**Taiwania, 58**(4): 305–310, 2013
*DOI: 10.6165/tai.2013.58.305*

**NOTE**

# New Distribution of *Pteris kawabatae* Sa. Kurata and Re-circumscription of *Pteris arisanensis* Tagawa

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(Manuscript received 13 May 2013; accepted 16 August 2013)

ABSTRACT: *Pteris kawabatae* Sa. Kurata was regarded as endemic to Japan. We here report its new distribution in China, Taiwan, and Vietnam. We also re-circumscribe *P. arisanensis* as an independent species and propose its Chinese name herein. A key is provided to compare those morphologically similar *Pteris* species in Taiwan, including *P. arisanensis*, *P. biaurita*, *P. fauriei*, *P. linearis*, *P. kawabatae* and *P. wulaiensis*.

KEY WORDS: New records, *Pteris*, *Pteris arisanensis*, *Pteris kawabatae*, *Pteris linearis*, taxonomy.

## INTRODUCTION

*Pteris kawabatae* Sa. Kurata was previously regarded as an endemic species of Japan (Iwatsuki et al., 1995) and critically endangered (CR) in Asia (Ebihara et al., 2012). Recently it was found in China, northern Taiwan, and northern Vietnam (Fig. 1).

While distinguishing *P. kawabatae* from other morphologically similar *Pteris* species, we also found that *Pteris arisanensis* Tagawa has long been mistreated as a synonym of *Pteris linearis* Poir. (Shieh, 1966, 1994; Wu, 1990). In this study, we revise the distribution of *P. kawabatae* and confirm the occurrence of *P. arisanensis*. A key to distinguish the morphologically similar species is also provided.

## TAXONOMIC TREATMENTS

***Pteris kawabatae*** Sa. Kurata in J. Geobot 17:59. 1969.-TYPE: Japan, Kyushu: Tachu, Yaku Isl., M. Kawabata, Apr. 1969 (holotype, TOFO, photo!)
無柄鳳尾蕨 Fig. 2

Evergreen. Rhizomes short-creeping, densely covered with bicolorous linear scales. Fronds clustered, to 80 cm long; stipes 20–60 cm long, dark-red or adaxially stramineous and abaxially dark-red, sparsely scaly at base, grooved on adaxial surface; laminae ovate, 25–60 cm long, 20–30 cm wide, bipinnatifid; lateral pinna 3-8 pairs, ascending at (an angle of) 70–80° to rachis, incurved, lanceolate, apex caudate or acute, pectinate, 3–4(5) cm wide, lowest pinnae bearing one long basiscopic secondary pinnae; segments of pinnae oblong, 3–8 mm wide, round at apex, entire at margin; the distance between adjacent sinuses 4–9 mm; veins forked, free; sori continuous along margins of pinna-segments, from near base to middle or more distal portion.

Distribution: East Asia. Japan (Yakushima Isl.), China (Guangxi), Taiwan, and Vietnam (Vinh Phuc); in shaded wet places near roadside, under evergreen broad leaf forest, less than 1,000 m in elevation.

Specimens examined: **CHINA.** Guangxi Pref.: Lingchuan, *P. F. Lu* 25410 (TAIF). **JAPAN.** Kagoshima Pref.: Yakushima Isl., *M. Kawabata s.n.*, July 13, 1969 (TNS255531, 384528), Aug. 9, 1970, (TNS290046, 290047, 523270), *K. Satake s.n.*, Aug. 15, 1959 (TNS523271), *T. Nakaike s.n.,* Aug. 22, 1983 (TNS710312), Aug. 20, 1982 (TNS712260). **TAIWAN.** Ilan County: Fushan Botanical Garden, *Y. H. Chang 733* (TAIF). —Keelung City: Nuannuan District, *P. F. Lu 22877*, *23145, 24225* (TAIF). —Taoyuan County: Mt. He-Wei, *Y. S. Chao 1742* (TAIF), *C. M. Chen* & *W. L. Chiou 84* (TAIF). —New Taipei City: Hsintien District, Mt. Chitang, *P. F. Lu 25181* (TAIF); Shuangxi District, Xiweilaio Trail, *P. F. Lu 24355*. **VIETNAM.** Vinh Phuc: Tam Dao, *Y. S. Chao 1632*, *1637* (TAIF, VNMN.B).

