

出國報告（出國類別：蒐集資料暨參加研習會）

蒐集資料暨參加『菲律賓生物教師研習  
會』報告

Material collection and workshop of “The  
Biodiversity Teachers Association of the  
Philippines”

服務機關：行政院農業委員會林業試驗所

姓名職稱：邱文良 副研究員兼組長

派赴國家：菲律賓

出國期間：96年4月10日~4月13日

報告日期：95年5月12日

系統識別號:

公 務 出 國 報 告 提 要

頁數: 37 含附件: 否

報告名稱:

出席『第三屆全球植物園大會』

主辦機關:

行政院農業委員會林業試驗所

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出國類別: 其他

出國地區: 菲律賓

出國期間: 民國 96 年 04 月 10 日 -民國 96 年 04 月 13 日

報告日期: 民國 96 年 05 月 24 日

分類號/目: F8/林業 F8/林業

關鍵詞: 蕨類植物,生態,保育,系統分類

內容摘要: 菲律賓臨近台灣南部，其植物相與台灣近似之比例高，以蕨類植物為例，台灣蕨類植物的馬來要素與泛舊熱帶要素約有 140 種，約佔 20%的比例，為研究台灣生物分類與親緣關係不可忽略之地。本次應邀於菲律賓全國生物教師科學研習會及菲律賓國家標本館，分別發表演講，介紹「台灣目前的蕨類研究及其對菲律賓之意義」，均引發熱烈迴響與合作研究之討論。演講之外，則藉此機會赴其國家標本館查閱標本，獲得本計畫標的「澤瀉蕨」在菲律賓的基本資料，經詳細比對細微特徵，得知係與台灣一致之二倍體。

本文電子檔已上傳至出國報告資訊網

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## 一、目的

菲律賓臨近台灣南部，其植物相與台灣近似之比例高，以蕨類植物為例，台灣蕨類植物的馬來要素與泛舊熱帶要素約有 140 種，約佔 20% 的比例。然而台灣的蕨類研究確鮮少觸及菲律賓之地段，反之亦然；本人這期的專題研究計畫「澤瀉蕨複合群之研究」，在菲律賓之材料上即遭蒐集之瓶頸。近年來在幾次的國際研討會中，本研究室多次與該國研究人員(如 Drs. Julie F. Barcelona, Domingo Madulid, Victor Amoroso 等)接觸及討論，雙方漸有合作之共識。

本(2007)年菲律賓舉辦其第 42 屆全國生物教師科學研習會(Annual National Convention & Scientific Sessions)，與會者來自全菲律賓各處生物教師近 200 人。本人應邀發表演講，介紹台灣目前的蕨類研究及其對菲律賓之意義(Current Status of Fern Research in Taiwan and its relevance to the Philippines)；同樣之主題亦在菲律賓國家標本館(Philippine National Herbarium, PNH)對其研究人員發表，均引發熱烈之討論。演講之外，則藉此機會赴其國家標本館查閱標本，以利專題研究計畫之後續進行。

## 二、過程

### (一)行程

日期	行程地點	工作內容
96 年 4 月 10 日	台北→馬尼拉	行程、標本館核對標本
96 年 4 月 11 日	馬尼拉	標本館核對標本、演講
96 年 4 月 12 日	馬尼拉	研討會及演講
96 年 4 月 13 日	馬尼拉→台北	標本館核對標本、返程。

## (二)內容

1. 演講內容如附錄一。
2. 標本查閱：觀察菲律賓國家標本館所典藏之 6 份澤瀉蕨標本的孢子體外部形態，無論營養葉或孢子葉均無任何之芽體；其中 5 份可取得孢子之標本，各量測 30 顆孢子大小，結果為： $35.8\pm 2.3\mu\text{m}$  (No. 62796),  $33.8\pm 2.2\mu\text{m}$  (No. 3938),  $34.9\pm 1.9\mu\text{m}$  (No. 67886),  $34.5\pm 2.0\mu\text{m}$  (No. 1704),  $34.3\pm 3.0\mu\text{m}$  (No. 4511)。
3. 台灣二倍體分類群孢子大小為  $36.0\pm 2.3\sim 38.5\pm 3.2\mu\text{m}$ ；觀察菲律賓標本館所典藏之標本，由其孢子大小推測此等植株均屬二倍體。此外，二倍體分類群植株葉片無不定芽，所觀測之標本亦都無不定芽，符合二倍體澤瀉蕨特徵。觀測之標本如附錄二。

## 三、心得及建議

### (一)心得

1. 菲律賓國家標本館於二次世界大戰前典藏植物標本約百萬份，為亞洲甚具規模與歷史之植物標本館；可惜於二次大戰期間遭戰火破壞，大部份之標本燬於當時，至今只典藏約 20 餘萬份。標本之蒐集不易，是蒐集人員的心血，科學家的研究材料，亦是國家的珍寶，一旦損毀，永無機會復原。因此應將副份標本分散典藏，減少標本全損之風險
2. 植物系統分類及演化之研究所需材料無法僅取自台灣，目前國科會政策支持研究人員赴國外蒐集材料，可有效協助此領域之進展。本次應邀菲律賓國家標本館及菲國生物教師年會中演講，引發不少學者對共同合作之興趣，為今後之合作研究踏出一步。

3. 澤瀉蕨在印度有為數豐富之三倍體，菲律賓所產之澤瀉蕨至今所觀察係與台灣一致之二倍體，且兩地族群與個體都屬稀少。假設二個倍數體有極接近的親緣關係，若三倍體未分布至台菲地區，推測在印、台、菲之間應有二種倍數體之交會地區，此尚需進一步求證。
4. 台灣與菲律賓所產澤瀉蕨均為二倍體，唯其基因型是否一致獲已有分化，還需進一步分析。

## (二)建議

1. 近年外國開始管制其野生物之離境，增加新鮮材料取得之困難度；台灣研究人員需積極與國外研究人員合作，共享研究經驗與成果，以克服材料取得之障礙。
2. 澤瀉蕨依據台灣植物誌的記載，分布自印度、中南半島、至菲律賓與台灣；另依其它文獻，在印度是一雜草型之蕨類，因此在紅皮書上並未特別受到重視。然根據本研究至今之數據顯示，台灣所產之澤瀉蕨與印度所產為不同之倍數體，是否屬於同種亦尚待斟酌。無論保育或分類之研究，本群均有再深入探討的必要。

