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Zoha Javaid
Department of Zoology,
University of Gujrat, Pakistan

Mubashar Hussain
Department of Zoology,
University of Gujrat, Pakistan

Kanwal Shahzadi
Department of Zoology,
University of Gujrat

Syeda Saneela
Department of Zoology,
University of Gujrat, Pakistan

Madiha Javed
Department of Zoology,
University of Gujrat, Pakistan

Correspondence
Zoha Javaid
Department of Zoology,
University of Gujrat, Pakistan

Human wildlife interaction; Efforts to save them

Zoha Javaid, Mubashar Hussain, Kanwal Shahzadi, Syeda Saneela and Madiha Javed

Abstract
The prime trial for human nowadays is to sustain wildlife along with satisfying the bottom requisites of growing human inhabitants. Regardless of the actuality that extinction is the principal part of evolution, but the human moderation to this planet in the last few centuries have considerably put on spurt the rate of extinction. One of the major root of extinction is habitat destruction but it may also act as a collaborative agent along with other drivers such as overhunting, over harvesting, pollution and climate change that may result in the future due to present human activities.

Keywords: Human, wildlife, conflict, impacts, management, save species

Introduction
In the past, the five major die-offs have been recorded in which almost 50 to 95% species were wiped out, in the Ordovician, Devonian, Permian, Triassic and Cretaceous periods. But now a days, human behavior especially in the last two hundred years, have increased the chances of global extinction crisis or the "Sixth great extinction wave" as compared to the previous five, thus we can say that the earth is facing the extinction crisis (Ceballos and Ehrlich, 2002; Thomas *et al.,* 2004) [6, 61].

The increasing human population and their demands have left huge negative footprints on biodiversity. In the current situations, humans are dominating the wildlife habitats at a rapid pace; and thus the wildlife must have to exploit human resources in order to survive (Castro and Nielsen, 2003) [5]. This results in interaction between the humans and wildlife which results in different consequences.

In order to know the future survival of the wildlife, we have to know the factors that affect their survival and what type of interactions exist between the humans and wildlife. In some of the cases, the humans have proved to be more dangerous even to the most treacherous animals, and thus there is a need to save the wildlife from the humans and to carry out such strategies that will give protection to wildlife and humans as well.

Human-Wildlife conflict
In order to pursue their needs, human and wildlife often harm one another resulting in a conflict between them (World Park Congress 2003). In such situations, the wildlife gives harm to human population by killing, threatening, attacking the humans or destroying their livestock, it may also occur when the human population purposely kills the wildlife, abuse or threaten them, from the fear of wildlife threatening their property and other belongings (Madden 2008). World Conservation Union describes human wildlife conflict occurs when the requirements of humans lap over with the requirements of wildlife and hence, setting up damage to wild animals and the man (World Park Congress 2003) [71]. Human Wildlife conflict has great environmental hit, as the species involved in such conflicts have a higher chance of getting eradicated from the world due to interactions with humans resulting in death of the wild either accidental or a deliberate act (Ogada *et al*. 2003) [42]. In the other case, wildlife can harm human population by damage to property, livestock, infrastructure, spread of disease, fear, physical injury thus damaging economically as well as socially (Hoare 1992) [18]. In such kind of conflicts, one of the groups is always at loss and in some of the situations, these conflicts result in harm to both the humans as well as to the wildlife such as the loss of property, lives and the risk to the survival of whole population.

Reasons for human-wildlife conflict
The main reasons for the rise of conflict worldwide between human and wildlife are:

i. Rapid Population growth

The human population is growing rapidly, resulting in direct contact of humans with wildlife as their population is expanding towards the wild habitat (IUCN 2003) [20]. In Africa, the rapid population growth has led to the invasion of wildlife habitat by humans and forcing it to minimal space, thus leading to the completion between them for basic resources (Siex and Struhsaker 1999) [53]. In such cases, when the animals of wildlife are rendered of their resources and they fail to fulfill their basic requirements, then the wildlife turns towards the human population in order to ensure their own survival.

