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*Varför vistas vårtsvinen *Phacochoerus africanus* på Kichwa Tembo*

Lina Hjertlöv

Skara 2015

Etologi och djurskyddsprogrammet

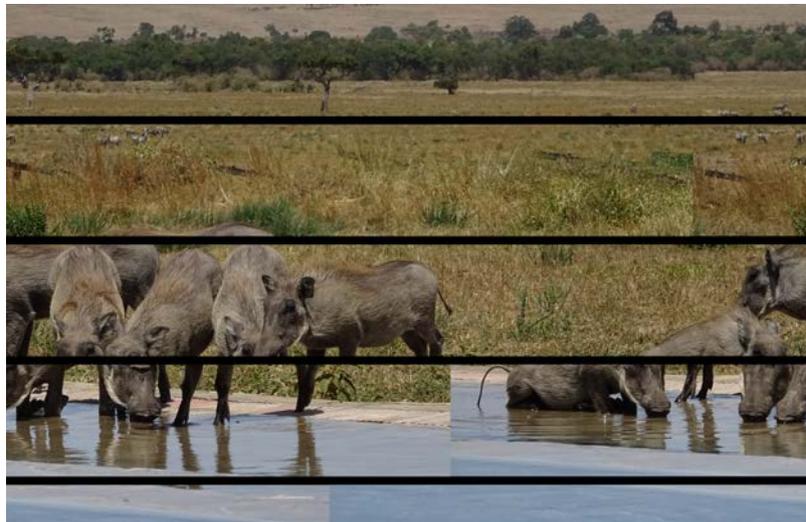


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I denna serie publiceras olika typer av studentarbeten, bl.a. examensarbeten, vanligtvis omfattande 7,5-30 hp. Studentarbeten ingår som en obligatorisk del i olika program och syftar till att under handledning ge den studerande träning i att självständigt och på ett vetenskapligt sätt lösa en uppgift. Arbetenas innehåll, resultat och slutsatser bör således bedömas mot denna bakgrund.

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Abstract

The common warthog (*Phacochoerus africanus*) is common over all of Africa's savannah grassland. The females live in small family groups with their offspring and the males alone or in bachelor groups. The warthog is a grazer but can also eat fruits and roots. Maasai Mara is a national reserve in Kenya with a rich species fauna. It is becoming an increasing problem with tourists and tourist lodges taking over the savannah, not treating the wildlife properly and forcing the animals to restrict their habitats to small areas. This study aims to find out why a group of 60 warthogs lives close to humans inside the fenced off area of one tourist lodge, called Kichwa Tembo. Kichwa Tembo is located at the edge of Maasai Mara National Reserve. The study was carried out for ten days during the light hours in the end of April and beginning of March in 2015. The results showed that the warthogs spent most of their time foraging for food. The most common food type was grass but a surprisingly large amount of their diet was figs from a strangler fig tree (*Ficus thonningii*), which made up to one third of their diet. The savannah was unusually dry for the season at the time of the study. The warthogs were observed eating bulbs, tubers and rhizomes when the grass was too dry to eat. Another reason for the warthogs to stay at Kichwa Tembo seemed to be for the protection against large predators due to the electric fence around the area.

Background

The common warthog

Common warthogs (*Phacochoerus africanus*) are found on the savannah grasslands in almost all of Africa's sub-Saharan countries (Powell, 2003; Berger *et al.*, 2006). Warthogs have disappeared in some areas where the human population is increasing and are therefore in some countries found only in protected areas (Muwanika *et al.*, 2006).

They are non-migratory and active during the day and they sleep in burrows usually abandoned by other animals during the night (d'Huart & Grubb, 2001; Treydte *et al.*, 2006a). Females live in small family groups with their offspring and the males live solitary or in bachelor groups (Berger *et al.*, 2006). Males fight over females and can mate with more than one female during a reproduction period (Berger *et al.*, 2006; Treydte *et al.*, 2006b).

The common warthog is a grazing ungulate with hindgut fermentation that eats grass, fruits, roots and bark (Creel, 2005; White *et al.*, 2010). Studies have shown that warthogs prefer to stay close to cattle enclosures during dry seasons because of the rich nutrient grass (Powell, 2003; Treydte *et al.*, 2006a; Treydte *et al.*, 2006b). The warthog's front knees are padded so they can stand on their front knees and graze, it is an adaptation to be able to eat short grass (Hatley & Kappelman, 1980; Creel, 2005).

The common warthog is dark brown and almost hairless except for a mane of hair along the neck and back (Powell, 2003). The side of the head have white whiskers and two pairs of warts under the eye and close to the tusks (Powell, 2003). Both males and females have tusks in the upper and lower jaw; the upper tusks can be up to 60 cm and the lower only around 13 cm (Powell, 2003). The height is 65-84 cm for both sexes; males weigh around 68-100 kg and females 45-71 kg (Powell, 2003).

Status/threats

The major threats to warthogs are large predators, for example lions (*Panthera leo*), leopards (*Panthera pardus*) and cheetahs (*Acinonyx jubatus*) (Owen-Smith & Mills, 2008; White *et al.*, 2010). They are also hunted for their meat and because they compete with the cattle for grass (d'Huart & Grubb, 2001; Treydte *et al.*, 2006b). Today they are listed as least concern of the IUCN (Powell, 2003; IUCN Redlist, 2014).