Note: The *Pteris* species with bipinnatifid fronds are difficult to distinguish from each other. The sessile pinnae with the basal pinna-segments adnate to the rachis is the most unique and distinct character of *P. kawabatae*. The basal segments of lateral pinna sometimes are elongate (Fig. 2B).

Jiang (2011) recorded *Pteris psedogrevilleana* Jiang *sp. nov. ined* in his thesis. After examining the voucher specimens and reference therein (IBK, photo!) and recent survey in Guangxi, China, it is identified to be



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**Fig. 1. Photographs of *Pteris kawabatae* Sa. Kurata in Keelung City, Taiwan. A: Habitat. B: A frond.**

*Pteris kawabatae* Sa. Kurata. Ebihara et al. (2012) nominated it a globally endangered species based on a formally known distribution range (endemic to Japan; Iwatsuki et al., 1995), but it should be updated following the present result.

***Pteris arisanensis*** Tagawa in Acta Phytotax. Geobot. 5: 102. 1936.-TYPE: Arisan, Formosa, 1914, *U. Faurie 603* (holotype, isotype, KYO!); Masamune, A List Vasc. Pl. Taiwan 8. 1954.

阿里山鳳尾蕨

*Pteris linearis* auct. non Poir.: Shieh, Bot. Mag. (Tokyo) 79: 291. 1966; *id.*, Q. Jour. Chin. For. 7: 91. 1974 [三角脈鳳尾蕨]; *id.*, Fl. Taiwan, 1st ed. 1: 297. 1975; *id.*, Fl. Taiwan, 2nd ed. 1: 229. 1994 [三角脈鳳尾蕨]; Kuo, Taiwania 30: 22. 1985; *id.*, Man. Taiwan Vasc. Pl. 1: 67. 1997 [三角脈鳳尾蕨]; Wu, Fl. Reipubl. Pop. Sinicae. 3(1): 75. 1990 [線羽鳳尾蕨]; Lu and Yang, Taiwnia 50: 147. 2005 [三角眼鳳尾蕨].

Evergreen. Rhizomes short-creeping, densely covered with bicolorous linear scales. Fronds clustered, to 90 cm long; stipes 20–50 cm long, stramineous or adaxially stramineous and abaxially brown, grooved on adaxial side; laminae oblong-ovate to oblong, about 30–50 cm long, 30 cm wide, bipinnatifid; lateral pinnae 4–7 pairs, ascending at (an angle of) 45–70° to rachis, stalked, straight, lanceolate, apex caudate or acute, pectinate, 2–3 cm wide, lowest pinnae bearing one long basiscopic secondary pinnae; pinna-segments falcate, 3–8 mm wide, round at apex, entire at margin; sinuses to adjacent ones 4–9 mm apart; veins forked, free or anastomosing to sometimes form single triangular costal areolae under sinus; sori continuous along margins of segment except the apex.

Distribution: Southeastern China, Taiwan, and India; in forests and semi-open areas, less than 2,500 m in elevation.

Specimens examined: **CHINA.** Hainan: Diaoluoshan, *Y. S. Chao 1764, 1769* (TAIF). Gungdong, Guangzhou City, *S. Y. Dong s.n.* (IBSC). **TAIWAN.** Arisan, *U. Faurie 603* (KYO).—Miaoli County: Mt. Nankeng, *T. C. Hsu s.n.* Jan. 16, 2013 (TAIF).—Nantou County: National Fonghuanggu Bird Park to Tienliao, *P. F. Lu 6510* (TAIF). **VIETNAM.** *Conlani 1589* (SING). —Vinh Phuc: Tam Dao, *Y. S. Chao 1621* (TAIF, VNMN.B)

Note: This species was named after the locality it was found, viz. Arisan, Taiwan. The type of *Pteris linearis* Poir. (P0048352!) was collected from Mauritius Island, near Madagascar in Indian Ocean. After checking some specimens of *P. linearis* from Africa and Madagascar and *P. arisanensis* from Asia, we found that the triangular costal areolae do not always present



