

**A revised taxonomic account of the fern genus  
*Woodwardia* (Blechnaceae) in Thailand**

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ABSTRACT. The genus *Woodwardia* Sm. is revised and is now represented in Thailand by two species, *W. harlandii* and *W. japonica*. These are described and illustrated. A key to the species is presented.

**INTRODUCTION**

The genus *Woodwardia* Sm. belongs to Blechnaceae subfam. Blechnoideae. So far 14 species have been recognised. These are predominantly distributed in the northern hemisphere, especially in eastern Asia (Kramer et al., 1990). Holttum (1960) in his *Ferns of Malaya* recorded only one species from tropical Southeast Asia, namely *W. auriculata* Blume from the Cameron Highlands, Malaysia. He also noted that this species is closely allied to *W. japonica* (L. f.) Sm. Devol (1980) recorded five species, namely *W. harlandii* Hook., *W. kempii* Copel., *W. japonica*, *W. orientalis* Sw., and *W. unigemmata* (Makino) Nakai from Taiwan. Hô (1991) noted four species from Vietnam, viz. *W. cochinchinensis* Ching, *W. harlandii*, *W. japonica* and *W. unigemmata*.

In mainland Asia, Chiu (1974) regarded *W. cochinchinensis* Ching as a separate species. However, he also noted that this species is similar to *W. auriculata*, *W. magnifica* Ching & P. S. Chiu and *W. japonica*. In his key the major difference between *W. cochinchinensis* and *W. japonica* is the number of pairs of pinnae (*japonica*: 10–15 pairs, *cochinchinensis*: 20–30 pairs). Raymond Cranfill (pers. comm.) treated *W. cochinchinensis* and *W. magnifica* as synonyms of *W. japonica*. He commented that “*W. japonica* is the most highly variable species of the genus, the variation is nevertheless not purely random. There are tendencies toward an increase in size, an elaboration of pinna segments and an increase in the number of such segments per pinna as one approaches the southern and eastern distributional limits of the species”. *W. japonica* and *W. auriculata* are morphologically similar, but can be distinguished by the combination of (1) the number of pairs of pinnae per frond (*W. japonica*: 9–21 pairs, *W. auriculata*: 17–23 pairs) and (2) the number of pairs of lobes per pinna (*W. japonica*: 10–23 (25) pairs, *W. auriculata*: 25–30 pairs).

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## WOODWARDIA IN THAILAND

In Thailand, Tagawa & Iwatsuki (1988) recorded only one species, *W. cochinchinensis* Ching. They noted that Ching (1931) used large oblong turgid sori, the membranous brown indusia and the larger size of plants (see Tagawa & Iwatsuki, 1988) as diagnostic characters to distinguish *W. cochinchinensis* from *W. japonica*. Moreover, they added that only the indusia and size of Thai plants agreed with the characteristics of *W. cochinchinensis*.

Thai material and material under *W. cochinchinensis* from existing herbarium specimens deposited at BCU, BM, BK, BKF, K, L, and P were re-examined. It was found that all Thai specimens have lateral pinnae in 7–20 pairs, with 12 pairs being the most common. From the information above it can be seen that Thai specimens have numbers of lateral pinnae which match the diagnostic characters of *W. japonica* (L. f.) Sm. as was pointed out by Chiu (1974) and R. Cranfill (unpublished data). Therefore all Thai specimens of *W. cochinchensis* are re-determined here as *W. japonica*.

Some time ago during a field trip to Phu Luang, a newly recorded species, *W. harlandii* Hook. was found in hill evergreen forest. Its occurrence in north-eastern Thailand is in agreement with its previously known geographical distribution in Vietnam, Taiwan, South China and South Japan.

### KEY TO THE SPECIES

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| 1. Rhizome creeping, stipe distant; frond dimorphic, fertile fronds with 3–5 pairs of lateral pinnae, pinnae shallowly lobed. Sori linear-oblong, along costa and costular areoles | <b>1. <i>W. harlandii</i></b> |
| 1. Rhizome stout, erect, stipe tufted; frond monomorphic, with 7–20 pairs of lateral pinnae, pinnae deeply lobed. Sori oblong, discrete, along costular areoles                    | <b>2. <i>W. japonica</i></b>  |

**1. *Woodwardia harlandii*** Hook., Fil. Exot.: t. 7. 1867; P. S. Chiu, Acta Phytotax. Sin. 2: 237–248. 1974; C. E. Devol, Fl. Taiwan 1: 156. 1980; P. H. Hô, Illustr. Fl. Vietnam 1: 259. 1991; K. Iwats., Ferns and Fern Allies of Japan 157, pl. 90. 1992. Figs. 1–2A–B.

