QUANTITATIVE COMMUNITY DESCRIPTION FROM CENTRAL KARAKORAM NATIONAL PARK (CKNP), GILGIT-BALTISTAN, PAKISTAN

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Abstract

A study was carried out to asses the communities and floristic composition of 32 stands of forest, shrubs and herbs from CKNP. On the basis of phytosociological analysis and maximum important value index, following 1 forest community, 3 pure stands and 6 shrubs and herbs communities are identified and quantitatively described.

In forested areas *Picea-Pinus wallichiana* community, *Juniperus excelsa* pure stand. *Picea smithiana* pure stand, *Pinus wallichiana* pure stand, while at non forested places *Rosa-Hippophae* community, *Hippophae-Ribes* community, *Rosa-Ribes* community, *Rosa-Berberis* community, *Hippophae-Tamarix* community and *Berberis-Tamarix* community, were dominated.

Poor floristic similarities between and within the communities at different elevations and slopes were seen however *Rosa-Hippophae* and *Picea-Pinus wallichiana* community showed higher floristic similarities within the community. Pine tree species were also distributed as a pure stand in different areas with higher density and basal area. It is shown that vegetation was deteriorating under anthropogenic disturbance therefore needs special attention to protect these forests and vegetation.

Introduction

Central Karakoram National Park is one of the 24 national parks of Pakistan. It is located in Northern areas (now Gilgit-Baltistan) of Pakistan. Many organizations are involved to protect this National Park by various means. Many researchers quantitatively investigated the vegetation of Northern Areas. First multivariate analysis of Skardu was conducted by Ahmed (1976). Ahmed and Qadir (1976) recorded many communities near road sites from Gilgit to Shandur. Ahmed (1986) also studied the vegetation of some foothills of Himalayan range of Pakistan. Ahmed *et al*. (1990 a, b) described the status and population structure of *Juniperus excelsa* in Baluchistan. Ahmed *et al*.(1991) also worked vegetation structure and dynamics of *Pinus geradiana* forest of Baluchistan. Hussain and Mustafa (1995) investigated the ecological study of plant and animal relation from Nasirabad Hunza Pakistan. Rasool (1998) worked on the protection of medicinal plants of Northern Areas of Pakistan. Shinwari and Gillani (2003) also reported the sustainable harvest of medicinal plants from Astor. Malik (2005) comparatively studied with special reference to range conditions on the vegetation of Ganga Chotti and Bedori Hills District Bagh of Azad Jammu Kashmir. Ahmed *et al.,* (2006) described the plant communities and forest structure of different climatic zones of Pakistan. Nafeesa (2007) described the phytosociological attributes and different plant communities of Pie Chinasi Hills of Azad Jammu Kashmir. Wali and Khatoon (2007) listed the detail of economically important species of Bagrot Gilgit. Wahab *et al.,* described the phytosociology and dynamics of some forests of Afghanistan. Ahmed *et al.,* (2010) studied the floristic composition and communities of deodar forest from Himalayan range of Pakistan. Akbar *et al.,* (2010) also studied the phytosociology and structure of skardu district.Hussain *et al.,* (2010) described the phytosociology and structure of few sites from Central Karakoram National Park. Siddiqui *et al,* (2011) described communities of moist temperate areas of Pakistan.

Beside these studies no inclusive quantitative investigation were carried out in the National Park .Therefore present study was conducted to describe the communities description and floristic composition of one of the most important National Park of Pakistan.

Materials and Methods

For quantitative sampling mature and least disturbed sites were selected. Point Centered Quarter Method of Cottam & Curtis (1956) was applied for tree species. In each stands 20 points were taken at every 20 meter interval. Quadrat method size (3 x 5 m) of Cox, (1990) was used for shurbs and herb species .GPS was used to record the elevation and quardinates while degree of slope was recorded by slope meter.

Phytosociological attributes and absolute values were calculated according to the method described by Mueller –Dombois & Ellenberg (1974) and Ahmed and Shaukat (2012). Highest important value of plant species in the stand was considered as dominant species (Brown & Curtis, 1952).Plant community of a particular area was named on the basis of first two dominant species.

