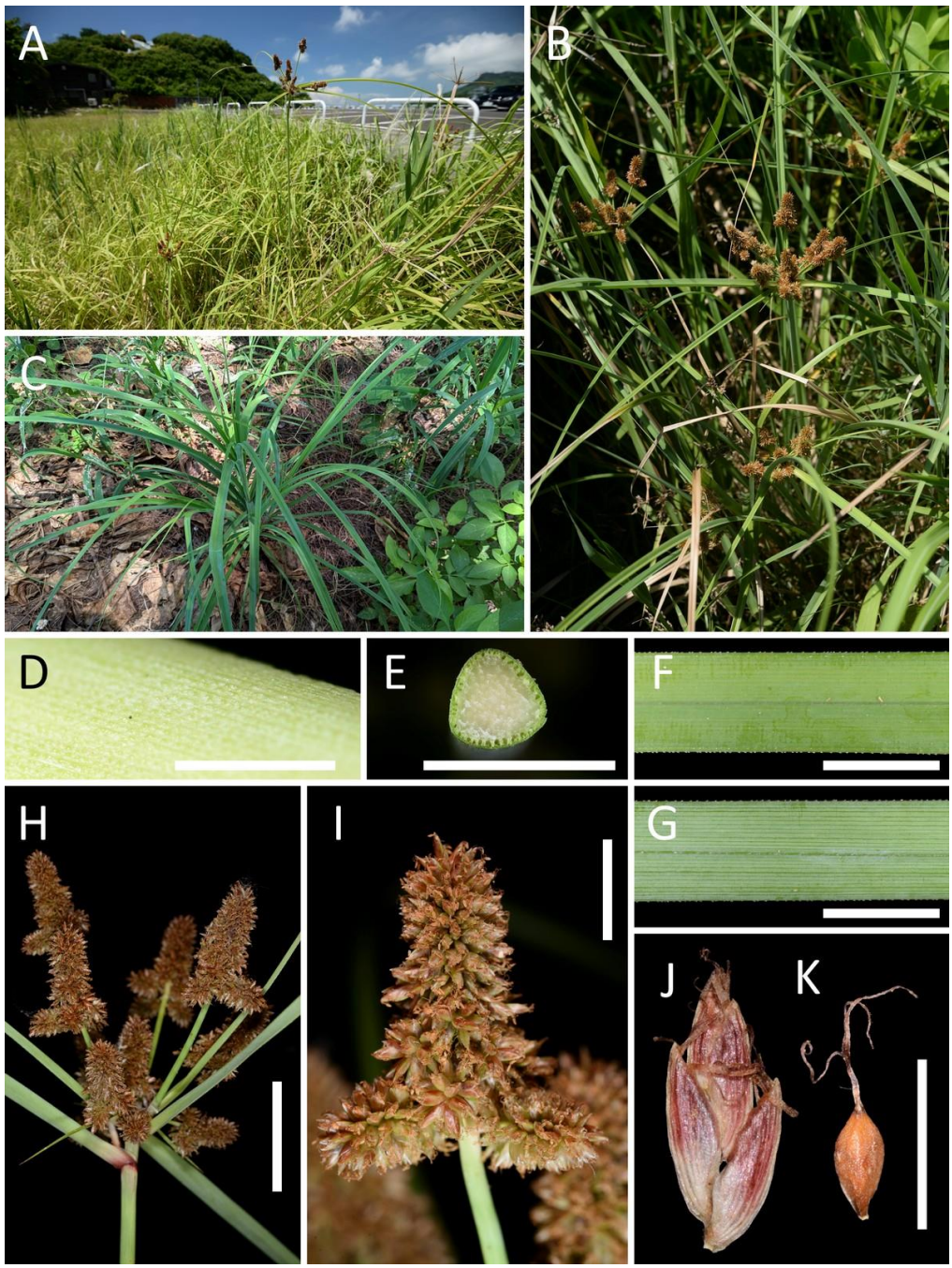

圖 4 舌狀磚子苗 (*Cyperus ligularis*) 之形態特徵，基於 *Hsu 15719* (TAIF)。A–C. 棲地與植物體。D. 稈表面。E. 稈橫截面。F. 葉近軸面。G. 葉遠軸面。H. 花序。I. 穗。J. 小穗。K. 瘦果。

Fig. 4 Morphology of *Cyperus ligularis*, from *Hsu 15719* (TAIF). A–C. Habitat and habits. D. Culm surface. E. Cross section of culm. F. Adaxial surface of leaf blade. G. Abaxial surface of leaf blade. H. Inflorescence. I. Spikes. J. Spikelet. K. Achene. Scale bars: D = 1 mm; E–G and I = 1 cm; H = 3 cm; J–K = 2 mm.