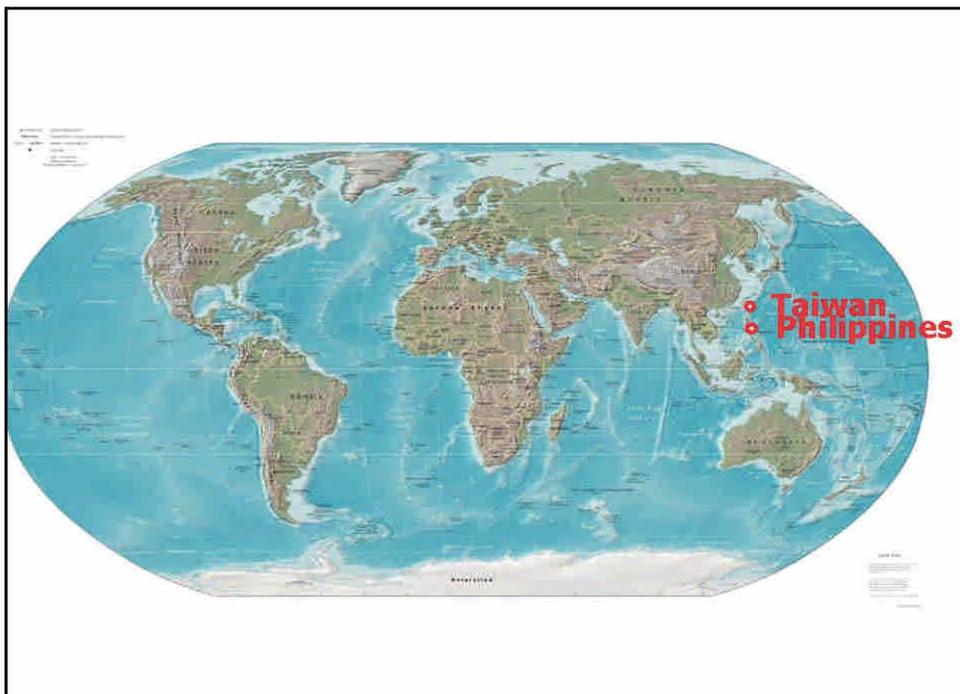
四、附錄一：演講講義

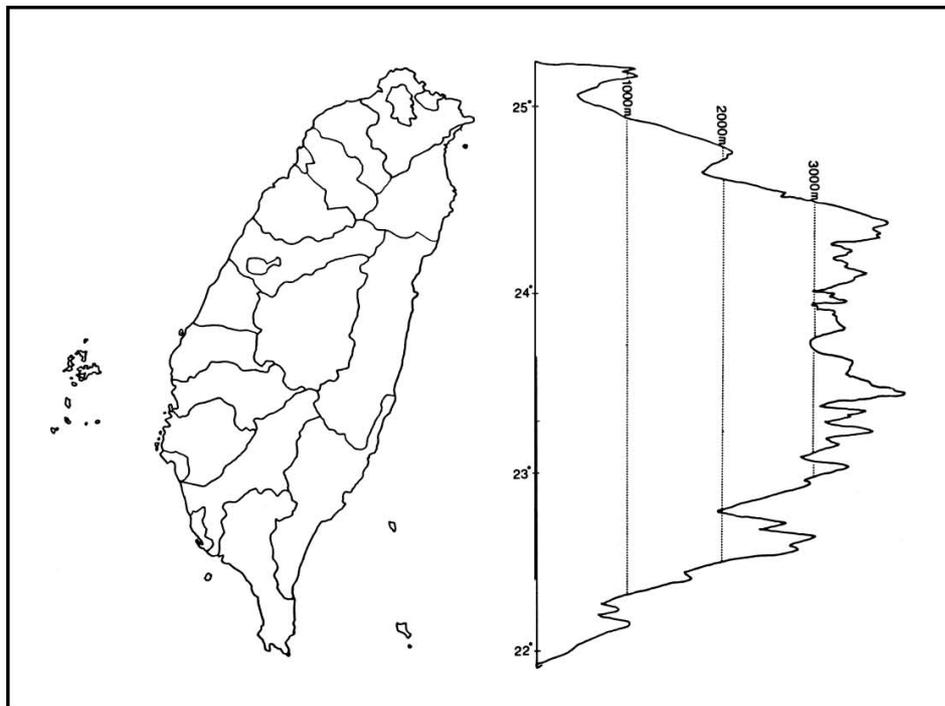
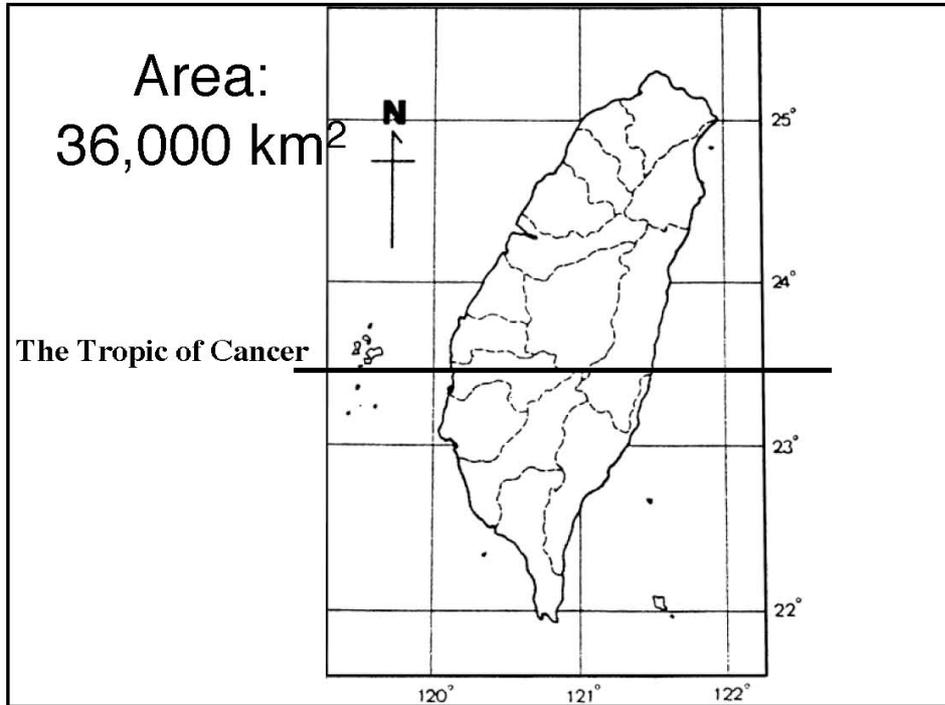
# Current status of fern research in Taiwan and its relevance to the Philippines

Wen-Liang Chiou

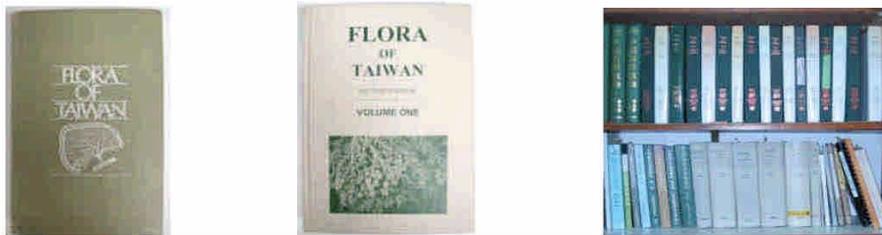
Curator: Herbarium of TFRI & Taipei Botanic Garden  
Chief: Division of Forest Biology of TFRI

Taiwan Forestry Research Institute (TFRI), Taipei, Taiwan





- **The Flora of Taiwan 1st ed. (1975~1979)**
- **The Flora of Taiwan 2nd ed. (1993~2003)**
- **Manual of Taiwan Vascular Plants  
Taiwanese version (1997~2003)**

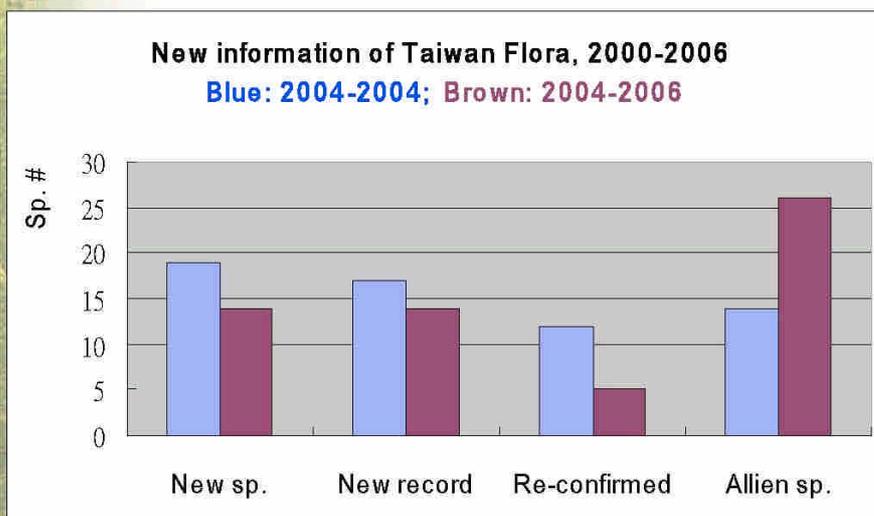


**About 2,000 new species have been published annually**

(Crane, 2004) ◦

**New information of Taiwan Flora, 2000-2006**

**Blue: 2004-2004; Brown: 2004-2006**



## **What is the next?**

**Flora on line, an electric version  
& interactive key  
(*e-flora*)**

### **Advantages of the *e-flora* compared to the “paper flora”**

- Immediate updating of information
- Unlimited extension of data
- No paper consuming
- Easy combination and communication of various databases through website
- Interactive key

# Traditional Key

Key to the genera of Athyriaceae

1. Sterile and fertile leaf dimorphism	Pentarhizidium
1. Sterile and fertile leaf monomorphism	(2)
2. Stipes or petioles articulated	(3)
3. Sori with indusia	Woodsia
3. Sori without indusia	Gymnocarpium
2. Stipes or petioles not articulated	(4)
4. Indusia round, inferior or semi-inferior	(5)
5. Folds and stipes with multicellular hairs	Acystopteris
5. Folds and stipes without hairs	Cystopteris
4. Indusia not as above or lacking	(6)
6. Stipe base swollen	(7)
7. Rhizome and stipe base covered densely reddish brown scales	Hypodematum
7. Rhizome and stipe base covered with brown or black scales	(8)
8. Grooves on dorsal sides of rachis and costae disconnected	Deparia
8. Grooves on dorsal sides of rachis and costae connected	(9)
9. Rhizome erect, rare thin and long creeping	(10)
10. Indusia absent	Cornopteris
10. Indusia exist	Athyrium
9. Rhizome thick, long creeping	Anisocampium
6. Stipe base not swollen	(11)
11. Veins anastomosing, two or more rows of areolae side by the costae	Diplazopsis
11. Veins free, one species with goniopteroid vein form	(12)
12. Scales black or reddish brown; indusia thin	Diplazium
12. Scales brown; indusia thick	Rhachidosorus

