



Review paper

## A Review of Distribution, Ecology and Conservation status of Endangered Species in Pakistan

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### Abstract

Strategic location, climatic conditions and resource availability in Pakistan provide diverse habitat to fauna for their survival. Astor markhor, Snow leopard, Musk deer, black scorpion and Green sea turtles were identified as endangered species by CITES. Their population is decreasing due to poaching, trophy hunting and retaliation. Several techniques like tracking researches, tagging animals, captive breeding are taking place for conserving these species. Several conservation practices were carried out including awareness campaigns, educating local communities, formation of protected areas, nesting sites and formulation of laws and bans. The review paper will be helpful in highlighting the conservation status of endangered species in Pakistan and will help in devising better conservation practices for preventing the extinction of these species.

**Keywords:** Astor Aarkhor, Black scorpion, Green Sea Turtle, Musk Deer, Snow Leopard.

### Introduction

WWF characterized endangered species as species of special concern<sup>1</sup>. The geography and climate of Pakistan are extremely diverse, and the country serves as home to a wide variety of wildlife. The fauna of Pakistan reflects its varied climates. The miscellany of landscapes and varying climatic conditions in Pakistan allows a wide variety of flora and fauna to thrive<sup>2</sup>. Pakistan lies between three zoogeographical zones and provide a corridor for local as well as migratory species from Palearctic, Oriental and Ethiopia. Pakistan's mountainous regions provides habitat site to snow leopard, markhor and musk deer<sup>3</sup>, Balochistan and Sindh beaches provide nesting sites to green sea turtles<sup>4</sup> and desert areas provide hub to black scorpions<sup>5</sup>. From past few years, many species are endangered or critically endangered due to illegal trade, hunting, habitat fragmentation, deforestation, mining and people's behavior<sup>6</sup>. In order to conserve the species diversity, several protected areas, national parks, wild life sanctuaries and game reserves were formed in Pakistan under Wild life act, 1974<sup>7</sup>. Several laws were formulated and Pakistan national conservation strategy was implemented<sup>8</sup>. But still population of endangered species listed under CITES is declining. The objective of this review study is to give brief over view about the most endangered species of Pakistan, threats and conservation measure.

### Astor Markhor (*Capra falconeri*)

Markhor is the national animal of Pakistan and serves as a keystone species, thus playing a unique and crucial role in the

functioning of the ecosystem. Astor Markhor or Flare Horned Markhor can only be found in the mountainous terrain of Northern Pakistan<sup>8,9</sup>. Locals state that it has the ability to kill snakes, hence the name 'Markhor'. This beautiful wild species has extremely bold, flared cork-screw like horns which may reach upto 160 cm<sup>10,11</sup>. The lifespan of *C. f. falconeri* ranges from 11 to 13 years<sup>12</sup>. It is listed under criterion C1 of IUCN list of endangered species. It also qualifies under Criteria C2a (i), as its subpopulations are extremely fragmented with less than 250 mature individuals and there is a continuing decline<sup>13-16</sup>. Under the protection of local tribesmen, paid by funds generated through sport-hunting, the markhor populations in Pakistan increased from 700 in 1994 to 2,500 in 2005 and 4,000 in 2010. Inspired by Pakistan successful program was started in Tajikistan for stopping illegal trade is also of markhor at community level<sup>17</sup>. The rise in number of wildlife species of markhor on the other hand had resulted in shrunken habitat. People in many villagers had also complained about wild animals straying into the populated areas. Due to this Wildlife Department had installed a wall of barbed wires around the communities<sup>18</sup>.

### Threats to Astor Markhor

Numerous factors has caused the decline of population in its range of occurrence including hunting for meat and sport (trophies), encroachment or fencing, population fragmentation, habitat alteration and degradation, competition with domestic livestock for fodder, land or water, disease transmission form

livestock and increase of the human population in the natural habitat of Markhor<sup>15-17</sup>.

### Conservation status

Many organizations have worked to conserve the dwindling animal from getting extinct. One of the major organization working in this regard is WCS which was found in 1985. It was an outcome of a book called Mountain Monarch by Dr. George Schaller, who surveyed Markhor in 1970's and contributed for the creation of Khunjerab National Park for Markhor. WCS having earned the title of trusted partner works as an umbrella organization, therefore, brings all the other organizations and communities closer to work together for a common goal. "Mountain Conservancies" is also the project of WCS, under this project all the valleys are grouped into larger governing body for more comprehensive planning and implementation compared to operating on valley-by-valley basis. This project also involves locals by appointing them as representatives and rangers which has almost completely solved the problem of poaching. To impose the ban of illegal hunting and habitat management in the vicinity WCS has also assisted in writing the bylaws and resource regulations<sup>18</sup>.