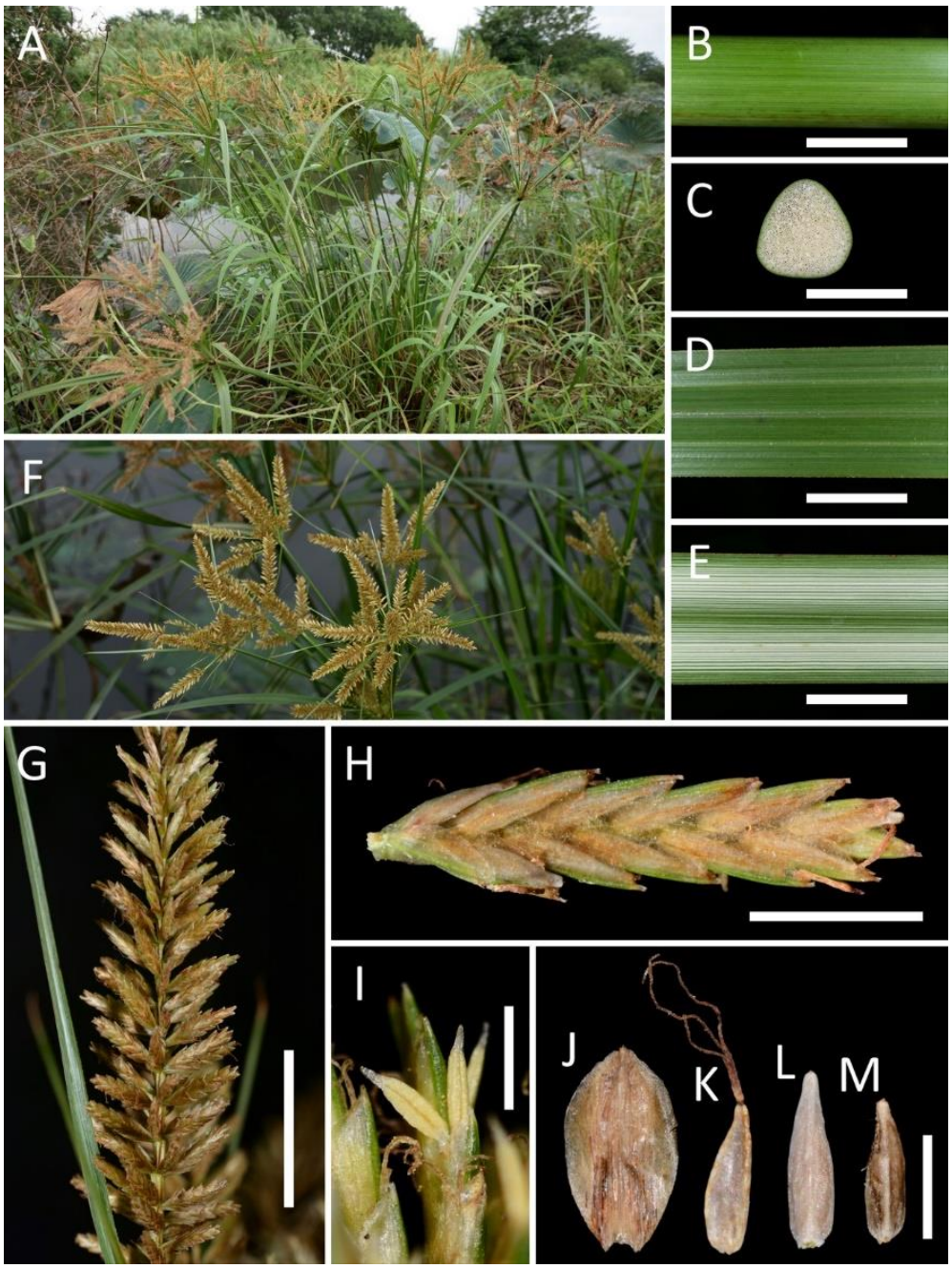

圖 5 大井氏莎草 (*Cyperus ohwii*) 之形態特徵，基於 *Hsu 15764* (TAIF)。A. 棲地與植物體。B. 稈表面。C. 稈橫截面。D. 葉近軸面。E. 葉遠軸面。F. 花序。G. 穗。H. 小穗。I. 雄蕊。J. 鱗片。K–M. 瘦果。

Fig. 5 Morphology of *Cyperus ohwii*, from *Hsu 15764* (TAIF). A. Habitat and habit. B. Culm surface. C. Cross section of culm. D. Adaxial surface of leaf blade. E. Abaxial surface of leaf blade. F. Inflorescence. G. Spike. H. Spikelet. I. Stamens. J. Scale. K–M. Achenes. Scale bars: B–E and G = 1 cm; H = 2 mm; I–M = 1 mm.

