



Review article

First report of Pteridophytes from Govind Wildlife Sanctuary, Uttarkashi, Uttarakhand, India

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Abstract: In the present study 55 species of ferns and fern-allies belonging to 26 genera of 15 families have been collected which is a first and preliminary report from Govind Wildlife Sanctuary. The species belonging to the genera *Dryopteris* and *Polystichum* were found maximum. The occurrence of the species *Dryopteris caroli-hopei* was observed to be at high risk. The populations of *Pteridium aquilinum* were more in most of the localities. The species compositions were different from place to place depending upon the altitude and topography.

Keywords: Ferns - Fern-allies - Govind Wild Life Sanctuary - Uttarakhand.

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INTRODUCTION

The Govind Wildlife Sanctuary is situated in Purohita Tehsil in the Uttarkashi district of Uttarakhand. Naitwar is the entrance and starting point of the sanctuary. This wildlife sanctuary was established on 1st March, 1955 and spreads over an area of 957.969 km². It lies between Longitude: 78.05°E and Latitude: 31.00 to 31.25°N. This sanctuary forms the upper catchment of the Tons river, which is the most important tributary of River Yamuna in its upper reaches. The area is very rich in plants and its large area along with the forests of the neighbouring forest divisions helps in maintaining genetic diversity. Pteridophytes play an important and significant role in the enrichment of biodiversity of this area. They grow luxuriantly in the moist and shady places. Dixit (1984), Chandra (2000) have Reported More than 1200 species of ferns and fern allies from India. Khuller (1994, 2000), Pandey & Pandey (2003) listed the ferns of Himalaya but did not explore and mention the areas of Govind Wildlife Sanctuary. Recently, Shah & Pande (2010) reported 186 species of ferns belonging to 52 genera under 26 families from Uttarkashi district, but they did not touch the areas of Govind Wildlife Sanctuary. The Pteridophytic diversity of this Wildlife Sanctuary has not been explored yet. It has always been a very difficult area to visit. Therefore, the authors have undertaken to document the Pteridophytic flora this area. The present report is the preliminary report on Pteridophytes of Govind Wildlife Sanctuary.

MATERIAL AND METHODS

Several field trips were undertaken in different seasons to different localities of Govind Wildlife Sanctuary to explore and survey the Pteridophytic flora. During the survey the detailed field notes on altitude, latitude, longitude and types of habitat of many plants were recorded. The localities visited are: Sankri, Jakhol, Taluka, Osla, on the way to Kedar Kantha from Sankri, Juda Tal, Ghuiyan Ghati, Badgad dhara, region between between Osla and Gangar and their nearby areas and Dhaula etc. as shown in figure 1. All the specimens were critically studied and identified by first author. All the herbarium specimens were processed and deposited in the Herbarium of the CSIR-National Botanical Research Institute, Lucknow, India (LWG). Each species is listed with author citation followed by the habitat on which it was found growing in the study area, the locality, altitude, latitude and longitude, the collector's name (acronyms: *SKB* - Sandip Kumar Behera; *SN* - Sanjeeva Nayaka; *VS* - Vinay Sahu), collection number. However, in some species altitude, latitude and longitude could not be noted because of some technical problem in the GPS handset (Gramin-72).

RESULTS

In the present study 55 species of ferns and fern-allies belonging to 26 genera of 15 families have been collected from the studied area. The families with maximum representation of species were Dryopteridaceae,



Figure 1. Map of Govind Wildlife Sanctuary in Uttarkashi district showing the locations of study areas.

