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

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**ABSTRACT**

Pindar Valleys with elevations exceeding 7,500 feet were chosen for the current study. This site was chosen primarily for research on ferns and allied species due to its high floral diversity and the lack of comprehensive information available about the species that are found there. In the course of investigating the diversity of fern and fern allies in the Pindar valley of Bageshwar district, 56 species of pteridophytes belonging to 25 genera under 14 families were explored. Research ravels 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 noted and found that majority of species are terrestrial with 61% of total collected species, 21 % species are also found to adapted more than one ecological conditions. The Habitat and collected locality as well as photo plate of species is also provided.

## 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.

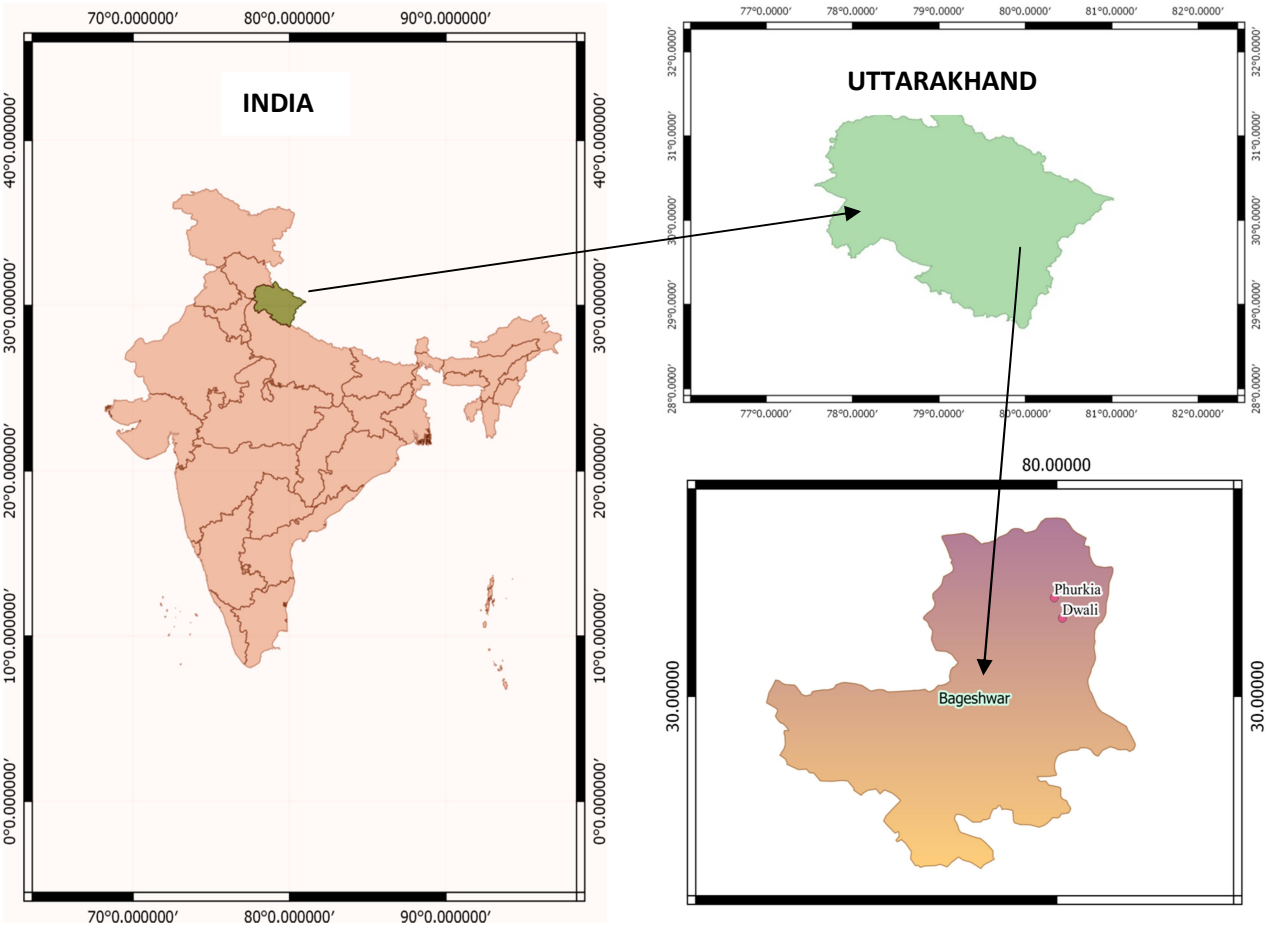


Fig a-Map of Study Area (Pindari Glacier Regions)

## Material and methodology

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).