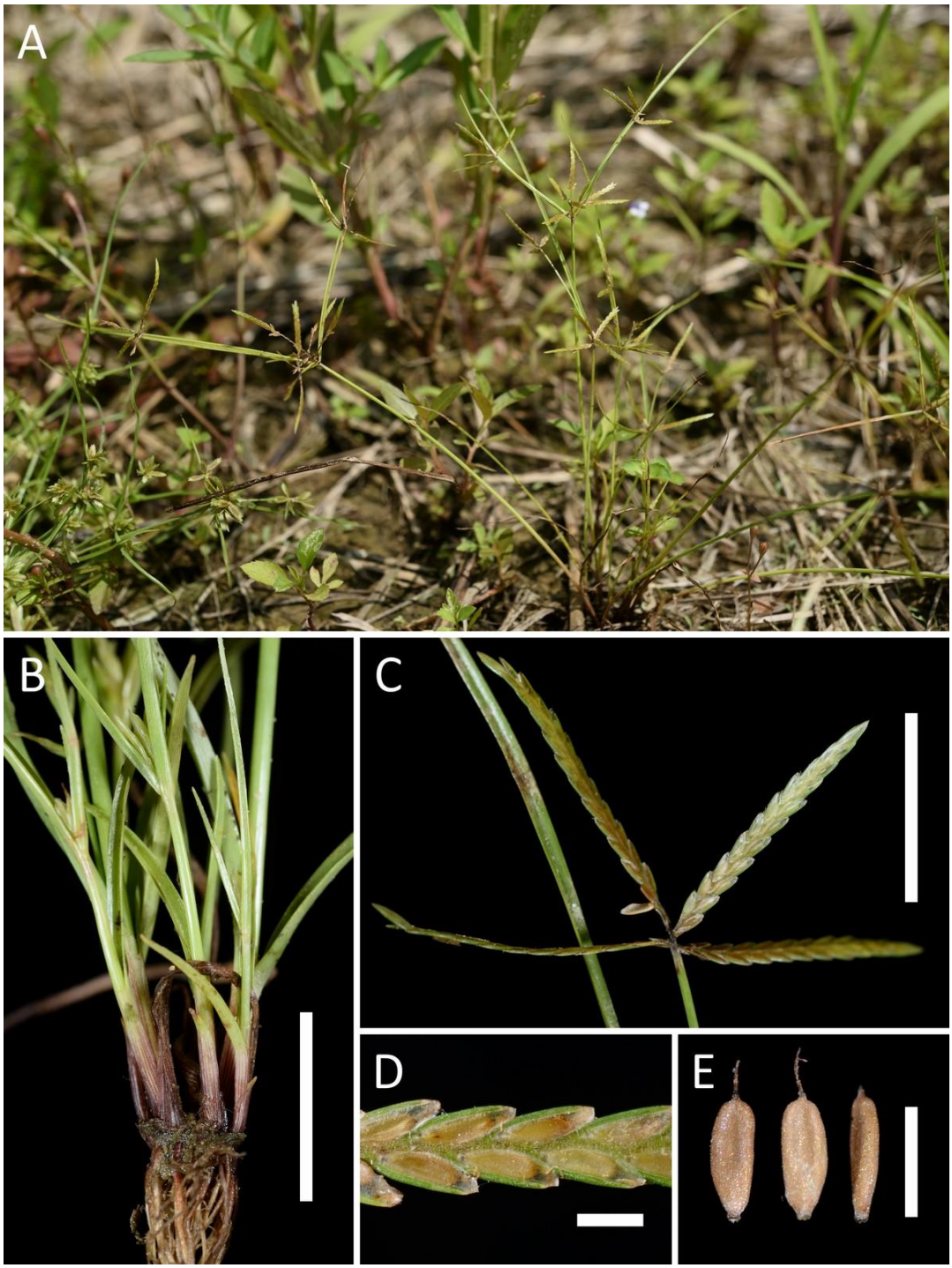

圖 6 墾丁扁莎 (*Cyperus sulcinux*) 之形態特徵，基於 *Hsu 15267* (TAIF)。A. 棲地及植物體。B. 植物體基部。C. 穗及小穗。D. 鱗片。E. 瘦果。

Fig. 6 Morphology of *Cyperus sulcinux*, from *Hsu 15267* (TAIF). A. Habitat and habit. B. Plant base. C. Spike and spikelets. D. Scales. E. Achenes. Scale bars: B–C = 1 cm; D = 2 mm; E = 1 mm.

