



**ORIGINAL ARTICLE**

**Bird Diversity index of Grassland Ecosystem around Yavatmal, Central Indian**

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**ABSTRACT**

*The study areas including six grasslands that were routinely visited for six month. The observational records said that total one sixty birds including twenty-three migratory species belonging to forty-five families were sighted in the area. All the grasslands are almost similar texture regarding floral diversity, soil quality, slope-up, downs, and surrounding area so the majority (108) species share all the grasslands. Twelve bird's species were sighted in a single habitat, 08 in two, 05 in three, 13 in four, 14 in five habitats. The Shannon diversity index has applied to analyzing counting data and results reveals that diversity index  $H$ -(NG-4.6, BG-4.60, UER-4.63, BEG-4.52, JR-4.61, CG-4.61), maximum diversity  $H_{max}$ -(5.07 to all) and evenness  $E$ -( NG-.90, BG-.90, UER-. 91, BEG-.89, JR-.90, CG-.90). Finally it is clear that species diversity index of all the grassland is same except BEG. The grassland facing so many problems like deforestation, over grazing and poaching, so the list of birds loses their perching & feeding ground and migrates from the areas. It was noticed that migratory number including winter migration is greatly affected so there will no surprise if coming year few birds only visited to grassland area. Prior action should be taken to stop anthropogenic activities in the area and scientific study will regularly conducted which helps us to know upgrading status of birds and surrounding area. With a few precaution the diversity index of birds of all the grassland will increased and Yavatmal region will be known as a new destination for grassland Birds.*

**Key words:** Bird diversity index, grassland ecosystem, Yavatmal city

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**INTRODUCTION**

Grasslands cover around 40 percent of the earth's surface, and they exist in both temperate and tropical regions, generally within the dry interior areas of landmasses. Several scientists have discussed ecological status of grassland in India. They have opined that the climax vegetation of India would be forests, or grasslands or desert vegetation. Grasslands in India are lands dominated by grasses with certain number of other plants like trees, shrubs and herbs. Indian grasslands are found at various altitudes and in various geographical regions under various climatic conditions. Thus, there are grasslands, which are found at altitudes higher than 2100 metres where the temperature is cold. In addition, there are grasslands, which are found at altitude between 150 to 300 metres where the temperature is warm. Grasslands of India are home to some of the most endangered species of animals and birds some of which are endemic. Even certain species of plants are only found in grasslands only. Insects and birds are the most common components of Indian Grasslands. The grasslands of the world are home to a wide range of birds that have adapted to life among the grasses and wildflowers. *Sehima-Dichanthium* Type of grassland are spread over the Central Indian plateau, Choto-Nagpur plateau and Aravalli ranges, covering an area of about 17,40,000 km<sup>2</sup>. There are 24 species of perennial grasses, 89 species of annual grasses and 129 species of dicots,

including 56 legumes. This is also a rich wildlife area, with a large number of protected areas, especially forest protected areas. Present study is based on Bird diversity index and to understand the status of grassland ecosystem around Yavatmal, Central Indian.

# MATERIALS AND METHODS

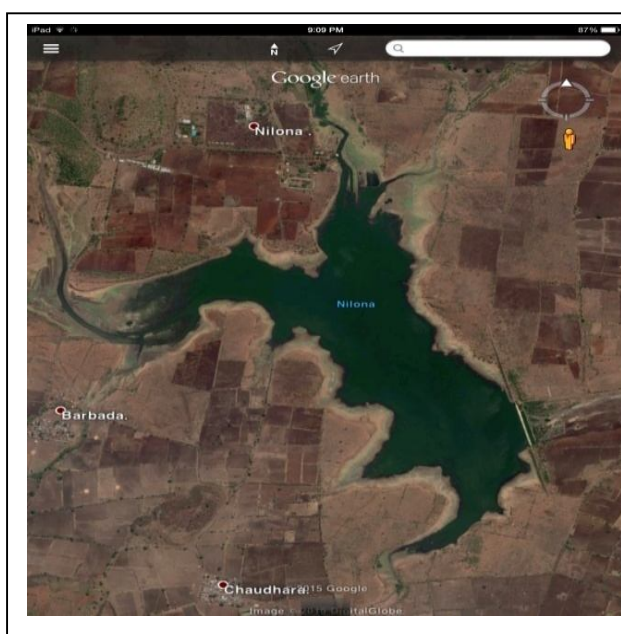
This paper mainly focuses on small grasslands, which were situated around fresh water resources, near forest and agricultural field around Yavatmal city. The study areas are Nilona grassland (NG), Borgaon grassland (BG), Jam range (JR), Umerda-Echori range (UER), Bemda grassland (BEG) and Chousala grassland (CG). The area is dominated by grasses but shrubs, herbs and trees are abundantly covers the area.