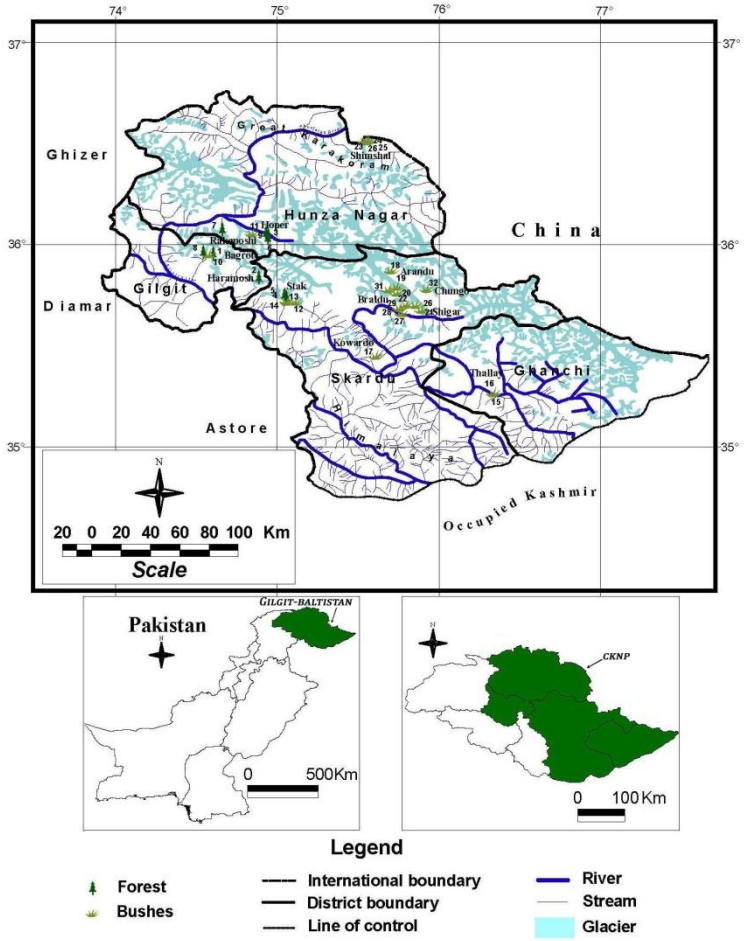

Fig. 1. Map of CKNP and sampling sites. Number are stand number, for details refer to Table 1.

Results and Discussion

Locations of sampling sites is shown in Fig.1.Ecological characteristics of each site is presented in Table 1 while phytosociological attributes and absolute values are presented in Table 2. Communities and their associated physiographic conditions are outlined in Table 3.On the basis of phytosociological analysis and the maximum IVI following communities and pure stands were recognized *i-e* one tree community, three pure tree stands and six shrubs/ herb communities.

Forest Community and Pure Stands

- *Picea-Pinus wallichiana* community
- *Juniperus excelsa* pure stand
- *Picea smithiana* pure stand
- *Pinus wallichiana* pure stand

Shrubs and Herbs Communities

- *Rosa-Hippophae* community
- *Hippophae-Ribes* community
- *Rosa-Ribes* community
- *Rosa-Berberis* community
- *Hippophae-Tamarix* community
- *Berberis-Tamarix* community

***Picea-Pinus wallichiana* community:** This community is distributed at Bagrot, Haramosh and Rakaposhi-4 (1, 2, 9 stands). The elevation ranged from 3110 to3512 m while degree of slope ranged between 45 to 70° (Table 3). The canopy of Bagrot was moderate while open canopy existed in Haramosh and Rakaposhi-4. Ground surface of Haramosh and Rakaposhi-4 was rich in grasses with scattered boulders in the community. Muddy type of soil, cut stems, burning stems and soil erosion was observed in Haramosh and Bagrot while in Rkaposhi-4 no cut stem and burnt stem were seen, however soil erosion seen in loamy soil. Being close to the village the forest of Bagrot was accessible to local people, therefore overgrazing, illegal harvesting, burning of stems and soil erosion was comparatively greater than that of remaining two stands. *Picea smithiana* is the leading dominant species having varied values of IVI (57-76 %), density (67-91/ha) and basal area (17-37 m^2/ha). Co-dominant species *Pinus wallichiana* was distributed with 20 to 25 % IVI, density was 17 to 31/ha with 5 to 7 m^2/ha basal area. The associated species *Juniperus excelsa* was recorded with low density and basal area (Table 2).

