Building evidence for conservation globally

Journal of Threatened Taxa

Open Access

10.11609/jott.2025.17.1.26331-26442
www.threatenedtaxa.org

26 January 2025 (Online & Print)
17(1): 26331-26442
ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

zoOreach @ 40

ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

Publisher
Wildlife Information Liaison Development Society
www.wild.zooreach.org

Host
Zoo Outreach Organization
www.zooreach.org

Srivari Illam, No. 61, Karthik Nagar, 10th Street, Saravanampatti, Coimbatore, Tamil Nadu 641035, India
Registered Office: 3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore, Tamil Nadu 641006, India
Ph: +91 9385339863 | www.threatenedtaxa.org
Email: sanjay@threatenedtaxa.org

For Focus, Scope, Aims, and Policies, visit https://threatenedtaxa.org/index.php/JoTT/aims_scope
For Article Submission Guidelines, visit https://threatenedtaxa.org/index.php/JoTT/about/submissions
For Policies against Scientific Misconduct, visit https://threatenedtaxa.org/index.php/JoTT/policies_various

continued on the back inside cover

Cover: Illuminating the cruelty of Pangolin trade in India for the purpose of black magic, for the sanctity of protection. Using an animal's shell, ripping its armor against the world to protect oneself. When does one become the evil they are trying to ward off? — Acrylic on wood. © Maya Santhanakrishnan.

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 January 2025 | 17(1): 26394–26400

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

https://doi.org/10.11609/jott.9253.17.1.26394-26400

#9253 | Received 30 June 2024 | Final received 11 December 2024 | Finally accepted 17 December 2024

OPEN ACCESS

COMMUNICATION

Assessing the conservation status of *Elaphoglossum stigmatolepis* (Fee) T.Moore (Dryopteridaceae), an endemic fern in the Western Ghats of India

A. Benniamin [1], Sakshi Pandey [2] & Rajat Mondal [3]

[1,2,3] Botanical Survey of India, Western Regional Centre, 7, Koregaon Road, Pune, Maharashtra 411001, India.
[1] fernsbenni@gmail.com (corresponding author), [2] sakshipecc.30@gmail.com, [3] rmbotany@gmail.com

Abstract: *Elaphoglossum stigmatolepis*, a fern species endemic to the semi-evergreen or evergreen forests of the Western Ghats of India, has recently garnered attention due to its precarious status within its native habitat. Thriving within the unique microclimates of these regions, this fern has been assessed for the first time. The results of this assessment are concerning, as the species has been classified as Endangered under the IUCN Red List Categories and Criteria 3.1. The limited population of *E. stigmatolepis* underscores its vulnerability, highlighting the pressing need for dedicated conservation efforts. This assessment represents a pivotal step in acknowledging and addressing the threats faced by *E. stigmatolepis*, emphasizing the urgency of implementing measures to ensure its survival and safeguarding the biodiversity of the Western Ghats.

Keywords: Biodiversity, endangered, epiphyte, GeoCAT, habitat, holodimorphic, population, species information assessment (SIS), survival, threat.

