NOTE

Dryopsis (Dryopteridaceae), a Fern Genus New to Vietnam

Hui-Hui Ding[1,2], Ping Wang[3]and Shi-Yong Dong[1*]

1. South China Botanical Garden, Chinese Academy of Sciences, Guangzhou 510650, China.
2. Graduate University of the Chinese Academy of Sciences, Beijing 100093, China.
3. College of Tourism and Geography Science, Yunnan Normal University, Kunming 650092, China.
** Corresponding author. Email: dongshiyong@scib.ac.cn*

(Manuscript received 13 August 2012; accepted 08 November 2012)

ABSTRACT: *Dryopsis clarkei* (Baker) Holttum & P.J. Edwards, representing the whole genus, is reported new to Vietnam. A detailed description, including the variation of gross morphology, spore morphology, and chromosome counts, is provided by means of words as well as photographs or drawings. *Dryopsis clarkei* is for the first time demonstrated to be a sexual diploid (2n = 82), with rather stable morphology except for the length of stipe.

KEY WORDS: *Dryopsis clarkei*, morphology, new record, taxonomy.

INTRODUCTION

Dryopsis Holttum & P.J. Edwards is a less known fern genus partly due to its rather late establishment (in 1986) and rare occurrence in the field. This is an intermediate group between *Dryopteris* Adans. and *Ctenitis* C. Chr., occurring mainly in the mountains of northeastern India and southwestern China. Morphologically *Dryopsis* is similar to *Dryopteris* primarily in frond dissection and scales on axes of fronds, but shares a kind of peculiar hairs (ctenitioid hairs) on adaxial surface of fronds with *Ctenitis*. As the close affinity of *Dryopsis* to *Ctenitis* suggested by ctenitioid hairs, the former has long been treated as a subgenus under *Ctenitis* (Ching, 1938). In recent phylogenetic analyses (Li and Lu, 2006; Liu et al., 2007, McKeown et al., 2012, Zhang et al., 2012), a few samples of *Dryopsis* were included and they were clustered with dryopterioid and peranemoid ferns. Molecular evidence so far obtained indicates *Dryopsis* is closer to *Dryopteris* than to *Ctenitis*, while the monophyly of *Dryopsis* and its systematic position remain uncertain.

A total of 27 named species have been proposed in *Dryopsis,* and none of them is recorded from Vietnam, i.e., most in central Himalayas to southwestern China, a few in Japan and Taiwan, southward to Malesia, and three separately in southern India and Sri Lanka (Holttum and Edwards, 1986; Dong and Lu, 2001). However, we recently found a specimen (*Petelot 7805*) of *D. clarkei* (Baker) Holttum & P.J. Edwards from northern Vietnam (Fig. 1A), which is deposited in the Philippine National Herbarium (PNH) and was erroneously assigned a name as *Dryopteris paleacea* C. Chr. (= *D. wallichiana* (Spreng.) Hyl.). The specimen, *Petelot 7805* (PNH), is hitherto the only representative of *D. clarkei*, as well as the genus *Dryopsis* recorded from Vietnam. Along with the report of new distribution, we provide here a critical observation on the morphology of *D. clarkei*, including the variation of gross morphology, spore morphology, and chromosome number. Hope this contribution could add knowledge to this less-known group and do help to a revision of flora of Vietnam and a revision of *Dryopsis* in the future.

MATERIAL AND METHODS

We checked all specimens of *Dryopsis* in Chinese herbaria (GAUA, HITBC, IBK, IBSC, PE, KUN, PYU) and in BM, BO, K, L, P, and PNH, and conducted field observations in southwestern China. The following description of *D. clarkei* is based on specimens throughout its distribution range. Spore samples of *D. clarkei* from an individual in East Himalaya (voucher: *Chu et al. 22475*, PYU) were observed under a scanning electronic microscopy using the method described in Dong (2010). For chromosome counts, root tips of a population in East Himalaya (voucher: *Jin et al. 2127*, IBSC, PE) were pretreated in the field and squashed according to the method also in Dong (2010).

