The usage of wildlife corridors in central Italy

by

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(Photo taken by Mario Cipollone, 2018)

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Abstract

Increasing human population sizes and the connected urban expansion are the main causes for habitat fragmentations we face today. Networks of roads cutting through the landscape and cut wild areas apart. The consequence out of this, is the isolation of animal populations, which disenables species exchange and can lead to a decrease in genetic diversity. Therefore, conservations actions as implemented from the independent foundation Rewilding Europe must be applied to ensure species migration and exchange in the long term. The rewilding project in the Apennines in central Italy aims at connecting four wild areas with the local economies and to establish a green corridor connection including the areas to ensure safe migration routes for wildlife fauna species. These corridors include an area of up to 40,000 hectares and consist of the Abruzzo, Maijella National parks and the Sirente Velino Regional park and their buffer zones. The organisation already works together with local partners like Salviamo L'orso towards the installation of road safety prevention measurement such as road signs and wildlife warning reflectors, but their efficiency is still not 100 % proven. Only the existence of wildlife corridors coupled with fenced roads could be considered as a reliable method to prevent animal crossings at all. Because of the lack of knowledge about fauna species using the existing wildlife corridors in Italy, in total four corridors including two overpasses and two underpasses, had been observed on the motorway SS17 running from Sulmona to Roccaraso in the Abruzzo region. Four camera traps were set up over a period of 74 days to get an idea of what kind of animals use the passes and on what frequency they are being used at what time. The data showed that all observed corridors were used during the research period. Most frequently recorded animals making use of the corridors are red deer, followed by roe deer and foxes. The highest rates of under and overpass utilization were observed to be at night, while roe deer showed higher frequencies during the day. No differences in the utilization between under and overpasses was detected. The development of animal numbers didn't significantly increase or decrease for 74 days. All wildlife corridors showed no fencing along the roads and animals are not guided towards the safe passes. Therefore, road crossings despite the corridors is uncertain. Consequently, the effectiveness of these corridors could therefore be questioned, and future conservation actions and measurements should be improved to ensure a full fencing along the roads, which would prevent animal crossing and would increase roads safety.

Introduction

The independent foundation Rewilding Europe established projects all across Europe, which also includes the rewilding area “Central Apennines” in Italy. In this area the goal is to establish coexistence corridors by connecting in total four wild areas with the local economies. These corridors include an area of up to 40,000 hectares and consist of the Abruzzo, Maijella National parks and the Sirente Velino Regional park and their buffer zones (Rewildingeuropecom, 2018). Another goal of this connection and rewilding project is to enable safe migration of wildlife fauna within the parks and to allow the exchange of species between these parks (Navarro & Pereira, 2015). Therefore, road networks that are separating these rewilding areas prohibit safe migrations for fauna species and form dangerous barriers. To enable a safe connecting zone between the areas, roads safety measurements have to be improved. Rewilding Europe supports road safety actions, in cooperation with their local project partners such as Salviamo L’orso. They install traffic accident prevention measure like road signs and acoustic and non-acoustic wildlife warning reflectors along the roads (Rewildingeuropecom, 2018), (Allen, Bosman, Helmer & Schepers, 2017) But there is still a discussion about the effectiveness of wildlife warning reflectors going on. While some studies proved their effectiveness like Ujvari, Baagøe and Madsen (1998) observed in their research about effectiveness of wildlife warning reflectors in reducing deer-vehicle collisions: a behavioral study, and some didn’t such as D'ANGELO *et al*. (2006) reported in their study about the evaluation of wildlife warning reflectors for altering white-tailed deer behavior along roadways. According to these sources it could be seen discussable how efficient the already executed road safety measurements really are. As Hedlund, Curtis.D, Curtis. G and Williams (2004) stated in their research about methods to reduce traffic crashes involving deer: what works and what does not, that the only wide spread proved method efficient enough to prevent animal crossings at all, is the fencing of roads combined with over and underpasses. Animal–road crossings have to be prohibited to reduce or better prevent road mortality at all. The “life strade” project has estimated that a minimum of 15,000 animals are killed in each province of Italy a year. Most of the species killed by road accidents are roe deer, wild boars, red deer, badgers, porcupines, foxes and also wolves (Lifestradeit., 2018). On the one site road densities increase connected to increasing human population sizes every year, while on the other site animal’s migration safeness decrease (Allen, Bosman, Helmer & Schepers, 2017). The road networks form dangerous barriers and lead to animal’s habitat fragmentation, reduced connectivity in their migration patterns and an increase in road mortality. (Beier, Majka, Newell & Garding, 2008) Especially habitat fragmentation has a major impact on animal’s survival. It can even contribute to the isolation of small populations and can contribute to loss of genetic diversity (Beier, Majka, Newell & Garding, 2008). Therefore, the building of wildlife corridor networks has become a more and more used action towards the preservation of biodiversity and the connection of isolated and fragmented habitats during the last years (Lindenmayer & Nix, 1993). According to the study of Foster and Humphrey (1995) about the use of highway underpasses by Florida panthers and other wildlife, the presence of underpasses connected with fences, reduced the mortality of badgers to 100 %, while most of the underpass studies dealing about ungulate species, their study also revealed that even large predators such as the Florida panther, wolves and the black bear made use of these underpasses. Therefore, it should be considered as important to investigate studies towards the use of wildlife corridors and their efficiency. The aim of this research is to collect data about the utilization of the already existing wildlife corridors to see how effective they are in terms of how frequently they are being used at what time and how their usage differs among different corridor types. The information obtained from this will give a better understanding of how these corridors might have to be improved to have better conservation actions and to ensure the safeness of species migration. Therefore, four wildlife corridors in the Abruzzo region on the motorway SS17 from Sulmona to Roccaraso have been observed over a period of 2 1/2 month to get information on the species using them and on how frequently they are being used at what time. In general, there is not much data available to refer to or to compare with, that gives information about the usage of wildlife corridors in Italy. A previous literature study conducted to this research has reviled, that there had been almost no studies about the use of wildlife corridors in Italy at all. Therefore, this research also aims at educating about a basic, profound understanding of the usage of wildlife corridors by different animal species in central Italy. It is expected that all observed corridors will be used by the most common wildlife species native to the area, whereby most of the utilization is expected to be at night, when car density is lower. The data obtained from this study, can help to get a better estimation of the usage of wildlife corridors in general and can help towards future conservation actions, as increasing road safety and connecting fragmented and isolated animal populations and their habitats.