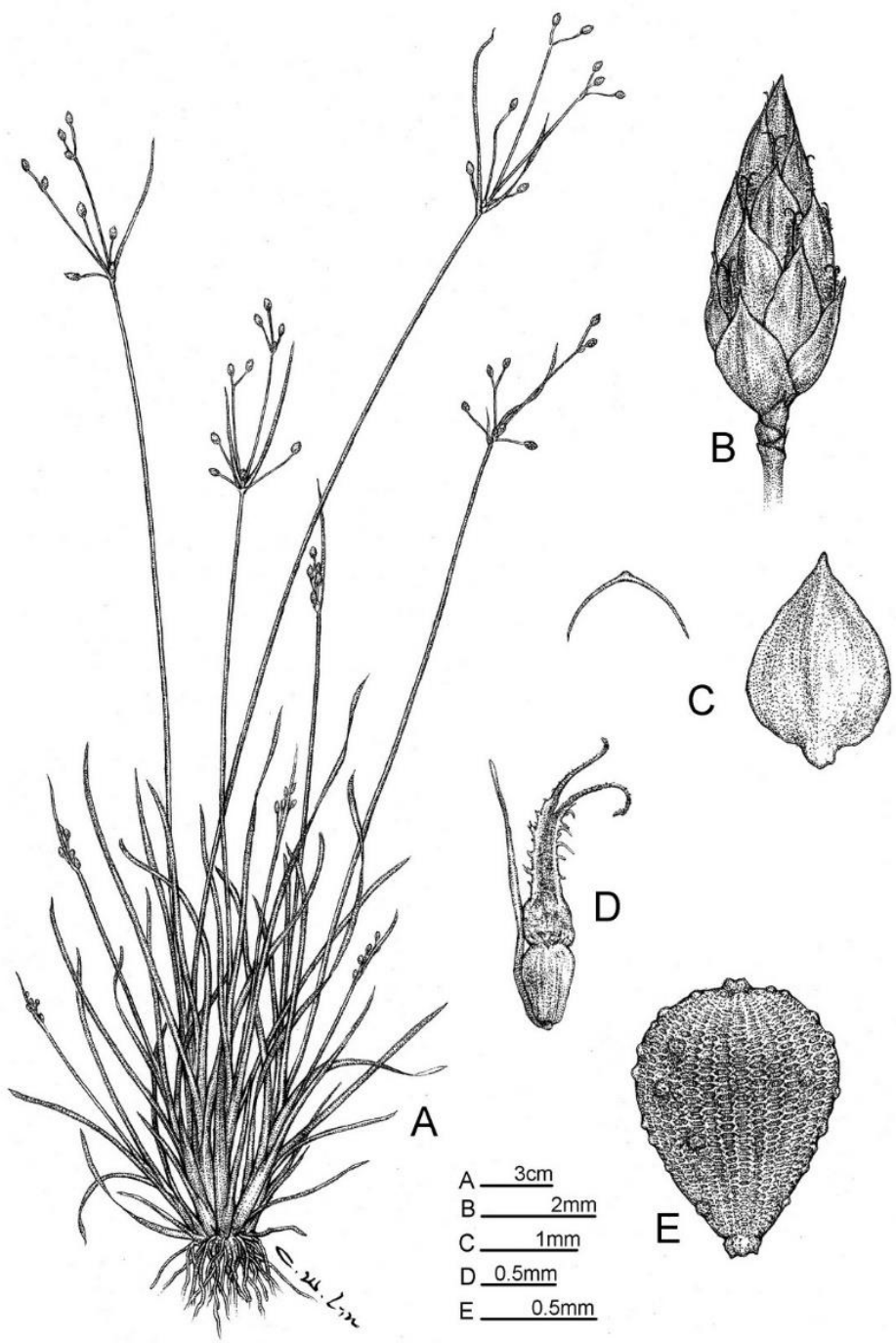

圖 7 白穗飄拂草 (*Fimbristylis alboviridis*) 之形態特徵，基於 *Hsu 1505* (TAIF)。A. 植物體。B. 小穗。C. 鱗片。D. 花。E. 瘦果。林哲緯繪製。

Fig. 7 Morphology of *Fimbristylis alboviridis*, from *Hsu 1505* (TAIF). A. Habit. B. Spikelet. C. Scale. D. Flower E. Achene. The figures were illustrated by Che-Wei Lin.