TAXONOMIC TREATMENT

Dryopsis clarkei (Baker) Holttum & P.J. Edwards, Kew Bull. 41: 181. 1986. - *Nephrodium clarkei* Baker, Syn. Fil. (ed. 2) 497. 1874. - *Lastrea filix-mas* var. *clarkei* (Baker) Bedd., Suppl. Ferns Brit. Ind. 17, pl. 371. 1876. - *L. filix-mas* var. *patentissima* subvar. *clarkei* (Baker) Bedd., Handb. Ferns Brit. Ind. 250. 1883. - *Dryopteris clarkei* (Baker) O. Ktze, Revis.

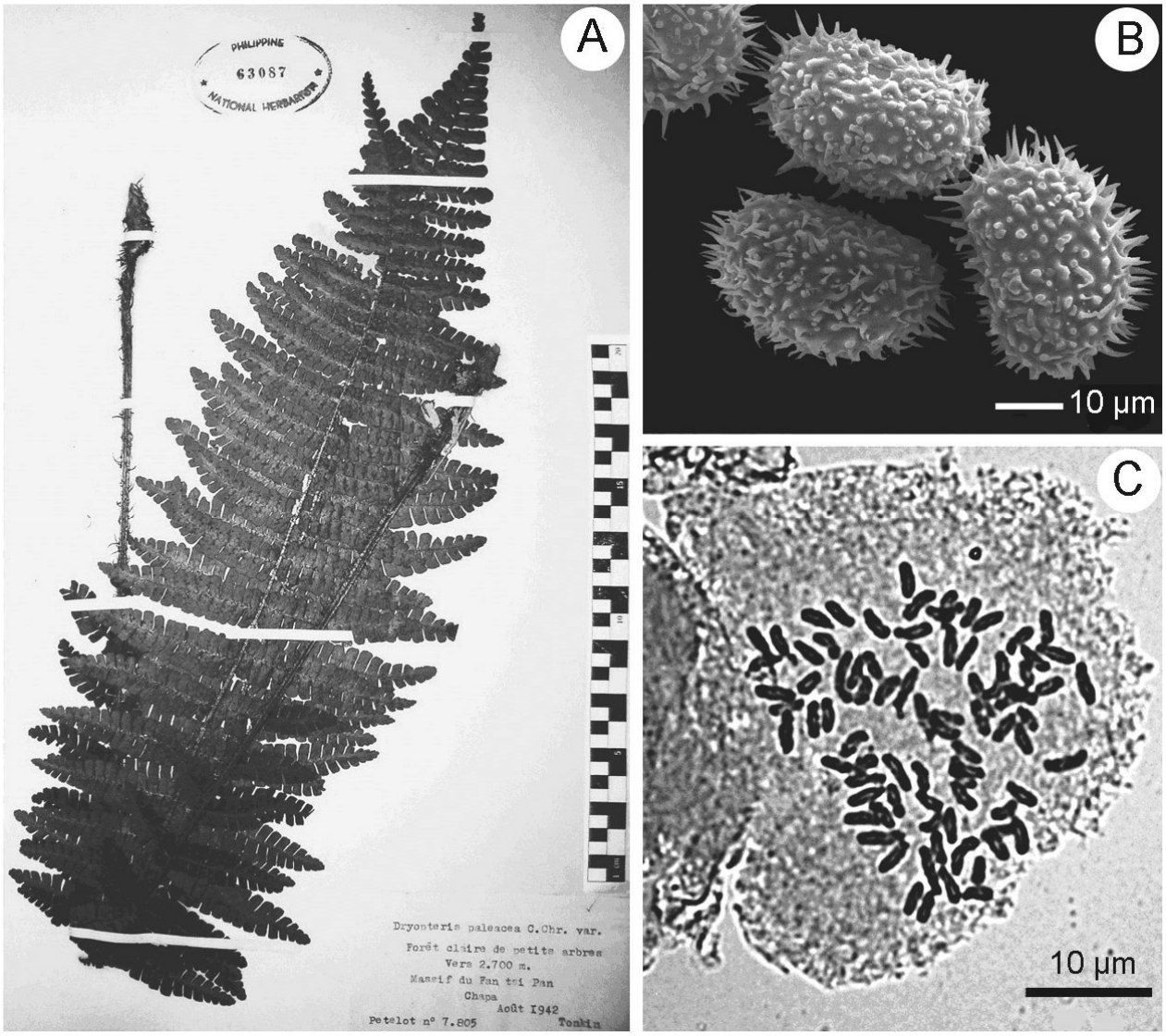

Fig. 1. Voucher specimen, spores, and chromosomes of *Dryopsis clarkei* (Baker) Holttum & P.J. Edwards. A: A specimen from Vietnam (*Petelot 7805*, PNH). B. Spores under scanning electron microscope (SEM) (*Chu et al. 22475*, PYU). C. Chromosomes at mitotic metaphase, 2n = 82 (*Jin et al. 2127*, IBSC, PE).

Gen. P1. 2: 812. 1891. - *Ctenitis clarkei* (Baker) Ching in Bull. Fan Mem. Inst. Biol. Bot. 8: 287. 1938. - Type: Sikkim: Yakla, c. 3000 m, 16 Oct 1869, *C.B. Clarke 10252* (lectotype designated by Holttum, K; isolectotype, BM). Figs. 1, 2 & 3