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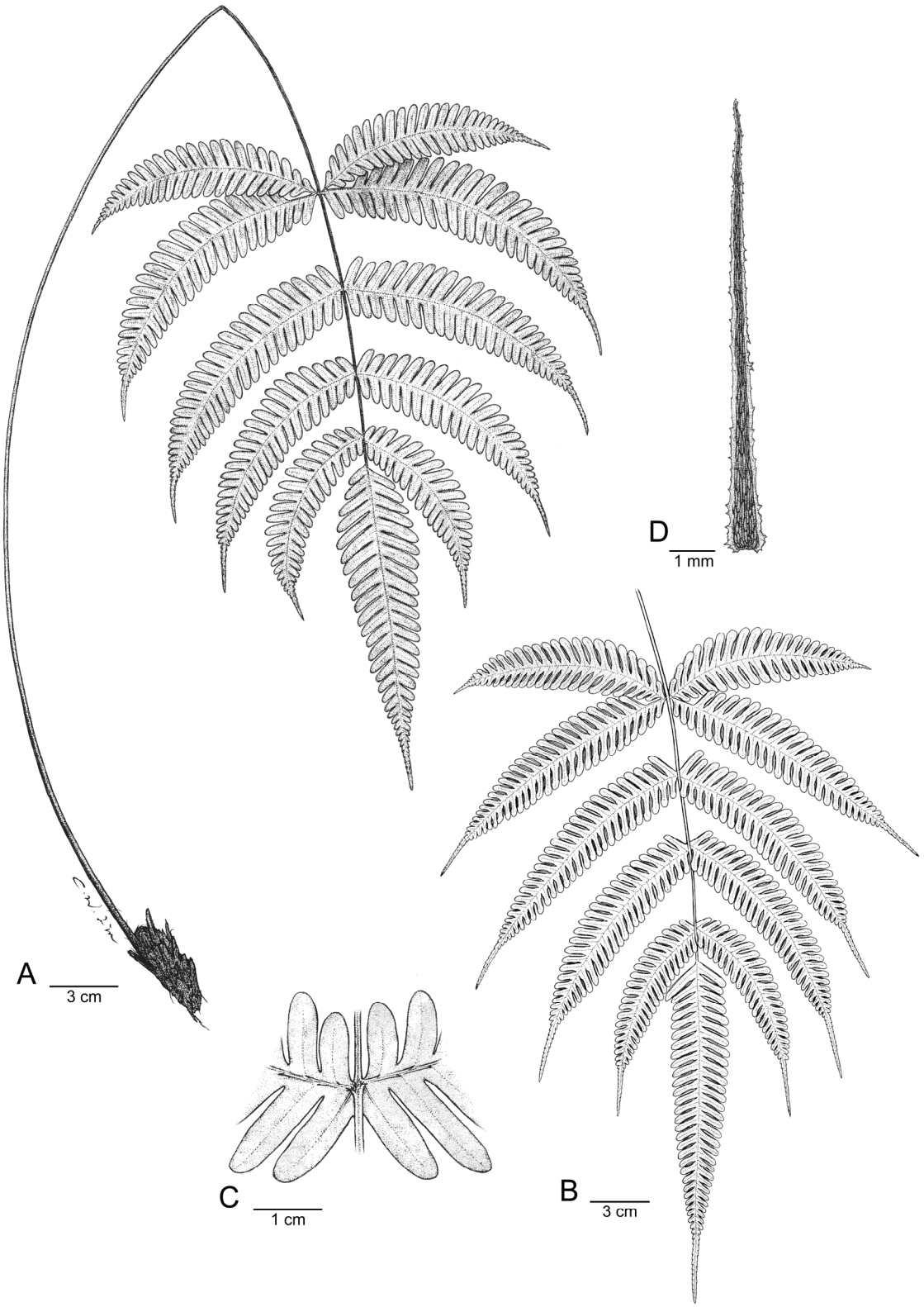



**Fig. 2. Illustration of *Pteris kawabatae* Sa. Kurata (voucher: *P. F. Lu 23145*). A: Habit. B: Fertile frond, with sori covering only about 3/4 margins of pinnules. C: Pinnae sessile, basal pinna-segments adnate to the rachis. D: Linear, bicolorous scale.**