Pteridaceae and Polypodiaceae, and the families with representation of single species were Blechnaceae, Coniogramaceae, Equisetaceae, Osmundaceae Pteridaceae, Pteridiaceae, Selaginellaceae, Sinopteridaceae (Table.1). Among the plants collected, genus *Dryopteris* had maximum, 10 species followed by the genus *Polystichum* with 8 species, *Pteris* with 5 species, *Asplenium* and *Athyrium* with 3 species, *Adiantum*, *Onichium*, *Lepisorus*, and *Polypodiodes* with 2 species and rest genus had 1 species each (Table 1). Only 2 species of fern-allies like *Equisetum diffusum* D. Don and *Selaginella kraussiana* (Kuntze) A. Braun were found and rest were true ferns. One population of the species *Dryopteris caroli-hopei* Fraser-Jenkin (Fig. 3E) was found in one locality with single individual, *Pteris wallichiana* J. Agardh (Fig. 5D) was found to grow luxuriantly in a single patch in single locality. The populations of *Pteridium aquilinum* (Fig. 5A) were more in most of the localities and were growing like weeds. The families, genus and species identified were listed alphabetically.

Table 1. List of the genera and total number of species in each genera belonging to different families.

Sl. No.	Name of the Families	Name of the Genus	No. of species
1.	Adiantaceae	<i>Adiantum</i>	2
2.	Aspleniaceae	<i>Asplenium</i>	3
3.	Athyriaceae	<i>Athyrium</i>	4
		<i>Diplazium</i>	1
4.	Blechnaceae	<i>Woodwardia</i>	1
5.	Coniogramaceae	<i>Coniogramme</i>	1
6.	Cryptogrammaceae	<i>Onichium</i>	2
7.	Dryopteridaceae	<i>Cyrtomium</i>	1
		<i>Dryopteris</i>	10
		<i>Hypodematium</i>	1
		<i>Polystichum</i>	8
8.	Equisetaceae	<i>Equisetum</i>	1
9.	Osmundaceae	<i>Osmunda</i>	1
10.	Polypodiaceae	<i>Arthromeris</i>	1
		<i>Drynaria</i>	1
		<i>Lepisorus</i>	2
		<i>Polypodiodes</i>	2
		<i>Pyrrhosia</i>	1
11.	Pteridaceae	<i>Pteris</i>	5
12.	Pteridiaceae	<i>Pteridium</i>	1
13.	Selaginellaceae	<i>Selaginella</i>	1
14.	Sinopteridaceae	<i>Cheilanthes</i>	1
15.	Thelypteridaceae	<i>Glaphyopteridopsis</i>	1
		<i>Pseudocycosorus</i>	1
		<i>Pseudophegopteris</i>	1
		<i>Thelypteris</i>	1

LIST OF THE PTERIDOPHYTES

Fern-allies

1. Family- Equisetaceae

Genus- *Equisetum*

(i) *Equisetum diffusum* D. Don. (**Fig. 2A**)

The plant was growing adjacent to water channel in the sandy soil near Sankri. In spite of being a common species, it was located in a single locality, 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253085.



Figure 2. A, *Equisetum diffusum* D. Don; B, *Selaginella kraussiana* (Kuntze) A. Braun; C, *Adiantum venustum* D. Don; D, *Adiantum Phillipense* L.; E, *Asplenium dalhousiae* Hook.; F, *Asplenium trichomanes* L.

2. Family- Selaginellaceae**Genus- Selaginella**

(i) *Selaginella kraussiana* (Kuntze) A. Braun (**Fig. 2B**)

The plant was collected from the place on the way to Kedarkantha, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253042. The plant was terrestrial as well as lithophytic.

Ferns**3. Family- Adiantaceae****Genus- Adiantum**

(i) *Adiantum Phillipense* L. (**Fig. 2D**)

The plant was terrestrial. Netwar, 3 kms away on the way to Sankri, 4512 ft., N 31° 04'08.96" E 078° 06'20.35", 8.11.2012, SKB 253707.

(ii) *Adiantum venustum* D. Don (**Fig. 2C**)

The plant was terrestrial and found to grow on moist places. On the way to Taluka from Sankri, 13.5.2011, SN 253001. En route to Osla from Taluka, 14.5.2011, SN 253016. On the way to Kedarkantha, 6547 ft., N 31° 04.331' E 078° 11.413', 5.11.2012, SKB 253027; 4 km before Jakhhol on the way from Shankri to Jakhhol, 6435 ft., N 31° 06.603' E 078° 14.777', 6.11.2012, SKB 253073. Between Osla and Gangar, 2456 m, N 31° 06'38.82" E 078° 19'28.64", 4.4.2013, VS 253104; 2388 m, N 31° 06'21.56" E 078° 18'50.00", 4.4.2013, VS 253107; 2456 m, N 31° 06'38.82" E 078° 19'28.64", 4.4.2013, SKB & VS 253104. On the way to Osla from Taluka, 2068 m, N 31° 04'49.48" E 078° 15'08.29", 1.4.2013, SKB 253096.