Interactive Key for Taiwan Plant - Windows Internet Explorer

http://tdi.fda.gov.tw/keys/

Interactive Key for Taiwan Plant

### Interactive Key of Taiwan Plant

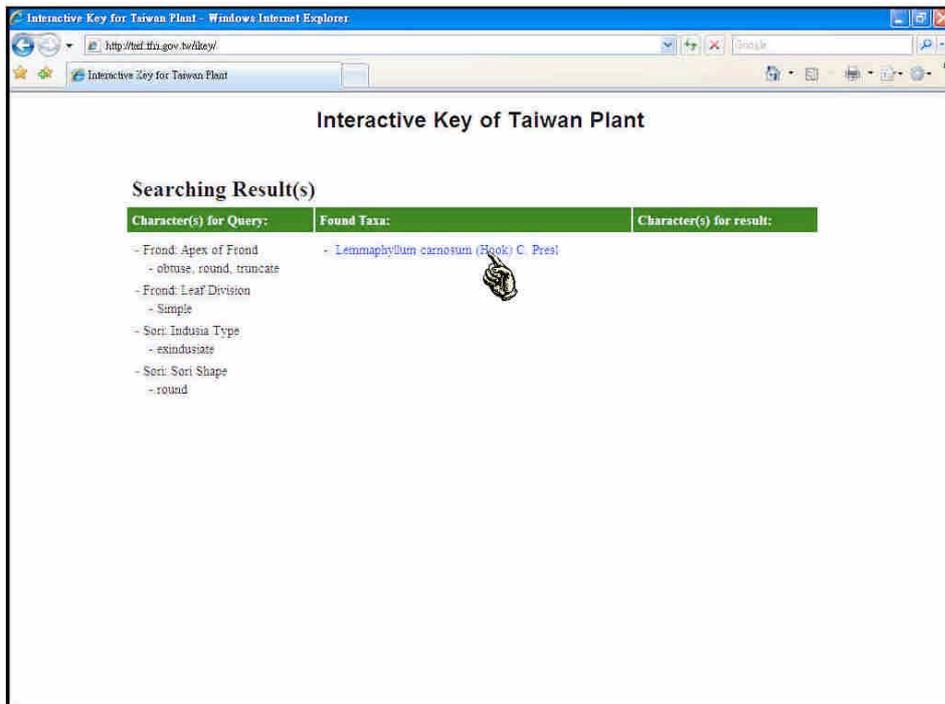
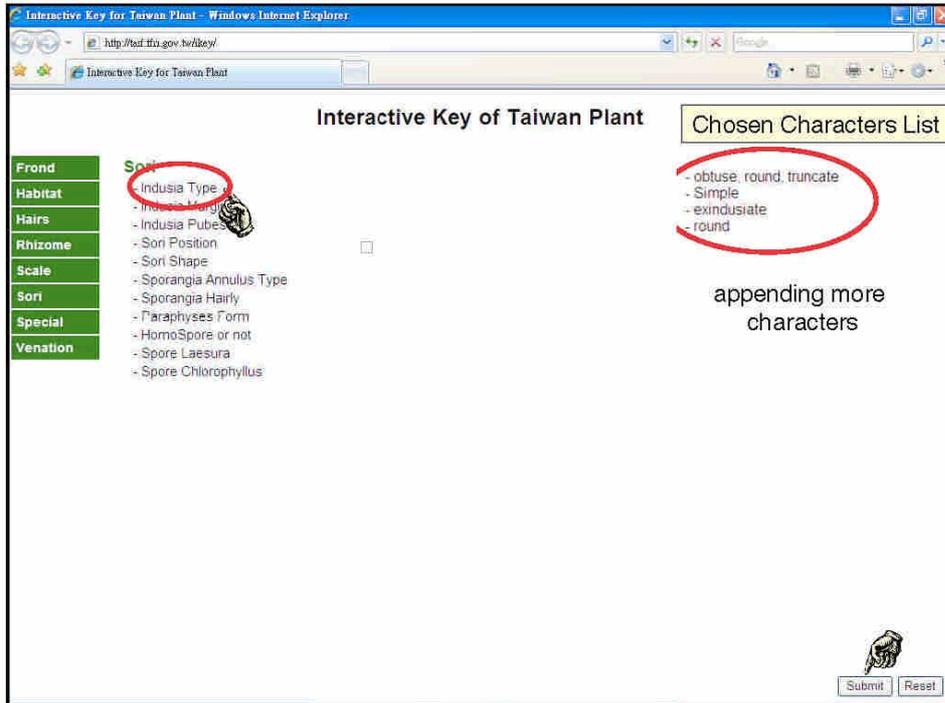
Chosen Characters List

<ul style="list-style-type: none"> <li><b>Fron</b></li> <li><b>Habitat</b></li> <li><b>Hairs</b></li> <li><b>Rhizome</b></li> <li><b>Scale</b></li> <li><b>Sori</b></li> <li><b>Special</b></li> <li><b>Venation</b></li> </ul>	<p><b>Fron</b></p> <ul style="list-style-type: none"> <li>- Adaxial outline of stipe and rachis</li> <li>- Apex of Frond</li> <li>- Apex of Pinnae</li> <li>- Apex of pinnae</li> <li>- Aristate</li> <li>- Base of Blade</li> <li>- Base of Pinnae (if exist)</li> <li>- Base of Pinnule (if exist)</li> <li>- Base Symmetric of Lowest Pinnae</li> <li>- Base Symmetric of middle Pinnae</li> <li>- Fertile &amp; Sterile</li> <li>- <b>Leaf Division</b></li> <li>- Leaf Shape</li> <li>- Low pinnae</li> <li>- Margin of Leaf (or pinnae, pinnule)</li> <li>- Pinnae Shape</li> </ul>	<p><b>Leaf Division</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Simple</li> <li><input type="checkbox"/> Simple to tritid</li> <li><input type="checkbox"/> Pinnatifid-Pinnate</li> <li><input type="checkbox"/> Bipinnatifid-Bipinnate</li> <li><input type="checkbox"/> Tripinnatifid-Tripinnate</li> </ul>	<p>Chosen Characters List</p> <p>- Simple</p>
---	---	--	---

select more characters

- Pinnule Arrange at Middle Pinnae Base
- Stipe
- Stipe Color
- Stipe diameter
- Texture of lamina

Submit Reset



Interactive Key for Taiwan Plant - Windows Internet Explorer

http://hif.fda.gov.tw/key/

Interactive Key for Taiwan Plant

### Interactive Key of Taiwan Plant

**Lemmaphyllum carnosum (Hook.) C. Presl**      POLYPODIACEAE

Drymoglossum carnosum J. Sm. ex Hook.  
Lemmaphyllum microphyllum Presl. 挂樹蕨(代石蕨)

**Publication:** Epim. Bot. 158. 1851

**Type Status & Publication:** T. Nepal, Wallich 138 (BM, US)

**Description:** Small epiphytes. Rhizome very long-creeping, about 1 mm wide; c.s. oval, with about 4 equalize bundles, scales sparse, clathrate, acicular with broad and forked bases. Stipes 1-2 cm apart, fronds small, dimorphic; sterile fronds variable in size and shape, usually ovate or orbicular, nearly sessile, cuneate at base, 1-2 cm long by 1-1.5 cm wide, or varying to oblanceolate and stipitate, to about 4 cm long and 6 mm wide, margins entire, texture somewhat fleshy; venation reticulate, hidden; fertile fronds narrowly linear, 2-5 mm wide, to about 6 cm long. Sporangia in a continuous linear row on either side of costa (coenosori), later nearly covering the undersurface except along the margins; covered with clathrate, pelate scales when young.

**Reference:** Editorial Committee of the Flora of Taiwan Second Edition. 1994. Flora of Taiwan Vol. 1 2nd Edition.

**Taxonomic Information**

Nomenclature & Synonyms

Original Publication

Type Specimens Data

Specimen Images

Descriptions

Relative Documents

Interactive Key for Taiwan Plant - Windows Internet Explorer

http://hif.fda.gov.tw/key/

Interactive Key for Taiwan Plant

### Interactive Key of Taiwan Plant

**Searching Result(s)**

Character(s) for Query:	Found Taxa:	Character(s) for result:
- Rhizome: Rhizome Type	- <i>Cyathea fenicis</i> Copel. 扇標葉蕨	Froned. Apex of Pinnas:
- Trunk-like, usually more than 1 m	- <i>Cyathea leprifera</i> (J. Sm. ex Hook.) Copel. 扇蕨	- acute
	- <i>Cyathea lohrii</i> Christ 扇標樹蕨	- acuminate
	- <i>Cyathea metteniana</i> (Hance) C. Chr. & Tard.-Blot 扇標樹蕨	- caudate
	- <i>Cyathea spinulosa</i> Wall. ex Hook. 台灣樹蕨	Froned. Apex of pinnaule:
	- <i>Brama insignis</i> (Hook.) J. Sm. 扇標蕨	- acuminate
		- caudate
		Froned. Base of Pinnas (if exist):
		- symmetric
		- cordate
		Froned. Base of Pinnule (if exist):
		- petiole
		- symmetric
		Froned. Shape of Pinnas:
		- Pinnatifid-Pinnax
		- Tripinnatifid-Trip
		Froned. Leaf Shape:
		- lanceolate

More characters for identification of the species listed in the right column

Interactive Key for Taiwan Plant - Windows Internet Explorer

http://taif.fra.gov.tw/key/

### Interactive Key of Taiwan Plant

Searching Result(s)

Character(s) for Query:	Found Taxa:	Character(s) for result:
<ul style="list-style-type: none"> <li>- Frond: Leaf Division</li> <li>- Pinnatifid-Pinnate</li> <li>- Rhizome: Rhizome Type</li> <li>- Trunk-like, usually more than 1 m</li> </ul>	<ul style="list-style-type: none"> <li>- <i>Brainea insignis</i> (Hook.) J. Sm. 蕨葉蕨</li> </ul>	

臺灣林業試驗所 植物標本館 Herbarium, Taiwan Forestry Research Institute - 標本查詢結果 Specimen

### Query Specimens Data in TAIF

## Herbarium, Taiwan Forestry Research Institute Specimen Data

26 specimens were found.

Sortfield: Herbarium No. Ascending/Descending: Ascending

Type Image	Herbarium No.	Family	Species Name	Collector
	182773	Blechnaceae	<i>Brainea insignis</i> (Hook.) J. Sm.	Wen
	195912	Blechnaceae	<i>Brainea insignis</i> (Hook.) J. Sm.	Shih, Fong, Li, I
	195913	Blechnaceae	<i>Brainea insignis</i> (Hook.) J. Sm.	Shih, Fong, Li, I
	195914	Blechnaceae	<i>Brainea insignis</i> (Hook.) J. Sm.	Shih, Fong, Li, I
	199775	Blechnaceae	<i>Brainea insignis</i> (Hook.) J. Sm.	Pi-F
	199776	Blechnaceae	<i>Brainea insignis</i> (Hook.) J. Sm.	Pi-F
	199777	Blechnaceae	<i>Brainea insignis</i> (Hook.) J. Sm.	Pi-F
	199778	Blechnaceae	<i>Brainea insignis</i> (Hook.) J. Sm.	Pi-F
	199779	Blechnaceae	<i>Brainea insignis</i> (Hook.) J. Sm.	Pi-F

Herbarium, Taiwan Forestry Research Institute Specimen Data

Herbarium No.: 182773 Family: Blechnaceae

Specimen Name: *Brainea insignis* (Hook.) J. Sm.