Plants terrestrial, c. 8–12 leaves spirally arranged on a caudex. Caudex erect, thick and short, with stipes on its apex; stipe dark brown, 3–18 cm long; stipe scales blackish brown, lanceolate or linear, 5–12 × 0.5–1 mm. Lamina 2-pinnatifid to 2-pinnate, lanceolate, 25–90 cm long, 7–17 cm wide; free lateral pinnae 20–40 pairs, rather densely arranged; several pairs of lower pinnae gradually shortened toward the base of lamina; basal pinna 1–4 cm long, 0.5–1.5 cm wide, reflexed; middle pinnae 3.5–8.5 cm long, 1–2 cm wide; pinnules sessile, adnate to pinna-rachis, entire, with hyaline structure (3–4 cells wide, one cell thick) at margin, obtuse or subtruncate at apex, covered adaxially with numerous ctenitioid hairs; ctenitioid hairs consisting of 6–12 cells, terete and colorless when living, contorted and rusty when drying. Axes of fronds terete, shallowly sulcate on adaxial surface, the costa groove closed at base (not open to rachis groove); rachises and costae bearing profuse ctenitioid hairs on adaxial surface, abaxially covered with scales; scales on rachis lanceolate, numerous, scales on costae broadly lanceolate, not very abundant; costules lacking scales. Veins free, pinnate, each lateral vein once forked, without glands on abaxial surface. Sori distributed on the main part of pinnules