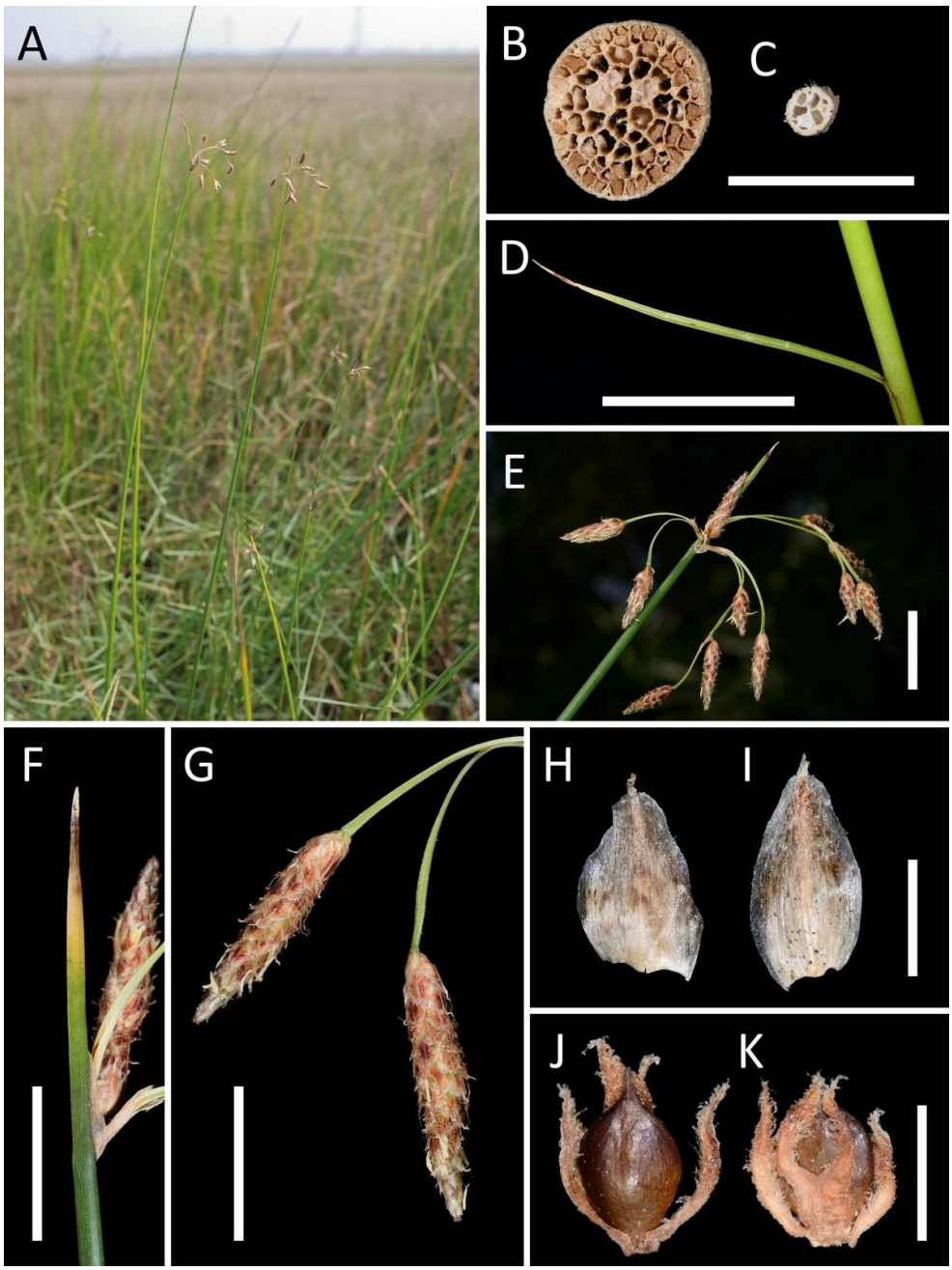

圖 8 鑽苞水蔥 (*Schoenoplectus subulatus*) 之形態特徵。A 基於 *Hsu 2074* (TAIF)；B–K 基於 *Hsu 15404* (TAIF)。A. 棲地與植物體。B. 稈近基部橫截面。C. 稈近頂端橫截面。D. 葉身。E. 花序。F. 總苞。G. 小穗。H–I. 鱗片 。J–K. 瘦果。

Fig. 8 Morphology of *Schoenoplectus subulatus*. A from *Hsu 2074* (TAIF); B–K from *Hsu 15404* (TAIF). A. Habits. B. Cross section of culm (near base). C. Cross section of culm (near apex). D. Leaf blade. E. Inflorescence. F. Involucre. G. Spikelets. H–I. Scales. J–K. Achenes. Scale bars: B–C = 5 mm; D = 5 cm; E = 2 cm; F–G = 1 cm; H–K = 2 mm.

Distimake aegyptius (L.) A.R.Simões & Staples (Convolvulaceae), a newly naturalized species of *Distimake* in Taiwan

臺灣蔓龍藤屬的新歸化物種—埃及蔓龍藤（旋花科）

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Abstract

The genus *Distimake* Raf. in Taiwan comprises six species, including two native species - *D. quinatus* (R.Br.) A.R.Simões & Staples and *D. vitifolius* (Burm.f.) Pisuttimarn & Petrongari, and four naturalized species - *D. tuberosus* (L.) A.R.Simões & Staples, *D. dissectus* (Jacq.) A.R.Simões & Staples, *D. cissoides* (Lam.) A.R.Simões & Staples, and *D. quinquefolius* (L.) A.R.Simões & Staples. This study documents *D.*

aegyptius (L.) A.R.Simões & Staples as a newly naturalized species in Taiwan found in low-altitude open areas across Changhua, Yunlin, and Pingtung. Morphological descriptions, color photographs, and an identification key for *Distimake* species in Taiwan are provided to facilitate accurate identification.

Key words: Convolvulaceae, *Distimake*, naturalized plant, Taiwan.

摘要

臺灣的萼龍藤屬 (*Distimake* Raf.) 有六種，包含兩種原生種：掌葉萼龍藤 (*D. quinatus* (R.Br.) A.R.Simões & Staples) 和葡萄葉萼龍藤 (*D. vitifolius* (Burm.f.) Pisuttimarn & Petrongari，原稱掌葉菜欒藤)；四種歸化種：萼龍藤 (*D. tuberosus* (L.) A.R.Simões & Staples)、七爪萼龍藤 (*D. dissectus* (Jacq.) A.R.Simões & Staples)、蔓生萼龍藤 (*D. cissoides* (Lam.) A.R.Simões & Staples)、五葉萼龍藤 (*D. quinquefolius* (L.) A.R.Simões & Staples)。本文報導歸化於彰化、雲林和屏東低海拔開闊地的埃及萼龍藤，並提供該種的形態描述、彩色圖片及臺灣的萼龍藤屬植物檢索表以協助鑑定。

