

錫蘭七指蕨在北臺灣之一新分布

New Distribution Area of *Helminthostachys zeylanica* (Ophioglossaceae) from North Taiwan

劉世強^{1*} 江木興² 蔡鎮陽³

Shih-Ciang Liou^{1*} Mu-Hsing Chiang² and Chen-Yang Tsai³

¹ 軟體工作者兼水生植物觀察家 247 新北市蘆洲區信義路 188 巷 16 號 1 樓

² 團膳工作者兼生態講師 252 新北市三芝區淡金路二段 87 巷 1 號 4 樓之 12

³ 海外森林環境觀察家 61 Jumbuck Cres, Lawson ACT 2617, Australia

¹ Field researcher of aquatic plants and software developer, 1F., No. 16, Ln. 188, Xinyi Rd., Luzhou Dist., New Taipei City

² Biological lecturer and senior chief of catering service, 4F.-12, No. 1, Ln. 87, Sec. 2, Danjin Rd., Sanzhi Dist., New Taipei City

³ Forester and environmental researcher, 61 Jumbuck Cres, Lawson ACT 2617, Australia

*Corresponding author: jforestluch@gmail.com

* 通訊作者：jforestluch@gmail.com

Abstract

A new distribution area of *Helminthostachys zeylanica* in North Taiwan was reported at Yangmingshan, which was supposed to be the northern boundary of this species in Taiwan. The phenology, the characters of its habitat, and companions are described in present study.

Key words: Ophioglossaceae, *Helminthostachys zeylanica*, Taiwan, Yangmingshan, rare species

摘要

本文介紹錫蘭七指蕨在臺灣的新分布地區—陽明山也是臺灣島內分布的北界，並描述其物候與生長環境之各項特徵及物候關係與伴生植物。

關鍵字：瓶爾小草科、七指蕨、臺灣、陽明山、稀有植物

Introduction

Helminthostachys zeylanica (L.) Hook. is the only species of the genus *Helminthostachys* in the Ophioglossaceae, this species was utilized as, medicinal properties such as malaria controlling preparation (Cicuzza, 2020). *Helminthostachys zeylanica* distributed in Sri Lanka, India, the Philippines, Ryukyu, Australia, Southern China, Malay Peninsula, and Taiwan (Ito, 1928; Hatsusima, 1975; Kuo, 1985; Shieh & Devol, 1994; Joshi, 2011; Zhang et al., 2013; Bharali et al., 2017). In Taiwan, the populations were reported from Tianchi of Lanyu, the third sector of Kenting Forest Recreation in Hengchun Peninsula (Kuo, 1997), Xiaolanyu (Yeh et al., 2010), Hushan Dam in Yunlin County (Huang et al., 2012), Huisun Experimental Forest Station in Nantou (Wang & Ou, 2002). Due to its scarcity, it needs to be protected. Most of the populations of *H. zeylanica* in Taiwan contained only few individuals, therefore, this was an endangered species in Taiwan (Lu & Chiou, 1997). In the Red List of Vascular Plants of Taiwan 2017, the conservation rank of this species was evaluated as Nationally Critically Endangered (NCR) (Editorial Committee of the Red List of Taiwan Plants, 2017).

In March 2020 our field survey first found plants in Yangmingshan National Park area. Therefore, we started phenological observation, and found more than 30 plants sprout in spring, and then matured with fertile spike in the summer.

Material and Methods

Phenological observations were conducted during Mar. 2020 to Sep. 2021. The different phenophases of *H. zeylanica* were recorded and photographed. Climate data of habitat were obtained from the website of Central Weather Bureau.

Results and discussion

I. Habitat condition of *H. zeylanica* in northern Taiwan

The habitat located in a mountain forest near Erziping in Yangmingshan National Park, the altitude was ca. 650 m and far from roadside. In addition to the ancestors' activities and graveyard, there is only few artificial disturbances. The habitat is located on 25 degrees north latitude, which is belonged to subtropical monsoon climate. The afternoon thundershowers in summer might cause this habitat submerged, under the water. In winter, due to the northeast monsoon, the climate here becoming with low temperature and high precipitation, moreover the habitat might cover by snow under some extremely weather conditions (Fig. 1). The weather data of 2020 from the nearby Zhuzihu weather station was revealed that the yearly sunshine hour of the area is less than 1,400 hours with more than 4,700 mm precipitation. The highest monthly temperature is 33°C in July, and the lowest one was 1.4°C in December (Fig. 2).

