INT. J. BIOL. BIOTECH., 10 (2): 229-235, 2013.

MAPPING THE ENDANGERED/KEY SPECIES OF HAZARGANJI-CHILTAN NATIONAL PARK THROUGH GEO-SPATIAL TECHNOLOGY

Sheeba Afsar and Sumaiya Bano

Department of Geography, University of Karachi, Karachi-75270, Pakistan
e-mail: sheebanaeem@hotmail.com

ABSTRACT

Satellite Remote Sensing has become an important tool for monitoring of protected areas. Fortunately Remote Sensing technology is a promising solution to the problem of accessibility. Using satellite remote sensing coupled with geographic information systems technologies have provided the capabilities to develop a database of information that permits systematic monitoring of national parks (protected areas) and an effective means of protecting National Parks from the anthropogenic activities. The Hazarganji-Chiltan National Park is one of the 25 declared national parks of Pakistan, which falls in IUCN Category V. According to the latest research available data, nine species of large mammals while 21 species of small mammals were recorded, Avifauna comprises of 36 Resident and 84 Migratory species, among reptiles, 15 lizards and 9 species of snakes and only one testudine was recorded. The Chiltan Markhor *(Capra aegagrus chialtanensis)* is endemic in Pakistan and is listed as critically endangered in the IUCN Red Data book, found in this area. The Hazar Ganji National Park was established in 1980 for the protection of this endemic species. From that day to now mostly population of this endemic species is gradually increasing. The only threat is the unstable political situation in that area.

Keywords: Protected Areas, Avifauna and Anthropogenic Activities

INTRODUCTION

A national park is comparatively a large area of outstanding scenic merit and natural interests with theprimary objective of protection and preservation of flora andfauna in natural state to which access for public, education and research may be allowed **(Zafar, *et al*. 2011).**

Biological diversity or biodiversity refers to the variety of life forms: the different plants, animals and microorganisms, the genes they contain, and the ecosystems they form. Biodiversity is reduced when people modify ecosystems and destroy habitats of plants and animals **(Anon., 2003)**. Pakistan has rich sources of biodiversity, which belong to a unique blend of habitat and ecosystem types.

Pakistan has rich sources of biodiversity, which belong to a unique blend of habitat and ecosystem types. These diverse ecosystems have their very own characteristic wild resources, which provide a web of living resources inter-depending on each other to sustain their life. Most of the southern parts of the country are rich with coastal ecosystem and arid plus desert habitat types with a variety of species **(Anon., 2003).**

Pakistan's mountain areas are world's exceptional wild resources, which harbor very different, isolated as well as hardy species that have learned to live in the harshness of the environment and in harmony with other species and communities **(Anon., 2003).**

With its dramatic ecology, broad latitudinal spread and immense altitudinal range, Pakistan spans a remarkable number of the world's ecological regions. These range from the mangrove forests fringing the Arabian Sea to the spectacular mountain tops where the Western Himalayas, Hindukush and Karakorums meet. These habitats support a rich variety of species (plants, mammals, birds, reptiles, amphibians, fishes, invertebrates) that contribute to the overall biodiversity of Pakistan **(Anon., 2003).**

Pakistan spans a remarkable number of the world's broad ecological regions, including four biomes: the desert biome, temperate grassland biome, tropical seasonal forest biomes, and mountain biome. Pakistan fauna includes 668 birds (25 threatened), 198 freshwater fishes (29 endemic, 1 threatened), 177 reptiles (13 endemic, 6 threatened), and 174 mammals (6 endemic, 20 threatened) **(http://www.cbd.int/countries/profile.shtml?country=pk#status**).

Pakistan has a number of the world's rarest animals like Indus River dolphin, Snow leopard, Western Tragopan, Markhor, etc. There are a total of three endemics, one species and two sub-species, namely, the Indus Dolphin, Woolly Flying Squirrel, Baluchistan Black Bear and Punjab Urial. All these and other species are in decline due to a combination of threats such as habitat loss and overuse of natural resources **(Anon., 2003).**

Baluchistan is the largest province of Pakistan extending over an area of 347,190 sq. km. It is located at the south-eastern edge of the Iranian Plateau and bridges the Middle East and Southwest Asia to Central Asia and South.