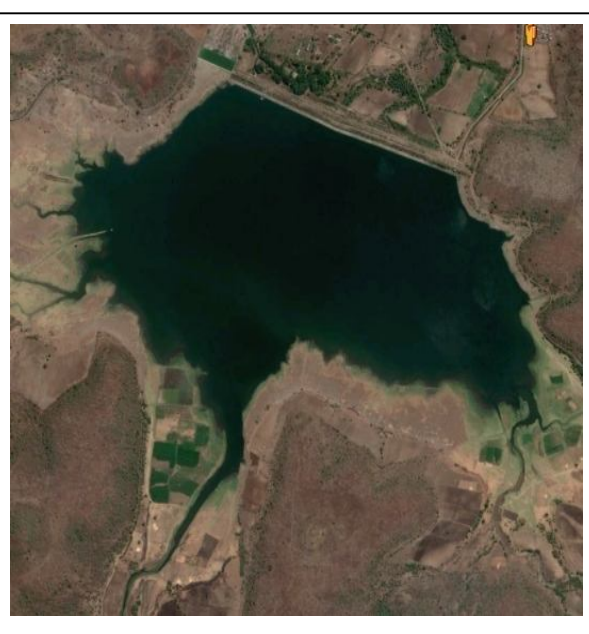
**Fig.1:** Jam range 20°21'07.97"N- 78°06'28.04"E.



**Fig. 2:** Umerda-Echori range 20°22'16.40"N 78°02'54.69"E



**Fig. 3:** Nilona grassland 78° -8'-32N"-20°-23'-10"E



**Fig. 4:** Borgaon grassland 78° -17'-43"N-20° -27'16"E



**Fig.5:** Chousala grassland 78° -04'-41.43''N-20°-25'-04.04''E

**Fig. 6:** Bemda grassland 78° -8'-05.88''N-20°-28'-07.20''E

Study duration was between Sept.2015 to Feb.2016. Birds Photos were taken by using Digital coolpix 520 Nikon for visual records. Celestron 10X50 binocular was used for observations. Bird diversity and their index have been studied by regular visit to these places specially morning and evening hours and available data helps to prepare the result. The data were analyzed using Shannon Wiener function formula; species diversity (H), maximum diversity (Hmax), and evenness (E)

$$H = \sum_{i=1}^S - (P_i * \ln P_i) \quad H_{\max} = \log S \quad E = H / H_{\max}$$

## RESULTS AND DISCUSSION

Almost six months of observationary records helps to reveals the results that clearly indicate the areas have rich in avifauna diversity as well as their numbers. One sixty species of birds belonging to forty-five families were observed during study period from the selected grassland. All the details is mention in Table No.-1. Laughing dove, Indian pond heron and Red vented bulbul were most common and sighted in the every visit. Some species like Yellow-legged buttonquail in Jam range, European roller in Chausala grassland, Sirkeer malkoha & Savannah nightjar in Umred Echori range. Indian thick-knee on Bemda grassland, Pied harrier on Nilona grassland and Montagu's harrier in Umred-Echori range, Eurasian Sparrow hawk & Brown shrike on Nilona grassland, Large billed Crow on Umred-echori range and Common rose-finch on Nilona grassland was restricted and found only in single and specific habitat. It was observed that twelve species recorded in the single habitat, eight species in two habitat, five species in three habitat, thirteen species in four habitat, fourteen species in five habitat and one hundred eight species in the entire habitat. Species wise Details regarding to their occurrence is mention in Table 2. The Shannon diversity index has applied to analyzing data and results shows that diversity index H regarding all the grassland is all most same except BED, maximum diversity H max values are common to all and Evenness is again common with minor variation in BED. All the values are given in the Table No. 3. The graph reflects that all values near about similar so there is a simple graph plotted with point values variation. (Graph-1)