4. Family- Aspleniaceae**Genus- Asplenium**

(i) *Asplenium dalhousiae* Hook. (**Fig. 2E**)

The plant was terrestrial. 4 km before Jakhhol on the way from Sankri to Jakhhol, 6435 ft., N 31° 06.603' E 078° 14.777', 6.11.2012 SKB 253072. Taluka 1 km towards Osla, 2022 m, N 31° 04'51.6" E 078° 15'11.9", 4.4.2013, VS 253109.

(ii) *Asplenium tenuicaule* Hayta

Lithophytic and epiphytic covered with moss near the water stream. On the way to Osla from Taluka, 14.5.2011, SN 253013; on the way from Taluka to Osla, 2083 m, N 31° 04'49.97" E 078° 15'10.26", 9.10.2013, SKB 253097; between Osla and Gangar, 2712 m, N 31° 06'41.9" E 078° 19'44.2", 4.4.2013, VS 253101. Taluka 1 km towards Osla, 2022 m, N 31° 04'51.6" E 078° 15'11.9", 5.4.2013, VS 253110. Dhaula, 5182 ft., N 31° 07' 52.5" E 078° 05'04.29", 9.10.2013, VS 253705.

(iii) *Asplenium trichomanes* L. (**Fig. 2F**)

The plant was lithophytic. On the way to Osla from Taluka, 14.5.2011, SN 253014. Sankri local, 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253088. Taluka, 1 km towards Osla, 2022 m, N 31° 04'51.6" E 078° 15'11.9", 5.4.2013, VS 253111.

5. Family- Athyriaceae**Genus- Athyrium**

(i) *Athyrium flabellulatum* (C.B. Clarke) Tardieu

The plant was terrestrial. On the way to Taluka from Sankri, 14.5.2011, SN 253023

(ii) *Athyrium foliolosum* T. Moore ex R. Sim

The plant was terrestrial and growing in moist shady slopes in the forest, 6547 ft., E 78° 11.413' N 31° 04.331', 5.11.2012, SKB 253029.

(iii) *Athyrium nigripes* (Blume) T. Moore.

The plant was terrestrial. Ghuiyan Ghati between Sankri & Jakhhol, 5507 ft., N 31° 04.830' E 078° 04.395', 5.11.2012, SKB 253058.

(iv) *Athyrium schimperii* Moug. ex Fée (**Fig. 3A**)

The plant was terrestrial. On the way to Kedarkantha, from Sankri, 7430 ft., E 078° 11.342' N 31° 03.95', 5.11.2012, SKB 253709.

Genus- *Diplazium***(i) *Diplazium polypodioides* Blume (Fig. 3D)**

The plant was terrestrial and found to grow on humus-rich mountain slopes with high moisture at various elevations, usually at edge of forests or in clearings, not in deep shade. On the way to Kedarkantha from Sankri, 7430 ft., N 31° 04.331' E 078° 11.413', 5.11.2012, SKB 253031; 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253051. 2 km before Jakhol from Sankri, 7060 ft., N 31° 06.733' E 078° 14.029', 6.11.2012, SKB 253070. Sankri local, 6479 ft., N 31° 04.618' E 078° 11.007', 7.11.2012, SKB 253074.



Figure 3. A, *Athyrium schimperi* Moug. ex Fée; B, *Cheilanthes farinosa* (Forssk.) Kaulf; C, *Coniogramma procerum* (Wall.) Fée.; D, *Diplazium polypodioides* Blume; E, *Dryopteris caroli-hopei* Fraser-Jenkin; F, *Dryopteris wallichiana* Wall.

