THE SURVEY OF HUMAN -WILDLIFE CONFLICT PARTICULARLY NILE CROCODILE (*Crocodylus niloticus*) IN THE NORTHWEST AND NORTHEAST NAMIBIA

By

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Abbreviations

ANOVA   Analysis of Variance

CBNRM   Community Based Natural Resources Management

HCC   Human Crocodile Conflict

HWC   Human Wildlife Conflict

MET   Ministry of Environment and Tourism

NACSO   Community Based Natural Resources Management

SPSS   Statistical Packages for the Social Sciences

TA   Traditional Authority

1. Introduction and Background

Human–wildlife conflict (HWC) is defined as "any interaction between humans and wildlife that results in negative impacts on human social, economic or cultural life, on the conservation of wildlife populations, or on the environment" (Madden, 2004). The conflict occurs when growing human populations overlap with established wildlife territory, creating reduction of resources or life to some people and/or wild animals. In Namibia Community based Natural Resource Management (CBNRM) Programme has played a major role in the increase of wildlife populations outside protected areas. However, HWC has been in existence for as long as humans and wild animals coexist and shares same resources (Madden, 2004). The HWC is a global issue and it causes severe problems, both on humans and wildlife (Aust, 2009). The conflict takes many forms ranging from loss of life or injury to humans and wild and domesticated animals. In Namibia, human-wildlife conflicts ranges from large mammals and carnivores, medium and small size carnivores and aquatic mammals such as crocodiles and hippos.

This survey attempt to quantify the incidence of human-crocodile conflicts (as form of human-wildlife conflicts) in the three perennial rivers namely: Kunene River, Okavango River and the four Zambezi River channels. These are the three river systems in Namibia that are most affected by human-wildlife conflicts. The survey further examine the perspective of local people who use these rivers on HWC, by unpacking the root causes of conflicts and identifying methods to mitigate HWC in the future. It also looked at the incidence of human-wildlife conflict trends and evaluate the effectiveness of the existing mitigation measures to reduce the HWC. The main objective of the survey is then to strengthen the existing mitigation measures used to reduce the human-crocodile conflicts and as well as to obtain data on the incidences.

1.2 Materials and Methods

1.2.1 Sampling

The HWC survey was undertaken on three occasions. The Kunene River was surveyed from the 03rd - 24th July, 2015, Kavango River from the 12th - 30th July 2015 while the Zambezi River systems (Chobe, Kwando, Linyanti, and Zambezi) was surveyed from the 17th - 30th October 2016.

A total of 100 households from the northwest (Kunene River), 100 households from Kavango West and East and 100 households from the Zambezi River systems were interviewed. Barnes *et al.* (2008) describes systematic sampling as a method which a researcher uses to randomly select the starting point on a list of names constructed and then systematically choose the individual by applying sampling interval.

In this survey, a list of all households in each village were compiled. Each household was given a unique identification number to be used for household selection for the interviews (Renzaho *et al.*, 2007).

A simple random sampling technique was followed to determine the first household to be surveyed, whereby the unique identification number representing each household was recorded on a piece of paper and folded and placed in the hat (Renzaho *et al.*, 2007). The papers were shaken ten times to ensure that the samples were properly randomised. All folded papers bearing a unique identification number of each household were randomly drawn from the hat. To determine the sampling interval, the number of households in each villages was divided by the number of households to be surveyed.

1.2.2 Research instrument

A structured questionnaire was developed to capture the data that were analysed quantitatively (Welman *et al.*, 2010). The questionnaire survey was used in the face-to-face interviews with one respondent at a time. The questionnaire was developed in English, which is the official language in Namibia, but was verbally translated in local languages during the interview session. The questionnaire consisted of four sections.

The first section of the questionnaire asked respondents for demographic information such as age, education, socio-economic status and livelihood.

The second section asked the respondents about their attitudes and perceptions towards the human-crocodile conflict (HCC). It consisted of closed questions that were in the form of statements on a 5-point Likert scale (ranking from 1 = strongly agree to 5 = strongly disagree) (Nimmo *et al.*, 2007). The respondents were asked to choose one response on the scale. Vogt

and Johnson (2011) describe the Likert scale as a method used to measure attitudes, perceptions, behaviour changes, knowledge and values. Respondents are given statements were they have to indicate whether they "strongly agree, agree, disagree, or strongly disagree." The respondents' answers were then summed up to provide scale scores and value, which can test the hypothesis (Vogt & Johnson, 2011).

Sandelowski (2000) points out that quantitative description has a restriction on the true meaning of the views of the respondents. Also, it allows little room for the respondents to provide more information on the issue. With this in mind, the researcher added open-ended questions to the questionnaire, which allowed the respondents to express themselves. The same format of questions was used in all sections.

1.2.3 Pilot survey

The main objective of pre-testing the questionnaire was to ensure that the respondents would interpret the questions in a consistent manner and also to allow the researcher to review and revise the questionnaire to serve the purpose of the survey (Burns *et al*., 2008). Reliability and validity were assessed by asking the same questions to the same participants on two different occasions to examine similarities in their responses (Burns *et al*., 2008). The pre-testing survey was conducted in the Kunene River, Epupa and Marienflus conservancies from the 16th – 20 May 2015 with ten participants. After reviewing and revising the questionnaire, the pilot test was conducted again in the above mentioned conservancies from the 13th - 17th June 2015 with the same ten previous participants. The participants responded to the questions in a consistent manners which has resulted in the development of the final questionnaire.

1.2.4 Ethical considerations

The researcher put in place some ethical considerations to ensure informed participation and protection of the participants. Due to language barrier the regional staff of the Ministry of Environment and Tourism (MET) in Kavango and Zambezi region, had to translate, while in the northwest the resident were used to translate.

The following guidelines and rules were followed according to Welman *et al*. (2010):
- The respondents were informed of the main objectives of the survey.
- Confidentiality was guaranteed, which enabled the respondents to provide the true answer and to reduce biases in their responses.
- The respondents' cultures and religions were respected.

- Respondents were informed of their rights and that they were taking part in the survey on a voluntary basis.

- The respondents were informed that they had the choice to terminate the interview session at any time when they were not comfortable with the interviews.

- All respondents were informed that the survey was for the Ministry to have a better understanding of HCC not necessary to prosecute any person. This was important because the researcher was from the Government department, which might cause the respondents to have negative perceptions and hide valuable information due to fear of being victimised.

- No promises or compensation were made to the interviewees.

- The traditional authorities (TA's) were consulted to conduct research in their respective jurisdiction areas and verbal informed consent was obtained.

1.2.5 Data analysis

The Likert scale items were summed up to provide a value for each concept. The open ended questions were grouped into themes and numerically coded to determine the attitudes and perceptions of local communities towards the crocodiles (Raubenheimer, 2014). The data were entered and coded using Microsoft Excel. SPSS Version 22 was used for data cleaning and management.

The demographic characteristics (e.g., head of household, age, income, etc.) questions were analysed using SPSS, and descriptive statistics were performed (frequency and percentages) and the results were presented in graphs. The Pearson's chi-square, Linear-by-Linear Association test and multiple test were used to test the relationship and association between the attitudes and perceptions of local communities in the three perennial rivers (perceptions, threats, management)

To test for significant differences between regions, when the dependent variable is an interval (continuous) variable (such as number of cattle), the ANOVA test were used.

However, we performed a non-parametric test, the Kruskall-Wallis test, which does not make the assumptions of normally distributed data and equal variances (Ashcroft, 2003). This test was used to determine if there are statistically significant differences between three or more groups of an independent variable (region = has three groups) on a continuous (number of cattle, goats owned) or ordinal dependent variable. It evaluates whether the medians of the dependant variable are the same across all groups of the independent variable (regions).

If the results of the test shows that there are statistically significant differences between the groups of the independent variable (regions) on the medians of the dependant variable (number of cattle, goats owned), then pairwise comparisons are conducted to determine where the differences lie. In other words, we compare the regions with each other (Kunene with Kavango West & East; Kunene with Zambezi; and Kavango West & East with Zambezi) to determine which group(s) differ.

For this survey the Pearson chi-square test was performed and when the data set were very few was violated, Fisher's exact test would have been performed, but due to lack of the software it was not performed, as most of the questions that had few data set where follow up questions which only require descriptive statistical analysis to interpret the results.

1.3 Survey Area

The survey area was undertaken along the three perennial rivers Kunene river (from Ruacana to Cirra-Casema), Zambezi River (includes the Zambezi, Chobe Kwando and Linyanti Rives) and Kavango River (Kavango West and East).

1.4 Questions we focused on

1. Did the incidence of HCC increased from year 2011 to 2015?
2. Do villagers views crocodiles as a specie that bring socio-economic benefit (perception of communities towards crocodiles)?
3. What are mitigation measures used by community members to prevent the HWC?
4. How do the community members would like the government to assist them in reducing HCC?

RESULTS

2.1 Demographic characteristics
2.1.1 Heads of households' gender
A total of 300 households (n=100 in each survey area) were surveyed. The results indicated that there were more male than female headed households (Figure 2.1). The Kavango West and East had 66 (66%) male and 34 (34%) female headed households, while Kunene had 69 (69%) male and 31 (31%) female headed households, and Zambezi River recorded 58 (58%) male and 42 (42%) female headed households (Figure 2.1).
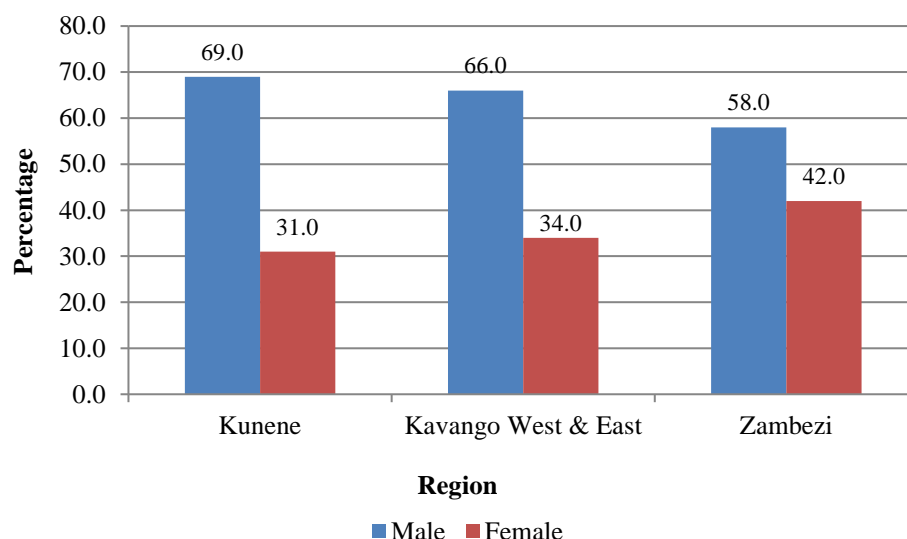
Figure 2.1: Shows household gender of the respondents in each survey area

2.1.2 Heads of households' language
A total of 19 different languages were recorded during the head of the household's survey. The results showed that in Kunene the OtjiHerero speakers had the highest participation 73 (73%) compared to the other languages which were less than 10% within the region. In Kavango West and East most of the respondents were Kwangali speaking 43 (43%). Meanwhile, in Zambezi there was a diverse participation from different ethnic groups. The Subia recoded the highest participation of 27 (27%), followed by Sifwe 22 (22%) (Figure 2.2).
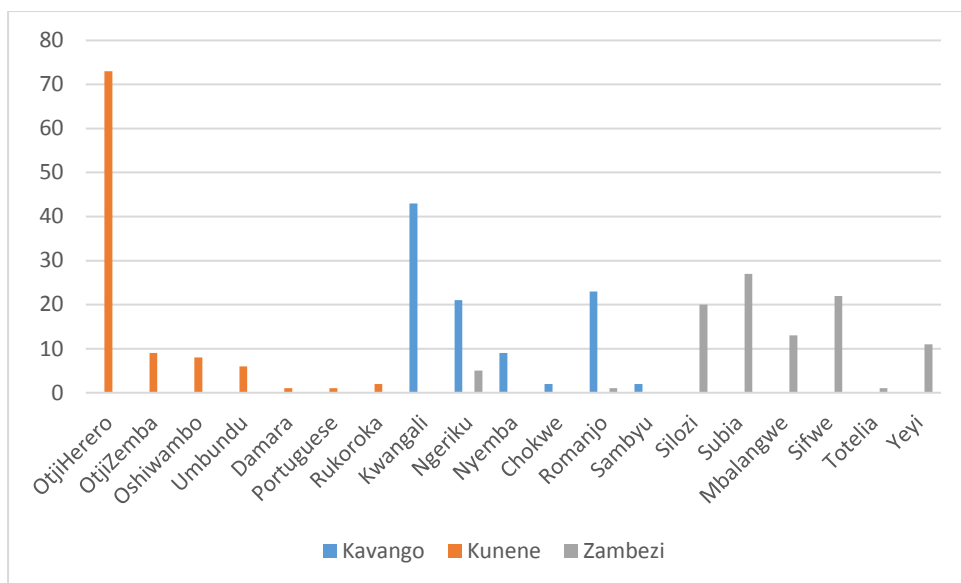
Figure 2.2: Language of heads of households in each survey area.

2.1.3 Heads of households' education

Since more than 20% of the cells have expected counts less than 5, and the variable 'educational level' is an ordinal variable, thus a 'Linear-by-Linear Association' was used. The results are significant X^2=64.751, df=1, P=0.30 (n=300), which means that there is a significant difference between the educational levels of the three regions. Kunene with the highest percentage of illiterate respondents (58.0%) differs from the other two regions were most respondents have attained secondary education levels (Kavango East & West, 51.0%; Zambezi, 73.0%) (Figure 2.3).

	Kunene	Kavango West & East	Zambezi
■ Illiterate	58.0	10.0	10.0
■ Adult education	0.0	3.0	1.0
■ Primary (Grade 1 – 7)	19.0	28.0	15.0
■ Secondary (Grade 8 – 12)	23.0	51.0	73.0
■ Tertiary education	0.0	8.0	1.0
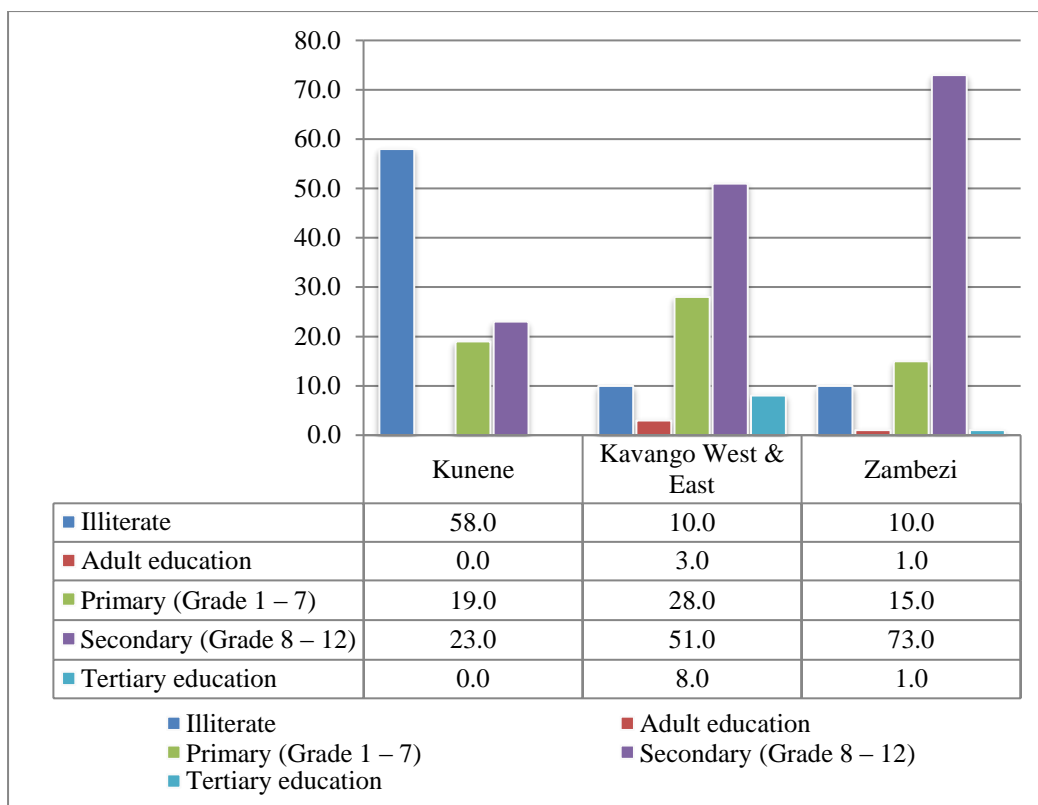
Figure 2.3: Level of education of respondent

2.1.4 Heads of households' age

The results from the Linear – by – Chi-Square test showed a significant difference in the age groups between the regions X^2=16.608, df=8, P=0.034 (n=300): Respondents from Kunene are younger than respondents from the two other regions (Figure 2.4).

