

**Floristic study of ferns flora of Pindar Valley, District Bageshwar Uttarakhand, Kumaun Himalaya**

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**ABSTRACT**

Pindar Valley, with elevations exceeding 7,500 feet, was chosen for the Present study. This site was selected primarily for research on ferns and fern allies due to its rich floral diversity and the lack of comprehensive information available about the species present there. In the course of investigating a total number of 56 species of ferns and fern allies were collected that belongs to 25 genera under 14 families. Research reveals that family dryopteridaceae dominating the higher elevation of Pindar valley with 25% of total collected species. The family polypodiaceae having the most number of genera, the habitat of collected species were also observed and found that majority of species were terrestrial with 61% of total collected species, 11% were epiphytes, 7% were lithophytes and 21 % species were adapted more than one ecological conditions. In addition to the list of collected species, ecological information about the habitat along with photographic documentation was also included.

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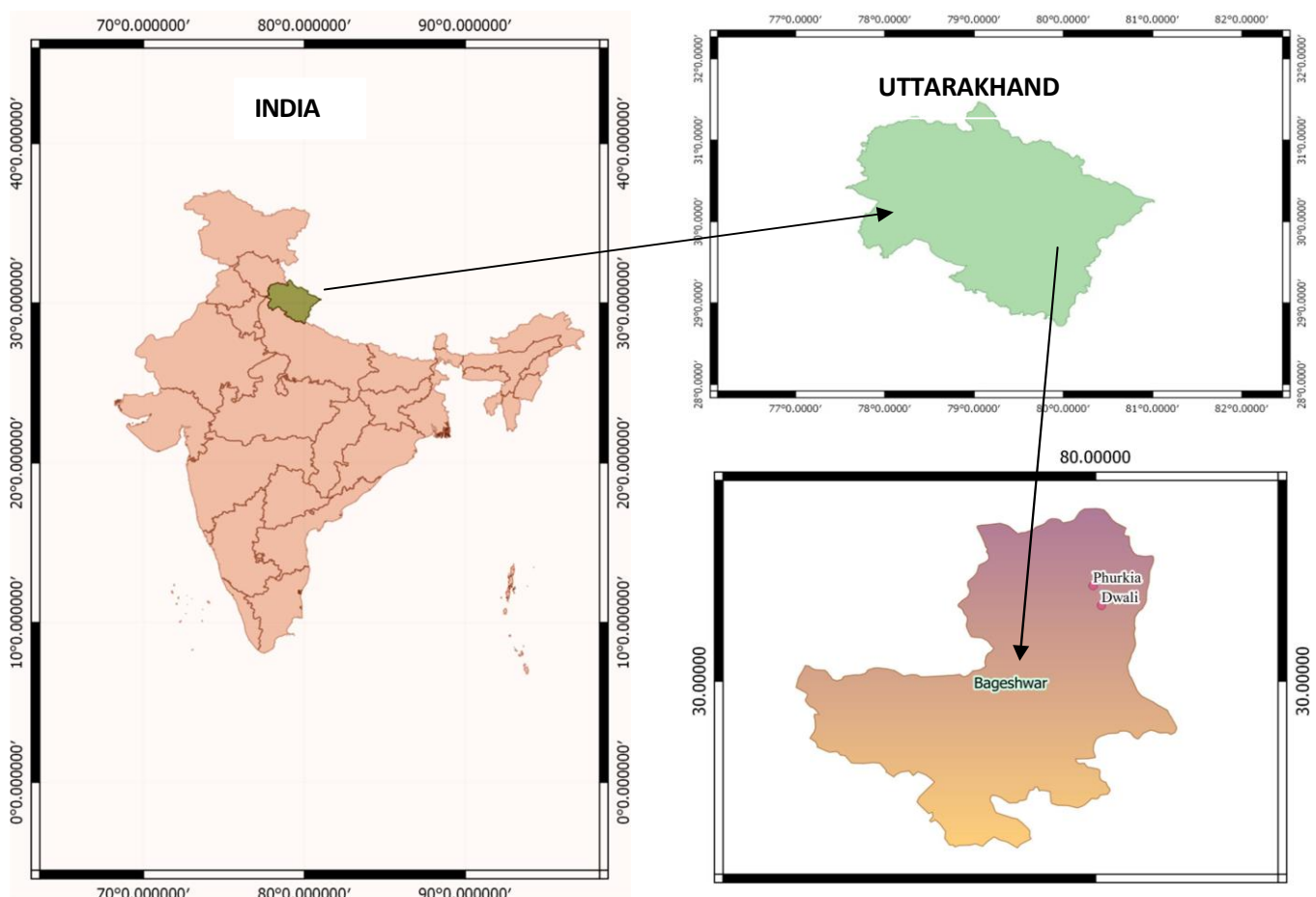
**Introduction**