Large parts of the African wilderness are being turned into farmed land and fenced in for protection of cattle and humans (Ogotu *et al.*, 2011). The habitat for wild animals is decreasing and most animals get restricted to wildlife reserves (Ogotu *et al.*, 2011). This leaves a great impact on the natural eco-system and forces animals to live closer to humans (Lamprey & Reid, 2004; Maasai Mara Conservancy, 2014).

Human-animal conflict

When animals are forced to live closer to humans conflict of interests will occur and animals will be forced to compete with humans for resources and habitat (Bagchi & Mishra, 2006; Athreya *et al.*, 2013). There are several examples of such competitions where both animal and humans will suffer.

Large carnivores in India, especially leopards, are known for causing problems (Athreya *et al.*, 2010; Athreya *et al.*, 2013). In India the wild animals share their land with one of the highest density of inhabitants in the world, making interactions between animals and humans inevitable (Athreya *et al.*, 2013). Urban living leopards have been reported attacking and killing humans, most problem animals are killed or relocated to another area (Athreya *et al.*, 2010; Athreya *et al.*, 2013).

Not only carnivores cause problems. In a national reserve in the Qinling Mountains, China, over half the households got their crop damaged by wild boars (*Sus scrofa*) in the area during a three-year period (Cai *et al.*, 2008). Some African elephants are also known for destroying fields of crops in their search for food, leading to a big economical loss for the farmer and a decreased tolerance for wild elephants amongst the local farmers (Sitati *et al.*, 2005). This leads to an increased illegal hunting of elephants, further declining their numbers as an already threatened species (Sitati *et al.*, 2005). As Sitati *et al.* (2005) writes the human animal conflict is a critical point in conservation of species, without local support for conservation the biodiversity will decrease.

Study area

Maasai Mara is a wildlife reserve park in Kenya and one of the most species-rich reserves in Africa (Maasai Mara, 2014). It is home to over 95 species of mammals including lions, black rhinos (*Diceros bicornis*), plain zebras (*Equus quagga*), cheetahs and leopards (Maasai Mara, 2014). Tourism is expanding and thousands of tourists are coming to Maasai Mara every year to see the animals and it is becoming an increasing problem according to Hatcher (2013). Garbage is dumped, vehicles are constantly disturbing animals and cars scare away prey from predators (Hatcher, 2013). New tourist lodges are being built all around the Maasai Mara, further restricting animal movement (Lamprey & Reid, 2004; Hatcher, 2013).

Kichwa Tembo is a tourist lodge located at the Maasai Mara, the lodge area is fenced off from the savannah with an electric fence so no large animals can get into the area (J. Jung, SLU, personal message, 10 September 2014). J. Jung (SLU, personal message, 10 September 2014) also mentioned that some animals manage to find their way in under the

fence and a group of about 60 wild common warthogs are currently living at the campsite of Kichwa Tembo. The warthogs graze the lawns and sleep inside the enclosure, but they are free to go outside the fenced area at any time (J. Jung, SLU, personal message, 10 September 2014). According to J. Jung (SLU, personal message, 10 September 2014) the warthogs seem to be allowed to live inside Kichwa Tembo and there are no efforts made to remove them.

Aims of the study

Conflict of interest can occur when animals are forced to live close to humans, the animals are most often seen as a problem that needs to be removed. But at Kichwa Tembo the warthogs have found a place where they are allowed to stay. This study aims to find out in what way the warthogs benefit from living inside the enclosure of Kichwa Tembo.

- Where at Kichwa Tembo do the warthogs spend their time?
- What behaviours do the warthogs display?
- Do humans feed them?
- Do they reproduce inside Kichwa Tembo?
- Can it have any negative effect on the warthogs to live inside Kichwa Tembo?
- Are there any signs of conflicts with humans?

Materials and methods

The study was carried out at Kichwa Tembo, a tourist lodge at Maasai Mara. The lodge area was fenced off to protect against wild animals but the warthogs were able to walk in and out under the fence. The wild warthogs living inside the enclosure were observed. The study was carried out for twelve days from the end of March to the beginning of April in 2015. Two days were carried out for a pilot study and ten days for the observation.

Data collection

The observations were divided in three work shifts per day; the first was from 6.30 to 8.30, the second from 13.00 to 15.00 and the third from 17.00 to 19.00. There were two observers at every shift, observing one pig each. The observations were made as an interval study every minute for the behaviours in ethogram 1 (table 1) and with continuous sampling for the behaviours in ethogram 2 (table 2). One continuous behaviour could only be registered once every minute and was not registered again if it lasted to the next minute. Only adult individuals were observed; one observer followed only female warthogs for one day and the other only males. The focal animal were chosen by observing the first animal spotted and it was followed until it was out of sight then the animal closest to the observer became the new focal animal. Total time of data collection was 12 hours a day for 10 days giving 120 hours total. But some hours were lost due to heavy rain making it impossible to observe. Leaving 95 hours that could be used for the results.

Study area

The study area was divided in different habitats. Habitat 1 was at the staff houses where no guests were allowed. It had a large strangler fig tree (*Ficus thonningii*) in the middle and a washing area where the staff threw away leftovers. Habitat 2 was a soccer field for the staff, an area covered with grass. Habitat 3 was the only area with tourists; the area was covered in grass and located in front of the restaurant and around the pool. Both observers

started at habitat 1 at the first shift. At the second and third shift the observers started in different areas but always moved if there were no warthogs in that area.

Ethogram

During the pilot study an ethogram was formed for the behaviours (table 1; table 2). The behaviours in ethogram 1 (table 1) were noted differently from the behaviours in ethogram 2 (table 2), in the protocol and are therefore separated in two tables.

