Evaluation of Changes in Ecosystem Services Due to the Conflict between Local Community and Red Fox

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ABSTRACT

Ecosystem services and their contribution to local economies and livelihoods need to be fully understood and recognized by many stakeholders and law-makers. Human-carnivore conflict (HCC) is an important dynamic that affects the ecosystem badly. The main primary purpose of the current study is to evaluate changes in the ecosystem from 2020 to 2022, caused due to conflict between Kashmir Hill red fox *Vulpes vulpes griffithii* and residential community of Azad Jammu and Kashmir. Such studies have not been conducted in this study area. The linear count survey (LCS) and questionnaire methods were used for the evaluation and assessment of recent records. Our results demonstrate that population of the fox is declining, as the three years data showed that 62 foxes were killed. More than 95% of the respondents desired the eradication or diminution of the red fox population followed by 40% and 50% of wolf *Canis lupus* and jackal (*Canis aureus*) populations respectively. The major reason of their killing was the attack on the local's livestock, cereals, crops etc. The results of current study have shown the damage ratio of cereals (P-value=0.001) and vegetables (P-value=0.042). As wolf and jackal are a lesser threat to their poultry as compared to the fox, the local community have a more negative attitude towards the red fox. Educating local people can greatly reduce negative perceptions. The drastic hunting/killing of the red fox needs our immediate attention, otherwise, the species could be exterminated from the area.

INTRODUCTION

Ecosystem services are essential for resource management and sustainable livelihood (Jewitt *et al*., 2016 and Grass *et al*., 2000). More than at any other moment in history, humans have drastically altered the geography of the Earth within the last 50 years (Steffen *et al*., 2011). Therefore, this time period is known as the "Anthropocene," which is characterized by accelerating and unprecedented human impacts on the earth and the need to modify this trajectory by supporting sustainable ecosystem (Lewis and Maslin *et al*., 2015 and Steffen *et al*., 2015) through rationalizing agriculture and urbanization that are among the leading causes of ecological change/s (Lin *et al*., 2020).

One of the biggest conservation issues has been the co-existence of people and mammals (Lamb *et al.,* 2020 and Ahmad *et al*., 2022). Human-wildlife conflict (HWC), which has ecological, socioeconomic, cultural, and commercial components, is a persistent conservation concern around the world (Young *et al*., 2010, Redpath *et al.,* 2013). Livestock predation that causes devastating economic loss to people, diverse socioeconomic and cultural communities with varying levels of poverty, and negative perception of carnivore species by local communities are some of the socioeconomic and cultural

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aspects of HWC (Moheb *et al.* 2012; Kansky *et al.* 2014).

Like everywhere else in the world, HWC issues also exist in Pakistan and Azad Jammu and Kashmir (AJK) (Roddick *et al.,* 2022). The majority of studies on HWC issues from Pakistan and AJK have been published, with a focus primarily on the northern flanks of the country, which are considered biodiversity hotspots and have less heavily populated landscapes (Ahmad *et al.,* 2016). We presume that the rest of Pakistan and AJK, which is home to potential ecosystems with a high biodiversity, have been left out of studies on these particular and related issues because the northern flanks have received so much attention (Echegaray and Vilà, 2010).

Thus, it is crucial to consider any potential conflicts of interest while evaluating how the neighborhood's red fox *Vulpes vulpes griffithii* dispute would affect ecosystem services. Because of the red fox predation on local livestock and potential effects on farming methods, the local economy, and biodiversity preservation, this conflict has arisen. Consideration of all relevant stakeholders and any potential conflict of interest is essential when evaluating these adjustments (Letnic *et al.,* 2012). There may be conflicting interests between the red fox and the locals, notably the farmers. The red fox, which preys on livestock, can be seen by farmers as a threat to their way of life. The red fox's potential economic repercussions, which could cause losses to farmers, are what sparked this argument. The fox may thus be perceived by farmers as a pest that needs to be managed or eliminated (Baker *et al.,* 2006).

