EXECUTIVE SUMMARY

1. An ecological study on the high altitude mountain grasslands of Bandipora, Kashmir was conducted during 2007-2010. The main objectives were to study the floristic composition and to elucidate the community analysis of these grasslands; to study the relation of the vegetation composition with the environment and to document the traditional uses of medicinal and edible plants, assess their current availability and suggest measures for their long term conservation.

2. Four grasslands viz. Matri (34°30’- 34°31’ N & 74°46’-74°47’E), Viji (34°33’-34°34’N & 74°43’ 74°45’E), Patalwan (34°31’-34°35’N & 74°49’-74°51’ E) and Minimarg (34°31’- 34°33’ N & 74° 51’-74° 53’E) across a broad latitudinal and altitudinal gradient were selected for the intensive floristic study. Each grassland area was stratified based on its various habitat and topographic features and in all 41 sampling stands/sites were selected. Extensive floristic survey covering most of the accessible landforms and habitat types in each stand by placing random quadrats of 50×50 cm to quantify various vegetation features like species diversity, richness, evenness and density, frequency and community types was done. Soil sampling and ethnobotanical survey was also carried out while the statistical estimates of total species richness were also calculated by using non parametric incidence-based richness-estimators.

3. A total of 251 species of vascular plants including 248 angiosperms, 1 gymnosperm and 2 pteridophytes were recorded within the study area. The ratios of the monocot and dicot families, genera and species were 1: 3.4; 1: 6.4 and 1: 7.55 respectively. The species frequency distribution differed greatly and on an
overall basis, the species occurrence frequencies (%) across the ten ordered classes were 70.91; 13.14; 6.77; 3.98; 2.39; 1.99; 0.39; 0.39; 0 and 0. Moreover while the comparison of the grasslands showed that their species occurrence frequency distributions were in different profiles but on an individual level, a greater proportion of species occurred in a small number of sampling sites across these grasslands and thus had narrow ecological amplitude.

4. There was a little similarity in the species composition among the surveyed grasslands and the amount of similarity generally decreased with distance among the grasslands sites with greater similarity between Minimarg and Patalwan and lowest between Viji and Matri. These results indicated high beta diversity across the region. Uncommon species, those occurring at only one grassland site, comprised 44.22% of the total species.

5. Phytogeographic analysis showed that the flora is predominantly West Himalayan with Sino-Himalayan, Central Asian, Irano-Turanian and Pamirean species being other important elements. Interesting to observe was the contribution of Eurasiatic and Cosmopolitan elements while the Tibetan and Endemic taxa were poorly represented.

6. The application of TWINSPAN to the abundance data resulted in the elucidation of twenty plant community types across the study area. The application of DCA confirmed the existence of these vegetation units, albeit with some overlap. The results further demonstrated that these community types could be clustered for three main groups along an altitudinal gradient. The lower elevated communities were more dynamic but less diverse while the mid-elevational types were more diverse and showed a high internal variation. In
contrast the higher elevational communities, except for one community, were more stable and restricted. The results of SHE analysis showed that greater diversity in the communities was primarily a function of increasing richness ln(S), though not always.

7. The results of Canonical Correspondence Analysis (CCA) showed that while broad parameters like altitude greatly affect the overall pattern, few site specific features like disturbance further redefine the compositional pattern and shape the overall vegetation structure. These variables explained a major part of the gradient variation with a cumulative percentage of variation of 41%, 53%, 63.8% and 74.5% in the first four axes respectively. Based on the results, it is proposed that systematically studying the structure and function of these vegetation units on a much larger scale can prove to be an important tool in interpreting these species assemblages over vast areas as many plant communities that are absent or have all but disappeared from other grasslands of Kashmir valley might be present over here at other grassland sites.

8. The data on the distribution and abundance of seven threatened medicinal plants viz. *Aconitum heterophyllum*, *Dactylorhiza hatagirea*, *Fritillaria roylei*, *Picrorhiza kurroa*, *Podophyllum hexandrum*, *Rheum webbianum* and *Saussurea costus* showed that their distribution varied both across the four grasslands as well as habitat types and on an overall basis *P. hexandrum* was most frequent, *P. kurroa* recorded the highest density while *S. costus* and *D. hatagirea* were least frequent and recorded the least abundance.

9. The altitudinal profile of the species showed that *D. hatagirea* is confined particularly to the lower alpine zone (<3500 m.a.s.l), *F. roylei* extends further (<
3700 m.a.s.l) while *P. kurroa* dominated exclusively in the latter (> 3700 m.a.s.l.) altitudinal belts. Further while these species are used by the ethnic tribes to cure different ailments on a household basis, a few are sold on a commercial scale. The results of the ethnobotanical survey showed that about 26 species (including medicinally important *P. hexandrum* and *R. webbianum*) are also used as wild edibles by these three ethnic tribes- Bakerwals, Gujjars and Chopans. However the degree and nature of use of both these types (medicinal and edible) varied significantly between the three communities. These findings can act as an additional aiding tool in formulating a conservation strategy for the hitherto unknown grasslands of Bandipora, Kashmir.

Based on this exploratory study, for the long term conservation of these grasslands, following actions are recommended: (i) identification, restoration and rehabilitation of the rare and threatened medicinal herbs and their habitats, (ii) control of deforestation and other anthropogenic activities in sub-alpine zone, (iii) continuous research and monitoring of these grazing systems with particular emphasis on the auto-ecological studies of various threatened species, (iv) documentation of traditional and folklore knowledge, (v) addressing the “feeling of disconnectedness” among the nomads, (vi) developing partnerships with various stakeholders, (vii) formulating interstate agreement and (viii) capacity building of the concerned staff and encouraging them to undertake various conservation programmes in the study area.