	Kunene	Kavango West & East	Zambezi
■ <= 29	30.0	14.0	15.0
■ 30 - 39	24.0	19.0	21.0
■ 40 - 49	21.0	25.0	33.0
■ 50 - 59	12.0	17.0	12.0
■ 60+	13.0	25.0	19.0

■ <= 29 ■ 30 - 39 ■ 40 - 49 ■ 50 - 59 ■ 60+
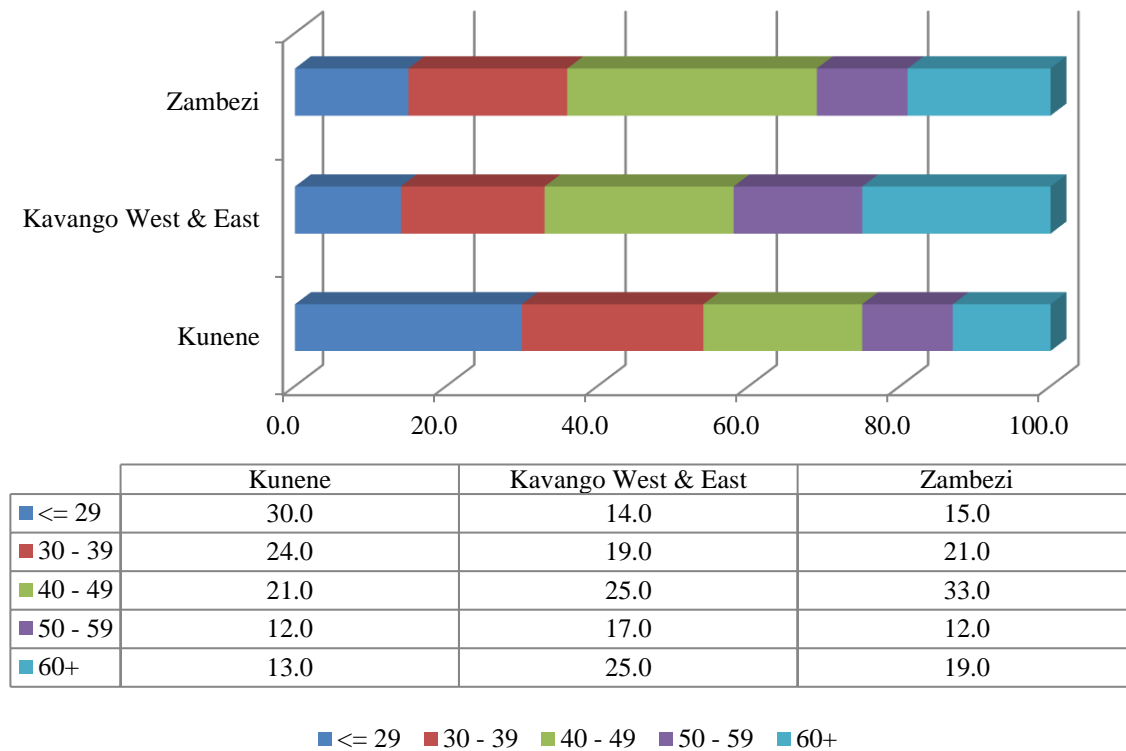
Figure 2.4: Age group of respondent (in years)

2.1.5 Heads of households' country of birth

The results from the Chi-Square test showed a significant difference between regions X^2=17.464, df=2, P=0.000 (n=300); Kunene has a higher percentage of non-Namibian respondents (Figure 2.5).

■ Kunene ■ Kavango West & East ■ Zambezi
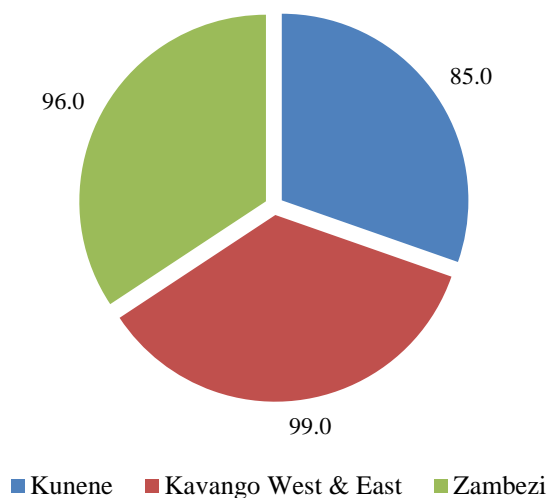
Figure 2.5: Born in Namibia? BY Region (Percentage 'Yes')

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2.1.6 Heads of households' source of income

The results from the Chi-Square test showed a significant differences in the income derived from different sources between the regions. Livestock sales are more important as a source of financial income for the Kunene respondents than those from the other two regions. Significant difference X^2=82.820, df=2, P=0.00: Kavango West & East respondents (27.0%) are more depended on pensions than Zambezi (20.0%), while only a few Kavango West and East respondents (8.0%) rely on pensions. for Kavango East & West and Zambezi more than half of the respondents mentioned 'Other' financial sources as the main source were is only about a quarter of respondents from Kunene (22.0%) rely on these financial sources (Figure 2.6).
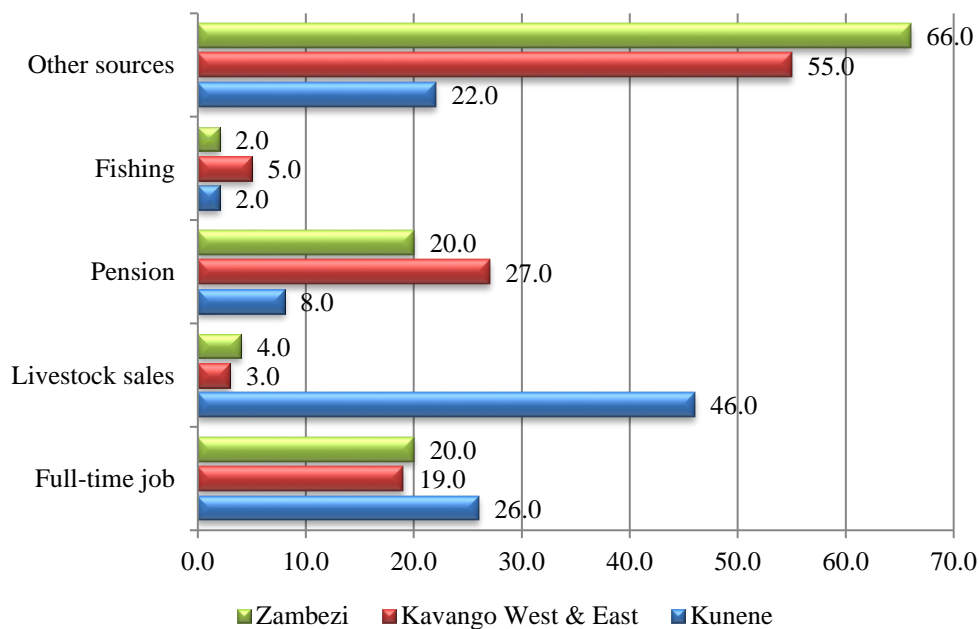
Figure 2.6: Main sources of financial income for respondent (Percentages)

2.2 Livestock ownership

The results from the Chi-Square test showed a significant differences in the livestock ownership between the regions X^2=11.397, df=2, P0.003 (n=300). Livestock ownership was widespread in the Kavango West and East, 78 (78%) of the respondents were livestock owners, compared to Kunene 70 (70%) in the Zambezi 56 (56%) (Figure 2.7).
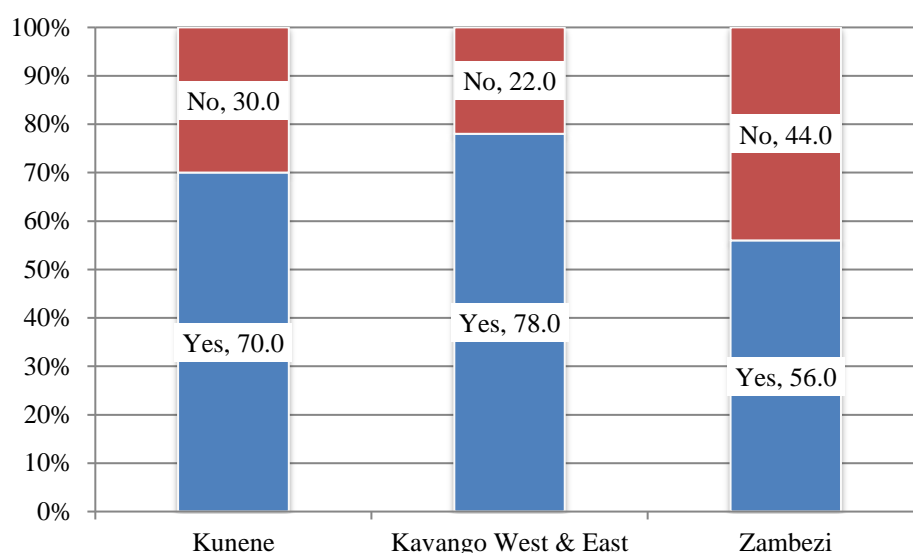
Figure 2.7: Do you own livestock? (Percentage)

2.2.1 Types of livestock owned by the households

If respondents answered "Yes" to ownership of livestock, they were requested to indicate the types of livestock they owned.

A Kruskall-Wallis test was performed to assess differences among the three regions (Kunene, Kavango West & East and Zambezi) on the median number of cattle owned. The test, which was corrected for ties, indicated that there is a statistically significant difference in the median number of cattle owned between the three regions, X^2=9.157, df=2, P= 0.000, (n=155).

Since the overall test was significant, pairwise comparisons among the three regions was done. The results of these tests revealed a significant difference between Kunene and Zambezi. The median number of cattle owned was greater for Zambezi than for Kunene.

A Kruskall-Wallis test was performed to assess differences among the three regions (Kunene, Kavango West & East and Zambezi) on the median number of goats owned. The test, which was corrected for ties, indicated that there was statistically significant difference in the median number of goats owned between the three regions X2=72.768, df=2, P= 0.000, (n=125).

A Kruskall-Wallis test was performed to assess differences among the three regions (Kunene, Kavango West & East and Zambezi) on the median number of other livestock (pig, chicken, dog etc.). The test, which was corrected for ties, indicated that there is a statistically significant

difference in the median number of other livestock owned between the three regions, $X^2=21.25$, df=2, P= 0.000, (n=145).

Since the overall test was significant, pairwise comparisons among the three regions was done. The results of these tests revealed a significant difference, Kavango West and East (67%) had greater number of other livestock owned, than Zambezi (41%) and Kunene (37%) (Figure 2.8).

	Others	Sheep	Goats	Cattle
■ Zambezi	41.0	0.0	10.0	54.0
■ Kavango West & East	67.0	0.0	46.0	61.0
■ Kunene	37.0	38.0	69.0	40.0

■ Zambezi   ■ Kavango West & East   ■ Kunene
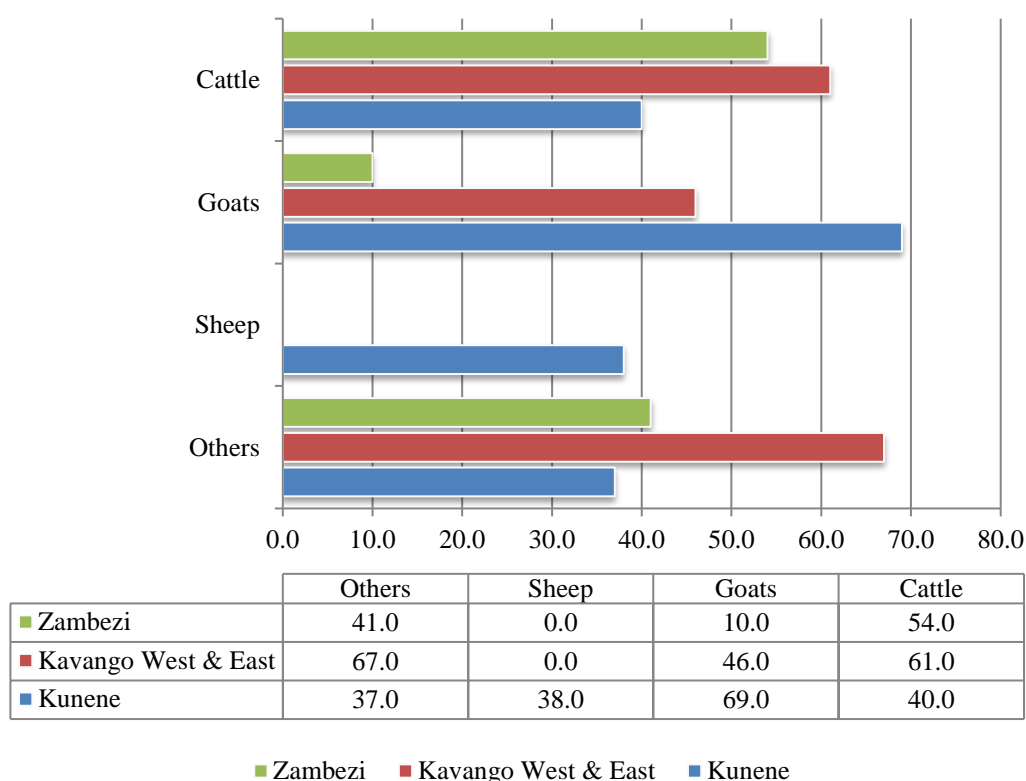
Figure 2.8: Type of livestock owned (Percentage)

2.4 Dependent on the river for livelihood

The results from the Chi-Square test showed a significant differences in the way the respondents use the river for their livelihoods between the regions $X^2=269.214$, df=8, P0.000 (n=300). Livestock watering was widespread among regions, in the Kavango West and East were (72%), Zambezi 65% and Kunene 58% (Figure 2.9). The results revealed that few people are drinking and bathing from the river in Zambezi, compared to the other two regions (Figure 2.9).
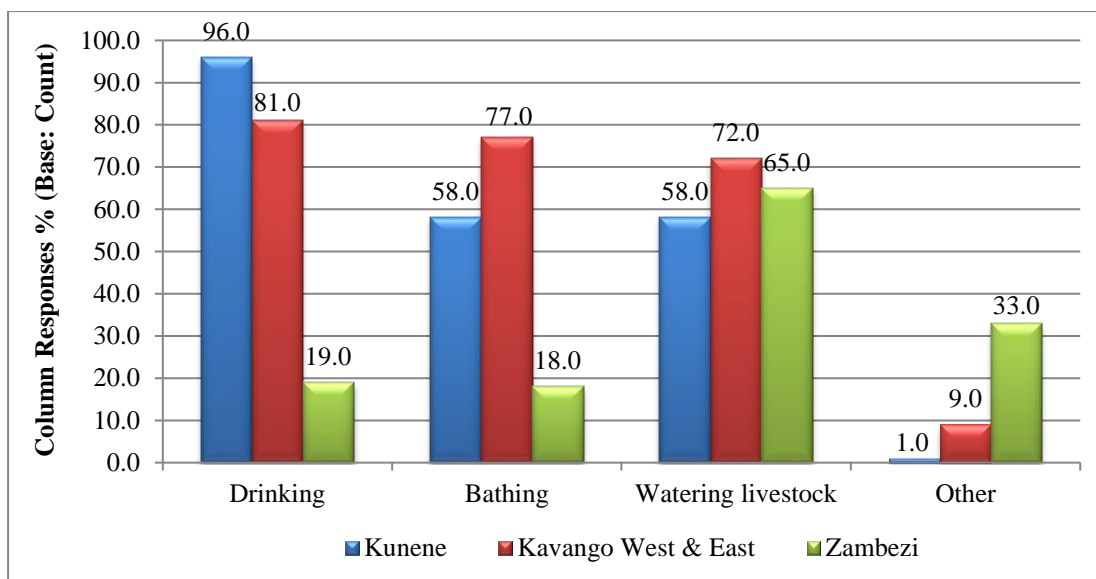
Figure 2.9: Depend on the river for livelihood (Percentage)