Preparation of herbaria-All the collected samples were first pressed then treated with antifungal agents and then mounted it in herbarium sheets.After the proper labeling herbarium was deposited in the department of botany Government Post Graduate College Berinag Pithoragarh.

## Classification Accordance

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

**Table I- List of Pteridophytes from Pindar Valley**

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

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|---|---|---|---|---|
| | | | | Phurkia |
| Dryopteridaceae | Dryopteris | *D.barbigera* | Terrestrial | Phurkai |
| Dryopteridaceae | Dryopteris | *D.chrysocoma* | Terrestrial | On The Way From Dwali to Phurkia |
| Dryopteridaceae | Dryopteris | *D.juxtaposita* | Terrestrial | On The Way From Dwali And Phurkia |
| Dryopteridaceae | Dryopteris | *D.nigropaleacea* | Terrestrial | On The Way From Dwali to Phurkia |
| Dryopteridaceae | Dryopteris | *D.redectopinnata* | Terrestrial | On The Way From Dwali to Phurkia |
| Dryopteridaceae | Dryopteris | *D.wallichiana* | Terrestrial | On The Way From Dwali to Phurkia |
| Dryopteridaceae | Polystichum | *P.discretum* | Terrestrial | On The Way From Dwali to Phurkia |
| Dryopteridaceae | Polystichum | *P.longipaleatum* | Terrestrial and Lithophyte | On The Way From Dwali to Phurkia |
| Dryopteridaceae | Polystichum | *P.mehrae* | Terrestrial and Lithophyte | Near Dwali |
| Dryopteridaceae | Polystichum | *P.manmiense* | Terrestrial and Lithophyte | On The Way From Dwali To Phurkia |
| Dryopteridaceae | Polystichum | *P.nepalense* | Terrestrial and Lithophyte | On The Way From Dwali to Phurkia |

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

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|---|---|---|---|---|
| | | | | Phurkia |
| Polypodiaceae | Lepisorus | *L.morrisoneris* | Epiphyte | On The Way From Dwali To Phurkia |
| Polypodiaceae | Loxogramme | *L.lanceolata* | Epiphyte | Near Dwali |
| Polypodiaceae | Microsorum | *M.membranaceum* | Epiphyte/Lithophyte | On The Way From Khati To Dwali |
| Polypodiaceae | Pichisermollodes | *P.ebenipes* | Epiphyte | On The Way From Dwali To Phurkia |
| Polypodiaceae | Pichisermollodes | *P.malacodon* | Lithophytes | Near Dwali |
| Polypodiaceae | Pichisermollodes | *P.stewartii* | Epiphyte | On The Way From Dwali To Phurkia |
| Polypodiaceae | Pichisermollodes | *P. stracheyii* | Epiphyte/Lithophytes | On The Way From Dwali To Phurkia |
| Polypodiaceae | Polypodiodes | *P.amoena* | Lithophyte | On The Way From Dwali To Phurkia |
| Polypodiaceae | Polypodiodes | *P.lachnopus* | Epiphyte/Lithophyte | On The Way From Dwali To Phurkia |
| Pteridaceae | Cheilanthes | *C.grisea* | Terrestrial | On The Way From Dwali To Phurkia |
| Pteridaceae | Coniogramme | *C.intermedia* | Terrestrial | On The Way From Dwali To |

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

| | | | | |
|---|---|---|---|---|
| | | | | To Phurkia |
| Woodsiaceae | Athyrium | *A.n* *m* | | The Way From Dwali To Phurkia |
| Woodsiaceae | Athyrium | *A.rupicola* | Terrestrial | Near Dwali |
| Woodsiaceae | Athyrium | *A.strigillosum.* | Terrestrial | On The Way From Dwali To Phurkia |
| Woodsiaceae | Athyrium | *A. wallichianum* | Terrestrial | Near Phurkia |