The red fox is the most widespread land mammal that occurs across five landmasses: Asia, Europe, Australia, Northern Africa and North America (Ables, 1975). The red fox is found all over Pakistan and AJK, with three subspecies currently recognized: *Vulpes vulpes griffithii* (also known as Kashmir hill red fox) in the temperate mountainous regions, *V. v. montana* along high altitude region of the Karakoram and Hindu Kush ranges, and *V. v. pallipes* in deserts and grasslands (Roberts, 1997). However, little is known about the distribution or genetic distinctiveness of these red fox subspecies.

Based on morphology, *V. v. griffithii*, is thought to inhabit the broad-leaved forested montane regions of AJK, India, Afghanistan and Pakistan along the Western Himalayan foothills. The subspecies has also been documented in the Afghan provinces of Balk, Badakhshan, Kabul, Faryab, Kandahar, and Jowzjan (Blyth, 1854). It is found throughout Pakistan's mountainous and intermountain valleys, including Ayubia National Park, in the provinces of Khyber Pakhtunkhwa, Punjab and AJK (Blyth, 1854). The genetic affinity of the Kashmir red fox towards the Palaearctic or Holarctic maternal lineage is still unknown because its putative range is located in the intermediate altitude habitat between the distributions of the montane red fox *(V. v. montana)* and white footed red fox (*V. v. pusilla*) (Roberts, 1997).

The diet of the red fox is diverse and includes invertebrates, small mammals, birds, fish, fruits, and carrion (Osborn and Helmy, 1980; MacDonald, 1981; Jdrzejewski and Jdrzejewska, 1992; Dell'Arte *et al*., 2007). However, the composition of its diet may change based on a number of factors, including habitat type (Hartova-Nentvichova *et al*., 2010), the availability of prey (Sidorovich *et al*., 2006), and seasonal variations in food availability (Baltrunaite, 2001, 2002). The cape hare *Lepus capensis*, flying squirrel *Petaurista petaurista*, house mouse *Mus musculus*. Himalayan palm civet *Paguma larvata*, and sheep *Ovis* spp. make up 80% of the fox's diet. The domestic donkey *Equus africanus asinus* was another food source for the fox. The fox consumes plants as well, which may aid some plant species in dispersing their seeds (Linnell *et al*., 2012).

The red fox may use human-derived resources in areas close to human habitations, which may have broad consequences on the ecosystem. In Pakistan's rural areas, red fox harms local economy and preys on livestock. As a result, HWC frequently happens when human ambitions negatively impact the needs of wildlife or when human goals negatively impact the behavior of animals. According to Bagchi and Mishra (2006), the assumption is that HWC is inversely proportional to the human population. The consequence of conflicts between humans and various wild species is often severe and well-documented in the case of large mammals (Aryal *et al.,* 2014). Some of the obvious and regular implications of HWC near protected areas are crop devastation, livestock predation, and assaults on humans by wild animals (Fleming *et al.,* 2016).

Poor pastoral communities throughout the world, including Pakistan, experience significant economic losses as a result of wild predator predation on cattle. Wild carnivores can feed on any type of livestock, including chickens, goats, sheep, horses, and cattle (Graham *et al.,* 2005). In Pakistan, a predominantly agricultural country, livestock production accounts for 37.5% of the country's agricultural value addition and between 9.4 and 23.3% of its GDP (Ghoshal *et al.,* 2016).

Because of the antagonistic sentiments of the locals, wildlife is retaliatory killed by various means, such as poisoning, shooting, or hunting. The aforementioned human behavior depends on peoples' willingness to put up with dangerous species (Greentree *et al.,* 2000). As a result, conservation in the twenty-first century has a fundamental challenge: combining human needs with those of wildlife living in environments subject to considerable anthropogenic pressures (Oli *et al.,* 1994).

The IUCN rates the red fox as least concern (LC) globally but near threatened (NT) in Pakistan due to shortage of food sources and habitat degradation (Khattak *et al*., 2022). According to Veorisalo *et al. (*2014), red fox prefers places with a variety of bushes and undeveloped ground. Temperature, day duration, climate, seasons, shelters, habitat productivity, prey availability, inter- and intraspecific competition, and other living and nonliving elements all have an impact on animal population density (Sargeant, 1972). The red fox population density is influenced by habitat choices.