2.5 Crocodile conflict in the area

The results from the Linear − by − Linear Association test showed a statistical significant differences in the livestock ownership between the regions X^2=8.052, df=1, P=0.005 (n=300). The results from the chi-square test showed that respondents among the three regions are aware of the crocodile conflict in their area (Kunene 96%, Zambezi 87% and Kavango West & East 82%)(Figure 2.10).
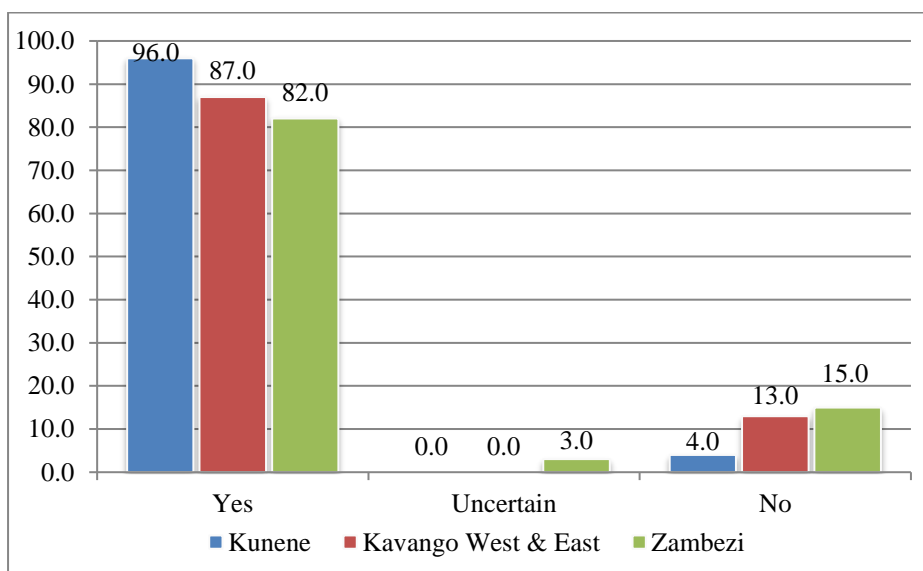
Figure 2.10: Does this area experience Human Crocodile Conflict (HCC)? (Percentage)

2.6 Crocodile awareness
2.6.1 Crocodile sighting in the area

The results from the Linear – by – Linear Association test showed that the respondents from both regions differed significantly in their opinions regarding the presence of crocodile in their area X^2=49.022, df=1, P=0.000 (n=300)

Figure 2.5 shows that 95 (95%) of the Kunene respondents, 54 (54%) of the Kavango West and East and Zambezi 48 (48%) respondents indicated that they always saw crocodiles in their respective areas. While 15 (15%) of the Zambezi and Kavango West and East 4 (4%) respondents indicated that they hardly ever saw crocodiles in their area (Figure 2.11).

In this survey, "almost always" meant every day; "frequently" meant once a month; "sometimes" meant at least once a month; "rarely" meant at least once a year; and "hardly ever" meant maybe once every two years.
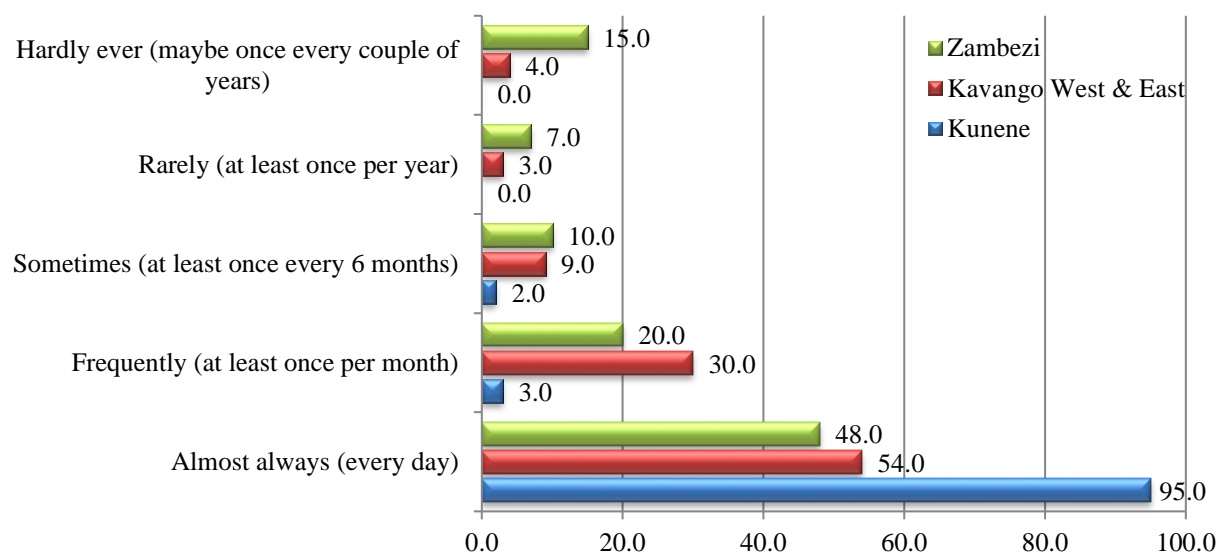
Figure 2.11 Crocodile sighting in your area (Percentage)

2.6.2 Species causing conflict in your area

The results from the Chi-Square test showed that the respondents among the regions differed significantly in their opinions regarding the conflict which caused by wildlife in their areas X^2=167.775, df=6, P=0.000 (n=300). All respondents in Kunene indicated that crocodiles are the only specie causing conflict 100 (100%), while the other two regions differs (Kavango East & West, 87% and Zambezi, 70.0%) (Figure 2.12).

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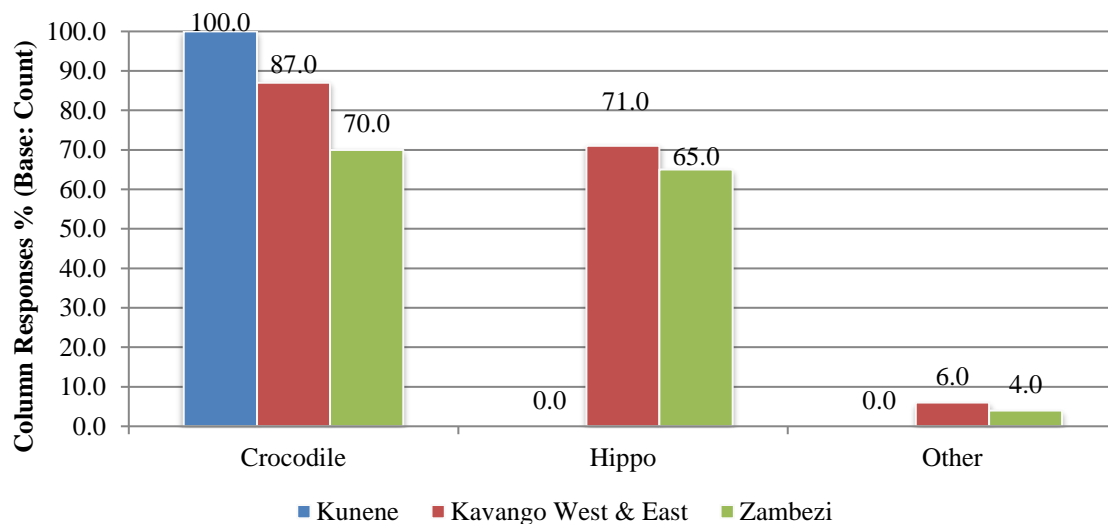
Figure 2.12: Species causing conflict in your area (Percentage)

2.6.3 Wildlife causing the most conflict in your area

The results from the Linear – by – Linear Association test showed that the respondents from both regions differed significantly in their opinions regarding the conflict which caused by wildlife in their area X^2=44.241, df=1, P=0.000 (n=300). Kunene respondents differ significantly from the other two regions (1000%) as most their conflict caused by one species, while Kavango West and East (crocodile 73%, Hippo 20%, Others 7% and Zambezi crocodile 55%, Hippo 40%, and others 5%) (Figure 2.13).
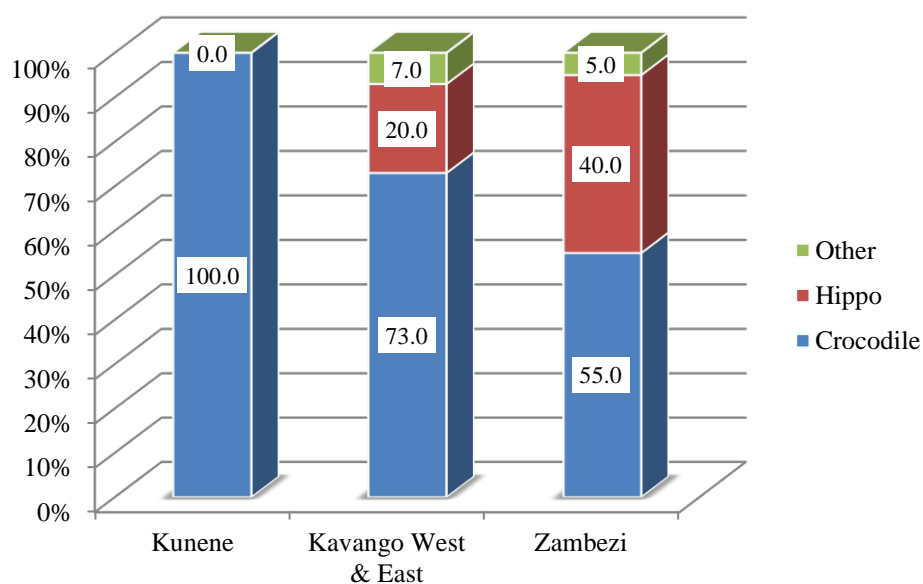
Figure 2.13: Which of the above wildlife causing the most conflict?

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2.6.4 Type of conflict caused

The results from the Chi-Square test showed that the respondents from both regions differed significantly in their opinions regarding the livestock attack in their area X^2=165.431, df=6, P=0.000 (n=300). Kunene recorded the highest number of livestock attack 53.4%, Kavango West and East 43.3% and Zambezi 40.9% (Figure 2.14). While Kavango East and West recorded high human attacked 49%, Kunene 46% and Zambezi 26% (Figure 2.14)

	Attack livestock	Attack human	Other
■ Kunene	53.4	46.0	0.6
■ Kavango West & East	43.3	49.0	7.6
■ Zambezi	40.9	26.0	33.1
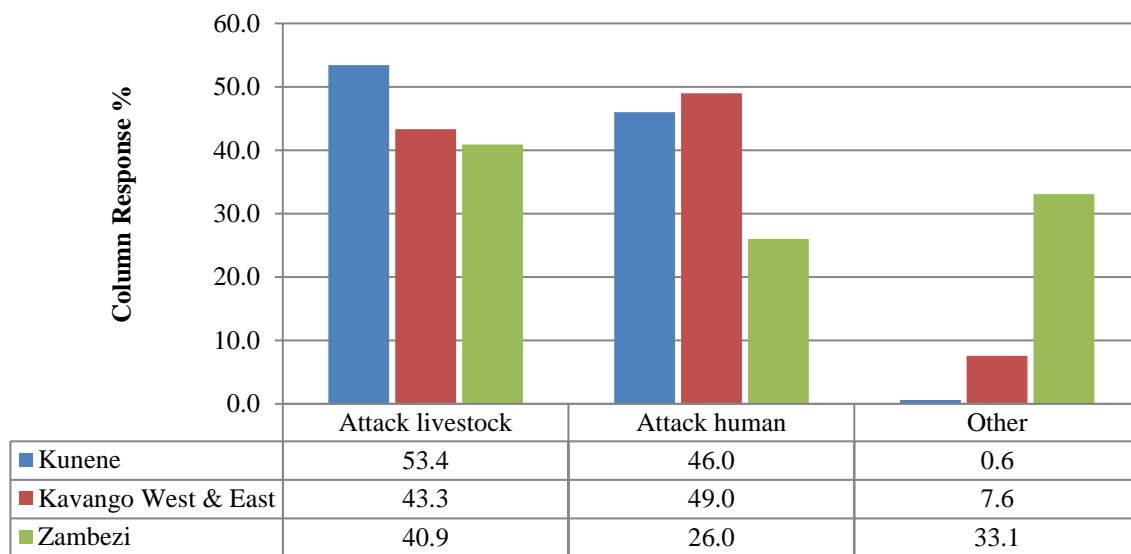
Figure 2.14: Type of HCC in your area (Percentage)

2.7 Mostly attacked livestock
2.7.1 Cattle

The results from the Linear – by – Linear test showed that the respondents from both regions differed significantly in their opinions regarding the ranking of cattle incidents in their area X^2=42.014, df=1, P=0.000 (n=298). Zambezi respondents ranked cattle attacked by crocodile the highest 79.8%, while Kunene respondents ranked cattle attacked medium 41% when compared to Kavango West and East 26.3% (Figure 2.15 (a).

	Kunene	Kavango West & East	Zambezi
■ Very low	3.0	14.1	2.0
■ 2	13.0	19.2	4.0
■ 3	41.0	26.3	5.1
■ 4	23.0	25.3	9.1
■ Very high	20.0	15.2	79.8
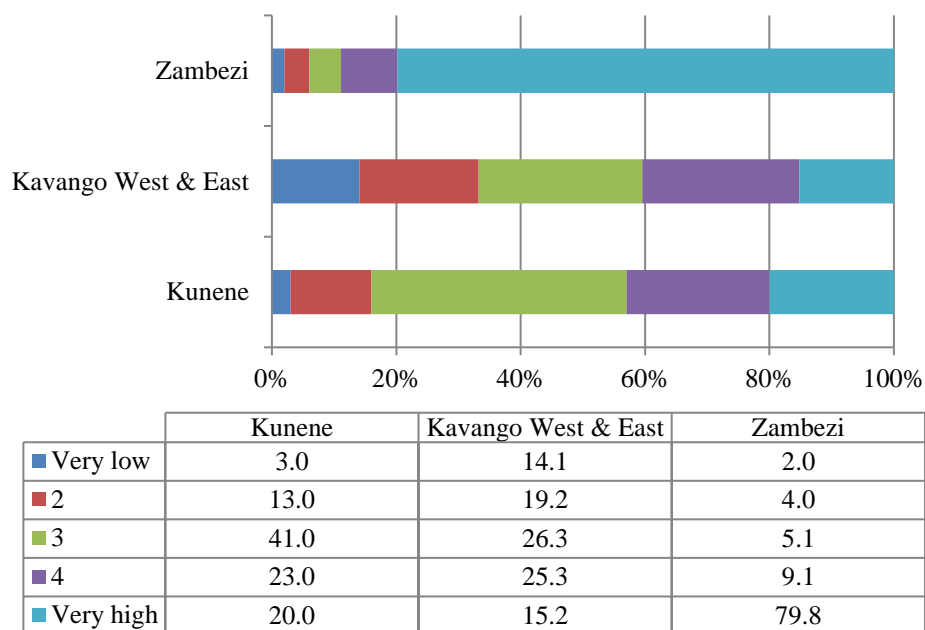
Figure 2.15 (a): What do crocodiles attack mostly? Ranking Cattle (Percentage)

2.7.2 Goat

The results from the Linear – by – Linear test showed that the respondents from both regions differed significantly in their opinions regarding the ranking of goat incidents in their area X^2=40.632, df=1, P=0.000 (n=239). Kunene respondents ranked goat attack at "very high" 42%, Kavango West and East 37% and Zambezi 5.1% respectively (Figure 2.15 (b).

