

ON THE REDISCOVERY OF *PELLAEA CALOMELANOS* IN CENTRAL HIMALAYA WITH A NOTE ON DISTRIBUTION

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ABSTRACT

Among the rare ferns of India, *Pellaea calomelanos* (Sw.) Link has been re-discovered from Kumaon region of central Himalaya after a gap of nearly 100 years. In the intervening years this rare fern was not collected from any other parts of Himalaya or India. A detailed note on its distribution in India, and other parts of the world along with a note on colonisation is elaborated.

Keywords: Kumaon, Distribution, *Pellaea calomelanos*, Re-discovery.

INTRODUCTION

Pellaea Link, a small genus of Pteridaceae is known to be represented by about 25 species (Smith, 2010) which are mainly distributed in the North and South America, Africa eastward to India, China and New Zealand (Tryon & al., 1990). *P. calomelanos* (Sw.) Link, though is often considered as native to the mountainous regions of the South Africa (Roux, 2001), has disjunct distribution in Spain, Azores and Western and Central Himalaya including northern Pakistan (Hooker 1958, Hooker and Baker 1865-1868). Shing and Wu (1990) have also reported its presence in the Yunnan and South Sichuan provinces of China. Based on the collection of Strachey and Winterbottom in 1848 from below Almora (Kumaon-Central Himalaya), this fern was first reported from India by Hooker (1858). Subsequently, it was collected by the famous British botanist and plant hunter Sir J.F. Duthie while on an expedition to the north eastern part of Kumaun (Darma and Byans valleys). Excited about the collection of this species Duthie writes in the Garden Chronicle: 'I left Nainital for Almora on August 9, breaking the journey at Khairana, the most interesting plant I saw was *Pellaea calomelanos*, one of the rarest of the Indian fern. I found it one or two spots close to the Khairana growing on exposed rocks by the side of the roads' (Duthie). The specimen (fn. 3677 both at CAL and DD) collected by J.F. Reid, Chief Secretary to the Government of N.W. Provinces and Oudh (Awadh) in October 1884 from 4-5000ft altitude on rock below Khairana, Almora (now in Nainital district) might be collected in the return journey of this excursion tour because Reid accompanied Duthie during his exploration to the interior parts of Kumaun for three successive years between 1884-1886 (Duthie 1906). Besides the collections of Strachey and Winterbottom, 1848 (CAL - 7694, original ticket) and J. F. Reid (fn. 3677 both at CAL and DD), the other collections from Kumaon at CAL and DD are: CAL -7691 *communicavit* by Norman Gill, Kumaun, July 1919; DD - P.W. and V.A. Mackinnons, Kumaon 1882; DD -29623 & DD- 29750 both fn 8037, Karana, 1888 (? from Khairana or by Kirna Ramsukh? Duthie's collector from unknown locality of Kumaon), E. Kumaon. There are also few specimens housed in DD from outside Kumaon, these are Duthie 115, Tehri Garhwal near Dhunda, Gange valley 4-5000ft., 12 June 1883; J.S. Gamble, Jaunsar (Nov 1894); DD 29750 J.F. Reid, *Communicavit* by Wilmot, Khaeri (? Lakhimpur Khaeri in U P Tarai) and R.R. Stewart, (fn. 14112) Abbottabad, Hazara, Pakistan, 14th July 1934.

Obviously, the occasional collections from scattered and specific localities by British collectors suggest its rare distribution in west and central Himalaya and these reports were followed in the classical as well as recent literature pertaining to the enumerations or taxonomy of ferns of west and central Himalaya (Hooker and Baker, 1865-1868; Beddome, 1865 - 1870, 1883; Clarke, 1880; Hope, 1891; Duthie, 1906; Dhir, 1980; Dixit, 1989; Khullar, 1994; Chandra, 2000; Pande and Pande, 2003; Fraser Jenkins and Dulawat, 2009, Pangtey & al., 2010). The herbarium records at CAL and DD also reveal that the last collection from India was in 1919 by Norman Gill and from Pakistan was in 1934 by Stewart (both the specimens have been cited above). Fraser-Jenkins (2008) listed it under critically endangered category of IUCN in Indian fern flora.



Fig. 1. *Pellaea calomelanos* (left whole plant, right plant showing lateral pinnae)

In Kumaon this fern has not been collected after independence from the place of its first collection, Khairana instead of a series of detailed explorations of Pteridophytes of Kumaon regions in general and Nainital in particular in recent years (Dhir, 1980; Verma and Khullar, 1980; Khullar, 1994, Khullar, & al., 1991, Pande and Pande, 2002, 2003, Pangtey & al., 2010). It is perhaps due to now Khairna has been built over considerably causing striking loss of vegetation. During recent plant collection tours in the inadequately explored parts of Champawat and Pithoragarh districts of east Kumaon (central Himalaya), the first author (KB) collected two plants of this fern (Fig. 1) from Chheena (about 38 km from Pithoragarh towards Lohaghat) where it was found growing intermixed with *Adiantum incisum*.