Materials and methods

Study area

The Apennines, the second main mountain range of Italy, stretches for more than hundreds of kilometres from the north of the country to its south and passes through the Abruzzo region (Giraudi & Frezzotti, 1997). This region is located in the centre of Italy, where the research area is located on the surrounding foothills of the mountain ranges. The landscape features include wide ranges of hills, narrow valleys, mixed broad leaf and coniferous forests, beech woods, open hillsides and mountain grasslands (Rewildingeuropecom, 2018). The present study was conducted on the road SS17, running from Sulmona in the north through the slopes of the Apennines to Roccaraso in the south. The road SS17 runs close to the Monte Genzana Nature Reserve (West) and the Maijella Nature Reserve (East) and stretches trough an area, which is a wildlife connection zone between the two national parks as shown in Figure 1 (Rewildingeuropecom, 2018). In total four out of ten wildlife corridors where chosen, whereby camera trap (CT) location 1 and CT 2 included an underpass and CT3 and CT4 an overpass[1]. During an investigation before the study, ten wildlife corridors along the road were visited and signs of present fauna utilizations were checked, including the observation for tracks and faeces. Also, the accessibility by fauna species was investigated, which was enhanced by high concrete walls at three of the ten corridors. Another three were declared as not suitable, because of road maintenance and construction actions present at the time. The four research locations were studied on a in total 4 km section of the SS17.

Figure1) showing the motorway SS17 running through the connection zone between the Abruzzo NP & Majella NP along the Monte Genzana Nature Reserve in the Abruzzo region in central Italy.

[1]The related figure is not available online as it shows sensitive information.

Wildlife corridor characteristics

The four wildlife corridor characteristics differ from each other, consequently the height, width, length and landscape features of the passes are noted. (Table1). The landscape at research location CT1 consists of a mixed broad leafed and coniferous forest towards the north and leads to an open grass area, which is shared with the northern site of research location CT2. Towards the south location CT2 consists of a mixed broad leafed and coniferous. The locations CT3 and CT4, both located on a steep mountainside share a mixed broad leaf and coniferous forest towards the west and east at CT3 and the west site of CT4, while CT4's eastside leads to an open scrub and bushland covering the steep mountainside.

Table 1) Shows the characteristics of each wildlife corridor including the height, width, length and landscape features

				Landscape features			
Wildlife corridor	Height (m)	Width (m)	Length (m)	*direction North*	*direction South*	*direction West*	*direction East*
CT1	20	15	2	Mixed broad leaf and corniferous forest	grass land	road	road
CT2	4	15	10	grass land	Mixed broad leaf and corniferous forest	road	road
CT3	10	15	200	road	road	Mixed broad leaf and corniferous forest	Mixed broad leaf and corniferous forest
CT4	10	15	46	road	road	Mixed broad leaf and corniferous forest	open scrub and bushland

Camera trapping

Four camera traps were set up on the 16.03.18, the recording time was 74 days. Photos of wildlife fauna were taken with four Bushnell cameras (Model119447C, 8MP Trophy CAM HD Trail camera). Each camera was set up on research locations (CT1-CT4). The cameras work with an infrared transmitter and a receiver. The camera takes a photo or video as soon as the infrared transmitter is interrupted. To ensure that animals of different sizes are having the same chance to be detected, trees were chosen for camera set ups, where the camera had a brought angle of detection on a height of 1,50 m. According to a literature review from Caravaggi, *et al*. (2017) about camera trapping for conservation and behaviour research, the most common height of setting up a camera trap would range from 20cm – 300cm. Consequently, the height of 1,50 m (the approximately middle of the range) has been determined. After testing the cameras for the first time on the desired research locations, the height of 1,50m approved to detect all sizes of animals, ranging from small rodents to large ungulates. All cameras were set up on a high detection level with a zero second recording interval. Cameras CT1, CT2 and CT3 where set up on video, while CT4 was set up on pictures, because the movement of vegetation triggered the camera too often, which would in long term led to a higher battery discharge. The Cameras were left on the whole time during the 2,5-month research period. In two-week intervals the batteries were checked and replaced if needed and the SD cards were changed, and the recordings were noted in a table. Thereby, it was from interest to count the animals per species using the over and underpasses. Only animals are counted that go through the over and underpass. Also, the time of the animal that triggers the camera is taken into account, thereby it is distinguished between day and night time. Consequently, the time information that is given when a photo or video is taken is used. The daily sunset and sunrise times are checked with the help of the website timeanddate.com and the footage depending on its time of trigger is categorized as either day or night time observation.

Species

The expected species to be captured by the four camera traps are the most common species native to the Abruzzo region in central Italy. According to a previous literature study in total 11 species of fauna likely to observe had been listed. These are the fox (*Vulpes vulpes*), wolf (*Canis lupus*), marten (*Martes foina*), badger (*Meles meles*), wild boar (Sus crofa), roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*), hare (*Lepus europaeus)* wild cat (*Felis silvestris silvestris*) and porqupine (*Hystricidae*) Deffontaine *et al.* (2005*)*. During this research there is also the chance to observe the Marsican brown bear (*Ursus arctos marsicanus*), but due to a very small population size and its critically endangered population size, chances of observation are expected to be very low or zero even though frequently reports exist observing the bear crossing the SS17 and even a bear- car collision happened in 2016 (Primadanoiit.it, 2018). Also, the number of detecting wild cats is due to their small population numbers expected to be very low.

Data preparation

All cameras that were set up recorded with no interruption and failure during the whole research period of 74 days. According to the observations all wildlife passes had been used. In total 1543 times the cameras recorded in the whole research period, whereby 73 % of the recordings included false triggers (no animals on the footage), that were either caused by moving vegetation triggered by too small or too fast-moving animals or heavy weather conditions such as snow and heavy winds. No camera errors such as empty batteries or damages occurred during the research period and in total 422 animals were recorded. The footage obtained from the cameras showed in overall 17 recordings, where it wasn't possible to identify the animals triggered the camera. The time of the animals observed by the cameras were either classified as night or day time. Earliest sunrise during the research period of 74 days was at 5:32 am and latest at 7 am. Earliest sunset was at 6:10 pm and latest at 8:31 pm.

