Global Scientific JOURNALS

GSJ: Volume 10, Issue 2, February 2022, Online: ISSN 2320-9186

www.globalscientificjournal.com

Human-Wildlife Conflict (HWC) a threat to the food security and livelihoods of the villagers in Mangwe Rural District, Matebeleland South Province, Zimbabwe.

Lesley Marisa, Aaron Tawedzerwa Chinofunga, Bartholomew Njini

Abstract—Mangwe Rural District which is situated in ecological region 4 and 5 of Matebeleland South Province Zimbabwe has 17 wards, 13 806 households and a population of of 67 005 people that are threatened with food insecurity, hunger and poverty as a result of the destruction of their crops, fields, infrastructure, depredation of their livestock, physical injury and potential loss of life due to wildlife. The District community also encounters big and venomous snakes which enter their homes and at times bite their pets and eat their chickens. With a community that has a lot of young children this is a precarious situation as they are endangered thereby altering their activity patterns. The District is a beneficiary of the Command agriculture program, Pfumvudza program and the Presidential input scheme in a bid to ameliorate the effects of climate change. However, these noble initiatives are greatly threatened by Human-Wildlife Conflict which bedevils Mangwe Rural District. The District is faced by 9 Problem Animal Species which range from Baboons (*Papio cynocephalus*), Elephants (*Loxodonta africana*), Kudu (*Tragelaphus strepsciceros*), Jackal (*Canis aureus linnaeus*), Hyena (*Crocuta crocuta*), Bushpig (*Potamochoerus larvatus*), Quelea birds (*Quelea quelea*) and several Snake species. The data was obtained from the Human-Wildlife Conflict reports submitted to Mangwe Rural District Council and the Zimbabwe National Parks Plumtree office that deals with Problem Animal Control (PAC). These reports on Human-Wildlife Conflict incidences in each and every ward were collected and collated on an *ad libitum* basis. The implications of each problem animal species (PAS) on food security and livelihoods of the Mangwe district communities was highlighted and a Human-Wildlife Conflict mitigation framework was proposed in the promulgation of mitigation strategies. The PAS control strategies applied by the communities were highlighted and discussed. It can be concluded that the Human-Wildlife Conflicct in Mangwe Rural District requires urgent attention and requisite policies promulgated and mitigation strategies employed to curb a potentially catastrophic situation.It is quite clear that a holistic approach in addressing this scenario is critical as both the animal and ecosystems need the appropriate management that will then ultimately bring a balance which will ensure that the lives and livelihoods of the humans are secured in conserving wildlife to bring a peaceful co-existence to Mangwe Rural District communities and wildlife.

Key Words Index Terms— food security, Problem Animal Species, Human-wildlife Conflict, Co-existence, Mangwe

1 INTRODUCTION

Human wildlife conflict is a global phenomenon and is becoming more prevalent as the natural resource requirements between humans and wildlife overlap. Human-Wildlife conflict is encountered in all communities ranging from border towns (Kariba, Victoria Falls Chirundu, and Beitbridge), communities close to protected areas, urban towns and communal areas alike. Human-wildlife conflicts can take various forms, including carnivores attacking and killing livestock or humans, species' raiding crops, competition for game and/or resources, disease exchange between livestock and wildlife, carcass poisoning, and retaliation killing[16][7]. The conflict involves a variety of mammals, birds, fish, insects, and reptiles [11]. Communities in Mangwe have not been spared from Human-Wildlife Conflict, with baboons and vervet monkeys taking a centre stage. Primates are highly adaptable to any kind of community and environment and can pose a serious problem as evidenced in Mangwe District where they are wrecking havoc.

Both baboons and Vervets are social animals with complex social systems which make them particularly difficult to deal with as they are intelligent and can adapt to any strategies that may be imposed to control them. However, they pose a serious danger to some communities by raiding homes, attacking women and children as evidenced in Mvuma town and Redcliff. Primate populations shape the ecosystem through seed dispersal and knowing how they relate to the environment in which they live helps us in controlling them before they become pests. The fulcrum of primate research is based on the interaction among food availability, diet, movement patterns, and sociality [6]. The environment also has an impact on these animals. The world is faced with climate change and global warming resulting in huge changes in microclimates. This is

further compounded by habitat fragmentation and increasing pollution, making it essential to understand the basic mechanisms animals use to adapt in their interaction with the environment. Space-use by animals reveals their habitat preferences and knowing what strategies baboons use to find what, where and when in different habitats constitutes an invaluable contribution on the management of the species. Habitat utilisation of animals is linked to many variables which include the nutritional requirements and constraints upon the species' physiological make up, the availability and spatial distribution of resources, population density, and competition with conspecifics and other species[3][13].