關鍵詞：旋花科、萼龍藤屬、歸化植物、臺灣

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Introduction

Following the dissolution of the tribe Merremieae in 2017, the broadly circumscribed genus *Merremia* Dennst. ex Endl. was reclassified into several genera, including *Camonea* Raf., *Decalobanthus* Ooststr., *Distimake* Raf., and *Merremia s.s.* (Simões and Staples 2017). Among them, *Distimake* comprises 35 species and exhibits a widespread distribution across tropical America and tropical Africa, with disjunct occurrences in Asia and northern Australia (Simões and Staples 2017). In addition, *Camonea vitifolia* (Burm.f.) A.R.Simões & Staples was transferred to *Distimake* based on molecular, morphological, and palynological evidence (Pisuttimarn *et al.* 2023).

The genus *Distimake* is distinguished by a set of diagnostic morphological traits. The leaves are typically five- to seven-palmately lobed or compound. The calyx generally consists of flat sepals that are appressed to the base of the corolla tube, becoming accrescent during fruit development. The corolla is usually white or pale yellowish, occasionally featuring a dark red center, entirely glabrous, and dries with distinct dark lines along the mid-petaline bands. Anthers dehisce in a spiral manner. Fruits are usually four-valved capsules, with the calyx becoming significantly accrescent in fruit and the sepals reflexing at maturity. Seeds are glabrous (Simões and Staples 2017). In Taiwan, the genus *Distimake* comprises six species, including two native species - *D. quinatus* (R.Br.) A.R.Simões & Staples (Lu 1972) and *D. vitifolius* (Burm.f.) Pisuttimarn & Petrongari (Wang and Yen 1995), and four naturalized species - *D. tuberosus* (L.) A.R.Simões & Staples (Staples and Yang 1998), *D. dissectus* (Jacq.) A.R.Simões & Staples (Tsai *et al.* 2010), *D. cissoides* (Lam.) A.R.Simões & Staples (Ko and Liu 2011), and *D. quinquefolius* (L.) A.R.Simões & Staples (Chung *et al*. 2017).

This study documents the discovery of *Distimake aegyptius* (L.) A.R.Simões & Staples, a species native to the tropical and subtropical regions of the Americas, and tropical Africa, in Sandimen Township, Pingtung, Taiwan. According to the plant observation database Nature Campus (自然攝影中心植物觀察資料庫 , http://nc.biodiv.tw/bbs/index.php), this species was first recorded in Taiwan between 2012 and 2014 in Yunlin, where it has been observed growing in fallow fields. Additionally, recent records from iNaturalist Taiwan (愛自然 - 臺灣 , https://taiwan.inaturalist.org) indicate its presence in Changhua and Yunlin during 2023–2024. Based on these observations, we report that *D. aegyptius* is a newly naturalized species of *Distimake* in Taiwan. Taxonomic descriptions, color photographs of *D. aegyptius*, and an identification key for the *Distimake* species in Taiwan are provided to facilitate accurate identification.

Taxonomic treatment

Distimake aegyptius (L.) A.R. Simões & Staples, Bot. J. Linn. Soc. 183: 583. 2017.

埃及萼龍藤 (Fig. 1)

Synonyms:

Merremia aegyptia (L.) Urb., Symb. Antill. 4: 505. 1910.

Ipomoea aegyptia L., Sp. Pl. 162. 1753. Type: 'America calidiore', *Herbar. Linn. No. 218.35* (lectotype, LINN)

Climbing plant, stems twining dextrorsely, young stems densely hirsute, long hairy, yellowish. Leaves 5-palmately compound, leaflets 4–17 × 2–6 cm, oblanceolate or elliptical, the apex and base acuminate, margins entire, both surfaces hirsute. Petioles 3–25 cm, densely hirsute, long hairy, yellowish. Petiolules nearly sessile. Dichasial cymes 10–50 cm, axillary; peduncles 7–30 cm long, densely hirsute, long hairy; bracts small, linear, deciduous; pedicels 0.5–4 cm, densely hirsute, long hairy, yellowish. Sepals 5, unequal, elliptic-oblong, 1.6–2.4 cm long, 0.9 cm wide, the outer

2 slightly larger, abaxial surfaces densely hirsute, long hairy, yellowish; the inner 3 smaller, abaxial surfaces subglabrous. Corolla white, infundibuliform, 3.5 cm in diameter, 3 cm long; margin shallowly 5-lobed, midpetaline bands 5. Stamens 5, not extruded out of corolla, base 4 mm adnate to corolla, the longer 1.5 cm long, the shorter four 1–1.3 cm long; anthers twisted, 4 mm long, vertically dehiscent. Ovary subglobose, 1 mm long, base with disc; style 2 cm long; stigma bifid, globose; 4-loculed, 4-ovuled. Capsules subglobose, 7–8 mm in diameter, drooping, surrounded by the persistent sepals. Seeds 4, trigonous, 5–6 mm long, brown, glabrous.

