Examining Proximity and Fine-Scale Movements to Assess Livestock Guarding Dog Effectiveness

A manuscript prepared for Applied Animal Behaviour Science

by

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Abstract

Human-wildlife conflict continues to increase exponentially as the global human population increases. This is especially prevalent in Namibia where cheetahs (*Acinonyx jubatus*) are targeted by farmers due to predation on their livestock. As livestock farming is a main source of income in the area, all farm animals lost are economically important to the farmers. Therefore, Non-Governmental Organisations have started to breed and train livestock guarding dogs with apparently great success. To date, the factors affecting the behaviour and effectiveness of individual dogs has not been studied. One factor thought to influence effectiveness is the proximity a dog keeps to the herd it is guarding. Therefore, this project formally examined the proximity measurements between livestock guarding dogs and a mixed livestock herd at the Cheetah Conservation Fund, Otjiwarongo, Namibia with the aim of testing for differences between individual dogs and exploring factors associated with such differences.

Five operational dogs were tracked daily for a period of three to seven days and their position relative to the head goat within a mixed herd of goats and sheep recorded. GPS co-ordinates were recorded every five minutes using Garmin 4.0 GPS units. A habitat visibility study was also undertaken to measure habitat thickness throughout the herd's range. Associations between recorded dog performance, proximity and habitat type were tested. A significant difference in the proximity measurements between the lead goat and the individual dogs was identified $F_{(4,1911)}=57.21$, $p<0.0001$. Furthermore, significant differences were also found in the proximity measurements when tested within habitat type ($F_{(3,13)}=3.50$, $p=0.047$), across the time of day ($F_{(8,30)}=3.86$, $p=0.003$) and at maximum temperatures ($F_{(1,1895)}=4.64$, $p=0.031$).

Further studies should be undertaken in order to examine the variation in behavioural patterns between dogs and their comparative success and longevity in the guarding role. Furthermore, the study area should be increased.

Key Words

Livestock Guarding Dogs, Human-wildlife Conflict, Proximity, Effectiveness

1. Introduction

Human-wildlife conflict is defined as “any interaction between wildlife and humans which causes harm, whether it is to the human, the wild animal, or property” (Government of Yukon, 2016). Through an exponential increase in the human population, human-wildlife conflict is increasing at an uncontrollable rate (Gusset *et al.* 2009). Numerous studies have been undertaken to research this field, with prominence given to the conflict between predators and livestock (Gusset *et al.* 2009; Marker & Boast, 2015). The human encroachment which has occurred due to the increase in population has caused significant reductions in many wildlife’s resources, particularly food. Therefore, many species of wildlife such as carnivores have sought alternative food sources. Regarded as easy prey, an alternative source of food is livestock of the traditional farmer (Monika Schiess-Meier *et al.* 2007). As an increasing number of these animals are taken, farmers have to use lethal control methods to protect their herds (Green *et al.* 1984). These methods have caused a sharp decline in carnivore numbers and has seen many of these species listed on the IUCN red list as Threatened or Endangered (IUCN, 2017).

In developing countries such as Namibia, livestock farming is a major source of income and any loss to a farmer’s herd can have a detrimental economic effect (Kgathi *et al.* 2012). Therefore, many compensation programmes have been introduced to reimburse the farmers for any loss in an attempt to minimise carnivore mortality (Kgathi *et al.* 2012). This method has no effect on reducing the number of livestock taken by carnivores which would be the ideal situation and furthermore, this method can also have a negative effect on a developing countries’ economy. Therefore, an alternative, sustainable method needs to be devised (Marker *et al.* 2005). This project measured the dogs’ proximity to a mixed herd in order to produce further evidence of livestock guarding dogs (LGD) as a sustainable livestock protection method with a hypothesis being devised that the dogs’ effectiveness is increased by its closeness to the herd. Further research and testing should be undertaken to substantiate this hypothesis as this method will not only be more economically viable for both the farmer and the government but would also reduce predation of livestock in the future.

The use of LGD's as a sustainable livestock protection technique is not new; these types of dogs have been historically documented up to 6000 years ago (Rigg, 2001). However, studies providing data for their effectiveness are minimal (Coppinger *et al.* 1988). Currently, LGDs are utilised globally protecting livestock herds on six continents. Notable examples include Mexico to protect herds from puma (*Puma concolor)* and jaguar (*Panthera onca*) and Namibia to offer protection from cheetah (*Acinonyx jubatus*) (Hansen *et al.* 2002; Zarco-Gonzalez *et al*.2013; Marker & Boast, 2015).