Understanding home range and dietary patterns is useful for models of primate behavioural ecology and quantifying the spatial and ecological needs of social groups, as it has important implications for the conservation and management of primate populations, particularly those found in small isolated habitats as is the situation for many primates today[15].

Feeding ecology is a central component of species biology [6]. Hence, knowledge of the dietary requirements of baboons and the plant communities within which their food sources occur could assist in making decisions on the implementation of effective management programmes of these species. Studies of diet, ranging patterns, and habitat utilisation are useful for understanding the habitat requirements that allow mantainance of viable populations, and may also contribute to our comprehension of the population dynamics and carrying capacity of a particular area [6]. Knowledge of the dietary patterns of primates may assist in designing management strategies to reduce human-wildlife conflict [6]. According to [10], animals shift their ranges in response to prevailing environmental and climatic conditions, for instance, the glacial changes in the forest line [17], or human induced vegetational changes such as deforestation or the designation of nature reserves.

Habitat utilisation, ecology and nutrition as well as how the primates interact with their highly fragmented environment have not been researched in Zimbabwe. The strategies that animals employ in order to access and utilise food components, the parts they utilise, their nutritional value and availability are largely unknown. Investigating the different strategies that baboons employ within the different ecosystems that we find in Zimbabwe provides important information for *Human-Wildlife Conflict* mitigation and management plans to be employed by conservation and local authorities.

The environment, that is the habitat, the climate and seasonality, can also be a potential stressor to the baboon populations and may act as an important ecological constraint. These ecological constraints can affect the day length as is the case in winter when the animals have to meet their thermoregulatory requirements due to low temperature [5][12]. This period also coincides with limited food availability where animals have to resort to under storage organs which take longer to process [1]. It is therefore important that these aspects are studied to determine how they respond to changes in their environment. This is critical information for it influences baboon movements' patterns and behaviour.

Human-Wildlife Conflict research with primary focus on baboons (*Papio cynocephalus*) seeks to understand how habitat fragmentation due to urban sprawl, rapid urbanisation and rural communal areas expansion due to population growth, food and nutrient availability influences habitat utilisation by free ranging baboons. In light of climate change and various anthropogenic influences [4], information on the changes in habitat, climate, and food availability is vital to assist our understanding of baboon behaviour in these areas.

It is also important to understand how they are affected by climatic stress factors and how they adapt their travel patterns, activity budget and diets, as they interaction with the environment. An understanding of the ecological importance of fall-back foods could assist in explaining the movement and foraging strategy and effort of baboons and other wildlife thereby aiding in improving the management and conservation of primate populations in Zimbabwe [9]. As fall-back foods are frequently the primary determinant of primate carrying capacity, determining whether the baboons have such foods, and if so, what management strategies can be implemented to aid the conservation of the baboons and mitigate Primate-Human conflict in the country.

Human-wildlife conflicts have escalated because of changes in land use, arable farming and the expansion of communal areas and urban sprawl due to increases in population. Zimbabwe is an agrarian based economy and land ownership is key, this causes a demand in land as the population increases. In the case of Mangwe District, the population focast by [18] shows that the majority of the population falls within the age group 0-19 years. This will mean that there will be increased Human-Wildlife Conflict in the future as these age groups progress into adulthood (See Table 1).

The situation in Mangwe is critical as the communities face relentless crop raiding by Primates (Baboons and Vervets) and large herbivores as well as livestock depredation by carnivores. Mangwe has no structured *Human-Wildlife Conflict* policy to deal with this increasing challenge thereby making the villagers susceptible to impoverishment. This paper therefore seeks to highlight the huge challenge that is faced with the Mangwe Rural District Council and villagers and come up with mitigation strategies. A theoretical framework for *Human-Wildlife Conflict* mitigation strategies will be crafted and promulgate resolutions that are holistic and bring about a harmonious coexistence between villagers and wildlife.

2 METHODOLOGY

2.1 Research Site

Mangwe Rural District has 17 administrative wards, with a total population of 67 005 people. The population consists of 13 806 households of which 31 478 are males and 35 527 are females. The population structure shows that the majority fall within the age group of 0-19 years. Mangwe Rural District is agro-based and is located in the semi-arid Matebeleland South Province of Zimbabwe. The majority of the inhabitants are poor and the district lies within the ecological region 4 and 5 which experiences erratic rains and extreme dry spells. It is an area that has felt the adverse effects of climate change and resorts to the cultivation of drought resistant small grains for the alleviation of hunger and poverty.