*Rhizome* creeping, covered with small scales; scales broadly lanceolate, entire; stipes distant in mature plants, covered with small narrowly lanceolate scales at base. *Fron*d dimorphic. *Stipe* brown-black at base, stramineous in upper portion, scaly at base, grooved; sterile stipe 12–24 cm long, fertile stipe up to 45 cm. *Sterile lamina* up to 24 cm long, simple, lanceolate, or tri-palmately lobed, terminal lobe the longest, base rounded, margin serrate near apex and shallowly lobed below, coriaceous, light green to light brown when dry. *Fertile lamina* up to 40 cm long, simply pinnate, with an elongated terminal pinna, lateral pinnae 3–5 pairs similar to the terminal one, pinnae sessile, forming a winged rachis with the opposite lateral pair, oblong, 2.5–3 by 20–25 cm; veins anastomosing. *Sori* linear, along costal and costular areoles; indusia linear, narrow, thin, opening towards costa or costule.

Thailand.— NORTH-EASTERN: Loei [Phu Luang, *T. Boonkerd* 579 (BCU!), 730 (BCU!) & 1644 (BCU!).]

Distribution.— South Japan, South China, Taiwan and Vietnam.

Ecology.— Terrestrial, on dry hill slope in hill evergreen forest, semi-shade at 1,200 m altitude.