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

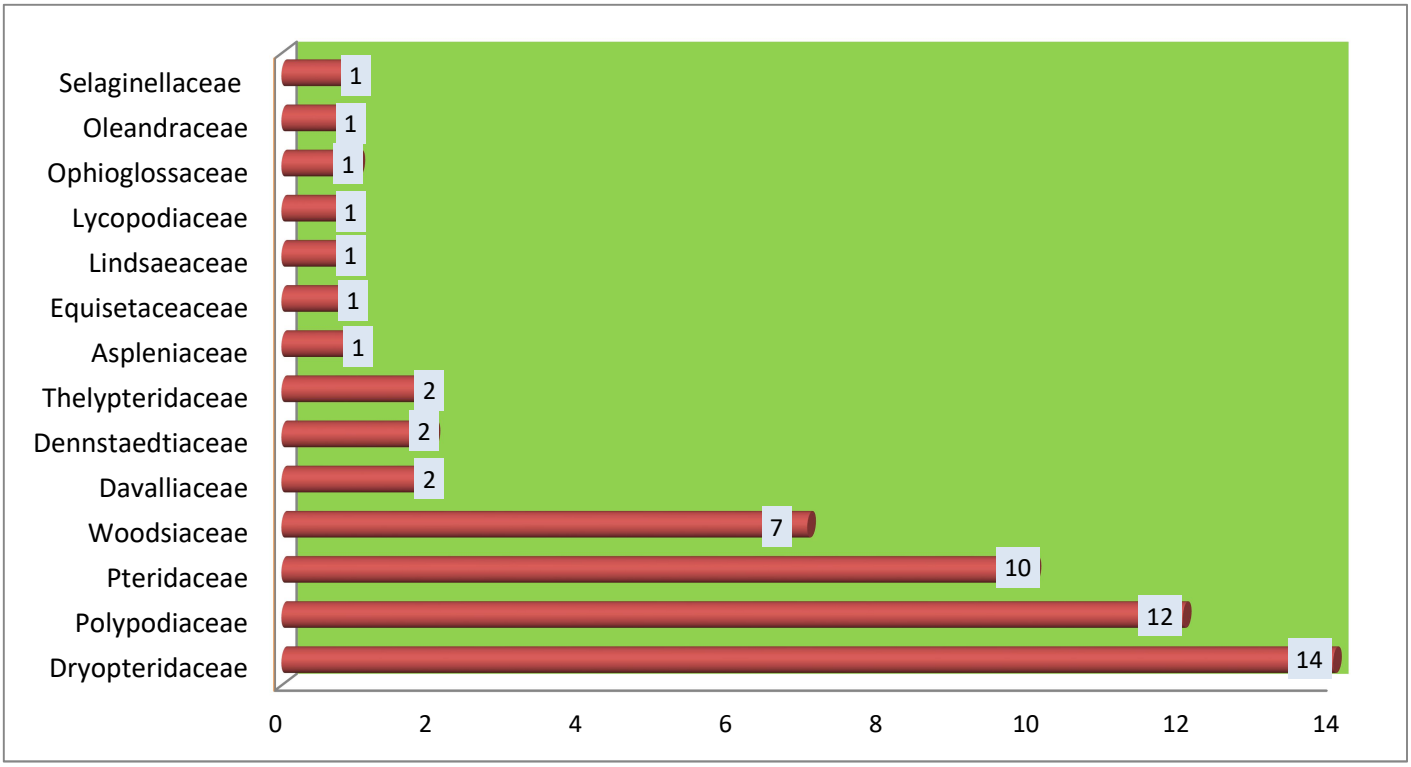



**Plate1-A-*Dryopteris nigropaleacea* B-*Pteris wallichiana* C-*Microsorum membranaceum* D-*Katoella pulchra.***

## Result

A total of 56 pteridophytes from 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 real ferns, while three species are part of the Lycophytes or fern allies group.

## Discussions

According to the study, the family Dryopteridaceae, which has 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, Equisetaceaceae, 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

The study's conclusion was that 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 un-favorable climate at higher elevations.

## Acknowledgement

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