



<https://doi.org/10.53032/tvcr/2024.v6n2.02>

Synopsis of the Genus *Athyrium* Roth in Jammu and Kashmir, India

Himanshu Dwivedi

Department of Botany,
M.S. College, Saharanpur, Uttar Pradesh, India.

Deen Dayal Giri

Department of Botany,
M.S. College, Saharanpur, Uttar Pradesh, India.

Brijesh Kumar

Botanical Survey of India,
Dehradun, Northern Regional Centre, Dehradun, India

Abstract

The present article comprises the enumeration (an overview) of the taxa belonging to genus *Athyrium* Roth in Jammu and Kashmir. In the study area, the genus is represented by nine species. Currently accepted names, basionyms (if any), important synonyms, and distribution, have been updated for each taxon. Through extensive field surveys and herbarium analyses, nine species were documented, representing approximately 15.25% of India's *Athyrium* diversity and 30% of Northern India's. Each species account includes updated nomenclature, synonyms, and distribution data. Notably, *Athyrium attenuatum*, *A. mackinnoniorum*, *A. pectinatum*, and *A. strigillosum* are prevalent in the region, while *A. rubricaulis* is considered rare. The findings underscore the ecological significance of the Himalayan region in supporting diverse pteridophyte flora and provide a foundation for future conservation and taxonomic studies.

Keywords: *Athyrium* Roth, Jammu and Kashmir, Pteridophytes

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Introduction

The genus *Athyrium* Roth, established by Albrecht Wilhelm Roth in 1799, is represented by ca. 220 species in world (Wang *et al.*, 2013). Most of the species are distributed in the Northern Hemisphere mainly in Eastern, South-eastern Asia, Himalaya and adjacent mountains. Few species are found in tropical and South Africa or in South America and very few are in Europe (Kramer & Kato, 1990). Member of this genus are mainly distributed in the sub-temperate, temperate zone and understories of subtropical mountainous regions of world and prefer to grow in cool, humid, shady and semi sun exposed condition but it can be grown in exposed areas under moist and cool conditions. That's why the maximum diversity of *Athyrium* Roth is found in Himalayan region. Of these, 59 taxa (48 species, 1 subspecies and 10 hybrids) are known from India (Dixit, 1984; Kapur, 1985; Khullar, 2000; Chandra, 2000; Fraser-Jenkins, 1984, 2008, 2015, 2016, 2017,) contributing ca 27% global diversity of genus *Athyrium*. Maximum diversity of this genus is recorded from North-eastern India (ca.45 taxa) followed by Northern India (ca.24 taxa), Southern India including Western Ghats and Peninsular India (ca. 10 taxa) and Central India (ca. 6 taxa).

Don (1825) in *Prodromus Florae Nepalensis* started the systematic studies on Indian sub-continental ferns and described three *Athyrium* species. Wallich collected eight *Athyrium* species from Indian subcontinent, named under different genera, under different specific names (Fraser-Jenkins, 1984). Later Beddome (1876, 1883), Clarke (1880), Beddome (1883), etc., enumerated twenty, twenty seven & thirty five taxon from different parts of the country. Several workers *viz.* Stewart (1945, 1951); Javeid (1965); Kapur & Sarin (1977); Kapur (1985); Navchoo & Kachroo (1995); Dixit (2000); Bhat *et al.* 2012; Wani *et al.* (2012 & 2016).

The state shares the international boundary with Pakistan on west and on south the state is bounded by Himachal Pradesh and of Punjab. The major rivers of the state and their tributaries are: Indus, Jhelum, Chenab, Ravi, Tawi, Lidder, Kishanganga, Hunza, etc. The state comprises of 20 districts with three divisions, Jammu and Kashmir offering a rich faunal, floral and cultural diversity.

Materials and Methods

Present study is based on extensive literature scrutiny as well as field survey and herbarium examination of the genus *Athyrium* Roth housed at different herbaria *viz.* CAL, BSD, DD, PAN, PUN, LWG, GUH, ALM etc.

Under the each taxa the synonyms have been arranged in chronological order. Apart from the first citation the other relevant references pertaining to the Indian flora have been cited whenever found necessary under correct name or synonyms. For each taxa Indian and global distribution has also been provided.

