NOTE

A Note on the Re-collection and Conservation of *Thelypteris kingii* (Thelypteridaceae) – an Endemic Fern of India

B. S. Kholia

Botanical Survey of India, Sikkim Himalayan Regional Centre, Gangtok – 737 103, Sikkim, India.
Email: bskholia_bsi@yahoo.co.in

(Manuscript received 29 June 2012; accepted 13 September 2012)

ABSTRACT: A rare and little known, endemic fern *Thelypteris kingii* C.F.Reed was first described from a 19th Century collection from an unspecified locality in what was then "British Sikkim", now Darjeeling District, India. Recently a small population of the plant was rediscovered by the author from present-day Sikkim State. Herbarium records and field study reveal that this species is very rare and under great threat of extinction due to natural and man-made impact. This species is therefore little known to pteridologists and is readily confused with the similar, but common species, *T. mollissima* (Kunze) N.Thapa as well as with another S. E. Asian species *T. leptogrammoides* (Ross.) C.F. Reed due to nomenclatural similarities or being later homonymous. Although only known so far from India, and thus an endemic Indian species, its presence in Tibet and China etc. is probably to be expected. A brief history of its discovery, taxonomy, morphology, habitat and ecology is presented here to assist taxonomists and conservation biologists with its identification and conservation. It has been identified as Endangered and Globally Threatened and efforts have also been made by the present author to include it in the forthcoming volume of the Red Data Book of Indian plants.

KEY WORDS: Endemic, Sikkim, *Stegnogramma leptogrammoides*, *Thelypteris kingii*, *Thelypteris leptogrammoides*.

INTRODUCTION

Sikkim and the Darjeeling Himalaya have been well explored botanically by many naturalists, explorers and well known botanists during the recent and more distant past (Kholia, 2011, Rawat and Tambe, 2011). Collections were distributed to many herbaria throughout the world (including CAL, K, BM, US, P, H, BR, C, E, NY, LE,G, MO, L, U, GH, W etc.) and various new species were established on their collections. The famous British Botanist, Superintendent of the Calcutta Botanic Garden and the first Director of the Botanical Survey of India, Sir George King (1840–1909), preserved a specimen collected by his Lepcha collector from Sikkim and identified it as *Gymnogramma totta* Schltdl.. This specimen labeled as, "*Gymnogramma totta*, Flora of the Sikkim Himalaya, Seoraj, *G. King's collector s.n.*, Oct. 1883, US 392178" and further specimens are at K and BM. *Gymnogramma totta* was later transferred by taxonomists into the genera *Stegnogramma* Blume or *Thelypteris* Schmidel depending upon different taxonomic opinions. Reed's single genus concept (Reed 1968) is accepted in this present paper.

Following the work of Ching (1936) in his taxonomic study of the fern genus *Stegnogramma*, Iwatsuki (1963) noticed that this specimen was distinct from the Indian plant generally known at that time as *Gymnogramma totta* and belonged to a separate and new species, which he described as *Stegnogramma leptogrammoides* K.Iwats. Subsequently, while indexing the family Thelypteridaceae and transferring various splinter genera into the single genus *Thelypteris*, Reed (1968) saw that if based on *Stegnogramma leptogrammoides* K.Iwats., a new *Thelypteris leptogrammoides* would be an illegitimate later homonym of *Thelypteris leptogrammoides* (Rosenst.) C.F.Reed (Basionym: *Dryopteris leptogrammoides* Rosenst.) from S.E. Asia, so provided a new name for the Sikkim plant, G. King who preserved, labeled and named the specimen collected by his Lepcha collector.