2.2 Methods

The data were collected from the *ad libitum Human-Wildlife*

Conflict cases reported in Mangwe Rural District spanning the period between 2017 and 2021. This consists of 14 recorded cases obtained from both the Parks and wildlife Authority Problem Animal Control (PAC) and the Mangwe Rural District Council Natural Resources Office. The data were then collected and collated to ascertain the nature of conflicts existing in the different wards wihin Mangwe Rural District. The data were then consolidated for the purposes of coming up with a short communication on the threat that is posed by baboons (*Papio cynocephalus*), elephants (*Loxodonta africana*) and Kudus (*Tragelaphus strepsciceros*), Jackal (*Canis aureus linnaeus*), Hyena (*Crocuta crocuta*), Bushpig (*Potamochoerus lavartus*), Quelea birds (*Quelea quelea*) and several snake species on the food security of the villagers in Mangwe district.

2.2.1 Problem Animal Control PAC

All the cases that were attended by the Problem Animal Control (PAC) are also recorded and the mitigation strategies employed by the villagers are documented and addressed in this paper.

3 RESULTS

A look at the projected population structure for Mangwe district using 2020 as a base year showed startling revelations. The district has a majority population of the most vulnerable age groups, i.e. those who are of school going age (0-19 years, see Table 1). The [14], Zimbabwe, does not have provisions for direct compensation for losses from wildlife this therefore means that local communities that are exposed to *Human-Wildlife Conflict* suffer a double edged sword thereby impacting mostly the vulnerable members of the society and the girl child in particular.

Table 1. The projected population structure for Mangwe District using 2020 as a base year.

	2020 Population Projection			2032 Population Projection		
Age	Male	Female	Total	Male	Female	Total
0-4 yrs	5 692	5 350	11 042	5 612	4 759	10 371
5-9 yrs	6 243	5 907	12 150	7 161	6 147	13 308
10-14 yrs	5 909	5 569	11 478	6 967	5 973	12 940
15-19 yrs	5 741	4 300	10 041	6 789	4 563	11 352
20-24 yrs	3 048	2 571	5 619	3 521	2 652	6 173
25-29 yrs	1 524	1 765	3 289	1 880	1 769	3 649
30-34 yrs	1 126	1 723	2 849	1 485	1 661	3 146
35-39 yrs	961	1 567	2 528	1 171	1 597	2 768
40-44 yrs	966	1 595	2 561	1 049	1 874	2 923
45-49 yrs	969	2 224	3 193	1 245	2 224	3 469
50-54 yrs	861	1 031	1 892	1 518	1 808	3 326
55-59 yrs	713	1 199	1 912	1 282	1 752	3 034
60-64 yrs	527	1 114	1 641	790	1 085	1 875
65-69 yrs	554	955	1 509	763	955	1 718
70-74 yrs	372	994	1 366	466	994	1 460
75-79 yrs	349	684	1 033	392	907	1 299
80+ yrs	452	1 120	1 572	452	1 149	1 601
Total	36 007	39 668	75 675	42 544	41 869	84 413

This means that there is an urgent need to monitor the dynamics and nature of the Human-Wildlife Conflicts occurring in the different wards and a requisite strategy implemented. This should then be coupled with a government policy that will deal with these cases in a comprehensive, holistic, robust and sustainable manner. There is a notable trend that can be picked from table 1 above which shows that of the majority of the populations in Mangwe district are females as compared to males. This implies that in cases where children have to guard fields to prevent crop raiding by baboons it would be the girl child that will be affected the most. The observation also means that the school going children would need to be accompanied to and from school as they may be in danger of marauding wild animals as was the case with a 14 year old boy who was mauled and injured by a hippo in KoGonde village in Masendu ward (7) in Bulilima district. A similar case is that a 9 year boy was also killed by an elephant in Chihanga village in Nyele Ward (4), whilst a woman was injured by an Elephant in Newline village, Mangwe District.

The population projection for 2032 (Table 1) [18] shows a continued increase in the population structure of the school going age group (0-19 years). This implies that there is going to be increased pressure on natural resources between people and animals in the near future, which if not addressed may reach catastrophic levels. This signals increased competition on space and space use, water resources, forest food resources, an increase in crop raiding and livestock depredation and human loss. The Mangwe district has a disturbing statistic of snake bites (Table 2) which may increase as snake habitats shrink with encroachment of people into forests as communal areas expand. An increase in households will also mean an increase in alternative food sources for snakes and other wildlife in the form of chickens and chicken eggs for example.

3.1 Human-Wildlife Conflicts in Mangwe

There is an interesting trend that is observable in Mangwe District that tends to suggest a link between *Baboon-Human conflicts* and *Elephant-human conflicts*. All the wards in Mangwe district experience challenges of *Baboon-Human conflicts* (Table 2) as well as *Elephant-Human Conflicts* which raises an important question:

Q1: 'Does omnivory and herbivory influence human-Wildlife conflict in Mangwe district?'