சுருக்கம்: *Elaphoglossum stigmatolepis*, இந்தியாவின் மேற்குத் தொடர்ச்சி மலைகளின் அரை-பசுமை அல்லது பசுமையான காடுகளுக்குச் சொந்தமான ஒரு டெரிடோபைட் இனம், அதன் சொந்த வாழ்விடத்திற்குள் அதன் ஆபத்தான நிலை காரணமாக சமீபத்தில் கவனத்தை ஈர்த்துள்ளது. இந்த பிராந்தியங்களின் தனித்துவமான மைக்ரோக்ளைமேட்டுகளுக்குள் செழித்து, இந்த டெரிடோபைட் முதல் முறையாக மதிப்பிடப்பட்டுள்ளது. இயற்கை பாதுகாப்புக்கான சர்வதேச ஒன்றியம் சிவப்பு பட்டியல் வகைகள் மற்றும் அளவுகோல் 3.1 இன் கீழ் இனங்கள் அழிந்து வரும் நிலையில் வகைப்படுத்தப்பட்டுள்ளதால், இந்த மதிப்பீட்டின் முடிவுகள் கவலையளிக்கின்றன. *E. stigmatolepis* மட்டுப்படுத்தப்பட்ட மொத்த எண்ணிக்கை அதன் பாதிப்பை அடிக்கோடிட்டுக் காட்டுகிறது, அர்ப்பணிப்புள்ள பாதுகாப்பு முயற்சிகளின் அவசரத் தேவையை எடுத்துக்காட்டுகிறது. இந்த மதிப்பீடு *E. stigmatolepis* எதிர்கொள்ளும் அச்சுறுத்தல்களை அங்கீகரிப்பதில் மற்றும் நிவர்த்தி செய்வதில் ஒரு முக்கிய படியை பிரதிபலிக்கிறது, மேற்குத் தொடர்ச்சி மலைகளின் பல்லுயிரியலைப் பாதுகாப்பதற்கும் அதன் உயிர்வாழ்வை உறுதி செய்வதற்கும் நடவடிக்கைகளை செயல்படுத்துவதற்கான அவசரத்தை வலியுறுத்துகிறது.

Editor: Aparna Watve, Biome Conservation Foundation, Pune, India.

Date of publication: 26 January 2025 (online & print)

Citation: Benniamin, A., S. Pandey & R. Mondal (2025). Assessing the conservation status of *Elaphoglossum stigmatolepis* (Fee) T.Moore (Dryopteridaceae), an endemic fern in the Western Ghats of India. *Journal of Threatened Taxa* 17(1): 26394–26400. https://doi.org/10.11609/jott.9253.17.1.26394-26400

Funding: Ministry of Environment, Forest and Climate Change, New Delhi.

Competing interests: The authors declare no competing interests.

Author details: Dr. A. Benniamin, scientist 'F' and head of the Botanical Survey of India, Western Regional Centre, Pune, is a distinguished researcher in the field of pteridophytes.He is also an Asia member of the IUCN SSC Group and a fellow of the Linnean Society, London. His research focuses on the taxonomy of pteridophytes, conservation of pteridophytes through tissue culture, and their IUCN assessment. Sakshi Pandey is working as a junior research fellow at the Botanical Survey of India. As an IUCN Species Information Service (SIS) assessor, she plays a role in documenting and assessing species, and her five research papers reflect her dedication to scientific inquiry in this field. Rajat Mondal is working as a junior research fellow at the Botanical Survey of India, Western Regional Centre, Pune. He is an IUCN Species Information Service (SIS) assessor and has published four research papers to his credit.

Author contributions: AB conducted the field surveys, analyzed the data, provided photographs, location details, and revised the initial draft. SP conceived and designed the study and authored the initial draft of the manuscript. RM contributed to data interpretation. All three authors reviewed and approved the final manuscript.

Acknowledgements: The authors are thankful to Dr. A.A. Mao, director, Botanical Survey of India, Kolkata, and head of the office of BSI WRC, Pune for their support and encouragement. I also want to thank Karnataka State Forest PCCF for granting permission for the field survey. Two of the authors, Pandey & Mondal, are thankful to the Ministry of Environment, Forest and Climate Change, New Delhi for providing financial support in the form of JRF under flora of India Project for this research work.