The province lies between 24^{o} 32'N and 60^{0} 70'E. The coastline is about 770 km long. The east-central and northern part of the province has high mountains of which considerable parts reach an elevation of above 2,300 m (7000feet) and the valleys are situated around 1,500 m above sea level.

Baluchistan has juniper (*Juniperus excelsa*) forests which cover approximately 140,000 hectares area of the province. The province also has some of the world's finest wetland habitats and these attract a variety of water birds including swans, geese, ducks, cranes, grebes, herons, and several species of waders. There are four species of threatened mammals in Balochistan, two are Critically Endangered – the Balochistan Black Bear (*Ursus thibetanus*) and the Chiltan Markhor (*Capra aegagrus chialtanensis*). Two species are Endangered – the Straight Horned Markhor (*Capra falconeri jerdoni*) and the Urial (*Ovis vigeni*) **(Khan and Siddiqui, 2011).**

STUDY AREA

The Hazarganji-Chiltan National Park lies between $29^{0}59'$-$30^{0}07'$N, $66^{0}24'$-$66^{0}54'$E. The Hazarganji-Chiltan National Park is one of the 25 declared national parks of Pakistan, which falls in IUCN Category V (Protected Landscape) establishment on 15 January 1980 and covers a total area of 27,421 hectares and it comprised of the Hazarganji State Forest and the Chiltan Protected Forest. It lies Baluchistan Province, some 20 Km south-west of the provincial capital of Quetta.

The area is characterized by mountainous and rugged precipitous slope which is divided by gullies, valleys and by deep ravines. The main axis of the mountain range is north-northeast/south-south-west with a marked divide between the Chiltan area to the south and west and Hazarganji range to the north and east. To the east and west of the park are gently sloping outwash plains of the Quetta and Kanak Valleys respectively **(Fig. 1).**

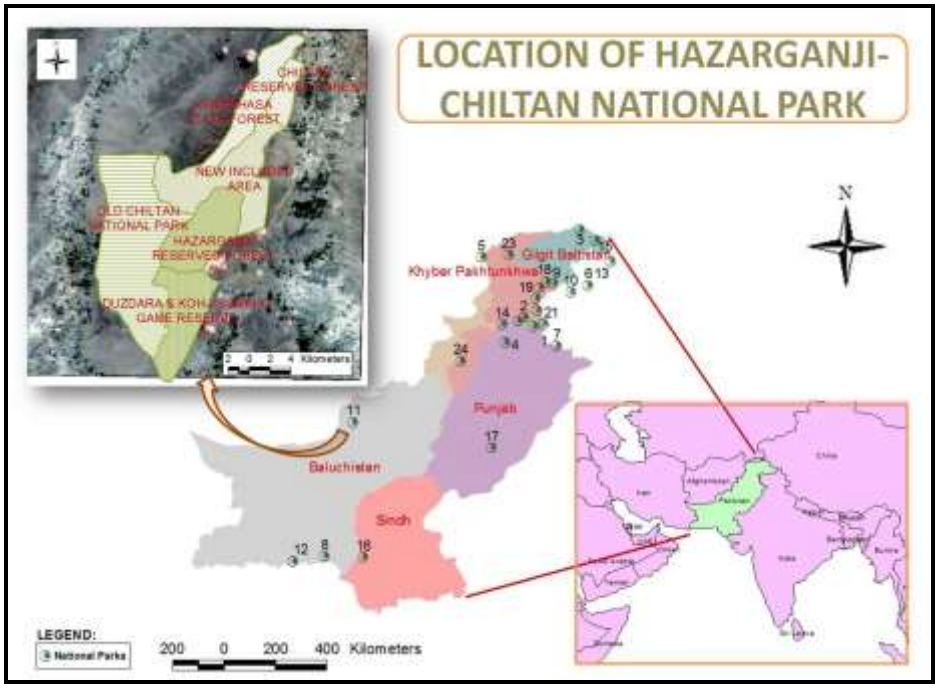

Fig. 1. Hazarganji-Chiltan National Park.