6. Family- *Blechnaceae***Genus- *Woodwardia*****(i) *Woodwardia unigemmata* (Makino) Nakai (Fig. 5F)**

The plant was terrestrial. 2 km before Jakhol from Sankri, 7060 ft., N 31° 06.733' E 078° 14.029', 6.11.2012, SKB 253069.

7. Family- Coniogrammaceae**Genus- Coniogramma**(i) *Coniogramma procera* (Wall.) Fée. (**Fig. 3C**)

The plant was terrestrial and growing in humus rich soil at higher altitude. On the way to Kedarkantha from Sankri, 6547 ft., E 078° 11.342' N 31° 03.95', 5.11.2012, SKB 253032.

8. Family- Cryptogrammaceae**Genus- Onychium**(i) *Onychium contiguum* Wall ex Hope (**Fig. 5E**)

The plant was terrestrial. On the way to Taluka from Sankri, 13.5.2011, SN 253006. On the way to Kedarkantha from Sankri, 6547 ft., N 31° 04.331' E 078° 11.413', 5.11.2012, SKB 253025; 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253041. Ghuiyan Ghati between Sankri & Jakhol, 5507 ft., N 31° 04.830' E 078° 04.395', 6.11.2012, SKB 253059.

(ii) *Onychium japonicum* var. *lucidum* (D. Don) Christ.

The plant was terrestrial. Located at Sankri, 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253089.

9. Family- Dryopteridaceae**Genus- Cyrtomium**(i) *Cyrtomium caryotideum* (Wall ex Hook et Grev.) C. Presl

The plant was terrestrial and growing in moist and shaded forest slopes. On the way to Osla from Taluka, 14.5.2011, SN 253009, 14.5.2011, SN 253020.

Genus- Dryopteris(i) *Dryopteris caroli-hopei* Fraser-Jenkin (**Fig. 3E**)

The plant was found to grow from the crevices of rocks of a wall. Sankri local, 6479 ft., N 31° 04.618' E 078° 11.007', 7.11.2012, SKB 253081.

(ii) *Dryopteris cochleata* (Buch. Ham ex D.Don) C.Chr

The plant was terrestrial. Ghuiyan Ghati between Sankri & Jakhol, 5508 ft., N 31° 04.830' E 078° 04.395', 6.11.2012, SKB 253061.

(iii) *Dryopteris conjugata* Ching

The plant was terrestrial and growing in moist slopes of the forest. On the way to Kedarkantha from Sankri, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253046.

(iv) *Dryopteris juxtaposita* Christ

The plant was terrestrial herb. On the way to Taluka from Sankri, SN 253010; on the way to Kedarkantha, from Sankri, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253047.

(v) *Dryopteris lepidopoda* Hayata

The plant was terrestrial and growing in moist slopes of the forest. On the way to Kedarkantha, from Sankri, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253038.

(vi) *Dryopteris neorosthormii* Ching

The plant was terrestrial and growing in moist and shaded forest slopes. On the way to Kedarkantha from Sankri, 6547 ft., N 31° 04.331' E 078° 11.413', 5.11.2012, SKB 253026.

(vii) *Dryopteris nigropalaceae* (Fraser- Jenk.) Fraser- Jenk.

The plant was terrestrial. On the way to Taluka from Sankri, SN 253012. On the way to Osla from Taluka, 14.5.2011, SN 2530019. On the way to Kedarkantha, from Sankri, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253044. Jakhol village, 7218 ft., N 31° 06.725' E 078° 13.919', 6.11.2012, 6.11.2012, SKB 253066. Sankri local, 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253086; 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253095. Between Osla and Gangar, 2456 m, N 31° 06'38.82" E 078° 19'28.64", 4.4.2013, VS 253106.

(viii) *Dryopteris sparsa* (Ham. ex D.Don) Kuntze

The plant was terrestrial and growing in moist and shaded forest slopes en route to Osla from Taluka, SN

253017; Sankri local, 6479 ft., N 31° 04.618' E 078° 11.007', 7.11.2012, SKB 253076.

