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Cover: Coromandal Sacred Langur *Semnopithecus priam* - made with acrylic paint. © P. Kritika.

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COMMUNICATION

The epiphytic pteridophyte flora of Cooch Behar District of West Bengal, India, and its ethnomedicinal value

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Abstract: Cooch Behar, located in the northeastern part of West Bengal, has a rich pteridophytic flora. The present field study was undertaken during January 2021 to September 2022 to document the epiphytic pteridophyte flora of the district and record ethnomedicinal uses, which had not been studied previously. Nine epiphytic species of pteridophytes belonging to six genera and three families were recorded, with Polypodiaceae being the dominant family represented by seven species (4 from genus *Pyrrosia*). Seven epiphyte species were used by ethnic communities and traditional healers to treat 10 different types of diseases, including common cough and cold, and jaundice. This study adds five epiphytic species of pteridophytes to previous records from Cooch Behar District.

Keywords: Ethnic communities, ferns and fern allies, medicinal plants, traditional knowledge, vertical distribution.

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INTRODUCTION

Pteridophytes are derived from ancient lineages dating back 400 million years, which dominated the earth's surface about 280–230 million years ago. But modern fern floras and families are highly evolved and constitute a fairly prominent part of the present-day vegetation of the world. Hassler (2004–2023) estimates that there are about 13,046 species of ferns and lycophytes throughout the world. In India, between 1,150 and 1,270 species of pteridophytes consisting of 33 families and 130 genera are reported (1,267 estimated by the Botanical Survey of India 2023), of which c. 50 species are endemic to India (Fraser-Jenkins 2008). According to Fraser-Jenkins et al. (2017, 2018, 2021), altogether there are about 1,135 species including 42 exotics and 53 further subspecies, in the Indian subcontinent and in West Bengal, approximately 528 species are reported. Epiphytic pteridophytes constitute an important part of the fern flora (Devi et al. 2007) and contribute to higher phytodiversity in vertical space in tropical rain-forest (Page 1979). Approximately, 29% of all fern species are epiphytes (Kress 1986).

Medicinal plants have been used in healthcare since time immemorial. Even today, more than 80% of the population in developing countries are directly dependent on ethnomedicine for healthcare (Farnsworth et al. 1985; WHO 2003). Pteridophytes have been considered as a source of medicine since ancient times but remain relatively under explored. Ancient classical work of Theophrastus (327–287 B.C.) and Dioscorides (100 A.D.) regarding ethno-medicinal values of pteridophytes is well known (Corne 1924). Sushrata and Charaka in their Samhitas (100 A.D.) also mentioned the medicinal utility of some pteridophytic plants.

Numerous ethnomedicinal studies (Caius 1935; Nayar 1959; Singh 1973; May 1978; Joshi 1997; Dhiman 1998; Sharma 2002; Srivastava 2007; Rout et al. 2009; Benniamin 2011; Giri et al. 2021; Dey & Bhandari 2022) on pteridophytes have been conducted in different parts of India over the past nine decades, but unfortunately, scientific documentation of the pteridophytic flora and its ethnomedicinal value in Cooch Behar District of West Bengal is very limited (Biswas 1956; Bandyopadhyay et al. 2006; Biswas et al. 2013).

Although the flora is limited compared to the higher regions further north, it is nevertheless known for its rich floristic composition and traditional culture. The district is still under developing status and rural people depend mostly on medicinal plants to treat common physical problems.

Keeping the importance of medicinal plants in the district in mind, the present study has been designed to explore uses of the epiphytic pteridophyte flora as medicinal plants among the ethnic people of Cooch Behar District. Scientific documentation of the fern flora will definitely enrich the floristic database of the state as well as of India and documentation of ethnomedicinal knowledge can be used as a reference for future research on formulation of new drugs and pharmaceutical products.

MATERIALS AND METHODS

Study area

Cooch Behar District (Figure 1) is situated in the foothills of the eastern Indo-Himalaya. Geographically the district lies between 26.6055°N to 26.9630°N and 89.9097°E to 89.7955°E and is bounded by the district of Jalpaiguri and Alipurduar in the north, Dhubri and Kokrajhar district of Assam in the east and the international border in the form of the Indo-Bangladesh boundary in the west as well as in the south. The elevation of the district ranges 39–76 m. The area of the district is 3,387 km^2, and constitutes 3.82% of the land mass of the state of West Bengal. The district is still fairly rich in forest canopy (10.31% of the total land mass) and in terms of forest canopy density, the forest areas are mostly open forests with a few areas under moderately dense forest; while the district lacks very dense forests areas (Das 2020). The forests are a mixture of deciduous elements with some evergreen trees.