This project was undertaken at The Cheetah Conservation Fund (CCF) in Otjiwarongo, Namibia where they have utilised LGDs since 1994 in an effort to protect the cheetah, a carnivore listed as Vulnerable on the IUCN Red List (Durant *et al.* 2017; IUCN, 2017). Here, they have their own on site LGDs as well as providing LGDs to farms within Namibia in a structured attempt to protect cheetah. At both the farms and CCF, each livestock herd is assigned its own LGD which supervises the herd on a daily basis either with or without a herdsman. In addition, CCF provide education to the local public and farms demonstrating the advantages of using LGDs in order to promote this livestock protection technique. The method utilised by CCF to train their dogs is one of raising the LGD puppies within the livestock herds; introducing them to the herd at the earliest possible stage, usually one-month old. This allows the dogs to become accustomed to viewing the herd as pack members and this is the primary training method used worldwide (Dalrymple, 1981; Hansen *et al.* 2002).

1.1 Aims

The aim of this study was to test the effectiveness of the LGD's in their relation to the proximity of the herd. The testing process focused on measuring whether there was a significant difference in proximity between individual dogs. Three variables were separately tested to see if they had an effect on proximity; habitat, time of day and maximum temperature. These were initially analysed overall and then studied in detail to examine the differences between the individual dogs. It was hypothesised that each variable would have a different effect on proximity. For example, areas of dense vegetation increased the risk of predation as the guard dog proximity to the livestock herd would be decreased based on a report by Mills & Funston (2003). In addition, it was expected that the longer the dog was in the field the proximity would decrease as the dog became tired. Finally, it was expected that in higher temperatures the dog would become fatigued at an earlier stage and thus the dog proximity would decrease.

2. Materials and Methods

This study obtained ethical approval on the grounds of it being an investigation involving animals from the universities animal care and use committee.

2.1 Location and Subjects

This project was undertaken between 21st February 2017 and 27th July 2017 at CCF. This extended period allowed for corrections to be made to the project in order to increase the study's accuracy. Data collection occurred at CCF where the LGD's and goat herd were located.

The study tracked the proximity measurements between the LGD's and a mixed livestock herd on their daily route around CCF's site which allowed the livestock to gain exercise and further nutrition. Herding routine varied daily but usually consisted of Armas Shaanika (head herdsman) leading the mixed herd on four pre-determined routes. The herd was constantly followed by an LGD and left the kraal at 08:00 and returned at 15:00 on weekdays and 13:00 at weekends. Five LGD's were utilised in this project which were identifiable by name; four resident at CCF (Aleya, Ray, Repet and Spots) and one who had been transferred to a neighboring farm (Ben). Their information can be noted in Table.1 below. In addition, the mixed herd used to test the LGD's proximity consisted of 128 boer goat (used for milk production) and 187 Damara fat-tailed sheep (used for meat production). Within this herd a focal goat identifiable by a number, 2-13, was chosen by the experienced head herdsman. The reasons for his choice were detailed in a questionnaire produced for this study where he outlined that the goat usually led the herd when moving and was centred within the herd when stationary (See Appendix.1). Furthermore, within this questionnaire Armas anecdotally ranked the four onsite dogs by their effectiveness with 1 being most effective and 4 being least effective to allow for comparison between Armas' rankings and the subsequent testing. These rankings can be noted in Table 1. below. Towards the end of the study it should be noted a second goat was identified as the focal goat as the primary goat gave birth and was unable to join the rest of the herd.

Table 1. Background information on each dog within the study, including a given effectiveness rank by the herder (Armas). 1 - being most effect, 4 – being least effective.

Dog	Studbook Number	Sex	Age	Breed	Spayed?	Origin	Rank	Extra Information	No. of Data Points
Aleya	SB424	Female	6 Years 11 months	Kangal	No	Imported from Germany	4	Good working dog but won't listen to commands	460 (5 Full Days, 2 Half Days)
Ben	SB609	Male	2 Years 0 months	Kangal	Yes	Born at CCF – Mother is Aleya	N/A	N/A	345 (3 Full Days, 1 Half Day)
Ray	SB664	Female	0 Years 10 months	½ Anatolian ½ Kangal	No	Born at CCF – Mother is Taya (SB490)	2	Has a lot of energy – distracted very easily	231 (3 Full Days)
Repet	SB507	Female	4 Years 2 months	½ Kangal ¼ Anatolian ¼ Mongrel	No	Born in Namibia – location unknown	3	Has a lot of energy – can misbehave when out	417 (5 Full Days, 2 Half Days)
Spots	SB413	Male	9 Years 6 months	Kangal	Yes	Donated from Holland (Spots Foundation)	1	Very good working dogs but has a lot of immune problems	463 (5 Full Days, 2 Half Days)