Until recently Section *Stegnogramma* of the genus *Thelypteris* had not been revised in detail in India and was poorly understood there. Thus Mehra and Bir (1964) identified all the Himalayan material as a single species *Leptogramma totta* (Schltdl.) J.Sm. (*sensu* Mehra & Bir, *non* (Schltdl.) J.Sm.) and merged *Stegnogramma leptogrammoides* K.Iwats. (i.e. *Thelypteris kingii*) and *Leptogramma himalaica* Ching (a synonym of *Thelypteris mollissima* (Kunze) N.Thapa, synonymised by Fraser-Jenkins, 1997) into it. Similarly Sledge (1981) also sunk *S. mollissima* into *S. pozoi*. Nayar and Kaur (1974), Dhir (1980), Dhir and Sood (1981), Dixit (1984), Kaur and Chandra (1985), Chandra and Kaur (1987), Irudayaraj *et al.* (1995) and Chandra (2000) also created nomenclatural confusion within Indian species of *Stegnogramma*. However Sledge (1981) and subsequently Fraser-Jenkins (1997, 2008b) critically revised this group of thelypteroid ferns

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in the region. The plants from the Himalaya misidentified as *Leptogramma totta* or *Stegnogramma pozoi* (Lag.) K.Iwats. were found to be *Stegnogramma mollissima* (Kunze) Fraser-Jenk. by Fraser Jenkins (1997), later transferred to *Thelypteris mollissima* (Kunze) N.Thapa; he further pointed out that *Thelypteris pozoi* (Lag.) C.V.Morton (syn.: *Leptogramma totta*) is the European, African and Macaronesian species, and does not occur in India, where it is replaced by *T. mollissima*. One of Bir's collections from Lachen, North Sikkim, in PAN was identified by Fraser-Jenkins (1997) as *Stegnogramma leptogrammoides* and Fraser-Jenkins (2008b) accepted this (as *T. kingii*) as a distinct species, though he pointed out that it was probably only temporarily endemic as to be expected in Tibet etc. Dixit (1984) mistakenly gave its distribution as "Eastern India, Japan", not realising that Sikkim is in the Central Himalayan region and presumably thinking that as Iwatsuki had described it might be in Japan, but this was corrected by Chandra (2000). Inspie of initial report on endemic nature of *T. kingii* or *S. leptogrammoides* from Sikkim (Iwatsuki 1963, Reed 1968,Jarrett 1983, Fraser Jenkins 1997) this fern has not been mentioned in the Indian Red-lists (Nayar and Sastry, 1983–1990; Rao et al., 2003), along with many other threatened pteridophytes that were not brought to attention. It was also inadvertently omitted by Chandra et al. (2008). (Fraser-Jenkins, pers. comm. 2012), though it was mentioned by Fraser-Jenkins (2008a) as currently being known as a species endemic to India, though to be expected elsewhere. It has also been listed as Endangered (EN) and Globally threatened by Ebihara et al. (2012) and Fraser-Jenkins (2012) in the new international list of rare and threatened Asian pteridophytes. The author was unable to find any specimens of *Thelypteris kingii*, including King's collection, during a recent visit to CAL and DD herbaria in 2010 and 2011 respectively but a couple of other collections (by Robert Pantling *s.n*., from Latong, 7000 ft.,May 1885; H.C. Levinge *s.n* ,between Lachung & Chungtang, alt. 10000 ft. fide Bootia collector, Nov. 1882) were found by Fraser-Jenkins in 2012 at CAL (Fraser-Jenkins, personal communication Aug 2012). The other herbarium-specimens housed in these herbaria under old name *Gymnogramma totta* have been identified as *Thelypteris mollissima*. One sheet of *Thelypteris kingii* (originally named as *Gymnogramma totta*, identified as *Thelypteris africana* by S. K. Mukarjee and reidentified by Fraser Jenkins as *Stegnogramma leptogrammoides* on 2-9-1998) was also seen in the Herbarium of Lloyd Botanic Garden, Darjeeling, India (no acronym), made by an unknown British collector and without any locality and label information. Furthermore, there is no earlier collection of this species in the Herbarium of the Botanical Survey of India (BSHC), Gangtok, India. Hence, based on herbarium records in India, published literature and field observations, it is clear that this little known and endemic species is very rare in distribution and is in dire need of conservation. It is therefore hoped that the present paper may assist in creating awareness among policy makers, forest officials, conservation scientists and local communities so that they can undertake the necessary action towards its conservation.

