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The baseline inventory of the plant biodiversity of central karakorum national park Gilgit-Baltistan (District Hunza Nagar) Pakistan

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Abstract

The baseline study of the flora of Central Karakorum National Park (CKNP) was carried out by field's trips conduct in the different seasons of the years. The study area was thoroughly surveyed throughout the year to ensure the collection of maximum diversity. The current study focus to the flowering biodiversity exists in the study area. For this purpose we collected the plant specimen from different localities of CKNP, Which give us total number of plant species, genera and plant families. The collected specimen consist of (200) plant species which belongs to 102 genera and 34 families. During the plant collection along the inventorying we observed the distribution of taxa and their dominance in the existing flora. The prime aim of this research is to provide the inclusive scientific inventory of existing flora of CKNP and define the dominant families and genera of the study area.

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Introduction

Central Karakoram National Park is the largest national park of Pakistan, was established in 1993. The park encompasses with an area of 10,000 sq. km. with most of its altitude above 2500m, while the highest point in the park is 8611m K-2 Peak. Major part of the CKNP lies in the Skardu district of Gilgit-Baltistan; about 40% part lies in the study area.

Some of the world's highest peaks and largest glaciers; there are sixty peaks above 7000m, and ten of the world's highest and most famous mountains including Gasherbrum, Broad peak, and Masherbrum are located within the Park's boundaries (www.icimod.org). The CKNP glaciers feed the Indus river and its tributaries, therefore this park is the largest source of freshwater for Pakistan and one of the largest mountain glacial systems in the world with the Siachen (75 km long), Baltoro (57 km long), and Hispur-Biafo (122km long) glaciers all originating within the Park boundaries **(WWF. 2009**).

Any detail information of inventory about Park's plant biodiversity is not available. Inventorying refers to the production of a list or inventory of biodiversity, usually focused on species diversity; monitoring on the other hand refer to the recording of changes in biodiversity (Coddington *et al.* 1991), or systemic collection of data over space and time with effective and rigorous documentation of change (Kutt *et al.* 2009). Inventorying of any group of organisms is not complete in Pakistan, and there is very little monitorying (Khatoon *et al.* 2004, 2005). Recently, Khan (2009) has done the inventorying and monitoring of floral biodiversity in the Haramosh and Bugrote valleys of Gilgit (northern Pakistan). Plant inventories are at the heart of conservation efforts (Lozano *et al.* 2012).

Material and methods

Collection of plant specimen and Field data

The reconnaissance study was conducted in the part of Central KarakorumNational park (KNP), situated in the districted Hunza Nagar Gilgit-Baltistan. The study area was thoroughly surveyed by field trips in different seasons of the year. It provides an opportunity to make plant collection observation. During the field survey along the collection of plant specimen we observed the dominant taxa in the current flora and their distribution.

Identification of Plant specimen

The collected specimens were identified with the help of Flora of Pakistan (Nasir & Ali, 1970-1989) and Ali and Nasir 1989-1991 and using available literature and comparison of specimen at Karachi University Herbarium.

Result and discussion

Flora of CKNP

The study area includes Part of Central Karakoram National Park (CKNP). In the present inventorying, 200 species have been recorded from CKNP. The complete list is given in the (Table-1). The 200 species of CKNP belong to 102 genera and 34 families. The Central Karakoram National Park (CKNP) which has roughly 40% of its area in the study area. As CKNP boundaries have still not been exactly demarcated, it is not possible to tell its exact dimensions, however its major part is present in the district Skardu of Gilgit-Baltistan. Recently, studies at the global or local scale that attempt to investigate the spatial patterns of species richness have become increasingly popular (Mazaris *et al.* 2008). Inventories and surveys provide important information regarding the spatial distribution of species (Sammul *et al.* 2008). At the present, plant surveys of any kind are a very active pursuit throughout the world, producing extraordinarily useful plant databases with elaborate information and large amount of records (Lozano *et al.* 2012). Many of the world s hot spots are in the mountain regions, as are many protected areas (Thorsell, 1997).