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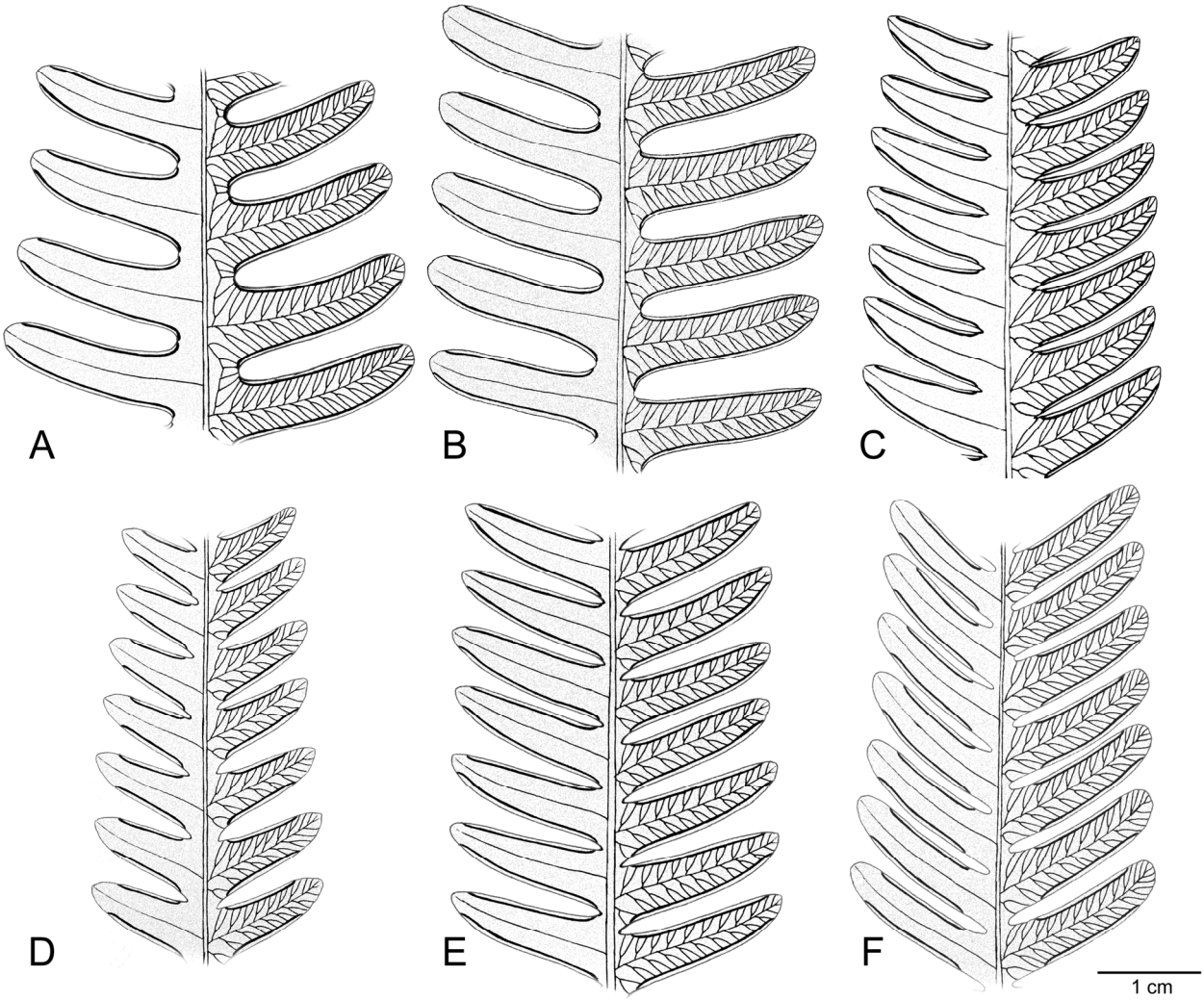



**Fig. 3. Pinnules and venations of A: *Pteris biaurita*. B: *P. linearis*. C: *P. arisanensis*. D: *P. wulaiensis*. E: *P. fauriei*. F: *P. kawabatae*.**

on each sinus of *P. linearis*, neither on *P. arisanensis*. The Chinese name "三角脈鳳尾蕨", meaning *Pteris* with "triangular vein", is not suitable for *P. arisanensis*. We here propose "阿里山鳳尾蕨" as its Chinese name, corresponding to its scientific name.