IUCN has played a central role in recognizing and identifying Markhor subspecies and declaring out the ones that are endangered. But a lot still has to be done in this regard since there are many controversies that exist. For example Kashmiri Markhor and Chiltan Markhor have not been identified. Locals state them to be another subspecies of Markhor but IUCN has not been able to work in this regard<sup>19</sup>. SOS (Save Our Species) however is also the project of IUCN which was implemented by WCS. This project with the help of Global Environmental facility (GEF) and World Bank provides fund and support to local community based projects which help in protection and management of this endangered species<sup>20</sup>.

CITES in 1973 placed Markhor in its Appendix II but later in 1992 it was transferred to Appendix I to halt the legal trophy hunting by foreign members. However, in 1997 on Pakistan's demand and proposal to start a Community based Trophy Hunting Program (CTHP) permission was granted for export of 6 markhor per year. CTHP with the support and active participation of stakeholders had been able to increase the 50% population in Chitral. Due to which IUCN later increased the quota from 6 to 12 animals per year<sup>21</sup>. CITES with the help of local Wildlife Department also helps in enforcing laws and granting incentives to the local communities<sup>22</sup>. Inspired by Pakistan successful trophy hunting program Tajikistan has also adopted the same program with the help of local community<sup>23</sup>. Under the protection of local tribesmen, funds generated through sport-hunting, the Markhor population in Pakistan increased from 700 in 1994 to 2,500 in 2005 and 4,000 in 2010. The rise in number of wildlife species of Markhor on the other hand had resulted in shrunken habitat. People in many villagers had also complained about wild animals straying into the

populated areas. Due to this Wildlife Department had installed a wall of barbed wires around the communities<sup>23</sup>.

### Black Scorpions (*Androctonus Crassicauda*)

In Pakistan under CITES Appendix II<sup>24</sup> the black scorpion is listed as the endangered species for its illegal trade<sup>25</sup> and hunting<sup>26</sup>. The black scorpions are native to dry areas which include Mir Pur, Azad Kashmir and interior Sindh including areas of Jamshoro, Mithi, Mir Pur Khas and Thatta<sup>27,28</sup>. The brokers that carry out the illegal trading are from Pakistan, USA, Australia, Sweden and China<sup>29</sup>. These species are captured in bouquets that are covered from top by the rocks, desert and trees. The food chain of the peacock in Pakistan<sup>30</sup> was affected by the decrease in numbers of the scorpion.

### Threats to Black Scorpion

The most feared anthropoids in the country was found to be the black scorpions and if found was to be killed on sight for protection. The foreigners working on different projects in Pakistan consumed the black scorpions as food. The illegal hunting was the most essential problem<sup>31</sup>. A single scorpion could be bought from poor people by dealer for price ranging from 5,000-30,000 and it is reported that it was sold in millions of dollar by the broker<sup>32</sup>. It was found that the cost of the species increased as there was an increase in species size and weight, a 60 gm scorpion would cost 50,000 dollars internationally whereas locally it would have a maximum price of 5,000 Pakistani rupees. The international price of one gallon venom of the black scorpion in 2007 was recorded to be 39 million dollars<sup>33</sup>.

### Conservation efforts

The first person who wrote the application to wildlife department of Sindh to extend awareness concerning the issue was Dr. Sajid Hassan Askari<sup>34</sup>. The wildlife department issued a notification after the awareness according to which punishment would be given to the one found catching and selling the scorpions according to the current Sindh Wildlife Laws<sup>35</sup>. There would be a fine of Rs.50,000 or an imprisonment of six months or both for the violator<sup>36</sup>. A strict action was taken according to the AJK wildlife act against the hunters/traders and in 10 AJK districts under Section 144 CrPC its hunting was also banned<sup>37,38</sup>. The wildlife department in Khyber Pakhtunkhwa (KPK) has decided to set prohibition on the business of black scorpions across the province<sup>39</sup>.

### Green Sea Turtle (*Chelonia mydas*)

Green Sea turtle (*Chelonia mydas*) is ranked as second largest of species of turtle population having one eighty Kilo gram weight and three and half feet size<sup>40</sup>. It is common in all sub-tropical and tropical oceanic countries like U.S, Virgin Islands, Mexican Islands, Florida Bay, Coast Rica, Saudi Arabia, Brazil, Oman, India, Pakistan, Indonesia, Malaysia, Philippine and Australia<sup>41</sup>.