It is concluded that the number of species sighted during search is satisfactory that is compare to grassland types. On Nilona grassland total 2418 including all species are



counted and remaining grass land like Borgaon -2533, Umerda-echori -2578, Bembda -2267, Jam -2387 and Chuasala grass-2379 are observed.

All grasslands having near about similar type of flora, it up & down land. Most of the area has covered with agricultural field that helps to solve the problem of feeding but poaching and deforestation are the main causes of destruction of habitat so it is need to look on positively and take serious action against them. The search is continued and there is no doubt the species number will increased in future.

**Table 1:** Species classification and occurrence details in different grassland

SN	Common Name	Scientific Name	Family	Numbers of times Counted						Total
				NG	BG	UE R	BE G	JR	CF	
1	Francolinus pondicerianus	Grey francolin	Phasianidae	23	10	12	20	09	11	85
2	Francolinus pictus	Painted francolin		02	04	11	04	01	02	24
3	Tumix suscitator	Barred buttonquail	Turnicidae	12	20	14	10	16	09	81
4	Turnix tanki	Yellow-legged buttonquail		00	00	00	00	03	00	03
5	Turnix sylvatica	Small buttonquail		05	07	06	09	03	05	35
6	Gallus gallus	Red jungle fowl	Phasianidae	00	00	02	00	02	04	08
7	Pavo cristatus	Indian peafowl		00	19	25	00	16	23	83
8	Jynx torquilla	Eurasian wryneck	Picidae	14	02	03	10	02	10	51
9	Dendrocopos nanus	Browncapped pygmy woodpecker		07	09	14	02	14	21	67
10	Dendrocopos mahrattensis	Yellow-crowned woodpecker		07	02	12	05	23	20	69
11	Chrysocolaptes lucidus	Greater flame back		05	07	18	20	27	25	102
12	Chrysocolaptes festivus	White-napped woodpecker		02	00	14	03	22	20	61
13	Megalaima haemacephala	Coppersmith barbet	Megalaimidae	23	29	27	12	32	28	151
14	Ocyrceros birostris	Indian grey hornbill	Bucerotidae	06	14	26	02	27	18	93
15	Upupa epops	Common hoopoe	Upupidae	28	25	29	23	06	21	132
16	Coracias benghalensis	Indian roller	Coraciidae	34	32	36	24	28	29	183
17	Coracias garrulous	European roller		00	00	00	00	00	07	07
18	Alcedo atthis	Common kingfisher	Alcedinidae	36	37	25	23	23	00	144
19	Halcyon smyrnensis	White throated kingfisher	Halcyonidae	38	40	43	40	36	24	221
20	Ceryle rudis	Pied Kingfisher	Cerylidae	18	25	12	19	09	00	83
21	Merops orientalis	Green bee eater	Meropidae	46	45	43	42	46	37	259
22	Clamator jacobinus	Pied cuckoo	Cuculidae	10	04	14	07	06	11	52
23	Hierococcyx sparveriioides	Large hawk cuckoo		02	03	06	01	02	01	15
24	Hierococcyx varius	Common hawk cuckoo		14	09	05	07	03	06	44
25	Cuculus micropterus	Indian cuckoo		04	05	09	02	10	05	35
26	Cuculus canorus	Eurasian cuckoo		03	04	05	03	09	07	31
27	Cacomantis passerinus	Grey -bellied cuckoo		05	09	04	06	08	04	36
28	Cacomantis merulinus	Plaintive cuckoo		02	04	03	07	03	01	20
29	Eudynamis scolopacea	Asian koel		07	03	06	09	10	02	37
30	Phaenicophaeus leschenaultii	Sirkeer malkoha		00	00	02	00	00	00	02
31	Centropus coucal	Greater coucal	Centropodidae	30	34	21	19	27	30	161
32	Psittacula eupatria	Alexandrine parakeet	Psittacidae	10	20	17	20	10	23	100
33	Psittacula krameri	Rose ringed parakeet		37	43	42	28	45	40	235
34	Psittacula cyanocephala	Plum-headed parakeet		19	23	32	14	22	39	149
35	Cypsiurus balasiensis	Asian palm swift	Apodidae	23	29	21	37	22	21	153
36	Apus affinis	House swift		05	03	09	03	07	04	31
37	Hemiprocne coronata	Crested treeswift	Hemiprocneidae	00	32	04	00	00	00	36
38	Tyto alba	Barn owl	Tytonidae	03	06	02	00	07	00	18
39	Athene brama	Spotted owl	Strigidae	35	05	30	07	29	24	130
40	Caprimulgus asiaticus	Indian nightjar	Caprimulgidae	02	04	20	03	07	09	45
41	Caprimulgus affinis	Savannah nightjar		00	00	07	00	00	00	07
42	Columba livia	Rock pigeon	Columbidae	48	49	45	43	47	48	280
43	Streptopelia orientalis	Oriental turtle dove		03	02	05	00	06	00	16
44	Streptopelia senegalensis	Laughing dove		50	50	50	50	50	50	300
45	Streptopelia chinensis	Spotted dove		42	32	45	39	42	46	246
46	Streptopelia tranquebarica	Red collard dove		19	05	10	05	20	17	76
47	Streptopelia decaocto	Eurasian collared dove		29	26	26	34	20	21	156
48	Treron phoenicoptera	Yellow-footed green pigeon		09	03	28	02	34	24	100
49	Amaurornis akool	Brown crane	Rallidae	02	00	20	00	00	00	22
50	Amaurornis phoenicurus	White breasted water hen		14	17	10	00	19	00	60
51	Pterocles indicus	Painted sandgrouse	Pteroclididae	00	00	09	00	02	00	11