Objectives

[1]. To detemnine the Land Cover Classification of Hazarganji-Chiltan National Park

[2]. To create the Spatial Variation of Elevation of Hazarganji-Chiltan National Park

[3]. To map the Key faunal species (Mammalian, Birds and reptile) in Hazarganji-Chiltan National Park

METHODOLOGY

Salient features of the methodology adopted are:

- Inventories of Vertebrate biodiversity in Hazargangi-Chiltan National Park has been collected from published research papers.
- High resolution Quickbird Satellite Data has been collected from Google Earth and Various clips have been stitched together to build a mosaic of study area satellite images using Adobe Photoshop.
- Satellite image mosaic had further processed by image rectification by using software Arc Map 9.3.
- Developed a Vector layer of zone of Hazargangi-Chiltan National Park.
- Unsupervised Land cover classification of Landsat TM data has also been performed by using ERDAS Imagine 8.6 software **(Fig. 2).**
- Elevation data have collected from topographical maps of Survey of Pakistan, by using this data interpolation (IDW) have been performed and contour lines also created.
- Heads of key faunal species have clipped for the development of final distribution maps of key species.

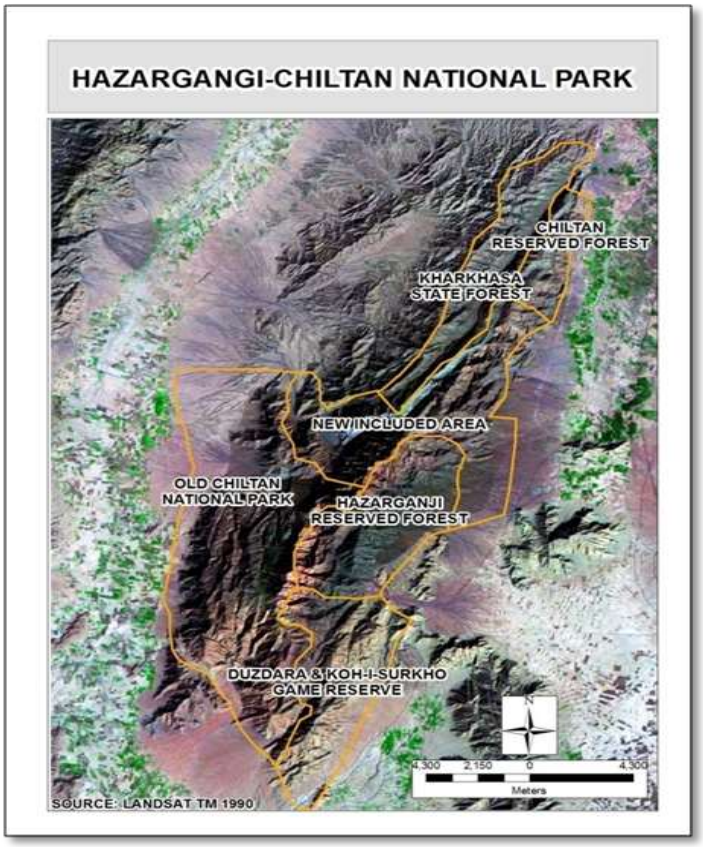

Fig. 2. Hazarganji-Chiltan National Park: Satellite Image.

RESULTS AND DISCUSSIONS

1. Land Cover Classification of Hazarganji-Chiltan National Park

The high and medium resolution satellite data are an excellent source of environmental data. In order to understand the character of the natural park the land cover will be extracted. In this study Landsat TM satellite image used for land cover extraction. **Fig. 3** shows the Land Cover Classification in the Hazarganji-Chiltan National Park , the three land cover classes mountainous areas, agriculture and bare soil are extracted.