Distribution of Flora in CKNP

The floristic composition of vegetation varies along the altitudinal gradient. Plants along the altitudinal gradient are exposed to gradients of solar radiation,

temperature, and precipitation (Anonymous 2008). In CKNP, the larger families ranking from one to five were: Compositae (29), Rosaceae (18), Brassicaceae (15), Papilionaceae (15), Umbelliferae (14), and Poaceae (9). While in CKNP the five larger genera were *Potentilla* (15), *Draba* (9), *Rhodiola* (7), *Astragalus* (6) and *Bupleurum* (6). The distribution of the families was observed in the whole study area. But the distribution of genera was observed restricted in different ecological zones. But only few genera were found in different ecological zones.

Habitat shift of species

Climate change has strongly influenced distribution and abundance of plant range margins of both in latitude and elevation (Hickling *et al.* 2006: Tryjanowski. 2005).

The consequences of climate change include changes in species distribution, increased extinction rates, changes in reproduction timings, and changes in length of growing seasons (Heywood 1995). As warming continues, some irreparable consequences including threats to species, then distribution, shift of habitat, and extinctions will occur (Li *et al.* 2013). In fact, habitat shifts are occurring at alarming rates all over the globe and changes in ecological systems have been reported across all biomes (Franzen and Molander, 2012). In the present work as well migration of species towards higher altitudes has been noticed during the study years.

Table 1. Species List of Central Karakorum National Park.

Serial No.	Family	Name of plant
	Gymnosperms-	
1	Cupressaceae	*Juniperus communis* L.
2	Cupressaceae	*Juniperus excelsa* M.Bieb.
3	Cupressaceae	*Juniperus turkestanica* Komarov
4	Pinaceae	*Picea smithiana* (Wall.)Boiss.
5	Pinaceae	*Pinus wallichiana* A.B.Jackson
		Angiosperms-Dicots
6	Balsaminaceae	*Impatiens brachycentra* Kar. & Kir.
7	Balsaminaceae	*Impatiens edgeworthii* Hook.f.
8	Boraginaceae	*Arnebia euchroma* (Royle ex Benth,)I.M.Johnston
9	Boraginaceae	*Cynoglossum lanceolatum* Forssk.
10	Boraginaceae	*Pseudomertensia* echioides (Benth.) Riedl
11	Boraginaceae	*Pseudomertensia moltkioides* (Royle ex Benth.)Kazmi
12	Boraginaceae	*Pseudomertensia trollii* (Melch.) Stewart & Kazmi var,*trollii*
13	Boraginaceae	*Pseudomertensia trollii* (Melch.) Stewart & Kazmi var.*edelbergii* (Rech,f.& Riedl) Kazmi
14	Brassicaceae	*Arabidopsis brevicaulis* (Jafri) Jafri
15	Brassicaceae	*Arabidopsis mollissima* (C.A.Mey) N.Busch
16	Brassicaceae	*Arabis pterosperma* Edgew.
17	Brassicaceae	*Arabis tibetica* Hook.f. & Thoms.
18	Brassicaceae	*Conringia planisiliqua* Fisch. & Mey.
19	Brassicaceae	*Draba lanceolata* Royle
20	Brassicaceae	*Draba affghanica* Boiss.
21	Brassicaceae	*Draba cachemirica* Gand.
22	Brassicaceae	*Draba korshinskyi* (O.Fedt.) Phole
23	Brassicaceae	*Draba lanceolata* Royle
24	Brassicaceae	*Draba lasiophylla* Royle
25	Brassicaceae	*Draba melanopus* Kom.
26	Brassicaceae	*Draba oreades* Schrenk
27	Brassicaceae	*Draba stenocarpa* Hook.f. & Thoms.
28	Brassicaceae	*Lepidium sativum* L.
29	Campanulaceae	*Codonopsis clematidea* (Schrenk) C.B. Clarke
30	Caryophyllaceae	*Lepyrodiclis holosteoides* (C.A.Mey.)Fenzl ex F.& M.
31	Caryophyllaceae	*Silene moorcroftiana* Wall ex Benth.
32	Caryophyllaceae	*Spergula fallax* (Lowe) E.H.L. Krause
33	Caryophyllaceae	*Stellaria montioides* (Edgew &Hook.f.)S.A.Ghazanfar