52	Burhinus oedicnemus	Indian thick-knee	Burhinidae	00	00	00	05	00	00	05
53	Vanellus malarbaricus	Yellow wattled lapwing	Charadriidae	10	34	41	23	02	12	122
54	Vanellus indicus	Red wattled lapwing		45	46	47	49	43	45	275
55	Cursorius coromandelicus	Indian courser	Glareolidae	00	00	12	00	00	00	12
56	Pernis ptilorhynchus	Oriental honey buzzard	Accipitridae	06	04	09	05	07	09	40
57	Elanus caeruleus	Black shoulder kite		32	29	21	28	20	27	157
58	Milvus migrans	Black kite		02	10	00	02	00	04	18
59	Circaetus gallicus	Short toed snake eagle		04	07	00	04	00	05	20
60	Spilornis cheela	Crested serpent eagle		00	06	13	00	03	04	26
61	Circus aeruginosus	Western marsh harrier		07	00	00	04	00	00	11
62	Circus melanoleucos	Pied harrier		02	00	00	00	00	00	02
63	Circus pygargus	Montagu's harrier		00	00	03	00	00	00	03
64	Accipiter badius	Shikra		21	23	24	29	19	32	148
65	Accipiter nisus	Eurasian sparrow hawk		02	00	00	00	00	00	02
66	Butastur teesa	White-eyed buzzard		25	27	21	28	16	24	141
67	Hieraaetus fasciatus	Bonelli's eagle		03	04	02	00	03	05	17
68	Falco tinnunculus	Common kestrel	Falconidae	20	16	29	26	08	04	103
69	Bubulcus ibis	Cattle egret	Ardeidae	45	48	45	49	49	45	281
70	Ardeola grayii	Indian pond heron		50	50	50	50	50	50	300
71	Butorides striatus	Little heron		25	32	36	33	39	26	191
72	Ixobrychus sinensis	Yellow bittern		02	04	02	06	00	00	14
73	Ixobrychus cinnamomeus	Cinnamon bittern		03	00	01	03	00	00	07
74	Dupetor flavicollis	Black bittern		01	00	02	00	00	00	03
75	Pseudibis papillosa	Black ibis	Threskiornithidae	20	29	06	21	09	02	87
76	Ciconia episcopus	Woolly necked stork	Ciconiidae	20	30	19	21	20	21	131
77	Lanius cristatus	Brown shrike	Laniidae	03	00	00	00	00	00	03
78	Lanius vittatus	Bay backed shrike		34	43	45	32	47	42	243
79	Lanius schach	Long tailed shrike		35	36	42	34	28	23	198
80	Lanius meridionalis	Southern grey shrike		01	00	04	00	00	00	05
81	Dendrocitta vagabunda	Rufous treepie	Corvidae	12	15	20	16	10	18	91
82	Corvus splendens	House crow		16	19	21	22	12	20	110
83	Corvus macrorhynchos	Large billed crow		00	00	05	00	00	00	05
84	Oriolus oriolus	Eurasian golden oriole		05	07	06	00	13	16	47
85	Coracina macei	Large cuckoo shrike		09	03	04	05	07	02	30
86	Coracina melanoptera	Black headed cuckoo shrike		03	06	07	10	08	14	48
87	Pericrocotus cinnamomeus	Small minivet		06	04	10	06	05	16	47
88	Pericrocotus erythropygius	White bellied minivet		04	03	06	00	02	06	21
89	Rhipidura aureola	White browed fantail		00	00	07	07	10	23	47
90	Dicrurus macrocercus	Black drongo		43	50	46	41	48	48	276
91	Dicrurus leucophaeus	Ashy drongo		10	03	05	07	12	05	42
92	Dicrurus caerulescens	White bellied drongo		10	04	16	05	08	15	58
93	Aegithina tiphia	Common iora		08	08	10	09	17	16	68
94	Tephrodornis pondicerianus	Common wood shrike		19	23	27	20	29	32	150
95	Monticola solitarius	Blue rock thrush	Muscicapidae	05	07	07	00	03	08	30
96	Luscinia svecica	Blue throat		04	07	00	05	04	09	29
97	Copsychus saularis	Oriental magpie robin		07	08	09	05	11	18	58
98	Saxicoloides fulicata	Indian robin		47	48	49	50	50	50	294
99	Phoenicurus ochruros	Black redstart		29	21	25	24	28	21	148
100	Saxicola torquata	Common stonechat		32	34	43	37	23	33	202
101	Saxicola caprata	Pied bushchat		28	32	26	29	20	18	153
102	Oenathe deserti	Desert wheatear		03	07	00	10	06	12	38
103	Cercomela fusca	Brown rock chat		03	04	02	06	04	10	29
104	Sturnus malabaricus	Chestnut-tailed starling	Sturnidae	04	09	13	15	10	11	62
105	Sturnus roseus	Rosy starling		11	14	15	18	19	21	98
106	Sturnus pagodarum	Brahminy starling		43	36	38	39	32	29	217
107	Sturnus contra	Asian pied starling		26	28	32	35	32	22	175
108	Acridotheres tristis	Common mynah	Paridae	45	43	47	49	43	42	269
109	Parus major	Great tit		02	04	09	13	30	32	90
110	Parus xanthogenys	Black lored tit	Hirundinidae	01	03	02	00	06	02	17
111	Riparia paludicola	Plain martin		11	13	12	17	21	11	85
112	Hirundo rustica	Barn swallow		20	32	26	30	32	10	176
113	Hirundo smithii	Wire tailed swallow		32	34	24	33	43	22	188
114	Hirundo daurica	Red rumped swallow		23	32	35	27	29	32	178
115	Hirundo fluvicola	Streak throated swallow		12	10	09	05	10	06	52
116	Pycnonotus cafer	Red vented bulbul	Pycnonotidae	50	50	50	50	50	50	300
117	Pycnonotus luteolus	White browed bulbul		03	05	00	00	00	00	08
118	Cisticola juncidis	Zitting cisticola	Cisticolidae	01	02	00	02	01	07	13
119	Prinia hodgsonii	Grey breasted prinia		05	04	08	11	03	06	37