TAXONOMY

Pellaea calomelanos (Sw.) Link, Fil. Sp. 61 (1841); C.B. Clarke, Trans. Linn. Soc. London II Bot. 1: 461 (1880); Bedd., Handb. Ferns Brit. India. 104 (1883); C. W. Hope, J. Bombay Nat. Hist. Soc. 13 : 448 (1901); Fraser-Jenkins, Taxonomic Revision of Indian Sub-continental Pteridophytes, 571 (2008). *Pteris calomelanos* Sw., in C. Schrader, J. Bot. 1800(2): 70. (1801); Bedd., Ferns Brit. India t. 22. (1864).

Pellaea hastata (Thunb.) Prantl in Eng., Bot. Jahrb., 3: 418. (1882); Khullar, An Illustrated Fern Flora of West Himalaya, Vol.1. 223 (1994). *Pteris hastata* Thunb., Prod. Fl. Cap. 192. (1800).

Rhizome short, stout, ascending, scaly; scales lustrous, chestnut coloured, linear, 0.4×0.5 cm, margins entire, apex acute; stipe 8 cm, chestnut-black, round, scaly; scales sparse, confined to base only, as on the rhizome but small; lamina oblong-deltate, 10.5 - 14 cm, 1 - 2 pinnate, apex imparipinnate, coriaceous or leathery, green, glabrous on both the surfaces; pinnae 7 pairs, opposite or alternate, 4×2 cm, basal pair largest, oblique, ovate-

deltate, stalked, imparipinnate or undivided, base cordate, margins entire, apex obtuse; pinnules 2 pairs, simple or 1-pinnate, 1×0.7 cm, stalked, apical pinnule hastate, largest, 1 cm long, 1.6 cm wide; rachis, costa, costules and stalks chest nut coloured; sori marginal, on the veinlet endings, forming a coenosous, indusiate, indusia entire; spores golden brown, $48 - 49 \times 50 - 51 \mu\text{m}$, globose, non-perisporiate, exospore smooth. (Fig. 1).

Specimens examined: KB 322, 323; August 16, 2010; Chheena, district Champawat in Kumaon Himalaya, 800m. The plant is extremely rare where it grows as lithophyte on open rocks during rainy season. Presently maintained by the second author (RP) in the Pteridology Laboratory, Department of Botany, Government Postgraduate College, Pithoragarh.

DISTRIBUTION

The distribution of *Pellaea calomelanos* is biogeographically interesting. It is widespread throughout the south, central, eastern and northern part of continental Africa including Madagascar and nearby islands (Comoros and Mascarene) but also has disjunct occurrences in Catalonia in Spain, the Azores Island in the middle of Atlantic sea (Hooker, 1958; Hooker & Baker, 1865 - 1868). It is also very rare towards east and sporadically been collected from the Himalayan region (N. Pakistan, Uttarakhand and Tarai region U. P. states of India and adjoining west Nepal) and far distant localities of Yunnan and Sichuan provinces of China (Shing and Wu 1990). Within the Himalaya, it is absent in the far west (Jammu Kashmir and Himanchal Pradesh states of India), in most parts of Nepal, the eastern Himalaya, eastern India, and northern Myanmar.

The disjunct distribution of the species is likely due to long-distance dispersal as fern spores have the potential for long dispersal by wind from one continent to another (Barrington, 1993; Smith, 1993; Kato, 1993; Moran & Smith, 2001; Kessler, 2010). Dispersal of the spores of *Pellaea calomelanos* from mainland Africa to Spain, the Azores, and Madagascar may have occurred by air or with the animal transport by ships or by both, but its eastward distribution to the interior parts of Himalaya and China was probably by wind. The species is not present in Sri Lanka and Southern India so that it is unlikely that the Himalayan populations are a relic, as otherwise it would be expected to be present in southern and central India in areas such as the Western Ghats, Aravali and Satpura hills, or Parasnath hills where the climate is conducive for its growth.

In its Asian range, *Pellaea calomelanos* appears to be rare. In China, it is only known from historical herbarium specimens (Zhang Gangman and Zhang, X. C. *per comm.*). In India, it was collected between 1848 and 1919 but during past few decades it was not found despite thorough searches at its classical locality Khairana. *Pellaea calomelanos* was recently also found in western Nepal (Fraser Jenkins & Dulawat, 2008, Fraser Jenkins, 2010) and only a couple of plants were collected by the present authors in 2010 from another locality in Kumaon. Despite several thorough searches during 2010 and 2011, no more plants were found in the same locality. Thus, it may be assumed that the species is still in the process of colonization in Kumaon or the western Himalaya, as is a common event in fern biogeography and well noted in ferns of Hawaiian islands (Wagner, 1995, Ranker & al., 1994; Gieger & al 2007). A molecular study of the plant from different localities may solve this question, but the occurrence of many African ferns in western India such as *Aleuritopteris scinosa* from Rajasthan (Fraser Jenkins & Dulawat, 2008) and *Actinopteris radiata*, *Pellaea calomelanos* etc. from northern India suggests that long-distance dispersal of ferns from Africa is still in progress, although in general the Himalayan fern flora is dominated by Malaysian and Sino-Himalayan elements and many species occurring in eastern Himalaya are still shifting from east to west and are frequently being reported as new to the western Himalaya (Punetha & Kholia, 1988, 1989; Kholia & Punetha, 2002, 2004; 2005, Kholia & Bhakuni, 2009).

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