Data collection

A total of four field visits were completed at different seasons between January 2021 and September 2022 documenting the epiphytic pteridophyte flora and to collect information on the ethnomedicinal uses of pteridophytes in the areas studied. Plant specimens were collected from their host plants with the help of a telescopic pole with a picker and sometimes with the assistance of a local tree climber. Digital photographs of the plant specimens were also taken wherever possible. Routine methods of plant collection and herbarium techniques (Jain & Rao 1977) have been followed in the study. Identification of all the collected plant specimens was made using relevant floras and standard literature (Beddome 1883, 1892; Prain 1903; Ghosh et al. 2004; Fraser-Jenkins et al. 2017, 2018, 2021) and proper nomenclature was maintained following IPNI (2023).

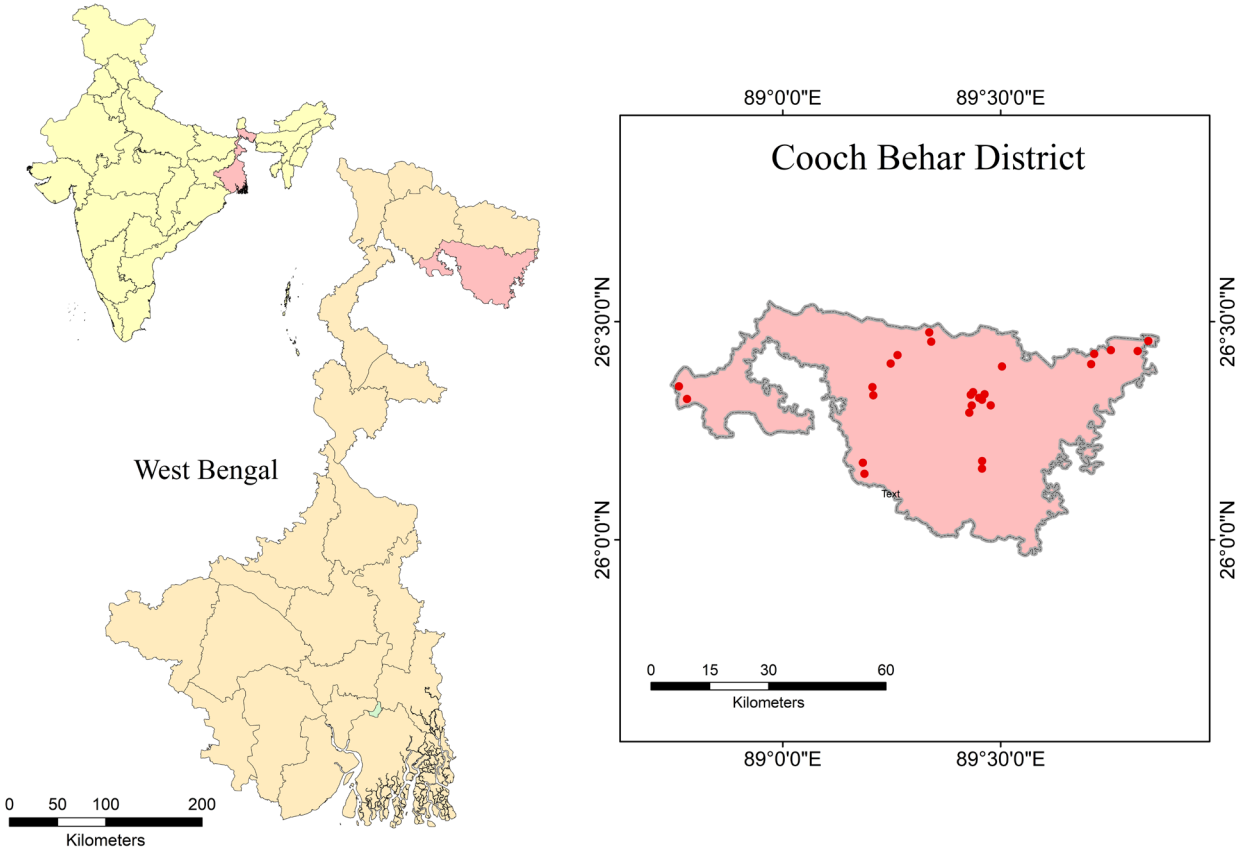

Figure 1. Map of Cooch Behar District showing sample collection sites (red dots) (Map prepared using an open source QGIS Desktop 3.22).