This region around 20 m² is featured by open forests gap with high sunlight exposure, many companion species in the understory layer, including *Ludwigia ovalis*,



Fig. 1 Habitat of *Helminthostachys zeylanica*. A. Overview B. Habitat submerged after heavy rain. C. The snow-covered neighboring region in 2018. (2016, 2018, and 2021 all have snowfall records in Yangmingshan)

圖 1. 錫蘭七指蕨 (*Helminthostachys zeylanica*) 環境概況。A. 林下環境概況 B. 低窪處強降雨後可致積水 C. 2018 年鄰近山區覆雪 (2016、2018、2021 年陽明山區皆有降雪紀錄)。

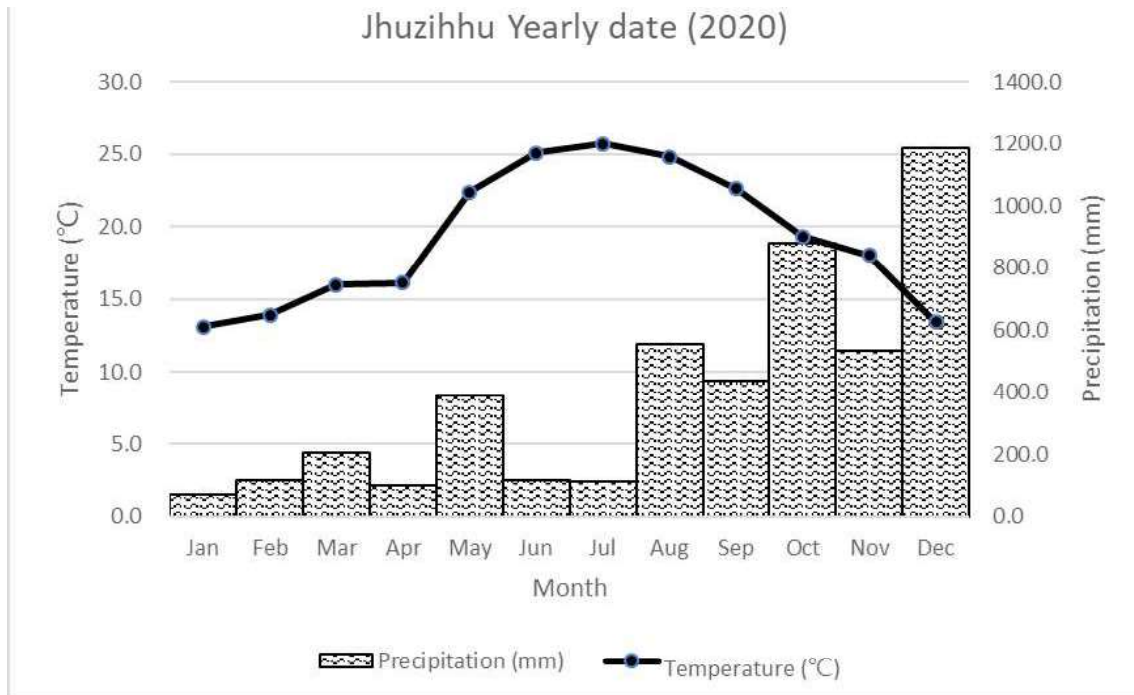


Fig. 2 Climatic data of 2020 from Zhuzihu weather station.