Recently the author came across a small population of *Thelypteris kingii* near Bansoi (between Chungthang and Lachen) in North Sikkim at an altitude of 2300m. The plant was found growing on a moist, shaded slope on rocks, growing as a lithophyte (Fig.1A), but the population is very small with a dozen of plants distributed in only two patches within less than 50 meters distance. After thorough search in nearby localities and similar habitats in the areas no further plants were found. But discovery of more populations away from the roadside after thorough search in Sikkim should not be ruled out. Another population of *Thelypteris* (sect. *Stegnogramma*) growing at slightly lower elevations (1900–2100 m) in the area between Bansoi and Chungthang belongs to another species *Thelypteris* (*Stegnogramma*) *mollissima* (Kunze) N.Thapa [syn.: *Thelypteris himalaica* (Ching) C.F.Reed; syn.: *Leptogramma yunnanensis* Ching; *Thelypteris* (*Stegnogramma*) *pozoi sensu auct Ind*. *non Thelypteris* (*Stegnogramma*) *pozoi* (Lag.) C.V.Morton]. However, *Thelypteris kingii* is a smaller plant with a horizontal or ascending, thin rhizome, very long hairs, a narrow frond, many reduced triangular lower pairs of pinnae and a different type of venation, having a basal pair of anastomosing veinlets below each pinna-lobe sinus (Fig. 1B-E).

TAXONOMIC TREATMENT

Thelypteris kingii C.F.Reed, Phytologia 17: 465. 1969; Jarrett, Ind. Fil. Suppl. V.: 193. 1985; Fraser-Jenkins, New Sp. Syndrome Indian. Pterid.: 239.1997; Tax. Rev. Three Hundred Indian. Subcont. Pterid. 195. 2008; *Stegnogramma leptogrammoides* K.Iwats., Act. Phytotax. Geobot.19: 119.1963, *non Thelypteris leptogrammoides* (Rosenst.) C.F.Reed.

Misapplied names: *Stegnogramma pozoi sensu auct. Ind.*, *pro parte*, *non* (Lag.) K.Iwats.; *Leptogramma totta sensu* Beddome, *non* (Schltdl.) J.Sm.

Rhizome horizontal or ascending, scaly at apex, scales 2–3 mm long, brown, awl shaped or oblong lanceolate, broadest at base, margins and surface hairy;