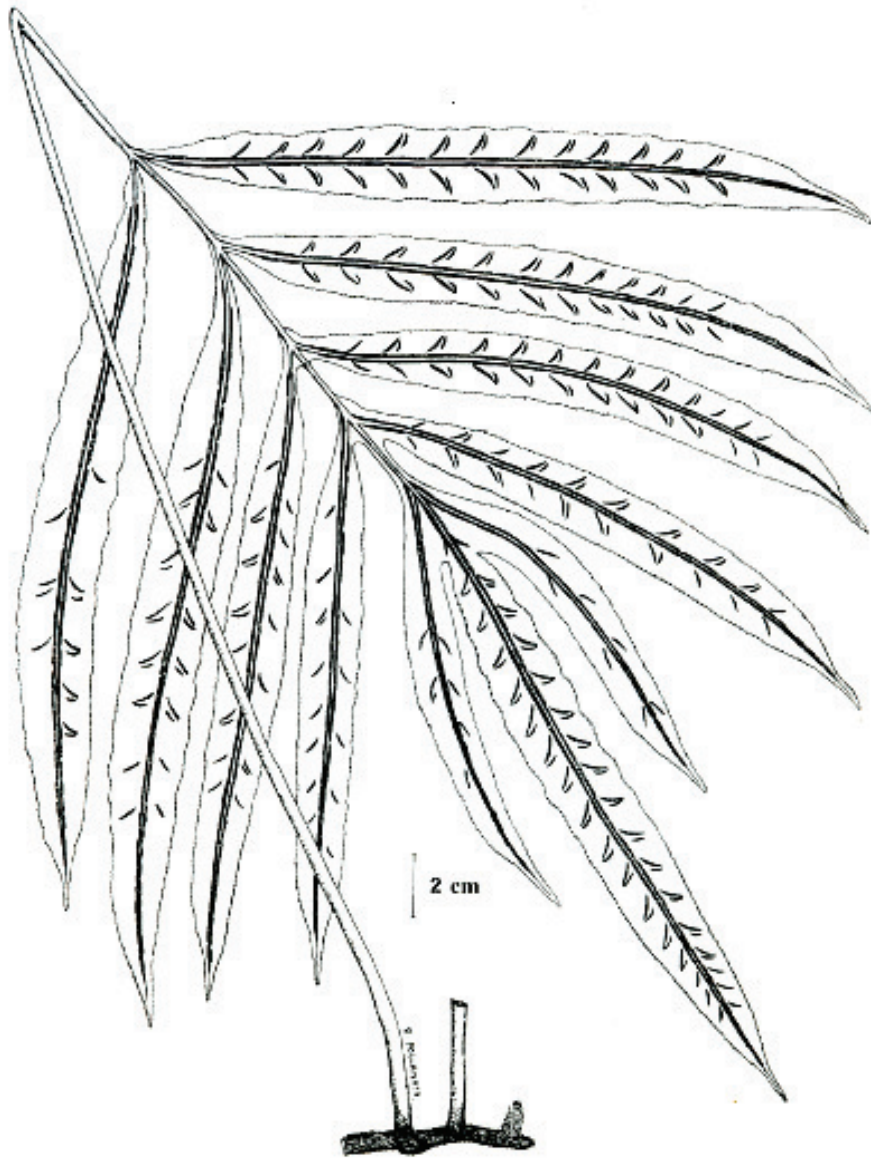


Figure 1. *Woodwardia harlandii* Hook.: habit and fertile pinnae. From T. Boonkerd 579.

**2. *Woodwardia japonica* (L.f.) Sm.**, Mém. Acad. Imp. Sci. Turin 6. 411. 1793; P. S. Chiu, Acta Phytotax. Sin. 2: 237–248. 1974; C. E. Devol, Fl. Taiwan 1: 159. 1980; P. H. Hô, Illustr. Fl. Vietnam 1: 259. 1991; K. Iwats., Ferns & Fern Allies of Japan: 156, pl. 89. 1992.—*Blechnum japonicum* L.f., Suppl.: 447 (1781).—*W. cochinchinensis* Ching, Sinensia 3: 334. 1933; Tagawa & K. Iwats., Fl. Thailand 3: 301, pl. 24. 1988. Fig. 2C–D.

*Rhizome* short, erect, covered with large red-brown scales at bases. *Stipe* 25–50 cm long, scaly at base; scale large, reddish-brown, lanceolate, entire. *Fronnd* large, monomorphic, 1-pinnate-pinnatifid; lamina oblong-lanceolate, 50–90 by 28–40 cm, truncate to rounded at base, acute to acuminate at apex; pinnae oblong-lanceolate, sessile, base truncate, lateral pinnae 7–20 pairs, lobed about  $\frac{3}{4}$  way to costa, segments on either side of costa of equal length; median pinnae 14–20 by 2–6 cm. *Sori* oblong, in 2 rows along costules, 2–4 mm long, sunken; indusia discrete, membranous, brown, opening towards costa and costules.



Figure 2. *Woodwardia harlandii* Hook.: A. habit; B. part of fertile pinnae; *Woodwardia japonica* (L.f.) Sm.; C. habit; D. part of fertile pinnae. Photographed by S. Suddee and S. Samransuk, Phu Luang, Loei.

Thailand.— NORTHERN: Chiang Mai [Pang Bo, *T. Smitinand* 8719 (BKF!, L!); Doi Ang Khang, *T. Boonkerd* 1366 (BCU!); Doi Pui, *T. Boonkerd* 1358 (BCU!); Doi Suthep, *W. Eiadthong* 226 (BKF!); Chiang Rai [Khun Korn Forest Park, *Khun Korn* 1394 (BCU!); Phu Langka, *T. Smitinand* 1769 (BKF!); Doi Langka, *K. Iwatsuki* & *N. Fukuoka* T-3569 (BKF!); Doi Pa Na Tu, *H. B. G. Garrett* 745 (BKF!); Doi Luang, *J. F. Maxwell* 97-565 (BKF!); Doi Tung, *K. Iwatsuki*, *N. Fukuoka*, *M. Hutoh* & *D. Chaiglom* T-11093 (BKF!); *R. Geesink*, *P. Hiepko* & *C. Phengklai* 8288 (BKF!); *T. Boonkerd* 1543 (BCU!); NORTH-EASTERN: Loei [Phu Luang, *T. Boonkerd* 1646/1 (BCU!)].

Distribution.— Korea, Japan, China, Taiwan and Vietnam.

Ecology.— Terrestrial, on dry hill slopes in hill evergreen forest, in semi-shade at 900–1,550 m altitude.

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