This will then be revealed by the phytosociology of the wards in those wards. The fruit species found in those wards could be driving the baboon and elephant habitat preference of those areas as it has been seen that baboons tend to prefer certain plant communities over others and they prefer fruits to other foods in their home ranges [9][2][8].

Table 2. The Ward populations, Wards that experience *Human-Wildlife Conflicts* and the Problem Animal Species involved.

Mangwe District		Ward Population by Sex			Animal species involved in Human-Wildlife Conflict in each Ward										
Ward	Nomenclenture	Males	Females	Total	Baboon	Buffallo	Elephant	Hippo	Hyena	Jackal	Kudu	Leopard	Lion	Snakes	Birds	Warthog
1	Empandeni	1 840	2 159	3 999												
2	Izimnyama Communal	1 853	2 199	4 052												
3	Madabe	2 101	2 432	4 533												
4	Tshitshi	2 437	2 936	5 373												
5	Mphoengs	1 487	1 680	3 167												
6	Sanzukwi	2 617	3 017	5 634												
7	Brunapeg	1 381	1 610	2 991												
8	Maninji	977	1 119	2 096												
9	Mambale	1 035	1 330	2 365												
10	Bango	2 339	2 765	5 104												
11	Marula	2 119	1 431	3 550												
12	Izimnyama Small Scale	1 302	1 411	2 713												
13	Embakwe	1 624	1 777	3 401												
14	Ngwanyana	996	1 114	2 110												
15	Makhubu	2 886	2 916	5 802												
16	Hobodo	2 664	3 492	6 156												
17	Makorokoro	1 820	2 139	3 959												
		31 478	35 527	67 005												
Key																
	Partly															
	Critical															

It is evident that the villagers in Mangwe District (Table 2) are in a precarious situation as all wards are affected by Human-Wildlife Conflict cases. This therefore requires that the situation be addressed as people lose their crops, infrastructure, and livestock, and their lives also are threatened by elephants, snakes and hyenas.

3.1.1 Human-Baboon Conflicts in Mangwe

There is a probable scenario that seems to suggest that baboons (*Papio cynocephalus*) find comfort and safety from predation in and around or near human settlements. All villages and wards in Mangwe district are heavily affected by baboons (*Papio cynocephalus*) between the periods Feb-Aug (Table 3).

Table 3. The *Human-Baboon Conflicts* experienced in all the wards of Mangwe District.

						Period of the year when Conflict is at its peak											
Ward Name	Ward Number	WOI	Affected Village	Worst Affected Village	Nature of conflict	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Empandeni	1		All		Crop foraging, raiding												
Izimnyama Communal	2		All	Zimnyama	Crop foraging, raiding												
Madabe	3		All		Crop foraging, raiding												
Tshitshi	4		All		Crop foraging, raiding												
Mpoengs	5		All		Crop foraging, raiding												
Sanzukwi	6		All		Crop foraging, raiding												
Brunapeg	7		All		Crop foraging, raiding												
Maninji	8		All		Crop foraging, raiding												
Mambale	9		All		Crop foraging, raiding												
Bango	10		All		Crop foraging, raiding												
Marula	11		All		Crop foraging, raiding												
Izimnyama small scale	12		All		Crop foraging, raiding												
Embakwe	13		All		Crop foraging, raiding												
Ngwanyana	14		All		Crop foraging, raiding												
Maithubu	15		All		Crop foraging, raiding												
Hobodo	16		All		Crop foraging, raiding												
Makorokoro	17		All		Crop foraging, raiding												

The villagers report *Human-Baboon Conflicts* to ZimParks Authority Problem Animal Control (PAC) resulting in (+/-) 50 baboons being killed annually. The villagers also use dogs to chase and scare away the baboons (*Papio cynocephalus*); however, this happens during the cropping season and is proving not effective as the baboons (*Papio cynocephalus*) continue to come back. The period that the *Human-Baboon Conflicts* are at their peak coincide with ripening of the agricultural crops and harvest time, hence the vilagers do suffer losses due to crop raiding and also affects their daily routines as they are now compelled to guard their fields on a daily basis.

3.1.2 Human-Elephant Conflicts in Mangwe

Elephants (*Loxodonta africana*) destroy crops, infrstrsuture and kill people. They are at their peak during Mar-Aug which also coincides with the harvesting period (Table 4). The same period coincides with winter where they migrate in search of food. During this same period they also raid granaries and they ranging in human habitation endanger the villagers. This observable trend of a link between *Baboon-Human conflicts* and *Elephant-human conflicts* in all the wards in Mangwe district raises an important question:

Q1: 'Does omnivory and herbivory influence human-Wildlife conflict in Mangwe district?'