Data analysis

The footage that was obtained in two-week intervals from the individual cameras at all four locations was based on the number of animals detected per species, recorded into a table as shown below. After sunrise recordings were considered as day time observations and after sunset recordings were considered as night time observations. The complete data set was used to calculate the total amount of all observed animals and to indicate highest and lowest numbers of animals. An independent t-test was executed to determine whether there is a statistically significance between the mean number of animals using over and underpasses or not. All statistics, tables and figures in this report were created with the program Excel version 16.10.

Table 2) shows the number of individuals per species recorded on all four research locations during a period of 2 weeks.

	Dates of recording (14.05.18-30.05.18))											
	Species observed											
Wildlife corridor	**Time**	**Fox** *(Vulpes vulpes)*	**Wolf** *(Canis lupus)*	**Marten** *(Martes foina)*	**Badger** *(Meles meles)*	**Wildboar** *(Sus crofa)*	**Roedeer** *(Capreolus capreolus)*	**Redeer** *(Cervus elaphus)*	**Bear** *(Ursus arctos marsicanus)*	**Wild Cat** *(Felis silvestris silvestris)*	**Hare** *(Lepus europaeus)*	**Porcupine** *(Hystricidae)*
CAMCT1	Day	1					4	7				
Underpass	Night			1	1		4	18				
CAMCT2	Day	1										
Underpass	Night	3									1	
CAMCT3	Day	1	1				7	3				
Overpass	Night	6	3	5	6		1	1				1
CAMCT4	Day		5				2					
Overpass	Night							12				

Results

In total 217 animals were observed on the two underpasses CT1 & CT2 and 205 on the two overpasses CT3 & CT4. Figure 3) shows the number of detected animals per species on each research location. From the animals native to the area that were expected to be detected, 85 % were observed during the research period. Red deer (*Cervus elaphus*) are the most frequently observed animals with 144 red deer at research location CT1, 16 at CT3 and 84 at CT4. Followed by roe deer (*Capreolus capreolus*), where at CT1= 21, CT2= 6, CT3= 23 and CT4= nine individuals were captured by the cameras. 12 Foxes (*Vulpes vulpes*), were counted at location CT1,16 at CT2 and 18 at CT3. Wild boar (*Sus crofa*) has only been observed at research location CT4 with in total 23 individuals. Wolves (*Canis lupus*) were observed at all locations with 3at CT1, 5 at CT2,7 at CT3, and six at CT4. Porcupines (*Hystricidae*) had been observed at locations CT2 and CT3 with both seven individuals in total. At CT3 five badgers (*Meles meles*) had been counted and three at CT4. Martens (*Martes foina*) had been observed at location CT1 with two individuals and CT3 with four. One single hare (*Lepus europaeus*) was observed at locations CT1. No Brown bear (*Ursus arctos marsicanus*) and no wild cat *(Felis silvestris silvestris*) had been observed.

Table 3) total number of animals observed on all four research locations on the SS17 in central Italy

Total number of animals observed on each camera location				
Species	**CAMCT1_U** Underpass	**CAMCT2_U** Underpass	**CAMCT3_O** Overpass	**CAMCT4_O** Overpass
Fox *(Vulpes vulpes)*	12	16	18	0
Wolf *(Canis lupus)*	3	5	7	6
Marten *(Martes foina)*	2	0	4	0
Badger *(Meles meles)*	0	0	5	3
Wildboar *(Sus crofa)*	0	0	0	23
Roe deer *(Capreolus capreolus)*	21	6	23	9
Red deer *(Cervus elaphus)*	144	0	16	84
Bear *(Ursus arctos marsicanus)*	0	0	0	0
Wild cat *(Felis silvestris silvestris)*	0	0	0	0
Hare *(Lepus europaeus)*	1	0	0	0
Porcupine *(Hystricidae)*	0	7	7	0

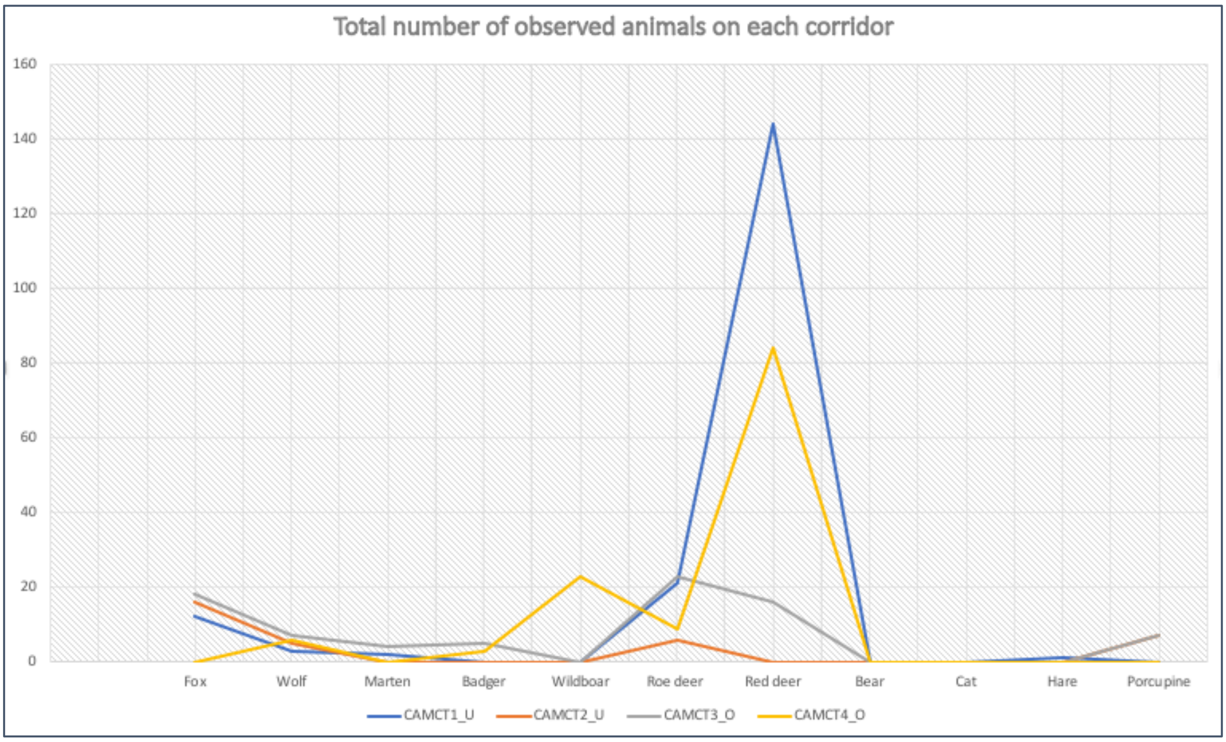

Figure 3) Total number of animals per species observed on each camera trap (CAMCT) location for 74 days on 4 wildlife corridors on the SS17 motorway in Italy