Taxonomic Treatment

1. *Athyrium atkinsonii* Bedd., Suppl. Ferns S. Ind.:11. t. 359. 1876; Bedd., Suppl. Ferns British India: 32. 1892; B.K. Nayar & S. Kaur, Companion Handb. Ferns Brit. India: 39.

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1974; R.D. Dixit, Census Indian Pterid.: 125. 1984; Fraser-Jenk., New Sp. Syndr. Indian Pteridol.: 56. 1997; Khullar, Ill. Fern Fl. West Himalaya 2: 27. t. 8. 2000; Subh. Chandra, Ferns India: 122. 2000; Thapa, Pterid. Nepal: 99. 2002; P.C. Pande & H.C. Pande, Pterid. West. Himalaya: 100. 2002; Fraser-Jenk., Taxon. Revis. Indian Subcontinental Pteridophytes: 356. 2008; P. Joshi, H.C. Pande & P.C. Pande, Ferns Cent. Himalaya 1: 354. 2009; Fraser-Jenk., D.R. Kandel, & S. Pariyar, Ferns Fern-Allies Nepal 1: 22. 2015.

Aspidium senanense Franch. & Sav., Enum. Pl. Jap. 2: 241. 636. 1879.

Asplenium atkinsonii (Bedd.) C.B. Clarke in Trans. Linn. Soc. London, Bot. 1(7): 487. 1880.

Asplenium lastreoides Baker in J. Bot. 26: 227. 1888.

Davallia athyriifolia Baker in Ann. Bot. (Oxford) 5(18): 200. 1891.

Pseudocystopteris atkinsonii (Bedd.) Ching in Acta Phytotax. Sin. 9: 78. 1964.

Athyrium lastreoides (Baker) Diels in Nat. Pfl. 1 (4): 224. 1899.

Athyrium monticola Rosenst. in Repert. Spec. Nov. Regni Veg. 13: 123. 1913.

Distribution: INDIA: Jammu and Kashmir: Kashmir (Baramulla, Khilanmarg, Gulmarg), Jammu (Chatra Gala pass, Kathua); Himachal Pradesh; Uttarakhand; West Bengal, Sikkim, Manipur, Arunachal Pradesh.

BHUTAN; CHINA; JAPAN, NEPAL.

2. *Athyrium attenuatum* (C.B. Clarke) Tagawa, Acta Phytotax. Geobot. 16(6): 177. 1956; B.K. Nayar & S. Kaur in Companion Handb. Ferns Brit. India: 41. 1974; Dhir in Biblioth. Pterid. 1: 82. 1980; Dixit, Census Indian Pterid.: 125, 1984; Fraser-Jenk., New Sp. Syndr. Indian Pteridol.: 57. 1997; Khullar, Ill. Fern Fl. West Himalaya 2: 30. 2000; Subh. Chandra, Ferns India: 123. 2000; P.C. Pande & H.C. Pande, Pterid. West. Himalaya: 100. 2002; Fraser-Jenk., Taxon. Revis. Indian Subcontinental Pteridophytes: 234. 2008; P. Joshi, H.C. Pande & P.C. Pande, Ferns Cent. Himalaya 1: 356. 2009; Fraser-Jenk., D.R. Kandel, S. Pariyar, Ferns Fern-Allies Nepal 1: 22. 2015.

Asplenium filix-femina (L.) Bernh. var. *attenuatum* C.B. Clarke, Trans. Linn. Soc. London, Bot. 1(7): 492. t. 59(1). 1880.

Polypodium dentigerum Wall., Numer. List n. 334. 1829. *nom. nud.*

Asplenium filix-femina (L.) Bernh. var. *dentigera* C.B. Clarke in Trans. Linn. Soc. London, Bot. 1(7): 491. 1880.

Asplenium filix-femina f. *dentigera* (C.B. Clarke) C. Hope in J. Bombay Nat. Hist. Soc. 14(1): 125-126. 1902.

Distribution: INDIA: Jammu and Kashmir: Kashmir (Pahlgam, Liddar, Pir Panjal, Dachigam Wildlife Sanctuary, Lower Rajdhangan Pass, Baramulla, Gulmarg, Rajdhan, Anantnag, Pahalgam, Shikargarh, Lidderwat, Ganderbal Amarnath, Pisso Ghati, Shopian,

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Rembiara Valley), Jammu (Patnitop, Kishanganga); Himachal Pradesh; Uttarakhand, Sikkim, Arunachal Pradesh.