When assessing the changes to ecosystem services, their perceptions and actions may be impacted by this bias. It could be necessary to choose between protecting the environment and policymakers' ability to address farmers' concerns. It can be challenging to strike a compromise between the neighborhood's financial concerns and the red fox's ecological significance. Currently in this study, the main objectives were to evaluate the changes that occurred in ecosystem services due to the human-red fox conflict (HRFC) in AJK. In order to reduce the conflict while creating sustainable policies, policymakers must take into account the various points of view and interests that are involved.

MATERIALS AND METHODS

Study area and topography

The current study was conducted in ten districts of AJK from 2020 to 2022. Due to its scenic beauty with an area of 13,297 km², AJK is also known as the paradise on earth. It is located between longitude 730-75 E and latitude 330-36 N (Akrim *et al*. 2019). From 360 meters in the south to 6325 meters in the north, the altitude varies substantially, according to topography of AJK.

Out of 10 districts in AJK seven districts viz., Neelum, Muzaffarabad, Hattian, Bagh, Kahuta, Poonch, and Sudhnoti are the northern districts that are typically mountainous, whereas three districts viz. Kotli, Mirpur, and Bhimber are southern districts that have comparatively flat surface topography.

Human population is approximately 4.045 million. Animals kept by locals include domestic cows, buffaloes, goats, sheep, dogs, horses, chicken, and rabbits. With an average household income per month ranging from US$ 100 (27,782 PKR) to US$ 200 (55,566 PKR), the majority of individuals are employed in the trades of agriculture, labor, government, and shop-keeping. Livestock is typically kept by farmers, business owners, and laborers for the purpose of producing milk and meat, as well as for subsistence (Akrim *et al*., 2019).

Climate

The weather accordingly in the current study area fluctuates with the north being colder and the south having dry sub-tropical climate. Average annual rainfall is from 1000 mm to 2000 mm, with 30–60% precipitation in the form of snow in northern parts (Akrim *et al*. 2019).

Fauna

Major fauna of AJK is common leopard (*Panthera pardus)*, rhesus monkey (*Macaca mulatta)*, Asiatic or golden jackal (*Canis aureus)*, Kashmir hill fox (*Vulpes vulpes griffithii)*, small Indian mongoose (*Herpestes javanicus)*, Indian grey mongoose (*Herpestes edwardsii)*, barking deer (*Muntiacus muntjak)*, Indian pangolin (*Manis crassicaudata)*. Five pheasant species have been reported from AJK viz. kaleej (*Lophura leucomelanos*), koklass (*Pucrasia macrolopha)*, cheer (*Catreus wallichii)*, monal (*Lophophorus impejanus)* and Western horned tragopan (*Tragopan melanocephalu*s) (Akrim *et al*. 2019).

Data collection

The linear count survey (LCS) method was used for the assessment of recent records, distribution of red fox according to seasonal change, and vegetation analysis in the study region. Both physical counts and questionnaire surveys of the entire group are suitable for use as direct and indirect observation techniques. A small (10 × 15 cm) image of the red fox was used in the questionnaire that followed for precise identification.

In May and June 2020, a reconnaissance survey was carried out to find the study species' likely habitat. Based on the study, plots were chosen in the likely habitat of the species, information was acquired from literature reviews. The choice was based on the accessibility of study sites. Azad Jammu and Kashmir, the two main zones, were further divided into survey plots.

Between May and June 2021, local residents in AJK were interviewed face-to face at site. To assess the survey's clarity and completion speed, a pretest (n = 20, on randomly selected participants) was done. Every district's cities, towns, and villages were visited between the hours of 9.00 and 15.00 and 17.00 and 21.00, Monday through Saturday. In order to create a demographically relevant sample, surveys were conducted with residents of the majority of neighborhoods, including both wealthy and less wealthy areas. Every fifth individual who passed the researcher in front was asked to participate by filling in a survey questionnaire. When more than five people passed while a questionnaire was being filled in, the first person encountered after finishing the questionnaire was chosen. To make sure that farmers and hunters were both represented in the sample, hunting clubs and farming cooperatives in the study area were also visited. With the interviewer's guidance, respondents completed the

questionnaire orally on an average for 10 min.