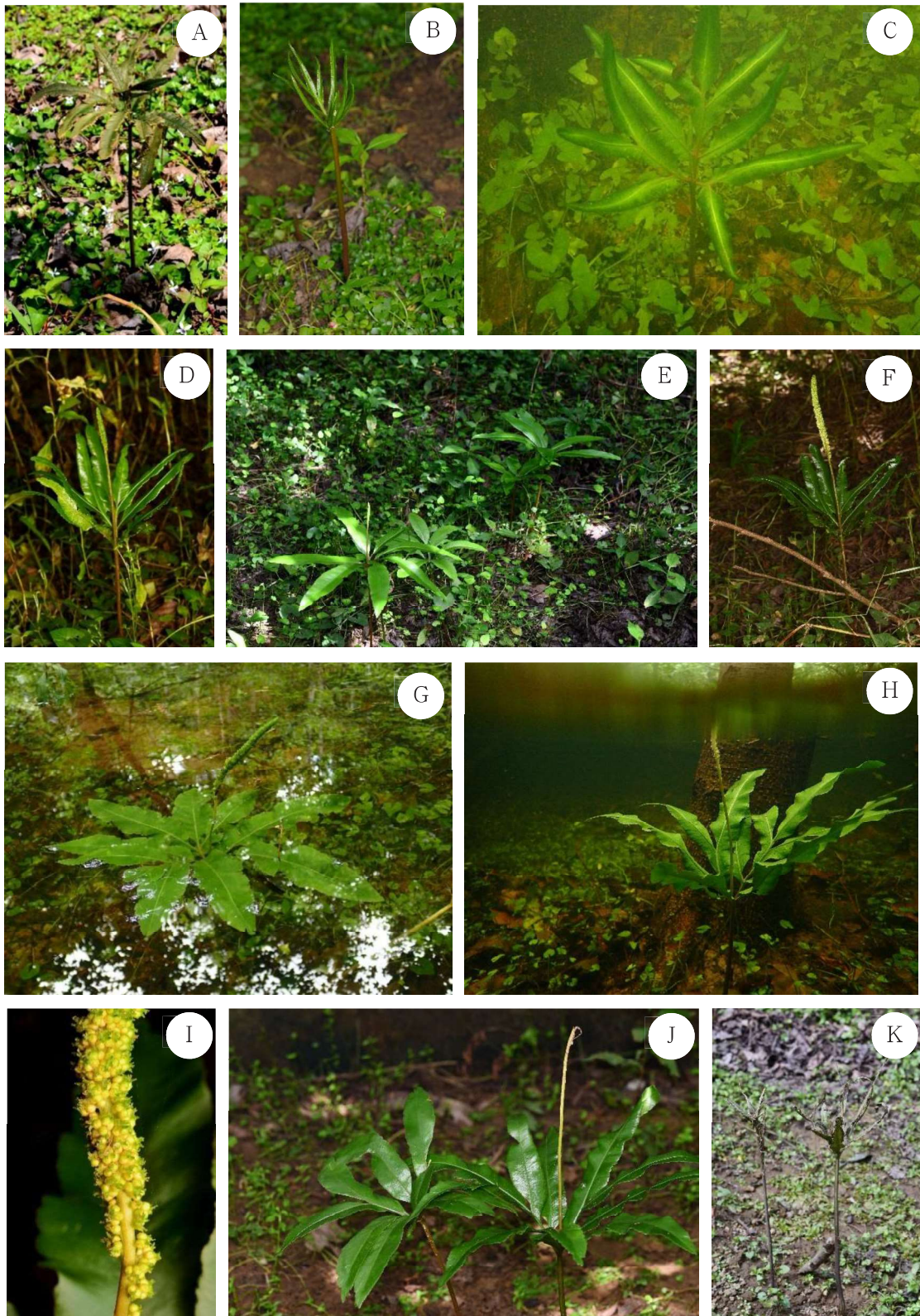
圖 2. 竹子湖氣候站 2020 年度氣象資料。

Ophioglossum petiolatum, *Duchesnea indica*, *Rubus buergeri*, *Persicaria chinensis* var. *chinensis*, *P. pubescens*, *Lobelia chinensis*, *Viola arcuata*, and *V. betonicifolia*, The surrounding canopy layer species, such as *Liquidambar formosana* and *Ardisia sieboldii*, have been identified, with following understory species, e.g., *Polia Miranda*, *Murdannia keisak*, *Amischotolype glabrata*, and *Paris polyphylla* var. *polyphylla* and some woody species, including *Eleutherococcus trifoliatus* var. *trifoliatus*, *Ficus erecta* var. *beecheiana*, *Euscaphis japonica*, *Euonymus carnosus*, *Machilus thunbergii*, *Hydrangea angustipetala*, and *Diospyros morrisiana*. The companion species in this region are relatively common in comparison with its adjacent areas, it

can be inferred that the distribution of *H. zeylanica* is not significantly correlated with its companion species. Besides, we also can find some common habitat characteristic between Yangmingshan and Tianchi of Lanyu, both them are known for their temporary wetland environment caused by heavy rainfall. It is noteworthy that such environmental condition can partly inhibit the growth of the understory layer, and thus leading to the dwarf vegetation under forests.

II. Phenology of *H. zeylanica* in northern Taiwan population

This study was conducted in March 2020. We only found a few individuals with leaves in the habitat, we believed that those leaves were persisted from the last winter.



However, as the local climate had become warmer, we detected 13 newly sprout plants on 30th May after heavy precipitation. In the middle of June, the mature plants with fertile spike have been spotted. The fertile spike turned into yellow color and their spores matured in August. The habitat submerged again on 12th August due to the

heavy rain, and spores are likely spreading by water force. Nearly all the fertile spike withered (only an individual remained intact) in September. After then, the habitat had suffered from the disturbance of wild boars, and only 2 of *H. zeylanica* individuals with leaves weathered the winter when we visited again in Feb. 2021 (Fig 3.). According



Fig 4. *Helminthostachys zeylanica* in the summer 2021. A.B. the fertile spike turned into yellow color and then their spores matured 11 July 2020. C.D. the fertile spike dropped from plants on 5 September 2020.

圖 4 錫蘭七指蕨 (*Helminthostachys zeylanica*) 2021 年夏季紀錄。A.B. 7 月 11 日觀測大部分植株孢子囊穗漸趨成熟 C.D. 同 9 月 11 日觀測孢子囊穗脫落後的植株。

to the recorded in 2021, the life cycle starts again. The fertile spike turned into yellow color was spotted on 11th July and dropped from plants on 11th September (Fig 4.).