Table 1. Ethogram with behaviours and their definitions.

Behaviour	Definition
Standing	Standing still with all four hoofs on the ground
Walking	Moving forward with head up in walking speed
Running	Moving faster than walking speed with head up
Eat stand	Standing or walking slow with head down and eating
Knee standing eat	Standing or moving on the front knees and eating
Lying	Lying down with no support on the legs
Social	Social interactions with physical contact with another animal
Drinking pool	Drinking in the pool
Out of sight	Outside our marked habitat

Table 2. Ethogram with behaviours and their definitions.

Behaviour	Definition
Tractor sound	The male is making the “tractor sound”. It is made when the male is courting the female.
Riding	A male puts his head on the females back. The front legs of the male are in the air or on the female.
Mating	A male is riding a female and has its penis in the females vagina
Approaching	A male is courting a female, sniffing the behind and/or salivating on the female
Chasing female	A male is chasing a female while courting
Chased female	The female is being chased by a male that is courting

Ambivalent	The female is not showing any reaction to the tractor sound and/or the approaching
Interested	The female is standing still and lets the male approach
Not interested	The female is walking/running away and the male does not follow

Protocol

A protocol was formed to register the behaviours (table 3). Pig type, Habitat, Food and Position were noted every minute. The food types were figs from a strangler fig tree, grass, ugali (a form of staple food made of corn flour) and other unidentified food from humans. The mating behaviours were noted continuously because the behaviours were only displayed by the animals for a very short time and would have been too easy to miss with an interval study. Out of sight were noted every minute until a new focal animal was found.

Table 3. The protocol used to note the behaviours in the study.

Time period (min)	Pig type Male Female	Habitat 1 2 3	Food Grass Human Food Ugali Ficus Other	Position Standing Eat standing Knee standing eat Walking Running Lying SOCial Drinking pool (Dp)	Out of sight Out of sight Beyond border	Mating behaviour	Mating behaviour
						male Tractor sound Riding Mating Approaching Chasing female	female Interested Not interested Ambivalent Chased female Mating
1							
2							

Data analysis

Excel was used to process and analyse data. The average time spent in each habitat was calculated by dividing the number of observations in one habitat with all observations.

Figure 1 was made by cross tabulation on how many times every behaviour occurred in each habitat. The same method of cross tabulation was used in table 4 to see how many times the warthogs foraged for a certain type of food in each habitat. In figure 2 the cross tabulation compiled how many times the warthogs foraged for figs on each day and in figure 3 how many registrations for “out of sight” were made on each day. Table 5 were compiled by adding up the number of every registered sexual behaviour in each of the sexes from the protocol.

The number of observations for foraging for figs was divided with all observations of foraging for food to calculate how big proportion the figs were of the overall observed diet. The same were made for calculating how big proportion the grass were of the overall observed diet, by dividing the number of observed foraging for grass with all observations of foraging for food.

Results

Due to the limited amount of data all results are descriptive without any statistical analysis.

The warthogs spent most of the observed time in habitat 1 (40%), they spent 36% of the observed time in habitat 2 and 24% in habitat 3.

The warthogs spent most of the observed time foraging in all three habitats; the foraging behaviours were “Eat stand” and “Knee standing eat” (figure 1). The warthogs spent more time standing up when foraging in habitat 1 and more time foraging on their knees in habitat 2 (figure 1). They spent 66% of the observed time on foraging in habitat 1. In habitat 2 they spent 76% of the observed time foraging and in habitat 3 they spent 74% on foraging.

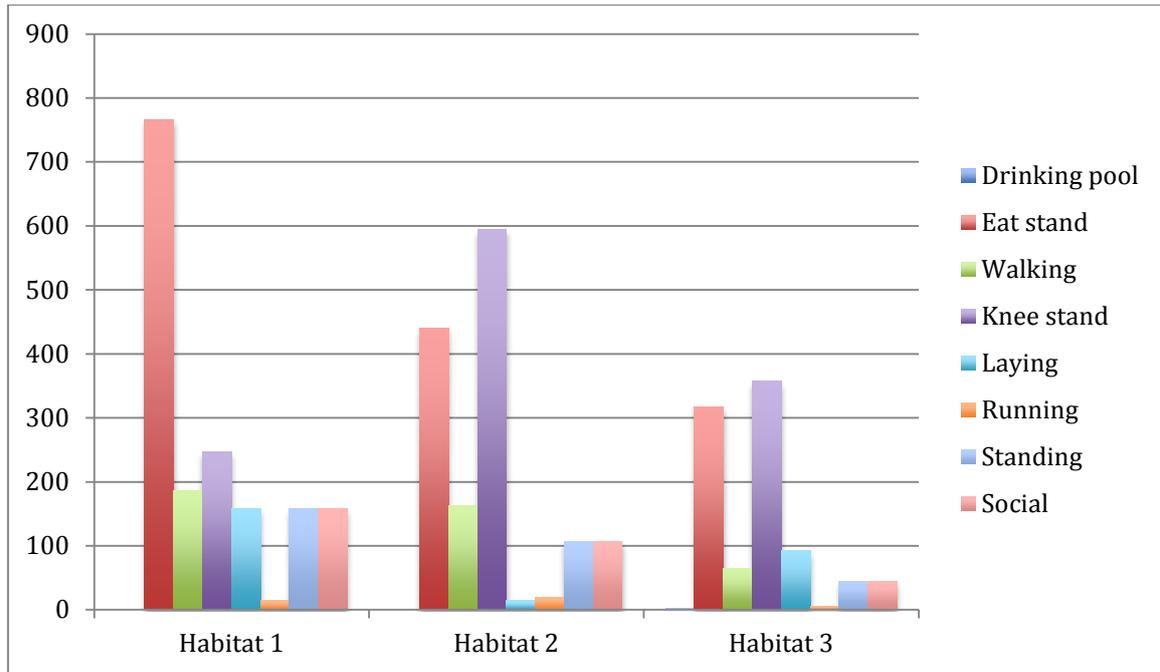


Figure 1. Number of observed warthog behaviours in each chosen habitat of Kichwa tembo.