ii. Land use transformation

Whenever the humans disturb the natural system of the earth, they always create dangers for their own population. Due to overpopulation, the forest ecosystem is converted into other land use to meet the demands of land, food and energy for the increasing population. As in Kenya, once a wildlife rich area, is now converted into farming area, in fact land is converted into small patches and is sold to the local residents (Kenya Wildlife Service 1996) [23]. In Indian state of Gujarat, an increase in conflict is observed with Asian Lions (*Panthera leo persica)* and Leopards (*Panthera pardus),* as the natural habitat is converted from groundnut (*Arachis hypogeal)* and great millet (*Pennisetum typhoides)* fields into growing sugarcane (*Saccharum officinarum)* and mango (*Mangifera indica)* cultivation, these crops are favorable for predators and are responsible for the rise of conflict (Vijayan and Pati 2002) [65]. These crop fields now give a good chance to the predators to hide themselves in the long plants and can easily attack anyone who is nearby. The land which was transformed for some other use to meet the requirements of man is now causing a major threat to man himself as the rate of predator attack has now increased to a great level.

iii. Habitat loss of Species

Man is becoming the major reason of extinction of different species from the earth now. The major outcome of over increasing population and land transformation is the loss of habitat of species, in addition to their degradation and fragmentation, as in the case of Sumatra, the population of Sumatran tiger (*Panthera tigris sumatrae)* have reduced to almost 500 individuals due to the conversion of forests into agricultural and grazing areas (Nyphus and Tilson 2004a) [40]. The land transformation is thus causing the harm to not only man but to the wild animals and plants also.

iv. Stochastic events

In a few cases, along with the human interventions in the nature causing major threat to many species of wildlife, the natural disasters are also to be blamed for human wildlife conflict. It is difficult to predict and prevent these occasional events, but they play a role in human wildlife conflict, as during 1997-1998, drought and fire at En Nino Southern Oscillation caused damage to large area of Sumatran forest resulting in fleeing of tigers and killing humans in nearby areas (Nyphus and Tilson 2004b) [41]. Such events brings man and other animals in a race to survive by using the maximum available resources, but such cases occur at very low rate than as compared to the activities done by the humans.

v. Climatic factors

Climate plays an important role in the modification of our environment, but it can also be dangerous when talking in the context of interaction of humans and wildlife. Although such factors cannot be controlled; they have important role in increasing human wildlife conflict. Any change in the climate gives a chance to wildlife to take advantage of it and get what they want easily. In Tsavo National Parks, it was seen that there is a positive relation between attacks of wildlife and rainfall, showing that in such regions, during rainfall reasons, the number of attack increases as the local pools fill with water attracting livestock towards it, making them an easy prey for tigers (Patterson *et al*. 2004) [43]. The tigers were ridden from their natural resources in the past by one way or the other in these places, so in order to get maximum chances for survival they attack any prey they find easy to get. The climate then gives them easy chances to attack the prey and indirectly they become a threat to humans by attacking their property.

Management of Human Wildlife conflicts

Since the human population growth is increasing day by day, along with the demand of all the basic resources required to fulfill, it is obvious that in such situations, the human wildlife conflict cannot be eradicated in near future, but we have to find ways to manage them properly to avoid such conflicts in the future. A large number of techniques have been developed all over the world to manage such conflicts, but in most of the cases, such techniques are site dependent or species dependent; making them unsuitable to use them everywhere (WPC 2003,IUCN 2003) [71, 20].

Strategies to overcome Human Wildlife Conflict

a. Barriers: Artificial and Natural

Barriers play an important role by preventing the overlapping of the geographical territories of the wildlife and humans, most of them are manmade however in some cases, they can exist naturally like rivers, mountains etc. In the case of Way Kambas National Park in Sumatra, only few cases of human tiger conflict were seen due to the presence of river, which prevented tigers to leave from the park (Nyphus ans Tilson 2004a) [40]. These natural barriers between wild animals and humans have existed for centuries and have kept both of them away from each other, but with the advancement in human lifestyle, we have disturbed many of these barriers, which has already resulted in much loss to the environment.

Other than these natural barriers, manmade barriers have also been developed to prevent further such interactions. In most of the cases, such barriers are not always successful, as in the case of District Gujarat, India, chain link fencing was constructed to prevent leopards and lion to stray out from the National park, but it was only partially successful; for such cases, other barriers like rubble walls and barbed wire fencing are under experimentation to observe their results (Vijayan and Patti 2002) [65]. No matter how much we try, but these manmade barriers are not as successful as the natural one because there is no replacement for the natural resources in our environment.