Voucher specimens were deposited in the Department of Botany, A.B.N. Seal College, Cooch Behar.

The ethnomedicinal data were collected through in-depth interviews with the knowledgeable local people of the ethnic communities and with traditional healers with the help of pretested semi-structured questionnaires (As per Sajem 2010). The questionnaire included information concerning plant local name, plant parts used, uses, process of preparation of medicine either individually or in combination with other plant parts, and mode of application and dosages to treat a particular disease(s). Prior informed consent (PIC) was taken from each informant before interview.

RESULTS AND DISCUSSION

The diversity and ethnomedicinal uses of epiphytic pteridophytes by different ethnic communities are presented in Table 1. The species collected are arranged in alphabetical order according to families and then according to genus and species within each family. Information regarding scientific name, family, localities of collections, and ethnomedicinal uses and mode of application for each species have also been provided.

A total of nine species of epiphytic pteridophytes belonging to six genera and three families (Table 1; Figure 2) were recorded during the field visits. Among these the dominant plant family was Polypodiaceae, represented by seven species (77.78%). Psilotaceae and Vittariaceae (Pteridaceae) were represented by a single species (11.11%) each. The genus *Pyrrosia* is represented by highest number of species (four species; 44.44%). They were mostly found to grow on trees of *Samanea saman* (Jacq.) Merr., *Monoon longifolium* (Sonn.) B.Xue & R.M.K.Saunders, *Shorea robusta* C.F.Gaertn., and *Tectona grandis* L.f., among others. Biswas (1956) reported 24 species of pteridophytes from Cooch Behar, of which five species were epiphytic. Out of five epiphytic species, four species, *Drynaria quercifolia*, *Leptochilus axillaris*, *Pyrrosia adnascens*, and *Psilotum nudum* were common. In comparison to the report by Biswas (1956), the present study has revealed five more epiphytic pteridophytes from the district. Bandyopadhyay et al. (2006) reported the occurrence of *Psilotum nudum* from the same studied area as was

Table 1. List of epiphytic pteridophytes and their uses by ethnic people of Cooch Behar District.

	Scientific name	Localities	Parts used	Preparation	Uses/ application	Mode of administration	Used by
1	*Drynaria quercifolia* (L.) J.Sm. [Polypodiaceae]	Cooch Behar; Rasik Bil; Tapurhat; Sitalkuchi; Mathabhanga; Baneswar; Haldibari	Whole plant	Decoction	Used to treat jaundice, fever, throat infection (itchy throat), dysentery and joint pain.	Oral	Rajbanshi, Rava, Santhals
			Rhizome	Paste	Used to treat body pain.	Topical	
2	*Leptochilus axillaris* (Cav.) Kaulf. [Polypodiaceae]	Tapurhat; Takagach	-	-	Not yet known.	-	-
3	*Microsorum punctatum* (L.) Copel. [Polypodiaceae]	Cooch Behar; Rasik Bil; Tapurhat; Sitalkuchi; Mathabhanga; Haldibari	Leaves	Decoction	Used to treat dysentery and constipation.	Oral	Rajbanshi, Rava
4	*Pyrrosia adnascens* (Sw.) Ching [Polypodiaceae]	Cooch Behar; Tapurhat; Sitalkuchi; Ghoskadanga; Rasik Bil	Rhizome	Decoction	Used to treat cough and cold.	Oral	Rajbanshi, Rava
5	*P. flocculosa* (D.Don) Ching [Polypodiaceae]	Rasik Bil; Jorai	-	-	Not yet known.	-	-
6	*P. lanceolata* (L.) Farw. [Polypodiaceae]	Rasik Bil; Tapurhat, Putimari Baksibas	Leaves	Paste	Stop bleeding from cut wound.	Topical	Santhals, Oraon
			Leaves	Decoction	Used to treat cough and cold, throat infection and urinary disorder.	Oral	Santhals, Oraon
7	*P. piloselloides* (L.) M.G.Price [Polypodiaceae]	Cooch Behar; Rasik Bil	Leaves	Decoction	Used to treat cough and cold.	Oral	Rava, Santhals
8	*Psilotum nudum* (L.) P.Beauv. [Psilotaceae]	Cooch Behar	Whole plant	Decoction	Used to heal cuts and wounds.	Topical	Rajbanshi
9	*Vittaria elongata* Sw. [Vittariaceae (Pteridaceae)]	Cooch Behar; Chhat Singimari	Leaves	Paste	Used to treat joint pain.	Topical	Santhals