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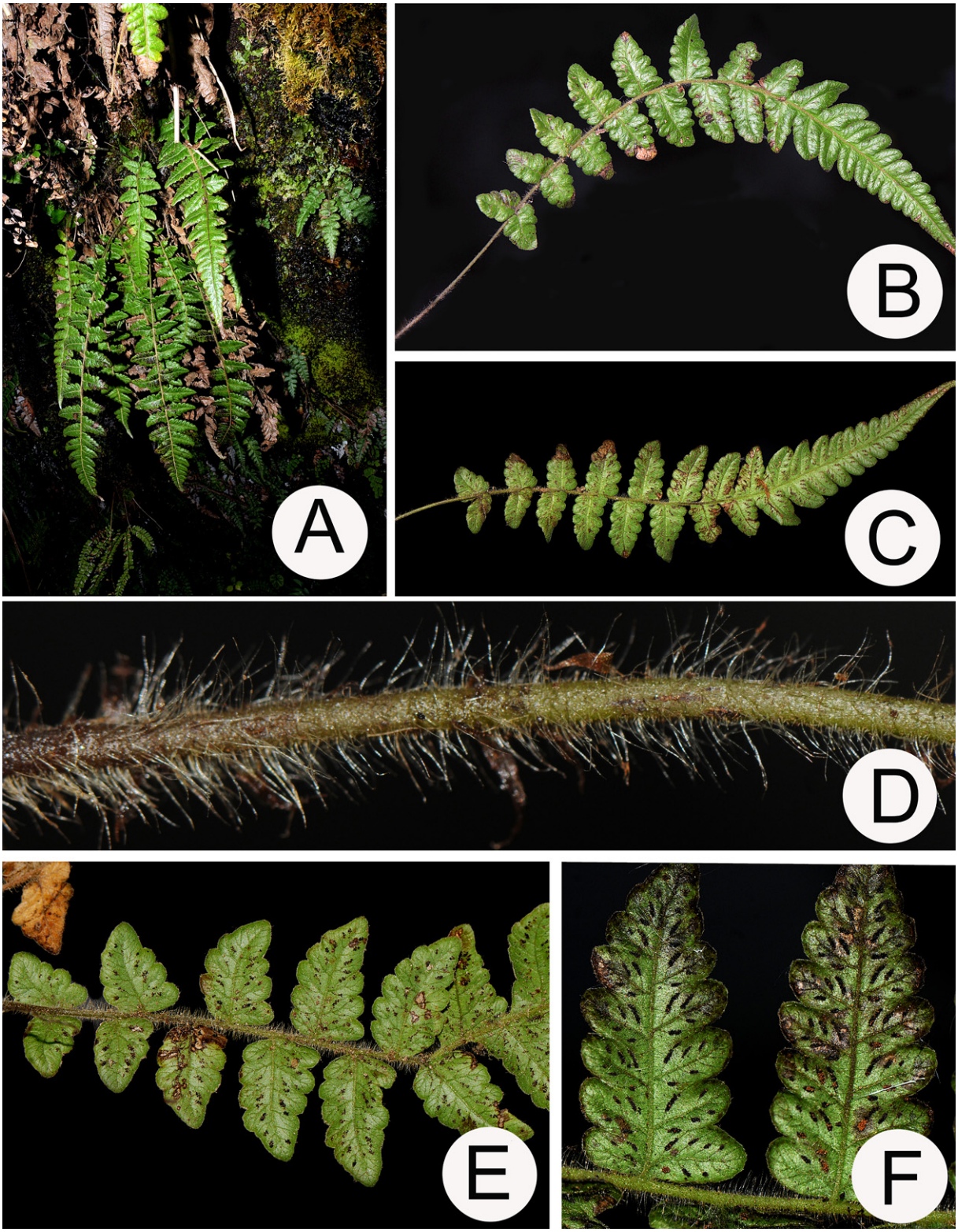


Fig.1. *Thelypteris kingie*. A: Habit and morphology. B: Frond (upper surface). C: Frond (under surface). D: Stipe showing characteristic long hairs. E: Lower part of lamina showing characteristic gradually reduced subdeltate pinnae and densely hairy rachis. F: Close up of pinnae showing venation and sori.

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fronds arise in tufts at the rhizome-apex; stipe 3–7 cm long, scaly at base, stipe and rachis densely hairy throughout, hairs hyaline, 1–4 mm long, mostly acicular but sparsely septate, glandular hairs also present; lamina 15–35 × 3–7 cm, linear lanceolate, once pinnate at the base, bipinnatifid towards the middle, lobed to crenate towards the apex, broadest at the middle, attenuated towards the base and apex, green, herbaceous, densely hairy on both surfaces, especially beneath; rachis, costae and veins also densely hairy, hairs large, acicular and hyaline; pinnae 10–15 pairs, lower ones opposite, mid-pinnae nearly alternate, lower pinnae sessile, upper ones adnate to the rachis, lower 3–4 pairs gradually reduced, subdeltate, middle pinnae oblong-subdeltate, with their apices slightly upwardly directed, base truncate to rounded, shortly auricled at their acroscopic base, margins rounded-lobed to crenate, lobes ciliate at the margins, pinna-apices acute; veins 2–6 pairs per pinna-lobe, lowest pair often anastomosing, the rest free; sori, elongated or oblong, positioned along the veins, exindusiate. (Figs. 1A–F).