The warthogs foraged for different types of food in the habitats. Feeding by humans was only observed in habitat 1, the warthogs were handed both ugali and other types of human food from humans that threw food on the ground in front of the warthogs (table 4). Human food and ugali were only a small part of the warthogs’ diet in habitat 1. The main part of the warthogs observed diet in habitat 1 was figs (table 4). The figs were 35% of the overall observed diet in Kichwa Tembo. The largest part of the warthogs observed diet in Kichwa Tembo was grass (table 4); it was 64% of their diet.

Table 4. Number of observed foraging of different types of food inside of Kichwa Tembo. “Other” is unidentified food. Human food is all food from humans except for ugali.

	Figs	Grass	Human food	Ugali	Other
Habitat 1	948	26	13	14	13
Habitat 2	4	1034			
Habitat 3		675			

As seen in figure 2, most observations on foraging for figs were made the first couple of days and then decreased until day 10. Simultaneously with the decreasing of figs the number of registration of out of sight increased until day 10 (figure 3).

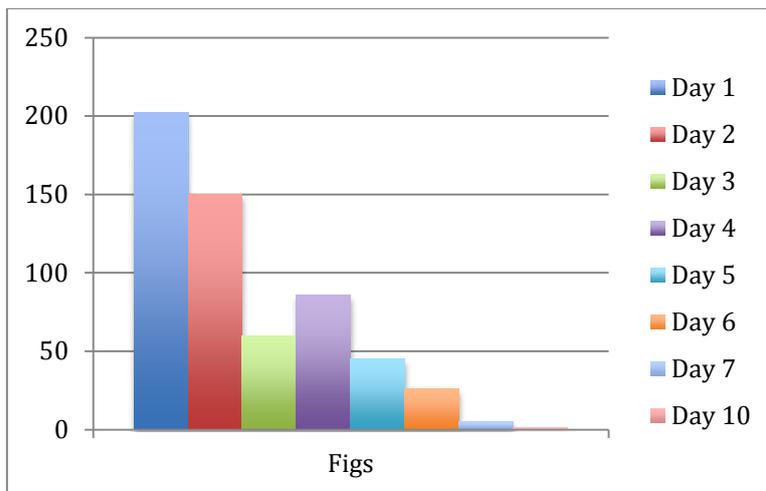


Figure 2. Number of observations foraging for figs by warthogs in the morning pass, day by day in Kichwa Tembo. No observations were made in the morning of day 8 and 9.

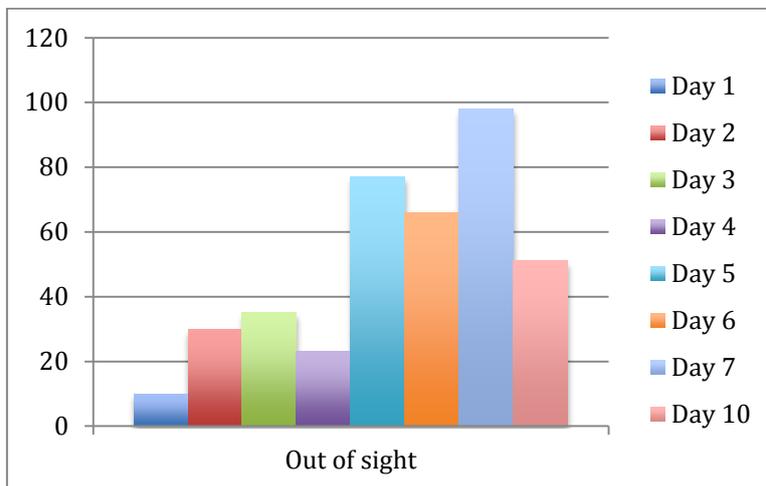


Figure 3. Number of registered “out of sight” observations of warthogs in the morning pass, day by day in Kichwa Tembo. No observations were made in the morning of day 8 and 9.

The warthogs displayed a great variety of mating behaviours with 10 observed successful matings (table 5).

Table 5. Female and male observed mating behaviour.

Female mating behaviour	Number of observations	Male mating behaviour	Number of observations
Mating	10	Mating	10
Chased	16	Chasing	18
Not Interested	17	Tractor_sound	48
Ambivalent	75	Approaching	71
Interested	4	Riding	0

Discussion

The results showed that the warthogs spent more of the observed time in habitat 1 and 2 compared with habitat 3. This is most likely explained by the fact that habitat 3 were the only habitat where tourists were allowed. Tourists were observed walking up to the warthogs and did not avoid them in the same way as the staff did in habitat 1 and 2. This and the fact that the staff actively scared away the warthogs that went too close to the pool and the restaurant in habitat 3, may have affected the warthogs to stay away from that area, as it was the only area where they had to run away from people. The warthogs had to move away from people passing by in habitat 2, too. But they were probably more motivated to stay there, as it was the only area with figs. The fact that the observers moved around looking for warthogs may also have affected the results. If an observer found a warthog in one habitat it may have missed that there were more warthogs in another habitat. It gives a false impression of where the majority of warthogs spent their time.