CHINA; NEPAL; PAKISTAN.

3. *Athyrium mackinnoniorum* (C. Hope) C. Chr., Index Filic.: 143. 1905; Dhir in Biblioth. Pteridol. 1: 87. 1980; R.D. Dixit, Census Indian Pterid.: 127. 1984; Fraser-Jenk., New Sp. Syndr. Indian Pteridol.: 57. 1997; Khullar, Ill. Fern Fl. West Himalaya 2: 56, t. 20. 2000; Subh. Chandra, Ferns India: 129. 2000; Thapa, Pterid. Nepal : 102, 2002; P.C. Pande & H.C. Pande, Pterid. West. Himal.: 103. 2002; 1: 224. 2003; Fraser-Jenk., Taxon. Revis. Indian Subcontinental Pteridophytes: 217. 2008; P. Joshi, H. C. Pande & P. C. Pande, Ferns Cent. Himalaya 1: 367, 2009. Fraser-Jenk., D.R. Kandel, & S. Pariyar, Ferns Fern-Allies Nepal 1: 23. 2015.

Asplenium mackinnoni C. Hope in J. Bot. 34(399): 124. 1896.

Athyrium caudipinnum in Ching, Acta Botanica Austro. Sinica 1: 20. 1983.

Distribution: INDIA: Jammu and Kashmir: Kashmir (Pir Panjal, Srinagar, Dachigam National Park, Baramulla, Gulmarg, Outer circuit Road Ferozepur nallah, Tangmarg, Kupwara, Keran, Anantnag, Pahalgam, Lidder Valley, Shikargarh, Bandipora, Kanzalwan), Jammu (Patnitop, near Vaishnodevi); Himachal Pradesh; Uttarakhand. AFGHANISTAN; CHINA; NEPAL; PAKISTAN; THAILAND.

4. *Athyrium pectinatum* (Wall. ex Mett.) T. Moore, Index Fil.: 186. 1860; Bedd., Suppl. Ferns British India: 36. 1892; B.K. Nayar & S. Kaur, Companion Handb. Ferns Brit. India: 42. 1974; Dhir in Biblioth. Pteridol.: 1: 85. 1980; R.D. Dixit, Census Indian Pterid.: 128. 1984; Khullar, Ill. Fern Fl. West Himalaya 2: 63. t. 23 2000; Subh. Chandra, Ferns India: 131. 2000; P.C. Pande & H.C. Pande, Pterid. West. Himalaya: 104. 2002; Fraser-Jenk., Taxon. Revis. Indian Subcontinental Pteridophytes: 220. 2008; Fraser-Jenk., D.R. Kandel, & S. Pariyar, Ferns Fern-Allies Nepal 1: 24. 2015.

Asplenium pectinatum Wall. ex Mett. in Abh. Senckenberg. Naturf. Ges. 3(1): 241. 1859; C. Hope in J. Bombay Nat. Hist. Soc. 14: 253. 1902.

Asplenium pectinatum Wall., Numer. List n. 231. 1829. *nom. nud.*

Athyrium pectinatum C. Presl, Tent. Pterid., 98. 1836. *nom. nud.*

Athyrium pectinatum (Wall. ex Mett.) Bedd., Ferns S. India 51. 1863.

Asplenium filix-foemina var. *pectinatum* Wall. ex. C.B. Clarke in Trans. Linn. Soc. London, Bot. 1(7): 492. 1880.

Distribution: INDIA: Jammu and Kashmir: Jammu (Kathua); Himachal Pradesh; Uttarakhand; Jharkhand, West Bengal, Sikkim, Meghalaya, Manipur, Arunachal, Rajasthan, Madhya Pradesh, Tamil Nadu.

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BHUTAN; CHINA; NEPAL; TIBET.