2.2 Data Collection

Data was collected everyday for 156 days. However, only 28 days of data was useable due to the inefficiency of the two Garmin 4.0 GPS units used to collect the head goat and LGD's coordinates (Garmin Ltd, Cayman Islands). This was due to battery issues, excessive time delays between the units or the units recording the same coordinates as each other. Data was collected daily from the two units which were attached to collars which I placed on the habituated LGD and head goat. I turned on the two GPS units a few minutes prior to the herd leaving the kraal. Commonly, a unit delay time (collar delay) occurred because one unit recorded data before the other. I noted this in a collated data spreadsheet to allow me to test whether there was a correlation between this delay and the proximity measurements. The two GPS units were preprogrammed to record the LGD's and head goat's GPS location every five minutes from the point the units were turned on to the point they were turned off. Once the route was complete and the herd returned to the kraal, I would immediately turn the units off and remove them so data could be collected. This data was entered into the supplied programme, Garmin Base Camp (GPC), which allowed me to format the data into an excel spreadsheet, with subject name/number, time, date and the GPS location in decimal degrees.

It was impossible to note every habitat where the coordinates were recorded. Therefore, four vegetation thicknesses were devised, numbered 1 to 4 (1-Open Ground, 2-Sparse Vegetation, 3-Intermediate Vegetation, 4-Dense Vegetation). These were produced using a method based on a paper by Nghikembua *et al.* (2016) which uses cheetah line of sight (which is similar to the height of the dogs) to measure bush thickness. Using a compass, three random bearings were obtained and then the Bushnell G Force DX 6 x21 rangefinder (Bushnell Corporation, Japan) was held 70cm above the ground and the distance was measured until a subject (in this case another person) was not visible within the vegetation. These three bearings were then used to collect three different measurements in each habitat type and an average taken. These were then utilised with the Arc GIS (Geographic Information System) daily databases on each dog and goat's movement allowing the points to be coordinated alongside the habitat type. These points were taken from the goat's location as the dog's movement was based on that of the goat. This data was then inputted into the excel spreadsheet which contained all the collated data.

Furthermore, I recorded daily maximum temperatures through a thermometer located outside one of the research centre buildings and this data was then also inputted into the excel spreadsheet.

2.3 Data manipulation

The spreadsheet created using GPC allowed for the data to be manipulated so it could be transferred into an Arc GIS database. The excel file was then split into two separate files, noting the daily data for the dog and goat. This was then converted to a Text (tab delimited) file. This allowed for each data set to be inputted into Arc GIS as two separate layers using the geographic coordinate system WGS1984. These were then saved within the programme as shape files and a base map was imported from Arc GIS online to underlay these points and therefore identifying their location within the CCF site. The resulting map illustrated the distance between the LGD and lead goat every five minutes.

To formulate the distance measurements required for the analysis a separate excel spreadsheet was created inputting both the dog and goat's longitude and latitude locations collected from the collars throughout the day. The formula below calculated a kilometre distance between the points which could then be converted to metres.

```
=ACOS(COS(RADIANS(90-DOG LATITUDE)) *COS(RADIANS(90-GOAT LATITUDE))
+SIN(RADIANS(90-DOG LATITUDE) *SIN(RADIANS(90-GOAT LATITUDE))
*COS(RADIANDS(DOG LONGITUDE-GOAT LONGITUDE))) *6371
```

2.4 Statistical Analysis

An initial GPS unit delay (collar delay) correlation was undertaken to see if there was an association between time delay and distance. The average metre distance per day was calculated and correlated against the unit delay time. This data was not normally distributed so a non-parametric correlation test had to be used. A Spearman's rank test was utilised which showed that there was a correlation.

Data was presented using boxplots, bar graphs, scatter plots and a line graph. These charts were created using a commercial SPSS Statistical Software. All the data collated (Dog, Day, Hour, Collar Delay, Habitat, Proximity Measurements (Distance) and Maximum Temperature) were inputted into an excel spreadsheet and then copied into an SPSS spreadsheet. A preliminary test for normality, the Kolomogorov-Smirnov test, was utilised due to the number of data points being more than 50. This test was undertaken using the proximity measurements to calculaute whether parametric or non-parametric tests could be undertaken on the data. The initial raw proximity measurements were not normally distributed and therefore a transformation using a log multiplication (ln distance) was utilised and histogram produced. This meant parametric tests could be used for analysis.

To establish if there were any significant associations between the proximity measurements and habitat type, time of day and maximum temperature a univariate general linear model (UGLM) was completed using ln distance as the dependent variable in all cases as well as Dog as a random factor. However, the fixed factor changed depending on the variable being tested. The raw data was then inputted into its own excel spreadsheet to produce the graphs for this data. Post hoc Tukey tests were undertaken within the variables to identify any significant interactions.

3. Results

An initial correlation had to be undertaken between the average distance per day and the collar time delay to see if this had an effect on the other results. A Spearman's rank test identified a positive correlation with a coefficient of $r_s(28)=0.51$ and this is statistically significant ($p=0.005$), therefore, affecting the accuracy of the results.