Safety

Kichwa Tembo is, as mentioned before, fenced off from the reserve to protect it from wild animals like elephants (*Loxodonta africana*), buffalos (*Syncerus caffer*) and large predators. Considering that the warthog is a prey for many large predators such as lions, hyenas (*Crocuta crocuta*) and cheetahs (Owen-Smith & Mills, 2008), it is possible that the warthogs experience Kichwa Tembo as a safe place, as there were no visible predators inside. This theory is strengthened by the fact that warthogs were often observed walking out of sight into dense bush landscape and forests, where a predator would be harder to detect, in spite of that they normally stay out in the open (Creel, 2005; Treydte *et al.*, 2006b).

There have been exceptions where lions entered Kichwa Tembo on two occasions but they were chased away by staff (Joel, staff at Kichwa Tembo, personal message, 20 March 2015). One hyena was observed inside and it seemed to live in a lair inside Kichwa Tembo's fence, but one hyena is probably easier to handle than an entire pack at the savannah.

Normally the young leave their mother at an age of 18-20 months (Creel, 2005). Young warthogs were never observed far away from their mothers on the savannah. But inside of Kichwa Tembo very young warthogs were observed wandering on their own, or even being left behind because they were not paying attention to their mother moving on. When they realized that they were alone they called for their mother but did not always get an answer. It is possible that the female warthogs inside of Kichwa Tembo are feeling so

secure that they do not watch over their young as careful as they would on the savannah. Studies of our domestic pigs (*Sus scrofa domesticus*) have noted that the sows have lost some of their protective instincts as a result of our breeding (Andersen *et al.*, 2005).

There is a possible similar effect on the wild warthog females if they stay at Kichwa Tembo for many generations without being exposed to predators. For example, the offspring of females, that would have been considered unsuitable mothers out on the savannah, will not be killed off. Instead they will reach adulthood and continue to pass on their not so suitable genes to future generations. If these warthogs one day have to leave Kichwa Tembo, and reproduce with other warthogs living on the savannah, it can lower the fitness of the entire species in Maasai Mara, leading to a lower number of surviving young.

This is hopefully a very unlikely scenario because females with young were observed leaving Kichwa Tembo during the day to go onto the savannah. As far as the observers could tell they returned with their young in the evening. So it is reasonable to assume that the females who leave still keep a close eye on their young on the savannah and that they are in no danger of losing their maternal instincts. But it is impossible for this study to tell for sure if they all leave.

The warthogs are according to both J. Jung (SLU, personal message, 10 September 2014) and several of the staff members sleeping inside of Kichwa Tembo. The warthogs were also observed sleeping under cars and close to buildings in the evening. This is also an indication of the sense of security the warthogs feel inside of Kichwa Tembo. It is most unlikely that an animal that normally sleep in a burrow and are dependent of its protection (Somers *et al.*, 1995; d'Huart & Grubb, 2001) would dare to sleep out in the open if they did not feel safe.

Food

One factor influencing how large a group of warthogs can be is the availability for everyone to find food (White *et al.*, 2010). The group at Kichwa Tembo consist of 60 individuals indicating that there are plenty of food resources inside. This seems to be an important reason for them to stay at Kichwa Tembo. According to Powell (2003), Treydte *et al.* (2006a) and Treydte *et al.* (2006b) the warthogs prefer to stay close to cattle enclosures because of the rich green grass. The grass inside Kichwa Tembo was much greener and richer than outside the fence and made up 64% of the warthogs observed diet inside Kichwa Tembo. This strengthens further the theory that the warthogs preferred Kichwa Tembo because of the food availability. Our study was performed in the end of a dry period and it was unusually dry out on the savannah for that time of the year (J. Jung, SLU, personal message, 22 March 2015). The fact that the savannah was so dry can have affected the warthog's behaviour and made them spend more time grazing inside Kichwa Tembo than they normally would. Without knowing how the warthogs spend their time the rest of the year, when the grass outside Kichwa Tembo is more attractive, we cannot assume that the rich green grass inside Kichwa Tembo is a reason for them to stay the rest of the year, only that it seems to be very attractive during dry periods.

Mason (1990) saw that during the dry season in 1982/83 in the Kruger National Park some warthogs dug up more bulbs, tubers and rhizomes from specific types of plants to survive when the grass was gone. But not all warthogs had the possibility to dig up these bulbs, tubers and rhizomes because warthogs are relatively non-migratory and stay in their home range and only some areas had the right conditions for the plants (Mason, 1990). Further

Mason (1990) concludes that warthogs living in home ranges without the right conditions for these bulbs, tubers and rhizomes were more affected by the drought. Many sows were in bad condition when farrowing, raising the numbers of neonatal deaths (Mason 1990). The juvenile's survival rates were affected and only around 10-20% survived the first year (Mason, 1990).