	Kunene	Kavango West & East	Zambezi
■ Very low	1.0	6.0	15.4
■ 2	5.0	15.0	41.0
■ 3	17.0	16.0	23.1
■ 4	35.0	26.0	15.4
■ Very high	42.0	37.0	5.1
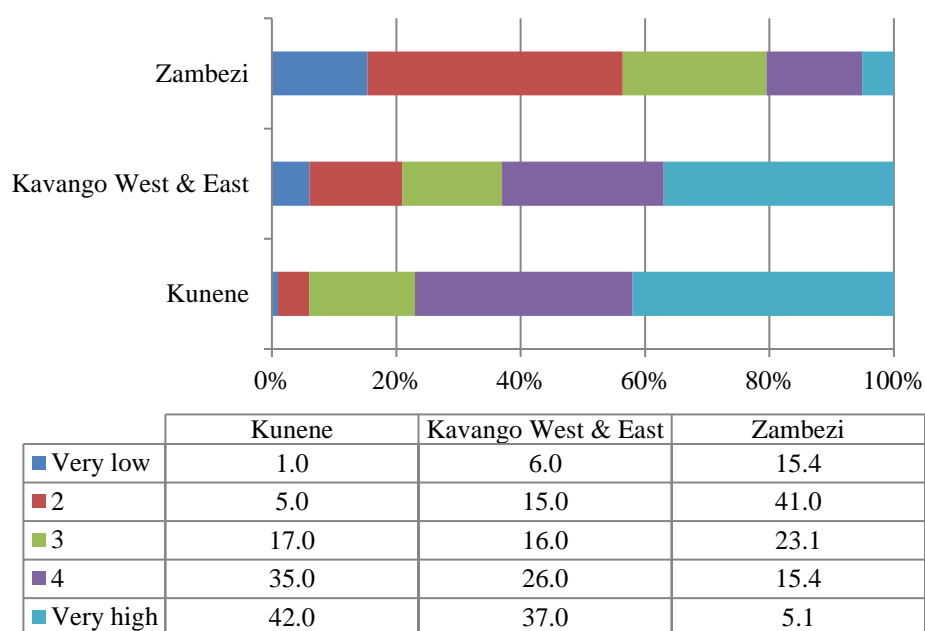
Figure 2.15 (b): What do crocodiles attack mostly? Ranking Goat (Percentage)

2.7.3 Human –Attacked by crocodile

The results from the Linear – by – Linear test showed that the respondents from both regions differed significantly in their opinions regarding the ranking of human attacked incidents in their area X^2=8.625, df=1, P=0.003 (n=273). Kunene respondents ranked human attack at "very low" 37%, Zambezi 29.7% respectively, while Kavango respondents ranked human attacked by crocodile at "very high" 35.4% (Figure 2.15 (c).

	Kunene	Kavango West & East	Zambezi
■ Very low	37.0	9.1	29.7
■ 2	33.0	12.1	20.3
■ 3	14.0	23.2	14.9
■ 4	12.0	20.2	27.0
■ Very high	4.0	35.4	8.1
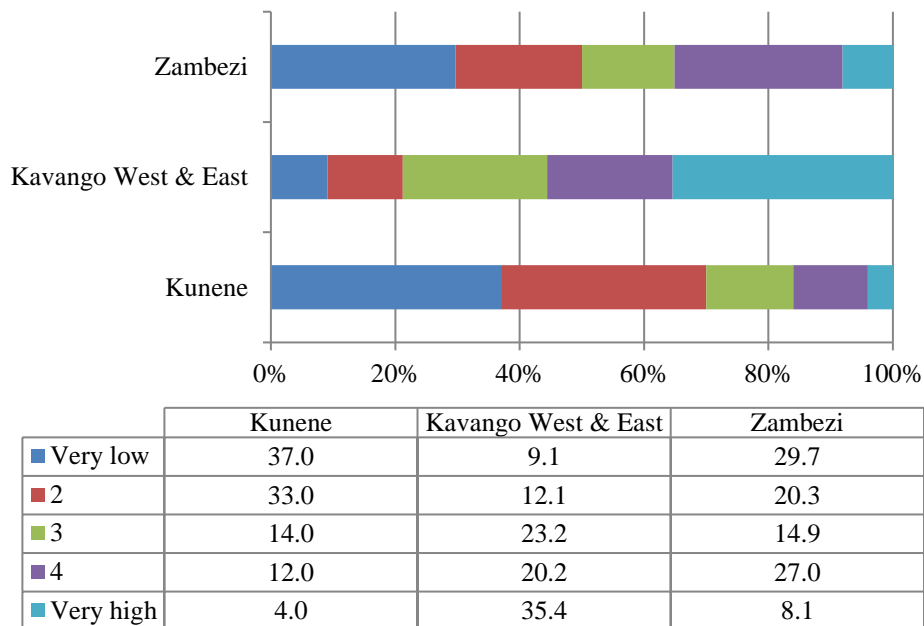
Figure 2.15 (c): What do crocodiles attack mostly? Ranking Human (Percentage)

2.7.4 Dogs –Attacked by crocodile

The results from the Linear – by – Linear test showed that the respondents among regions differed significantly in their opinions regarding the ranking of dogs attacked by crocodile in their areas X^2=19.826, df=1, P=0.000 (n=280). Kavango respondents ranked dog attack at "low" 38.4%, Kunene 22% and Zambezi 16% respectively (Figure 2.15 (d).

	Kunene	Kavango West & East	Zambezi
■ Very low	7.0	19.2	23.5
■ 2	22.0	38.4	16.0
■ 3	20.0	19.2	35.8
■ 4	21.0	18.2	22.2
■ Very high	30.0	5.1	2.5
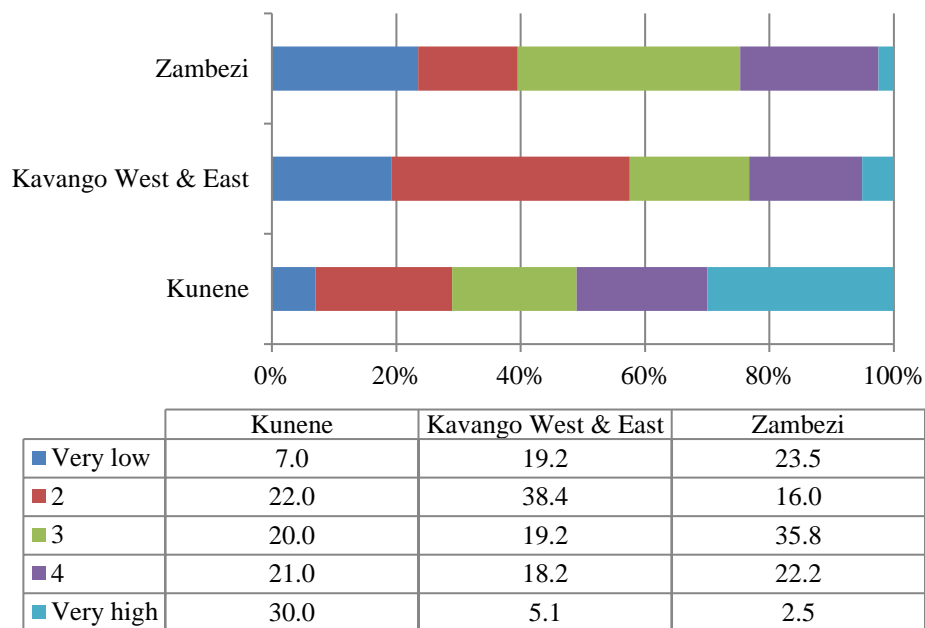
Figure 2.15 (d): What do crocodiles attack mostly? Ranking Dogs (Percentage)

2.7.5 Other livestock –Attacked by crocodile

The results from the Linear – by – Linear test showed that there are no significance difference in their opinions regarding the ranking of other livestock (e.g. pigs, chicken) attacked by crocodiles in their area X^2=1.316, df=1, P=0.251 (n=181). Kavango respondents ranked other livestock attacked at "very low" 60.8%, Zambezi 53.8% and Kunene 51.9% respectively (Figure 2.9 (e).

	Kunene	Kavango West & East	Zambezi
■ Very low	51.9	60.8	53.8
■ 2	29.6	9.5	7.7
■ 3	6.2	13.5	15.4
■ 4	11.1	9.5	19.2
■ Very high	1.2	6.8	3.8
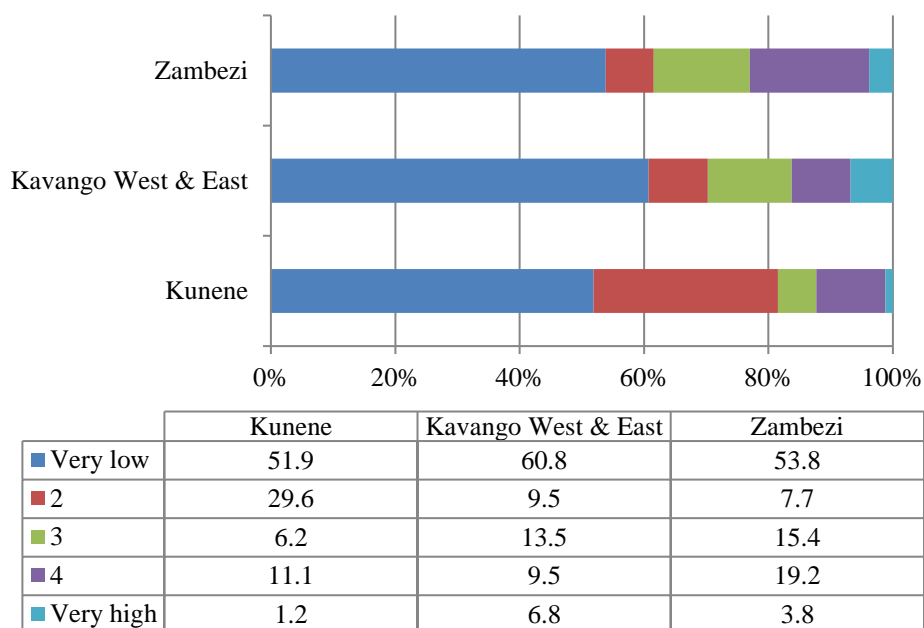
Figure 2.15(e): What do crocodiles attack mostly? Ranking Other (Percentage)

2.8 Lost livestock from crocodile in the past five years

The results from the Chi-Square test showed that there are significance difference in the responses of whether respondents lost livestock from the crocodile in the past five years X^2=15.445, df=2, P=0.000 (n=300). About 75% of Kunene respondents lost their livestock from the crocodiles, while Zambezi 53% lost their livestock. Half of the respondents in Kavango West and East 50% did not lost their livestock from the crocodile (Figure 2.16).
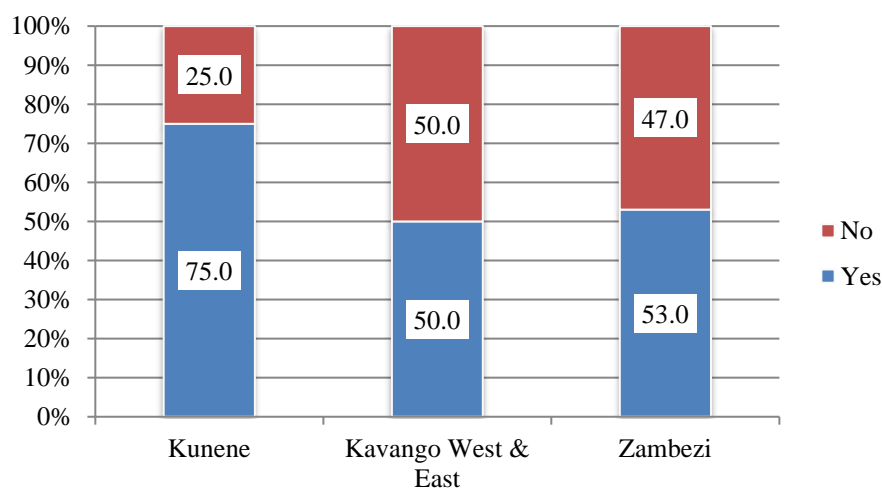
Figure 2.16: Lost livestock from crocodile attacks in the last five years? (Percentage)

2.8.1 Number of cattle lost from the crocodile from 2011 to 2015

A Kruskall-Wallis test was performed to assess differences among the three regions (Kunene, Kavango West & East and Zambezi) on the median total number of cattle lost from crocodile attacks from 2011 – 2015. The test, which was corrected for ties, indicated that there was no statistically significant difference in the median total number of cattle lost from crocodile attacks from 2011 – 2015 between the three regions $X2=5.506$, $df=2$, $P=0.064$. Although there was no significance difference between the region, Kunene recorded the highest cattle attack during year 2011 (79) and 2014 (84) compared to Kavango West and East with 2011 (12) and 2014 (20) cattle attacked by the crocodiles (Figure 2.17).
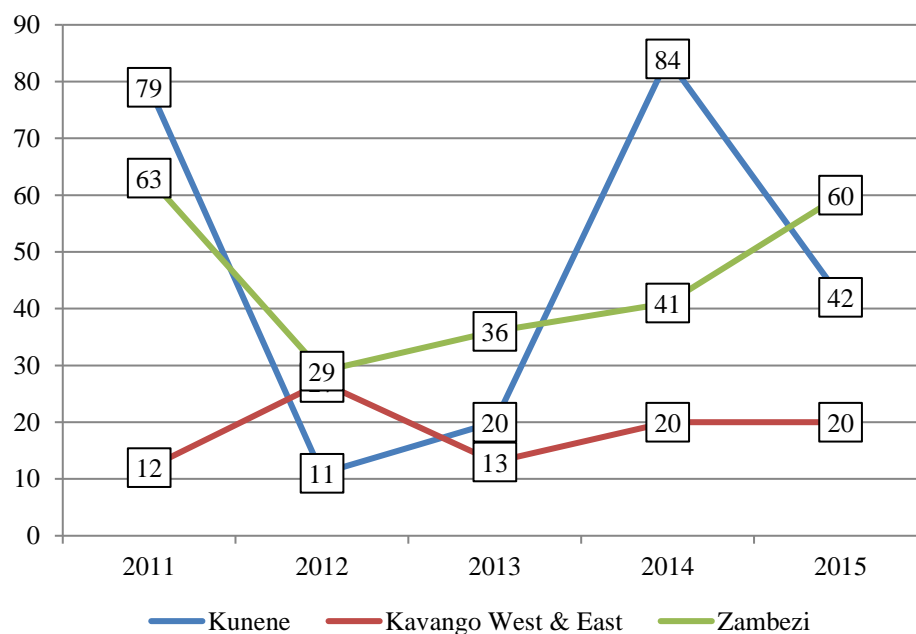
Figure 2.17: Number of cattle lost from crocodile attacks from 2011 – 2015

2.8.2 Number of goats lost from the crocodile from 2011 to 2015

A Kruskall-Wallis test was performed to assess differences among the three regions (Kunene, Kavango West & East and Zambezi) on the median total number of goats lost to crocodile attacks from 2011 to 2015. The test, which was corrected for ties, indicated that there is a significant difference in the median total number of goats lost to crocodile attacks from 2011 to 2015 between the three regions, $X2=19.87$, $df=2$, $P=0.000$ (n=93).

Since the overall test was significant, pairwise comparisons among the three regions was performed. The results of these tests revealed a significant difference between Kunene and

Kavango West and East. The median total number of goats lost to crocodile attacks from 2011 to 2015 was greater for Kunene than for Kavango West and East (Figure 2.18).
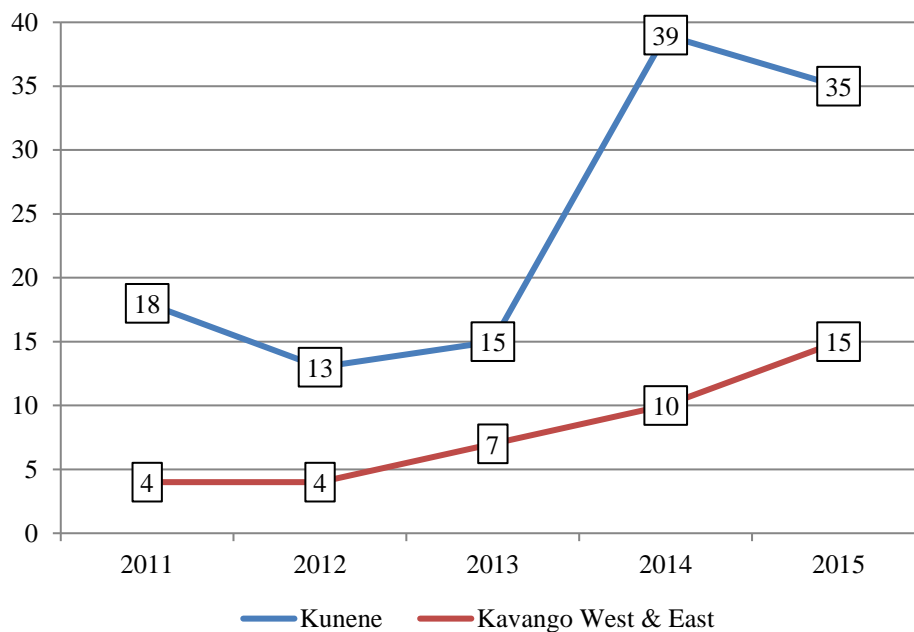
Figure 2.18: Number of goats lost from crocodile attacks from 2011 - 2015 (excluded Zambezi)

2.9 Crocodile attacked any member of your family

The results from the Chi-Square test showed that there are no significance difference in the families experiencing crocodile attacks on any of their members within the three region*s* X^2=22.632, df=2, P=0.000 (n=300). In both three regions most of the respondents indicated that they did not lost any member of their family from the crocodile: Zambezi 94%, Kunene 76%, and Kavango West and East 68%, (Figure 2.19).
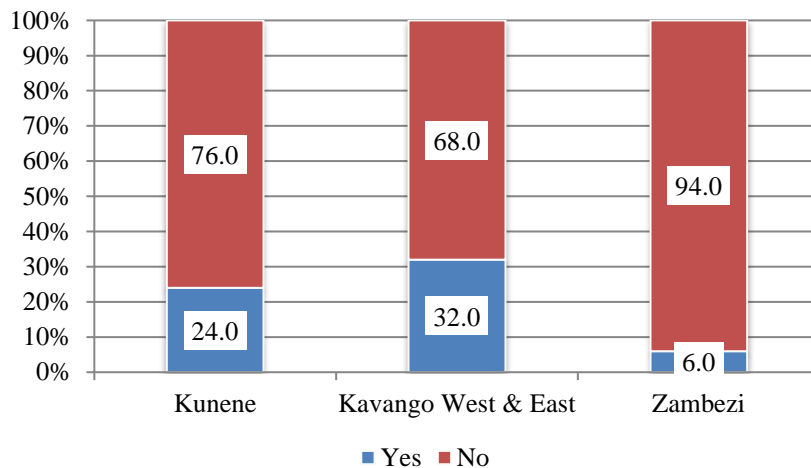
Figure 2.19: Crocodile attacked any member of your family (Percentage)

2.10 Number of attacked member of family

If respondents answered "Yes "to crocodile attack members of their families, they were requested to indicate the number of people attacked in each year. For the purpose of this survey respondents were asked to provide the name, sex, and age of the attacked person to be used for removing those incidents that were reported more than once.