Under and overpass utilization

Figure 4) shows the usage of over and underpasses during 74 days of camera observations. Comparison between under and overpass usage: The unpaired sample t test showed that there is no significant difference in the utilization between underpasses (M=19.27, SD= 40,54) and overpasses (M=18,63, SD=27.56); t (18) =2.11, p= 0.95. Animal observations are distributed quite steady between over and underpasses. The highest numbers of animals detected were red deer, roe deer and foxes. All animals were observed quite equally as well on underpasses as on overpasses.

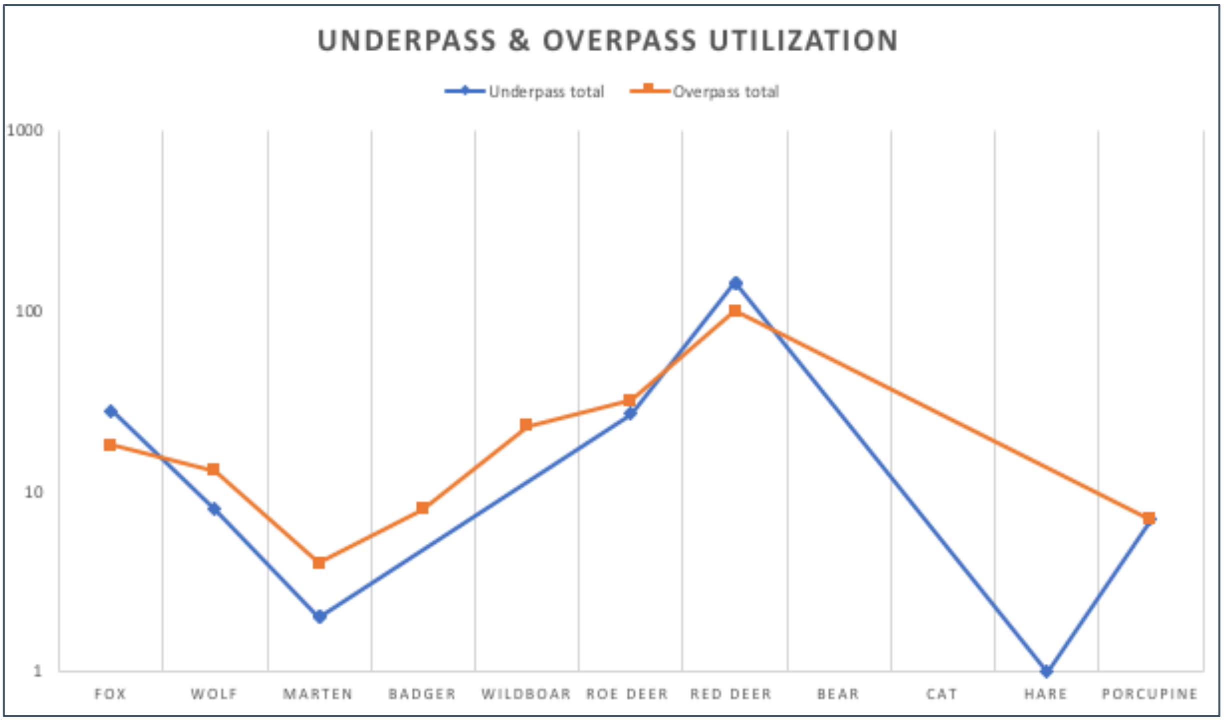

Figure 4) Utilization of under and overpasses during 74 days of research on the SS17 in central Italy

Overall day and night time utilization

Figure 5) shows the total amount of both day time (inner circle) and night time observations (outer circle). Comparing both observation times it can be seen that red deer numbers are higher during the night (62%) then during the day (47%). Also, foxes show higher percentages during the night (13%) than during day (7%). Porcupines were only observed during the night (1%). Wild boars show with 15 % a higher percentage than during the night (3%). Wolves have the same percentage in both observing times, 5 % each., while martens were only observed during the night (4%). Badgers were also only observed during night time (5%), while roe deer was more often observed during the day (26%, than during night (7%). Only one single hare was detected during the night. No wild cats and no brown bears were observed during the whole research time.