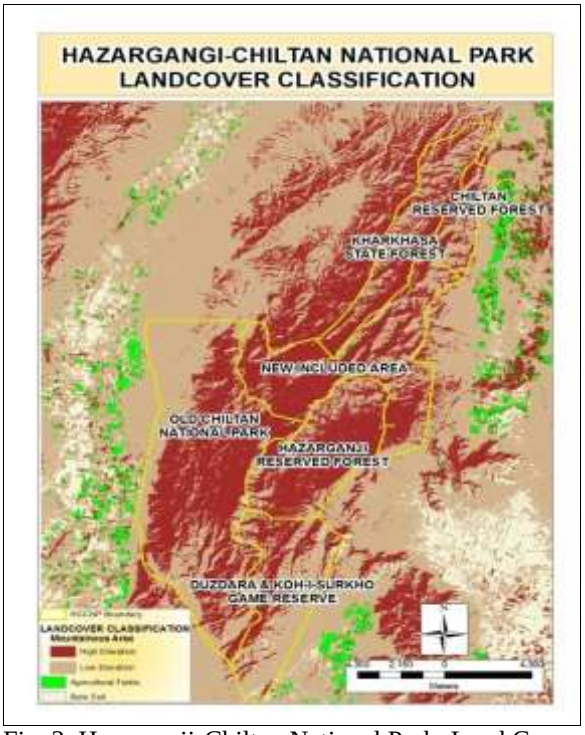

Fig. 3. Hazarganji-Chiltan National Park: Land Cover Classification.

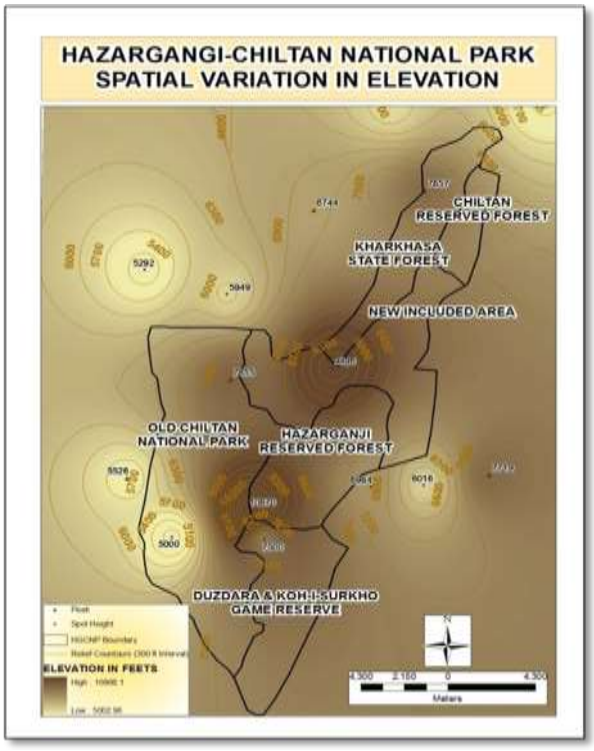

Fig. 4. Hazarganji-Chiltan National Park: Spatial Variation of Elevation.

2. **Spatial Variation of Elevation of Hazarganji-Chiltan National Park**

Heights peak (10670 feet) of Hazarganji-Chiltan National Park in Hazarganji reserve forest zone. **Fig. 4** shows the Spatial Variation of Elevation in the Hazarganji-Chiltan National Park.

3. Key faunal species of Hazarganji-Chiltan National Park

Key faunal species of Hazarganji-Chiltan National Park, mentioned in the following **Table 1**

Table 1. Key faunal species of Hazarganji-Chiltan National Park.

Mammals	**Status**
Chiltan Markhor (*Capra aegagrus chialtanensis*)	Critically Endangered (IUCN)
Caracal (*Felis caracal*)	Least Concern (IUCN ver. 3.1)
Beech or Stone Marten (*Martis foina*)	Least Concerned (IUCN ver. 3.1)
Marbled Polecat (*Vormela peregusna*)	Vulnerable (IUCN ver. 3.1)
Striped Hyaena (*Hyaena hyaena*)	Near Threatened (IUCN ver. 3.1)
Avifauna	**Status**
See-See Partridge *(Ammoperdix griseogularis)*	Least Concern (IUCN ver. 3.1)
Chukor *(Alectoris chukar)*	Least Concern (IUCN ver. 3.1)
Houbara Bustard *(Chlamydotis undulata)*	Vulnerable (IUCN ver. 3.1)
Reptiles And Amphibians	**Status**
Central Aasian/ Afghan Tortoise *(Agrionemys horsfieldii),*	Vulnerable (IUCN ver. 2.3)

