DISTRIBUTION AND HABITAT MAPPING OF KEY FAUNA SPECIES IN SELECTED AREAS OF WESTERN HIMALAYA, PAKISTAN

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ABSTRACT

The forests of the Western Himalaya - particularly the temperate forests - have been reliably identified as a 'biodiversity hotspot', a global priority for the conservation of biodiversity. Machiara National Park, Chitral Gol National Park and Pallas valley lie within the boundary of Western Himalayan Ecoregion. There are a number of wildlife ecologists and biologists who have studied and surveyed these areas at different times and compiled the species data with more or less account of the spatial distribution. In the current study distribution of the key fauna species and habitat maps were developed based on the sighting data, vegetation type and other terrain factors including altitude, slope and aspect. Habitat maps of five mammals including Snow leopard, Common leopard, Musk deer, Grey langur and Wolf in Machiara National Park, habitat map of the Western Tragopan in Pallas Valley and habitat maps of seven mammal species including Snow leopard, Yellow throated martin, Long tailed marmot, Indian wolf, Flying squirrel, Cape hare, and Asiatic jackal in Chitral Gol National Park were developed.

Key words: Western Himalaya, Machiara, Chitral Gol, Pallas, Spatial Distribution, Habitat Mapping

INTRODUCTION

Wildlife management and conservation initiatives are only possible with the appropriate information on wildlife and its habitat (Kafley, 2008). Wildlife habitat basically comprises of food, cover and water. Each species require a particular habitat or the space, food, shelter and other needs of survival so much so that species are said to be the product of their habitat (Smith, 1974). Wildlife management is much more than the preservation of certain plant and animal species; it involves management of a complete ecosystem. Information collected with a GPS receiver may be combined with other geographic data using GIS technology for habitat mapping of key fauna species (Lenton *et al.,* 2000). The ability to model spatial distribution and changes in distribution of wildlife is of considerable importance for wildlife management. Once spatial distribution can be adequately modeled, the distribution and abundance can be monitored efficiently over time, and future changes can be predicted. These spatial characteristics and relationship are often difficult to identify and hard to display with traditional ground survey or statistical model. Therefore, using Geographic Information System (GIS) has become an evitable trend in ecology studies and developing wildlife habitat model (Kafley, 2008). The characteristics of spatial analysis and spatial display of GIS not only provides efficient way of data handling, storage, and analyzing, more importantly, it also enables mapping of wildlife distribution, identification of patterns, and generation of habitat spatial characteristics, hence, a useful tool in decision making for conservation and wildlife management (Scott *et al.*, 1992, Long *et al.,* 1993, Ji-Wei and Clinton 2000, Lenton *et al.,* 2000).

The Himalayas, extending from Pakistan to Bhutan, are the steepest and tallest mountains in the world. According to the regional characteristics, the areas of Nepal and Bhutan fall under the Eastern Himalaya, the areas of India fall under the Central Himalaya and areas of Pakistan and Indian held Kashmir fall under the Western Himalaya. The Western Himalayan mountain ranges are known lush forests, snow-crested lofty peaks, cascading streams and sun-bathed valleys. The climate ranges from tropical at the base of the mountains to permanent ice and snow at the highest elevations (Wikramanayake *et. al.,* 2002).

The Western Himalayas have more extensive conifer forests of blue pine (*Pinus wallichiana*), chilgoza pine (*Pinus gerardiana),* fir (*Abies spectsbilis*), silver fir (*Abies pindrow)* and spruce *(Picea smithiana*) than the moist eastern part of the mountain range. Cypress (*Cupressus torulosa*) and deodar (*Cedrus deodara*) are common above 2,400 m. The forests of the Western Himalaya - particularly the temperate forests - have been reliably identified as a `biodiversity hotspot', a global priority for the conservation of biodiversity. According to WWF Ecoregions, four distinct ecoregions occur in Western Himalayas including Himalayan subtropical pine forests, Northwestern Himalayan alpine shrubs and meadows, Western Himalayan broadleaf forests and

Western himalayan subalpine conifer forests. The Western Himalayas' bird fauna consists of 285 species of which nine are endemic to the ecoregion (Himalayan Quail, Western Tragopan Hoary-throated Barwing, White-cheeked Tit, White-throated Tit, Spectacular Finch, Wren Babbler, Orange Bullfinch and Kashmir Nuthatch. The ecoregion has critically endangered Himalayan Griffon vulture *Gyps himalayensis* (Wikramanayake *et. al.,* 2002).The Western Himalayas is the catchment area of 70 - 80% water from the melting of snow and glaciers to the Indus Delta. Its significance in watershed management is critical; deforestation in the area will have far reaching consequences that will have impact in the Indus and Ganges deltas.