Collector(s): Wen-Liang Chen

Locality: Taiwan (臺灣省), Hsinchu County (新竹縣), Hsinchu

Image(s): Sheet 1

**TAIF : 1,500,000 specimen space  
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<http://taif.tfri.gov.tw>

Herbarium, Taiwan Forestry Research Institute  
*Specimen Data Search*

Choose species name query method :  
 Family  Genus  Species Name Keywords

Genus :  or select genus list:

Collector :

Location :

If you have any comment or suggestion, please Contact Us.  
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[http://taif.tfri.gov.tw/taif\\_en/](http://taif.tfri.gov.tw/taif_en/)

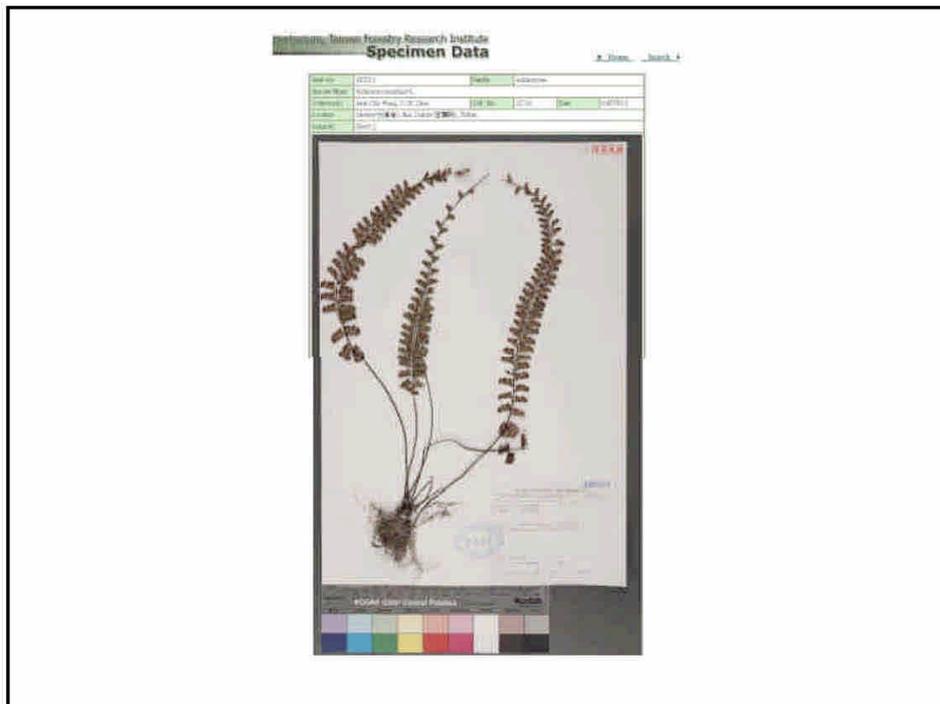
## Herbarium, Taiwan Forestry Research Institute *Specimen Data Search*

224 specimens were found.

Sortfield :  AscendingDescending :

[Home](#) [Search](#)

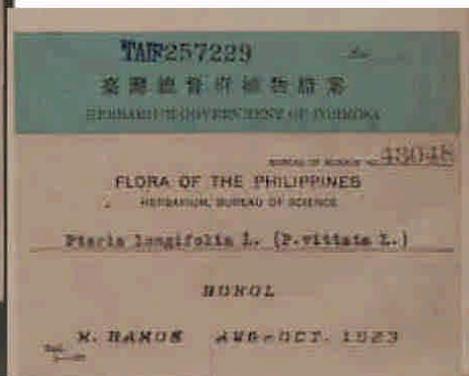
Type	Image	Herbarium No.	Family	Species Name	Collector(s)	Coll. No.	Date	Location
		101828	Adiantaceae	<i>Adiantum diaphanum</i> Blume	Yao-Mou Huang	71	1999/5/1	Chuyang
		101829	Adiantaceae	<i>Adiantum diaphanum</i> Blume	Yao-Mou Huang	72	1999/5/1	Chunyang
		163196	Adiantaceae	<i>Adiantum capillus-veneris</i> L. forma <i>lanivanuui</i> W. C. Shieh	Pi-Fong Lu	3956	2002/4/5	Lanyu
		165296	Adiantaceae	<i>Adiantum meishanense</i> Kuo	Bi-Jao Wang	13943	1988/5/28	Meishankou
		165297	Adiantaceae	<i>Adiantum meishanense</i> Kuo	Bi-Jao Wang	13943	1988/5/28	Meishankou
		165298	Adiantaceae	<i>Adiantum meishanense</i> Kuo	Bi-Jao Wang	13943	1988/5/28	Meishankou
		167848	Adiantaceae	<i>Adiantum pedatum</i> L.	Wen-Liang Chiou	14353	1994/9/8	Rest area of #169 Highway
		167849	Adiantaceae	<i>Adiantum pedatum</i> L.	Wen-Liang Chiou	14353	1994/9/8	Rest area of #169 Highway
		172574	Adiantaceae	<i>Adiantum caudatum</i> L.	Pei-Hsuan Lee, Shih-Wen Chung, Chiao-Yu Kuo, Jun-Ming Chen	1640	2002/7/29	Hsinwu
		175236	Adiantaceae	<i>Adiantum caudatum</i> L.	Her-Long Chiang	3019	2002/8/7	Tapu
		175237	Adiantaceae	<i>Adiantum caudatum</i> L.	Her-Long Chiang	3019	2002/8/7	Tapu
		181293	Adiantaceae	<i>Adiantum edentatum</i> Christ	Pei-Hsuan Lee, Jun-Ming Chen	2090	2002/10/5	Chikai Main Peak
		181420	Adiantaceae	<i>Adiantum fabelliculatum</i> L.	Chuan-Chieh Chen	477	2002/9/28	Takualhatling
		182402	Adiantaceae	<i>Adiantum edgeworthii</i> Hook.	Huang, Shieh	1688	1985/7/3	Tong-Pu
		182513	Adiantaceae	<i>Adiantum caudatum</i> L.	Jenn-Chie Wang, C. H. Chen	10510	1997/8/15	Chulan
		183001	Adiantaceae	<i>Adiantum fabelliculatum</i> L.	Pei-Hsuan Lee, J M Cheng	2382	2003/1/21	Luku
		183445	Adiantaceae	<i>Adiantum edentatum</i> Christ	Xian-Chun Zhang	211	1990/5/25	Sanquan
		183475	Adiantaceae	<i>Adiantum edgeworthii</i> Hook.	Yian-Chun Zhang	186	1989/9/27	Sanquan



## Scanning & digitalization



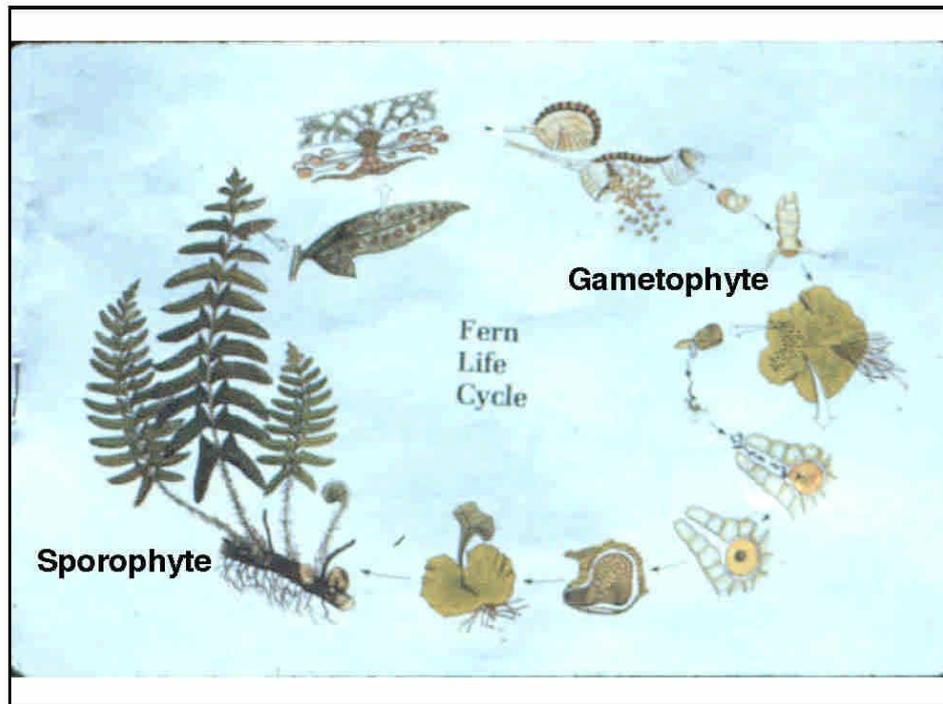
139 specimens  
collected from the  
Philippines (1911~1992)  
and deposited in TAIF  
<http://taif.tfri.gov.tw/search.php>



## How many ferns in the world?

- Total: ca.12,000 species
- North American: ca. 450 spp.
- Europe: ca. 150 spp.
- Taiwan: ca. 650 spp.
- Philippines: 943 species (Copeland, 1958-1960)

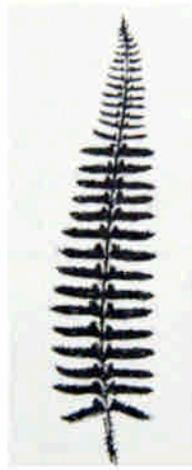
**\*: Pteridophytes =  
ferns + fern allies**