Pteridophytes are vascular plants without seeds that make up the majority of the earth's flora. Ferns constitute a significant portion of the living pteridophytes and may be found in about any type of ecological setting that supports growth and development.

The Himalayan regions both the Eastern and Western Himalaya have the highest number of pteridophyte varieties, however our understanding of this area is still lacking. The floristic richness of Kumaun Himalaya is another well-known feature. Researchers have previously conducted a lot of studies on ferns and their associates. Among the significant contributors are:

Between 1846 and 1849, Strachey and Winterbottom assembled the most extensive and comprehensive collection of ferns from the Kumaun Himalayan region latter in 1987, Punetha and Kaur produced a thorough inventory of the pteridophytes in Pithoragarh. In 2003, Pande & Pande also published an amazing description of Kumaun's fern flora.

The Pindar Valley, located in the Bageshwar district of Uttarakhand, is also a part of the Kumaun Himalaya. The area between khati and dwali and dwali to phurkia is surrounded by a variety of species of higher plants, such as *Ficus auriculata*, *Rhododendron arboretum* species of *Quercus*, *Alnus nepalensis* etc. These plant varieties also serve as hosts for epiphytic fern species.



**Fig A-**Map of Study Area (Pindari Glacier Region)

## Material and methods

Survey of study area-The study region was surveyed in 2021 and 2022, especially during the rainy season when ferns are at their most prolific growth and development. Plant samples were collected by author personally from all possible locations in the study area elevation range above 7500 feet. Specimen identification-To ensure accurate identification of spacemen, photographs were captured in their native environment, specimens are identified using the available literature, regional flora (Pandey and Pandey 2003 and Khuller and Fraser-Jinkins 2023).

For the preparation of herbarium, all the collected samples were first pressed then treated with antifungal agents and then mounted it in herbarium sheets. After the proper labeling herbarium were deposited in the department of botany Government Post Graduate College Berinag, Pithoragarh.

## Classification Accordance

The Fraser-Jenkins 2020 system of classification was used for the categorization of the species. Every family is arranged in alphabetical order

**Table I-** List of ferns and ferns allies from Pindar Valley

Family	Genus	Species	Ecological Categories	Locality
Aspleniaceae	Asplenium	<i>A.capillipes</i>	Lithophyte	Phurkia
Davalliaceae	Katoella	<i>K.beddomei</i>	Epiphyte/Lithophyte	On The Way From Dwali to Phurkia
Davalliaceae	Katoella	<i>K.pulchra</i>	Epiphyte	Near Phurkia
Dennstaedtiaceae	Dennstaedtia	<i>D.appendiculata</i>	Terrestrial	On The Way From Dwali to Phurkia
Dennstaedtiaceae	Pteridium	<i>P.revolutum</i>	Terrestrial	On The Way From Dwali To