Table 1. Environmental characteristics of forests, shrubs and herbs sites of CKNP

Stands	Main Location	Lat.(N)	Long.(E)	Ele.(m)	Asp.	Slo	CN
	Forest areas						
1	Bagrot	36.02918	74.60156	3130	E	45°	Mod.
2	Haramosh	35.88388	74.88433	3296	E/S	53°	Ope
3	Hoper	36.14278	74.94410	3486	E	49°	Clo
4	Stak 1	35.75901	75.05340	3344	E	35°	Mod
5	Stak 2	35.77398	75.04300	3600	E	20°	Mod
6	Rakaposhi 1	36.12485	74.94081	3444	N	70°	Mod
7	Rakaposhi 2	36.18000	74.66000	3263	N	59°	Mod
8	Rakaposhi 3	36.04021	74.54186	3188	N	64°	Mod
9	Rakaposhi 4	36.15703	74.92910	3512	N/E	70°	Mod
	Shurbs/Herbs area						CS
10	Bagrot	36.03400	74.57735	27774	N	Pla.	Ope
11	Hopar	36.16258	74.84320	3353	N/E	30°	Ope
12	Stak 01	35.73915	75.10943	2949	E/N	35°	Ope
13	Stak 02	35.74459	75.05935	2782	E/S	20°	Ope
14	Stak 03	35.74053	75.05651	2742	E	Pla	Ope
15	Thallay 01	35.17268	76.33680	3300	E	20°	Ope
16	Thallay 02	35.17575	76.33440	3500	E/N	25°	Ope
17	Kowardo	35.40611	75.60833	3559	E	50°	Ope
18	Arandu 1	35.93333	75.70375	2790	S/W	30°	Ope
19	Arandu 2	35.83333	75.73858	2815	S	25°	Ope
20	Arandu 3	35.79565	75.73868	2875	S/W	35°	Ope
21	Shigar 1	35.68970	75.88908	2527	N/E	40°	Ope
22	Shigar 2	35.72278	75.79650	2444	E	35°	Ope
23	Shimshal 1-1	36.73260	75.53743	3047	E/S	Pla	Ope
24	Shimshal 1-2	36.73423	75.54813	3065	E/S	Pla	Ope
25	Shimshal 2-1	36.73228	75.55151	3076	E/S	Pla	Ope
26	Shimshal 2-2	36.72853	75.55553	3097	E/S	Pla	Ope
27	Braldu 1-1	35.67020	75.76706	2895	E	25°	Ope
28	Braldu 1-2	35.70150	75.75516	2910	E	20°	Ope
29	Braldu 2-1	35.70516	75.75353	2948	E/S	35°	Ope
30	Braldu 2-2	35.71848	75.85377	3055	E	30°	Ope
31	Chungo 1	35.81715	75.68707	3010	N	40°	Ope
32	Chungo 2	35.81808	75.92186	3109	N/E	35°	Ope

Lat = Latitude, Long = Longtitude, Ele = Elevation, Asp = Aspect, Slo = Degree of slope, CN = Canopy, Mod = Moderate, Ope = Open, Clo = Closed, CS = Covered surface, Pla = Plain.

Table 2. Phytosociological attributes and absolute values of forest trees, bushes and herbs from CKNP