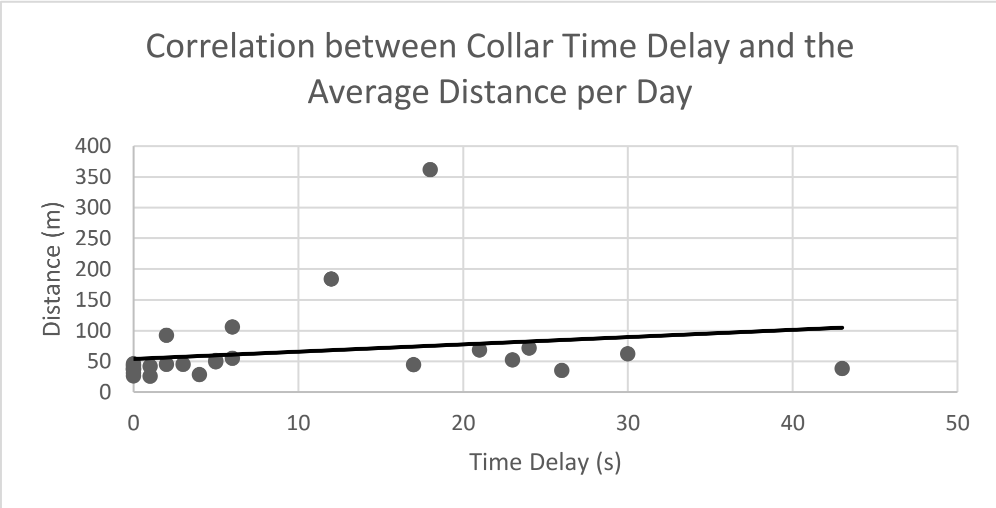

Figure 1. Correlation between collar time delay and the average proximity distance per day between the LGD'S and herd.

3.1 Overall Proximity of Dog

Undertaking a UGLM with ln distance as the dependent variable and dog as a fixed factor a significant interaction between individual dogs in their proximity to the main focal point of the herd was identified ($F_{(4,1911)}$=57.21, p<0.0001). A further post-hoc Tukey test identified there were significant interactions in proximity measurements between Aleya and Ben and the rest of the dogs P<0.05. The means provided by the boxplots showed that Spots' proximity was the closest throughout the study, whereas Ben had the furthest proximity measurements.

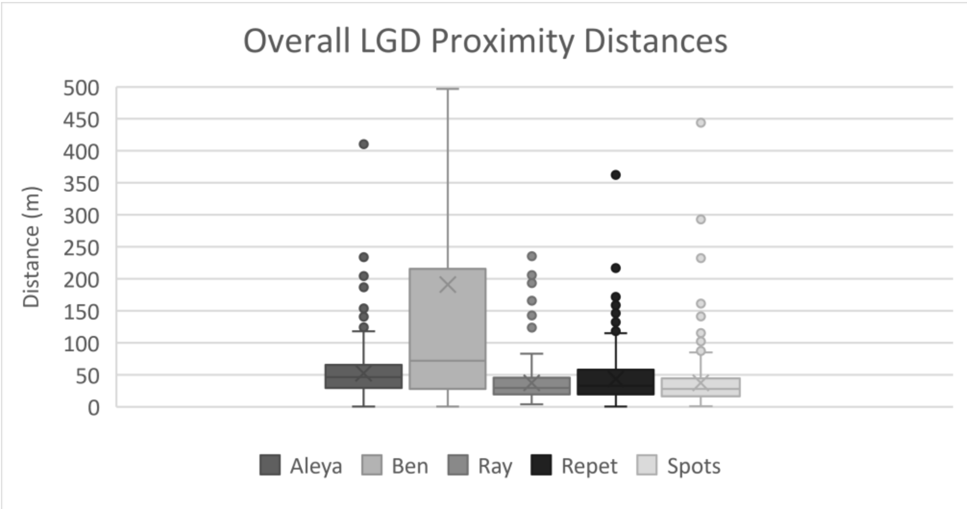

Figure 2. The overall proximity distances recorded by each dog and lead goat over the study period

3.2 Proximity and Habitat

A UGLM including ln distance as a dependent variable and habitat as a fixed factor revealed that habitat exerted a significant effect on proximity ($F_{(3,13)}$=3.50, p=0.047). A post-hoc Tukey test identified the only significantly different result was between dense vegetation and sparse vegetation p=0.033. Furthermore, using the boxplot means, it showed that open ground had the lowest proximity measurements followed by dense vegetation.