Karachi and Blochistan beaches of Pakistan provide nesting sites to 2 turtle species every year<sup>42</sup>. One of them, is Green sea Turtle (*Cheloniemydas*)<sup>43</sup>. The important habitats which are recognized as important nesting site for Green sea turtle are located in Sindh and Blochistan<sup>44</sup>.

### Threats

Different threats to this turtle specie in Pakistan contain pollution of every kind on beaches or near nesting sites which leads to loss of locations for nesting and loss of quest as well as loss of habitats. Other threats include poaching, predation, catching and killing in fishing nets and unrestricted expansion at the beaches<sup>45,46</sup>. The survival of hatchlings because of these threats was found to be about 0.1 %. Other reasons of low hatchlings survival are hunters attack on the baby turtles, quashing by vehicles, illegal collection of eggs by people so that to treat various ailments<sup>47,48</sup>. All these pressures lead to continues declining of population of *Cheloniemydas* in Pakistan. Green sea turtle was acknowledged as "endangered" and was protected under law of Sindh Wildlife Protection Ordinance, 1972 and the Sindh Wildlife Protection Act, 1993<sup>49,50</sup>.

### Conservation status

Commercial export for meat and eggs consumption of *Cheloniemydas* was banned by Pakistan in 1976 when it became the participant to the (CITES) that is Convention on International Trade of 'Endangered' Species of Flora and Fauna. In this convention all the turtles were listed in Appendix I which makes the inhibition of trade of these species to international markets and to the signatory states as well<sup>51</sup>. To inhibit the exploitation of endangered species of Green sea turtle there were different efforts which had been carried out through the country by collaboration of many NGOs and IUCN and National Departments like WWF working in Pakistan along with Wildlife Department of Sindh. Two projects related to conservation of Green sea turtle were conducted by Sindh Department of Wild life, World Wide Fund (WWF) Pakistan, Forest Ministry and wild life and Government of Sindh. Project started in 1979 included tagging of old adult sea turtles and their eggs were incubated in special enclosures made at Hawkesbay and Sandspit. after collection from beach. Hatchlings after release sent to lab of Sindh Wildlife department for weighing and counting. Total 400,000 hatchlings were released during this project. Awareness campaign was also run about conservation of Green sea turtle during nesting season. The tagging of breeding females during the project helped in locating the migration of Green Turtles across oceans<sup>52</sup>. In 1995 a female turtle which was tagged in Hawks bay was again captured from Village of Beraisole, North East Africa. This project helped a lot in sustaining the population of Green sea turtle so that they can be seen nesting at Karachi beaches. The data about navigation and foraging habitats was collected with the help of Satellite transmitter under project running by

WWF, Wildlife Department of Sindh, Pakistan and Abu Dhabi Environment Agency<sup>53</sup>. The NGO named Shehri-CBE established a "Habitat Management Plan" which aided as a vital training for any upcoming beach development and turtle management actions. As specified by WWF (2013) that installation of satellite beacon was done on ten turtles and it was scheduled to install satellite beacon on 10 turtles and stream their activities for two years<sup>54</sup>.

In Sindh and Blochistan beaches Green sea turtle conservation was analyzed in relations of hatching period, size of nesting, period of nesting and nesting species, their clutch size and period of incubation at Darran Beach, Sand spit and Hawks bay Beach. Field enclosures of size 24x24 m were made to protect the eggs and hatchlings of turtle. The egg carrying capacity of these enclosures was about 300 nests at a time. At every night eggs were picked up and were counted along with calculating the number of dead turtles at beach. After eggs were laid, the adult turtles were tagged (Monal tagging) and their returns were recounted for indigenous areas as well as for larger relocations. This also involved dissection of dead species so that the gut and parasite content would be analyzed<sup>55</sup>.

The number of protected hatchlings was left at beaches during 1999-2008 and monitoring of turtles that did not nest was also done with the collaboration of local community. "Wire Mesh Cages" were utilized to protect the eggs. The hatchlings released from protected nests were left to sea at night to avoid predators attack while rotten eggs were buried in the sand<sup>56</sup>. From October 1979 to the December 1997, total 1,453,966 green turtle eggs were secured. After 40-60 days of period of incubation, about 370,414 turtle hatchlings were released in the sea along with the 88,108 new born which were spotted outside the vicinity of enclosure, thus total 479,664 green turtles hatchlings were saved during the October, 1979 to December, 1997. 3,093 turtles were labeled from August, 1982 to December, 1997 and 564 were recollected locally. Three far away tagged recoveries were spotted from India, Africa and Iran<sup>57</sup>. Also more new nesting sites were found near Mubarak village which was 25km away from the Hawks bay. 20-50 cases were reported later with nocturnal observations of nest and in 2004-2007 female turtle population was (492 to 2372)<sup>58</sup>.