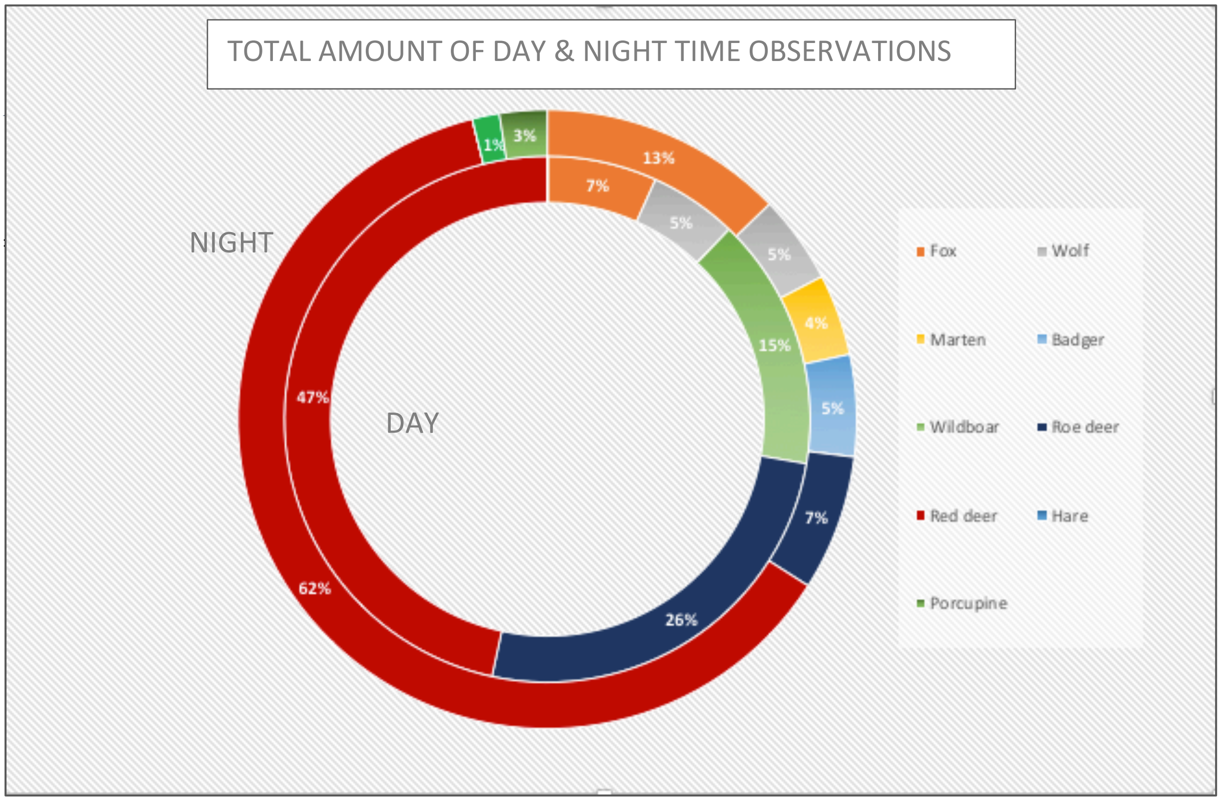

Figure 5) shows the percentage of observed animal species on all 4 observed research locations on the SS17 motorway in Italy during night and day in a period of 74 days

Specific day and night time utilization

Most of the red deer were observed during the night (183 animals) between 9.30 pm and 5 am, while day time observations were 20 animals, most often observed in the early morning, see (Figure 6). Roe deer were mostly recorded during the day (38 animals), highest observations were in the early morning hours from 6 - 9 am. In total 20 roe deer were observed during the night, most frequently between 11:30 pm and 5 am, see (Figure 7). Foxes counted 35 animals in total during the night, mostly recorded between 11 pm and 5 am. The day time observations were particularly spread during the day, see (Figure 8).

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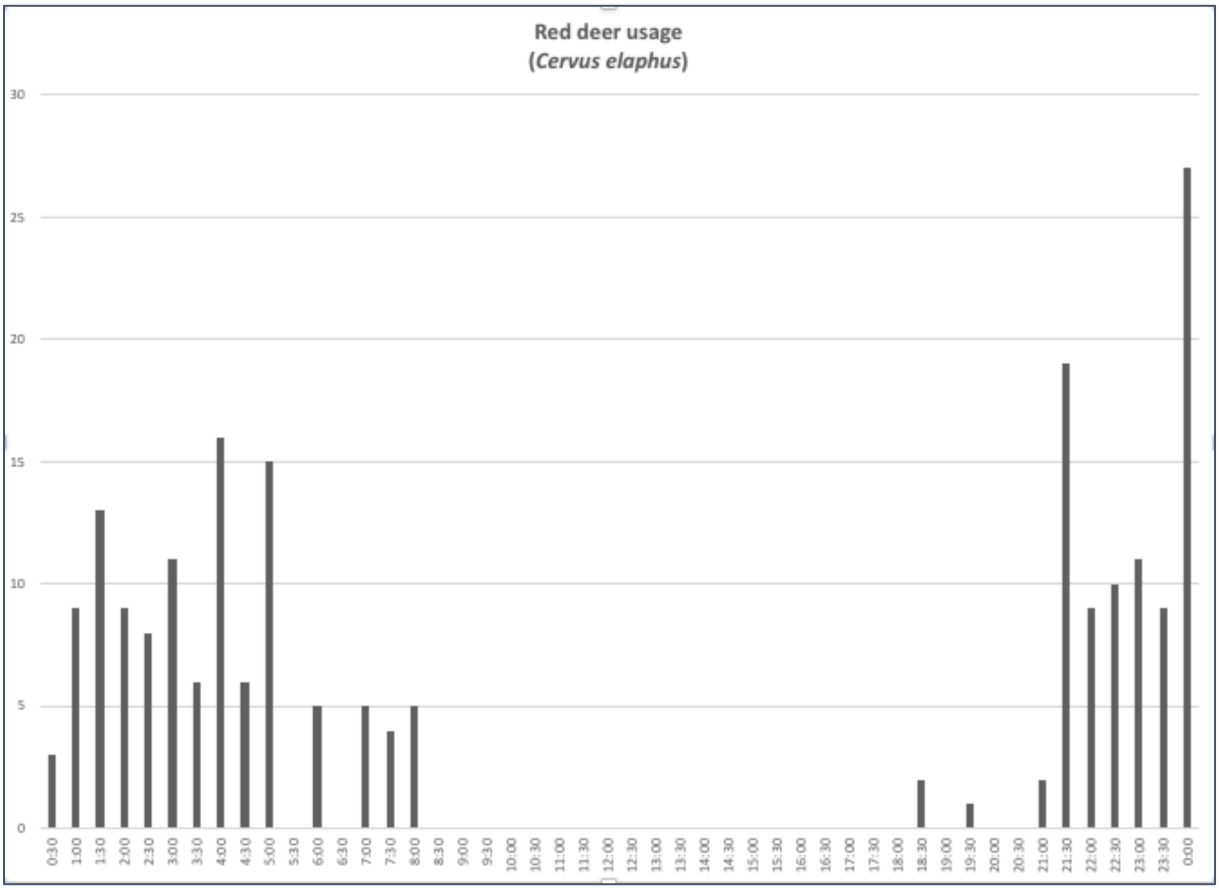

Figure 6) Number of red deer using under and overpasses during night and day time (24 h;1/2 h intervals) during 74 days of research on the SS17 in central Italy