Stands	Location	Name of Species	R.F	R.D	R.B.A/ R.C	IVI	Rank	D/ha	B.A /Cover $m^2 ha^{-1}$
	Forest area								
1	Bagrot	*Picea smithiana*	52	61	73	64	1st	67	17
		Pinus wallichiana	28	28	24	20	2nd	17	5
		Juniperus excelsa	21	15	6	13	3rd	12	1
2	Haramosh	*Picea smithiana*	43	61	57	57	1st	75	22
		Pinus wallichiana	30	23	22	25	2nd	29	7
		Juniperus excelsa	26	15	11	17	3rd	18	3
3	Hopar	*Juniperus excelsa*	100	100	100	100	Pure	123	22
4	Stak 1	*Picea smithiana*	100	100	100	100	Pure	109	41
5	Stak 2	*Juniperus excelsa*	100	100	100	100	Pure	106	47
6	Rakaposhi 1	*Juniperus excelsa*	100	100	100	100	Pure	135	25
7	Rakaposhi 2	*Picea smithiana*	100	100	100	100	Pure	143	53
8	Rakaposhi 2	*Pinus wallichiana*	100	100	100	100	Pure	94	40
9	Rakaposhi 4	*Picea smithiana*	54	62	76	64	1st	91	76
		Pinus wallichiana	24	21	14	20	2nd	31	14
		Juniperus excelsa	22	16	10	16	3rd	24	10
Bushes and Herbs									
10	Bagrot	*Rosa webbiana*	18	24	39	25	1st	667	1240
		Hippophae rhamnoides	13	14	27	18	2nd	533	853
		Berberis lycium	16	14	20	17	3rd	533	656
11	Hoper	*Rosa webbiana*	15	16	36	22	1st	667	1239
		Hippophae rhamnoides	13	13	30	19	2nd	533	1050
		Berberis lycium	10	10	36	21	3rd	400	297
12	Stak 1	*Rosa webbiana*	11	14	36	21	1st	333	570
		Hippophae rhamnoides	9	11	25	15	2nd	466	947
		Urtica dioca	11	10	0.04	7	3rd	400	2
13	Stak 2	*Hippophae rhamnoides*	11	11	21	15	1st	400	623
		Ribes alpestre	8	9	23	13	2nd	333	675
		Rosa webbiana	6	7	14	10	3rd	266	429
14	Stak 3	*Rosa webbiana*	6	8	24	13	1st	333	563
		Hippophae rhamnoides	8	9	18	12	2nd	333	431
		Ribes alpestre	6	5	17	10	3rd	200	404
15	Thallay 1	*Hippophae rhamnoides*	17	21	47	29	1st	800	1688
		Rosa webbiana	15	15	27	19	2nd	600	960
		Berberis lycium	9	9	15	11	3rd	333	523
16	Thallay 2	*Rosa webbiana*	12	19	50	27	1st	733	1616
		Hippophae rhamnoides	8	9	12	10	2nd	333	400
		Ribes orientale	6	7	13	9	3rd	267	418
17	Kowardo	*Rosa webbiana*	24	26	49	33	1st	1067	2198
		Ribes orientale	10	11	18	13	2nd	467	790
		Berberis lycium	10	8	10	10	3rd	333	459
18	Arandu 1	*Rosa webbiana*	22	17	43	26	1st	267	452
		Berberis lycium	9	8	18	12	2nd	133	188
		Artemisia maritima	13	17	0.1	10	3rd	267	1
19	Arandu 2	*Rosa webbiana*	14	14	35	21	1st	533	824
		Hippophae rhamnoides	14	13	36	21	2nd	467	845
		Berberis lycium	11	16	24	17	3rd	600	562
20	Arandu 3	*Hippophae rhamnoides*	13	13	45	24	1st	400	633
		Rosa webbiana	13	15	38	22	2nd	467	633
		Artemisia maritima	10	13	0.1	8	3rd	400	1
21	Shigar 1	*Rosa webbiana*	16	17	59	31	1st	533	759
		Hippophae rhamnoides	10	10	23	15	2nd	333	294
		Berberis lycium	10	10	18	13	3rd	333	231
22	Shigar 2	*Rosa webbiana*	11	12	34	19	1st	400	462
		Hippophae rhamnoides	16	16	41	24	2nd	533	547
		Tamarix indica	11	10	11	10	3rd	333	142
23	Shimshal 1-1	*Rosa webbiana*	7	7	44	19	1st	267	547
		Hippophae rhamnoides	7	7	16	10	2nd	267	547
		Tamarix indica	12	9	19	13	3rd	333	239
24	Shimshal 1-2	*Hippophae rhamnoides*	13	12	40	22	1st	600	686
		Tamarix indica	9	7	13	10	2nd	333	215
		Ribes orientale	7	7	13	9	3rd	333	215
25	Shimshal 2-1	*Hippophae rhamnoides*	12	13	48	24	1st	533	649
		Tamarix aphylla	12	13	18	14	2nd	533	244
		Juniperus communis	10	10	9	9	3rd	400	119
26	Shimshal 2-2	*Hippophae rhamnoides*	13	13	49	25	1st	533	774
		Rosa webbiana	9	8	23	13	2nd	333	361
		Tamarix indica	11	13	12	12	3rd	533	195