120	<i>Prinia socialis</i>	Ashy prinia		16	15	10	11	16	06	74
121	<i>Prinia inornata</i>	Plain prinia		32	34	41	29	37	20	193
122	<i>Zosterops palpebrosus</i>	Oriental white eye	Zosteropidae	19	16	19	20	21	22	117
123	<i>Acrocephalus dumetorum</i>	Blyth's reed warbler		10	09	03	07	04	09	42
124	<i>Hippolais caligata</i>	Booted warbler		24	26	21	28	26	19	144
125	<i>Hippolais rama</i>	Sykes's warbler		04	02	03	04	06	02	21
126	<i>Orthotomus sutorius</i>	Common tailorbird		07	03	06	04	02	09	31
127	<i>Phylloscopus collybita</i>	Common chiffchaff		03	05	00	01	00	02	11
128	<i>Phylloscopus affinis</i>	Tickell's leaf warbler	Sylviidae	01	02	00	00	00	01	04
129	<i>Chrysomma sinense</i>	Yellow eyed babbler		19	15	10	11	09	19	83
130	<i>Turdoides caudatus</i>	Common babbler		34	31	36	29	18	23	171
131	<i>Turdoides malcolmi</i>	Large grey babbler		05	07	02	05	01	06	26
132	<i>Turdoides striatus</i>	Jungle babbler		03	02	04	02	01	05	17
133	<i>Sylvia curruca</i>	Lesser white throat		07	09	02	00	04	05	27
134	<i>Mirafr cantillans</i>	Singing bushlark		02	02	00	00	00	01	05
135	<i>Mirafr erythroptera</i>	Indian bushlark		36	38	36	42	23	43	218
136	<i>Eremopterix grisea</i>	Ashy crowned sparrow lark		26	28	16	13	11	13	107
137	<i>Ammonomanes phoenicurus</i>	Rufous tailed lark	Alaudidae	28	35	21	37	23	11	155
138	<i>Galerida cristata</i>	Crested lark		10	09	03	05	09	02	38
139	<i>Galerida deva</i>	Sykes's lark		05	05	00	01	00	03	14
140	<i>Alauda gulgula</i>	Oriental skylark		02	04	02	05	03	00	16
141	<i>Nectarinia zeylonica</i>	Purple rumped sunbird	Nectariniidae	24	26	32	10	24	19	135
142	<i>Nectarinia asiatica</i>	Purple sunbird		30	20	24	31	34	20	159
143	<i>Passer domesticus</i>	House sparrow		34	25	21	12	22	30	144
144	<i>Petronia xanthocollis</i>	Chestnut shouldered petronia		32	31	23	21	25	18	150
145	<i>Motacilla personata</i>	White wagtail		36	35	24	27	21	20	163
146	<i>Motacilla thunbergi</i>	Yellow wagtail		20	21	22	25	20	18	126
147	<i>Anthus rufulus</i>	Paddy field pipit		20	19	23	23	22	17	124
148	<i>Anthus godlewskii</i>	Blyth's pipit		03	04	00	01	00	03	11
149	<i>Anthus trivialis</i>	Tree pipit	Passeridae	07	05	02	00	02	10	26
150	<i>Anthus hodgsoni</i>	Olive backed pipit		02	03	00	00	00	01	06
151	<i>Ploceus philippinus</i>	Baya weaver		32	33	27	25	28	30	175
152	<i>Amandava amandava</i>	Red avadavat		32	40	20	19	11	19	141
153	<i>Lonchura malabarica</i>	Indian silverbill		27	24	20	30	31	27	159
154	<i>Lonchura punctulata</i>	Scaly breasted munia		20	24	27	25	20	30	146
155	<i>Lonchura Malacca</i>	Black headed munia		05	09	00	00	00	00	14
156	<i>Carpodacus erythrinus</i>	Common rosefinch		02	00	00	00	00	00	02
157	<i>Melophus lathami</i>	Crested bunting	Fringillidae	09	05	11	10	08	07	50
158	<i>Emberiza buchanani</i>	Grey necked bunting		02	03	00	00	12	10	17
159	<i>Emberiza melanocephala</i>	Black headed bunting		23	27	17	12	14	19	112
160	<i>Emberiza bruniceps</i>	Red headed bunting		22	21	26	18	13	20	120