This will then be revealed by the phytosociology of the wards in those wards. The fruit species found in those wards could be driving the baboon and elephant (*Loxodonta africana*) habitat preference of those areas as it has been seen that baboons (*Papio cynocephalus*) tend to prefer certain plant communities over others and they prefer fruits to other foods in their home ranges [9][2][8].

Table 4. The *Human-Elephant Conflicts* experienced in all the wards of Mangwe District.

						Period of the year when Conflict is at its peak											
Ward Name	Ward Number	WOI	Affected Village	Worst Affected Village	Nature of conflict	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Empandeni	1		All		field crops destruction												
Izimnyama Communal	2		All	Zimnyama	infrastructure destruction												
Madabe	3		All		homestead destruction												
Tshitshi	4		All		destruction of fences												
Mpoengs	5		All		destruction of school fences												
Sanzukwi	6		All		Pollution of dam water												
Brunapeg	7		All	Newline, Brunapeg	kill people												
Maninji	8		All														
Mambale	9		All														
Bango	10		All														
Marula	11		All														
Izimnyama small scale	12		All														
Embakwe	13		All														
Ngwanyana	14		All														
Maithubu	15		All	Mabuleti													
Hobodo	16		All														
Makorokoro	17		All														

A life was lost due to an elephant attack, the villagers do report *Human-Elephant Conflicts* to ZimParks' Problem Animal Control section and this resulted in 3 elephaants being eliminated in 2020 and 2 others in 2021. However, this lethal strategy of control does not eliminate the problem as elephants still come into the area and inflict the damage and losses.

3.1.3 Human-Kudu Conflicts in Mangwe

The kudus destroy and invade the crop fields and this usually is at the peak during Mar-Jun (Table 5). Kudus could be killed for meat by the communities though there are no reports to back up this assertion.

Table 5. The *Human-Kudu Conflicts* experienced in all the wards of Mangwe District.

						Period of the year when Conflict is at its peak											
Ward Name	Ward Number	WOI	Affected Village	Worst Affected Village	Nature of conflict	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Empandeni	1		All		Field crops invasion												
Izimnyama Communal	2		All		Field crops invasion												
Madabe	3		All		Field crops invasion												
Tshitshi	4		All		Field crops invasion												
Mpoengs	5		All		Field crops invasion												
Sanzukwi	6		All		Field crops invasion												
Brunapeg	7		All		Field crops invasion												
Maninji	8		All		Field crops invasion												
Mambole	9		All		Field crops invasion												
Bango	10		All		Field crops invasion												
Marula	11		All		Field crops invasion												
Izimnyama small scale	12		All		Field crops invasion												
Embakwe	13		All		Field crops invasion												
Ngwanyana	14		All		Field crops invasion												
Maithubu	15		All		Field crops invasion												
Hobodo	16		All		Field crops invasion												
Makorokoro	17		All		Field crops invasion												

The cases of Kudus are not usually reported by the communities but the communities use dogs and sometimes snares to trap the kudus. As a result (+/-) 20 kudus are killed per year

though they are no reports made.

3.1.4 Human-Jackal Conflicts in Mangwe

Jackals are a huge problem as they depredate small livestock in Mangwe District and they pose this challenge in all districts. The Jackals kills goats, sheep, chickens and colts. This is a huge loss to the communities which also affect tgheir livelihoods. Chickens are used in batter trade in rural communities and for meat, same as goats and sheep. The colts are important as donkeys are used for draught power and transportation. Jackals are a challenge through out the year and impose a huge blow to the communities (Table 6).

Table 6 The *Human-Jackal Conflicts* experienced in all the wards of Mangwe District.

Ward Name	Ward Number	WOI	Affected Village	Worst Affected Village	Nature of conflict	Period of the year when Conflict is at its peak
						Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Empandeni	1		All		depredation of sheep, goats	
Izimnyama Communal	2		All		chickens, colts	
Madabe	3		All			
Tshitshi	4		All			
Mpoengs	5		All			
Sanzukwi	6		All			
Brunapeg	7		All			
Maninji	8		All			
Mambale	9		All			
Bango	10		All			
Marula	11		All			
Izimnyama small scale	12		All			
Embakwe	13		All			
Ngwanyana	14		All			
Makhubu	15		All			
Hobodo	16		All			
Makorokoro	17		All			

The communities do report all Human-Jackal Conflicts to the ZimParks Problem Animal Control (PAC) section, however the communities also employ their own control strategies. The communities chase and scare the jackals with dogs, use snares and poisoning. This results in approximately (+/-) 80 Jackals dying every year. This is quite a huge number of jackals that die every year and a hbolistic approach would definitely assist in ensuring that a peaceful co-existence between the communities and the jackals is achieved.