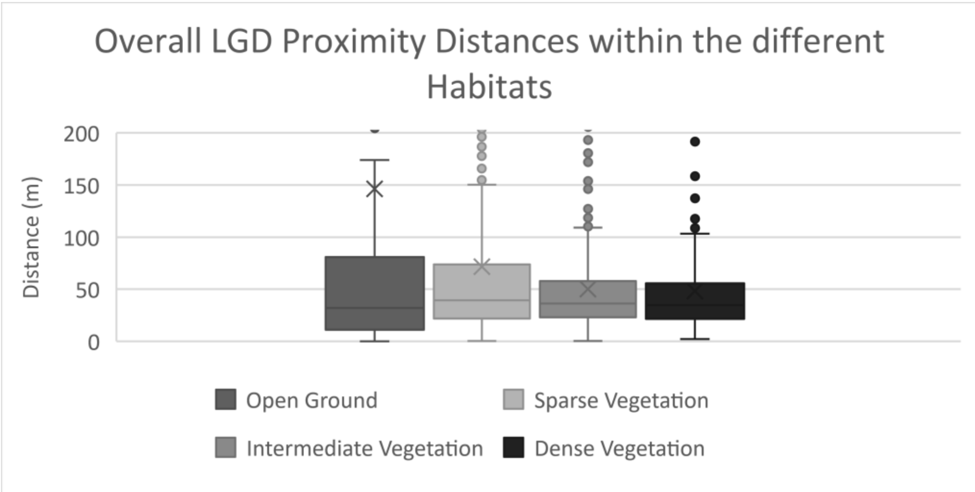

Figure 3. The overall proximity distance recorded within each habitat over the study period

3.2.1 Proximity and Habitat between individual Dogs

The UGLM was repeated with ln distance as a dependent variable and habitat as a fixed factor but this time adding dog in as a random factor. As Bens results skewed the data he was removed to produce a separate graph which allowed easier comparisons. There was still a significant interaction between habitat and ln distance ($F_{(3,9)}$=4.44, p=0.034) and each dogs proximity distance within the habitats ($F_{(9,1555)}$=4.16, p<0.0001). Here, the graphs show that the dogs further proximity measurements are in sparse vegetation for all dogs apart from Ben.

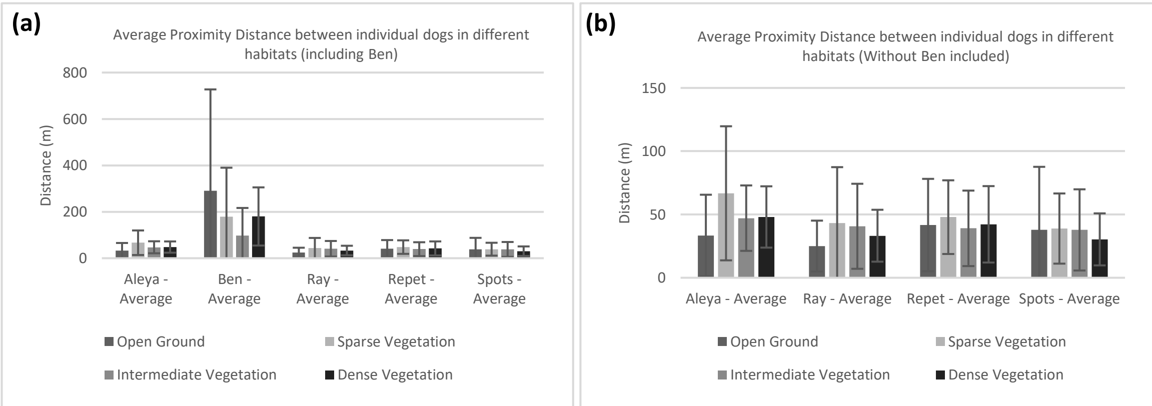

Figure 4. The overall proximity distance for each dog recorded within each habitat over the study period. (a) – Including Ben (b) – Without Ben included

3.3 Proximity Distance and Time of Day

Overall proximity measurements of the LGDs to the main focal point of the herd between each hour of their working day were also tested. As only two dogs (Aleya and Ben) had recorded times at 07:00 this time was removed from analysis. A UGLM was completed with ln distance as a dependent variable and time of day as a fixed factor revealed that time of day exerted a significant effect on proximity ($F_{(8,30)}$=3.86, p=0.003). A post-hoc Tukey test found there was a significant difference between 8:00 and 15:00 and in fact all the hours (P<0.05). The boxplot means showed that 14:00 had the furthest proximity measurements whereas 08:00 had the closest proximity measurements.