Questionnaire survey

For the purpose of identifying the human-red fox conflict, information was gathered and documented in the study region via questionnaire surveys and interviews with members of the local community, including farmers, villagers, wildlife experts, and hunters. After categorizing survey participants as members of the general public, farmers, hunters, a series of questions about demographic traits and the acceptability of management practices were then posed to them. Gender and age (aggregated into three classes of adults (18 or more than 18 years of age) according to ELSTAT (2011) classification: i) 18-34 years old, ii) 35-54 years old, and iii) over 55 years old) were demographic characteristics.

Red fox samples, such as scats, hair, or other body parts, can be used to examine genetic variation. We also tried to collect as many samples as we could, and we always made sure that n=43 was the minimum. For genetic investigations, the polymerase chain reaction and DNA analysis are common molecular methods. We pictured each survey as it was being conducted for records. Deployed cameras with the ability to record digitally stamped photos with a precise date and time; these are available for purchase. Locations for installing camera devices were chosen depending on the presence of animal tracks. The 24-hour data were recorded at a given spot using camera units. Records were retrieved between the date that the camera was set and the required date.

Data analysis

Logistic regression analysis was conducted to evaluate the association between crop type and crop damage caused by Red foxes in the study area. The results show a significant association between crop type and the probability of crop damage ($\chi^2 = 27.34$, df = 1, $p < 0.05$). Both cereal and vegetable crops revealed significant associations with crop damage by Red fox (cereal: odds ratio = 0.031, p = 0.001; vegetable: odds ratio = 0.100, p = 0.042) (Table 1).

Table I: Crop damage inflicted by red fox in the study area.

Crop type	Odds ratio	Coefficient	SD	P-value
Cereal	0.031	−3.468	1.012	0.001
Vegetable	0.100	−2.306	1.135	0.042

RESULTS

The data were collected from 10 districts of AJK during 2020-2022. The results of the present study were based on the evaluation of changes in ecosystem services via sighting reports of red fox. Red fox basically affects livestock and is a threats to farmers and local community. Table II shows the number (N) of red fox i.e. killed in different locations of AJK.

Sighting report of red fox and other wild animals in the selected area

Four species of mammals were reported i.e. red fox, common leopard, grey wolf, and golden jackal, in the last three years (2020–2023). Red fox sightings were reported to be the most frequent (an average of 55 per respondent each year), followed by a grey wolf (30 %), common leopard (10%), and golden jackal (5%). The common leopard and golden jackal had the fewest sightings reported by respondents in the research area (Fig. 1A). According to current results, common leopard was a rare species. The golden jackal was also listed as a rare species in the region by a sizable portion of respondents. More over 80% of respondents thought that the red fox was abundant in the area (Fig. 1B).

Red fox killed in different locations of AJK

The number of red fox killed by various human and animal activities is given in Table II. It demonstrates that, as a result of human population growth, red fox death rates rise every year. The greatest number of red fox were killed in 2020 followed by 2021 and 2022. In 2020, 25 fox were retaliatory killed due to attack on local's poultry. In 2021, 20 foxes were killed while in the year 2022 the number of red fox killed was 17. The number of kills decreased due to decline in the population of the fox.

Table II: Number of red fox killed suring 2020-2022 in different locations of AJK.

Year	No of fox killed	Reason of killing
2020	25	Attack on poultry (89)
2021	20	To train dogs (15)
2022	17	Entertainment/prey (11) and for medicinal reason (9)