INTRODUCTION

The *Elaphoglossum* genus, originating from Schott's initial description and later revised by John Smith, stands as one of the most diverse genera within the fern family, boasting around 600 species. Interestingly, the bulk of these species find their home in the New World. According to the Pteridophyte Phylogeny Group I (PPG I) classification, this species belongs to the family Dryopteridaceae. Approximately, 13 species of *Elaphoglossum* inhabit India (Fraser-Jenkins et al. 2021). Among all the above species *E. beddomei* Sledge, *E. nilgiricum* Krajina ex. Sledge, and *E. stigmatolepis* (Fee) Moore are endemic to the southern Western Ghats. Madhusoodanan (2015) observed only two species—*E. nilgiricum* and *E. beddomei* in Kerala. Rajagopal & Bhat (1998) reported the presence of only *E. nilgiricum*, while a more recent study by Tripathi et al. (2016) confirmed the existence of *E. stigmatolepis* in Karnataka and Tamil Nadu (Manickam & Irudayaraj 2003). The species' distribution is restricted to a few specific localities within these states, making it susceptible to habitat fragmentation and other environmental threats.

The present study aimed to assess the status of *E. stigmatolepis* using the IUCN Red List Categories and Criteria which involves a thorough analysis of the species' extent of occurrence (EOO) and area of occupancy (AOO) from field data and secondary sources. This evaluation is crucial for understanding the conservation needs of this species and formulating effective strategies to ensure its continued survival amidst the growing threats of habitat degradation and climate change in the Western Ghats. In some earlier assessments of *E. stigmatolepis* it was considered as 'rare' even though some effective attempts were made by the authors Chandra et al. (2008), Ebihara et al. (2012), Fraser-Jenkins (2012), and Benniamin et al. (2021); it may not be fully in accordance with the IUCN criteria.

Through rigorous scientific investigation and proactive conservation measures, the goal is to mitigate the risks facing this unique and ecologically significant fern species, safeguarding its presence for future generations and preserving the rich biodiversity of the Western Ghats ecosystem. The work also forms a baseline for ecologists, conservation biologists, and applied researchers for conservation and sustainable utilization of the species.

METHODS

Study area

The study focused on the Western Ghats in general with particular reference to Kudremukh National Park, located in the Chikkamagalur District of Karnataka (13.0169–13.4880 N & 75.1527–75.4169 E). Among various sites within the park, Kadambi Falls was selected as a key location for its rich biodiversity. At this site, researchers found and collected a specimen of *E. stigmatolepis*, a rare epiphytic fern, growing exclusively on a *Memecylon* tree. This fern, observed in a single patch on the tree, highlights the park's unique and diverse plant life.

Methodology

Extensive field exploration formed the cornerstone of the data collection process. Geographical coordinates were meticulously recorded using a geographical positioning system (GPS) during field expeditions to capture accurate location data of *E. stigmatolepis* populations. These field excursions provided us with primary data crucial for understanding the distribution and habitat preferences of the species. Supplementing our primary data collection efforts, secondary data were gathered from various herbaria such as the Central National Herbarium (CNH) Botanical Survey of India, Western Regional Centre (BSI), and digital herbaria namely Flora of Peninsular India, Digital Flora of Karnataka, CALI (Calicut University Herbarium) & XCH (St. Xavier's College, Palayamkottai). Additionally, a preliminary search in the GBIF showed some odd and wrong records under the name '*E. stigmatolepis*' from Reunion (Africa), and iNaturalist (2024) which yielded results with zero observation. The reviewed published literature further enriched the understanding of the geographic locations of Benniamin et al. (2020, 2021), Rajagopal & Bhat (1998), Manickam & Irudayaraj (2003), and ecological characteristics of *E. stigmatolepis*. To systematically organize the compiled data, essential parameters such as distribution, localities, state, collector names, date of collection, basis of record, altitude, latitude, longitude, and habitat were recorded in an Excel spreadsheet (Table 1). Subsequently, this data was imported and processed for analysis. Utilizing open-source online software, specifically the Geospatial Conservation Assessment Tool (GeoCAT) developed by Bachman et al. (2011), available at http://geocat.iucnredlist.org (Image 1). The area of occupancy (AOO) and extent of occurrence (EOO) values were calculated based on the recorded location points. These metrics

Image 1. Evaluation of area of occupancy and extent of occurrence of *Elaphoglossum stigmatolepis* (Fee) T.Moore in India by using GeoCAT.

