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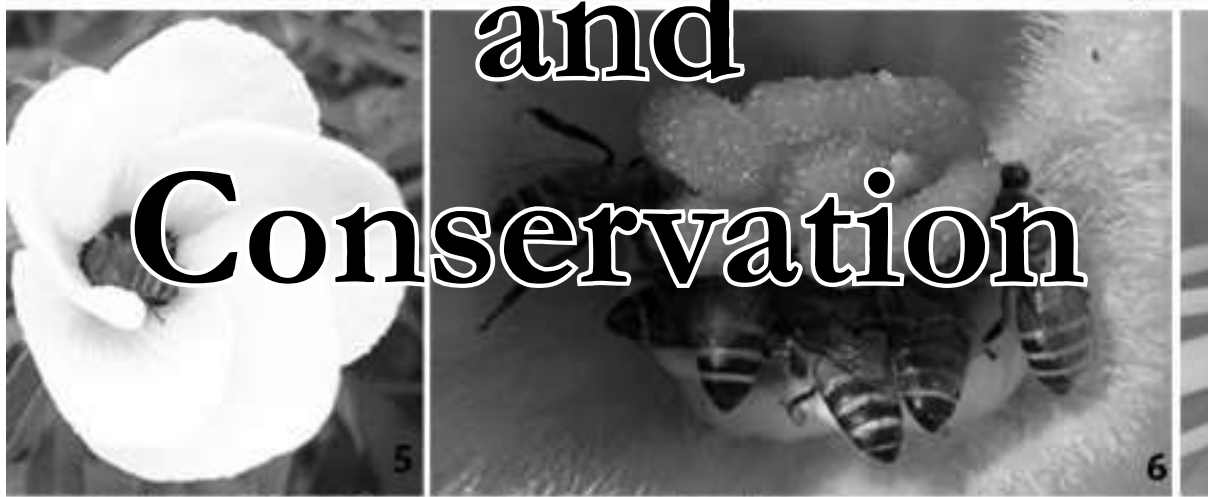
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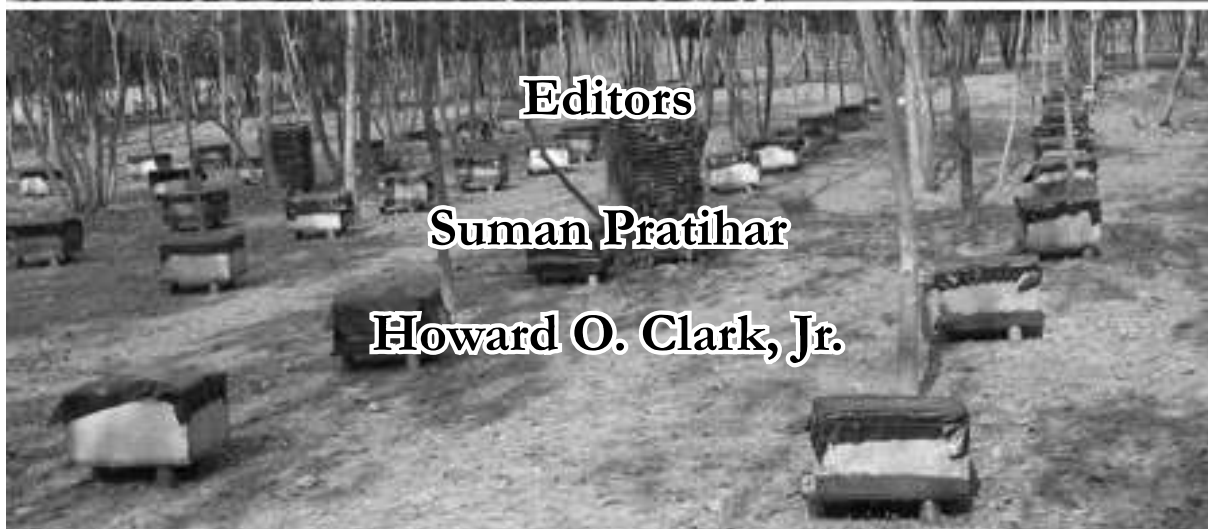


# Defaunation

and



# Conservation



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# Present Wave of Defaunation in Pakistan

Muhammad Sharif Khan

306 North Morton Avenue  
Morton, PA 19070, USA  
*Muhammad.sharifkhan@gmail.com*

## Introduction

Presently Pakistan is in the grip of the 6<sup>th</sup> wave of the “Anthropocene Defaunation,” which started 1000 years ago, triggered by human interference in natural phenomenon, destroying century’s old well-rooted ecosystem. Present interference is now aided by new inventions to milk natural resources as dry as possible, speeding up defaunation at an unparalleled rate and magnitude as previous recorded in earth’s history (Barnosky 2012).

Back in 3000 BC the Indus Valley had been a hustling and bustling subtropical broad-leaf ecosystem with rich megafauna, in addition to the domesticated animals (cow, buffalo, horse, donkey, etc.), there were prides of tigers, cheetahs, herds of wild buffalo, wild pigs, bears, porcupines, crocodiles, rhinoceros, antelopes and elephants, roaming about on the landscape (Khan 2006). Now the landscape in the Indus Valley is reduced to an arid grassland, with the loss of lush vegetation and all components of the megafauna, even the domestic animals are at the mercy of favorable changes in climate (Khan 1990).