Since there were few cases and most respondents had only one family member attacked by crocodiles, none of the statistical tests were performed. In 2015 Kavango West and East recorded the highest number of human attack (17), compared to the other two counterparts, Kunene with (9) and Zambezi (1) (Figure 2.20).
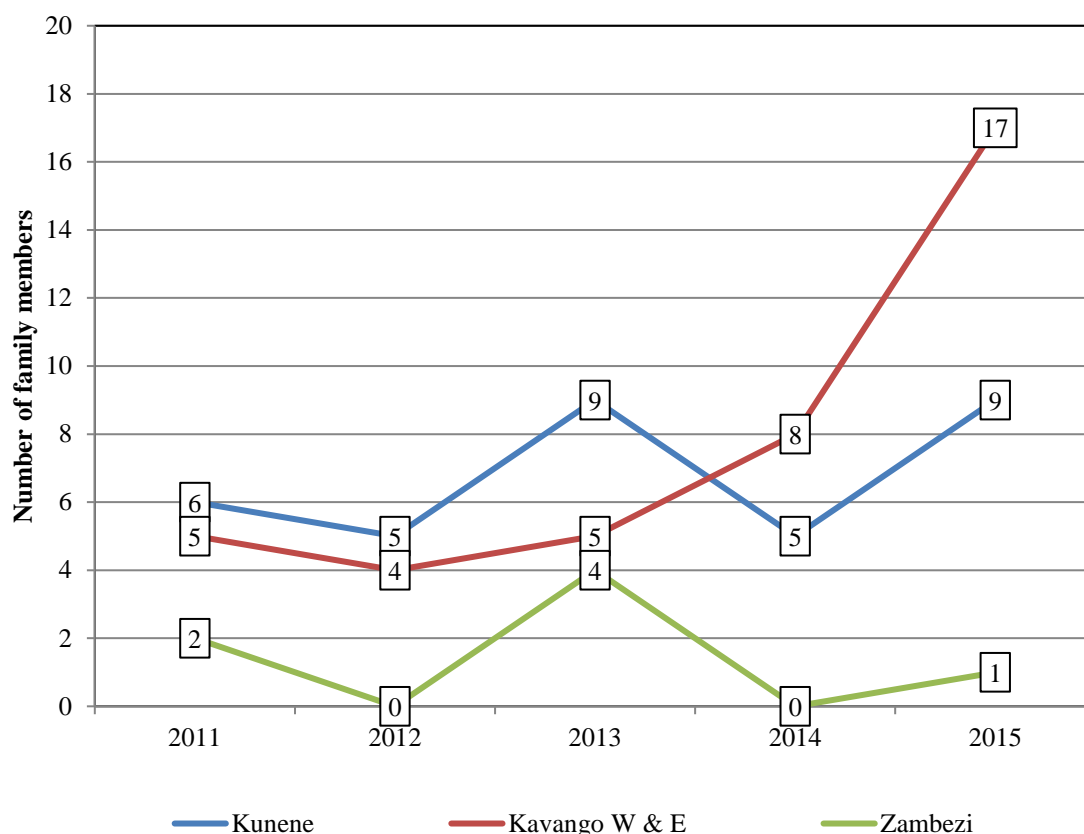
Figure 2.20: Total number of family members attacked

2.11 Type of injuries sustained by attacked member of your family

As a follow up question from (section 2.10), respondents were asked to indicate the type of injuries sustained by the victims.

Since there are so few cases and most respondents had only 1 villagers attacked by crocodiles, none of the statistical tests was performed, therefore no statistical test will be presented in this section, and thus the results are interpreted in a graph form. The majority of the crocodile victims in Kavango West and Eat (84.6%) and Kunene (76.5%) were killed by crocodile, compared to Zambezi (42.9%). Similarly, in Zambezi 42.9% of the victims were sustained series injuries such as loss of body parts (Figure 2.21)
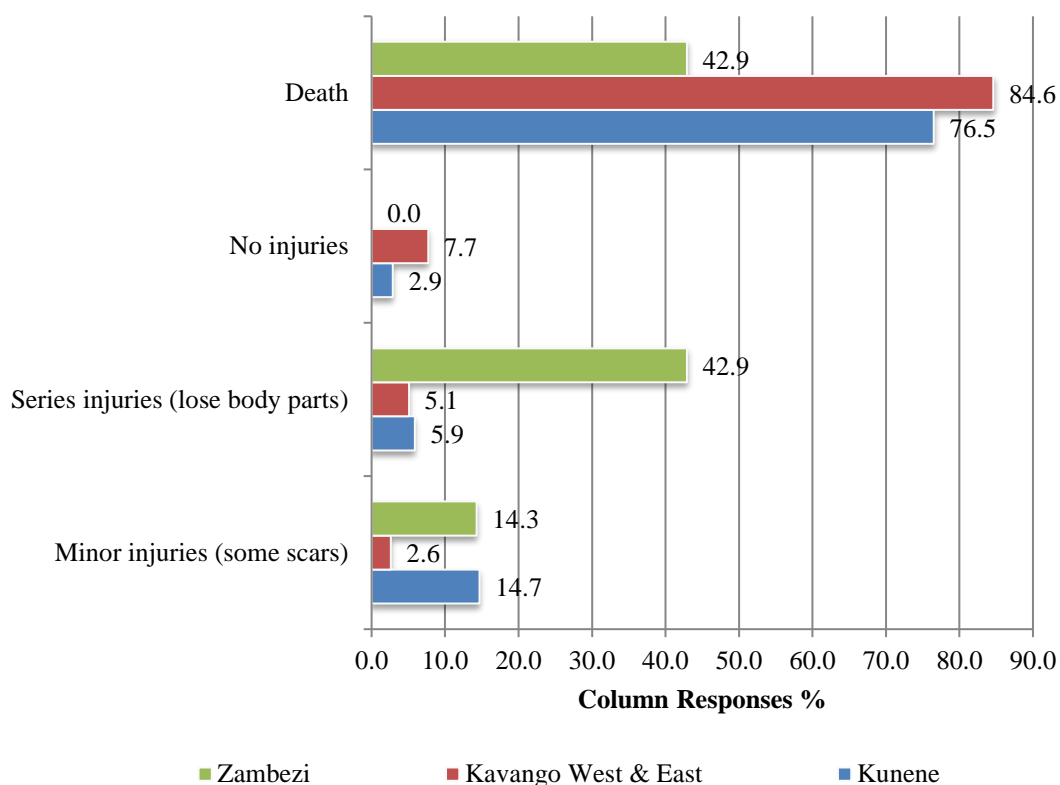
Figure 2.21. Injuries from crocodile attacks sustained by the victim over the five years 2011 - 2015 (percent)

2.12 Number of attacked villagers

If respondents answered "Yes "to crocodile attack members of their families, they were requested to indicate the number of people attacked in each year. For the purpose of this survey, respondents were asked to provide the name, sex, and age of the attacked person to be used for removing those incidents that were reported more than one.

Since there are so few cases and most respondents had only 1 villagers attacked by crocodiles, none of the statistical tests was performed, therefore no statistical test will be presented in this section, and thus the results are interpreted in a graph form. Between 2015 and 2016 Kavango West and East recorded the highest number of human attacked at village level (15) and (13), compared to the other two counterparts, Kunene with (2) and (12) and Zambezi (0) and (4) (Figure 2.22).
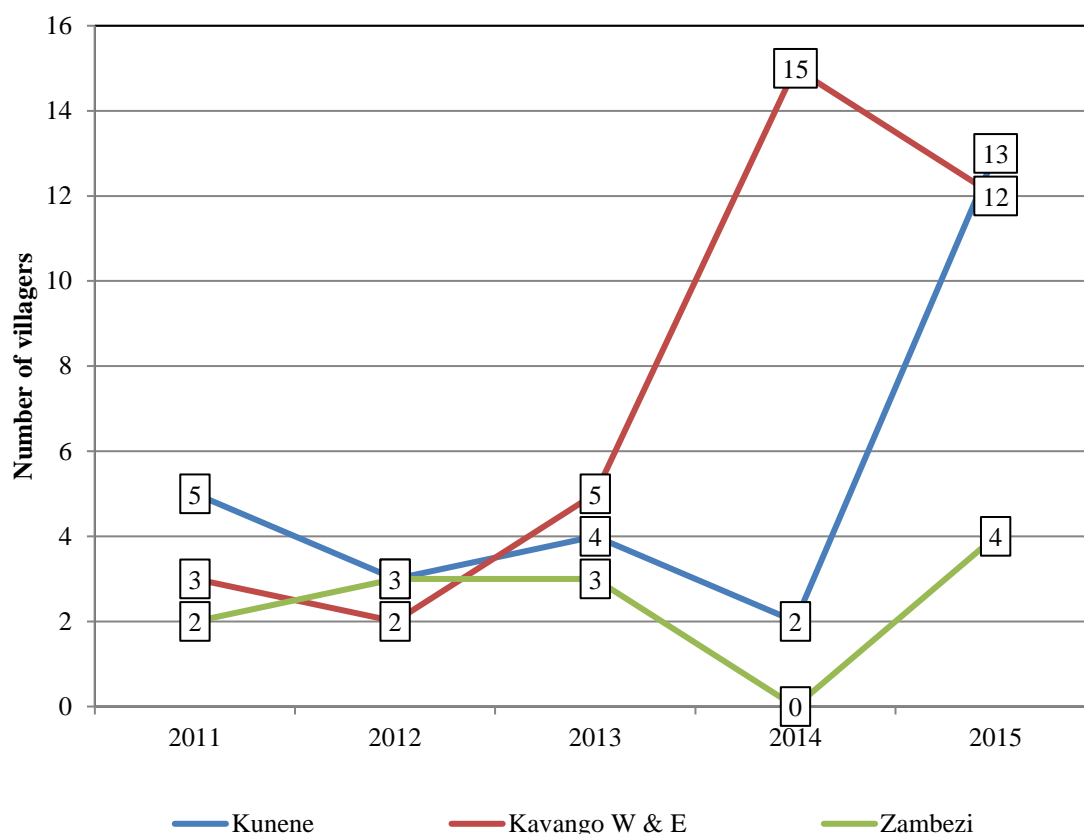
Figure 2.22: Total number of villagers attacked by crocodiles

2.13 Type of injuries sustained by attacked villagers

If respondents answered "Yes "to crocodile attack villagers, they were requested to indicate the number of people attacked in each year. For the purpose of this survey, respondents were asked to provide the name, sex, and age of the attacked person to be used for removing those incidents that were reported more than one.

Since there are so few cases and most respondents had only 1 villagers attacked by crocodiles, none of the statistical tests was performed, therefore no statistical test will be presented in this section, and thus the results are interpreted in a graph form. The majority of the crocodile victims in Kavango West and East (74.3%) and Kunene (54.5%) were killed by crocodile, compared to Zambezi (50%). Similarly, in Zambezi 50% of the victims were sustained series injuries such as lose body parts (Figure 2.23)
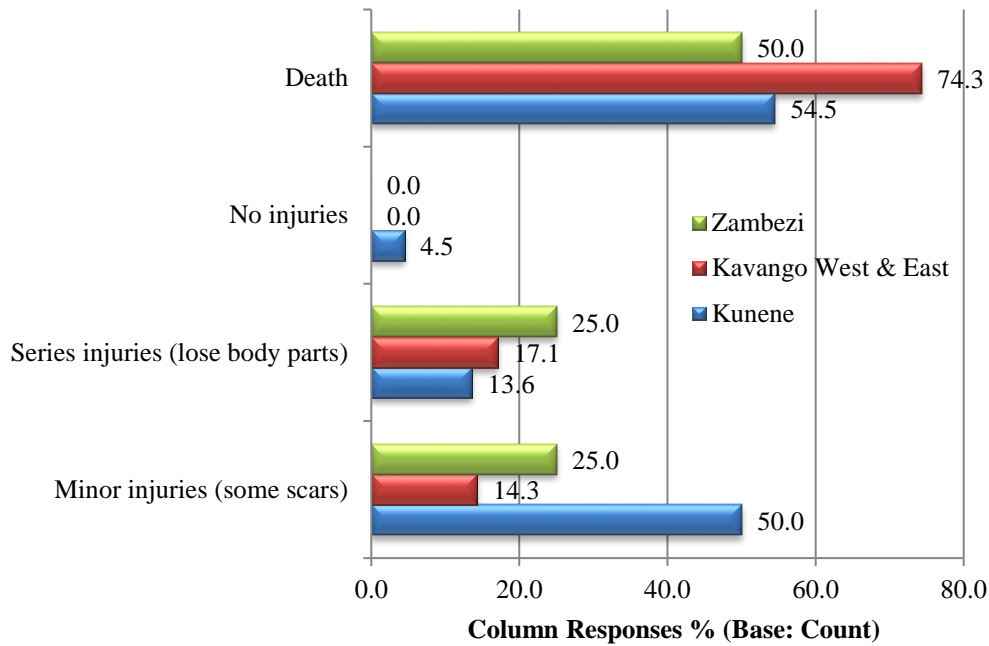
Figure 2.23: Injuries from crocodile attacks sustained by villagers over the five years 2011 - 2015

2.14 Time of the year is highest peak for crocodile attack

The Mantel-Haenszels test for trend was performed and the results were significant $X^2MH=97.04$, df=1, P=0.001(n=300). This suggests that there was a significant difference between the regions with respect to time of the year when crocodile attacks are at their highest peak,

The differences between the regions with respect to time of the year when crocodile attacks are at their highest peak are evident from Figure 2.24, Kavango West & East experienced the highest peak during the summer period (55.0%), whereby for both Kunene (93.0%) and Zambezi (46.0%) most of the crocodile attacks happened in the spring period from September to November (Figure 2.24). Autumn and winter appears to be the seasons where crocodile attacks are at their lowest for all three regions.