Machiara national park, Chitral Gol national park and Pallas valley lies within the boundary of Western Himalayan Ecoregion (Fig. 1). There are a number of wildlife ecologists and biologists who have studied and surveyed these areas in different times and compiled the species data with more or less account of the spatial distribution. In the current study, the applicability of using the GIS techniques coupled with field survey data from the field biologist were assessed for key fauna distribution and habitat mapping in selected areas of Western Himalayan Ecoregion.

Study Areas: Three selected study areas include Machiara National Park in district Muzaffarabad of Azad Jammu and Kashmir, Pallas Valley in district Kohistan of Khyber Pakhtunkhwa and Chitral Gol National Park in district Chitral of Khyber Pakhtunkhwa.

Machiara National Park: The Machiara National Park (MNP) is located at 34° 31′ latitude and 73° 37′ longitude, on the right bank of River Neelum at about 35 km from Muzaffarabad. The MNP falls in the moist temperate zone with cold winters and deep snow. It covers an area of 13,531ha.

Pallas Valley: Pallas valley is located at 34° 44′ latitude and 72° 57′ longitude lies in the Kohistan district, North West Frontier Province. It covers an area of 132,500 ha. Climate types vary from sub-tropical at low elevations to alpine at high elevations with mix temperate forest in between.

Chitral Gol National Park: Chitral Gol N.P. is located at 35º 42'N latitude and 71° 36'E longitude lies in district Chitral, North West Frontier Province. Chaudhry and Arshad (2004) has described the climate of the Park as dry temperate up to tree limit and icy cold above tree limit. It covers an area of 35,781 hectares including the two buffer zones

MATERIALS AND METHODS

The habitat maps were developed from different maps and digital models of the terrain that allow the actual vegetation to be related to the other environmental factors. In general methodology covers the acquisition and processing of satellite data, digitisation of topographical data, field surveys to collect data of flora and fauna (primary and secondary), and processing of the data to derive information on topography, infrastructure, terrain, and natural vegetation.

Data and information on the occurrence and distribution of wildlife species was collected from different sources including wildlife survey reports, and data encoding forms describing direct sighting of the species. Habitat preference of the identified species was also compiled through literature review and field staff consultation.

Development of accurate land cover map has a primary importance in habitat mapping of fauna species. For developing the land cover of the study areas appropriate recent satellite images were acquired and Maximum Likelihood Classifier (MLC) algorithm was applies based on the ground truth data collected during the field surveys, digital photographs (both from ground and air), Digital Elevation Model (DEM), information of the local forest and vegetation types. In addition to the above mentioned sources, GIS datasets including land cover, DEM, Slope, Aspect were used in delineating the habitat of the selected mammal species.

For species distribution mapping geo-coded sighting point datasets were retrieved in the Arc-View GIS as event theme for displaying species existence. Relevant attributed information of wildlife species were added in the attribute tables

The habitat extent of some key mammal species within the study areas was also pointed out by the wildlife staff of the respective areas was purely based on their field experience and knowledge. They identified different species habitat on the large scale maps. These areas were manually delineated on the map and on-screen digitised in Arc-View. GIS. Map has been developed which indicates the known spatial distribution of habitats of selected mammal species.

RESULTS AND DISCUSSION

High species richness in MNP, Pallas valley and CGNP represents diversity in habitats, which is due to great variations in altitude and slope of mountains of the study area. In Machiara National Park there are 42 recorded small and large mammal species (Baig, 2004). Out of these 42 species distribution of 8 mammals including Common leopard, Black bear, Grey goral, Murree vole, Musk deer, Rhesus monkey, Snow leopard

and Grey langur and the habitats of 5 mammals including Snow leopard, Common leopard, Musk deer, Grey langur and Wolf were mapped (Fig. 2, 3).

In Pallas valley the distribution and habitat of the Western Tragopan has been mapped (Fig. 4).

Chitral district is home to many wildlife species and the region represents Palearctic Zoogeographical realm (Mirza, 2003). There are 42 recorded mammal species in CGNP (Roberts, 1997). 17 mammal species were selected for distribution mapping while the habitat mapping of 5 mammal species was carried out in CGNP (Fig. 5, 6)

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

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