				Phurkia
Dryopteridaceae	Dryopteris	<i>D.barbigera</i>	Terrestrial	Phurkai
Dryopteridaceae	Dryopteris	<i>D.chrysocoma</i>	Terrestrial	On The Way From Dwali to Phurkia
Dryopteridaceae	Dryopteris	<i>D.juxtaposita</i>	Terrestrial	On The Way From Dwali and Phurkia
Dryopteridaceae	Dryopteris	<i>D.nigropaleacea</i>	Terrestrial	On The Way From Dwali to Phurkia
Dryopteridaceae	Dryopteris	<i>D.redectopinnata</i>	Terrestrial	On The Way From Dwali to Phurkia
Dryopteridaceae	Dryopteris	<i>D.wallichiana</i>	Terrestrial	On The Way From Dwali to Phurkia
Dryopteridaceae	Polystichum	<i>P.discretum</i>	Terrestrial	On The Way From Dwali to Phurkia
Dryopteridaceae	Polystichum	<i>P.longipaleatum</i>	Terrestrial and Lithophyte	On The Way From Dwali to Phurkia
Dryopteridaceae	Polystichum	<i>P.mehrae</i>	Terrestrial and Lithophyte	Near Dwali
Dryopteridaceae	Polystichum	<i>P.manmiense</i>	Terrestrial and Lithophyte	On The Way From Dwali To Phurkia
Dryopteridaceae	Polystichum	<i>P.nepalense</i>	Terrestrial and Lithophyte	On The Way From Dwali to Phurkia

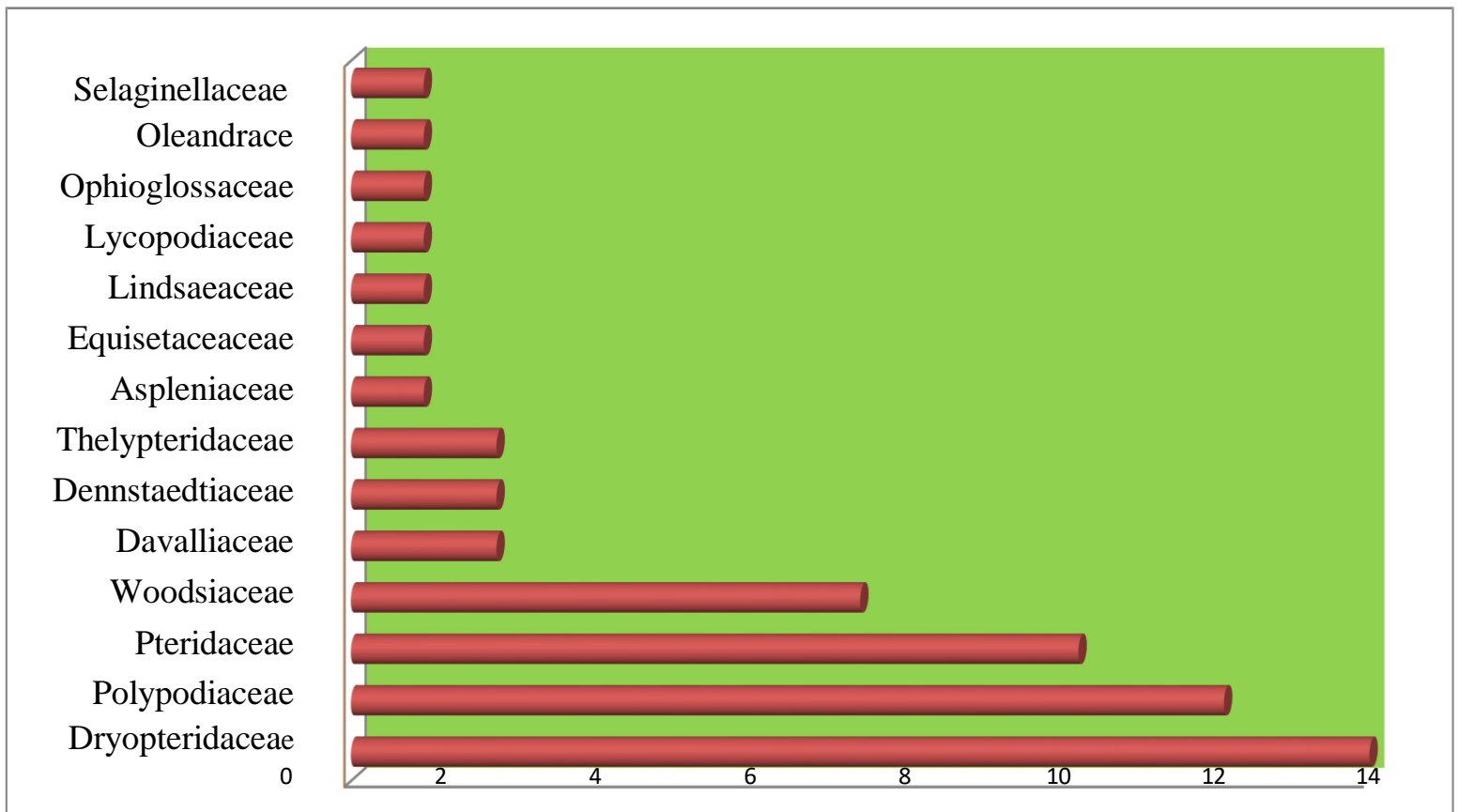
Dryopteridaceae	Polystichum	<i>P.prescottianum</i>	Terrestrial	On The Way From Dwali To Phurkia
Dryopteridaceae	Polystichum	<i>P.sinense</i>	Terrestrial and Lithophyte	On The Way From Dwali To Phurkia
Dryopteridaceae	Polystichum	<i>P.squarrosom</i>	Terrestrial	On The Way From Dwali To Phurkia
Equisetaceaceae	Equisetum	<i>E.arvense</i>	Terrestrial	On The Way From Dwali To Phurkia
Lindsaeaceae	Odontosoria	<i>O.chinensis</i>	Terrestrial	On The Way From Dwali To Phurkia
Lycopodiaceae	Lycopodium	<i>L.japonicum</i>	Terrestrial	On The Way From Dwali To Phurkia
Ophioglossaceae	Botrychium	<i>B.lanuginosum</i>	Terrestrial	Khati And Dwali
Oleandraceae	Oleandra	<i>O.wallichii</i>	Epiphyte, Lithophyte and Terrestrial	On The Way From Dwali To Phurkia
Polypodiaceae	Arthromeris	<i>A.lehmannii</i>	Lithophyte	On The Way From Dwali To Phurkia
Polypodiaceae	Drynaria	<i>D.mollis</i>	Epiphyte	On The Way From Khati To Dwali
Polypodiaceae	Lepisorus	<i>L.kashyapii</i> .	Epiphyte/Lithophyte	On The Way From Dwali To