provided crucial insights into the spatial distribution and extent of the species' range. To ensure comprehensive documentation of the findings, the Species Information Service (SIS) portal was utilized to detail various aspects of *E. stigmatolepis*, including species attributes, geographic range, AOO, EOO, number of locations, elevation occurrence, population information, habitat and ecology, threats, conservation strategies, ecosystem services, and Red List assessment. By employing a multidimensional approach encompassing fieldwork, data synthesis from diverse sources, and advanced analytical tools, the methodology aimed to provide a robust assessment of the threatened status of *E. stigmatolepis*. This systematic methodology lays the foundation for informed conservation strategies tailored to safeguarding this endemic fern species and its fragile habitat in the Western Ghats ecosystem.

RESULTS

Elaphoglossum stigmatolepis (Fee) T.Moore, Index Fil. 16. 1857; Sledge in Bull. Brit. Mus. (Nat. Hist). Bot. 4: 86. 1967; Nayar & Kaur, Comp. Bedd. Hand., 97. 1974; Dixit, Census 166. 1984; Manickam & Irudayaraj Pterid. Fl. West. Ghats 287. 1992. *Acrostichum stigmatolepis* Fee, Mem. Fam. Foug. 2: 62 t. 24 f. 2. 1845. *Elaphoglossum conforme* sensu Bedd. FSI 67 t. 198 (1864) & Handb. 416 t. 247 (1883) pro parte (non J. Sm.). *Acrostichum conforme* sensu Clarke in Trans. Linn. Soc. London II Bot. 1: 576. 1880 pro parte. *Elaphoglossum ballardianum* K. Biswas in Bull. Misc. Inf. Kew. 1939: 239. 1939.

Rhizome long creeping, 3–4 mm thick, densely scaly; scales ovate-lanceolate, attenuate, brown at the base, blackish-brown above. Stipes scattered, deep brown, 8–11 cm long. Lamina simple, dark green, lanceolate, 8–18 cm long;–1.5–2.0 cm wide, apex acute. The upper and lower–halves of the lamina gradually narrowed, with an entire margin with a cartilaginous border. The midrib is slightly raised on both sides and shallowly grooved above; veins immersed; the underside of the lamina and midrib covered by minute, fimbriate scales. Fertile fronds approximately 12–14 cm long and 1–1.5 cm wide, oblanceolate, much compressed, with a moderately longer stipe and revolute margin. Sori acrostichoid; spores monolete, reniform, dark brown (Image 2).

Habitat and Ecology: It is an epiphytic fern thriving in the semi-evergreen and evergreen forests that characterize this region. It typically grows on tree trunks under the dense forest canopy, which provides the shaded, humid environment essential for its survival. This fern prefers elevations ranging 1,000–2,650 m, where the cool, moist conditions of the montane regions are ideal for its growth.

Specimen examined: Karnataka, Kadambi Falls, Kudremukh National Park, 24.xi.2015, coll. Devendra Tripathi, 197952, BSI (Image 3).

Distribution: Tamil Nadu and Karnataka. Endemic to southern India.

DISCUSSION

Elaphoglossum stigmatolepis is placed under the Endangered (EN) category in the present assessment as the species is restricted to only two states in India, i.e., Karnataka and Tamil Nadu. The EOO for the species was estimated to be 7,808.857 km^2 which is more than

Table 1. Distribution of *Elaphoglossum stigmatolepis* in the Western Ghats.