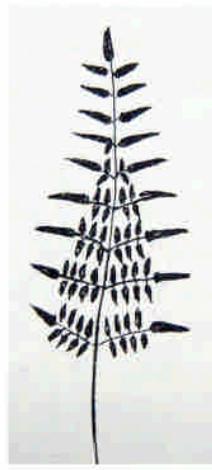
## Types of Leaf Division



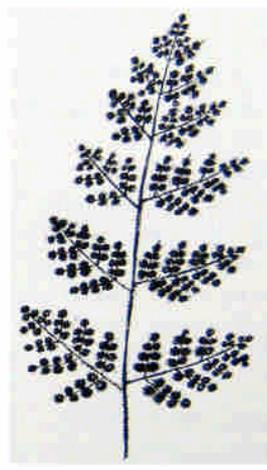
simple



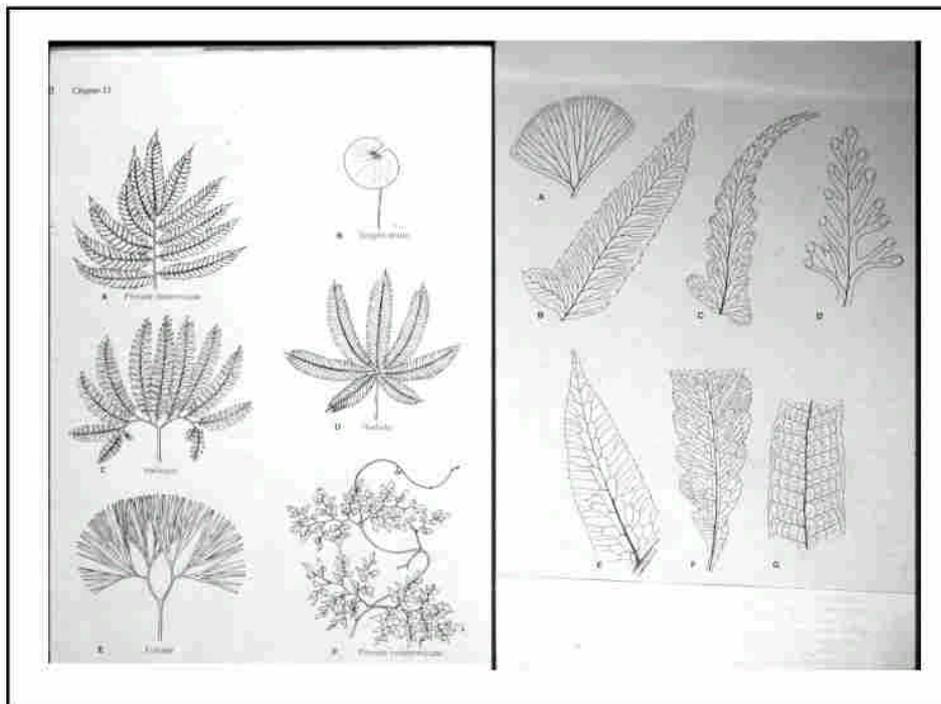
1- pinnate

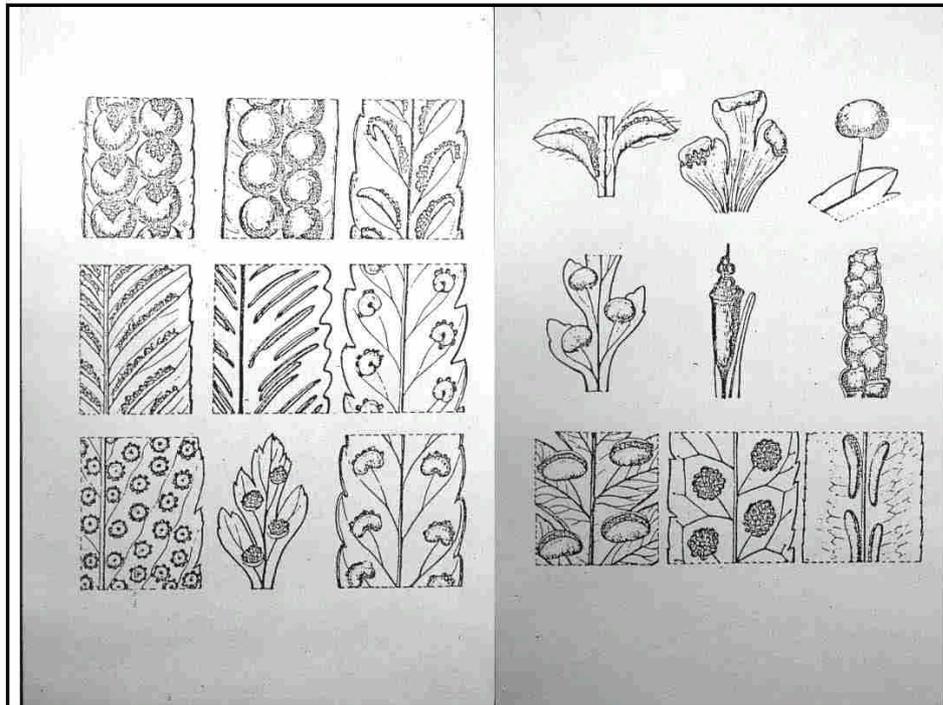


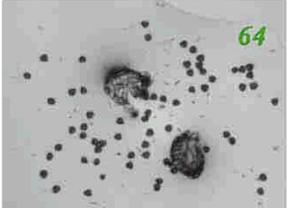
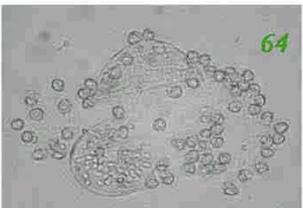
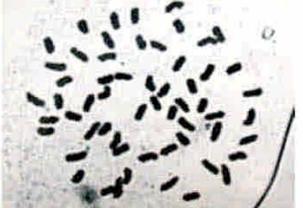
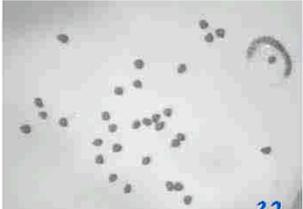
2- pinnate

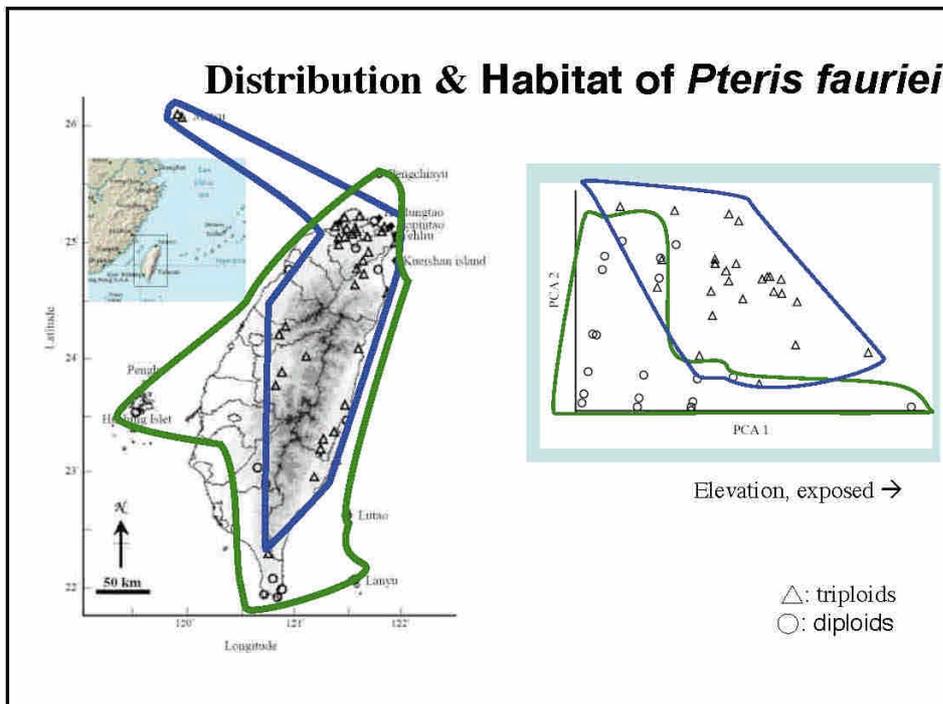
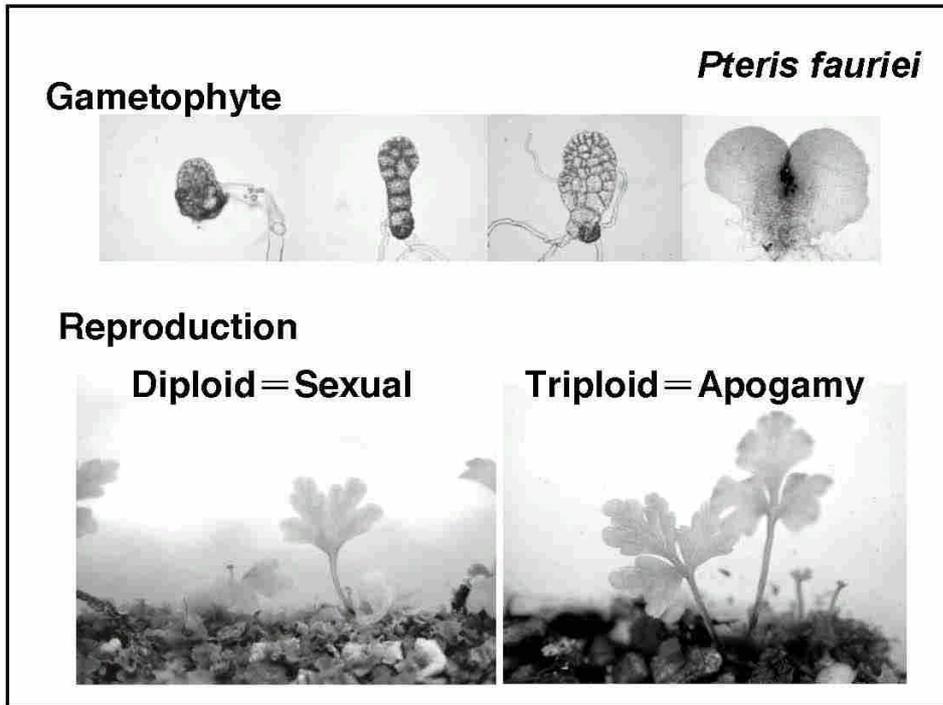