Table 2. Continue …

Stands	Location	Name of Species	R.F	R.D	R.B.A/ R.C	IVI	Rank	D/ha	B.A /Cover $m^2 ha^{-1}$
27	Braldu 1-1	*Rosa webbiana*	10	9	45	21	1st	400	513
		Berberis lycium	14	12	23	16	2nd	533	260
		Hippophae rhamnoides	10	7	28	15	3rd	333	321
28	Braldu 1-2	*Berberis lycium*	11	11	17	13	1st	467	434
		Tamarix indica	7	8	36	17	2nd	333	435
		Hippophae rhamnoides	11	11	17	13	3rd	467	203
29	Braldu 2-1	*Rosa webbiana*	10	10	47	22	1st	400	580
		Hippophae rhamnoides	7	8	33	16	2nd	333	408
		Berberis lycium	10	10	15	12	3rd	400	193
30	Braldu 2-2	*Rosa webbiana*	11	10	50	24	1st	467	586
		Hippophae rhamnoides	9	7	35	17	2nd	333	415
		Berberis lycium	6	7	10	8	3rd	333	116
31	Chungo 1	*Hippophae rhamnoides*	9	9	46	21	1st	400	517
		Rosa webbiana	9	7	28	15	2nd	333	313
		Ribies orientale	7	6	13	8	3rd	267	141
32	Chungo 2	*Hippophae rhamnoides*	8	8	30	15	1st	400	362
		Rosa webbiana	6	6	31	14	2nd	333	373
		Berberis lycium	8	9	17	11	3rd	467	206

Sta = Stand Number, R.F = Relative frequency, R.D = Relative density, B.A = Basal area, R.B.A = Relative basal area, R.C = Relative cover, IVI = Important value index, D/ha = Density per hectare, BA = Basal area (trees).

Table 3. Communities of forests, bushes and herbs from CKNP

	Name of Community	Stand Nos.	IVI Range	Density/ha Range	Basal/Cover m^2/ha Range	Elevation Range(m)	Slope Range
A	**Forest Area**						
1	*Picea-Pinus wallichiana*	1,2,9	57-76	67-91	17-37	3110-3512	45-53°
			20-25	17-31	5.0-7.0		20-70°
2	*Juniperus excelsa**	3,5,6	100	106-135	22-47	3486-3600	Plain
3	*Picea smithiana**	4,7	100	109-143	41-53	3263-3344	20°
4	*Pinus wallichiana**	8	100	94	40	3188	64°
B	**Bushes/Herbs Area**						
5	*Rosa-Hippophae*	10,11,12,14,	13-31	333-800	362-1600	2444-3500	Plain-40°
		15,16,19,20,	10.0-14	267-600	294-1050		
		21,22,23,26,					
		29,30,31,32					
6	*Hippophae -Ribes Alpestre*	13	15	400	623	2782	20°
			13	333	675		
7	*Rosa - Ribes orientale*	17	33	1067	2197	3559	50°
			13	4667	790		
8	*Rosa - Berberis*	18,27	21-26	267-400	452-513	2790-2895	20°-25°
			12-16	133-533	188-260		
9	*Hippophae-Tamarix*	24,25	22-24	533	649-686	3065-3076	Plain
			10.0-14	333-533	215-244		
10	*Berberis -Tamarix*	28	19	467	434	2910	20°
			8	267	116		

*****Pure stands
Range of first and second dominant species is given separately.

A total of 42 species of ground flora were recorded under this community. Seven species, *Astragalus gilgitensis, Impatiens balfourii, Lentopodium himalayanum, Rubus ulmifolius, Spiraea canescens, Taraxacum*

officinale, and *Taraxacum karakorium* were frequently distributed in all three stands. Forty % similarity was found in the floristic composition of Bagrot and Haramosh and 17% similar floral distribution were recorded from Bagrot and Rakaposhi- 4 while 20% similar flora were recorded from Haramosh and Rakaposhi- 4. *Erigeron multicepes* and *Rosa webbiana* were found at Haramosh while *Acontholimon lycopodiodes, Artemisia roxburgiana, Bergenia stracheyi, Bistorta affinis, Epilobium angustifolium, Juniperus communis, Lentopodium nanum, Sedum quadrifidum and Taraxacum nigrum* were only found in Rakaposhi-4.

***Juniperus excelsa* Pure Stand:** Pure stand of *Juniperus excelsa* is located at Hopar, Stak-2 and Rakaposhi-1(3, 5, 6 stands). The elevation of these sampling sites ranged from 3486 to 3600 m while degree of steep slope ranged 20 to 70° (Table 3) .The canopy of these pure forests was open and surface of ground was rich in vegetation and boulders with muddy soil cut stems and dead stems were found in Stak-2 and Rakaposhi-1 while many dead standing trees were found in Hopar but no cut stem was recorded from rest of two sites.