	Summer (Dec - Feb)	Autumn (March - May)	Winter (June - August)	Spring (Sept - Nov)
■ Zambezi	34.0	11.0	9.0	46.0
■ Kavango West & East	55.0	1.0	9.0	35.0
■ Kunene	4.0	0.0	3.0	93.0

■ Zambezi   ■ Kavango West & East   ■ Kunene
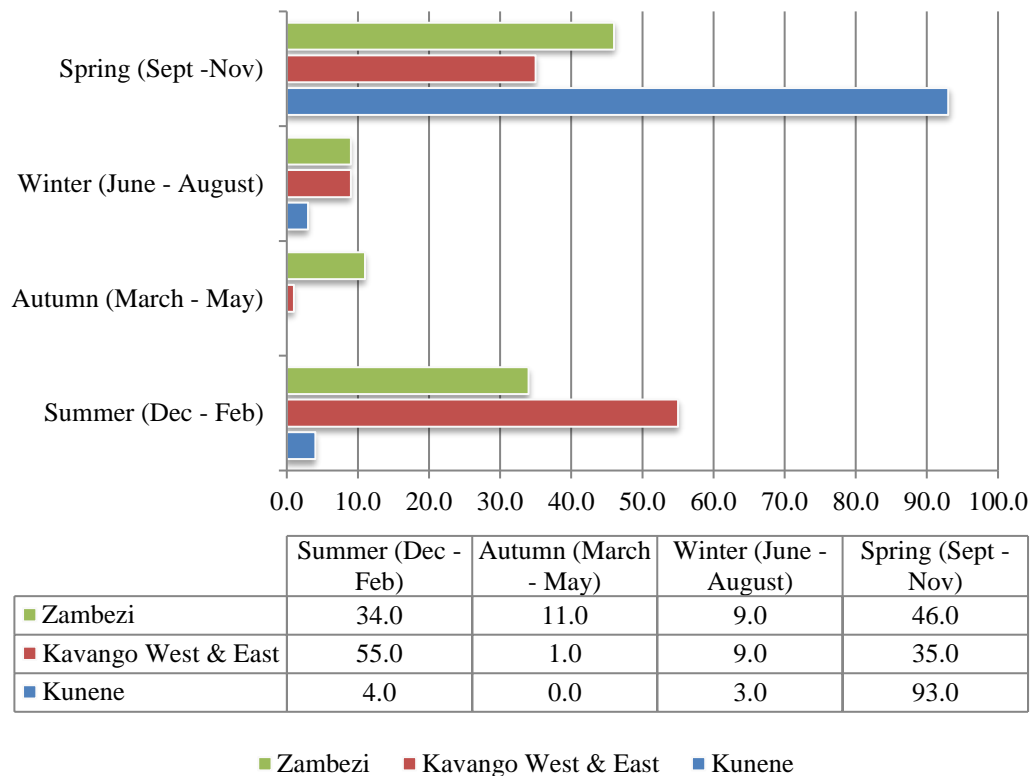
Figure 2.24: Time of the year is highest peak for crocodile attack (Percentage)

2.15 The level of the river when is highest peak for crocodile attack

The Chi-Square test showed a significant difference between the regions with respect to the level of the river when crocodile attacks are at their highest peak.

X^2 =97.04, df=1, P= 0.001(n =300).

The differences between the regions with respect to level of the river when crocodile attacks are at their highest peak are evident from Figure 2.25, Kavango West & East experienced the highest peak when the river level is normal (46.0%), whereas for both Kunene (39.0%) and Zambezi (50.0%) most of the crocodile attacks happened when the river level is low (Figure 2.25).
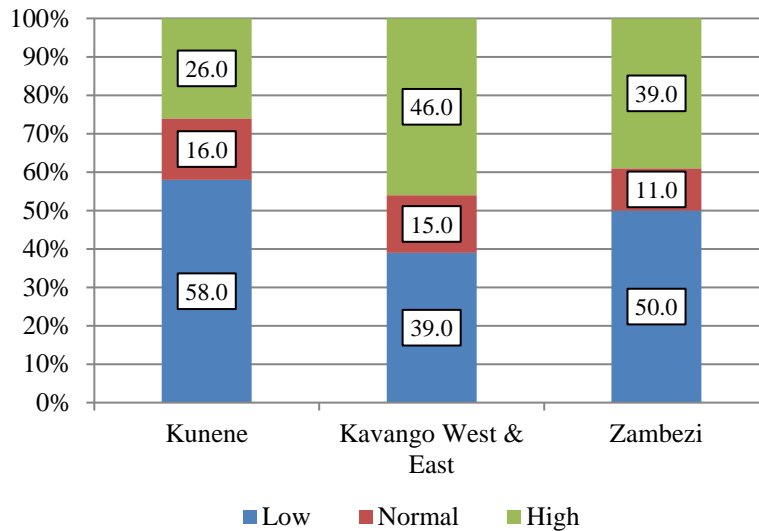
Figure 2.25: Level of the river is highest peak for crocodile attack (Percentage)

2.16 Time of the day is highest peak for crocodile attack

The Chi-Square test showed a significant difference between the regions with respect to the time of the day when crocodile attacks are at their highest peak X^2 =58.592, df=8, P=0 .000(n =300).

The differences between the regions with respect to time of the day when crocodile attacks are at their highest peak are evident from Figure 2.26, Kavango West & East experienced the highest peak during the afternoon (32%) and any time of the day (35%) is normal (46.0%), whereas for both Kunene (39.0%) similarly, Kunene also in the Afternoon (48%) and any time of the day (44%), while the Zambezi differ from the two counter parts, most the highest peak are in afternoon (32%) and midday (29%) (Figure 2.26).

	Kunene	Kavango West & East	Zambezi
■Morning	5.0	12.0	14.0
■Midday	2.0	21.0	29.0
■Afternoon	48.0	32.0	32.0
■Night	1.0	0.0	9.0
■Any time	44.0	35.0	16.0
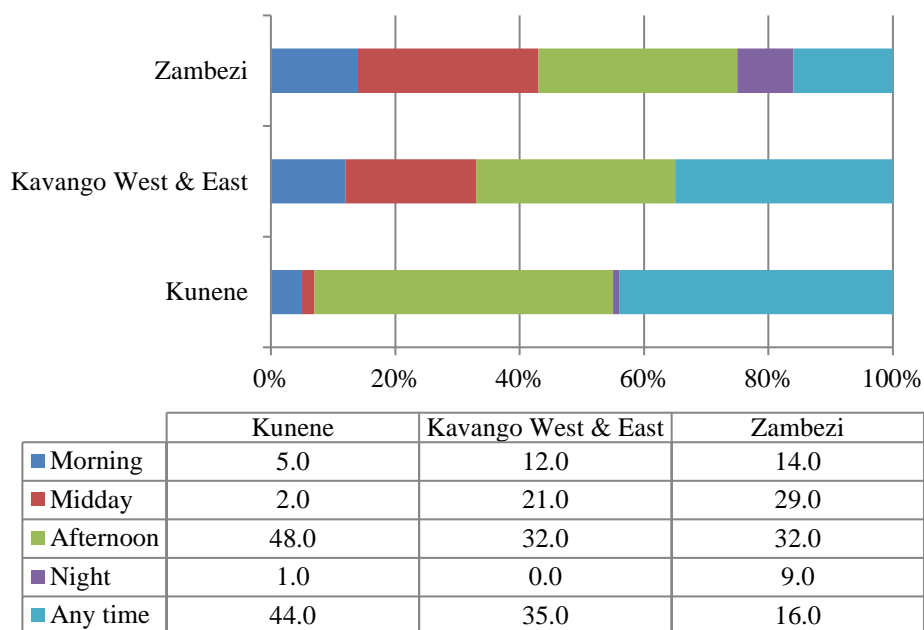
Figure 2.26: Time of the day is highest peak for crocodile attack (Percentage)

2.17 Do you go fishing?

The Chi-Square test showed that the results were significantly different X^2 =0.509, df=2, P=0.775 (n =300). Although a slightly higher percentage of respondents from Kavango West and East (49.0%) and Zambezi (47.0%) indicated that they go fishing than their counterparts in Kunene (44.0%), the difference was not significant (Figure 2.27).
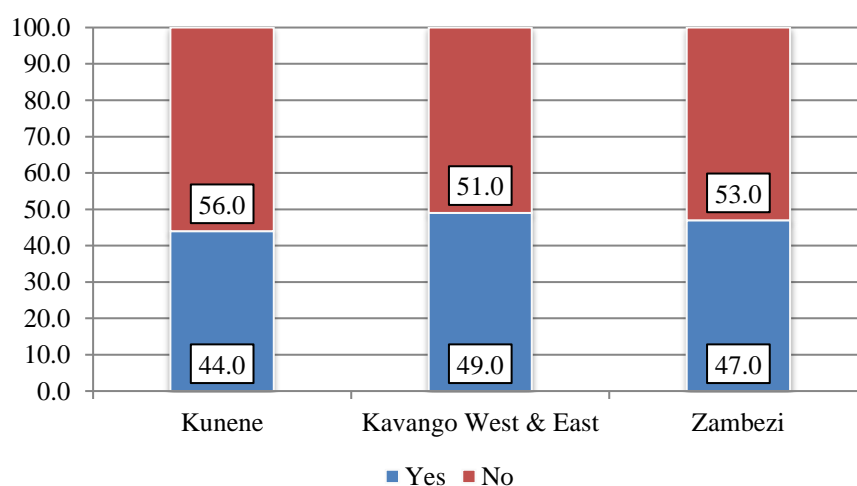
Figure 2.27: Do you go fishing? (Percentage)

2.18 Mode of fishing used

If respondents answered "Yes "to fishing, they were requested to indicate the mode of fishing used.

Since there are so few cases and most respondents had only few mode of fishing, none of the statistical tests was performed, therefore statistical test will not presented, and thus the results are interpreted in a graph form. For the purpose of this survey respondents were asked to provide more than one answers, which has resulted for the responses percentages to go beyond hundred percent.

Kunene recorded the highest number of fish line use (97%), when compared to the other two counterparts, Zambezi with equal amount of fish line and fish net, (57.4) and Kavango West and East with fish line (53.7%) respectively (Figure 2.28).
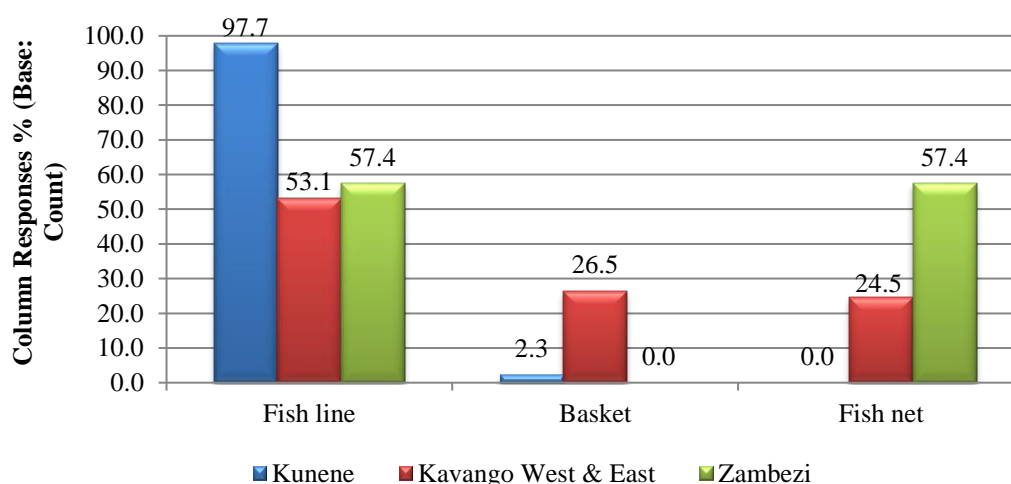
Figure 2.28: Mode of fishing used for fishing

2.19 Benefits that crocodile bring to the communities

The results from the Chi-Square test showed that there are no significance difference in the responses towards the benefits derived from the crocodile X^2=6.522, df=2, P=0.038 (n=300). In all three regions most of the respondents indicated that crocodile do not bring benefits to their communities: Kavango West and East 91%, Zambezi 85% and Kunene 78%, (Figure 2.29).

31
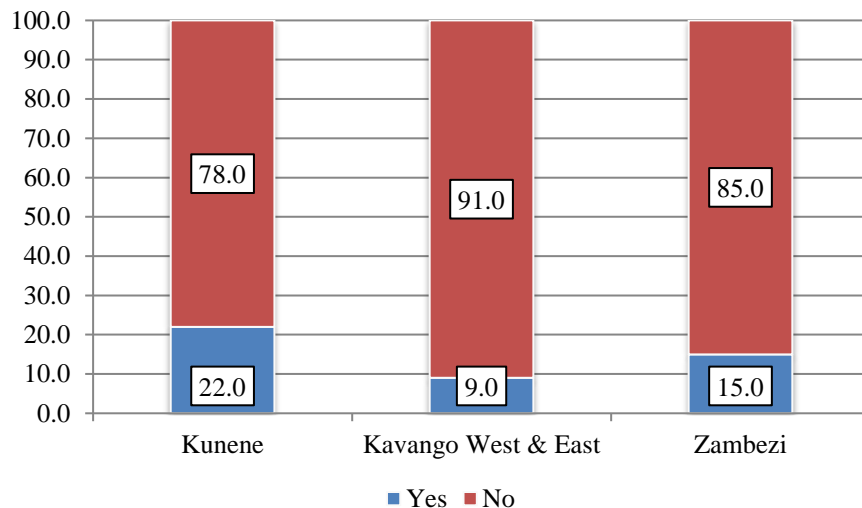
Figure 2.29: Benefit crocodiles bring benefits to the communities (Percentage)

2.20 Type of benefits that crocodile bring to the communities

As a follow up question, the 46 respondents who had answered that crocodile brought benefits were asked to indicate the type of benefit derived from crocodiles.

In all three regions most of the respondents indicated that photo tourism was the highest benefits which crocodile brings to their communities: Kunene 15%, Zambezi 11% and Kavango West and East 5%, (Figure 2.29).
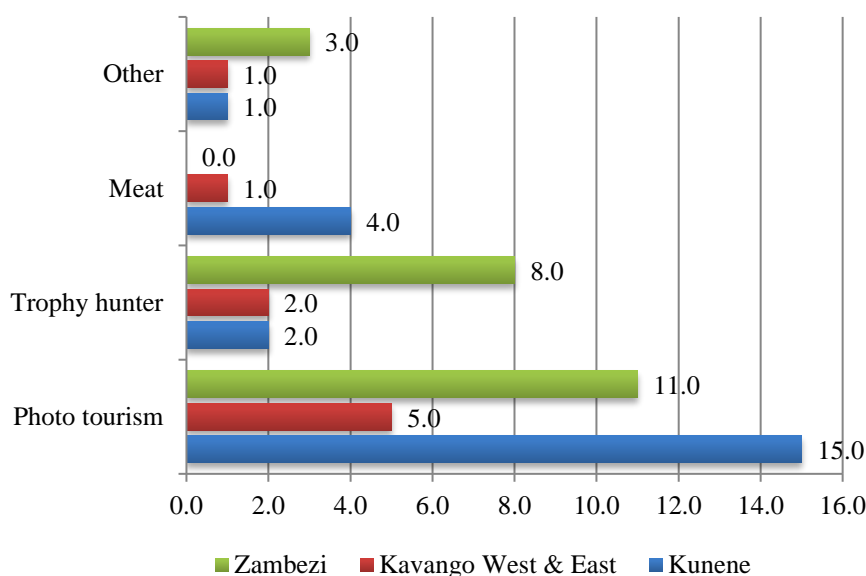
Figure 2.29 Type of benefits do crocodiles bring to the community (Percentage)

2.21 Reduce human-crocodile conflict

The results from the Chi-Square test showed a significant difference between the regions with respect to the methods suggested to be used to lessen crocodile attack

X^2 =82.557, df=14, P=0.000 (n =300).