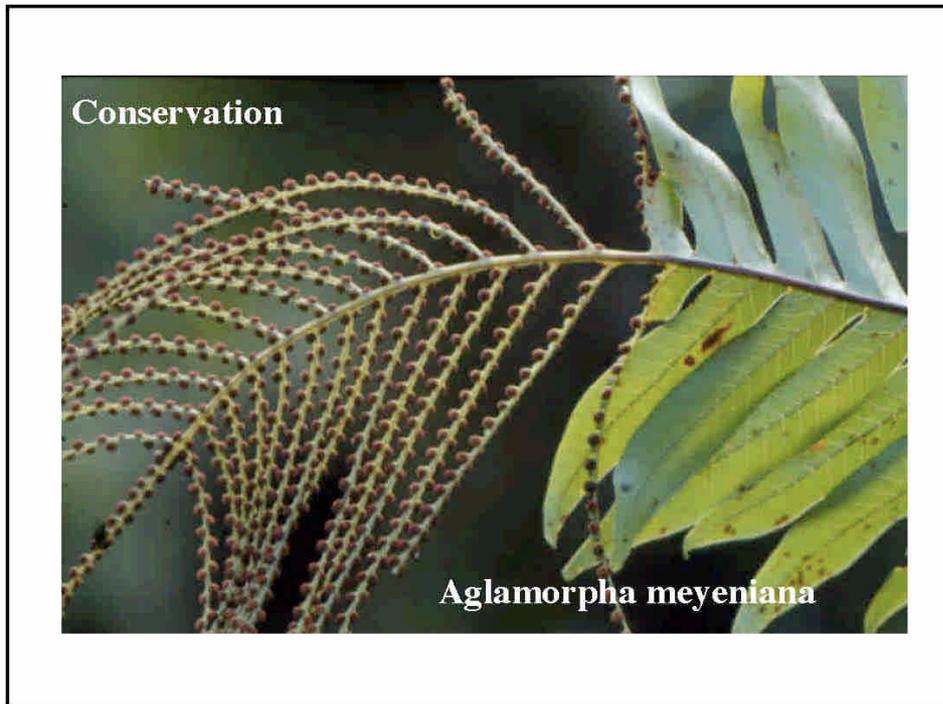
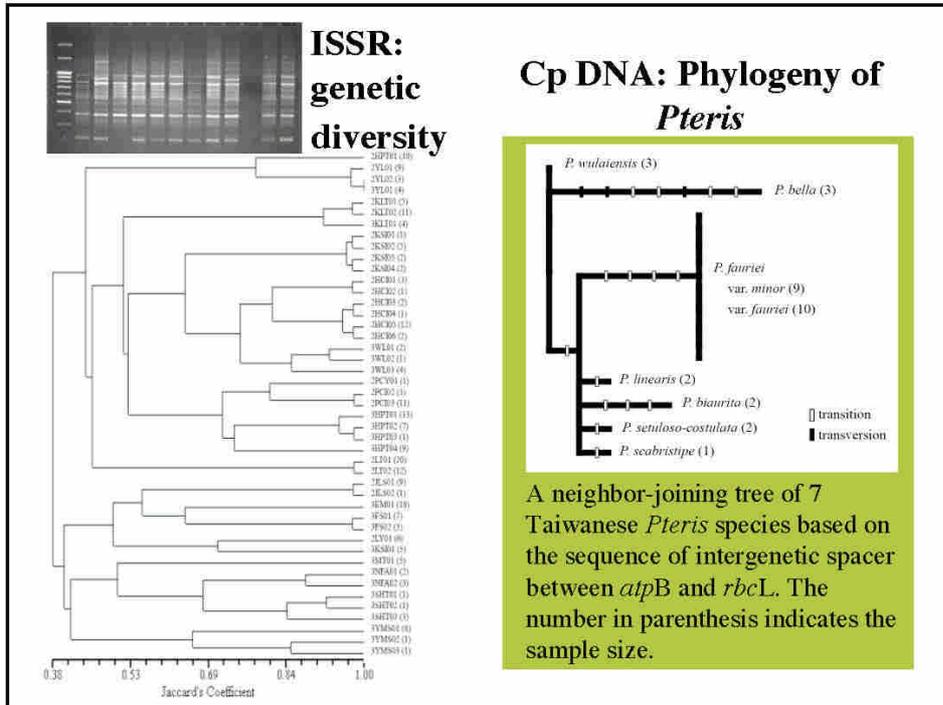
3- pinnate  
and even more....

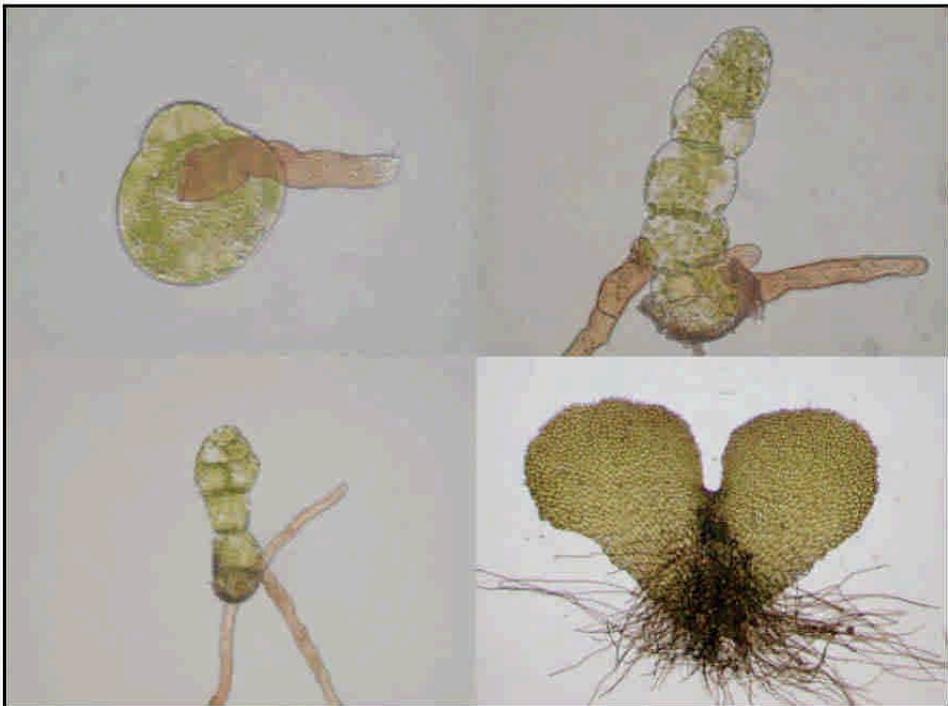
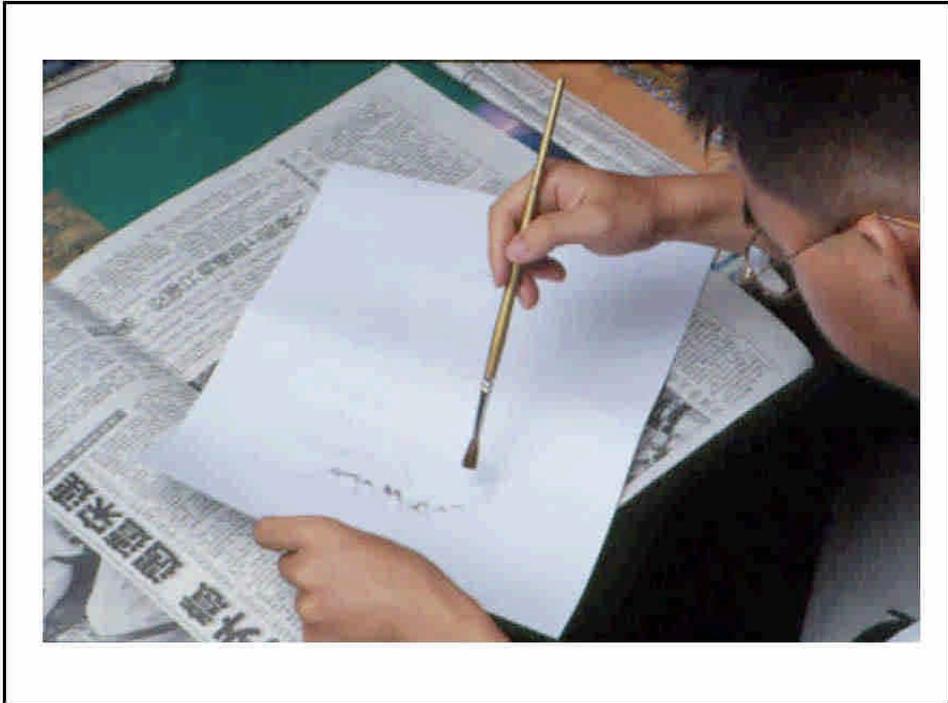