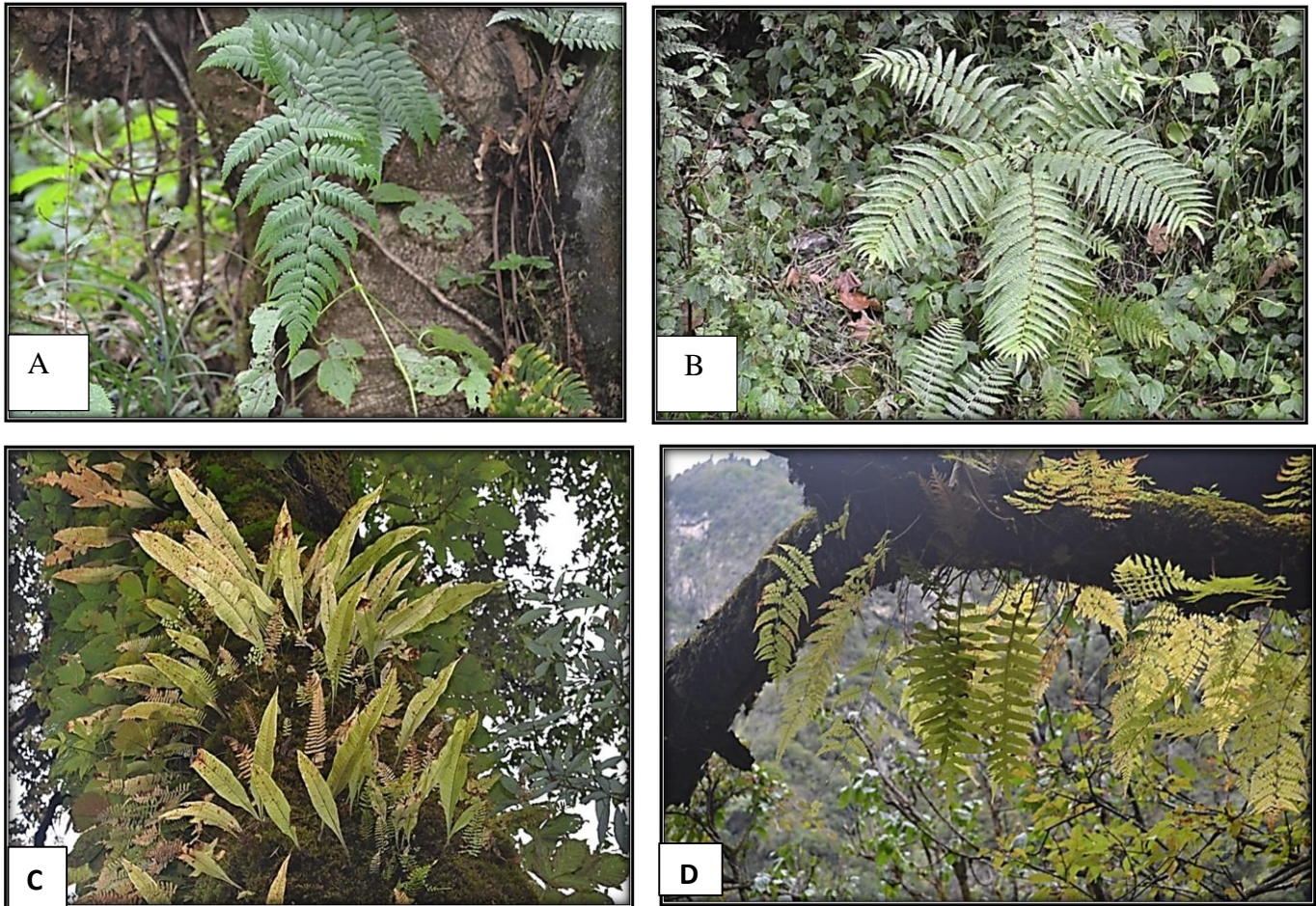
				Phurkia
Polypodiaceae	Lepisorus	<i>L.morrisoneris</i>	Epiphyte	On The Way From Dwali To Phurkia
Polypodiaceae	Loxogramme	<i>L.lanceolata</i>	Epiphyte	Near Dwali
Polypodiaceae	Microsorium	<i>M.membranacem</i>	Epiphyte/Lithophyte	On The Way From Khati To Dwali
Polypodiaceae	Pichisermollodes	<i>P.ebenipes</i>	Epiphyte	On The Way From Dwali To Phurkia
Polypodiaceae	Pichisermollodes	<i>P.malacodon</i>	Lithophytes	Near Dwali
Polypodiaceae	Pichisermollodes	<i>P.stewartii</i>	Epiphyte	On The Way From Dwali To Phurkia
Polypodiaceae	Pichisermollodes	<i>P. stracheyii</i>	Epiphyte/Lithophytes	On The Way From Dwali To Phurkia
Polypodiaceae	Polypodiodes	<i>P.amoena</i>	Lithophyte	On The Way From Dwali To Phurkia
Polypodiaceae	Polypodiodes	<i>P.lachnopus</i>	Epiphyte/Lithophyte	On The Way From Dwali To Phurkia
Pteridaceae	Cheilanthes	<i>C.grisea</i>	Terrestrial	On The Way From Dwali To Phurkia
Pteridaceae	Coniogramme	<i>C.intermedia</i>	Terrestrial	On The Way From Dwali To