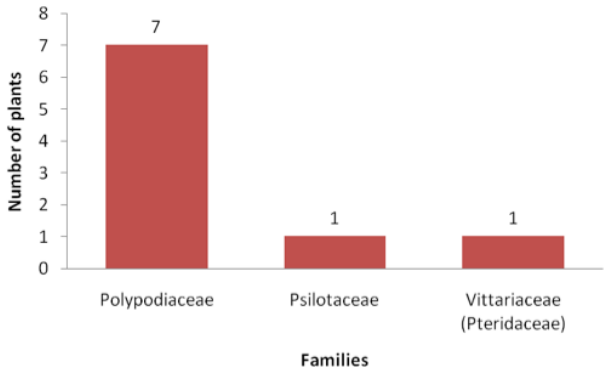

Figure 2. Family-wise number of ethnomedicinal pteridophytes of Cooch Behar District, West Bengal.

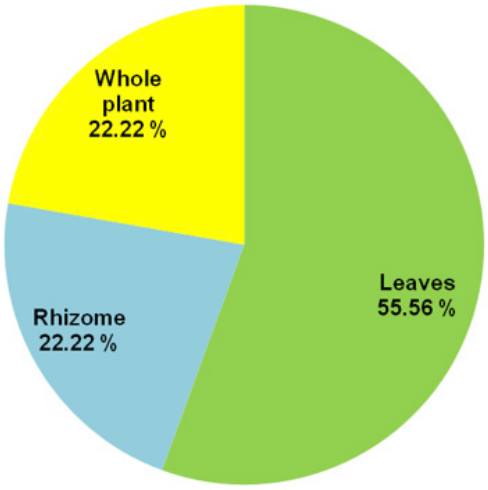

Figure 3. Plant parts used for herbal preparation by the ethnic communities of Cooch Behar.

reported earlier by Biswas (1956). Biswas et al. (2013) only recorded list of pteridophytic families claiming 36 species of pteridophytes growing at Rasik Beel region of Cooch Behar district but no other information or names of species was given.

Out of nine epiphytic pteridophytes, seven species were found to be used by ethnic communities and traditional healers in the studied area to treat 10 (Table 1) different types of physical ailments ranging from common cough and cold to jaundice. Herbal medicines were mostly found to be used by ethnic people to treat cough and cold, joint and body pain, dysentery, throat infection followed by jaundice, fever, constipation, urinary problems, or as a blood coagulant to heal cuts and wounds.

For the preparation of herbal medicine (Table1, Figure 3), leaves (55.56%) were found to be the most frequently used plant parts followed by rhizomes and the whole plant (22.22%, each). Modes of preparation of ethnomedicine include decoctions (66.67%) and

pastes (33.33%) and were mostly taken orally (55.56%) followed by topical administration (44.44%) (Table 1).

However, in all the cases the exact method of medicine preparation and dosage of administration were not disclosed as ethnic people believe that disclosure of knowledge to outsiders may damage the effect of the medicine (Mandal et al. 2020a), also the status and importance of medicine men will not be upheld if their secrets were revealed (Mandal et al. 2020b).

CONCLUSION

The district of Cooch Behar of West Bengal is quite rich in pteridophytes. Scientific documentation of the pteridophytic flora in this district is lacking. The present study investigates the epiphytic pteridophyte flora of the district which will help to enrich the database of pteridophytes in India. Documentation of traditional knowledge of ethnic people concerning pteridophytes from the district has been carried out for the first time. Ethnic people are very rich in traditional knowledge which is passed down from one generation to another by verbal means. Documentation of this knowledge is therefore of the utmost importance. Plants are used in the treatment of very common physical ailments and for complex diseases. Further research on medicinal pteridophytes encompassing ethnic knowledge may lead to the development of additional modern drugs and pharmaceutical products.

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