(ix) *Dryopteris subimpressa* Loyal

The plant was terrestrial. On the way to Kedarkantha, from Sankri, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253053.

(x) *Dryopteris wallichiana* Wall (Fig. 3F)

The plant was terrestrial, evergreen with shuttlecock-like rosettes of lance-shaped fronds. On the way to Kedarkantha, from Sankri, 7430 ft., E 078° 11.342' N 31° 03.95', 5.11.2012, SKB 253033.

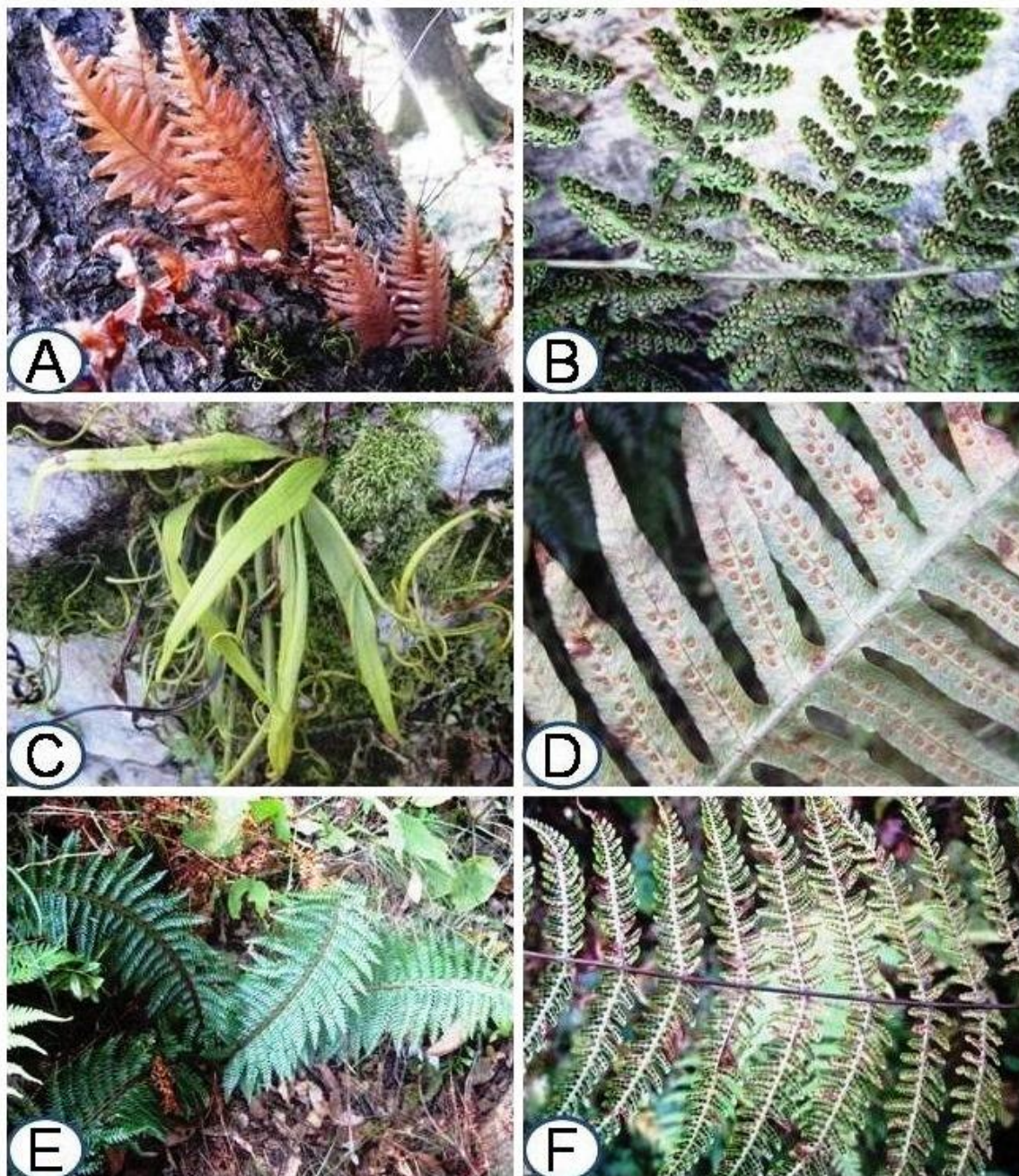


Figure 4. A, *Drynaria propinqua* (Wall) J. Smith; B, *Hypodematium crenatum* (Forssk.) Kuhn; C, *Lepisorus nudus* (Hook.) Ching; D, *Polypodiodes amoena* (Wall. ex Mett.) Ching; E, *Polystichum squarrosum* D. Don; F, *Pseudophegopteris pyrhorachis* (Kunze) Ching.

Genus- *Hypodematium*

(i) *Hypodematium crenatum* (Forssk.) Kuhn (Fig. 4B)

The plant is lithophytic and found to grow in the rock crevices in the exposed areas of forest. Sankri local, 6479 ft., N 31° 04.618' E 078° 11.007', 7.11.2012, SKB 253077.

Genus- *Polystichum*(i) *Polystichum discretum* (D.Don.) J. Smith

The plant was terrestrial. Near Juda tal, on the way to Kedarkantha, 9429 ft., N 31° 03.116' E 078° 11.016', 5.11.2012, *SKB* 253054.

(ii) *Polystichum mucranifolium* (Blume)

The plant was terrestrial. En route to Osla from Taluka, 13.5.2011, *SN* 253008.

(iii) *Polystichum obliquum* (Don) Moore

The plant was lithophyte and was growing in ravines swamp and gorges. En route to Osla from Taluka, 14.5.2011, *SN* 253021.

(iv) *Polystichum piceopaleatum* Tagawa