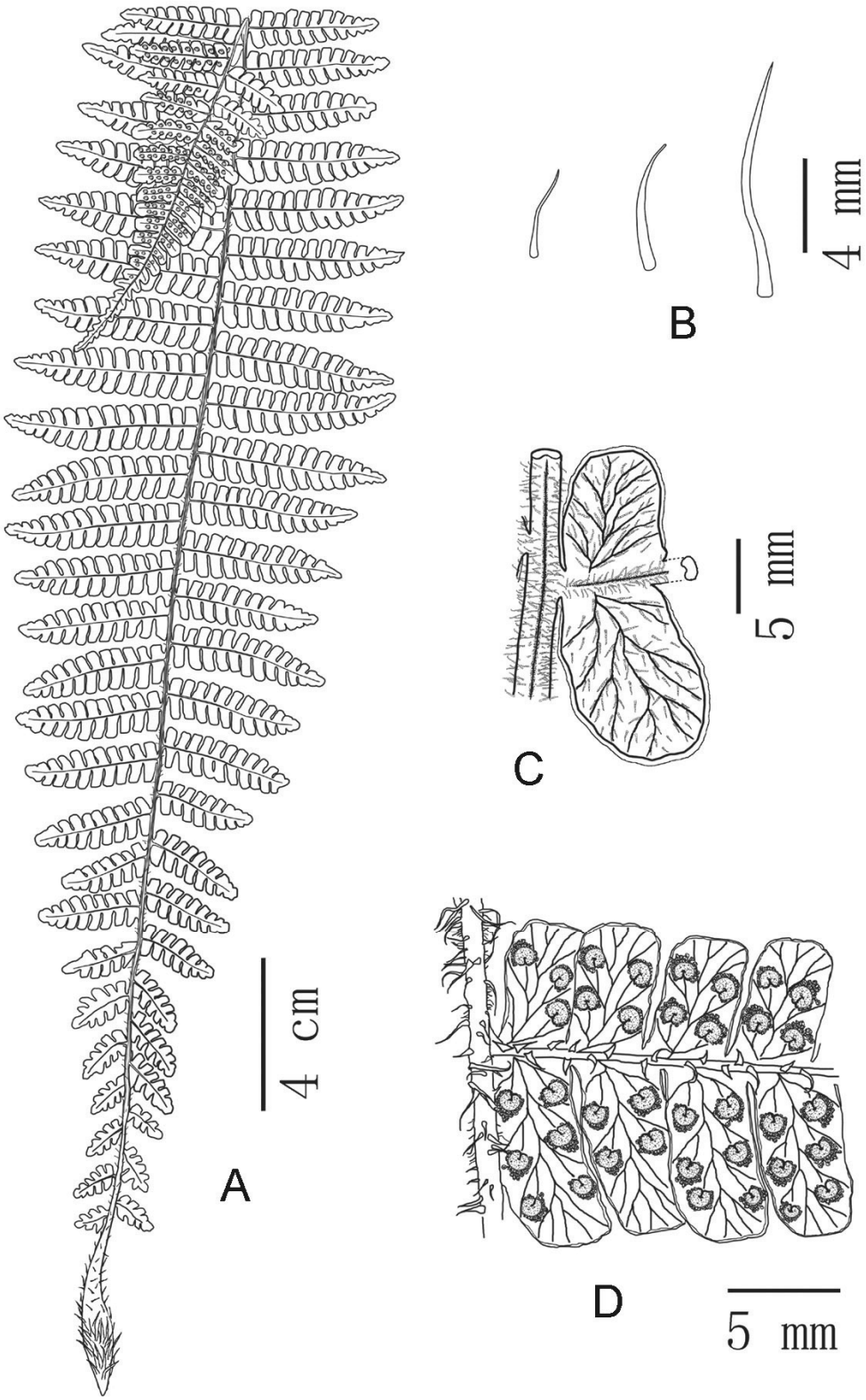

Fig. 2. Lectotype of *Dryopsis clarkei* (Baker) Holttum & P.J. Edwards (*C.B. Clarke 10252*, K). A: Habit of a frond. B: Scales on rachis, stipe, and caudex, respectively from left to right. C: Basal pinnules and part of rachis (adaxial view), showing hyaline margin on pinnules, hairs on adaxial surface, and groove on costa not connected to that on rachis. D: Part of pinna and rachis (abaxial view), showing sori, veins, and scales. Drawn by Dr. Wen Shao.