According to the interview with 89 participants, the primary cause of the fox deaths was their attacks on domesticated birds in human communities. Fifteen persons reported that fox killing increased due to trained dogs. Other interviewees stated that red fox were mostly killed in AJK due to entertainment/prey and being considered as enemies.
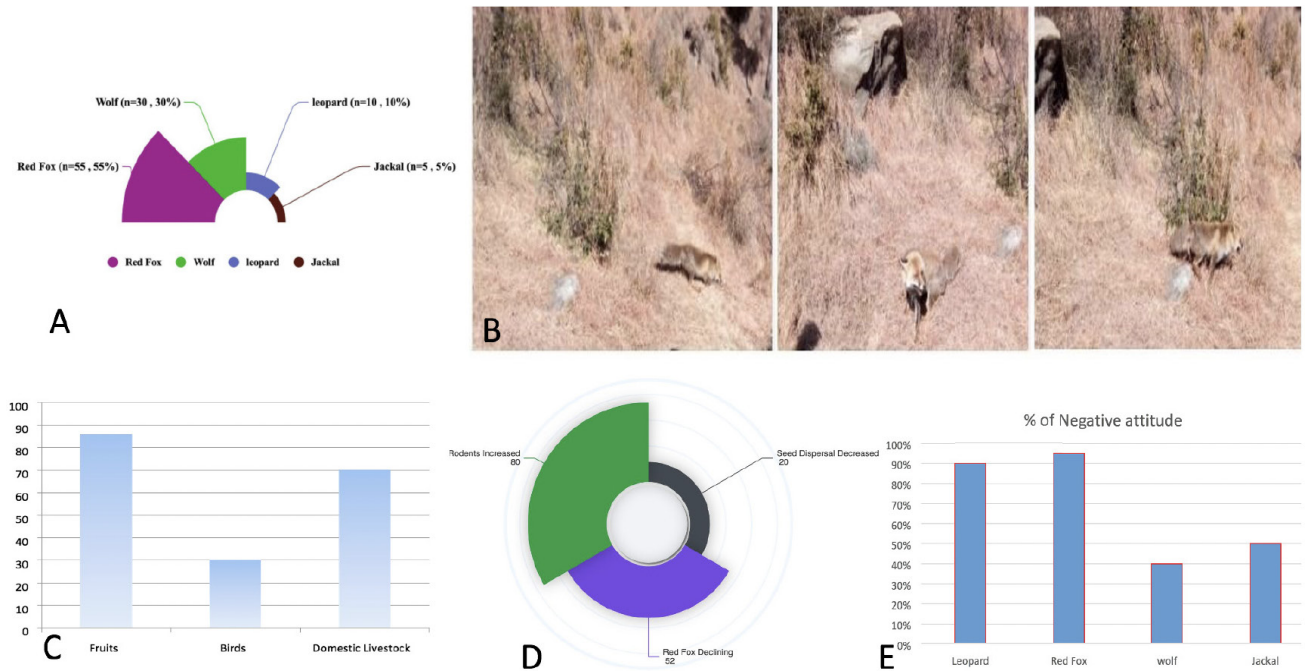
Fig. 1. Human-red fox conflict. A, frequency for leopard, wolf, and jackal seen in the area. B, red foxes seen in the area. C, damage caused by red fox. D, pie-chart shows declining fox population and seed dispersal where- as rodent's population increased that disturbed food web of ecosystem services. E, negative attitude of local people towards red fox and other mammals.

The red fox is an opportunistic predator, as farmed poultry is considered to be an easy source of food when attacked. The fox can be a threat to poultry, including chickens, ducks, and other small birds, particularly in rural areas where human populations are encroaching on natural eco-systems. Utilizing deterrents like motion-activated lights or noise generators may help keep foxes away because they can be sensitive to loud noise or bright lights. Prob-lematic foxes may be trapped and relocated in some circumstances.

Consumption of fruits, birds and domestic livestock by red fox

Fruits are one of the most important food items consumed by red fox in our study. Different kinds of fruit (86%) were damaged by the red fox including banakhor (*Aesculus indica)*, anjeer (*Ficus carica)*, amla (*Phyllanthus emblica)*, akhrot (*Juglans regia)* and apricot (*Prunus armeniaca)* followed by domestic livestock (70%) (Fig. IC). During this period, we also found that red fox also fed on birds, tragopan, cheer pheasant*,* kalij pheasant and chicks of peafowl are also a component of biodiversity of the area and render important ecosystem services as pollinators, seed dispersal agents, whereas the red fox while preying on them serves as nutrient cycling agent and believed to be ecosystem engineer.

Disturbance of food web

Our study recorded that population of rodents increased (80%) whereas population of red fox was declining (52%) day by day via conflict as shown in Figure 1D. By declining the fox population, seed dispersal (20%) was also affected. Seed dispersal is one of the predominant factors in the ecosystems. Scavenging activity is also disturbed due to fox killing in the study area. Due to that many zoonotic diseases spread and environment polluted because of delayed decomposition.

During the field observations, questionnaires and interviews recorded of the local community, the main root causes of changes in ecosystem due to the conflict of red fox and local community in the study area were the feeding habits of the fox, damaging the poultry and fruit, declining fox population due to which the rodent population increased.