				Phurkia
Pteridaceae	Onychium	<i>O.cryptogrammoides</i>	Terrestrial	Near Dwali
Pteridaceae	Pteris	<i>P.aspercaulis</i>	Terrestrial	Near Dwali
Pteridaceae	Pteris	<i>P.biaurita</i>	Terrestrial	Near Dwali
Pteridaceae	Pteris	<i>P.cretica</i>	Terrestrial	Near Dwali
Pteridaceae	Pteris	<i>P.cretica Sub.Sp. laeta</i>	Terrestrial	On The Way From Khati To Dwali
Pteridaceae	Pteris	<i>P.excelsa</i>	Terrestrial	On The Way From Dwali To Phurkia
Pteridaceae	Pteris	<i>P.aspericaulis</i>	Terrestrial	Near Phurkia
Pteridaceae	Pteris	<i>P.wallichiana</i>	Terrestrial	On The Way From Dwali To Phurkia
Selaginellaceae	Sellaginella	<i>S.chrysocaulos</i>	Terrestrial	On The Way From Dwali To Phurkia
Thelypteridaceae	Thelypteris	<i>T.appendiculata</i>	Terrestrial	On The Way From Dwali To Phurkia
Thelypteridaceae	Thelypteris	<i>T.auriculata</i>	Terrestrial	Near Dwali
Woodsiaceae	Athyrium	<i>A.atkinsonii</i>	Terrestrial	Near Phurkia
Woodsiaceae	Athyrium	<i>A.attenuatum</i>	Terrestrial	On The Way From Dwali To Phurkia
Woodsiaceae	Athyrium	<i>A.davidii</i>	Terrestrial	On The Way From Dwali