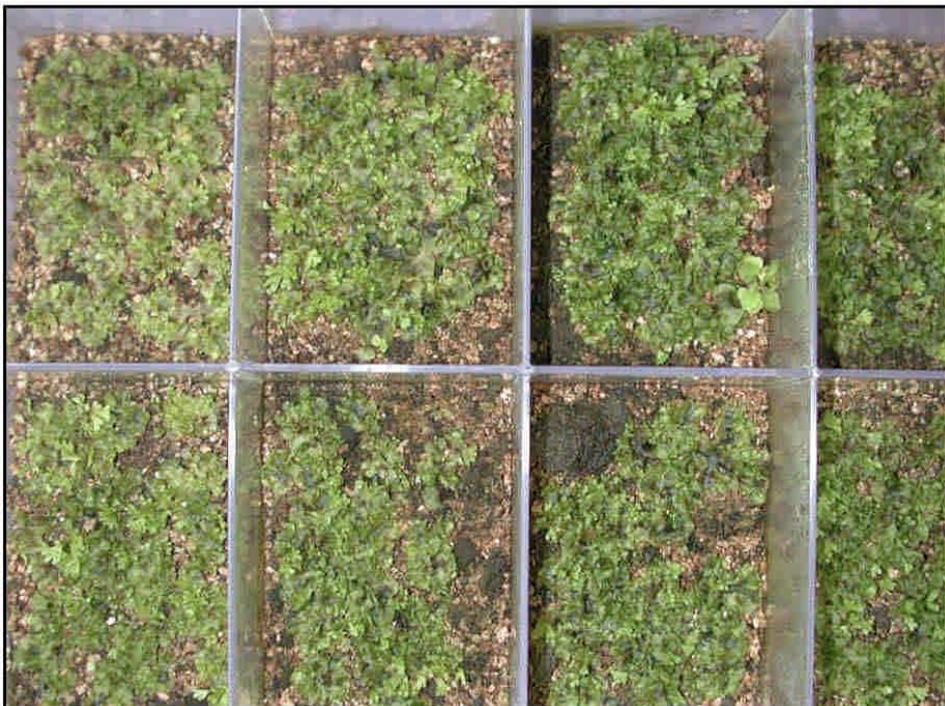
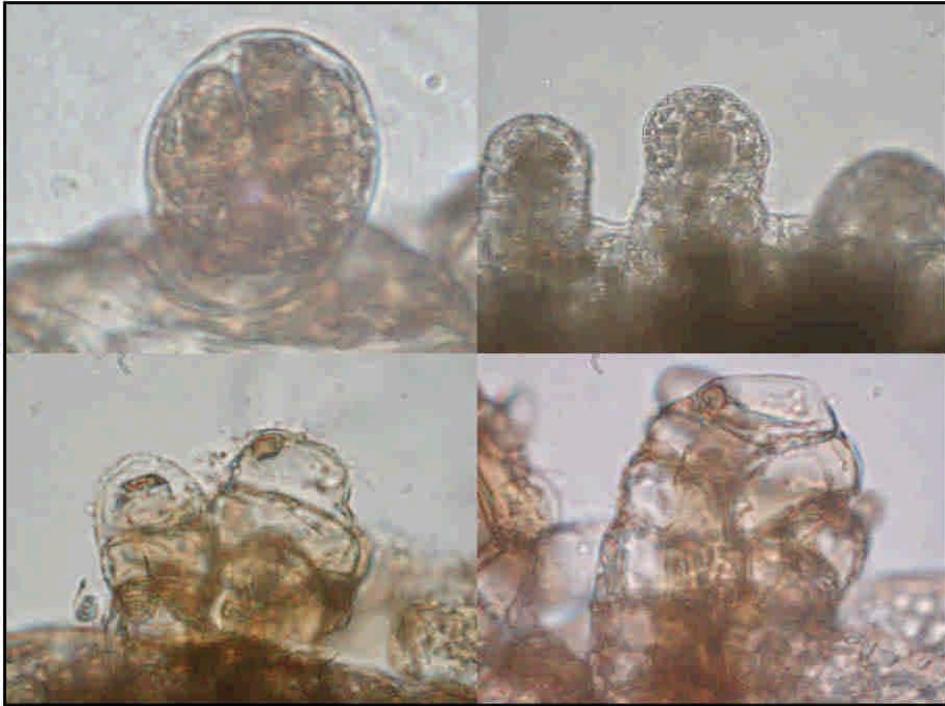


		
<i>Pteris fauriei</i>		$2n=2X=58$
		
Spore # per sporangium	Sperm # per Antheridium	Chromosome #



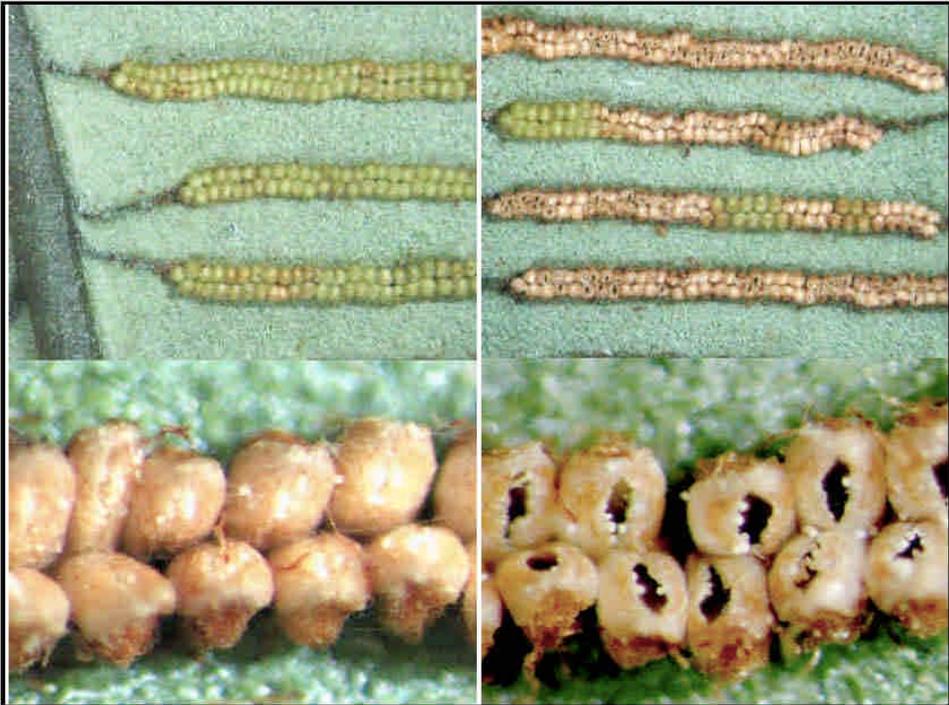








	<p><b>Angiopteris</b></p> <p><i>A. somai</i> : Endangered          Endemic          2 populations          &lt; 1,000 individuals</p>
<p><i>A. itoi</i> : Critical endangered          Endemic          Single population          &lt; 100 plants</p>	



## Media

Agar

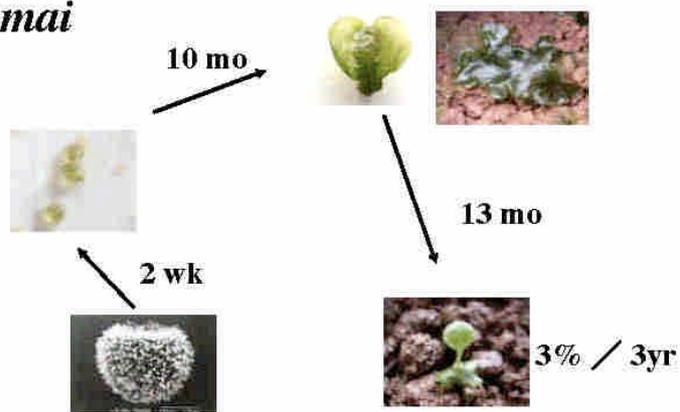
Sphagnum

Peat moss

.....