One of the diagnostic characteristics to distinguish *P. linearis, P. arisanensis*, and *P. biaurita* is the anastomosing pattern of costal areolae. The areolae of *P. linearis* and *P. arisanensis* are triangular (in the case areolae present), formed by the joining of a pair of trifurcate veinlets or a pair of bifurcate veinlets, respectively (Fig. 3B & C). The areolae of *P. biaurita*, usually somewhat arched but triangular sometimes, are connected with several free veinlets at the sinus side (Fig. 3A). Although *P. arisanensis* frequently grow with *P. biaurita* together that often makes their misidentification, they can be distinguished by their different anastomosing areolae.

Fraser-Jenkins (2008) thought that "*P. arisanensis*" should be applied to "Himalayan and Taiwan *P. linearis*". Here we point out the morphological difference between the typical *P. arisanensis* and *P. linearis*, but only address that *P. arisanensis* occurs in SW. China, Vietnam, and Taiwan. In Himalayan ferns, there are some questions about the components of the ''*P. linearis*'' species complex, such as *P. confusa* T. G. Walker and *P. gongalensis* T. G. Walker (Fraser-Jenkins, 2010). Furthermore, "*P. linearis*" in Himalayas is triploid (Fraser-Jenkins, 2008), but *P. arisanensis* is tetraploid (Tsai and Shieh, 1984). More reliable evidences, especially the cytology and molecular data, are needed to decipher the taxonomy of the Himalayan ''*P. linearis*'' species complex and *P. arisanensis*.



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A key to distinguish *P. arisanensis* and *P. linearis* from the morphologically similar species in Taiwan, including *P. biaurita*, *P. fauriei* Hieron, and *P. wulaiensis* C.M. Kuo, is provided below.

### Key

1. Pinnae sessile, incurved; pinnules oblong, with rounded apex ……. ……. ***P. kawabatae***
1. Pinnae stalked, straight; pinnules falcate, with obtuse apex …….. 2
2. Venation completely free, no costal areolae ……..…. 3
3. Lateral pinna widest at middle; lamina chartaceous to coriaceous; scales concolorous on the base of stipes. ……..... ***P. fauriei***
3. Lateral pinna widest at base; lamina herbaceous; scales bicolorous on the base of stipes. ……..... ***P. wulaiensis***
2. Venation free or with costal areolae. …….. 4
4. Costal areolae arched, few triangular, connective vein with free veinlets ……..…… ***P. biaurita***
4. Costal areolae triangular or wanting, if presented conected by a pair of furcated veinlets. …… 5
5. A pair of trifurcate veinlets joining a triangular costal areola; sinuses wide as pinnules; distributed in Neotropics, Africa, and Madagascar. ……. ***P. linearis***
5. A pair of bifurcate veinlets joining a triangular costal areola, if the areolae presenting; sinuses narrow than pinnules wide, distributed in Asia. ……. ***P. arisanensis***

## ACKNOWLEDGEMENTS

The authors thank Ms. Pi-Fong Lu for her assistance in collecting plant samples and photographs of plants in field, Yea-Chen Liu and Li-Yuan Kuo for photographs of type, and Che-Wai Lin for illustration drawing.

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# 無柄鳳尾蕨的新分布與阿里山鳳尾蕨的確認

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(收稿日期：2013年05月13日；接受日期：2013年08月16日)

摘要：無柄鳳尾蕨過去被認為是日本特有種，本文報導了本種在大陸、台灣和越南的新分布；另確認 *P. arisanensis* 為一獨立的種，並建議其中文名稱為「阿里山鳳尾蕨」。本文並提供檢索表，比較幾種形態相似的台灣產鳳尾蕨屬物種，包括阿里山鳳尾蕨、弧脈鳳尾蕨、傅氏鳳尾蕨、三角脈鳳尾蕨、無柄鳳尾蕨與烏來鳳尾蕨等。

關鍵詞：新紀錄、鳳尾蕨屬、阿里山鳳尾蕨、無柄鳳尾蕨、三角脈鳳尾蕨、分類。



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