Another technique, the Flood barriers which are very common in Europe and Russia, consisting of hanging flags from ropes which are placed near to ground and are 0.5m apart; used to hunt wolves and to save domestic animals from wild attack (Mussiani *et al*. 2003) [36]. But these barriers are only beneficial to humans and not to the wildlife animals, because in this case the wolves are hunted down and killed for the safety of humans and their properties. Another type of barriers made from plants such as spiny cacti and moat are also being

used as they are not only cost effective but they prevent passing of ungulates as well as the carnivores; but their disadvantage is they grow slowly, do not stop large animals and can spread uncontrollably (Hoare 1992) [18]. Man should find a way in which both the sides of the conflict are benefited rather than killing others for our own safety. We should look more towards the natural barriers as they are the part of the nature and are the best control of the conflict, along with them in some cases, manmade barriers can be used in such a way that they do not cause any harm and can control the dangerous interactions of humans with wild animals.

b. Relocation

If there is availability of a substitute land and facilities, one can relocate the communities living nearby so that they can get better access to natural resources and other socio economic opportunities, such management can be a better solution to the existing Human Wildlife Conflict (Madhusudan 2003) [29]. These relocations can be beneficial only in the situations in which the community that is relocated can get better availability of resources; and they do not have any fear of losing their property and they do not face any type of pressure from political, social and cultural oppositions (Treves and Karanth 2003b) [62]. This is a better way to avoid the conflict but in most of the cases, the communities are not give any chance by the authorities leaving them in the situations that prove to be dangerous to their life and the future generation. In such situations the people are not left with any choice but to kill the wild animals in order to save themselves, and the wild animals in return are put into the dangerous situation where they run away, die or they become dangerous enough to kill the human communities.

c. Guarding

In the places like East Africa, the people involved in the activity of animal husbandry, the herder must have an active defense and ability to monitor herds to prevent their cattle from the predators. Many herders have been reported in these regions who are involved in scaring and chasing away the dangerous animals like lions, tigers, cheetahs, hyenas with their simple weapons like knives or spears (Patterson *et al.,* 2004) [43]. While in Northern Kenya, less attack to livestock by wildlife is observed due to presence of human guards, and dogs (Ogada *et al.,* 2003) [42].

These activities of guarding have been considered as the most successful strategy to prevent crops, livestock, and property from wildlife attack in the regions like India, although they may require more guards at night time (Sekhar, 1998) [52]. In other areas in North America, the dogs are solely used for guarding their livestock without human labor; such method is not much successful as compared to guarding techniques from other areas in Europe and North Asia when the human is also involved in guarding along with their dogs (Mussiani *et al.,* 2003) [36]. This method of protecting the human property from wild animals although is much older and is applied in many areas of the world, but it is not much successful when considering the strength of wild animals in comparison to that of the humans. In most of the cases, the wild animals get frightened and run away but in other case the animals may attack in a group that is much powerful than the human's guarding team. So it can be said that the method of guarding to protect human and property is not a successful one and the man should look for some other ways which are much more powerful and harmless as well.

In order to overcome the conflict of humans with the wild animals, proper strategies must be planned that should not only protect man from wild life but also look for the method to protect wildlife from the activities of humans. The man should not break into the territories of the wildlife and give them their space to fulfill their needs to survive.

Impact of human activities on wildlife

It has been widely accepted that humans have affected landscape and biodiversity (Wilson 1988; Lubchenco *et al*. 1991; Ehrlich 1995; McNeely *et al*. 1995; Forester and Machlis 1996; Vitousek *et al*. 1997) [70, 26, 33, 11, 66]. As the human population is increasing, the need to fulfill the demands of the increasing population is also increasing putting a pressure in the natural resources leaving only few places unaffected, even the protected areas are also affected by human activities (Dompka 1996) [8]. The aim to protect wildlife is in serious problem due to the needs of the ever increasing population (McNeely and Ness 1996) [31]. The major threat to biodiversity is recognized as the pressure from the increasing population (Holdren and Ehrlich 1974; Ehrlich 1988) [19, 10] but the mechanism between the interaction of population and biodiversity is still not known properly (Dompka 1996) [8]. To overcome the problems of wildlife, and to protect it from human activities we have to understand that how humans are effecting the wildlife (Liu, J., *et al*. 1999) [25]