Livestock

Livestock is one of the main sources of income for the residents in the study area, who generally live an agro-pastoral lifestyle. About 39% of the respondents were dependent on agriculture and animals. The 498 participants in the current study reported owning 10,324 animals (21 animals per household). The majority of livestock, or roughly 51%, was made up of goats, followed by donkeys

and poultry with 23% and cattle and sheep with 20% and 6%, respectively. Sometimes the red fox attacked these animals. Therefore, red fox is considered a major threat to livestock in AJK resulting in significant financial losses.

Negative attitude of local people toward red fox and other mammals

In order to understand the causes of the locals' animosity towards red fox and other species, we gathered information about their attitudes. In our results, four categories were used to classification of the residents' attitudes towards wildlife: sustain, increase, decrease, and eradicate. Positive attitude (keep and increase) and negative attitude (reduce and eliminate) were further divided into these four categories. More than 90% of respondents had an un-favorable opinion towards the leopard. Either eradication or a decline in their population was what they desired. More than 95% of the respondents desired the eradication or diminution of the red fox, and 40% and 50% of wolf and golden jackal respectively (Fig. 1E).

Outcome of human-red fox conflict

In our study area, the conflict has repercussions for both humans and wildlife species. The respondents reported a total of nine wildlife attacks on people over the previous three years. Eight attacks were reported by respondents to have involved wild boar *Sus scrofa*, while one attack involved a golden jackal. These attacks reportedly resulted in serious injuries, however none of them was fatal. Conflict between red fox and people also has an impact on other wildlife species. In response to livestock predation, agricultural damage, and human assaults, the locals recorded a total of 62 (n = 234 each year) wildlife kills. Wild boar (65.7%) and golden jackal (23.7%) were the most frequently killed animals, followed by red foxes (4.6%), Indian porcupine *Hystrix indica* (4.3%), grey wolf (1.3%), and common leopard (0.4%).

Effect of conflict as service provider by fox to environment

Current study found that the fox performs a variety of ecosystem services, such as scavenging behavior. Fox is opportunistic omnivore, which means that it has a varied diet and can consume both plant and animal matter. Despite its reputation as skilled hunter consuming small mammals, birds, insects, and even carrion, it typically engages in scavenging behavior when it comes across easily accessible food sources. Fox is renowned for scavenging on the remnants of dead or naturally dying animals. It might eat the remains of larger animals like deer or wild hare, but being scavengers, they might also devour dead birds or rodents. In metropolitan areas, fox

may scavenge on human garbage, including trash, leftover food, and even pet food that has been left outside.

This behavior has increased in frequency as the fox has adapted to living in or near human settlements. Fox has keen senses and is sensitive of its surroundings. Any available food source, including fruits, berries, and insects, will be used by it. Fox is known to bury surplus food as a kind of storage. It will eventually discover these caches when food supplies are few, particularly during the winter. Since it might save leftover food for later use, this activity of caching might be seen as a scavenging approach.

All these ecosystem services are disturbed by conflict because mice are eaten and involved in prey and predator competition. Fox attacks small cats hence if fox population decreases due to human killing activities the population of cats will increase and may produce many problems in the ecosystem. Fox also attacks birds. The decrease in the fox population may result in the increase in the number of mice that may be harmful for the environment (Scasta *et al.*, 2017).

DISCUSSION

The results of our study accord useful insights into the nature of HRFC in AJK. No systematic studies have been carried out in AJK, on their conflict with anthropogenic disturbance and on the red fox, as ecosystem is changing adversely (Nowak, 1999; Jiang *et al.*, 2003; Lundrigan and Baker, 2003). As the present results revealed the harmful changes occurring in the ecosystem of AJK due to the conflict between local community and red fox. Increased reporting of conflict incidents from various regions of the country could be due to an increase in HCC research interest or it could be a legitimate reflection of more recent conflict zones. Knight (2000) and Henle *et al.,* 2008) have previously connected increased reporting of HCC from new locations to changes in land use and livelihoods as well as increased agricultural activity.