The differences between the regions with respect to methods suggested to be used to reduce crocodile attacks are evident from Figure 2.30, Nearly 50% of the respondents in both Kavango West & East (48%) and Kunene suggested that crocodile must be killed, while 41% of the Zambezi also given the similar responses (Figure 2.30).
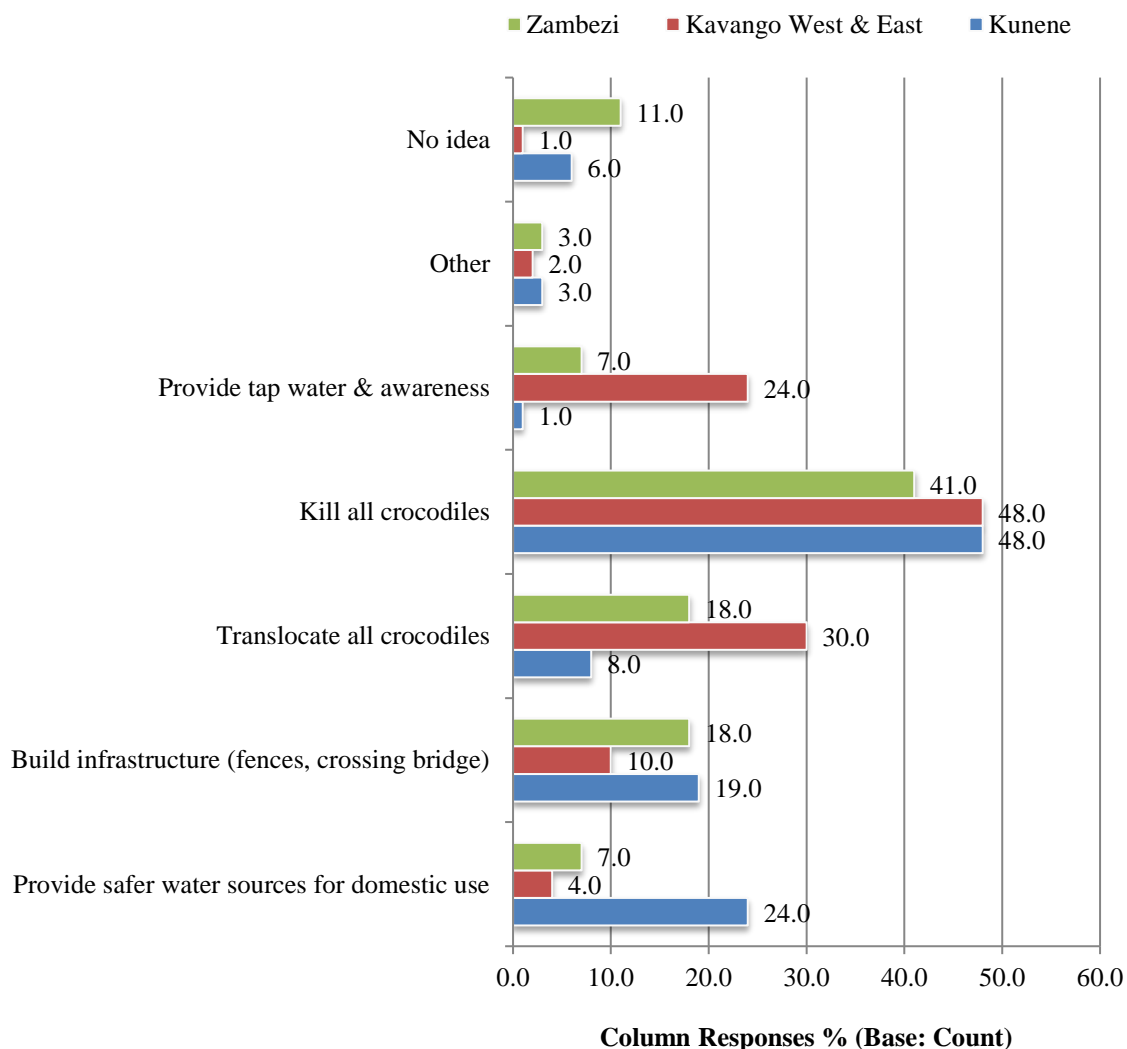
Figure 2.30: What can be done to reduce human crocodile conflict in your area? (Percentage)

2.22 Existing methods are used to mitigate/ reduce attacks by crocodiles

The results from the Chi-Square test showed a significant difference between the regions with respect to the existing methods used to lessen crocodile attack $X^2 = 225.886$, df=18, P=0 .000 (n =300).

The differences between the regions with respect to the existing methods used to reduce crocodile attacks are evident from Figure 2.31, Kunene had recorded the greater number (61%) of respondents indicating that they are throwing stones to scare crocodiles, compared to the other two regions, Kavango West and East (7%) and Zambezi (7%) (Figure 2.31).
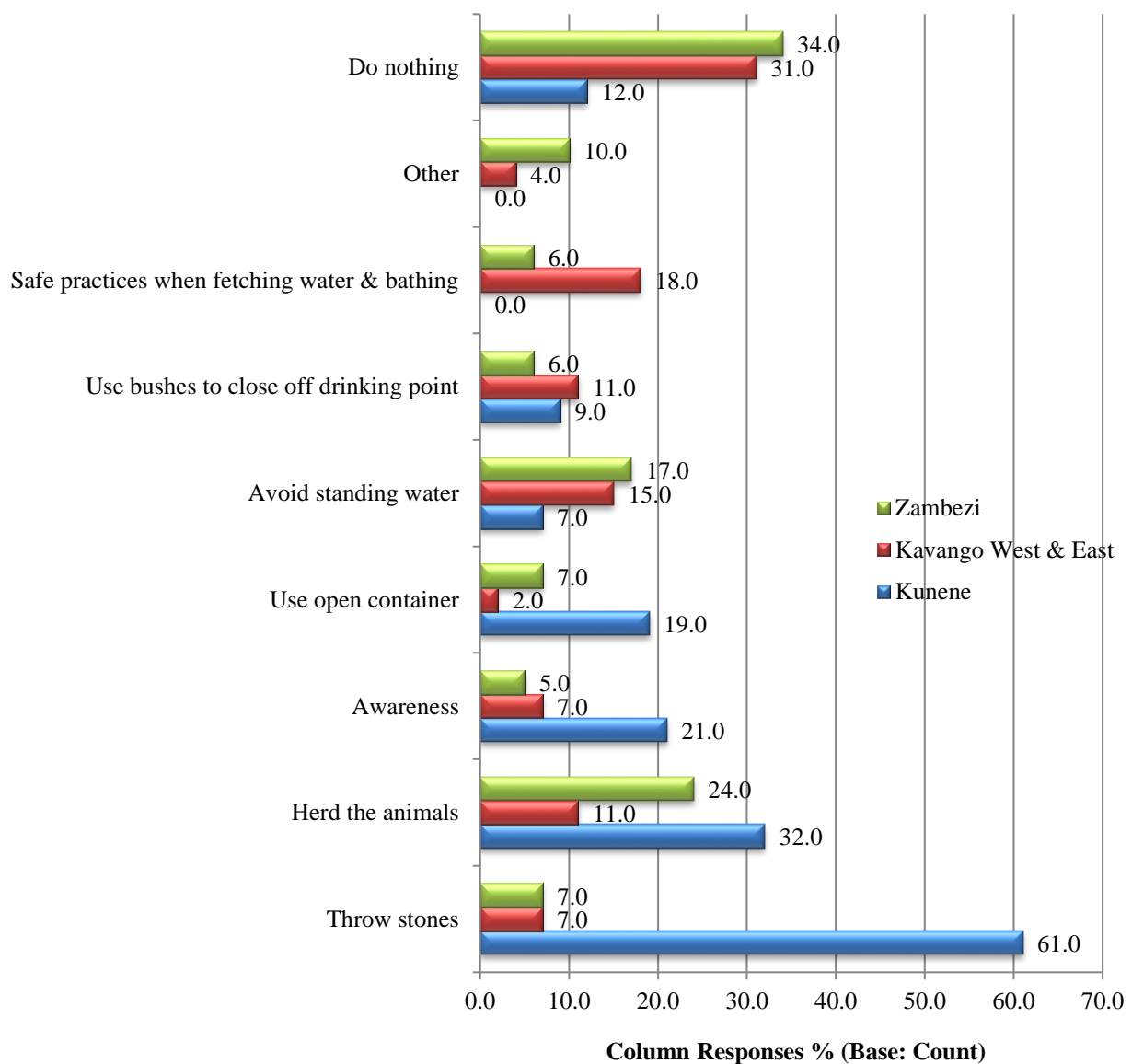
Figure 2.31: Existing methods are used to mitigate/ lessen attacks by crocodiles (Percentage)

2.12 Identify a problem crocodile to be killed: BY Region

The results from the Chi-Square test revealed a significant difference in the responses to identify problem crocodile to be killed $X^2=115.069$, d f=10, P=0.000 (n=300). In all three regions, respondents were guessing they did not have an exact answer. Most of the respondents in Zambezi 61% indicated that they do not identify problem crocodiles, while in Kunene 24%, and Kavango West and East 13% also given similar answers (Figure 2.31).
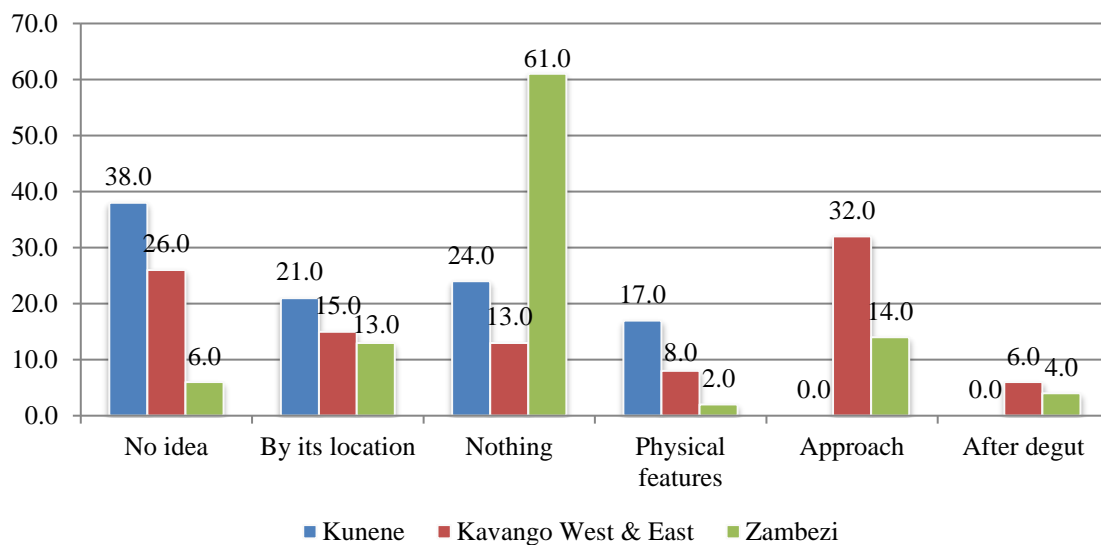
Figure 2.31: How do you identify a problem crocodile to be killed? (Percentage)

2.13 Methods used to kill problem crocodiles?

2.13.1 Rifle

The results from the Chi-Square test revealed a significant difference in the rifle used to kill problem crocodiles between the three regions $X^2=13.760$, df=2, P=0.001 (n=300). The Zambezi 38% showed a high rifle usage than Kunene 20% and Kavango West and East 17% Figure 2.32 (Figure 2.32).

2.13.2 Snares

The results from the Chi-Square test revealed a significant difference in the snares used to kill problem crocodiles in the three regions $X^2=8.425$, d f=2, P=0.015 (n=300). The Zambezi 18% showed a more snare usage than Kunene 11% and Kavango West and East 5% (Figure 2.32).

2.13.3 Do not kill

The results from the Chi-Square test revealed a significant difference in the number of respondents indicated that they do not kill crocodiles between the three regions $X^2=11.562$, d f=2, P=0.003 (n=300). The Kavango West and East 59% revealed that they don't kill crocodile, compared to Zambezi 47% and Kunene 35% (Figure 2.32).

2.13.4 No Idea

The results from the Chi-Square test revealed a significant difference in the number of respondents indicated that they do not have knowledge of methods used to kill crocodiles between the three regions $X^2=49.668$, d f=2, P=0.000 (n=300). The Kunene Region 43% revealed that they do not have any idea of how to kill a crocodile, compared to Kavango West and East 17% and Zambezi 3% (Figure 2.32).
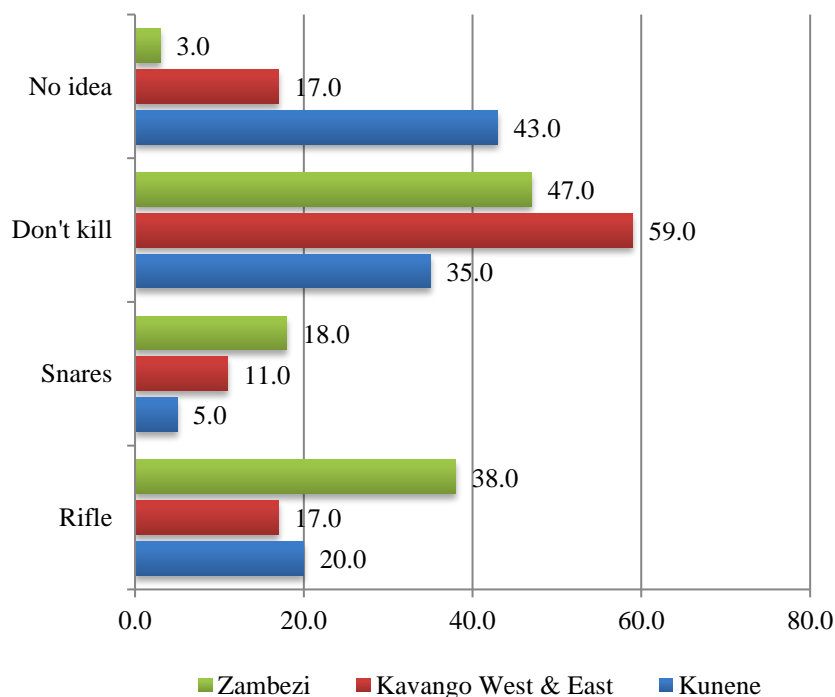
Figure 2.32: Methods used to kill problem crocodiles (Percentage)

2.14 Who kills/destroys problem crocodiles in your area?

The results from the Chi-Square test revealed a significant difference in the number of respondents indicated who kill problem crocodiles between the three regions $X^2=116.008$, d f=8, P=0.000 (n=300). The Kunene respondents 77% revealed that they do not kill problem crocodile, compared to Kavango West and East 47% and Zambezi 18%. However, only less

than 20% of the respondents indicated that local people are killing problem crocodile in all three region (Figure 2.33).
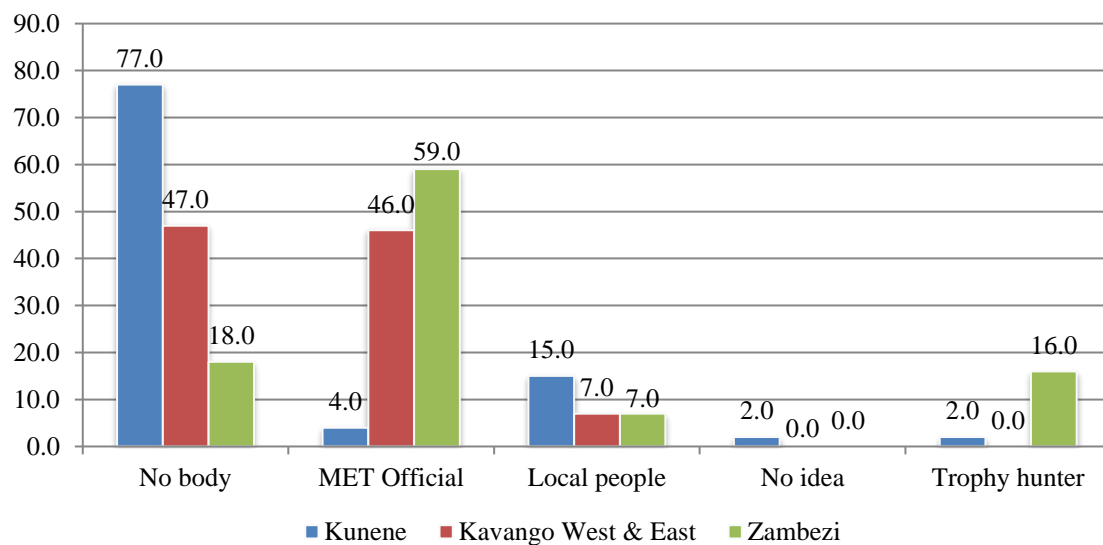
Figure 2.33: Who kills/destroys problem crocodiles? BY Region (Percentage)

2.15 What happens to the carcass/products of destroyed crocodile?

The results from the Chi-Square test revealed a significant difference in the number of respondents indicated the type of uses of the products of the destroyed crocodiles between the three regions $X2=116.008$, $df=8$, $P=0.000$ (n=300). The Kunene respondents 77% revealed that they don't have knowledge of what happen to the product of the destroyed crocodile, compared to Kavango West and East 54% and Zambezi 41%. However, only less than 20% of the respondents indicated that local people are eating or selling the skin of the crocodiles in all three region (Figure 2.34).
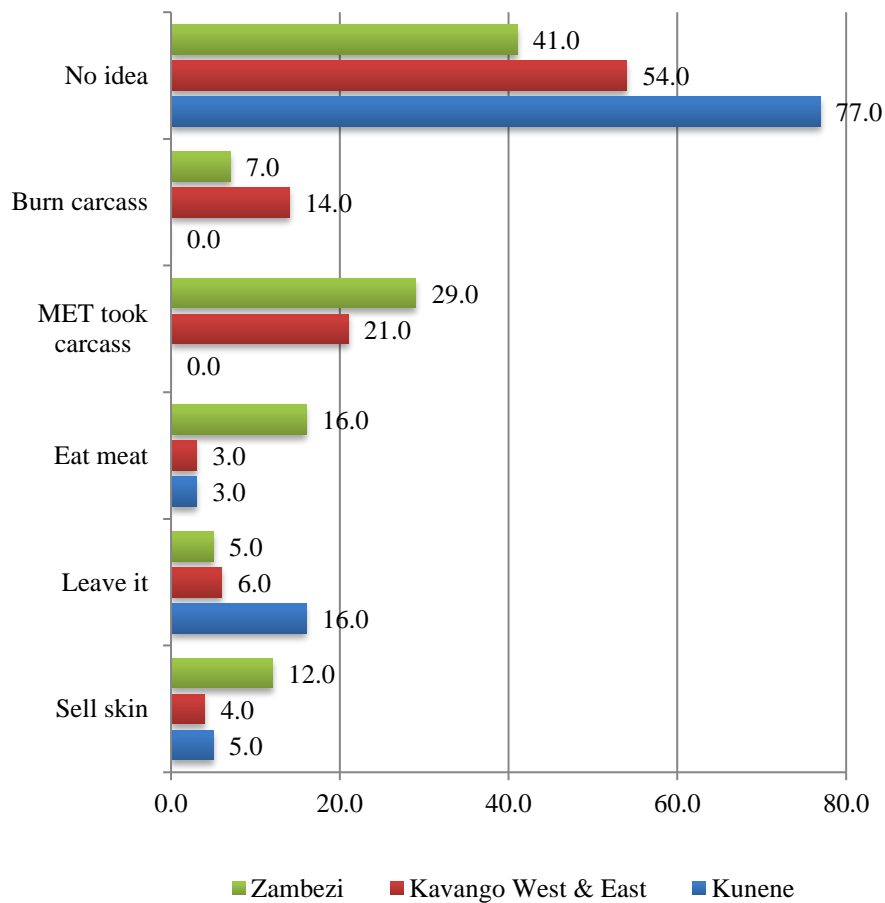
Figure 2.34: What happens to the carcass/products of destroyed crocodile (Percentage)

DISCUSSION

3.1 Demographic characteristics

Social demographic factors have an impact on the opinions of people by shaping their attitudes and perceptions towards conservation and land use. Therefore, it is important to consider social demographic variables when designing conservation strategies (Jew & Bonnington, 2011).