	Basis of records	Collection no.	Collection date	Altitude (m)	Name of collectors	State	Locality	Habitat	Data source
1	Preserved specimen	197952	24.xi.2015	1,350	Deventra Tripathi & A. Benniamin	Karnataka	Kudremukha National Park, Kadambi Falls.	Epiphyte exclusively on *Memecylon* tree (one patch).	BSI (Botanical Survey of India, Western Regional Centre) Pune.
2	Preserved specimen	RHT 32615	02.v.85	2,200	VSM & KMM	Tamil Nadu	Madurai (Anna), Kodaikanal, Palni Hills, Gundar Shola.	Epiphyte.	XCH (St. Xavier's College, Palayamkottai).
3	Preserved specimen	RHT 34438	16.ii.86	1,850	VSM & KMM	Tamil Nadu	Coimbatore, Valparai, Anaimalai Hills, Grass Hill- Periyar Path.	Epiphyte on forest trees.	XCH (St. Xavier's College, Palayamkottai).
4	Preserved specimen	XCH 410 (2)	24.x.91	2,650	VSM	Tamil Nadu	Nilgiri, Dodabetta Road.	Occasional epiphyte in the forest interior.	XCH (St. Xavier's College, Palayamkottai).
5	Preserved specimen	XCH 436	24.x.91	2,650	VSM	Tamil Nadu	Nilgiri, Dodabetta Road.	Rare epiphyte locally abundant in shola interior.	XCH (St. Xavier's College, Palayamkottai).
6	Preserved specimen	XCH 456	25.x.91	2,200	VSM	Tamil Nadu	Nilgiri, Forest Bungalow of Terrace Estate.	Epiphyte, occasional and locally abundant.	XCH (St. Xavier's College, Palayamkottai).
7	Preserved specimen	XCH 568	27.x.91	2,300	VSM	Tamil Nadu	Nilgiri, Sholas Between T.R. Bazaar And Belluve.	Epiphyte. Rare.	XCH (St. Xavier's College, Palayamkottai).
8	Preserved specimen	XCH 583	28.x.91	2,300	VSM	Tamil Nadu	Nilgiri, Shola On The Short Cut From The T.R. Bazaar To Naduvattum.	Occasional epiphyte. Sterile.	XCH (St. Xavier's College, Palayamkottai).
9	Preserved specimen	XCH 855	06.xii.91	2,100	VSM	Tamil Nadu	Nilgiri, Avalanchi Forest.	Epiphyte in shola; rare.	XCH (St. Xavier's College, Palayamkottai).
10	Preserved specimen	XCH 900 (2)	07.xii.91	2,100	VSM	Tamil Nadu	Nilgiri, Avalanchi Forest.	Rare, in the forest interior; sterile.	XCH (St. Xavier's College, Palayamkottai).
11	Preserved specimen	XCH 933	08.xii.91	2,200	VSM	Tamil Nadu	Nilgiri, Round Road on the Plateau, Upper Bhavani (Manjoor).	Rare, epiphyte in the shola.	XCH (St. Xavier's College, Palayamkottai).

the threshold value for the Endangered category, so it's not applicable for category assignment. The AOO was calculated based on the cell size of (2 × 2 km) recommended by IUCN and it was estimated to be 32 km^2 which meets criterion B2 for the Endangered category. Field experiences and data collected from secondary sources indicate that the species is reported from five localities, namely, Palani Hills, Nilgiris, Anamalais Hills, Kodaikanal (Gundar Shola) in Tamil Nadu, and Kadambi Falls in Kudremukh National Park, Karnataka, this aligns with sub-criterion 'a' for the endangered category, as the number of locations are five.

The species is facing multiple threats across its distribution range, leading to a continuous decline in habitat quality and population size. In Kudremukha National Park, infrastructure development such as road construction and increased tourism activities have further degraded its habitat. Additionally, invasive plant species like *Lantana camara* and *Chromolaena odorata* are outcompeting native vegetation, reducing the availability of suitable microhabitats. The climate crisis exacerbates the situation by altering rainfall patterns and microclimatic conditions essential for the species' growth and reproduction. Intrinsic factors, such as poor spore viability, low germination rates, and limited genetic diversity due to declining population size, further jeopardize its survival. These cumulative threats not only reduce the extent of suitable habitat but also impact the species' ability to regenerate, qualifying it for listing under the Endangered category based on sub-criterion 'b (iii)'.