3.1.5 Human-Hyena Conflicts in Mangwe

Hyenas depredate small livestock in all the wards in Mangwe District. They kill goats, sheep, chickens and colts. This is a huge impact to the livelihoods of the communities as they chickens in batter trade and for meat. Goats and sheep are also used for meat and as a source of income which they sell for cash. The colts are important as donkeys are used for draught power and transportation. Jackals are a challenge through out the year and impose a huge blow to the communities (Table 7).

Table 7. The *Human-Hyena Conflicts* experienced in all the wards of Mangwe District.

Ward Name	Ward Number	WOI	Affected Village	Worst Affected Village	Nature of conflict	Period of the year when Conflict is at its peak
						Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Empandeni	1		All		depredation of sheep, goats	
Izimnyama Communal	2		All		chickens, colts	
Madabe	3		All			
Tshitshi	4		All			
Mpoengs	5		All			
Sanzukwi	6		All			
Brunapeg	7		All			
Maninji	8		All			
Mambale	9		All			
Bango	10		All			
Marula	11		All			
Izimnyama small scale	12		All			
Embakwe	13		All			
Ngwanyana	14		All			
Makhubu	15		All			
Hobodo	16		All			
Makorokoro	17		All			

The communities do report all Human-Jackal Conflicts to the ZimParks Problem Animal Control (PAC) section. However, the communities also employ their own control strategies. The communities chase and scare the hyenas with dogs, use snares and poisoning. This results in approximately (+/-) 35 hyenas dying every year. This is quite a huge number of hyenas that die every year and a holistic approach would definitely assist in ensuring that a peaceful co-existence between the communities and the hyenas is attained.

3.1.6 Human-Bushpig Conflicts in Mangwe

Bushpigs destroy and forage on crops thereby affecting yields by the communities. They are at the peak and problematic to the community between Mar-Jun every year (Table 8).

Table 8. The *Human-Bushpig Conflicts* experienced in all the wards of Mangwe District.

Ward Name	Ward Number	WOI	Affected Village	Worst Affected Village	Nature of conflict	Period of the year when Conflict is at its peak
						Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Empandeni	1		All		field crops invasion	
Izimnyama Communal	2		All		field crops invasion	
Madabe	3		All		field crops invasion	
Tshitshi	4		All		field crops invasion	
Mpoengs	5		All		field crops invasion	
Sanzukwi	6		All		field crops invasion	
Brunapeg	7		All		field crops invasion	
Maninji	8		All		field crops invasion	
Mambale	9		All		field crops invasion	
Bango	10		All		field crops invasion	
Marula	11		All		field crops invasion	
Izimnyama small scale	12		All		field crops invasion	
Embakwe	13		All		field crops invasion	
Ngwanyana	14		All		field crops invasion	
Makhubu	15		All		field crops invasion	
Hobodo	16		All		field crops invasion	
Makorokoro	17		All		field crops invasion	

The communities do not report all *Human-Bushpig Conflicts* to the ZimParks Problem Animal Control (PAC) section. The communities however, use snares and chasing of the bushpigs using dogs. This results in approximately (+/-) 20 Bushpigs dying every year.

3.1.6 Human-Snake Conflicts in Mangwe

Snakes pose a danger to human life in Mangwe District as (+/-) 10 people are bitten every year. Pythons also attack the kids from the goats resulting in approximately (+/-) 100 kids being lost to Pythons. The communities also lose their chickens to snake with about (+/-) 200 chickens being lost per year. The communities also lose eggs to snakes. Snakes are problematic throughtout the year (Jan-Dec), but the situation is critical in wards 1, 2, 6 7 and 12-17 (Table 9).

Table 9. The *Human-Snake Conflicts* experienced in all the wards of Mangwe District.