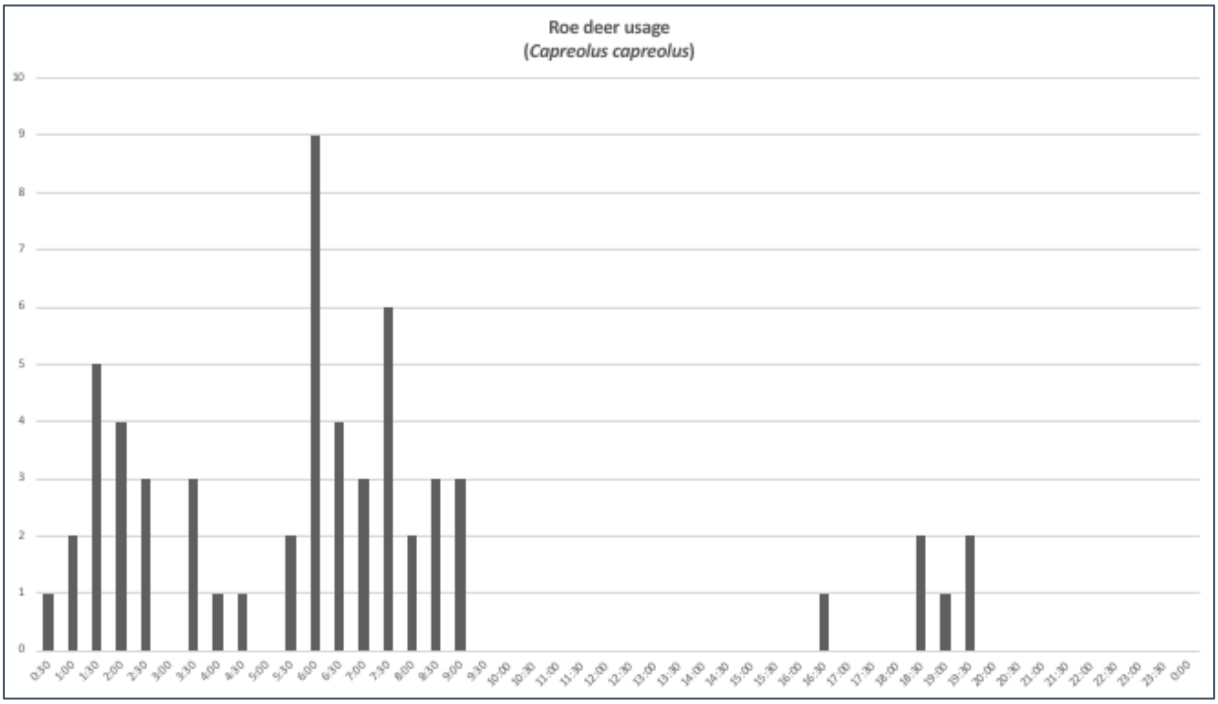

Figure 7) Number of roe deer using under and overpasses during night and day time (24 h;1/2 h intervals) during 74 days of research on the road SS17 in central Italy

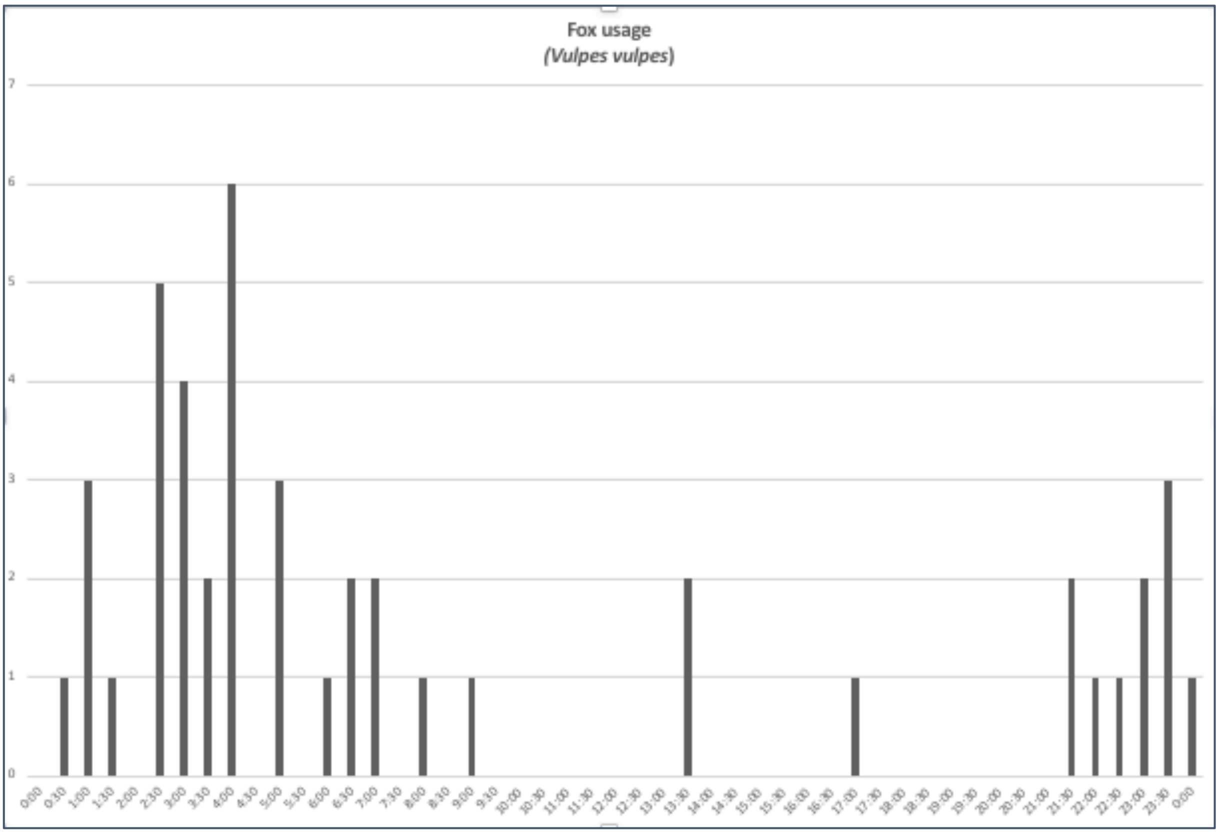

Figure 8) Number of foxes using under and overpasses during night and day time (24 h;1/2 h intervals) during 74 days of research on the SS17 in central Italy

Utilization development

The number of animals detected by the cameras at all four research locations shows differences during the two-week control intervals. The changes cannot be considered as a stable decrease or increase. Figure 9) shows that the numbers of red deer increased by almost 100 animals more in the period from 26.04 till 14.05.18, but numbers dropped by the same amount in the following period. Also, roe deer showed the highest number of observed animals in this period, but the numbers decreased the next period again. The amount of foxes indicates an increase starting from period 16.04-14.05.18.