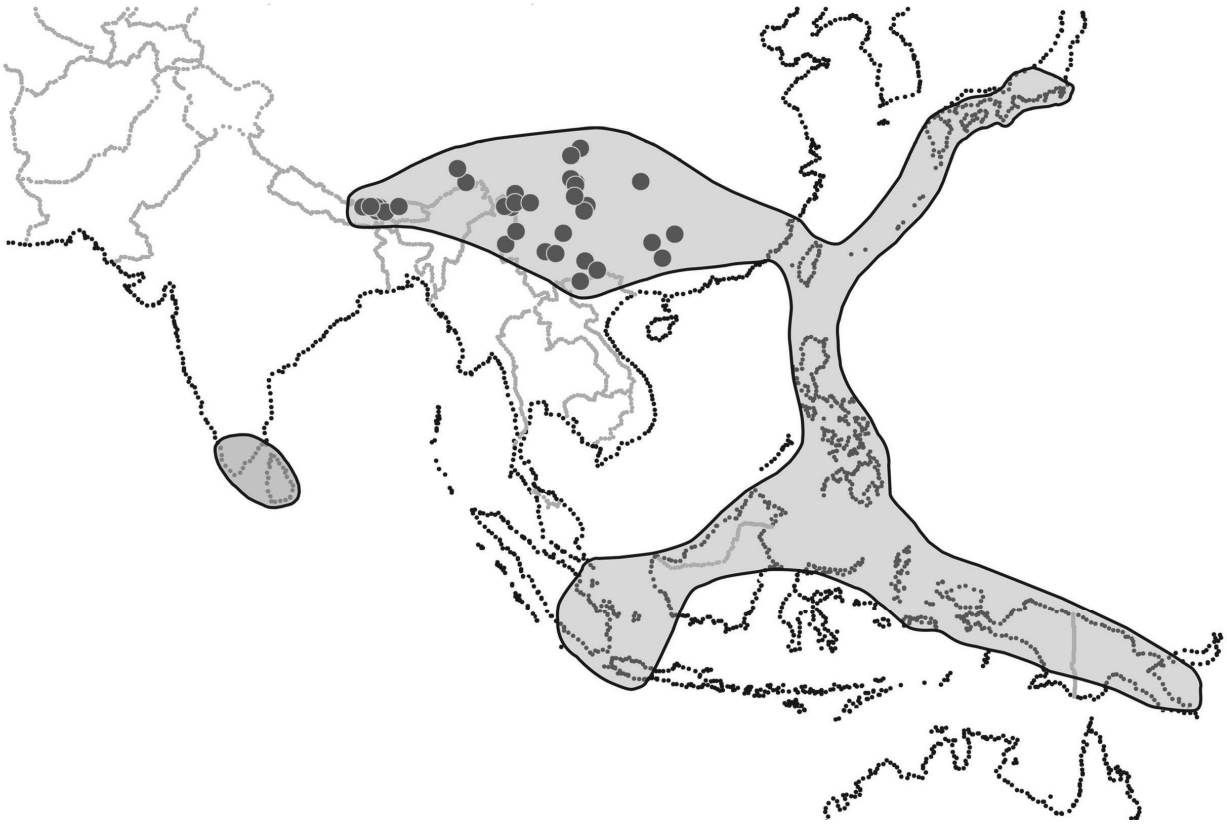

Fig. 3. Distribution of *Dryopsis* Holttum & P.J. Edwards (grey region) and *D. clarkei* Holttum & P.J. Edwards (● labeled).

(not on apexes or very bases), separate, medial to submarginal; indusia distinct, persistent or partly fugacious, entire or nearly so. Spores monolete, 32–35.5 µm long in polar axis, 21–23.5 µm long in equatorial major axis, perispore echinate; spines on perispore numerous, (1.3–)3–6 µm long, terete at base and sharp at apex. Chromosome number 2n = 82 (a population from Yunnan, China).

Ecology: Terrestrial, in mossy forests or *Rhododendron* shrubs, usually at high altitude, (1300–) 2000–3800 m above sea level.

Distribution: Bhutan, Southwest China (Guangxi, Guizhou, Sichuan, Xizang, Yunnan), NE India (including Sikkim), North Myanmar, Nepal, Vietnam (voucher: *Petelot 7805* at PNH from Mt. fanxibang, Tonkin, c. 2700 m, August 1942) (Fig. 3).

Notes: *Dryopsis clarkei* is morphologically good, stable species. Many characters hardly present appreciable variations in its whole distribution range; including lamina dissection, the shape and structure of scales on axes, axes as well as lamina always bearing ctenitioid hairs, several pairs of lower pinnae gradually shortened toward the base of lamina, the shape of pinnae or pinnules, pinnules always presenting hyaline margins, etc. The length of stipe, however, is variable, ranging from 3 to 18 cm. There seems to be a tendency that the stipe length is short (usually 4–7 cm) (Fig. 2A) and rather uniform in central Himalaya, whereas is longer (c. 5–14 cm) and more variable in eastern Himalaya to Sichuan and Guangxi (SW China). The only voucher of *D. clarkei* from Vietnam agrees well with many specimens from Guangxi by having stipes as long as 12–15 cm (Fig. 1A). But for the stipe length there is no clear differentiation between the regions mentioned above, as some specimens are found from central Himalaya with longer stipes (e.g., 12 cm in *Kanai et al. 725316A* from Nepal), and also exist many collections from Sichuan with shorter stipes (4–7 cm). So it is not justified that Holttum and Edwards (1986: 179) listed the short stipe (4–7 cm) as a diagnostic character for *D. clarkei*.