In order to fulfill the needs and the demand for the better life with the improvement in technology, biodiversity has been targeted for a long period of time (Wuver and Attuquayefio, 2006) [72]. For the better livelihood of humans, biodiversity is being damaged at a much faster rate creating negative results (Turner *et al.,* 1990) [63]. As a result, Biodiversity is facing the problem of decline at damaging scale, which can result in mass extinction of species in future (Wilson 1992) [69]. The evidences from Ghana show that in recent times with development, the rate of environmental degradation has increased, (Gyasi *et al.,* 1995) [15], the rich forests from past are now savanna woodland and previous savanna woodlands are now deserts (Hawthrone and Abu-Juam, 1995) [16].

In the past, Wetlands were not given any importance and were considered as waste lands, and were thus handled by flooding, filling, and were also excavated for industrial and agricultural use (Williams, 1993; Ryan and Ntiamao-Baidu, 2000) [68, 46]. At present, Wetlands have gained their importance as they are the habitat of wildlife (Sather and Smith, 1984; Ryan and Ntiamoa-Baidu, 2000) [49, 46], Coastal wetlands are especially important as they provide nutrient rich habitat for spawning of fish and nursery (Ntiamoa-Baidu and Gordon, 1991) [39]. From the evidences, it is now clear that the wetland degradation was largely due to the neglect and fleeting human activities over the years (Ntiamoa-Baidu and Gordon, 1991; Ryan and Ntimoa- Baidu, 1998) [39, 47].

The man has transferred many land forms on the earth into different agricultural or industrial lands to meet the requirements of ever increasing demands of human populations. The natural land is transferred in such a way that the animals and plants surviving in such areas were eradicated and many of them died. This type of land transformation is not only for a small scale but it has occurred worldwide converting thousands of acres of forest land into some other forms useful for the humans. These forests provided home to thousands of different species, and when the forests are cleared the animals are forced to leave the place and find

some new place to survive, but in most of the cases, the animals are not successful in finding an appropriate place, and this results in deaths of many animals threatening the survival of the whole species.

Besides transferring the land to some other forms; human have also interfered in the environment which have directly or indirectly harmed the wildlife populations.

Impact of wildlife on humans

In many areas of the world, human population and wildlife live side by side, interacting among themselves and effecting each other's environment. The day to day interaction of wildlife and humans has modified human culture a lot (Carter *et al*. 2014) [4]. In Chitwan, a minority group, the Tharu people, have gods that according to their beliefs live in nearby forests (Muller-Boker 1991) [35]. In the areas of Wolong, the forests, mountains, animals are considered as holy spirits by the local people residing there. In such areas, according to the religion of Hinduism and Buddhism, animals act as vessels, to call the spirits of the ancestors (McNeely and Sochaczewski 1991) [32]. Due to such beliefs, people consider respecting the forests as an important act or else it would bring them tragedy, so people often leave small gifts for the animals for safe passage through the forest (Carter *et al*. 2014) [4]. Such perceptions of wildlife and knowledge among local people influences on the way that how people consider wildlife as an important part of their religion and culture and thus work for its conservation (Kissui 2008) [24]. In such areas the wildlife has left positive marks of themselves on the people. The people respect them and are afraid to kill them or to harm them in any way.

As observed in a survey held in Chitwan, among the local population, 90% agreed that the tigers had the right to live alongside people as they were the part of the area before the people inhabited it (Carter *et al* 2012a) [3]. These areas also get benefit economically as a part of tourism, as in case of Wolong, household net benefits increased from 0.7% in 1998 to 6% in 2007 (Yang *et al*. 2013a) [73]. Other than such benefits, tiger population is also playing an important role as it checks the population of ungulates (Terborgh *et al*. 1999) [60], which otherwise would have led to overgrazing of the area reducing the availability of plants to the local population (Ripple *et al*. 2014) [45]. Along with the benefits, wildlife has also caused local population to suffer, such as the conservation efforts have caused much difficulty to local population (Nepal and Webber 1995, He *et al*. 2008) [37, 17]. Along with it, tigers have also caused a lot of damage to the livestock of local people by predating on them (Spiteri and Nepal 2008) [56]. Such impacts of wildlife on humans have led to their own killing as a survey report shows that almost 25 tigers were killed during their attack on human property in Chitwan from 1979 to 2006 (Gurnug *et al*. 2008) [14]. So in these areas, the man communities are benefited by the wildlife they live with, so they do not cause much harm to the wild animals and plants. In such areas, where the man and wild live side by side, although it is much risky but the people prefer to live here as they get many benefits as well and when the wild enter the human territories, and cause damage to humans in any way, they get killed by the humans, as the man cannot tolerate such risks in his life.