The study of Mason (1990) is 25 years old, made in another national park than Maasai Mara and referring to studies that are old, but it is reasonable to assume that drought still affects the warthogs in Maasai Mara today because there have been dry seasons every year from 1931 to 1990 according to Hulme (1992) that supports his data on two independent studies of 572 quality secure weather stations with monthly data from every year. There is no reason to believe that it has stopped now as J. Jung (SLU, personal message, 22 March 2015) said that the savannah at our time of study was unusually dry. As mentioned before the warthogs seem to stay at Kichwa Tembo to be able to handle the drought better and take better care of their young during dry periods, because of the greener grass. The warthogs inside Kichwa Tembo were also on several occasions observed digging for food in habitat 2, which can indicate that habitat 2 was a good place for certain types of roots, rhizomes, tubers and bulbs the warthogs prefer. But as the protocol did not include digging as an option for position or roots, bulbs, tubers and rhizomes as an option for food, there is no data telling if this was a regular part of their diet during this drought. As the observers instead registered digging as "Knee standing eat" or "Stand eat" and the food type as grass. But if the roots are a big part of the diet, it could indicate that the warthogs prefer Kichwa Tembo during dry periods because of the roots, bulbs, tubers and rhizomes.

The strangler fig tree at habitat 1 was a popular place for the Blue monkey (*Cercopithecus mitis*) and the red-tailed monkey (*Cercopithecus ascanius*) to eat figs. When they dropped fruits the warthogs ate the fruits. As shown in the results the figs of the strangler fig were a third of the warthogs observed diet (35%). As far as this study could tell there were no strangler figs outside of Kichwa Tembo in the nearest area of the savannah. Usually warthogs prefer to stay in open areas and avoid dense bushy landscape (Creel, 2005; Treydte *et al.*, 2006b). Considering that warthogs normally do not enter a forest, they probably do not encounter figs on a regular basis outside of Kichwa Tembo, making the figs at Kichwa Tembo a rare treat for them and a reason for them to stay when available. This is supported by the fact that the warthogs were easiest to find the first mornings, when there were still plenty of figs (figure 2; figure 3). The first mornings at the strangler fig, there were around 20 warthogs each morning and still plenty of fruit in the tree and on the ground. But as the fruits in the tree and on the ground decreased so did the number of warthogs visible each morning (figure 2; figure 3), until there were only one or two visible warthogs in the morning. It is possible that the warthogs were still at Kichwa Tembo in the last days of the study but not in any of the areas observed.

The warthogs spent more time standing up when they foraged in habitat 1 than in the other habitats where it was more common with foraging on their knees (figure 1). It is explained by the fact that warthogs are known for grazing on their knees as a strategy to reach short grass (Creel, 2005) and in habitat 2 and 3 it was mostly very short grass. In habitat 1 they mostly foraged for figs that were harder to find. The warthogs had to move around in search for them, making it harder to stand on the knees. Habitat 1 also had a lot of staff walking back and forth right where the warthogs foraged. The warthogs often had to move or walk away to avoid the humans passing by and it is easier to walk away if you already are standing up.

The pool at Kichwa Tembo is located in front of the restaurant on the grass just by the savannah in area 3. The warthogs were observed drinking out of the pool twice while grazing in front of it (figure 1). Warthogs were observed both drinking and bathing in the pool at several more occasions but it was not noted in the protocol, because it was not the focal animal doing it. As the savannah was so dry, the pool made an excellent drinking place for the warthogs. The savannah did however provide the warthogs with water, in a stream running through it, but it had high riverbeds and hippos in the water. It is reasonable to assume that this made the pool more attractive to the warthogs.

During our observation the warthogs were only observed eating food handed from humans on 27 occasions and it was only scraps from plates (table 4). Human food and ugali does not seem to be a big part of their diet and are therefore not a likely reason for them to stay at Kichwa Tembo. The warthogs were however only observed at specific times during the day and the study can easily have missed if the warthogs were given larger amounts of human food at some time during the day. At more than two occasions the warthogs in the bush behind the staff cafeteria were observed eating something. It looked like big piles of human food but it was difficult to see clearly so no assumptions can be made.

Mating

Studies have shown that the mating behaviour can be affected by the prevalence of predators. The prevalence of predators decreased the numbers of matings with 50% in water striders (Sih *et al.*, 1990). Guppies changed their courtship behaviour when predators were present (Endler, 1987). Birds are known for changing the nest site when predators are present and some species even skip the mating completely if the predation is too high (Lima, 2009). These are all studies of non-mammalian species but it still shows that the risk of predation affects the mating behaviour in a large variety of animals and can in some cases stop it completely. Therefore it is not unlikely that predators also affect warthogs negatively during mating season, as they are prey for large predators.

The warthogs at Kichwa Tembo can benefit from staying in the area during their mating season because they can avoid predators and are able to focus more on the mating. The warthog males at Kichwa Tembo were observed both courting and mating with the females at several occasions (table 5). Warthog males were observed to be very consistent in their courtship and could follow the female for hours until she was ready to mate. It must be easier to follow a female inside a safe area than out on the savannah where predators are present.

Human-animal relationship

There were no obvious signs of problems with the warthogs at Kichwa Tembo, they did not destroy any crops or property, there were never any attacks on humans and most people seemed to be friendly to the warthogs. The only signs of problem were visible at the staff houses where some staff seemed to be afraid of the warthogs and had a hard time relaxing if there were warthogs close by. But it did not seem to be reason enough to remove them from Kichwa Tembo. Most of the tourists also seemed positive and seemed to see the warthog as a chance to see wild animals up close. This allowed safety to feed, court, mate and raise young without predators is a great advantage for the warthogs living inside of Kichwa Tembo compared with the warthogs out on the savannah.