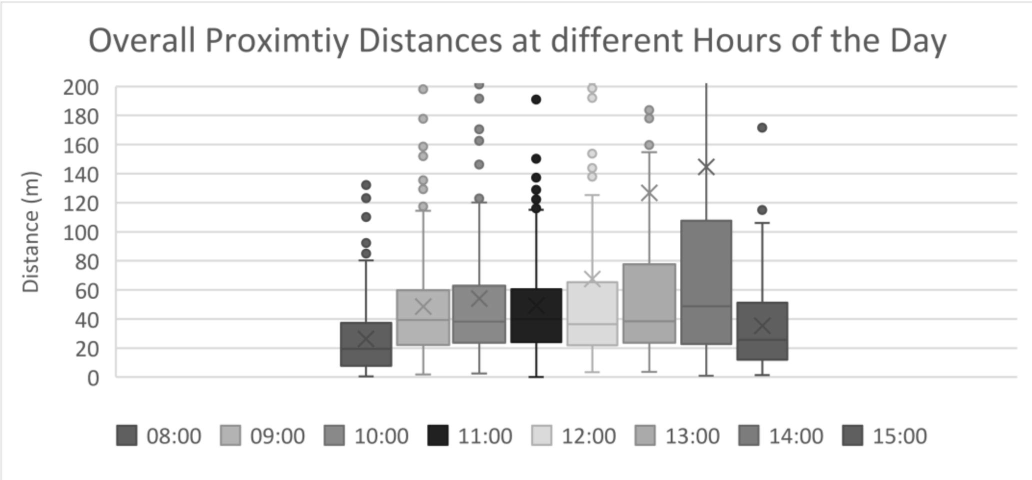

Figure 5. The overall proximity distances recorded within each working hour over the study period

3.3.1 Proximity Distance and Time of Day within individual Dogs

The UGLM was then repeated with ln distance as a dependent variable and time of day as a fixed factor but this time adding dog in as a random factor and was found to have a significant difference P<0.0001, therefore indicating there was a significant interaction between the LGD's and time of day. Figure 6. shows that all the dogs apart from Ben follow the same trend. However, due to Ben skewing the data it made it difficult to identify variations between the dogs within the hours.

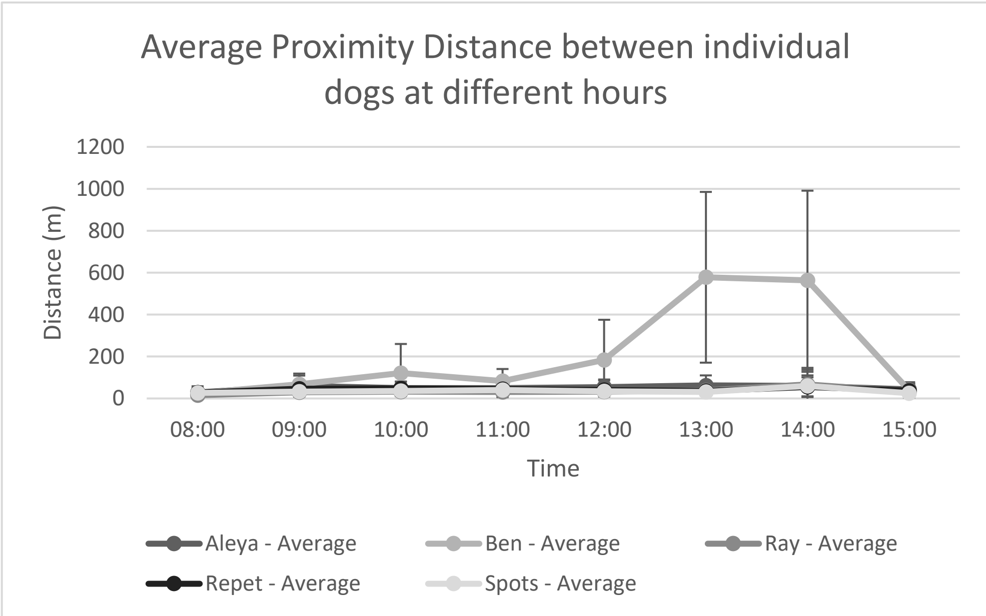

Figure 6. The overall proximity distance for each dog recorded within each time period recorded.

3.4 Average Daily Proximity and Maximum Daily Temperature

Finally, the average daily proximity of the LGDs to the main goat was analysed against maximum daily temperatures. A UGLM was run with ln distance as the dependent variable, habitat as a fixed factor, dog as a random factor and maximum temperature as a covariate. This showed that maximum temperature exerted a significant effect on proximity ($F_{(1,1895)}$=4.64, p=0.031). Figure 7., there was a positive trend in this variable meaning that as temperature increased so did proximity distance.