The plant was terrestrial. En route to Kedarkantha from Sankri, 15.5.2011, *SN* 253024. On the way to Kedarkantha, 3 km from Sankri, 6547 ft., N 31° 04.331' E 078° 11.413', 5.11.2012, *SKB* 253028. Between Osla and Gangar, 2712 m, N 31° 06'41.9" E 078° 9'44.2", 1.4.2013, *VS* 253100.

(v) *Polystichum shensiense* Christ

The plant was terrestrial and was growing in alpine forest. On the way to Kedarkantha, from Sankri, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, *SKB* 253040.

(vi) *Polystichum stimulans* (Kunze ex Mettenius) Beddome

The species was terrestrial and growing in moist and shaded forest slopes en route to Taluka from Sankri, *SN* 253007. On the way to Osla from Taluka, 2108 m, N 31° 04'50.58" E 078° 15'13.10", 1.4.2013, *SKB* 253098. On the way from Osla to Gangar, 2468 m, N 31° 06'39.83" E 078° 19'38.01", 4.4.2013, *SKB* 253102, 4.4.2013, *SKB* 253103.

(vii) *Polystichum squarrosus* D.Don (**Fig. 4E**)

The plant was terrestrial. En route to Taluka from Sankri, 13.5.2011, *SN* 253004, 253011. Sankri local, 6479 ft., N 31° 04.618' E 078° 11.007', 7.11.2012, *SKB* 253078; 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, *SKB* 253091.

(viii) *Polystichum yunnanense* Christ

The plant was terrestrial. On the way to Kedarkantha, from Sankri, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, *SKB* 253048. Near Juda tal, on the way to Kedarkantha, 9429 ft., N 31° 03.116' E 078° 11.016', 5.11.2012, *SKB* 253055. Sankri local, 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, *SKB* 253094.

10. Family- Osmundaceae**Genus- *Osmunda***(i) *Osmunda claytonia* L.

The plant was terrestrial and growing in humus rich soil at higher altitude. En route to Osla from Taluka, 14.5.2011, *SN* 253018, *SN* 253022.