III. The distribution of *H. zeylanica* in Taiwan

The distribution of *H. zeylanica* in Taiwan is very sporadic and only with few individuals in each locality (Fig. 5), such pattern is probably caused by long-distance dispersal events. Barrington (1993) revealed that pteridophytes are easier carried by other approaches to spread a long distance to other areas due to their small spores. This result is also supported by other recent studies that pointed out the significant effects of long-distance dispersal events on

several fern species (Perrie and Brownsey, 2007; Bauret et al., 2017). However, no robust evidence to prove if the distribution of *H. zeylanica* is associated with the long-distance dispersal events.

IV. The significance of *Ludwigia ovalis* in this area

Among those companion species in these regions, *L. ovalis* is the rarest species, one of rare aquatic plant species in Taiwan. Based on the previous records, it was mainly found in mid-altitude lakes, including Shuanglianpi, Lunpi Lake, Caopi, Mingchi, Yuanyang Lake, and Mysterious Lake. (Yang and Yen, 2001) Moreover, it is important to note that *L. ovalis* has been recognized as a NVU species on the Red List of Vascular

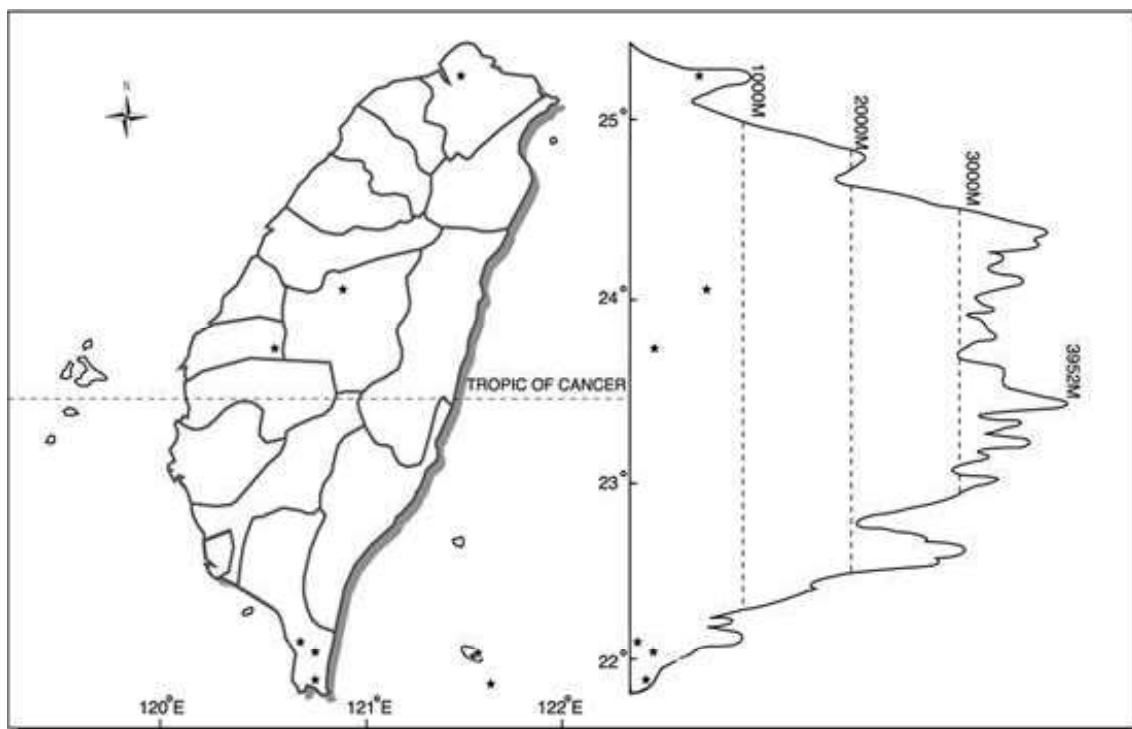


Fig 5. The distribution map of *Helminthostachys zeylanica* in Taiwan.

圖 5. 錫蘭七指蕨 (*Helminthostachys zeylanica*) 分布圖。

Plants of Taiwan (Editorial Committee of the Red List of Taiwan Plants, 2017). The habitat here in northern Taiwan is the only one where both *H. zeylanica* and *L. ovalis* existing together. Therefore, the biodiversity might be underestimated here, and some unknown species might be recorded in the future.

Conclusion

It was widely believed that *H. zeylanica* is a tropical species which was restricted in southern part and Lanyu island. But some northern populations in Yunlin and Nantou County were recently recorded. Moreover, this study further expanded its northernmost boundary in Taiwan to Yangmingshan where did not belong to tropical climate area actually. These findings implied that the distribution of *H. zeylanica* is out of southern Taiwan and remote island. Therefore, it is expected that more populations would be found in other places with similar condition in the future.

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