At above mentioned locations *Juniperus excelsa* pure stand occupied 106 to 135 individuals per hectare with 22 to 47 m^2/ha basal area (Table 2). Ground flora was composed of 36 species. Eleven species *Astragalus gilgitensis, Berberis vulgaris, Cicer songaricum, Fragaria nubicola, Lentopodium himalayanum, Rubus ulmifolius, Sedum multicepes, Sedum quadifidum, Tanacetum artemisoides, Taraxacum officinale* and *Trifolium repnes* were recorded in all three stands. Floristic composition of Hopar and Stak-2 occupied 42 % similarity and between Stak-2 and Rakaposhi-1, 32 % similarity was recorded while 61 % similar floristic composition was found in Hopar and Rakaposhi-1. *Acontholimon lycopodiodes* recorded only in Hopar and all other species of Rakaposhi-1 found in Hopar while *Lentopodium limerifolium, Artemisia maritima, Potentilla baltistana, Ribes orientale, Rosa webbiana, Rubus irritans, Taraxacum baltistanicum* and *Thymus linearis* were recorded in Stak-2, only.

***Picea smithiana* Pure Stand:** Pure forest of *Picea smithiana is* distributed in Stak-1 and Rakaposhi-2 (4, 7 stands). The elevation ranged from 3263 to 3344 m while degree of slope ranged between 35 to 59° (Table 3). The canopy of these forests was open and ground surface was rich in grasses. Thick liter surface was found in Stak- 2 with muddy soil while loamy soil and boulders were found in Rakaposhi-2. Cut stems, standing dead trees and burnt stems were recorded in Stak-2 while wood cutting was seen in Rakaposhi-2.

Picea smithiana was distributed with 43 to 143 density per hectare with 42 to 53 m^2/ha basal area (Table 2). Ground flora was composed of 34 species. Only 8 species *Astragalus gilgitensis, Bergenia stracheyi, Geranium pratense, Juniperus communis, Sedum quadrifidum, Taraxacum officinale, Trifolium repnes* and *Urtica dioca* were similar and occupied 24 % similar floristic composition between these two locations. *Artemisia maritima, Astragalus zanskrensis, Cicer songaricum, Hippophae rhamnoides, Lentopodium limerifolium, Potentilla baltistana, Ribes orientale, Rosa webbiana, Rubus irritans, Taraxacum baltistanicum* and *Thymus linearis* were recorded in Stak-1 while *Anaphalis virgata, Artemisia roxburgiana, Bistorta affinis, Fragaria nubicola, Impatiens balfourii, Lentopodium himalayanum, Lentopodium nanum, Potentilla anserina, Rubus ulmifolius, Sedum multicepes, Silene vulgaris, Tanacetum artemisoides , Taraxacum karakorium* and *Taraxacum nigrum* were recorded in Rakaposhi-2.

***Pinus wallichiana* Pure stand:** This community is recorded from Rakaposhi-3 (stand 8), at the elevation of 3188 m where degree of slope was 64° (Table 3) .The canopy of this pure forest was open and ground surface was rich with various bushes, grasses and boulders. Cut stems and loamy soil were found in this forest. *Pinus wallichiana* was distributed with 94 density per hectare and 40 m^2/ha basal area (Table 2).

Ground flora was rich and composed of 22 species in which *Tarxacum karakorium* occupied 10 % of highest frequency. *Astragalus gilgitensis, Rubus ulmifolius* and *Taraxacum nigrum* were distributed with 8 % and *Artemisia roxburgiana* and *Lentopodium nanum* were recorded with 6 % relative frequency.