						Period of the year when Conflict is at its peak											
Ward Name	Ward Number	WCI	Affected Village	Worst Affected Village	Nature of conflict	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Empandeni	1		All		(+/-) 200 chikens lost each year												
Izimnyama Communal	2		All		(+/-) 200 eggs eaten each year												
Madabe	3		All		(+/-) 100 kids eaten each year												
Tshitshi	4		All		(+/-) 10 People bitten each year												
Mpoengs	5		All														
Sinzukwi	6		All														
Brunapeg	7		All														
Maninji	8		All														
Mambale	9		All														
Bango	10		All														
Marula	11		All														
Izimnyama small scale	12		All														
Embakwe	13		All														
Ngwanyana	14		All														
Makhubu	15		All														
Hobodo	16		All														
Makorokoro	17		All														

Snakes pose a danger to human life in Mangwe District as (+/-) 10 people are bitten every year. Pythons also attack the kids from the goats resulting in approximately (+/-) 100 kids being lost to Pythons. The communities also lose their chickens to snake with about (+/-) 200 chickens being lost per year. The communities also lose eggs to snakes. Snakes are problematic throughtout the year (Jan-Dec), but the situation is critical in wards 1, 2, 6 7 and 12-17 (Table 9).

3.1.7 Human-Quelea Conflicts in Mangwe

Quelea birds are a challenge to small grain farmers as they feed on the crops thereby lowering yieds. They also feed on wheat also affecting the yield and causing financial losses. The communities report the *Human-Quelea Conflicts* to the Zim-Parks PAC team but at times the cases are not adequately attended to due to challenges in resources and finances.

3.2 Proposed Theoretical Framewwork for Mitigation

Based on the nature of the Human-Wilife Conflicts being experienced in Mangwe District, it is imperative that a holistic mitigation strategy be adopted which will encompass all aspects for the attainment of peaceful co-existence between human beings and wildlife (Figure 1).

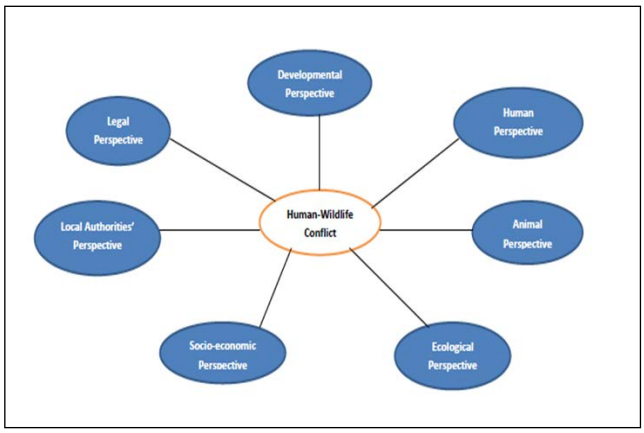

Figure 1. The Philosophy of the *Human-Wildlife Conflict* resolution and mitigation Strategy

Developmental Perspective

This is the view that takes account of the developmental aspects of each ward. This consists the expansion of the communal area due demand for land to build homesteads and opening up of farming land as the population of that particular ward expands. This results in deforestation which causes habitat fragmentation and alteration of the phytosociology of that particular ward.

Human perspective

This involves taking the way the people who experience the Human-Wildlife Conflicts into context. This is important for it gives the authorities the real issues on the ground and the nature of the human-wildlife conflicts people experience at household level and how this affects them.

Legal perspective

This is taking the legal provisions into context. This assists the authorities and the communities develop procedures on how to address the human-wildlife conflicts. The gaps in the legal provisions that encourage a sustainable mitigation strategies being implemented will then need to be filled for a peaceful coexistence of the community and nature.

Local authority perspective

This is the perspective of the local authorities on human-wildlife conflicts in their jurisdictions. This is an important aspect as the local authority gives a balance between compliance to the law and the protection of the community.

Socio-economic perspective

This involves looking at hoe human-Wildlife Conflict impacts on the society particularly the vulnerable individuals of the society which includes the young the elderly women and the girl child. The economic impact of the Human-Wildlife Conflict on the society particularly the vulnerable is critical and important for it influences the mitigation strategies to be implemented.

Ecological perspective

This involves the behavioural ecology of the Problem Animal

- *Dr. Lesley Marisa is a Senior Lecturer in the Department of Environmental Science, Solusi University, Zimbabwe, PH-+263781651133. E-mail: lesleymarisa10@gmail.com*
- *Aaron T. Chinofunga is a Forestry Commission District Forest ExtensionOfficer, Zimbabwe, PH-+263717157218. E-mail: aaronchinoz@gmail.com*

Species and how they influence the ecosystem in each they inhabit within each particular ward. The behaviour of a particular Problem Animal Species and the ecological factors that influence its behaviour also influence the nature of the conflict they pose to the community. This would mean that an alteration of one of the ecological factors would either mitigate the human-wildlife conflict or exacerbate it.

Animal perspective

This involves the investigation of the animal's biology and the factors that could drive it to cause the human-wildlife conflict. This comprises of the animal's physiology, biology diet and activity patterns.