			Terrestrial	To Phurkia
Woodsiaceae	Athyrium	<i>A.mackinnoniorum</i>		The Way From Dwali
Woodsiaceae	Athyrium	<i>A.rupicola</i>	Terrestrial	To Phurkia Near Dwali
Woodsiaceae	Athyrium	<i>A.strigillosum.</i>	Terrestrial	On The Way From Dwali To Phurkia
Woodsiaceae	Athyrium	<i>A.wallichianum</i>	Terrestrial	Near Phurkia

**Figure B:** Showing Number of Species within Families





**Plate1-A-*Dryopteris nigropaleacea* B-*Pteris wallichiana* C-*Microsorium membranaceum* D-*Katoella pulchra*.**

### **Results and Disussion**

A total of 56 ferns and ferns allies belonging to 25 genera and 14 families were collected during the field survey above the elevation range of 7500 (TABLE-I). 53 species of the 56 pteridophytes that were gathered fall into the category of true ferns, while three species are part of the Lycophytes or fern allies. The family Dryopteridaceae, with 14 species, dominates the higher elevation of the Pindar Valley. It is followed by the Polypodiaceae, which has 12 species, the Pteridaceae, which has 10 species and the Woodsiaceae, which has 7 species. Almost 77% of all the species that have been collected belong to these four families. Three families, Davalliaceae, Dennstaedtiaceae and family Thelypteridaceae

have two species each and remaining seven families Aspleniaceae, Equisetaceae, Lindsaeaceae, Lycopodiaceae, Ophioglossaceae, Oleandraceae and family Selaginellaceae were represented by only single species. The habitat conditions of the ferns in the research region were also observed, and it found that 34 species of ferns were terrestrial, 04 species were lithophytes, 06 species were epiphytes, and 12 species were adapted to more than one ecological circumstances.

## Conclusion

Overall there is a great deal of floristic diversity within the study area, which stretches from Dwali to Phurkia. Between Dwali and Phurkia, there is a good diversity of ferns and higher plants. The presence of higher plants benefits the ferns because they create a dense canopy that makes the soil wet and shaded, which is the ideal growing environment for ferns. The species variety abruptly decreases as we approach Phurkia because of the unfavorable climate at higher elevations.

## Acknowledgement

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