Methods

Specific times of the day were chosen to observe the warthogs because there were only two observers and it seemed impossible to observe for 12 hours each day. Instead the day was divided in shifts. It was noted during the pilot study that the warthogs were very active in the early morning, especially in habitat 1 around the strangler fig tree at the staff houses. Later during the morning they went into the bushes and out of sight, this meant that the observations had to be as early in the morning as possible. Had it been any later several behaviours would have been missed. It was not possible to observe the warthogs earlier than 6.30 because it was too dark; the study started when the morning light was bright enough. The second shift was around lunchtime for the guest and because the other observer was interested in interaction between guests and warthogs it was decided that 13.00-15.00 was a good time to observe the warthogs. The third shift were placed as late as possible because in the pilot study the warthogs who left Kichwa Tembo during the day came back from outside of Kichwa Tembo around 17-18 so the last shift started at 17 and ended at 19 when it started to get too dark to see them. So the hours chosen for this study were probably the best possible hours to see the warthogs and to catch a broad variety in behaviours.

The first shift was chosen on the condition that the strangler fig tree would carry fruit the entire study period, but it did not. During the first days there were about 20 warthogs around the strangler fig tree during the mornings, but this number dropped after a few days. The last four days it was only a few pigs every morning, probably because the strangler fig tree no longer carried any fruit. The monkeys did not stay for so long in the trees and almost no fruits were visible on the ground. This is something that the study should have taken into consideration and adjusted after accordingly.

When the warthogs were observed during the pilot study there were no observations of them eating roots or other plants than grass. This led to the shaping of a protocol without an option for that type of food. The warthogs were observed eating roots and bulbs at the soccer field at many occasions but it was registered as eating grass instead due to the lack of options. This meant that this study lost the opportunity to for sure tell if roots and bulbs were a reason for the warthogs to stay because there were no indications to how common this was.

The decision to divide Kichwa Tembo into three habitats has affected the results because the habitats were only a small part of the entire area. This meant that some areas close to habitat 3, where the guest's houses were and many warthogs went to graze, was excluded from the study. We were not allowed to disturb the guests in their houses so it was not possible to observe the warthogs in these areas. This may have given a false impression of them spending more time in the other habitats. The observers could also not follow the warthogs when they went into the bushes and the forest. This meant that this study cannot tell what the warthogs do inside the dense vegetation and it is possible that this study are missing one or more reasons for the warthogs to stay at Kichwa Tembo. But the decision to only study the warthogs in certain areas of Kichwa Tembo were for this study the best decision as it would be too easy to loose them out of sight in the dense forest. The warthogs were also very easily frightened if the observers tried to follow them but did not react as long as they stood still.

The thought with the behaviour social interaction was not to be able to say something about the warthog's social interactions between individuals. It only served a purpose as to

have something to write in the protocol, when a mating behaviour occurred on the time for noting a behaviour for position. Because of this there is no possibility for this study to say something about the warthogs' social behaviours. The definition of social interaction should have been divided in several separate behaviours and explanations to be of any use to tell something about their social interactions apart from mating behaviours. It was an active choice in the study to use social interaction in this way, because the two observers observed for two different studies and already had a lot of behaviour to keep track of.

Some of the observations were missed due to the rain. Two morning shifts (6.30-8.30) and one evening shift (17.00-19.00) were completely missed and six more were shortened. The missed and shortened shifts affect the data's reliability as there are fewer observations strengthening my conclusions. The rain did also affect the warthog's behaviour as they started to spend more time out on the savannah and were harder to find when it was about to rain.

The fact that the focal animal were chosen through a convenience choice can have affected the results. When choosing the closest animal the observer risked choosing an individual that were not as afraid of humans as the ones further away. Which also meant that this animal most likely always will be the closest animal, and therefore risks to be observed more often than the more afraid animals. Possibly giving the study a false impression of the results if that animal did not represent the average behaviour of the group. However the observers learned to recognize many individuals and tried to avoid choosing the same animal more than once at one shift.

Sources

Most of the scientific sources in the background are around ten years old but I consider them to still be reliable when it comes to basic knowledge on the common warthog. Most is already known about the warthogs and it is almost impossible to find recent scientific sources saying the same because it would only be repetition on already known facts. When it comes to fact about tourism and the present situation in Kenya I find it more reliable to use recent references as a land's financial status and tourism attraction can change fast. In order to find recent references I had to use some non-scientific webpages but it is only to support what I already know and have seen myself and that was hard to find in a recent scientific article. For example the fact that humans are expanding their home range and the tourism is expanding, causing problems for the wildlife, as they get restricted to small areas is a well-known problem but as far as I can tell not commonly written about in recent scientific articles.

I use an article in the Guardian written by Hatcher (2013) as a reference, she is a reporter who went to Kenya to speak with the local guides that are members of the Kenya professional safari guides association. The association is a quality stamp for guides meaning that they are trained and have a great knowledge of the wildlife and nature of Kenya. Of course an article in a paper is never to be fully trusted as it is not peer reviewed as a scientific article can be, but the statement that tourists are causing problems in Kenya is more credible as it is observed by people living in Kenya and working with tourists every day.

I have referred to a webpage (Creel, 2005) several times in the description of warthogs, it is not an original source, but I see it as a reliable source as it has based its facts on scientific articles, and matches what I already know. But it is always risky to use a

summing of fact that someone else has written. The author (Creel, 2005) may have misread or misinterpreted the conclusions and facts in the studies it is referring to. To decrease the risk of false information and to support Creel (2005) and some of my other references I support one reference with several references saying the same thing, as it makes it more reliable when several authors say the same thing.