A future for all

For the protection of biodiversity, the most Powerful Law ever passed by any Nation is Endangered Species Act (ESA), as it has proved to be successful in avoiding extinction successfully and helping species to recover, indeed it was estimated that if the Act was not passed, at least 227 additional species would have gone extinct since 1973 (Scott *et al.,* 2006) [51]. Furthermore, from all the species that were listed in Northeastern United States, no species has gone extinct and all are stable and are heading towards recovery since the Law has passed (Suckling 2006) [57, 58]. Although the Endangered Species Act has gone through many hardships in the beginning such as delayed species listing, failure to design proper habitat, and poor recovery plans, it has proved to be successful (Greenwald *et al*. 2006, Suckling and Taylor 2006, Schwartz 2008) [13, 57, 58].

(i) Listing of species as Threatened or Endangered

When the species are listed as Threatened or Endangered, then only they can receive special attention by the protection Act, so listing of species is an important foundation, but the listing has been affected as the species which are at risk of extinction are not listed (Greenwald *et al*. 2006) [13]. The delay in such listings is due to many reasons as insufficient funding for such programs, weak listing process, and opposition from politics (Greenwald *et al*. 2006, FWS 2009) [13, 12]. To overcome such problems, there has been an increase in budget in recent years from $9 million to $22 million in 2010 (Department of Interior and Related Agencies Appropriations Act, 2002 and 2010). This increase in budget has proved to be encouraging but yet they are insufficient, due to the tiresome process of listing in which 15 agency officials, scientists and solicitors have to sign off on every decision (FWS 2009) [12]. We can overcome one of the major challenge faced by us today to save the species of extinction by listing the species in categories, so proper attention can be given to the one which are at verge of extinction. From the beginning this method has faced a lot of difficulties which are there due to unavailability or poor supply of funds required as well as the pressure of politics is also a major contributor for the slow process of the listing.

For the successful completion of the task, the authorities must be provided with proper budget and should be helped and encouraged by other recognized agencies.

(ii) Critical Habitat Designation and Adverse Modification

When the Endangered Species Act was passed, it was realized that the habitat plays an important role in protecting species. It was stated that for the protection of endangered species on large measures depends on the protection of species habitat then, the effectiveness of the Act depends upon the designation of critical habitat (U.S Congress 1976, Salzman 1990) [64, 48]. According to Taylor *et al*. (2005) [59], species which have critical habitat are more likely to improve under the Act than the species without such habitat.

After listing the species in their categories, the next step is to protect the habitat. Any animal must require its habitat in order to survive in the environment, as the habitat provides them with basic requirements which are not available everywhere, so the protection of habitat is much important and a critical step for the protection of species.

(iii) Threatened and endangered species: Recovery

The Endangered Species Act was introduced not only to save the species but to help them recover so that the protection is no more needed (U.S.C). For this purpose, the Act requires recovery plans for all the species that are listed endangered, as

the species with recovery plans are likely to improve more than the species without such plans (Taylor *et al*. 2005) [59].

(iv) Protecting listed species from effects of Climate Change

As the man is making advancement by technology, he has also led to climatic change all over the world, resulting in global warming which is a major threat to the survival of species (Karl *et al*. 2009) [22]. Studies show that if the increase of the temperature of earth continues, one quarter of all the species will go to extinction (Malcolm *et al*. 2006) [30]. The Endangered Species Act must be planned to overcome this climatic change (Cummings and Siegel 2009) [7]. The study was done by Povilitis and Suckling (2010) [44] to show that before 2005, only 5 percent of the recovery plans included climatic change problems but after that it was addressed by at least 59 percent of the recovery plans.