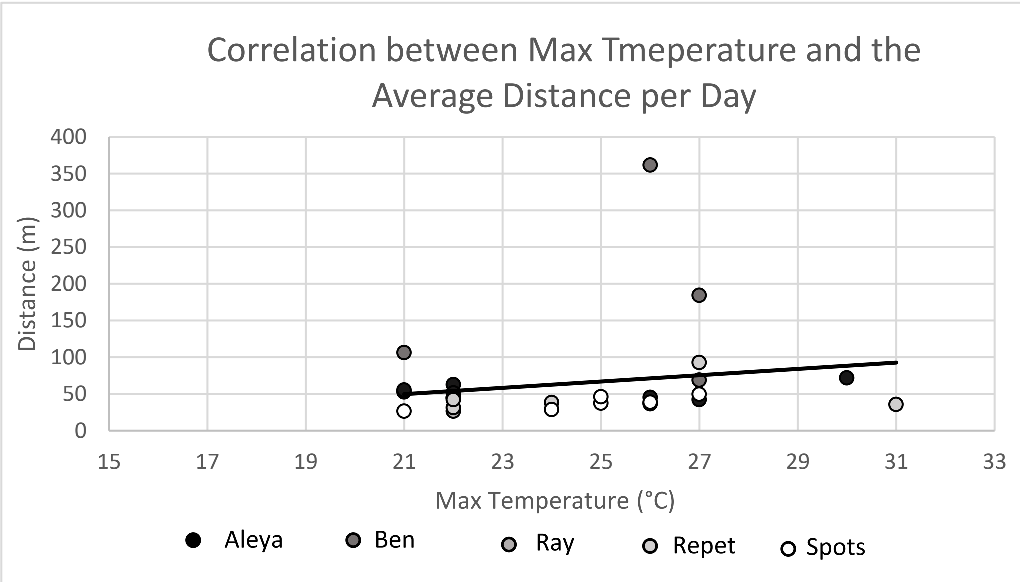

Figure 7. The daily proximity distances moved by each dog within the recorded temperatures over the study period

4. Discussion

Despite the difficulties experienced in data collection, the project has produced sufficient data to indicate the effect that proximity, habitat, time of day and maximum temperature have on the LGDs performance. This data, collected for the first time, can now be used alongside testing of the actual performance measures of the LGDs. It should be noted that my research shows that the dogs differ in behavior despite common training and repetitive herding methods.

4.1 Overall Proximity

The results from the overall proximity test between the dogs and the livestock herd and Figure 2. showed Spots was recorded as having the closest proximity to the herd by having the lowest means. This supported Armas' identification of Spots being the most effective. This effectiveness was based on the assumption that the closer the dogs are to the herd the more effective they are. One reason for this could be that Spots is the oldest dog within the study and therefore has the most livestock guarding experience. However, Figure 2. clearly shows that Ben had the highest proximity mean which would indicate that he was the least effective of the assessed dogs. As he is not a resident dog at CCF he may not have received the necessary level of training and attention in the field.

4.2 Proximity and Habitat

As mentioned in section 3.2 open ground had the lowest proximity measurements and this is opposed to the initial hypothesis which suggested that dogs would be closest in dense vegetation. However, a possible explanation is that the goats tended to spread out more in the open area therefore allowing the dogs to get closer to the head goat thus giving closer proximity measurements. Furthermore, the primary points recorded from the collar started just outside the kraal on the herds departure and this could cause a slight bias as the dog and goat always started relatively close together. Similarly, at the end of the day it was noted that the dog and the goat returned in close proximity at the kraal. Analysing Figure 3. further, it shows that dense vegetation has the next closest proximity measurements recorded for all the dogs. These figures were expected as it was hypothesised the occurrence of a threat was increased in this habitat type and therefore the dogs would guard the herd closer (Mills & Funston, 2003).

Further analysis between the individual dogs in each habitat using the graphs in Figure 4. showed that there is only one habitat type where every dog exhibited similar proximity measurements. This is in areas of sparse vegetation where they all record the highest spatial distancing. This could be explained to the LGD's being able to keep watch easier in the clearer habitat and exhibiting a tendency to wander off to explore. It should be noted that Spots' proximity measurements were the lowest in areas of dense vegetation supporting Armas' anecdotal suggestion that Spots was the most effective LGD.

4.3 Proximity and Time of Day

When analysing the effect of the time of the day on the proximity Figure 5. clearly shows that the dogs are closest at the beginning and the end of the working day. This correlates with the previous section in suggesting a possible reason for this is due to the dogs starting and finishing close to the herd. It should also be noted in Figure 5. that the distance can be seen to increase over the course of the day, indicating that fatigue could be setting in, resulting in the dog starting to trail behind the herd more with every hour. This would be expected based on a study by Van Citters & Franklin (2014) who identified that cardiovascular performance would be effected by prolonged exercise.

Figure 6. shows that apart from Ben each dog demonstrates a similar pattern as the day develops and this helps support the reliability of the results. Therefore, the suggestion of

fatigue being the cause of this trend will be better supported because of this. The reason for the difference between the dogs on site and Ben could be due to the training and the difference in herder.