In preliminary research, many complaints, anecdotes, and descriptions of red fox behavior, impact on the neighborhood, and conflict between villagers and red fox were documented. HCC has a long history because of its growing size and complicated character, it has become a major challenge for the ecosystem. Previously, conflict between humans and wildlife was regarded to be an issue in rural or agricultural areas, mostly affecting small towns closer to forests (Messmer, 2000; Ahmad *et al.*, 2022). It was discovered throughout the current investigation that the problem was mostly brought on by red fox foraging activities, which cause damage to and consumption of human-cultivated fruits as well as attacks on domestic fowl. Retaliatory killings are reportedly motivated by domestic

animal predation. Our study supports the previous study of Ahmad *et al*., 2022), where the conflict occurs between local community and Himalayan palm civet due to food competition and poultry attacks.

Despite the fact that there have never been reports of human-red fox conflict in AJK, there are concerns and unfavorable attitudes among the locals. This is mostly because of poor personal encounters with the fox and also a lack of knowledge about the ecosystem services provided by the fox (Delibes-Mateos *et al*., 2013). These result in the idea that red fox is a pointless pest that must be eliminated. A further difficulty that exacerbates the situation and may thwart efforts to advance more sympathetic views of synanthropic red fox is the potential of zoonotic diseases. This study demonstrates the need for multidisciplinary red fox conservation initiatives that include several strategies (Kinnear *et al*., 2002).

In the same survey, it was also discovered that the chances of encountering a red fox were the greatest along the forest edge, followed by grassland and agricultural terrain. This could be because the animal spends most of its time in locations where it also makes great use of them for cover, reproduction, and defense against other predators. The animal may have access to essential resources at the perimeter of this area, such as food, den sites, resting areas during the day, and shelter. A similar strategy might be used to hunt mice in grassland (Delibes-Mateos *et al*., 2013).

The findings are consistent with the study from AJK, where red fox prefers forests with patches of meadow or alpine fell-fields while hunting in open regions and habitats in forests for cover and reproduction. Edges are frequently used. The presence of significant population of many rodent species as well as characteristics like hedge rows surrounding fields, which may provide ideal resting spots, may explain why red fox signals are also common in cultivated regions. This illustrates how opportunistic omnivores like red fox eat a variety of foods such as fruits, berries, small mammals, insects, amphibians, fish, carrion and human garbage (Kinnear *et al*., 2002).

It has long been known that humans and wildlife have interactions, and it has been seen that these relationships can combine both joy and dread. In order to change the attitudes and opinions of the local community living next to a protected area or reserve, it appears that human animal interaction is a key aspect. The results of the study demonstrate that conflicts between people and wildlife are frequent and may eventually endanger both their survival and the livelihoods of local people. The majority of locals have reported that the park's wild animals are causing them problems, including the loss of a variety of crops and cattle (Scasta *et al*., 2017).

CONCLUSION

This study shows that there are quite a few conflicts between people and red fox in Azad Jammu and Kashmir districts, which calls for cautious investigation. The red fox's behavior of predation and crop damage in the study area is a significant issue harming the quality of life of the locals and putting the existence of wildlife at risk. Management strategies backed by actual research are needed to solve the issue. We strongly hypothesize, based on the results of the present study that the absence of top predators and low densities may have led to an abundance of "meso-carnivores and other nuisance species," which are damaging poultry and crops. These species cause a sizable loss in the typical annual household income. In order to maintain sustainable herd sizes and reduce rates of livestock predation, more research is needed to better understand existing livestock management practices.

RECOMMENDATION

Our results suggest that moral or altruistic ideals alone are not adequate, nevertheless. The people in the study area appear to have perspectives towards nature and animals that are mostly anthropocentric, similar to those seen in Pakistan, despite the fact that some people understand the intrinsic value of red fox as living organisms. This is primarily shown by negative and utilitarian attitudes towards unpopular fauna, such red fox. If we don't respond with proportionately appropriate conservation measures, we fear that local support for conservation may suffer. For the future of conservation, there is however, optimism. By combining awareness, mitigation, and tourism, it may still be possible to alter attitudes and behaviors, engage local populations constructively, and come to a win-win conservation solution.

DELARATIONS

IRB approval

This study employed non-invasive methods, including field observations and questionnaires, without harming Red Foxes. Since no live animals were captured or handled and no human subjects were directly involved,

IRB approval was not required

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