Distribution: *Distimake aegyptius* is native to tropical and subtropical regions of the Americas and tropical Africa. It has been introduced to various parts of the world, including Cape Verde, Comoros, Hawaii, India, Madagascar, the Marianas, Mauritius, Myanmar, the Northern Territory (Australia), Pakistan, Réunion, Vietnam, the western Himalayas, and Western Australia (POWO 2024). In Taiwan, the species is naturalized in Changhua, Yunlin, and Pingtung (Fig. 2).

Phenology: Flowering: October to December. Fruiting: December to February.

Ecology: In Taiwan, *Distimake aegyptius* is typically found in disturbed open areas at low altitudes, exhibiting a twining growth habit, often enveloping nearby plants and forming extensive vegetative cover.

Voucher specimen: TAIWAN. Yunlin County: Mailiao, 2 Feb. 2014, *L.-H. Yang 630* (TAIE); same loc., ? Feb. 2022, *L.-H. Yang 1000* (TAIE). Pingtung County: Sandimen, 5 Dec. 2024, *P.-H. Chen 3923, 3924* (TAIF); same loc., 13 Jan. 2025, *P.-H. Chen 3925, 3926* (TAIF).

Key to the Species of *Distimake* in Taiwan

1. Leaves palmately lobed..... 2

1. Leaves palmately compound ……...……...……..... 4

2. Leaves pubescent……..... ...1. *D. vitifolius* (葡萄葉萼龍藤，新擬)

2. Leaves glabrous ……..... 3

3. Leaves entire……..... ……..... 2. *D. tuberosus* (萼龍藤)

3. Leaves irregularly incised……..... ……..... 3. *D. dissectus* (七爪萼龍藤)

4. Leaflets entire …..... 5

4. Leaflets with serrate margins…… …….....6

5. Leaflets < 4 cm long, glabrous..... ..... 4. *D.* quinatus (掌葉萼龍藤)

5. Leaflets > 4 cm long, hirsute……..... ……..... 5. *D. aegyptius* (埃及萼龍藤)

6. Leaflets pubescent……..... .....6. *D. cissoides* (蔓生萼龍藤)

6. Leaflets glabrous……..... .....7. *D. quinquefolius* (五葉萼龍藤)

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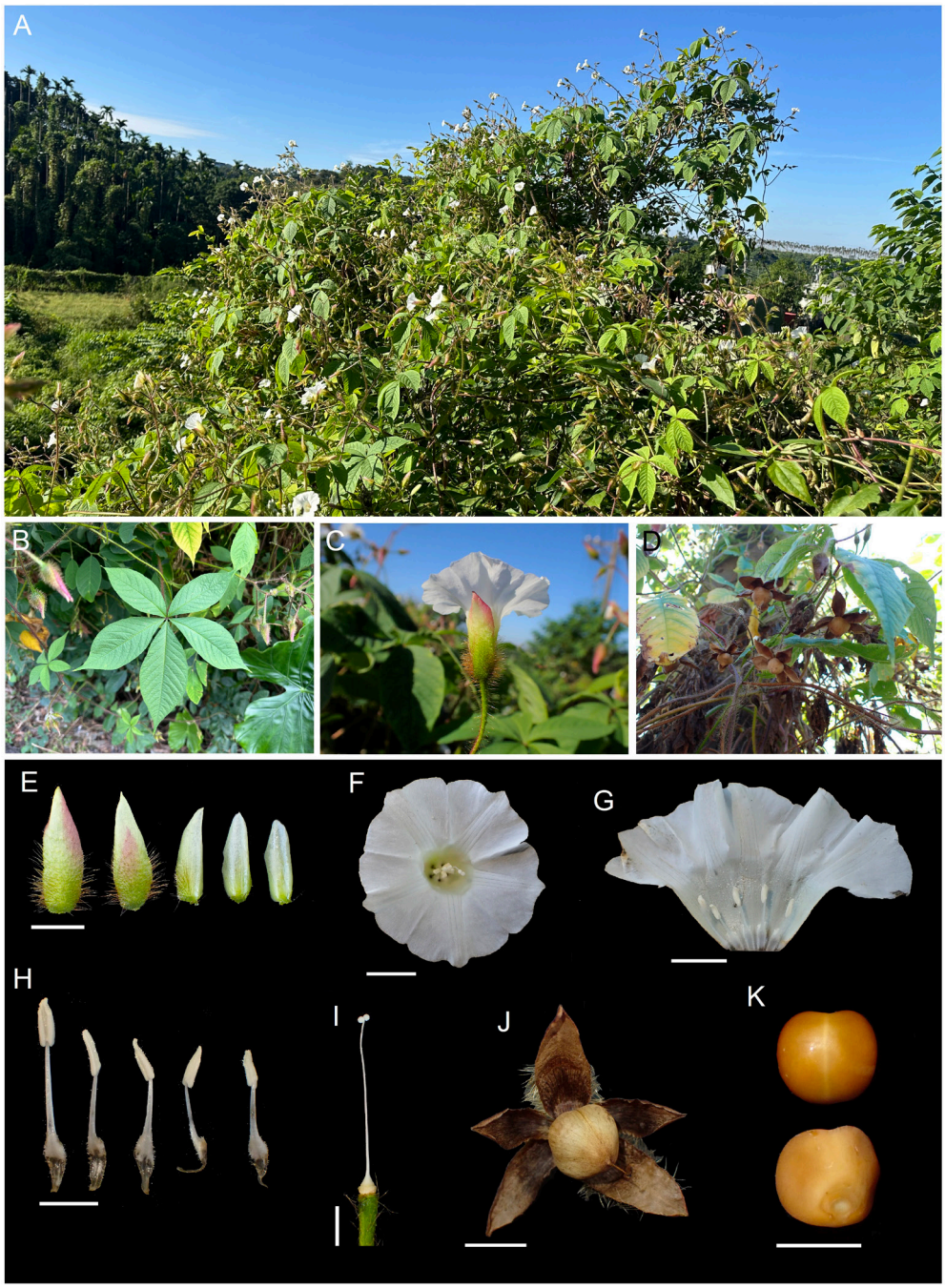