Serial No.	Family	Name of plant
34	Chenopodiaceae	*Atriplex tatarica* L.
35	Chenopodiaceae	*Kochia scoparia* (L.) Schrad.
36	Chenopodiaceae	*Salsola tragus* L.
37	Compositae	*Allardia glabra* Decne.
38	Compositae	*Allardia stoliczkae* CB.Clarke
39	Compositae	*Allardia tomentosa*.Decne.
40	Compositae	*Allardia tridactylites* (Kar. & Kir.) Schultz-Bip
41	Compositae	*Anaphalis boissieri* E.Georgiadou.
42	Compositae	*Anaphalis chitralensis* Qaiser & Rubina Abid
43	Compositae	*Anaphalis nepalensis* (Spreng.)Hand.-Mazz.
44	Compositae	*Anthemis cotula* L.
45	Compositae	*Aster flaccidus* Bung
46	Compositae	*Brachyactis pubescens* (DC.)Aitch
47	Compositae	*Brachyactis roylei* (DC.) Wend.
48	Compositae	*Conyza japonica* Less.
49	Compositae	*Hieracium umbellatum* L.
50	Compositae	*Hieracium vulgatum* Fries
51	Compositae	*Hieracium virosum* Pall.
52	Compositae	*Jurinea ceratocarpa* (Dcne.)Bth.
53	Compositae	*Jurinea himalaica* RRS.
54	Compositae	*Lactuca serriola* L.
55	Compositae	*Ligularia thomsonii* (Clarke) Kitam.
56	Compositae	*Mulgedium clarke* (Hook.f)
57	Compositae	*Myriactis wallichii* Less.
58	Compositae	*Psychrogeton andryaloides* (DC.)Novopokr.ex Krasch. var. *andryaloides*
59	Compositae	*Scorzonera koslovskyi* Sonson
60	Compositae	*Scorzonera virgata* DC.
61	Compositae	*Senecio kraschenninikovii* Schischkin
62	Compositae	*Solidago virgaurea* L.
63	Compositae	*Tanacetum artemisioides* Schultz-Bip.ex Hook.f.
64	Compositae	*Tanacetum falconeri* Hook.f.
65	Compositae	*Youngia gracilips* (Hook.f.)Babcock& Stebbins
66	Crassulaceae	*Hylotelephium pakistanicum* (G.R. Sarwar) G.R.Sarwar
67	Crassulaceae	*Pseudosedum condensatum* Boriss.
68	Crassulaceae	*Rhodiola fastigiata* (Hook.f.& Thomson) S.H.Fu
69	Crassulaceae	*Rhodiola hetrodonta* (Hook.f. & Thomson)
70	Crassulaceae	*Rhodiola imbricata* Edgew.
71	Crassulaceae	*Rhodiola quadrifida* (Palls) Schrenk
72	Crassulaceae	*Rhodiola recticaulis* Boriss.
73	Crassulaceae	*Rhodiola tibetica* (Hook.f. &Thomson) S.H.Fu
74	Crassulaceae	*Rhodiola saxifragoides* (Frod.) H. Ohba
75	Fumariaceae	*Corydalis crithmifolia* Royle
76	Fumariaceae	*Corydalis pseudocrithmifolia* Jafri
77	Gentianaceae	*Jaeschkea oligosperma* (Griseb.) Knobl.
78	Gentianaceae	*Lomatogonium carinathiacum* (Wulf.)A.Br.
79	Gentianaceae	*Lomatogonium coeruleum* (Royle) H.Simth ex B.L.Burt.
80	Gentianaceae	*Swertia ciliata* (G.Don) B.L. Burtt
81	Geraniaceae	*Geranium collinum* Steph.ex Willd.
82	Geraniaceae	*Geranium himalayense* Kl.
83	Geraniaceae	*Geranium pamiricum* Ikonnikov
84	Geraniaceae	*Geranium pratense* L. var.*stewartianium* Y.Nasir
85	Geraniaceae	*Geranium swatense* Schonbeck-Temesy
86	Geraniaceae	*Geranium wallichianum* D.Don ex Sweet
87	Grossulariaceae	*Ribes alpestre* Decne.
88	Grossulariaceae	*Ribes himalense* Decne.
89	Grossulariaceae	*Ribes orientale* Desf. Hist.
90	Labiatae	*Nepeta eriostachys* Benth.
91	Labiatae	*Nepeta laevigata* (D.Don) Hand-Mazz
92	Labiatae	*Nepeta leucolaena* Benth ex Hook.f.
93	Labiatae	*Nepeta nervosa* Royle ex Benth.
94	Labiatae	*Scutellaria chamaedrifolia* Hedge & Paton
95	Labiatae	*Scutellaria heydei* Hook.f.
96	Labiatae	*Scutellaria paulsenii* Briq.
97	Onagraceae	*Epilobium agustifolium* L.