Among seven species of *Elaphoglossum* in India,

Image 2. Habitat of *Elaphoglossum stigmatolepis* (Fée) T.Moore – Kadambi Falls, KNP, Karnataka. © A. Benniamin & Devendra Tripathi.

only *E. stigmatolepis* and *E. stelligerum* are with holodimorphic fronds and the remaining five species are with weak or hemidimorphic fronds. It is possible that the relative costs of this reproductive system are offset by increased spore dispersal (Watkins et al. 2016). Most of the species in the related lomariopsidoid genus *Bolbitis* are with strictly holodimorphic fronds (Hennipman 1977). In general, frond dimorphism may influence the reproductive successfulness of that particular fern, at least to some extent by the production of a low number of spores which may be released within a short span of time this might be the reason for continuous reduction in a number of mature individuals which qualify the species for the Endangered category under sub-criteria 'b (v)'.

In Kudremukh National Park, the primary threats to *Elaphoglossum stigmatolepis* include habitat loss due to deforestation for agricultural expansion and tree cutting, which significantly impacts its association with *Memecylon* species. Increased infrastructure development, such as road construction, has fragmented the habitat, isolating subpopulations and limiting dispersal. In Nilgiris, tourism-related activities, including trekking and recreational pursuits, lead to habitat disturbances like soil compaction and trampling, which degrade the forest floor and reduce the availability of suitable microhabitats. In Kodaikanal hills, the conversion of forested areas into plantations has caused severe habitat modification and population declines. Across these locations, climate change intensifies these issues, with altered rainfall patterns and rising temperatures further reducing habitat quality and the species' ability to regenerate. These localized threats collectively contribute to a decline in both the extent of habitat and the size of subpopulations, justifying its endangered status.

Elaphoglossum stigmatolepis, an endemic fern of the Western Ghats, is reported from Karnataka and Tamil Nadu with an EOO of 7808.857 km² and an AOO of only 32 km², calculated using GeoCAT and a 2 × 2 km grid. The species is restricted to five locations, with a reported continuous decline in the number of locations, mature individuals, and habitat quality due to threats such as deforestation, road expansion, urbanization, and other anthropogenic pressures. The limited AOO, small number of locations, and ongoing decline in population