3.1.1 Heads of households' gender

In this survey, it was found that households are mostly headed by males (section 2.1.1). This results are comparable to the study done by !Uri-≠Khob (2004) and /Uiseb (2007), on the assessment of the attitudes and perceptions of local communities towards re-introduced black rhino (*Diceros bicornis*) in southern and north-western Kunene northwest.

3.1.2 Heads of households' education

Many respondents in the Kunene Region are illiterate and were unable to read and write (section 2.1.3). A similar survey done by the National Planning Commission (2012) in the Kunene region indicated that 44% of the respondents in the rural area that are 5 years and above did not attend school. In this survey, over 70% of the respondents from Zambezi and Kavango West and East had attained secondary education (section 2.1.3). According to Long (2004), the vastness of the region as well as the distance that learners have to travel from home to school and the low number of schools in the region are the contributing factors that lead to many people not attending school in Kunene region .

3.1.3 Main source of income for the households

The livelihood strategies of people living close to the rivers in this survey vary enormously, many respondents in the Kunene depended on selling livestock as their main sources of income (section 2.1.6). This could be attributed by the climatic condition such as arid condition. Ashley 2000, pointed out that lack of perennial rivers in Kunene had contributed to a greater dependency on livestock. Similarly, livestock sale was not regarded as the main source of financial income in Kavango West and East, most of these households have diversified strategies, they rely on range of natural resources, and remittances. These results are supported by the findings of the Ashley (2000), who found that livestock sales contributed very low to households in the north-eastern Namibia, while wood, veld products, carving, weaving and thatching grass are contributed more to households needs.

3.1.4 Livestock ownership

The results showed that most respondents were farming with livestock in the three regions, while only a few people did not have livestock (section 2.2). According to Bradley-Cook (2008), Weaver and Skyer (2003) and IECN (2011), climate has influence on the type of farming activities in the northwest part of Namibia, were by livestock farming is the dominant industry.

3.1.5 Types of livestock owned by households

This survey confirmed that cattle and goats were the main type of livestock farming in the three regions (section 2.2.1). A survey conducted by Long (2004) supports this finding. There were strong cultural values attached to the number of cattle owned by individuals (Ashley, 2000; Long, 2004). !Uri-≠Khob (2004) points out that for a head of household to gain respect from members of the community, he/she must have a lot of cattle. Cattle and goats are the main suppliers of meat and milk for many residents in the Kunene (Long, 2004; !Uri-≠Khob, 2004; Muzuma, 2015).

3.2 Crocodile awareness in the area

3.2.1 Dependent on the river for livelihood

The results indicated that most the respondents that took part in this survey used the river for their livelihoods in one way or other (section 2.4). The results indicated that very few Zambezi respondents used the river for drinking water and bathing. Low dependent on river water for human consumptions may be attributed by rural piped water distribution. Respondents have indicated that they get their water from different municipalities, such as Katima Mulilo.

3.2.2 Human Crocodile Conflict (HCC) in the area

The results indicated that nearly 90 percent of the respondents that took part in this survey were aware of the HCC in their respective areas (section 2.5). Therefore, these results has confirmed the first objective of this survey, which aimed to assess the HCC in their areas.

According to López-Mosquera and Sánchez (2012), assessing environmental knowledge will assist the environmental manager to determine which factors are regarded by individual persons as important for them to become environmentally active. With that in mind, it of the paramount important to manage and control HCC in these areas, as most respondents are aware of the challenges they are facing in the three river systems.

3.2.3 Crocodile sighting in the area

The results indicated that most of the respondents that took part in this survey were aware of the presence of the crocodile in their respective areas (section 2.6.1). Therefore, these results has confirmed the third objective of this survey, which aimed to assess the awareness of the local communities regarding the presence of the crocodile in the rivers.

3.2.4 Wildlife causing conflict in the area

The results indicated that all the conflict associated with the Kunene river were caused by the crocodile, while in the Zambezi and Kavango West and East were caused by crocodile and Hippopotamus (section 2.6.2). The respondents were right as Kunene River have only crocodiles no Hippo, while the other rivers have both species. Similarly, Crocodile was identified as the species that had caused the most conflict in all three rivers (section 2.6.3). These could be attributed to the increased crocodile population, especially in Kunene and Kavango Rivers (MET, 2015).

3.3.1 Type of conflict caused in the area

3.3.1.1 Attack livestock

High density of livestock attacked by crocodile were reported in Kunene and Kavango West and East, with moderate attacked reported in Zambezi River (section 2.6.4,). The low livestock attack in the Zambezi River systems may be caused by the introduction of crocodile fences at the livestock drinking points, couple with low crocodile density compared to Kavango River wereby crocodile fence were only introduced to one portion of the river (Kavango West) but not Kavango East and Kunene which does not have crocodile fence to deter crocodiles. Furthermore, the Zambezi respondents had piped water supply with more water points for livestock when compared to the other two regions with few water points. The high crocodile population could also have contributed to different livestock attack intensities, for instances, Kunene recorded a high crocodile population ranging between 775 – 1056, Kavango West and East 234 – 680 and Only one portion of Zambezi regions was statistically tested which is Kwando 118 – 276 (MET, 2015).

The attack on livestock affect households on different level, this depends on whether the family has few livestock that they depend on or they have other sources of income, otherwise this will

economically affect the family badly. With that in mind, the crocodile attack impact will be severe in Kunene were livestock is the main source of financial income for most of the respondents, compared to the other two river systems with diverse income (section 2.6).

3.3.1.2 Attack human

High density of human attacked by crocodile were reported in Kunene and Kavango West and East regions, with moderate attacked reported in Zambezi River (section 2.7.3). This could be attributed by the successful introduction of crocodile fence in some areas, at the area were people are fetching drink water in the Zambezi region, contrary, to Kunene and Kavango river regions which does have less to no crocodile fence to deter crocodile from attacking human, neither do they have tape water in most villagers (section 2.22), while in Zambezi most of the respondents indicated that they are getting their drinking water from different municipalities (those villages closed to town), they are using the river for drinking water on several occasions, which has reduced their level of vulnerability to crocodile attack.

3.3.1.3 Other livestock attack

Moderate intensities of other livestock (such as chicken and dogs) attacked by crocodile were reported in Zambezi region, with low intensities of attack reported in Kavango West and East regions (section 2.7.5). This could be attributed by the nature of the species visiting the river. In Zambezi most of the respondents indicated that most of the chicken are attacked during floating season, while dogs are vulnerable when crossing or swimming.

3.4 Rank attacked livestock in your area

Most of the respondents ranked cattle as the most attacked animals when compared to all the other species (section 2.7.1, 2.7.2, 2.7.3, 2.7.4 and 2.7.5). As evident from the graph in section 2.7.1, higher mortalities were reported in cattle when compared to goat. This could attributed by the cultural values attached to cattle by most the respondents, it is notable that it was very easy for the respondents to rank cattle and human than take time to think about the other species such as goat, sheep and dogs. Cattle regarded as a reserve and investment for many local people (Ashley, 2000). This perhaps an indication of the perception of what matter to them. Human life is considered very important, regardless of the amount of attacked happen in the communities.

3.5 Mostly attacked livestock in your area

Most of the respondents indicated that they did lost their livestock from crocodile (section 2.8). It is evident from the graph in section 2.8.1 and 2.8.2 high number of cattle and goats attacked by crocodile from the year 2011 to 2015 were recoded, with exception to Zambezi were low number of livestock attacked were reported. These could be attributed by the methods used by the local people to prevent their livestock from being attacked such as throwing stones in the river to scare crocodiles, herding their livestock. Some of the respondents noted that they are herding their livestock year round, while some of them said they only herd during planting season, to prevent livestock from eating their gardens. Climatic condition such as prolonged drought due to lack of rainfall might have contributed to farmers not to herd their animals throughout the year, due to lack of good grazing.

3.5 Crocodile attacked human and type of injuries sustained

Although most of the respondents indicated that they did not lost members of their families from crocodile attack (section 2.9). It is evident from the number of attack that took place from the year 2011 to 2015 (Section 2.10), whereby more cases of crocodile attacking human were reported, were people lost their life or some body parts, Kavango West and East had the highest record of victims and most of them dead, similar situation was also recoded in Kunene, with exception to Zambezi were few cases of crocodile attacked and death were reported (section 2.11, 2.12. and 2.13). These could be attributed by the methods used by the local people to prevent themselves from being attacked such as throwing stones in the river to scare crocodiles, going to the rivers site in groups (Section 2.22), when compared to Zambezi with more advanced existing used methods such as crocodile fence and tape water (recorded as other in Figure 2.31). Some of the respondents indicated that they avoid the river by all means.

3.6 Highest peak for crocodile attack

The survey showed that the highest peak for crocodile attack were in summer for the Kavango West and East, while for both Kunene and Zambezi were in spring and autumn (section 2.14). These incidents are taking place during either in the afternoon, midday or any time of the day (section 2.16), especially when the water level is low or normal (section 2.15). All these finding of this survey could be associated with human activities such as fetching water, watering their animals or crossing the rivers were they are vulnerable to attack. Climatic condition such as

drought could also contributed to highest peak for attack, due to lack of water and food which resulted in more animals grazing near the river bank or bed.

3.6 Fishing and type of fishing mode used

The results showed that more than fifty percent of the respondents that took part in this survey are not fishing (section 2.17), despite that most of respondents that embark on this survey were of younger age group (section 2.1.4). Fish line were commonly used across the three regions, with exception to the Zambezi region were both fishing line and destructive fishing method such as fishing net were equally used (section 2.18). Surprisingly, most people that resides near the rivers were not keen to go fish. Could this be attributed by crocodile threat or low fish number which might negatively impact the success of fish catch? Another survey might be of important to answer those questions.

3.5 Can people benefit from crocodile?

The results showed that most respondents valued crocodile as a species that has no potential of bringing benefits to the people in their area (section 2.19). According to Oreg and Katz-Gerro (2007), individual behaviour or feelings towards the environment are influenced by what people think about the environment. This survey has confirmed that communities have negative attitudes towards the crocodile in terms of the benefits that it can generate. Prior to the CBNRM programme, many people in the communal areas regarded wildlife as a liability because they did not bring income to them (Weaver & Skyer, 2003; !Uri-≠Khob, 2004; /Uiseb, 2007; Muzuma, 2015). It seems like local people have positive perception towards other species such as rhino, black-faced impala, were they have utilitarian view, but not predators. Other researchers, confirmed that people's perceptions and attitudes have changed since they were granted ownership over the wildlife. Therefore, these finding has confirmed the sixth research objective, which aimed to explore how the communities perceive crocodile as a species that brings benefit to the conservancy.

3.5.1 Types of benefits crocodile will bring to the communities

The results showed that less than 20% of the respondents were of the opinion that photo tourism is a benefit that crocodile would bring in their communities (section 2.20). It evident from the results that most of the respondents had no idea of the type of benefits which crocodile could bring to them, regardless of some of them belonging to the conservancies. This survey has confirmed that communities have no to little knowledge of the benefits that derived from the

crocodiles. This could be one of the reason why they saw crocodile as an enemy to human and their livestock, due to increase HCC with less to no tangible benefits derived from the crocodiles.

3.6 Reduce crocodile conflict in area

It is evident from the graph in section 2.21, nearly fifty percent of the respondents in each river system are of the opinion that the best way to solve the HCC is to kill all crocodile (Figure 2.30), which is from conservation perspective not acceptable. Very few respondents give amicable solution such as building crocodile fence, drill borehole, crossing bridges and providing awareness which are long term solutions.

3.7 What existing methods used to reduce crocodile conflict in area

Most of the respondents are using traditional methods such as "throwing stones", "bushes to closed drinking point" to scare crocodile, while the majority of the respondents in Kavango West and East indicated that they do nothing (section 2.22). This survey divulge different methods used by the local people to lessen the attack by crocodile, however, there is a need to test their effectiveness as some of the techniques might increase their vulnerability to be attacked.

3.8 Illegal killing of crocodile

Although the results have shown that very few respondents had indicated that there are few cases of illegal hunting of crocodile in the regions (section 2.13.4). The respondents indicated that most of the incidents are from accidentals snaring. The results have confirmed that firearms are mostly used as a hunting technique in the few cases were illegal hunting occurs, however, it was noted in a follow up question that most of the fire-arms were used by either trophy hunters or MET officials to kill a declared problem crocodile (section 2.14).

CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

This survey was conducted to explore the attitudes and perceptions of local communities towards human wildlife conflict- particularly Nile crocodile in the northwest and northeast Namibia. The aim of the survey was to collect information that would be used for better mitigating HCC in Namibia.

The survey found that most households were headed by males in three regions, most of them had low education levels. Also, most of the respondents who undertook this survey were from the middle age-groups. The majority of the respondents were farming with livestock. The sale of livestock was the main source of income for most respondents in Kunene while in north-eastern had more economic diversity.

Based on the findings, the researcher concludes that local people in the three rivers are aware of the presence of crocodiles in their rivers. The survey confirmed that people have negative attitudes towards the crocodiles, due to HCC. Most of the respondents consider lethal method such as killing of crocodile as the best solution to reduce HCC. The survey recorded higher number of human attacked by the crocodiles of which most of them dead, this survey also confirmed that there is lack of knowledge of benefits that crocodile brings to the people, which might had led to negative perception towards the crocodile as most people saw the specie as liability to them.

The survey found that the people in the three regions do not consider crocodile as under serious threat. Only few cases of illegal hunting of crocodile were recorded, which is snaring are predominantly used.

4.2 Recommendations

Based on the findings and the objectives of the survey, the researcher makes the following recommendations:

- There is a need for conservation outreach programmes to educate people about crocodile ecology and their conservation status. Such programmes will enable the local communities to conserve the species due to better understanding of the species.
- MET needs to produce and distribute crocodile posters in those areas were crocodiles is likely to be found. By doing so, awareness will be increased, which can lead to better conservation of the specie.

- There is a need to introduce crocodile restraining fence in areas were livestock and humans get water to reduced HCC.

- There is a need to provide awareness of the crocodile restraining fence, and their usage as well as their limitations, for the local communities to use them effectively.

- There is a need to provide tape water to residents that are residing near the rivers, by doing so more people will rarely use the river which will reduced their level of vulnerability to crocodile attack.

- There is a need to increase crocodile hunting quotas for the conservancies, to reduce the crocodile population, by doing so you will reduce HCC and improve income derived from the species.

- Relevant authorities need to control the use of snares, as well as other hunting methods used for illegal hunting of crocodiles.

- Relevant authorities need to control the use of fishing net (especially mosquito net), used for fishing.

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