11. Family- Polypodiaceae**Genus- *Arthromeris***(i) *Arthromeris wallichiana* (Spreng.) Ching

The plant was epiphyte and found to grow on tree trunk. En route to Osla from Taluka, 14.5.2011, *SN* 253015

Genus- *Drynaria*(i) *Drynaria propinqua* (Wall) J. Smith (**Fig. 4A**)

The plant is epiphytic. Near Juda Tal, on the way to Kedarkantha, 9429 ft., N 31° 03.116' E 078° 11.016', 5.11.2012, *SKB* 253056.

Genus- *Lepisorus*(i) *Lepisorus contortus* Ching

The plant was lithophytic. Badgad dhara (near bridge), 1 km before Jakhhol village, 7335 ft., N 31° 06.728' E 78° 14.375', 6.11.2012, *SKB* 253068. Sankri local, 6479 ft., N 31° 04.618' E 78° 11.007', 7.11.2012, *SKB*

253080. Dhaula, 5182 ft., N 31° 07'52.5" E 078° 04. 29", 9.10.2013, VS 253703.

(ii) *Lepisorus morrisonensis* (Hayata) H. Ito

The plant was lithophytic and epiphytic growing on rocks and tree. Dhaula, 5182 ft., N 31° 07'52.5" E 78° 04.29", 9.10.2013, VS 253702.

(iii) *Lepisorus nudus* (Hook.) Ching (**Fig. 4C**)

The plant was both lithophytic and epiphytic. Dhaula, 5182 ft., N 31° 07' 52.5" E 078° 04. 29" 9.10.2013, VS 253706.

Genus- *Polypodiodes*

(i) *Polypodiodes amoena* (Wall. ex Mett.) Ching

The plant was epiphytic growing on rocks or on tree trunks. On the way to Kedarkantha, from Sankri, 7430 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253034; Juda Tal, on the way to Kedarkantha, 9429 ft., N 31° 03.116' E 078° 11.096', 5.11.2012, SKB 253057. Sankri local, 6479 ft., N 31° 04.618' E 078° 11.007', 7.11.20.12, SKB 253079.

(ii) *Polypodiodes lachnopus* (Wall. ex Hook.) Ching

The plant was lithophytic. Dhaula, 5182 ft., N 31° 07'52.5" E 078° 05'04.29", 9.10.2013, VS 253704.

Genus- *Pyrrosia*

(vii) *Pyrrosia porosa* (C. Presl) Hovenkamp

The plant was lithophytic and epiphytic growing on rocks and tree. Dhaula, 5182 ft., N 31° 07'52.5" E 078° 05'04.29", 9.10.2013, VS 253701.

12. Family- Pteridaceae

Genus- *Pteris*

(i) *Pteris aspericaulis* Wall. ex J. Agardh

The plant was terrestrial and was commonly growing along streams, stream banks and marshes in high altitudes. On the way to Kedarkantha, from Sankri, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253043.

(ii) *Pteris cretica* Linn. (**Fig. 5B**)

The plant was terrestrial. En route Taluka from Sankri, 13.5.2011, SN 253004. On the way to Kedarkantha, from Sankri, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253050. Ghuiyan Ghati, between Sankri & Jakhhol, 5508 ft., N 31° 04.830' E 078° 04.395', 6.11.2012, SKB 253064. Sankri local, 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253084. On the way to Osla from Taluka, 2108 m, N 31° 04'50.58" E 078° 15'13.10", 1.4.2013, VS 253099.

(iii) *Pteris excelsa* Gaud (**Fig. 5C**)

The plant was terrestrial. Ghuiyan Ghati between Sankri & Jakhhol, 5508 ft., N 31° 04.830' E 078° 04.395', 6.11.2012, SKB 253060. Sankri local, 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253091.

(iv) *Pteris pseudoquadriaurita* Khuller

The plant was terrestrial. Jakhhol village, 7218 ft., N 31° 06.725' E 078° 13.919', 6.11.2012, SKB 253065. Badgad dhara (near bridge), 1 km before jakhhol village, 7335 ft., N 31° 06.728' E 078° 14.375', 6.11.2012, SKB 253067. Sankri local, 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253082.