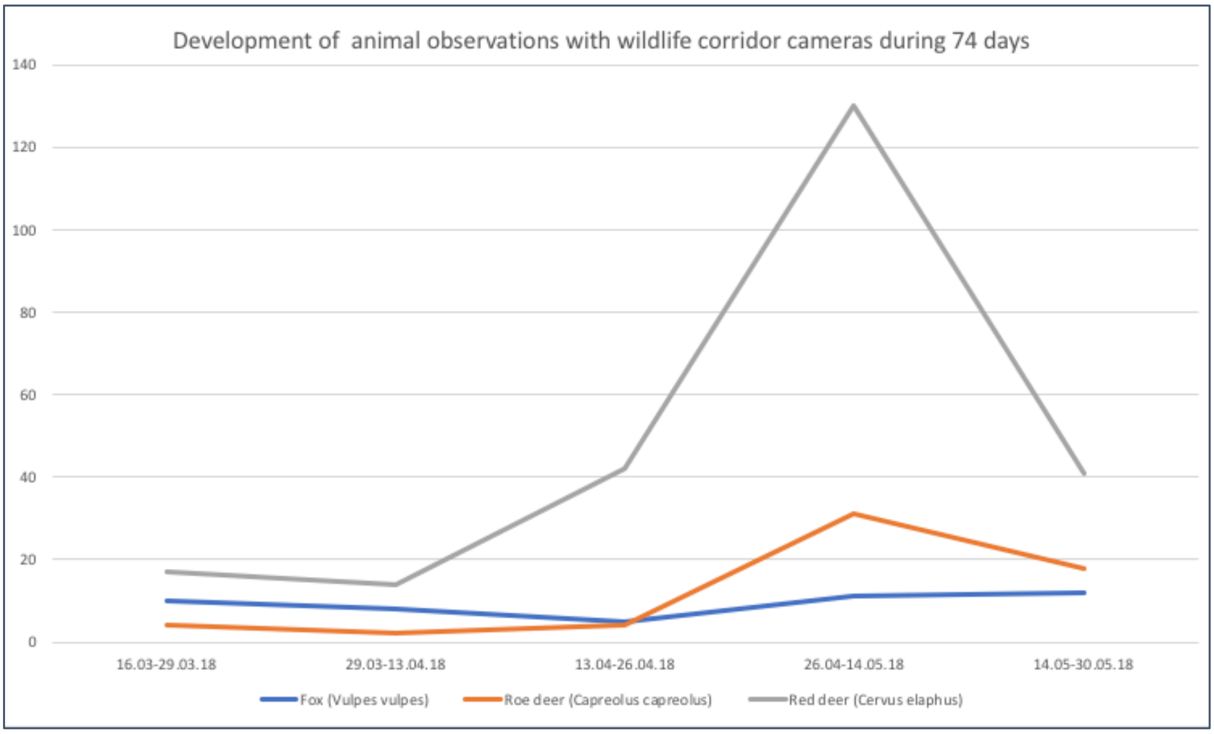

Figure 9) Development in animal observation numbers on each research location from the 16.03-30.05.18 on the SS17 in central Italy

All information on all animals observed during each control period starting from 16.03.18 till the 30.05.18 is listed below (Table 4). The highest number of wolves were observed in the last period at the end of May, also marten and badger show the highest numbers of animals detected in this period. Wild boars were only observed from the 26.04-14.05.18. All other species are more particularly spread over all periods and show no significant differences in observations numbers during one specific period.

Table 4) Number of animals observed at all four wildlife corridor locations in each control period on the SS17 in central Italy

Species	Control period				
	16.03-29.03.18	29.03-13.04.18	13.04-26.04.18	26.04-14.05.18	14.05-30.05.18
Fox *(Vulpes vulpes)*	10	8	5	11	12
Wolf *(Canis lupus)*	4	1	2	5	9
Marten *(Martes foina)*	1	1	2	2	6
Badger *(Meles meles)*	3	2	0	2	7
Wildboar *(Sus crofa)*	0	0	0	23	0
Roe deer *(Capreolus capreolus)*	4	2	4	31	18
Red deer *(Cervus elaphus)*	17	14	42	130	41
Hare *(Lepus europaeus)*	1	2	0	0	1
Porcupine *(Hystricidae)*	1	5	0	0	1