***Rosa-Hippophae* Community:** This shruby community is widely distributed at 16 locations *i-e* Bagrot, Hopar, Stak-1, Stak-3, Thally-1, Thally-2, Arandu-2, Shigar-1, Shigar-2, Shimshal 1- 1, Shimshal 2-2, Braldu 2-1,Braldu 2-2, Chungo-1 and Chungo-2 (10,11,12,14,15,16,19,20,21,22,23,26,29,30,31,32 stands). The elevation ranged from 2444 to 3500 m while degree of slope was plain to 40° (Table 3). The leading dominant species was *Rosa webbiana* in 11 stands out of 16 stands with 13-31 IVI, 333-800 density/ha and 362-1600 m^2/ha cover (Table 2) while *Hippophae rhamnoides* was also dominant species in 5 stands out of 16 stands with 10-24 % IVI, 267-600 density /ha and 294-1050 m^2/ha cover (Table 2). The associated species *Thymus linearis* distributed in 15 stands, *Berberis lycium* in 13 stands and *Artemisia maritima* in 12 stands. Other associated species contributed varied IVI values *i-e Nepeta sp* 4% and *Lentopodium himalyanum* 2% recorded in Arandu-3(stand 8), *Ephedra sp* 3% and *sedum roseum* 2% in Shigar-1(stand 21), *Mentha sp* and *Lectuca sp* 5% *Rheum sp* 2% in Shigar-2(stand 22), *and Astragalus gilgitensis* 1% in Bagrot (stand 10). *Artemisia roxburgiana* and *Taraxacum nigrum* 5%, *Lentopodium nanum* and *Rubus ulmifolius* 3%, *Geranium collinum* 2% *in* Hopar (stand 11). *Festuca communsii* 1% in Thally-1(stand15).

***Hippophae-Ribes alpestre* Community:** This community is located at Stak-2 (Stand 13) at the elevation of 2782 m where degree of slope was 20°(Table 3).The vegetation was existed along with glaciers, indicating soil erosion .Village is also close to these bushy areas therefore anthropogenic disturbance also present. The dominant species *Hippophae rhamnoides* was distributed with 15% IVI, 400 density/ha and 623 m^2/ha cover. The co-dominant species was *Ribes alpestre* associated with 13% IVI, 333 density/ha and 675 m^2/ha cover (Table 2). Eighteen species contributed to this stand in which *Rosa webbiana* and *Ribes orientale,* 9 % IVI, *Berberis lycium* 8 % IVI and *Bistorta affinis* associated with 6% IVI.

***Rosa-Ribes* orientale Community:** Like previous community this community is also distributed at one location (Kowardo, stand 17). Its elevation was 2197m while degree of slope was 50° (Table 3). Anthropogenic disturbance was less than previous stand due to the high elevation and steep slope. Ground flora was rich in grasses with loamy soil. The dominant species was *Rosa webbiana* with 33% IVI, 1067 density/ha and 2197 m^2/ha cover (Table 2). The co-dominant species *Ribes orientale* was distributed with 13 % IVI, 467 density/ha and 790 m^2/ha cover. Eighteen species contributed to this stand in which *Berberis lycium* 9% IVI, *Sedum quadrifidum* 8 % IVI, *Taraxacum officinale* and *Thymus linearis* 5% IVI and *Ribes alpestre* were contributed 4% IVI.

***Rosa-Berberis* Community:** This community is located at Arandu-1 and Braldu 1-1 (Stand 18, 27). The ground surface was rich in vegetation and close to village therefore anthropogenic disturbance were prominent resulting soil erosion in loamy soil. The elevation ranges from 2790 to 2858 m while degree of slope was between 20 to 25°(Table 3).The leading dominant species *Rosa webbiana* occupied 21 to 26 % IVI, 267 to 400 density /ha and 452 to 513 m^2/ha cover. The co-dominant species *Berberis lycium* has 12 to 21% IVI, 133-400 density/ha and 188-513 m^2/ha cover (Table 2). This community composed of 15 species in which four species *Hippophae rhamnoides* (IVI 27-28%) *Astragalus zanskrensis* (5-9 %), *Anaphalis virgata (* 4-9%) and *Spiraea canescens* (2-3% IVI) were recorded in both stands. *Artemisia maritima* with 10% IVI and *Ephedra geradiana* (6% IVI) were found only in Arandu-1 while *Thymus linearis* (*8*% IVI) *Taraxacum officinale*(7% IVI) *Bistorta affinis* (6% IVI), *Carum carvi* (5% IVI), *Lentopodium sp* (4 % IVI) and *Potentilla sp* (3 % IVI) were found only in Braldu 1-1.