- The **Chiltan Wild Goat** is endemic in Pakistan and is listed as critically endangered in the IUCN Red Data book. The Chiltan Goat was restricted in the early 1970s to four or five populations around Quetta, the main one being on the Chiltan range itself. **Schaller and Mirza (1971)** reported the population of 107 Markhors. This population was estimated to number about 200 in 1975 by Schaller and Mirza, who actually counted 168 individuals. The Hazar Ganji National Park was established in 1980 and rigid protection for the first decade enabled the wild goats to increase to an estimated 480 animals in 1990. Recent population estimates done by **WWF-Pakistan in 1997** have put the number of the Chiltan Goat at around 800. Due to the park's proximity to Quetta city, poaching had hitherto always been a major problem. During 1992, Marri tribal groups who had migrated to Afghanistan returned to Pakistan because of the effects of the civil war in the former country. They were temporarily settled by the Government of Baluchistan on the lower slopes adjacent to the Chiltan range. This had a disastrous effect on the natural vegetation and surviving scrub forest cover, and on the wildlife within the National Park **(Roberts, 1998).**

- The **caracal** is distributed over Africa, the Middle East, Pakistan and India. Its chief habitat is dry steppes and semi-deserts, but it also inhabits woodlands, savannah, and scrub forest. They generally prefer open country, so long as there is sufficient cover, in the form of bushes and rocks, from which to ambush prey. The **caracal** is a fiercely territorial medium-sized cat ranging over Western Asia, South Asia and Africa. In Pakistan it distributed mainly in Lal Sohanra National Park, Kirthar National Park, Hazarganji-Chiltan National Park, Runn of Kutch Wildlife Sanctuary.

- The **stone marten** prefers more open areas than other martens. It is typically found in deciduous forest, forest edge, and open rocky hillsides (sometimes above the tree line). However, in Switzerland, north-east France, and southern Germany, it is very common in suburban and urban areas, often building its nest in house attics, outhouses, barns, garages, or even car engine spaces. The beech marten (*Martes foina*), is native to much of Europe and Central Asia though it has established a feral population in North America.

- **Marbled polecats** are found in open desert, semi-desert, semi-arid rocky areas in upland valleys and low hill ranges, steppe country and arid subtropical scrub forest. They avoid mountainous regions. Marbled polecats have been sighted in cultivated areas such as melon patches and vegetable fields. The Marbled polecat if found Southeast Europe to Russia and China. Range Includes Bulgaria, Georgia, Turkey, Romania, Asia Minor, Lebanon, Syria, Jordan, Israel, Palestine, Armenia, Iran, Afghanistan, North-Western Pakistan, Yugoslavia, Mangolia, China, Kazakhstan, north to the Altai Steppes in Siberia and Sinai Peninsula, Egypt.

- The **Striped Hyaena** has a very large, albeit now patchy distribution, extending from Africa, north of and including the Sahel, and including much of East and North-east Africa south to about central Tanzania, through the Middle East and Arabian Peninsula, Turkey, the Caucasus, Central Asia, and the Indian subcontinent, though not reaching Assam, Bhutan or Myanmar. They may have recently expanded into Nepal. Figure 5 (a) shows the distribution of Key Mammalian species in the Hazarganji-Chiltan National Park.

Key Bird species

- The **See-see Partridge** (*Ammoperdix griseogularis)* is a gamebird in the pheasant family Phasianidae of the order Galliformes, gallinaceous birds. This partridge has its main native range from southeast Turkey through Syria and Iraq east to Iran and Pakistan.

- The **Chukar Partridge** or Chukar (*Alectoris chukar*) is a Eurasian upland game bird in the pheasant family Phasianidae. This partridge has its native range in Asia, from Israel and Turkey through Afghanistan to India, along the inner ranges of the Western Himalayas in Nepal. In southeastern Europe it is replaced by the Red-legged Partridge (*Alectoris rufa)*. It barely ranges in Africa on the Sinai Peninsula. The habitat in the native range is rocky open hillsides with grass or scattered scrub or cultivation. It is mainly found at an altitude of 2000 to 4000 m except in Pakistan, where it occurs at 600m. They are not found in areas of high humidity or rainfall.