Serial No.	Family	Name of plant
98	Papilionaceae	*Arachis hypogaea* L.
99	Papilionaceae	*Astragalus himalayanus* Klotzsch
100	Papilionaceae	*Astragalus hoffmeisteri* (Klotzsch)Alis
101	Papilionaceae	*Astragalus penduncularis* Royle ex Benth.
102	Papilionaceae	*Astragalus subumbellatus* Klotzsch
103	Papilionaceae	*Astragalus tibetanus* Benth. ex Bung.
104	Papilionaceae	*Astragalus tribuloides* Delile
105	Papilionaceae	*Caragana brevifolia* Komarov
106	Papilionaceae	*Caragana tragacanthoides* Delil
107	Papilionaceae	*Lathyrus sativus* L.
108	Papilionaceae	*Oxytropis crassiuscula* A.Boriss.
109	Papilionaceae	*Oxytropis glabra* DC.
110	Papilionaceae	*Oxytropis mollis* Royle ex Benth.
111	Papilionaceae	*Oxytropis staintoniana* Ali
112	Papilionaceae	*Oxytropis tatarica* Camb.ex Bunge
113	Parnassiaceae	*Parnassia nubicola* Wall ex Royl subsp.occidentalis E.S.Temesy
114	Polygonaceae	*Fagopyrum dibotrys* (D.Don)Hara
115	Polygonaceae	*Oxyria digyna* (L) Hill
116	Polygonaceae	*Polygonum polycnemoides* Jaubert & Spach.
117	Polygonaceae	*Rumex crispellus* Rech.f.
118	Primulaceae	*Androsace baltistanica* Y.Nasir
119	Primulaceae	*Androsace muscoidea* Duby
120	Primulaceae	*Androsace rotundifolia* Hardwicke
121	Primulaceae	*Androsace septentrionalis* L.
122	Primulaceae	*Androsace thomsonii* (Watt) Y.Nasir, stat nov.
123	Primulaceae	*Cortusa brotheri* Pex ex Lipsky
124	Primulaceae	*Primula elliptica* Royle
125	Primulaceae	*Primula rosa* Royle
126	Primulaceae	*Primula schlagintweitiana* Pax
127	Ranunculaceae	*Aconitum violaceum* Stapf
128	Ranunculaceae	*Anemone rupicola* Camb.
129	Ranunculaceae	*Aquilegia fragrans* Benth. *var.fragrans*
130	Ranunculaceae	*Aquilegia moorcroftiana* Wall ex Royle
131	Ranunculaceae	*Aquilegia pubiflora* Wall ex Royle
132	Ranunculaceae	*Delphinium brunonianum* Royle
133	Ranunculaceae	*Pulsatilla wallichiana* (Royle) Ulbr.
134	Ranunculaceae	*Ranunculus laetus* Wall.ex Hook.f. & Thoms.
135	Rosaceae	*Fragaria nubicola* (H.f.) Lindl. ex Lacaita
136	Rosaceae	*Potentilla agrimonioides* M.Bied.
137	Rosaceae	*Potentilla cathaclines* Lehm.
138	Rosaceae	*Potentilla doubjouneana* Cambess
139	Rosaceae	*Potentilla eriocarpa* Wall. Ex Lehm
140	Rosaceae	*Potentilla evestita* Th.Wolf
141	Rosaceae	*Potentilla grisea* Juz.
142	Rosaceae	*Potentilla hololeuca* Boiss.
143	Rosaceae	*Potentilla monanthes* Lindl. ex Lehm
144	Rosaceae	*Potentilla multifida* L.
145	Rosaceae	*Potentilla ochreata* Lindl.
146	Rosaceae	*Potentilla pamirica* Th. Wolf var.*pamiroalaica* (Juz.) M.Shah & Wilcock
147	Rosaceae	*Potentilla subdigitata* Yu et Li
148	Rosaceae	*Potentilla supina*L.subsp. p*aradoxa* (Nutt.exTorrey & Gray) Th. Wolf
149	Rosaceae	*Potentilla turczaninowiana* Stscheg var. *turczaninowiana*
150	Rosaceae	*Potentilla tephroleuca* T.H, wolf.
151	Rosaceae	*Sibbaldia procumbens* L.
152	Rosaceae	*Sorbus tianschanica* Rupr
153	Rubiaceae	*Asperula oppositifolia* Reg. & Schmalh.
154	Rubiaceae	*Galium ceratophylloides* Hook.f.
155	Rubiaceae	*Galium pauciflorum* Bunge
156	Salicaceae	*Salix iliensis* Regel
157	Salicaceae	*Salix karelinii* Turcz.
158	Saxifragaceae	*Bergenia stracheyi* Hook.f.Thoms
159	Saxifragaceae	*Saxifraga sibirica* L.
160	Scrophulariaceae	*Euphrasia incisa* Pennell
161	Scrophulariaceae	*Euphrasia petiolaris* Wettst.
162	Scrophulariaceae	*Scrophularia decomposita* Royle ex Bth.