Specimens examined: INDIA. Bansoi, North Sikkim, 2300m, *B.S. Kholia 36977*, *36991*, 15 Dec. 2011 (BSHC).

Distribution: As known so far, apparently endemic to India but according to Fraser-Jenkins (1997, 2008a, 2008b, 2012) also to be expected in Tibet and probably S.W. China. In India, it occurs in Sikkim and recently also known from Uttarakhand (Fraser-Jenkins 2010 and pers.comm.).

Threatened Status and Conservation: The present population of *Thelypteris kingii* is very small with only some ten to fifteen individuals present and is under great threat due to a recent extensive landslide just beside the population. Another major threat is due to the widening of roads and throwing of excavated soil and boulders below the road. This unplanned disposal of material will very probably be responsible for burying the present population if it continues. A similar case happened previously with a rare variegated form of *Pteris subquinata* named as "Sikkim Silver Brake fern" (Kholia, 2010a) which was driven towards extinction (Kholia, 2010b) from its classical locality at Chungthang (Beddome, 1992), where it had been found in some quantity at Pakung by Fraser-Jenkins in 1998, and at present only a small population of less than 25 plants survives near the temple there, though Fraser-Jenkins has found it in quantity in East Bhutan and has also identified it from Arunachal Pradesh. Almost the whole of the natural roadside area between Toong and Chungthang has been washed away by massive landslide during the recent Sikkim earthquake of 2011, because the rocks were prone to landslide due to disturbance by heavy excavators and frequent use of explosives during road widening. This is a serious problem for foresters, developmental agencies and conservationists because during the road-building process large patches of natural forest are buried under soil throughout the length of hill roads. They then become prone to invasion by weed species, ultimately changing the structure and composition of the natural vegetation. Identification of earth-dumping areas in barren or fragmented forest land may solve this problem to some extent. The author therefore appeals to the concerned authorities to make proper scientific impact assessment and plans to control damage before starting further developmental work of this nature.

ACKNOWLEDGEMENTS

The author is highly indebted to Prof. K. Iwatsuki, Tokyo and Mr. C.R. Fraser-Jenkins, Kathmandu,for their helpful comments, suggestions, correction, inputs and encouragement concerning the typescript. Prof. M. Kato, Tsukuba, is also acknowledged for his suggestions and kind help. Thanks are also due to Dr. P. Singh, Director, Botanical Survey of India (BSI) and Dr. D. K. Singh, Additional Director, BSI, Kolkata, for their encouragement and support.

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印度特有種蕨類 *Thelypteris kingie*（金星蕨科）的再發現與保育狀況之記要

B. S. Kholia

Botanical Survey of India, Sikkim Himalayan Regional Centre, Gangtok – 737 103, Sikkim, India.
Email: bskholia_bsi@yahoo.co.in

（收稿日期：2012年6月29日；接受日期：2012年9月13日）

摘要：印度稀有特有種*Thelypteris kingii* C.F.Reed最早的採集紀錄來自於19世紀之“英屬錫金區”（現為印度大吉嶺縣）之不明地點。作者近來在現今的錫金邦再度發現了本種的小族群。從標本館的紀錄與野外調查可以得知，這個物種因人為的環境衝擊而使族群數變得非常稀少，目前正面臨滅絕的危機。由於本種在野外極稀有，因此蕨類學家對其知之甚少，甚至容易與另一種常見的物種*T. mollissima*(Kunze) N.Thapa混淆，或因命名的關係易與另一東南亞物種*T. leptogrammoides* (Ross.) C.F. Reed產生誤解。本文提供了此種之發現歷史、分類處理、型態與生態描述，來協助未來的分類學者與保育學者進行必要之分類與保育工作，目前此種判斷為瀕危及全球性受威脅等級，作者也盡力將此物種納入未來之印度植物紅皮書當中。

關鍵詞：特有種、錫金、*Stegnogramma leptogrammoides*、*Thelypteris kingii*、*Thelypteris leptogrammoides*。

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