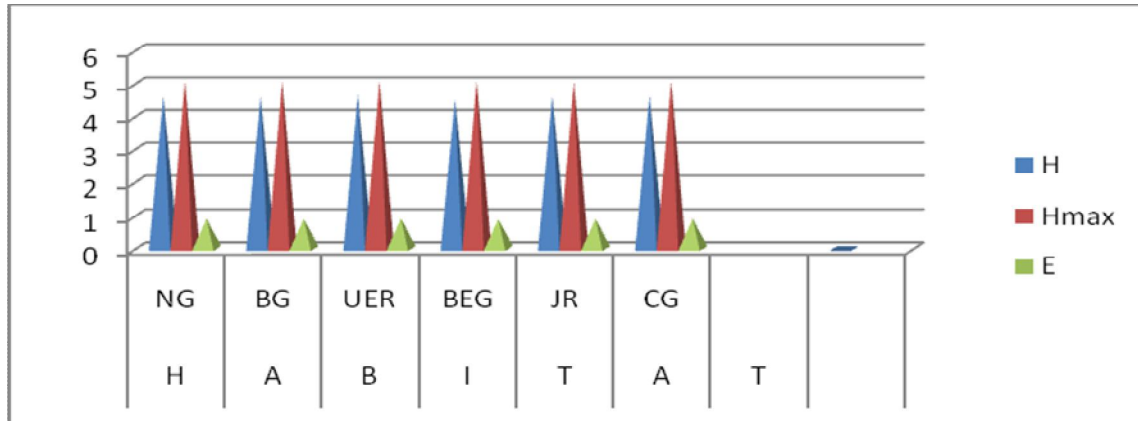
**Table 2:** No. of Species recorded in No. of Grassland

