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Arunachali Yak and Impact of Climate Change on Its Habitat

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Arunachali is the first and only recognized breed of Indian yak. They are mainly distributed in West Kameng and Tawang districts of Arunachal Pradesh where they are reared by the transhumant pastoralists, *Brokpas*, of Monpa tribe. Yaks are intricately associated with the culture, religion and social life of the Monpa tribe and are also treated as an asset by the rural community.

Arunachali yaks are compact with angular type body shape, supported by short, strong and straight legs. They have heavy head, wide convex forehead with small horizontal ears and short neck. Male yaks can be massive with adult weight upto 410 kg while females are medium sized with maximum adult weight upto 270 kg. The mean height at withers of these animals in males and females is 111 and 94 cm, respectively. Black is the predominant coat colour of *Arunachali* yak followed by brown. Combinations of coat colour of black with white patches or strips are also seen in some animals. Although very less in number, grey and white coat colours are also found.

Habitat

The breeding tract of *Arunachali* yak spans around 5000 square kilometers, covering parts of the West Kameng and Tawang districts, and is situated between 3000 and 6000 meters above mean sea level. Yaks live in wet, humid locations with 1,607 millimeters of annual rainfall on average. Yaks are among the most unique and hardy animals because of their adaptability to harsh climates and high-altitude conditions.

Traditionally, they are reared under transhumant system in free-range manner. During summer months from May to September, they are taken to high altitude alpine pasture for summer grazing and return to temperate pasture of mid altitude with the onset of winter from October to November for winter grazing (December to February). They rely on available green forage and tree leaves for their nutrition with almost zero input except for occasional handful of concentrate in the form of ground maize and salt, which are fed to them by the herders.

Figure 1: *Arunachali* yak in its summer pasture

Climate change

Climate change refers to the long-term shifts in temperature and weather patterns. It is a global problem since shifting climatic circumstances have an impact on a variety of habitats. It affects several kinds of environments and the organisms themselves in a variety of ways. Raising temperatures in aquatic environments cause more evaporation, which changes the water's salinity. Increased sea levels lead to the loss of habitat for coastal species, while in terrestrial ecosystems, rising temperatures bring on drought and less rainfall, which impact the growth of vegetation and the availability of food and shelter for living things. Additionally, it has an impact on when seasonal behaviors like migration and mating occur, which upsets preexisting food webs and predator-prey dynamics. Climate change also impacts a number of natural disturbances that threaten forest health, these include insect outbreaks, invasive species, wildfires and storms.

Impact of climate change on habitat

Global warming causes a variety of risks to mountain habitats by affecting the distribution of plants and animals (Beckage et al. 2008), resulting in

loss of rare species of alpine habitats and dearth of pasture lands. One of the most important environmental variables that affect the health, welfare and the production efficiency of animals is the temperature (Kuczynski et al. 2011). Yaks are exquisitely adapted to the high-altitude conditions and are therefore likely to be severely affected by climate change. Climate change not only have impact on the environment and ecosystem but also affects the survival, productivity and welfare of this unique species. The mean environmental temperature of yak habitat at the altitude of 3,000 m and above varies from -1.16 to 11.06°C and 7.88 to 19.69°C during winter and summer, respectively, and an increase in temperature from this range causes thermal stress to the yak during summers (Krishnan et al. 2010).

The habitat of *Arunachali* yak too is facing the woes of climate change. With the rise in temperature there is degradation of high- altitude pastures and gradually shortening of winter which in turn impacts the production, reproduction, health and overall yak husbandry. Climate change has led to the Brokpas responding and modifying their migratory route and transhumant yak herding practices. Transhumant yak rearing involves the seasonal migration or movement of the animals along with its herder between summer and winter pastures according to biomass and pasture availability. Summer migration to high altitude starts with the melting of snow in winter pasture conventionally around the month of April, however, recent times have had farmers start their hike to summer pasture as early as late February due to considerable decrease in the amount of snowfall and early onset of summer. Physiologically, the heavy coat and other specialized thermoregulatory mechanism of yak keep them alive in extreme conditions of high altitude but are responsible for heat stress in warm climatic condition (Wiener et al. 2003). The herders are forced to migrate to a higher altitude in search of a more ambient temperature for their animals and stay for a longer duration due to longer summer months.

Climate change affects the quantity and quality of alpine pasture (Li et al. 2010) which impacts the overall productivity of yak. Yaks gain their body weight during summer and lose 25–30% of their body weight during winter (Pourouchottamane et al. 2011). Due to cyclic nutrient deficiency or unbalanced nutrient supply within short growing seasons for herbage, annual cycle of weight loss in cold season and weight gain or compensatory growth in warm season in yak is a common phenomenon (Xue et al. 2005). As a result of climate change, the changes in forage quality and its availability, delay the recovery of body condition in summer months leading to reduced reproductive efficiency in addition to increased disease susceptibility. Water sources have also dried up and as such new tracts are to be sought during migration for availability of water. Furthermore, there is encroachment upon yak pasture with warm climate wild shrubs and plants like Rhododendrons, thereby, shrinking the grazing ground of yak.

Figure 2: *Arunachali* yak in its winter pasture

The occurrence of disease has become more prominent along with the changing climate (Sherpa and Kayastha 2009). Diseases like foot and mouth, brucellosis, infectious bovine rhinotracheitis, hemorrhagic septicemia, chlamydiosis, salmonellosis, gid, and tick-borne diseases have increased incidences and are causing death of yaks The rise in ambient temperature due to climate change has also resulted in increase of pests and parasites like leech and *Fasciola sp.* as well as diseases especially in the lower settlements in the sub-alpine region thereby making these areas unsuitable for yaks (Wangchuk et al. 2013).

Conclusion

Increasing ambient temperatures, more erratic precipitation patterns, higher rates of natural disasters, growing disease risk, and disruption of food

plant ecosystems are all likely to bring more challenges to *Arunachali* yak habitat and husbandry. Different strategies should be developed to mitigate the effects of climate change in terms of helping yak to adapt to their changing environmental circumstances. Mitigation of the effect of climate change on yak may be achieved by three means, physical modification of the environment, improved nutritional management and genetic development of strains that would be less sensitive to heat stress (West 2003, Collier et al. 2006).

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