Observations made at 1999 to 2008 and stated the most successful year as 16,976 baby turtles were released. Number of nesting was 5455-8784 in the year 2006 to 2008. In 2006 1512 turtles had the false crawling. The size of clutch was different varying from 78 to 120 eggs per nest. Rain and temperature were found to be critical factors which are affecting the nesting. The normal incubation period was 55 to 104 days. This time period can be extended depending on rainfall and temperature conditions. In 2003 16,976 new born were saved and released to the sea along with highest protection of 420 nests. During 1999-2008, the hatching success was 32% with preservation of 2751 nests and 91776 hatchlings. The hatchling number was reduced in year 2006 and 2007 because of heavy rainfall<sup>59</sup>.

## Himalayan musk deer (*Moschus chrysogaster*)

Himalayan musk deer (*Moschuschrysogaster*) of Moschidae family was represented globally by four species viz., Siberian musk deer, Dwarf musk deer, Black musk deer and Himalayan musk deer<sup>60</sup>. In forested sites of Tibet-Qinghai plateau abundance and ecology musk deer was estimated in 1988-1990 resulted its population record 2-3 animals km<sup>2</sup><sup>61</sup>. In the foot hills of southern Himalaya around 50 000 km<sup>2</sup> about 200 000 musk deer can accommodate but only 30,000 animals were anchorages in migrating season<sup>62</sup>. In Pakistan subalpine scrub are most appealing and favorite habitat for musk deer. Musk deer species were found in Gilgit particularly Astor valley, in northwestern Himalaya, in Baltistan particular in Hushe Valley, in Panjkora Valley at two locations Dir Kohistan and at Indus Kohistan<sup>63</sup>. Latest revisions suggest the presence of specie but also indicate decrease in population rate. Musk deer is very much particular in selecting habitat; as well don't allow other to share its boundaries with other. Cliff with gentle slopes and dense vegetation as well as stream beds, small ridges, valleys and colder climatic regions are favorable for its habitat<sup>64</sup>. Musk deer population is declining very rapidly as it is listed in endangered species globally and critically endanger in Pakistan under Appendix I of CITES in the eleventh meeting of conference of parties<sup>66</sup>. Musk deer is famous for its musk which is present in musk gland of mature male. Musk is famous for its fragrance with worth equal to gold rate in international market and it also had medicinal value<sup>67</sup>. Secondly urbanization industrialization and shift into comfort lifestyle hence intensifying human settlements cause declining in population growth of Musk deer<sup>68-70</sup>.

## Threats

Nature of Musk deer is very much self-contained, likes the area where no other can interrupt and gets its food in surrounding. Vanishing flimsy alpine and subalpine meadowlands subsequently lead to decrease in animal population<sup>71,72</sup>. Male musk deer are precious for their musk produced in musk gland during breeding season. Illegal hunting for high value musk is very much practiced in which many female including under age small musk deer also get hunt which is very much responsible for its decreasing population growth<sup>73</sup>.

## Conservation status

To conserve this endanger specie several activities are under taken to record its population status and spread awareness among local community. Baseerud din Qureshi with the help of Rufford Small Grant Foundation took a step to aware local people district officer and government employs about musk deer habitat and friendless nature, complain took place in Neelum valley, Jehlum valley, Pallas valley and outlying of Deosai plains, during complain Baseerud din Qureshi undertaken an activity to count habitat and distribution status of musk deer in an area<sup>74,75</sup>. An area in (AJandK) by the name Machiara

National Park is converted into restricted area to conserve musk deer population, in 2006 estimation study was carried by both direct observation and indirect observation showed increasing population growth rate as compare to 2004. Total 31 musk deer were sighted from 19 sights (6 in subalpine scrub forest and 25 in Himalayan moist temperate forest)<sup>76</sup>. In Karakoram, Hindu Kush and Himalayan mountain areas of Pakistan (Gilgit-Baltistan) during 2005-2010 a study was conducted to count musk deer and to improve musk deer habitat. Study showed six major ungulate species that are Himalayan ibex (*Capra ibex sibirica*), Blue sheep (*Pseudois nayaur*), Astoremakhor (*Capra falconerifalconeri*), Ladakhurial (*Ovis vignei*), Marco polo sheep (*Ovis ammon polii*) and Himalayan musk deer (*Moschuschrysogaster*). Results clearly showed decline in habitat, food resource and shift of animal from locality<sup>77</sup>.