The unique character for *D. clarkei* is the conspicuous hyaline margin of pinnules, by which we can easily distinguish *D. clarkei* from other *Dryopsis* species. The species morphologically most similar to *D. clarkei* is *D. nidus* (Baker) Holttum & P.J. Edwards. Apart from the presence of clear hyaline margin on pinnules, *D. clarkei* differs from the latter in the more close arrangement of pinnae and in the more pinnae shortened on lower part of lamina.

By counting chromosome number, we confirm *D. clarkei* is a diploid with 2n = 82 (Fig. 1C). This is the

first report of cytology data for this species. We also counted and as a result found 64 spores in each sporangium, which indicates *D. clarkei* is a sexual species.

ACKNOWLEDGEMENTS

We would like to thank Dr. Wen Shao for her wonderful drawings. This study is supported by the National Nature Science Foundation of China (grant nos. 30570127 & 31270258) and by the Key Research Program of the Chinese Academy of Sciences (grant no. KSCX2-EW-J-28).

LITERATURE CITED

Ching R.-C. 1938. A revision of the Chinese and Sikkim-Himalayan *Dryopteris* with reference to some species in the neighbouring regions. Bull. Fan Mem. Inst. Biol. Bot. **8**: 275–334.

Dong S.-Y. 2010. Nomenclature, sporophyte and gametophyte morphology of a fern species misapplied as *Tectaria subpedata* (Tectariaceae). Syst. Bot. 35: 235–243.

Dong S.-Y., S.-G. Lu. 2001. Classification of the genus *Dryopsis* (Tectariaceae) from Yunnan. Acta Bot. Yunnan. **23**: 181–187.

Holttum R. E., P. J. Edwards. 1986. Studies in the fern genera allied to *Tectaria* II, *Dryopsis*, a new genus. Kew Bull. **41**: 171–204.

Li C.-X., S.-G. Lu. 2006. Phylogenetic analysis of Dryopteridaceae based on chloroplast *rbc*L sequences. Acta Phytotax. Sin. **44**: 503–515.

Liu H.-M., X.-C. Zhang, Z.-D. Chen, S.-Y. Dong, Y.-L. Qiu. 2007. Polyphyly of the fern family Tectariaceae sensu Ching: insights from cpDNA sequence data. Sci. China Ser. C Life Sci. **50**: 789–798.

McKeown M., M. Sundue, D. Barrington. 2012. Phylogenetic analyses place the Australian monotypic *Revwattsia* in *Dryopteris* (Dryopteridaceae). PhytoKeys **14**: 43–56.

Zhang, L.-B., L. Zhang, S.-Y. Dong, E.B. Sessa, X.-F. Gao, A. Ebihara. 2012. Molecular circumscription and major evolutionary lineages of the fern genus *Dryopteris* (Dryopteridaceae). BMC Evol. Biol. **12**: 180.

軸鱗蕨屬（鱗毛蕨科），越南一新分布蕨類屬

丁惠惠[1,2]、王平[3]、董仕勇[1*]

1. 中國科學院華南植物園，廣州 510650。
2. 中國科學院研究生院，北京 100093。
3. 雲南師範大學旅遊與地理學院，昆明 650092。
* 通信作者。*Email:dongshiyong@scib.ac.cn*

（收稿日期：2012年8月13日；接受日期：2012年11月8日）

摘要：膜邊軸鱗蕨*Dryopsis clarkei* (Baker) Holttum & P.J. Edwards及其代表的屬—軸鱗蕨屬（鱗毛蕨科），首次被發現在越南有分佈。除了新分佈區的報導，本文為膜邊軸鱗蕨提供了一個詳盡的形態學描述，包括植物宏觀形態的變異、孢子形態和染色體數目。膜邊軸鱗蕨首次被證實為一個營有性生殖的二倍體種，它的形態學性狀穩定，但葉柄長度的變異相對較大。

關鍵詞：膜邊軸鱗蕨，形態學，新記錄，分類學。