- The ***Houbara Bustard*** is a small to mid-sized bustard. It measures 55–65 cm (22–26 in) in length and spans 135–170 cm (53–67 in) across the wings. It is brown above and white below, with a black stripe down the sides of its neck. In flight, the long wings show large areas of black and brown on the flight feathers. It is slightly smaller

and darker than Macqueen's Bustard. The sexes are similar, but the female is rather smaller and greyer above. The body mass is 1.15–2.4 kg in males and 1–1.7 kg in females. The Houbara Bustard is found in the Canary Islands North Africa, Iran, Saudi Arabia, India, Pakistan, Kazakhstan, China, and the UAE. It breeds in deserts and other very arid sandy areas and is largely resident within its range. **Fig. 5 (b)** shows the distribution of Key Bird species in the Hazarganji-Chiltan National Park.

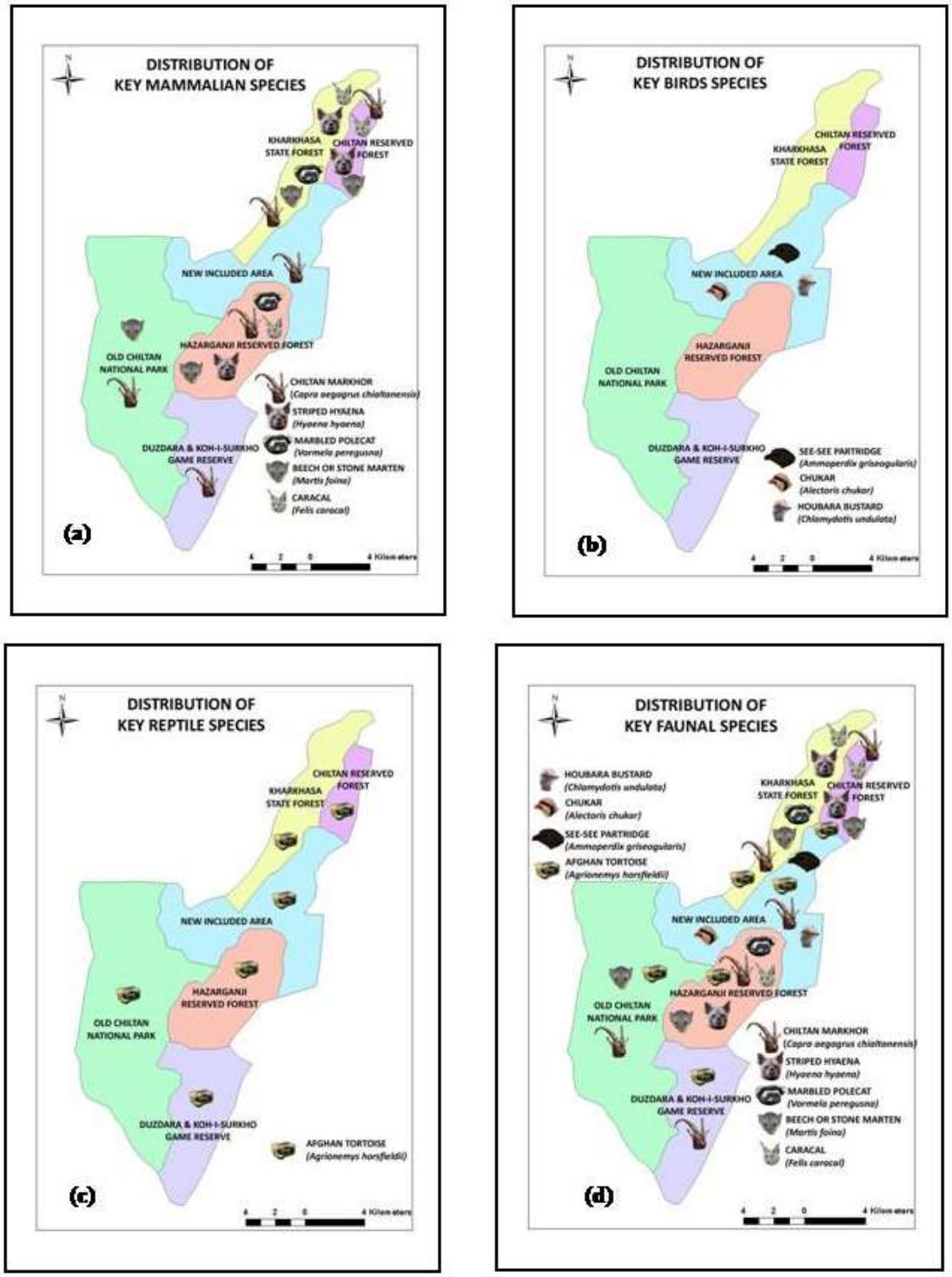

Fig. 5. Distribution of Selected Key (a). Mammalian Species, (b). Birds Species, (c). Reptile Species and (d).all funal Species.

Key reptile species

- The Russian tortoise, Horsfield's tortoise, **Afghan Tortoise** or Central Asian tortoise (*Agrionemys horsfieldii)*, is a species of tortoise that is a popular pet. It is named after the American naturalist Thomas Horsfield. It ranges from Afghanistan to Central Asia, Iran and Pakistan. It usually lives in dry areas with sparse vegetation. Fig. 5 (c) shows the distribution of Key reptile species in the Hazarganji-Chiltan National Park.

CONCLUSION

It is concluded that according to latest research, nine species of large mammals while 21 species of small mammals were recorded in Hazarganji Chiltan National Park, Avifauna comprises of 36 Resident and 84 Migratory species, among reptiles, 15 lizards and 9 species of snakes and only one testudine was recorded in Hazargani-Chiltan National Park. The Chiltan Wild Goat, Caracal, Marbled Pole Cat and Stone Marten are the key species among the mammals. See-See Partridge, Chukor and Houbara Bustard are important avifaunal species in this national park. Among reptiles, Afghan Tortoise, Persian Horned Viper and Laventine Viper are the key species.