## The Demise of Indus Civilization

This highly developed Indus civilization rapidly declined, and by 1500 BC it was practically wiped out. The diagnosed apparent cause had been repeated flooding rivers, destroying towns and villages, incurring heavy losses to property and life; triggered by ecological disasters following unabated felling and destruction of natural resources (Khan 2006).

The wetter climate, dense jungles, filling the riverine strips of the Indus River system, shallow ground water, gallery forests of tamarish, acasia, delbergia, shisham etc., flanked by dense grasses and marshlands conceded to the explosion in human population: changing balance, destroying megafauna (Fig. 2) and flora.

## Present Changes in the Valley

Rising temperatures in Pakistan and India, are causing current wave of defaunation, encompassing all taxonomic groups from lowest to the largest (Cardillo 2008), worrying equally the scientific community, the general public, and biodiversity scientists (Dirzo 2014).



Fig. 1. Map of the subcontinent approximately 10,000 years ago. The Indus valley.



Fig. 2. A stellate dugout from Indus valley with engravings of the megafauna.

### The Dilemma

Defaunation starts at cryptic levels, becomes apparent after that it has gathered momentum, and gets out of control. The resistant species do not allow to quantify its magnitude and damage, scientists need intensive multiple surveys, still with greater risk of error.

### Differential Patterns of Defaunation

Defaunation factors may differ from place to place, depending on location and local bio-ecological conditions. Moreover, certain lineages are particularly susceptible, while other are relatively least affected i.e., 41% amphibians, while birds (17%), mammals and reptiles experience intermediate threat level. Current

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global Defaunation threatens 1,437 mammals and 4,263 bird species per 10,000 km<sup>2</sup> (Barnosky 2012; Brook et. al. 2008).

### Factors Speeding Defaunation-Anthropogenic Pressures

Plants and animals co-exist in a peaceful harmony, enjoying available natural resources, until outside forces interfere to destabilize the equilibrium:

**Exploitation:** The equilibrium in an ecosystem, follows the rule “live and let live.” Khan (1990) reported human activities affecting amphibian populations in the Indus Valley. One of the most prominent drivers of defaunation is direct harvesting, whether for food, medicine, or animal parts or pet trade. Estimates of harvest rates are high, 5 million tons of bush meat is harvested annually across tropical rainforests, includes large and medium sized species.

**A. Exploitation:** None of the amphibian species, in Pakistan, is included in the dietary of the local population. However, amphibians are used in colleges and universities, throughout Pakistan for demonstration of vertebrate anatomy (*Hoplobatrachus tigerinus* is used in Indus Valley institutions, while *Chrysopaa sternosignata* and *Euphlyctis cyanophlyctis* in Balochistan). The number of these species has been found to have been considerably reduced, and have become quite rare around college campuses (Khan 1990).

Each year, hundreds of millions of plants and animals are gathered from the wild and sold as food, pets, ornamental plants, leather, tourist curios, and medicine. If within legal bounds, it should not harm wild populations. However it becomes worrisome when it becomes illegal and threatens the very survival of many endangered species. Overexploitation is the second-largest direct threat to many species after habitat loss, WWF in Pakistan addresses illegal and unsustainable wildlife trade as a priority issue.

According to a recent report, Pakistani illegal trade in different species of frogs, geckos, lizards, snakes, and freshwater turtles is illegally meeting continuously increasing demands in the world pet trade markets. In 2015 alone, consignments with estimated worth of Rs143 million were confiscated. Besides this, there is also a growing trend of keeping large wild animals as pets, become a reflection of one’s financial status and power, in which lions and tigers are particularly popular. Unfortunately some are being associated with political parties in Pakistan.

**B. Destruction of habitat:** Scientists pressurized by the growing demands develop more efficient chemical fertilizers and potent pest controls to boost agriculture produce. The wash-down of these chemicals are absorbed in soil, changes soil chemistry, and encouraging growth of invasive weeds. Moreover, pest control sprays kill resident populations of amphibians and reptiles who prey upon the pests acting as natural exterminators (Dodd 1977; Barclay 1980; Khan 1990).

**C. Use of pesticides:** The mechanized ploughing banished amphibians and reptiles from fields, they were naturally controlling the pests; consequently there is a rise in pests and decline in production.

The advent of new pesticides have not solved the problem, rather it has furthered deterioration. To boost yield of cash crops, improved long-acting

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pesticides are being used to control crop pests. The effects of pesticides on field animals, toads, frogs, and reptiles (skinks, *Mabuya dissimilis* and *Eurylepis taeniolatus*), are well illustrated by number of dead animals which lay dead. Scattered around recently sprayed fields (Khan 1990).

At several sites frogs, tadpoles, and fishes have been found killed in nearby ponds and puddles receiving runoff water from sprayed fields; birds die by eating sprayed insects and caterpillars (Khan 1990).