Fig. 1 *Distimake aegyptius* (L.) A.R.Simões & Staples. A, habitat; B, leaf; C, lateral view of flower; D, capsules; E, sepals; F, front view of flower; G, corolla (with stamens); H, stamens; I, pistil; J, capsule; K, seeds. Scale bars: E, F, G, and J=1 cm, H, I, and K=5 mm.

圖 1 埃及萼龍藤 (*Distimake aegyptius* (L.) A.R.Simões & Staples)。A：生育地；B：葉；C：花的側面；D：蒴果；E：萼片；F：花的正面；G：花冠 (與雄蕊)；H：雄蕊；I：雌蕊；J：蒴果；K：種子。比例尺：E、F、G、J = 1 cm，H、I、K = 5 mm。

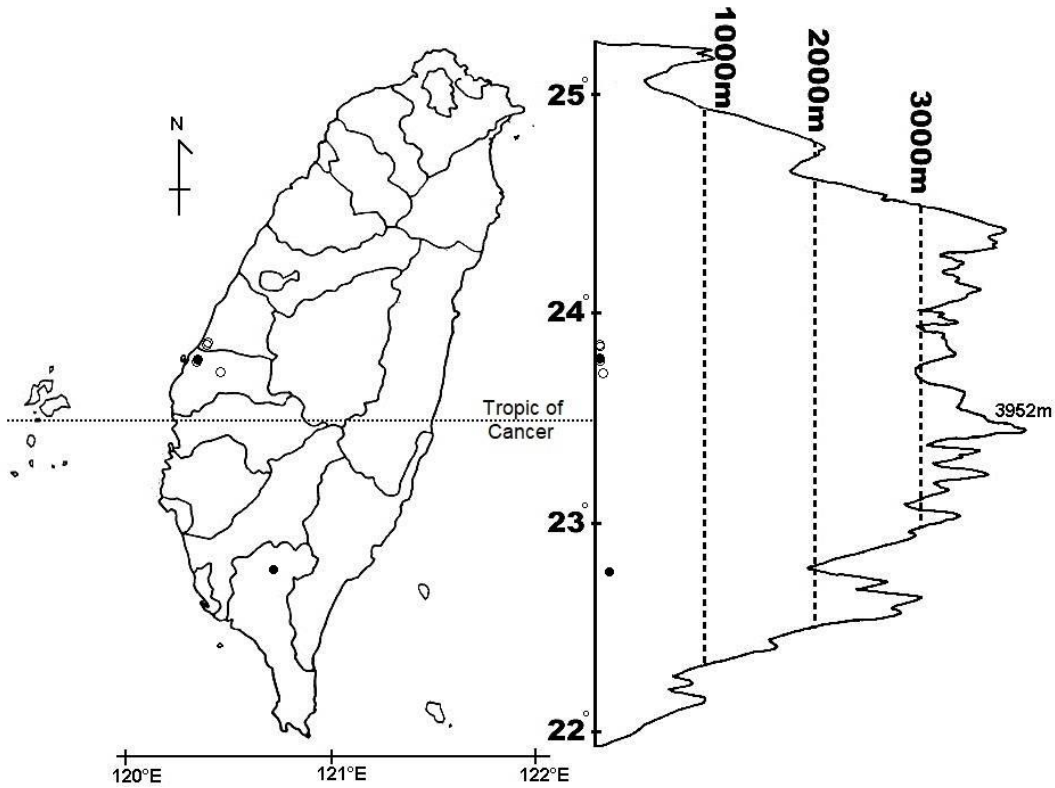

Fig. 2 Distribution of *Distimake aegyptius* (L.) A.R.Simões & Staples in Taiwan. The distribution in the map is based on verified voucher specimens (●) and additional iNaturalist Taiwan observations (○).

圖 2 埃及萼龍藤 (*Distimake aegyptius* (L.) A.R.Simões & Staples) 在臺灣的分布。地圖上的分布點是根據引證標本 (●) 和愛自然 - 臺灣的觀察 (○)。

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