(v) *Pteris wallichiana* J. Agardh (**Fig. 5D**)

The plant was terrestrial, large, evergreen and clumping. The plant was found 4 km before Jakhhol from Sankri, 6435 ft., N 31° 06.603' E 078° 14.777' 6.11.2012, SKB 253071.

13. Family- Pteridiaceae

Genus- *Pteridium*

(i) *Pteridium aquilinum* (L.) Kuhn (**Fig.5.A**)

The plant is terrestrial which forms large clonal colonies in its habitat. On the way to Kedarkantha, from Sankri, 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253052. Sankri local, 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253092.



Figure 5. A, *Pteridium aquilinum* (L.) Kuhn; B, *Pteris cretica* Linn; C, *Pteris excelsa* Gaud; D, *Pteris wallichiana* J. Agardh; E, *Onychium contiguum* Wall ex Hope; F, *Woodwardia unigemmata* (Makino) Nakai.

14. Family- *Sinopteridaceae*

Genus- *Cheilanthes*

(i) *Cheilanthes farinosa* (Forssk.) Kaulf. (**Fig. 3B**)

The plant was both terrestrial and lithophytic. 1 km from Taluka, towards Osla, 6653 ft., N 31° 04'51.6" E 078° 15'11.9", 5.4.2013, VS 253112.

15. Family- *Thelypteridaceae*

Genus- *Glaphyopteridopsis*

(i) *Glaphyopteridopsis erubescens* (Wall. ex Hook.) Ching

The plant was terrestrial. Ghuiyan Ghati, between Sankri & Jakhol, 5508 ft., N 31° 04.830' E 078° 04.395', 6.11.2012, SKB 253062.

Genus- *Pseudocycosorus*

(i) *Pseudocycosorus canus* (Baker) Holttum & J.W. Grimes

The plant was terrestrial. Sankri local, 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253087.

Genus- *Pseudophegopteris*

(i) *Pseudophegopteris pyrhorachis* (Kunze) Ching (Fig. 4F)

The plant was commonly growing along streams, stream banks and marshes in high altitudes. On the way to Kedarkantha from Sankri, 8070 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253035; 8094 ft., N 31° 03.612' E 078° 11.342', 5.11.2012, SKB 253043. Ghuiyan Ghati, between Sankri & Jakhol, 5508 ft., N 31° 04.830' E 078° 04.395', 6.11.2012, SKB 253063; Sankri local, 6479 ft., N 31° 04.618' E 078° 11.007', 7.11.2012, SKB 253075; 6282 ft., N 31° 04.552' E 078° 10.652', 7.11.2012, SKB 253090.

Genus- *Thelypteris*

(i) *Thelypteris palustris* Schott

This is a perennial fern and found to grow in open area where the soil is permanently wet and organic at Netwar, 3 kms away on the way to Sankri, 4512 ft., N 31° 04'08.96" E 078° 06'20.35", 8.11.2012, SKB 253708.

DISCUSSIONS

The preliminary observations of the studied areas showed that this Sanctuary is most diversified in terms of taxa although some genera had single representation of species. The species *Dryopteris caroli-hopei* Fraser-Jenkin (Fig. 2E), which is believed to be common fern in Western Himalaya and hence not listed in threatened category by Chandra *et al.* (2008) was observed in one locality with single individual, indicates the species is at risk. The luxuriantly growth of *Pteris wallichiana* J. Agardh in a specific habitat shows, it prefers to grow in open spaces with sufficient sun light at high altitude. At the same time since the habitat was road side hence, it was more prone to destruction by anthropogenic activities. The plants of *Pteridium aquilinum* (L.) Kuhn were being used by the local people for burning fire after drying it, which was again a threat for the survival of this plant.

The natural calamity due to heavy rain fall and cloud burst which resulted in destruction of roads debarred us to visit the all areas of the sanctuary. However, the complete studies of the Pteridophytic flora of all the areas of the sanctuary will give the clear picture of the status of different species and hence will fill up the gap left behind.

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