5. *Athyrium rubricaula* (Edgew. ex C.B. Clarke) Bir in Nova Hedwigia 4: 169. 1962; R.D. Dixit, Census Indian Pterid.: 128. 1984; Fraser-Jenk., Khullar, Ill. Fern Fl. West Himalaya 2: 67. 2000; Subh. Chandra, Ferns India: 133. 2000; Thapa, Pterid. Nepal: 103.2002; P.C. Pande & H.C. Pande, Pterid. West. Himalaya: 104. 2002; Fraser-Jenk., Taxon. Revis. Indian Subcontinental Pteridophytes: 218. 2008; Fraser-Jenk., D.R. Kandel, S. Pariyar, Ferns Fern-Allies Nepal 1: 23. 2015.

Asplenium filix-femina (L.) Bernh. var. *retusa* (Decne.) C.B. Clarke, subvar. *rubricaula* Edgew. ex C.B. Clarke in Trans. Linn. Soc. London, Bot. 1(8): 492. 1880.

Athyrium filix-femina (L.) Roth subvar. *rubricaula* (Edgew. ex C.B. Clarke) Bedd., Suppl. Ferns Brit. Ind.: 35. 1892.

Distribution: INDIA: Jammu and Kashmir: Kashmir (Baramulla, Gulmarg, Anantnag, Pahalgam); Himachal Pradesh; Uttarakhand; West Bengal; Sikkim; Arunachal Pradesh.
BHUTAN; CHINA.

6. *Athyrium rupicola* (Edgew. ex C. Hope) C. Chr., Index Filic. 3: 145. 1905; Dhir, in Biblioth. Pteridol. 1: 82. 1980; R.D. Dixit, Census Indian Pterid.: 129. 1984; New Sp. Syndr. Indian Pteridol.: 58. 1997; Subh. Chandra, Ferns India: 133. 2000; Khullar, Ill. Fern Fl. West Himalaya 2: 69. 2000; Thapa, Pterid. Nepal: 103. 2002; P.C. Pande & H.C. Pande, Pterid. West. Himalaya: 105. 2002; Fraser-Jenk., Taxon. Revis. Indian Subcontinental Pteridophytes: 234. 2008; Fraser-Jenk., D.R. Kandel, S. Pariyar, Ferns Fern-Allies Nepal 1: 23 2015.

Asplenium rupicola Edgew. ex C. Hope in J. Bombay Nat. Hist. Soc. 12: 531. t. 5. 1899.

Asplenium rupestre C. Hope in J. Bombay Nat. Hist. Soc. 12: 532. t. 5. 1899.

Athyrium falcipinna Ching, Sporae Pterid. Sin: 214. t. 43. 1976.

Asplenium filix-femina (L.) Bernh. var. *retusa* subvar. *elongata* C.B. Clarke ex Blanf. in J. Asiat. Soc. Bengal 57(2-4): 306. 1888.

Athyrium glandulosum Ching in Acta Bot. Boreal.-Occid. Sin. 6 (1): 19-20. 1986.

Distribution: INDIA: JAMMU and KASHMIR: Kashmir (Anantnag, Pahalgam); Himachal Pradesh; Uttarakhand; West Bengal, Sikkim; Meghalaya; Arunachal Pradesh.
BHUTAN; CHINA; NEPAL; PAKISTAN.

7. *Athyrium schimperi* Moug. ex Fée subsp. *biserrulatum* (Christ) Fraser- Jenk., New Sp. Syndr. Indian Pteridol.: 60. 1997; Fraser-Jenk., Taxon. Revis. Indian Subcontinental

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Pteridophytes: 603. 2008; Fraser-Jenk., D.R. Kandel, S. Pariyar, Ferns Fern-Allies Nepal 1: 24. 2015.

Athyrium biserrulatum Christ in Bull. Acad. Int. Géogr. Bot. 17(212):135. 1907.

Athyrium wumonshanicum Ching in Acta Bot. Boreal.-Occid. Sin. 6(1): 20. 1986.

Distribution: INDIA: Jammu and Kashmir: Kashmir (Baramulla, Gulmarg, Baba Rishi), Jammu (Udhampur, Patni Top, Sanasar, Kathua); Himachal Pradesh; Uttarakhand; West Bengal; Sikkim; Meghalaya; Arunachal Pradesh.

BHUTAN; CHINA; NEPAL; PAKISHTAN.

8. ***Athyrium strigillosum*** (T. Moore ex E.J. Lowe) Salomon, Nomencl.