Soil from original habitat

*A. somai*



1. Low sporophyte production of *A. somai*
2. Spores of *A. itoi* do not germinate



*A. itoi* reproduced from stipules



3 mo

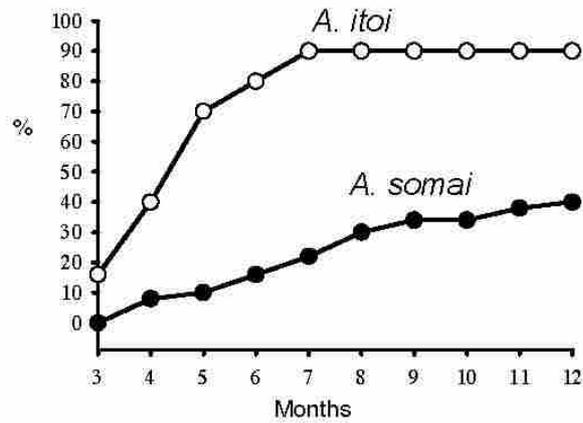


8 mo



1 yr

## Sporophyte production from stipules

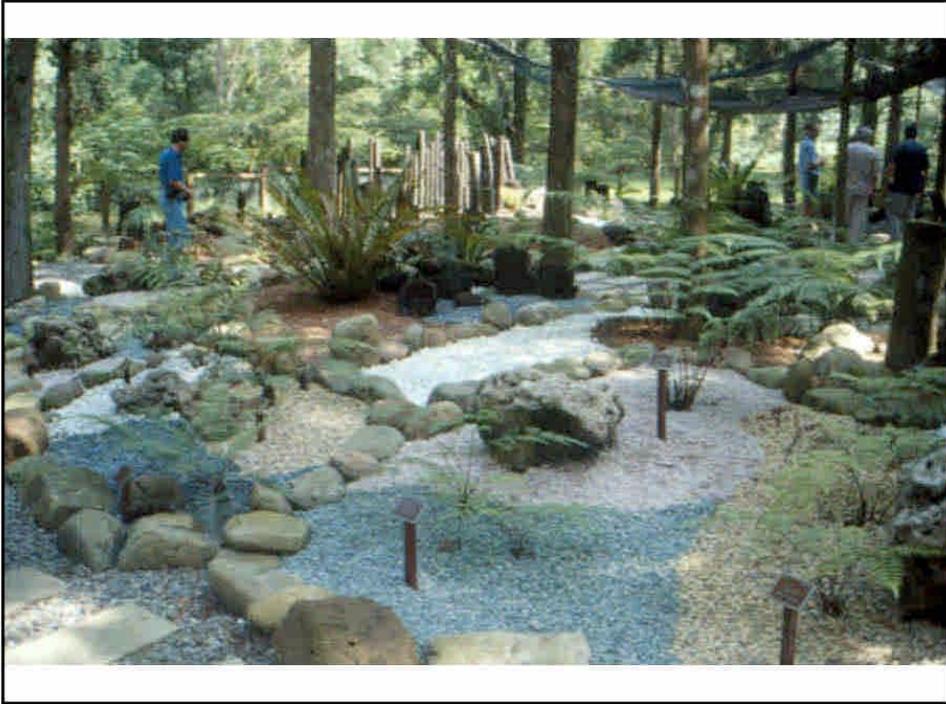


### Seedlings transplant:

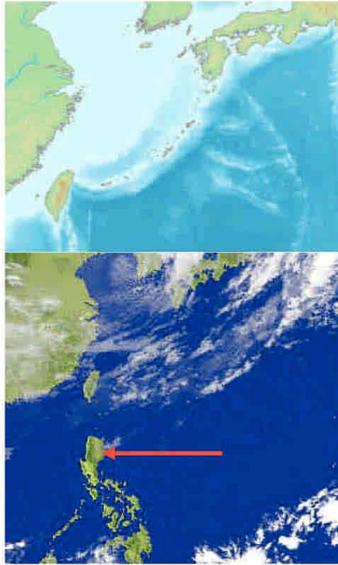
1. Taipei Botanic Garden
2. The original habitat

### Conservation & education





## Research



- Traditional taxonomy
- E-Flora & Interactive key
- Phylogeny, phylogeography
- Conservation
- Education
- Herbarium & Botanic garden

***Diospyros philippensis***  
**(*Diospyros dioscolor*)**  
**VS**  
***Diospyros blancoi* A. DC.**

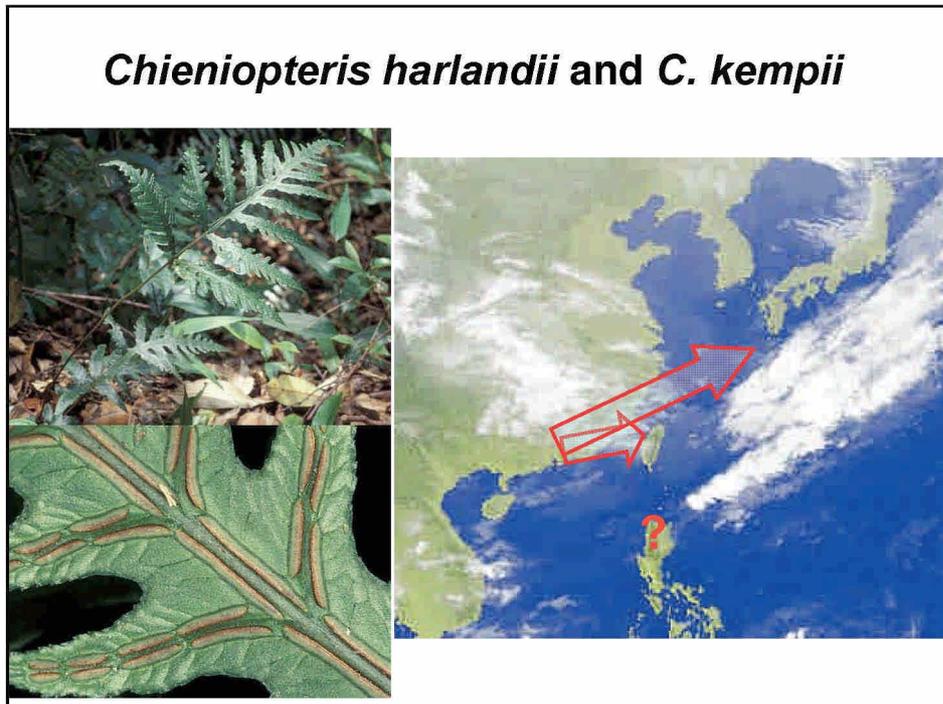
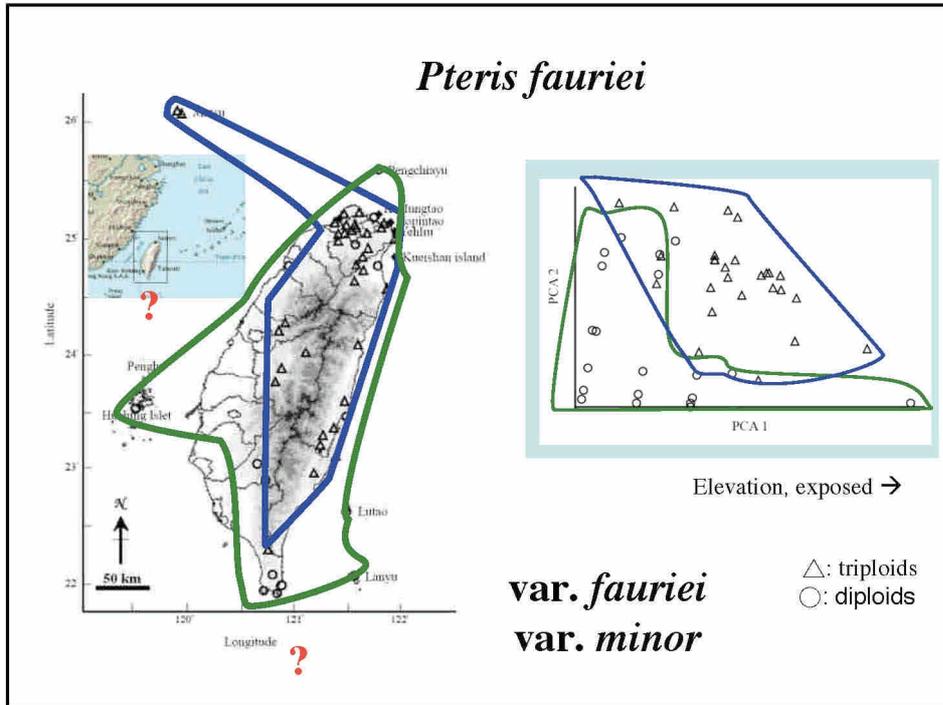


*Medinilla formosana* Hayata  
VS  
*Medinilla pendula* Merr.

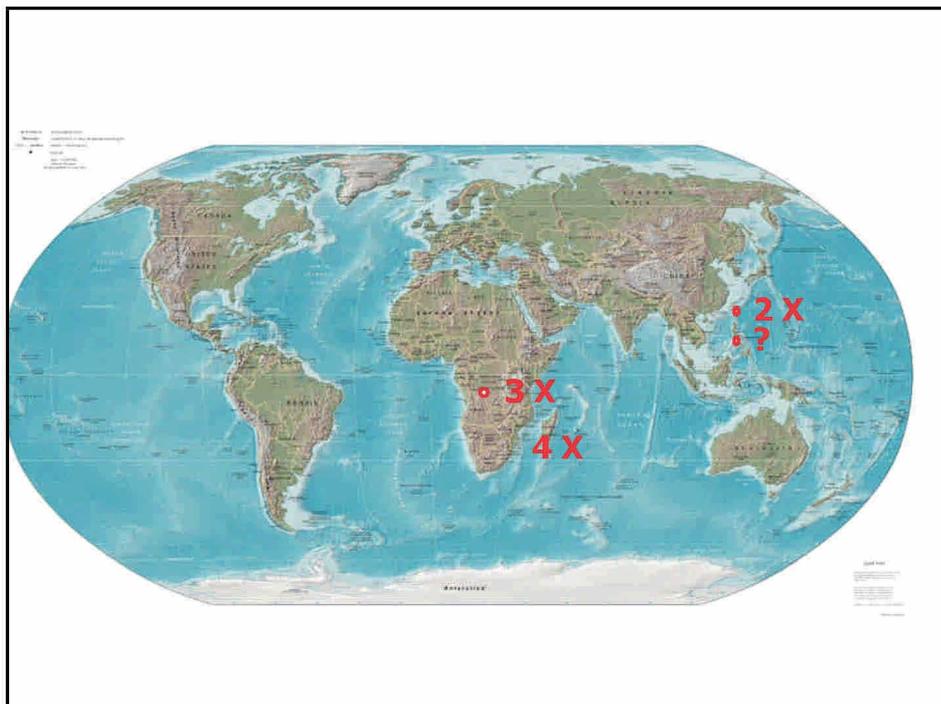


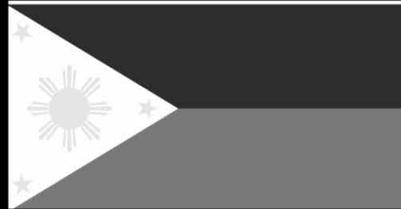
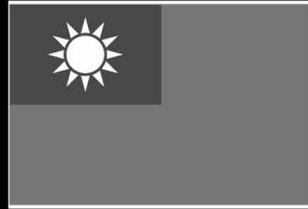
*Clerodendron kaempferi*  
VS  
*Clerodendron intermedium*





***Hemionitis arifolia* (2X, 3X, 4x)**





Thank you

五、附錄二：菲律賓國家標本館典藏之澤瀉蕨標本