The Chiltan Markhor is endemic in Pakistan and is listed as critically endangered in the IUCN Red Data book. The Hazar Ganji National Park was established in 1980 for the protection of this endemic species. From that day to now mostly population of this endemic species is gradually increasing. Hyaena (NT), Marbled Pole Cat (E), Houbara Bustard (V), Egyptian Vulture (E) and Afghan Tortoise are among the Threatened Species. In this National Park there are no serious threats to the biodiversity. The only threat is the unstable Tribal situation in that area.

GIS (Geographical Information Systems) is a fundamental tool that is widely used in the National Park. Its importance plays a role ranging from ensuring the efficiency of planning applications to the management and conservation of the National Park. Knowledge of the location is important for making key decisions through maps, analysis, spatial queries and statistics.

ACKNOWLEDGMENTS

First, I would like to thank The Great Almighty Allah who gives me strength to complete this task. I am highly grateful to Dr. Muhammad Zaheer Khan, Department of Zoology, University of Karachi for guiding me throughout this work. I am also very grateful to Prof. Dr. Jamil Hasan Kazmi, Department of Geography, University of Karachi for his support and guidance.

REFERENCES

http://www.cbd.int/countries/profile.shtml?country=pk#status

Anonymous, (2003). Status and Red List of Pakistan's Mammals, Pakistan Mammal Conservation Assessment & Management Plan Workshop. 18-22 August 2003.

Khan, M.Z. and S. Siddiqui (2005). The Vertebrate Biodiversity of Hazarganji Chiltan National Park, Balochistan. J. nat. hist. wildl. 4(1):93-99.

Khan, M.Z. and S. Siddiqui (2011). Studies on Bioecology and Fauna of Hazarganji Chiltan National Park and Development of Ecotourism in Protected Areas. Journal of Basic and Applied Sciences. 5(1):1371-1384.

Roberts, TJ. (1998). The Mammals of Pakistan (Revised Edition). Oxford University Press, Karachi.

Schaller, GB. and ZB Mirza (1971). Observations on Urial and Markhor in West Pakistan. (unpublished report for Pakistan Government).

Zafar, S.M., M.A. Baig and M. Irfan (2011). Application of GIS/ RS for Management Zoning of Margallah Hills National Park, Islamabad. 2nd International Conference on Environmental Science and Technology IPCBEE vol.6, IACSIT Press, Singapore.

(*Accepted for publication March 2013*)