Serial No.	Family	Name of plant
163	Scrophulariaceae	*Scrophularia nudata* Pennell
164	Scrophulariaceae	*Veronica alpina* Pennell
165	Umbelliferae	*Aegopodium alpestre* Ledeb.
166	Umbelliferae	*Bunium persicum* (Boiss) Fedtsch.
167	Umbelliferae	*Bupleurum aitchisonii* (Boiss.)Wolff
168	Umbelliferae	*Bupleurum candollei* Wall. ex DC.
169	Umbelliferae	*Bupleurum gracillimum* Kl.
170	Umbelliferae	*Bupleurum linearifolium* Dc.
171	Umbelliferae	*Bupleurum marginatum* Wall.ex DC.
172	Umbelliferae	*Bupleurum tenue* Buch. Ham. ex Don.
173	Umbelliferae	*Carum carvi* L.
174	Umbelliferae	*Pleurospermum candollei* (DC.) Clarke
175	Umbelliferae	*Pleurospermum govanianum* (DC.) Clarke
176	Umbelliferae	*Pleurospermum stellatum* Benth.var.*lindleyanum* (Kl.) Clarke
177	Umbelliferae	*Selinum filicifolium* (Edgew.) E.Nasir
178	Umbelliferae	*Torilis leptophylla* (L.) Reichb.
179	Urticaceae	*Urtica dioica* L.
180	Urticaceae	*Urtica hyperborea* Jacq. ex Wedd.
181	Urticaceae	*Parietaria judaica* Del.
182	Valerianaceae	*Valeriana himalayana* Grubov
183	Valerianaceae	*Valeriana jaeschkeyi* C.B.Clarke var.*jaeschkei*
184	Valerianaceae	*Valeriana stracheyi* C.B.Clarke
185	Violaceae	*Viola fedtschenkoana* W.Bkr.
186	Violaceae	*Viola rupestris* F.W.Schm
		Angiosperms- Monocots
187	Alliaceae	*Allium consanguineum* Kunth,
188	Alliaceae	*Allium filifolium* Regel
189	Alliaceae	*Allium tuberosum* Rottl. Ex Spreng.
190	Juncaceae	*Juncus membranaceus* Royle ex Don
191	Liliaceae	*Tulipa clusiana* DC.
192	Poaceae	*Agrostis gigantea* Roth
193	Poaceae	*Aristida cyantha* Nees ex Steud.
194	Poaceae	*Bromus japonica* Thunb. Ex Murr.
195	Poaceae	*Bromus pectinatus* Thunb.
196	Poaceae	*Elymus nutans* Griseb.
197	Poaceae	*Phleum alpinum* L.
198	Poaceae	*Poa attenuata* Trin.
199	Poaceae	*Poa pratensis* L.
200	Poaceae	*Stipa sibirica* (L.) Lam.

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