Conclusions

This study aimed to find out why the common warthogs chose to stay at Kichwa Tembo. It seems that the biggest attraction to Kichwa Tembo is the availability of food and safety. The warthogs were observed grazing the lawn, digging for bulbs, drinking the water from the pool, sleeping under cars, mating and raising their young. All of this seems to be good reasons for them to stay at Kichwa Tembo.

This study cannot tell for sure why the warthogs prefer Kichwa Tembo because it was only ten days of the year and lacks a comparison with the behaviour and preferences of the warthogs outside of Kichwa Tembo. But it is an indication to what attracts the warthogs to Kichwa Tembo and it is reasons that seem likely to attract an animal to a human residence.

Possible use of this study

As the results showed the warthogs used habitat 3 to drink water from the pool, something that the staff did not like and tried to stop the warthogs from doing. One way to stop the warthogs from drinking the water would be to put up a fence around the pool area to stop the warthogs from reaching the water. It would not have to be a very high fence as the warthogs did not seem to be very good jumpers and rather walk around object than trying to get over them. Another possible way would be to offer them water to drink and cool off in somewhere else, where the tourists were not allowed. As the warthogs tried to avoid getting too close to humans they would most likely prefer a water source where there were little or no humans and it would be especially important that they easily could get in and out of the water to cool off.

Another reason for the warthogs to stay in habitat 3 was that this was the only area where the staff watered the grass, which made it much greener than anywhere else. Again a good way to keep the warthogs off the grass would be with low fences that they could not crawl under. As soon as the rain started and the soccer field in habitat 2 started to be covered in grass the warthogs moved there to feed. If the staff watered the soccer field during the dry season maybe the warthogs would prefer that area instead of habitat 3.

At the same time every day the electricity was turned off and that was when most warthogs went out on the savannah by crawling under the turned off electric fence in front of the restaurant in habitat 3. One way to stop the warthogs from using just that area to crawl under, and reduce the warthog traffic in front of the restaurant, would be to make it harder for them by putting up a wooden fence or leave the electricity on in just that part of the fence.

Future research

This study was only ten days during a dry period and in order to truly answer the questions asked in this study, it would need to be a bigger study that studies the warthogs through all seasons of the year and more than six hours a day. The study would also have to compare the behaviours and preferences of warthogs living inside of Kichwa Tembo with warthogs that stay at the savannah, in order to tell if there are any differences in their behaviours.

It would be interesting to study if there have been any changes in the warthogs behaviour as a consequence of their safe living. If it is possible to detect any differences in the maternal instincts of females inside of Kichwa Tembo compared to females only living on the savannah. Also if any other behaviours of the warthogs at Kichwa Tembo have been affected, for example their response to a threat. If it is possible to already see a difference in the behaviours of completely wild and the semi-wild warthogs at Kichwa Tembo this could mean that there are high risks for animals living close to human. This is something to take in consideration, when animals are forced to live closer to humans, we may affect their behaviours unintentionally for the worse and in the future reduce their fitness.

Populärvetenskaplig sammanfattning

Vårtsvinet (*Phacochoerus africanus*) lever på stora delar av Afrikas savanner söder om Sahara. Honorna lever i familjegrupper med sina ungar och hanarna lever ensamma eller i grupper med andra hanar. Vårtsvinet är en gräsätare men kan även äta frukter och rötter.

Maasai Mara i Kenya är en av världens artrikaste nationalparker och en av många parker där vårtsvinen lever. Många nationalparker i Afrika har idag problem med turism där turister kommer och skrämmar djuren och turisthotell bygger ut utan hänsyn till djuren. Vilket leder till att djurens levnadsområde minskar drastiskt och tvingar dem att leva nära människor. Vissa djur verkar anpassa sig bra till detta nya levnadssätt och ett exempel är vårtsvinen på Kichwa Tembo, ett turisthotell i Maasai Mara. En flock på ungefär 60 vårtsvin lever inne på området som är avgränsat från savannen med eltråd.

Syftet med den här studien var att förstå varför vårtsvinen väljer att leva inne på Kichwa Tembos område bland människor. Resultaten visar att tillgången till mat och trygghet var två starka orsaker för vårtsvinen att vilja stanna.

Vårtsvinen sågs beta på hotellets gräsmattor varje dag. En oväntat upptäckt gjordes då vårtsvinen sågs äta fallna fikon från ett stryplikusträd (*Ficus thonningii*) som växte inne på området. Normalt sett undviker vårtsvin skog och träffar därför väldigt sällan på den typen av träd. Det gör fikusträdet till en ovanlig buffé och kan vara en av orsakerna för vårtsvinen att stanna på Kichwa Tembo. Vårtsvinen sågs även dricka ur och bada i poolen som fanns på området och det är troligt att det var en stor dragning till området, eftersom det var ovanligt torrt för årstiden just då. Vårtsvin har i tidigare studier setts gräva efter rötter i jorden då det är torka för att överleva men inte all mark är gynnsam för den typen av rötter de äter. Inne på Kichwa Tembo observerades vårtsvinen när de grävde och åt rötter från jorden vilket gör området ännu mer lockande under just torrperioder eftersom det finns rätt typ av rötter där.

Tack vare eltråden som avgränsar Kichwa Tembo från savannen så finns det inga stora rovdjur inne på området. Det innebär att vårtsvinen kan leva och fostra sina ungar utan samma oro för rovdjur som vårtsvinen på savannen har. Deras känsla av trygghet märktes också då vårtsvinen påträffades sovandes under bilar eller mot husväggar istället för i hålor som de gör på savannen.

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