Similarly, this theory can be advanced to state that as the day goes on the effectiveness of the LGD's is also negatively affected. Therefore, it can be suggested that the shorter the working day, the more effective the dogs' performance. To analyse and support this theory, more data needs to be collected on half working days in order to compare proximity measurements collected on full days thus increasing the reliability of this hypothesis.

4.4 Proximity and Maximum Temperature

As each dog does not get subjected to each temperature, identifying the effect of each temperature between the dogs was not viable. However, overall analysis which can be seen in Figure 7. shows there is a moderate but significant correlation between maximum temperature and proximity measurements. As temperatures increase, proximity measurements also increase. This supports the original hypothesis which was based on a study by Nybo *et al.* (2014). Thus, on the basis that effectiveness is increased with lower proximity measurements, the effectiveness of the dogs is affected as temperature increases.

4.5 Difficulties in data collection

During data collection, many difficulties occurred which affected accuracy and reliability of the results. Firstly, data is incomplete due to the loss of one of the dogs (Ray) through a traffic incident, affecting the reliability of her results. Secondly, the initial head goat gave birth resulting in her withdrawal from the study. Although another goat was chosen, the movement of both goats being identical is implausible and this has had an effect on the accuracy of the results. The amount of data collected was affected due to the efficiency of the collars. As mentioned in section 2.2 the inefficiency of the collars resulted in a limited amount of data being collected thus reducing the accuracy of the results. Furthermore, due to the popularity of CCF headquarters and their work, the studies were interrupted frequently by the arrival of international media crews whose presence affected the dog's behaviour by asking them to change their natural daily routine in order to obtain the best newsworthy output.

5. Conclusion

The threat posed to numerous global carnivore species is detrimental, not just to a country's economy due to the loss of ecotourism but also to a country's landscape and ecosystem (Beschta & Ripple, 2008). Therefore, the use of sustainable livestock management techniques is imperative. This study demonstrated the presence of a most effective dog (Spots) confirming the original rankings recorded in the herdsman's questionnaire. The study demonstrated that the dogs were at their closest to the head goat in open ground and at the beginning and at the end of their working day. In addition, it showed that higher temperatures have a negative impact on the LGD's effectiveness as does the actual length of the working day. The data suggests that further studies need to be undertaken looking specifically at habitat types in more detail to further study the original hypothesis that the dogs were more effective in dense habita. CCF state that "the dogs are credited with saving hundreds of cheetah lives since the LGD programme began" (CCF, 2017). Therefore, steps should now be taken to measure a dog's effectiveness in livestock protecting. A more accurate representation of the dog's performance could be collated by increasing the study area to include more farms within Namibia and studies should be undertaken in examining the behavioural patterns between the dogs to compare the success and longevity in the guarding role. The data obtained in this project, although small, does start to indicate behavioural pattern that can assist in increasing the effective of LGD's as a major force in the area of livestock protection.

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Appendices

Appendix.1 – Questionnaire Completed by the Head Herdsman (Armas)

Questionnaire

1. Date Completed: 15/06/2017 2. Herder Name: Armas Shaanika

3. How long have you worked as a goat herder at the Cheetah Conservation Fund; 16 Years

4.Do you walk a pre-planned route: Yes ☑ No ☐

4a. If not, how many different routes do you walk: 1 ☐ 2☐ 3☐ 4+☑

5. Is there a dog you like to work with the best: Spots 1 Ray 2 Aleya 4 Repet 3
(Rank 1-4 (1-Best, 4 Worst))

6. Why did you decide to put 2-13 as head goat?

She is the focal goat, when moving she gernerally leads the herd and when stopped she is central within the heard

7a. Dog behaviour on walk: Aleya

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The dog sticks close to the herd	☐	☑	☐	☐	☐
The dog sticks close to the herder	☐	☐	☑	☐	☐
The dog behaviour represents an effective guard dog	☐	☑	☐	☐	☐

9b. Dog behaviour on walk: Repet

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The dog sticks close to the herd	☑	☐	☐	☐	☐
The dog sticks close to the herder	☐	☑	☐	☐	☐
The dog behaviour represents an effective guard dog	☐	☑	☐	☐	☐

9c. Dog behaviour on walk: Ray

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The dog sticks close to the herd	☐	☑	☐	☐	☐
The dog sticks close to the herder	☑	☐	☐	☐	☐
The dog behaviour represents an effective guard dog	☐	☑	☐	☐	☐

9d. Dog behaviour on walk: Spots

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The dog sticks close to the herd	☑	☐	☐	☐	☐
The dog sticks close to the herder	☐	☑	☐	☐	☐
The dog behaviour represents an effective guard dog	☑	☐	☐	☐	☐

10. Is there any other relevant information you'd like to add (E.g. any key information on any of the dogs that should be noted (Biggest asset and biggest problem of each dog));

Spots is the best working dog I have ever worked with. If all of the dogs were like Spots, no dogs would be returned from the farms they are transferred out to.