***Hippophae-Tamarix* Community:** Shimshal 1-2 and Shimshal 2-1 (stand 24, 25) were dominated by this community where elevation ranged from 3065 to 3076 m on nearly flat surface (Table 3).Vegetation was rich and existed along with river. Soil was sandy in Shimshal 1-2 and muddy type in Shimshal 2-1. Village is surrounding with high mountains and temperature was not so clod although glaciers were near. The dominant species *Hippophae rhamnoides* showed 22-24 % IVI, 533-600 density/ha and 689-686 m^2/ha cover. The co-dominant species *Tamarix indica* have 10 to 14 IVI %, 333-533 density/ha and 215-244 m^2/ha cover (Table 2). This community was composed of 17 species with 8 similar species in both stands *i-e Rosa webbiana* (IVI 10-12%), *Juniperus communis* (7-9% IVI) , *Tarxacum officinale* (7% IVI), *Thymus linearis* (5-7% IVI), *Silene vulgaris* (5-7% IVI) , *Ribes alpestre (*5-6 % IVI), *Bistorta affinis* (4-5% IVI), and *Anaphalis virgata* 4% IVI . *Cicer songaricum* 5% IVI *and Geranium pratense* with 1% IVI *were* recorded in Shimshal 2-1 while *Ribes orientale* 9% IVI, *Artemisia maritima 4*% IVI, *Lentopodium sp* 3% IVI, *Sedum sp* and *Potentilla sp* 2% IVI *were* found only in Shimshal 1-2.

***Berberis-Tamarix* Community:** This community is located at Braldu 1-2 (stand 28) at the elevation of 2910m while degree of slope was 20 °. Vegetation was near to river where anthropogenic disturbances were less as compare to other stands. Soil erosion was present in sandy soil. The dominant species was *Berberis lycium* with 19% IVI, 467 density/ha and 434 m^2/ha cover. The co-dominant species *Tamarix indica* occupied 17 % IVI, 333 density /ha and 435 m^2/ha cover. Twelve species were associated with this community. Associated species *Hippophae rhamnoides* with 13 % IVI, *Rosa webbiana* 8% IVI , *Thymus linearis* and *Taraxacum officinale* 7% IVI , *Bistorta affinis* and *Artemesia sp* 5 %, IVI *Geranium pratense* was present with 4% IVI.

National Park covered 10,000 sq.km. area is one of the famous national park of Pakistan. It is important for its unique topography, landscape, snow covered peaks, harsh weather, wildlife and flora. However due to long history of human interference the flora is rapidly degrading. Few areas under the snow covered peak are dominating with pine species like *Picea smithiana, Pinus wallichiana* while comparatively some of the dry valleys are occupied by scattered, stunted and disturbed *Juniperus excelsa* trees. These forests tree species are under high pressure and threatened due to unavailability of cheap alternate fuel.

Among shrubs, herb and grasses, the dominant species associated with *Picea-Pinus wallichiana* community are *Astragalus gilgitensis, Impatiens balfourii, Lentopodium himalayanum, Rubus ulmifolius, Spiraea canescens, Taraxacum officinale,* and *Taraxacum karakorium* while *Astragalus gilgitensis, Berberis vulgaris, Cicer songaricum, Fragaria nubicola, Lentopodium himalayanum, Rubus ulmifolius, Sedum multicepes, Sedum quadrifidum, Tanacetum artemisoides, Taraxacum officinale* and *Trifolium repnes* were dominated with

Juniperus excelsa pure stand. *Astragalus gilgitensis, Bergenia stracheyi, Geranium pratens, Juniperus communis, Sedum quadifidum, Taraxacum officinale, Trifolium repnes* and *Urtica dioca* associated with *Picea smithiana* while *Taraxacum karakorium, Astragalus gilgitensis, Rubus ulmifolius, Taraxacum nigrum, Artemisia roxburgiana* and *Lentopodium nanum* were distributed with *Pinus wallichiana* pure stand.

Non forested areas were widely dominated by *Rosa-Hippophae* community. This community occupied sixteen sites. Dominating species *Rosa webbiana* also associated with tree species in various forests. In addition this species was also associated with *Ribes orientale* and *Berberis lycium* forming communities in three locations. *Hippophae rhamnoides* appeared as a first leading dominant with *Ribes alpestre* and *Tamarix indica.* All above species preferred higher amount of moisture therefore distributed near glaciers, dry streams near the springs or rivers. These areas are highly affected by overgrazing .several medicinal plants going in the park are also in high risk due to plant pickers. Therefore prompt action, conservational measure and scientific management plan is required to save flora of the unique national Park.

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