Gefasskrypt.: 112. 1883; B.K. Nayar & S. Kaur, Companion Handb. Ferns Brit. India:

42.1974; R.D. Dixit, Census Indian Pterid.: 129. 1984; Fraser-Jenk., New Sp. Syndr.

Indian Pterid.: 61. 1997; Khullar, Ill. Fern Fl. West Himalaya, 2: 77. t. 28, 2000; Subh.

Chandra, Ferns India: 137. 2000; Thapa, Pterid. Nepal: 105. 2002; P.C. Pande & H.C.

Pande, Pterid. West. Himalaya: 98. 2002; Fraser-Jenk., Taxon. Revis. Indian

Subcontinental Pteridophytes: 231, 232. 2008; Fraser-Jenk., D.R. Kandel, S. Pariyar, Ferns

Fern-Allies Nepal 1: 24. 2015.

Asplenium strigillosum T. Moore ex E.J. Lowe, Ferns 5: 107, pl. 36. 1858.

Athyrium tenuifrons Wall. ex Sim in Priced Cat. Ferns 6: 17. 1859.

Asplenium tenuifrons Wall. ex C. Hope in J. Bombay Nat. Hist. Soc. 14: 120, t.

22. 1903.

Athyrium petiolosum Christ in Bull. Acad. Int. Géogr. Bot. 17: 134. 1907.

Distribution: INDIA: Jammu and Kashmir: Jammu (Poonch, Kishtwar, Doda); Himachal Pradesh;

Uttarakhand: West Bengal, Sikkim, Assam, Meghalaya, Arunachal Pradesh;

BHUTAN; CHINA; JAPAN; MYANMAR; NEPAL; PAKISTAN; TAIWAN; THAILAND.

9. ***Athyrium wallichianum*** Ching in Bull. Fan Mem. Inst. Biol. Bot. 8 (6):

497. 1938; Dhir in Biblioth. Pteridol. 1: 92. 1980; R.D. Dixit, Census Indian Pterid.:

130. 1984; Khullar, Ill. Fern Fl. West Himalaya 2: 82. t. 29. 2000; Subh. Chandra,

Ferns India: 139. 2000; Thapa, Pterid. Nepal: 105. 2002; P.C. Pande & H.C. Pande, Pterid.

West.Himalaya: 106. 2002; Fraser-Jenk., Taxon. Revis. Indian Subcontinental

Pteridophytes: 238.2008; Fraser-Jenk., D.R. Kandel, S. Pariyar, Ferns Fern-Allies Nepal 1:

24. 2015.

Aspidium brunonianum Wall., Numer. List n. 344. 1828. num. nud.

Lastrea brunoniana C. Presl Tent. Pterid.: 76. 1836.

Aspidium brunonianum Wall. ex Mett. in Abh. Senckenberg. Naturf. Ges. 4:

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54. 1858.

Nephrodium brunonianum Hook, Sp. Fil. 4: 113. t. 251. 1862.

Lastrea brunoniana (Wall. ex Mett.) Bedd., Ferns Brit. India t. 37. 1865.

Distribution: INDIA: Jammu and Kashmir: Kashmir

(Amarnath, Baramulla, Razdhan, Gulmarg, Alpathar, Khilanmarg, Anantnag, Pahalgam, Lidder); Himachal Pradesh; Uttarakhand: West Bengal; Sikkim, Arunachal Pradesh; BHUTAN; CHINA; NEPAL; PAKISTAN.

Results

Present communication includes 9 taxa of genus *Athyrium* Roth reported from Jammu and Kashmir. Which share 15.25% of total species diversity of genus *Athyrium* Roth in India and 30% diversity of Northern India. Among these *Athyrium attenuatum* (Wall. ex C.B. Clarke) Tagawa, *A. mackinnoniorum* (C. Hope) C. Chr., *A. pectinatum* (Wall. ex Mett.) T. Moore, *A. strigillosum* (T. Moore ex E. J. Love) Salomon are common species of the area while *A. rubricaula* (Edgew. ex C.B. Clarke) Bir is rare species of the area.

Acknowledgements

The authors are grateful to the Director, Botanical Survey of India, Kolkata and the Principal, M. S. College, Saharanpur for providing the necessary facilities and encouragement. We are also thankful to Dr. Prashant K. Pusalkar, Senior Scientist, Botanical Survey of India, Dehradun for his valuable suggestions and support.

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