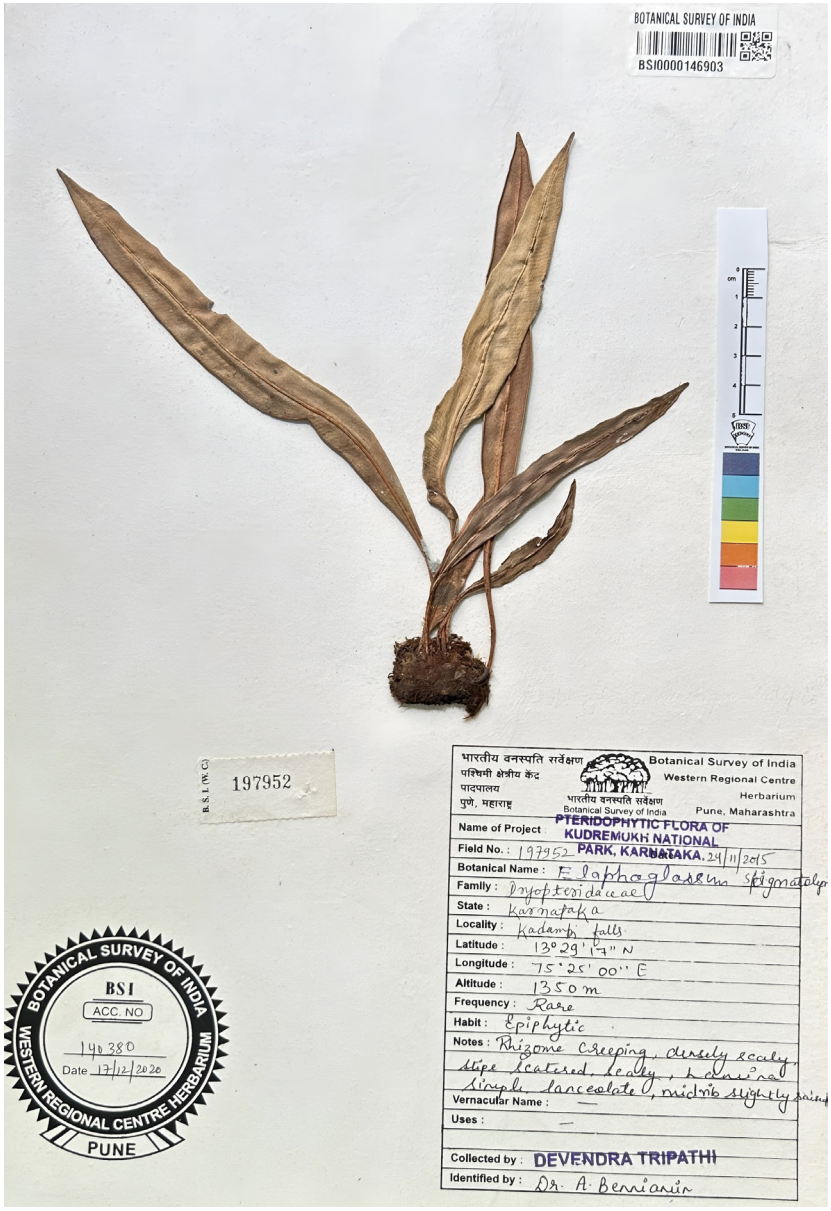

Image 3. Herbarium specimen of *Elaphoglossum stigmatolepis* (Fee) T.Moore. © Sakshi Pandey.

and habitat quality justify its assessment as Endangered under the IUCN Red List criterion B2ab(iii,v).

In light of these findings, a comprehensive conservation strategy for the endangered endemic fern E. *stigmatolepis*, utilizing both in vivo and in vitro methods is strongly recommended. Existing research, such as studies by Johnson et al. (2015) and Johnson & Shibila (2018), highlights the potential of in vitro spore culture. Effective conservation strategies should include habitat protection, ecological restoration, continuous monitoring, community engagement, and climate change adaptation efforts. Addressing these diverse challenges is essential to safeguarding *E. stigmatolepis* and securing the long-term survival of this unique fern species in the Western Ghats.

REFERENCES

Bachman, S., J. Moat, A.W. Hill, J. Torre & B. Scot (2011). Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. *ZooKeys* 150: 117–126. https://doi.org/10.3897/zookeys.150.2109

Benniamin, A. & S. Sundari (2020). *Pteridophytes of Western Ghats – A Pictorial Guide*. Bishen Singh Mahendra Pal Singh, Dehradun, 203 pp.

Benniamin, A., M.S. Sundari, D. Jesubalan & C.B. Singh (2021). Threatened Pteridophytes of Western Ghats of Karnataka. *Indian Fern Journal* 38: 219–232.

Britton, M.R. & J.E. (Jr) Watkins (2016). The economy of reproduction in dimorphic ferns. *Annals of Botany* 118: 1139–1149. https://doi.org/10.1093/aob/mcw177

Chandra, S., C.R. Fraser-Jenkins, A. Kumari & A. Srivastava (2008). A summary of the status of threatened pteridophytes of India. *Taiwania* 53(2): 170–209.

Ebihara, A., C.R. Fraser-Jenkins, B.S. Parris, X.C. Zhang, Y.H. Yang, W.L. Chiou, H.M. Chang, S. Lindsay, D. Middleton, M. Kato & T.N. Praptosuwiryo (2012). Rare and threatened pteridophytes of Asia 1. An enumeration of narrowly distributed taxa. *Bulletin of the National Museum of Nature and Science, Series B* 38(3): 93–119.