Due to human activities, the species are going towards extinction at an increased rate, and many of them have disappeared from the face of the earth even before they could be marked or identified. The earth is kept stable by participation of all the living organisms found on the earth. If many of them are disappearing at a large scale on the daily basis, then the whole balance of the ecosystem on the earth is disturbed which in the end would lead to the collapse of the ecosystem resulting in the death of whole human race. To prevent all such consequences, Endangered Species Act was introduced that help in the recognition of species and protecting them from the human activities, but from the beginning the program has faced a lot of difficulties and pressure. It was not well accepted by the scientists of the world and was also facing difficulties due to small amount of funds.

Despite all these difficulties, the Act has been successful in saving more and more species from getting faded away from earth. Saving the species requires their identification and a proper plan to recover them, but there are many other problems that come with no solution such as the climatic change resulting from human activities which is much dangerous for life on earth and there is no proper way to stop this climatic change.

Why save species?

Humans have caused a large number of changes in the world by destroying the natural habitats, water and air pollution, climatic change, the Earth is suffering from the species at a large amount, according to scientists we are losing species at the rate of 10,000 than the natural process. In the case of North America, for amphibians alone, more than one third of them are at a risk of disappearing from the world (Wake and Vredenburg 2008) [67]. 30 percent of the birds of the country need conservation strategies for their survival (North America Bird Conservation Initiative) while 40 percent of the fish are at danger of extinction (Jelks 2008) [21] and the primates are at major risk, being half of them at the risk of extinction from all over the world (Mittermeier 2009) [34]. One of the world's famous scholar of biodiversity, E.O. Wilson, have given an estimation that if the current trends of habitat destruction by humans continue, half of the world biodiversity will disappear from the earth (Adam *et al*. 2011) [2].

The survival of the Human beings depends upon the survival of the ecosystem of the planet Earth, as we not only depend on biodiversity for food and oxygen, but they play an important role for maintaining this ecosystem. If the components of ecosystem are disturbed and damaged, the whole ecosystem would collapse, making our survival next to impossible.

A need to compromise

As the human population is growing with time, we have dominated most of the part of the earth's landscape, and in many places, we coexist with wildlife, which is the reason for conflict. Such situations need to be resolved by tolerance (Sillero-Zubiri and Laurenson 2001) [54]. As humans come in contact with wildlife, both the populations compete for the natural resources; the solution involves respectful engagement with wildlife rather than sealing off the people from the nature (Macdonald 2001) [27]. In this century, the conflict between the humans and wildlife will continue and will need management strategies for conserving the threatened species as well as to save abundant species from the future threat of extinction (Sillero-Zubiri *et al*. 2006) [55]. To resolve the conflict, it is required to recognize the importance of the large areas of habitat as well as the safety of human communities and wildlife (Sillero-Zubiri *et al*. 2006) [55].

Conclusion

The human population is increasing day by day and so are the demands. To fulfill them, we are disturbing our environment and causing a lot of damage that we cannot even imagine. In order to become more industrialized and find shortcuts in each and every aspects of our life, we have in one way or the other disturbed the whole nature, and even the wildlife is not spared. Due to many human activities, they are moving towards the extinction at very high speed.

The extinction of some of the species like the pollinators and the predators have overwhelming effect on the ecosystem than as compared to other species. The decline of one kind of predator from the ecosystem, for example, disturbs the whole ecosystem. If the large predators are overhunted, the decrease in their population gives more chances of survival to other small predators which in turn lead to decrease in number of their prey population. This hypothesis is called as "meso-predator release".

When the human beings destroy the natural habitat of the wildlife they are not only disturbing the existence of that particular specie whose members are inhabited there but it also have adverse effect on many other species which coexist with that particular species for example the extinction of the host specie can also lead to extinction or endangering of the parasite specie. However, in most of the cases, such co-extinctions have gone unnoticed. Thus two interdependent taxa are placed in peril by habitat eradication.

The human beings depend upon plants as a major part of their diet, and these plants are pollinated by insects. In the last some, there has been a decline in the number if pollinators and this impedes the plant reproduction. If the plants fail to reproduce they will not be available to the humans to fulfill our necessities of life. Thus in way or the other, as we disturb the wildlife, we are disturbing the whole ecosystem as well as our own chances of survival on this planet. In other words we can say that, the simple truth is we cannot live without them.

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