Discussion

The aim of this research was to find out primarily what kind of species using the four wildlife corridors and secondarily how frequently they are being used and at what time. The obtained data showed that each single corridor was utilized by the expected fauna species native to the research area. Wildlife corridor usage by red deer were highest followed by roe deer and foxes. An independent t test revealed that there was no significant difference in the usage between under and overpasses. Day and night time comparison indicates that most animals make use of the corridors during the night. The development of animal numbers did not indicate a significant increase or decrease over the control periods for 74 days. In general, all expected animals were observed by the cameras set up on each corridor, only wild cats and the Marsican brown bear were not observed. This could might be explained due to their low population sizes, especially the critically endangered brown bear, the two species are not widely distributed and therefore considered as rare observation animals. A larger amount of red deer had been observed at CT1 compared to the other locations, which could might be explained due to the presence of the big grazing plane that is shared with location CT2. Wild boar and badger were only observed on the overpasses. According to a research about ungulate traffic collisions in Europe conducted by Bruinderink and Hazebroek (1996), wild boars were observed using any type of underpass which will allow their passage. Also, badgers were observed using underpasses as Mata, Hervás, Herranz, Suárez and Malo (2015) observed in their research about the complementary use by vertebrates of crossing structures along a fenced Spanish motorway. Therefore, it might be not correct to relate the recordings that were only observed on overpasses in this research to any kind of corridor type preference made by the species. The number of animals that didn't trigger the cameras during the research is not known. As Jumeau, Petrod and Handrich (2017) stated in their research about a comparison of camera trap and permanent recording video camera efficiency in wildlife underpasses, that without permanent recording it is not possible to say how many animals were not detected and therefore didn't triggered the camera. The efficiency of a camera is also depended on environmental conditions and the right set up height, angle and the correct settings (Meek et al., 2016) The comparison of species utilization during day and night time showed that more roe deer were recorded during the day rather than during the night as expected. Information about the species activity patterns state that roe deer are observed to be most active at dusk and dawn (Staines & Ratcliffe, 1987). Most of the roe deer observations during this research were recorded in the early morning from 6 am- 9 am (55%) and (8%) in the evening, while night time observations were 38 %. As mentioned previously, the only wide spread proved method efficient enough to prevent animal crossings at all, is the fencing of roads combined with over and underpasses. (Hedlund, Curtis, Curtis & Williams, 2004) All overpasses and underpasses that were observed during the research were not fenced. Also, the whole 4 km section of the investigated road, wasn't fenced. Only concrete walls are partially present along the road, but these were mainly built to prevent falling rocks and to support the water drainage system on both sites of the road. With the absence of a fenced road, the animals are not guided towards the safe crossings and the therefore missed number of animals crossing the roads despite the presence of over and underpasses is uncertain. Consequently, the efficiency of these wildlife crossings without fencing in general might be questionable.

Limitations

Not all animals utilized the corridors could be recorded. The setup of permanent cameras additionally to the camera traps could due to limiting resources not be realized. Another limiting factor for this research was, that four observed wildlife corridors might not collect enough data and might produce not a large sample size, which should be possible to draw more conclusions from. More wildlife corridors should be observed in further researches to combine the new information with the already existing data obtained from this research. A limited amount of equipment did not allow the observation of more corridors. Besides that, the lack of previous conducted research giving information and data about wildlife corridors in Italy isn't available or wasn't accessible. Therefore, it was solely possible to compare with and refer to research that had been done in other countries. The comparison might be, due to dissimilarities in geography and other countries specific aspects, not as accurate as pleased.

Recommendations

This research gives a first impression and idea of the usage of the observed wildlife corridors on the SS17 motorway in central Italy. The research revealed that, the absence of a proper fencing guiding the wildlife towards the safe crossings is missing. Therefore, the wildlife corridors efficiency might be questionable. Consequently, the following three recommendations can be stated. Firstly, Conservation actions and measurements should be improved in the future, including the building of the missing fences should be considered as essential for their efficiencies. Their presence is from high importance and can prevent many road kills and wildlife-car collisions. Secondly, roads safety measurements should be further improved. The SS17 cuts through the connection zone between the Abruzzo and the Maijella National park. To enable a safe connecting between these areas and also the Monte Genzana Nature reserve. Especially, to conserve the critically endangered Marsican brown bear, who already had been reported quite frequently crossing the SS17. Thirdly, more data has to be collected on more wildlife corridors to get more knowledge about their usage and to increase their effectiveness to choose for the most suitable type of corridors and the best building places for new corridors in the future.

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Appendix: Data sheets for recording camera trap data

	16.03-29.03.18													
	Species													
Wildlife corrido	**Time**	**Fox**	**Wolf**	**Marten**	**Badger**	**Wildboar**	**Roedeer (M)**	**Roedeer (F)**	**Redeer (M)**	**Redeer (F)**	**Bear**	**Cat**	**Hare**	**Porcupine**
CAMCT1_U	Day								7					
	Night	2	2	1			1		9				1	
CAMCT2_U	Day	3												
	Night		2											
CAMCT3_O	Day						1							
	Night	5							1					1
CAMCT4_O	Day							1						
	Night				3			1						

	29.03.-13.04.18													
	Species													
Wildlife corrido	**Time**	**Fox**	**Wolf**	**Marten**	**Badger**	**Wildboar**	**Roedeer (M)**	**Roedeer (F)**	**Redeer (M)**	**Redeer (F)**	**Bear**	**Cat**	**Hare**	**Porcupine**
CAMCT1_U	Day								8					
	Night													
CAMCT2_U	Day	3												
	Night	2	1										2	
CAMCT3_O	Day						1	1	2	1				
	Night	3		1	2					3				5
CAMCT4_O	Day													
	Night													

	13.04-26.04.18													
	Species													
Wildlife corrido	**Time**	**Fox**	**Wolf**	**Marten**	**Badger**	**Wildboar**	**Roedeer (M)**	**Roedeer (F)**	**Redeer (M)**	**Redeer (F)**	**Bear**	**Cat**	**Hare**	**Porcupine**
CAMCT1_U	Day													
	Night	4		1			2		26					
CAMCT2_U	Day													
	Night													
CAMCT3_O	Day						1		1					
	Night	1	2	1	1			1		2				
CAMCT4_O	Day									1				
	Night									12				

	26.04.18-14.05.18													
	Species													
Wildlife corrido	**Time**	**Fox**	**Wolf**	**Marten**	**Badger**	**Wildboar**	**Roedeer (M)**	**Roedeer (F)**	**Redeer (M)**	**Redeer (F)**	**Bear**	**Cat**	**Hare**	**Porcupine**
CAMCT1_U	Day						1		22	9				
	Night	5	1				8	1	33	5				
CAMCT2_U	Day						1	5						
	Night	4	2											
CAMCT3_O	Day	1	1				4	5	1					
	Night	1		2	2		1		1					
CAMCT4_O	Day		1			23	1	4		7				
	Night									52				

	14.05.18-30.05.18													
	Species													
Wildlife corrido	**Time**	**Fox**	**Wolf**	**Marten**	**Badger**	**Wildboar**	**Roedeer (M)**	**Roedeer (F)**	**Redeer (M)**	**Redeer (F)**	**Bear**	**Cat**	**Hare**	**Porcupine**
CAMCT1_U	Day	1					2	2	1	6				
	Night			1	1		4		17	1				
CAMCT2_U	Day	1												
	Night	3											1	
CAMCT3_O	Day	1	1				3	4		3				
	Night	6	3	5	6		1		1					1
CAMCT4_O	Day		5				1	1						
	Night									12				