Fraser-Jenkins, C.R., K.N. Gandhi, B.S. Kholia & D.R. Kandel (2021). *An Annotated Checklist of Indian Pteridophytes Part-3 (Lomariopsidaceae to Salviniaceae)*. Bishen Singh Mahendra Pal Singh, Dehradun, 450 pp.

Fraser-Jenkins, C.R. (2012). Rare and threatened Pteridophytes of Asia 2. Endangered species of India — the higher IUCN categories. *Bulletin of the National Museum of Nature and Science, Series B (Botany)* 38(4): 153–181.

Hennipman, E. (1977). *A Monograph of the Fern Genus Bolbitis (Lomariopsidaceae).* Leiden: University Press. Leiden University Press (Leiden Botanical Series No. 2), 331 pp.

IUCN (2023). The IUCN Red List of Threatened Species. Version 2023-1. https://www.iucnredlist.org.

Johnson, M., I. Revathy, T. Shibila & N. Janakiraman (2015). Effect of auxins on vegetative propagation of *Elaphoglossum stigmatolepis* (Fee) T. Moore and *Lepisorus nudus* (Hook.) Ching. *Indian Fern Journal* 32(1): 16–28.

Johnson, M. & T. Shibila (2018). *In vitro* spore culture and ontogeny of *Elaphoglossum stigmatolepsis* (Fee.). Moore. *Phytomorphology* 68(1&2): 35–38.

Madhusoodanan, P.V. (2015). *Hand Book on Ferns and Fern Allies of Kerala, Malabar Botanical Garden and Institute for Plant Sciences (MBGIPS)*. Kozhikode, Kerala, India, 322 pp.

Manickam, V.S. & V. Irudayaraj (1992). *Pteridophyte Flora of the Western Ghats of South India*. B.I. Publications Pvt, Ltd., New Delhi, 653 pp.

Manickam, V.S. & V. Irudayaraj (2003). *Pteridophyte Flora of Nilgiris, South India*. Bishen Singh Mahendra Pal Singh, Dehradun, 192 pp.

PPG-I (2016). A community-derived classification for extant lycophytes and ferns. *Journal of Systematics and Evolution* 54(6): 563–603. https://doi.org/10.1111/jse.12229

Rajagopal, P.K. & G.K. Bhat (1998). Pteridophytic flora of Karnataka State, India. *Indian Fern Journal* 15(1–2): 1–28.

Tripathi, D., A. Benniamin & D.J. Balan (2016). New record of endemic fern: *Elaphoglossum stigmatolepis* (Fee) T. Moore (Lomariopsidaceae) for the state of Karnataka, India. *Indian Journal of Forestry* 39(2): 1–8.

Watkins, J.E. Jr., A.C. Churchill & N.M. Holbrook (2016). A site for sori: ecophysiology of fertile-sterile leaf dimorphy in ferns. *American Journal of Botany* 103(5): 845–855. https://doi.org/10.3732/ajb.1500505

Journal of Threatened Taxa is indexed/abstracted in Bibliography of Systematic Mycology, Biological Abstracts, BIOSIS Previews, CAB Abstracts, EBSCO, Google Scholar, Index Copernicus, Index Fungorum, JournalSeek, National Academy of Agricultural Sciences, NewJour, OCLC WorldCat, SCOPUS, Stanford University Libraries, Virtual Library of Biology, Zoological Records.

NAAS rating (India) 5.64

Print copies of the Journal are available at cost. Write to:
The Managing Editor, JoTT,
c/o Wildlife Information Liaison Development Society,
3A2 Varadarajulu Nagar, FCI Road, Ganapathy, Coimbatore,
Tamil Nadu 641006, India
ravi@threatenedtaxa.org & ravi@zooreach.org

Journal of Threatened Taxa

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

January 2025 | Vol. 17 | No. 1 | Pages: 26331–26442
Date of Publication: 26 January 2025 (Online & Print)
DOI: 10.11609/jott.2025.17.1.26331-26442

Publisher & Host

WILD zoo reach
Zoo Outreach Organisation

Threatened Taxa