## Snow Leopard (*Panthera uncia*)

Snow leopards are found in an area of almost 500Km<sup>2</sup><sup>78</sup>. This area currently comprises of twelve countries which have harsh climate and jagged mounts. In Asia, the number of snow leopards is decreased to 3000-7500 for every 3 million Km<sup>2</sup><sup>79</sup>. Himalayas, Karakorum, Hindu kash, Pamris, Tienshans and Altai ranges are considered as impending territory of this specie. Because of its decreasing population, it was enlisted as endangered in 1972 by IUCN<sup>80</sup>. Globally, snow leopard population is estimated to 4080-6590 individuals where as in Pakistan only 200-420 individuals are predicted which is continuously decreasing with time<sup>81</sup>.

## Threats to Snow Leopard

Three major threats were found to be affecting snow leopard population includes habitat degradation<sup>82</sup>, grazing of livestock in its habitat<sup>83</sup> and killing by rustic communities<sup>84</sup> for the revenge for their livestock (hunted as a prey by snow leopard)<sup>85</sup>. Other threats to this specie include the illegal hunting and poaching for their use in Chinese medicines, hunting of male snow leopards because they feed six times more as compared to their females<sup>86</sup>.

## Conservation Status

From centuries, major dependency of the local people of such areas was on livestock that's why snow leopard's attacks on the livestock arise many conflicts. To avoid this problem, construction of corals with bricks called predator proofing was done that helped in stopping snow leopard attack on livestock. Programs including live stock insurance, community based eco-tourism and live stock vaccination were started to hoist the livelihood of the local community. To save snow leopard, different organizations had started purchasing eco-cafes and handicrafts from its haunt. In 2011-13, project was initiated by snow leopard trust under save our species project (SOS) in five valleys of Gilgit which involve 14 villages. This project resulted in increased production of meat in the local market<sup>87</sup>.

Environmental education programs were started for the awareness of the local community to know about significance and conservation of species with the help of brochure distribution, pamphlet, workshops and training courses. In order to educate at school level and engaging local community in conservation efforts, different nature clubs were formed. Pursuing local community in these efforts resulted in increasing positive attitude towards conservation<sup>88,89</sup>. Anti-poaching programs were initiated to limit hunting activities and illegal trading like construction of many nature reserves and protected areas including Khunjerab National Park, northern areas, Pakistan, Chitral Gol National Park, in the KPK province, Pakistan<sup>90</sup>. In spite of these, some other measures included tracking programs and research programs for habitat study<sup>91</sup>, climate smart landscape management programs for investigating climate change impact over population and counting the species population<sup>92,93</sup>.

## Conclusion

Pakistan being the signatory of CITES is trying to protect endangered species listed under CITES. The population of CITES listed species of Astor markhor, Snow leopard, Black scorpion, Musk deer, and Green sea turtle is declining. Only 200 - 420 individuals of snow leopards were left. 700 species of Astor markhor was reported in 1995 which was increased to 4000 in 2010 after conservation activities. In 1998-1999 population of musk deer was recorded 2-3 animal's km<sup>2</sup> which was decreased in 2004 and species reached to 35. Conservation efforts in 2006 increased musk population to 64. Conservation activities had increased green sea turtle population from 1979-2007, 479,664-91,776 fledglings were produced and freed securely into sea with a fledgling success rate of 32%. The major threats indentified included illegal trading, hunting, lack of awareness and poor enforcement of laws.

**Recommendations:** Some of the recommendations after reviewing the existing literature included: Habitats of endangered species should be converted in number of protected areas and habitat fragmentation should be controlled. Hunters are only permitted in specific time to hunt specific age of specie. Tagging should be done on species to count the number of migrating individuals. As snow leopard habitat includes Pakistan, India, Nepal, Afghanistan and other countries so international transnational collaboration is necessary to save this specie. Only the conservation efforts in Pakistan will not work if its habitat is destroyed in some other country or its individuals are hunted in some other area. Along with all these efforts to conserve sea green turtle it is also necessary to give awareness to local community and educate them about the importance, protection and management of green sea turtles. There should be a limit set to the use of land especially in vicinity of nesting sites. All tourist activities should be prohibited during nesting season. Highly sensitive nesting sites should be located and measures should be taken to protect the nesting habitats. Measures should be taken to protect the new born from their

predators. Development on beach near the nesting area should be restricted. Land use management program should be initiated to protect critical green turtle habitat.

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