4 Conclusion

Mangwe Rural District communities are faced with a deep impending food insecurity crisis in the near future that may be precipitated by *Human-Wildlife Conflict*. A holistic approach is necessary that will result in the safeguarding of the households from hunger and poverty yet managing the ecosystems in a sustainable manner. There is need of comprehensive research that factor in the behavioural ecology and ecosystem services of the Problem Animal Species. A deliberate well coordinated behavioural change, response and adaptation of the communities to wildlife is also necessary to shape a positive view of wildlife in them. There is also need for the promulgation of a *Human-Wildlife Conflict* policy, law and management document that will bridge the gap between the communities, local authorities, regulatory authorities and wildlife for a sustainable peaceful co-existence.

Acknowledgment

The authors wish to thank the following people: Nkululeko Manzini, Mangwe Rural District Council, Bhekimpilo Mbewe, Moffart Ncube, Sinethemba Ndebele, and Priscillar Tozana for the support they rendered and still give in this ongoing research. This work was not supported by any grant.

References

[1] S. A. Altmann S. A. 2009. Fallback Foods, Eclectic Omnivores, and the Packaging Problem. *Am. J. Phy anthropo.*, 140: 615–629.

[2] L.R. Brown. A.I. Marais, S.P. Henzi, & L. Barrett. 2005. Vegetation classification as the basis for baboon management in the Bourke's Luck Section of the Blyde Canyon Nature Reserve, Mpumalanga. Koedoe 48(2): 71-92.

[3] R.I.M. Dunbar.1988. Primate social systems. Chapman and Hall, London.

[4] A. Estrada. P. A. Garber. A. B Rylands. C. Roos. E. Fernandez-duque. A. Di fiore. K. A. I Nekaris. V. Nijman. E. W. Heymann, J. E. Lambert, & F. Rovero (2017). Impending extinction crisis of the world's primates: Why primates matter. *Science Advances, 3*: e1600946.

[5] R. Hill. 2006. Thermal constraints on activity scheduling and habitat choice in baboons. Am J Phys Anthropol, 129:242–249.

[6] G. Hohmann. M. M. Robbins. C. Boesch, (2006). Feeding ecology in apes and other primates, Ecological, Physical and Behavioural aspects, ed. Pp1-10.

[7] F. M. Madden, 2008. The growing conflict between humans and wildlife: law and policy as contributing and mitigating factors. *Journal of International Wildlife Law & Policy* 11:189–206.

[8] A.J. Marais, 2005. Resource utilisation of the chacma baboon in different vegetation types in northeastern mountain sour veld, Blyde Canyon Nature Reserve. M. Tech dissertation. University of South Africa, Florida.

[9] L. Marisa. 2020. The nutritional ecology, habitat utilisation and activity scheduling of free ranging Chacma *baboons (Papio hamadryas urisinus*) of Telperion Nature Reserve in Mpumalanga, South Africa Ph. D thesis. *University of South Africa.*

[10] A. M. Matsumoto-oda, B. Kasagula. 2000. Preliminary study of feeding competition between baboons and Chimpanzees in the Mahale Mountains National park, Tanzania. Afri. Stud. Monog., 21(4): 147-157.

[11] M. J Manfredo. A. A Dayer. 2004. Concepts for Exploring Concepts for Exploring the Social Aspects of Human–Wildlife Conflict in a Global Context. *Human Dimensions of Wildlife*, 9:317–328.

[12] R. Mcfarland. L. Barrett. R. Boner. N. J Freeman. S.P Henzi. 2014. Behavioural Flexibility of Vervet Monkeys in Response to Climatic and Social Variability. *Am. J. Physi. Anthropo.*, 00:00–00.

[13] P. D Mcloughlin, S.H. Ferguson .2000. A hierarchical pattern of limiting factors helps explain variation in home range size. *Ecoscience* 7: 132-130.

[14] Parks and Wildlife Act 1975

[15] M. M. Robbins. A. J Mcneilage. 2003. Home range and frugivory patterns of mountain gorillas in Bwindi Impenetrable National Park, Uganda. *Int. J. Primatol.*, 24: 467–491.

[16] S. R. Thirgood, R. Woodroffe, AND A. Rabinowitz. 2005. The impact of human-wildlife conflict on human lives and livelihoods. Pages 86–106 *in* R. Woodroffe, S. Thirgood, and A. Rabinowitz, editors. *People and wildlife: conflict or coexistence?* Cambridge University Press, Cambridge, UK.

[17] E. S Vrba. 1985. Environment and evolution: alternative causes of the temporal distribution of evolutionary events: S. Afri. J. Scie., 81: 229-236.

[18] ZimStats 2020: Zimbabwe National Statistical Agency Matebeleland South Province District Population Projections Report.