- D. Fumigation of granaries:** Throughout grain-producing areas in the Indus Valley, large granaries are built to store grain, attracting insect pests and rats, which are followed by their predators: amphibians, lizards, and snakes. Periodically granaries are fumigated killing both pests and their predators.
- E. Industrialization:** Large water catchment area “grasslands” in the suburbs of cities and towns across Pakistan (Lahore, Gujranwala, Sheikhpura, Wazirabad, and Failsailabad), which had been feeding and breeding grounds of local species of amphibians and turtles; local flora attracted different arthropods, providing food to the resident amphibians and reptiles, had been replaced by large industrial buildings, with extermination of local flora and fauna (Khan 2006).
- F. Mechanization of agriculture:** Usually resident amphibians retreat in holes and crevices in tilled fields, close to their feeding and breeding sites. The ox-driven ploughing method gave sufficient time to the disturbed animals to escape from being injured or crushed.

Though mechanization has boosted agriculture produce many folds and saved time, the deep ploughing unearths animals from their burrows, does give the have no time to escape, and are trampled and crushed under heavy machinery.
- G. Fragmentation of habitat:** Extensive network of roads and link roads constructed across industrial areas, have fragmented surrounding grasslands. Day/night traffic, kills by crushing different types of wildlife as they move across the roads. Moreover, fragmentation of natural habitat had disturbed harmony and reduction in animal number.
- H. Nutrient cycling decomposition:** Because of use of extensive spray on crops by pesticides, diversity and functional invertebrate communities, have dramatically impacted in reduction of decomposition rate of nutrient recycling. Mostly there is decline in populations of mobile species that move nutrients long distances, affecting agriculture produce.
- I. Pollination:** 75% decline in insect pollinator diversity is strongly linked to the decline in produce. Decline in pollinators has reduced seed production and reduction in bird population, affecting honey production. The ramification of roads in the grasslands not only partition the habitat, it has obstructed natural water flow, thus increased pollution in habitats.
- J. Water quality:** Defaunation has affected water quality and dynamics of freshwater systems. The global decline in amphibian populations is also due to increased algae and detritus biomass in habitats, reduced nitrogen uptake, affecting whole-stream respiration. Large animals, including ungulates, hippos and crocodiles prevent the formation of anoxic zones through agitation effecting water movements through trampling.
- K. Human health:** Defaunation affects human health in many ways: Reduction in ecosystem goods and services, pharmaceutical compounds, livestock



Fig. 3. Subcontinent showing recent temperature increase.

species, biocontrol agents, food resources and disease regulation. Birds 23-36%, mammals and amphibians used for food or medicine are threatened with extinction. In many parts of the world wild animals are the only food source and are critical part of the diet, particularly of the poor. Vertebrate used for food have declined at least 15% since 1970.

- L. Habitat destruction:** During last two decades, these sites have mostly been acquired to set up multipurpose industrial complexes. Draining, digging and levelling construction activities by using heavy machinery, has destroyed local fauna and flora by trampling and drying ponds and puddles.
- M. Urbanization:** similarly almost universally in the suburbs of villages and towns, there had been ponds and puddles formed by the excavation of earth for building purposes, where amphibian and turtle species breed during the summer. These sites have now been filled to destroy breeding grounds of mosquitos, destroying local species of frogs and turtles.

### Concluding Remarks

Khan (2006) enumerates wide range of instances of unlawful exploitation of herps going throughout Pakistan: like plundering sea turtles *Lepidochelys olivacea*, *Chelonia mydas*, and *Dermochelys coriacea* and their nests along coastal beaches, when they annually visit sea coast along Pakistan. The poaching activities of local nomadic snake charmer tribes: “sanyasies”, “gagras” and “Tapri-was” actively engaged in destruction and depletion of reptilian populations in the wild, to sell in market (Minton and Minton 1964; Khan 1993). They endlessly hunt for several wild reptiles including: *Varanus bengalensis*, *V. griseus*, *Sara hardwickii*, *S. asmussi*, *Trapelus agilis*, *Python molurus*, *Ptyas mucosus*, *Spalerosophis diadema*, etc., lured by high price their skins and body parts fetch (Konieczny 1969b; Vohora and Khan 1979; Khan 1993, 2000).

Local venomous snakes: *Bungarus caeruleus*, *Naja naja*, *N. oxiana*, *Echis carinatus*, and *Daboia russelii* are caught at random from wild, and are supplied in the hundreds to the Health Institutions for venom extraction, to produce antivenin, without consideration of damage done to natural population and ecosystem.

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The snakes are kept congested in filthy small pens, are never fed. Those succumbing to adverse conditions are thrown away or burned.

Lizards especially snakes are killed on sight by the general public, as reptiles are regarded as venomous and harmful, following common philosophy “**kill it before it kills you!**”

Due to pressures from all sides, the resident reptiles in Pakistan are fast depleting in number and species, as demonstrated by record of killed/alive reptiles received by the author (Khan 2006) in Herpetological Laboratory Pakistan, from 1964 to 1998 (Table 12.1), note decrease in receipts from 243 in 1964 to 44 in 1998.

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