Species Sighted No. of Habitat	S.No. of species are recorded in the different grassland
1( 12)	4,17,30,41,52,55,62,63,65,77,83,156
2(8)	37,49,51,61,74,80,117,155
3(5)	6,73,128,134,150
4(13)	7,38,43,50,58,59,60,72,89,127,139,158
5(14)	12,18,20,67,84,88,95,96,102,110,118,133,140,149
All the Habitat(108)	1,2,3,5,8,9,10,11,13,14,15,16,19,21,22,23,24,25,26,27,28,29,31,32,33,34,35,36,39,40,42,44,45,46,47,48,53,54,56,57,64,66,68,69,70,71,75,76,78,79,81,82,85,86,87,90,91,92,93,94,97,98,99,100,103,104,105,106,107,108,109,111,112,113,114,115,116,119,120,121,122,123,124,125,126,129,130,131,132,135,136,137,138,141,142,143,144,145,146,147,151,152,153,154,157,159,160

**Table 3:** Shannon diversity index values of selected grassland

Diversity Index	Habitat					
	NG	BG	UER	BEG	JR	CG
H	4.61	4.60	4.63	4.52	4.61	4.61
Hmax	5.07	5.07	5.07	5.07	5.07	5.07
E	0.90	0.90	0.91	0.89	0.90	0.90

**Graph 1:** Values of diversity index from the different habitat



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