Camera trapping of medium and large-sized mammals in western black sea deciduous forests in Turkey

Mühsin ÇOĞAL[1]*, Mustafa SÖZEN[2]

[1,2]Department of Biology, Faculty of Arts and Sciences, Bülent Ecevit University, 67100, Zonguldak, Turkey

[2]ORCID iD: 0000-0002-1911-605X, e-mail: spalaxtr@hotmail.com

*Correspondence: ORCID iD: 0000-0002-7749-3566, e-mail: mhsncogal@gmail.com

Abstract

Camera trapping is one of the most effective methods for mammal inventories in most habitats and conditions. This study is based on the mammal records of a camera trap study in Northwest Anatolia. The study area was about 3,500 km^2 and the study was carried out between May 2014 and May 2015. A total of 62 sites were surveyed, resulting in 3653 records of 16 mammal species (*Sciurus anomalus*, *Erinaceus concolor*, *Felis silvestris*, *Canis lupus*, *Canis aureus*, *Vulpes vulpes*, *Ursus arctos*, *Meles meles*, *Martes foina*, *Martes martes*, *Mustela nivalis*, *Lutra lutra*, *Sus scrofa*, *Capreolus capreolus*, *Lepus europaeus*, *Cervus elaphus*) within 11,868 camera trapping days. The highest detection rate among the species was that of the *Sus scrofa* (36.57%), followed by *Martes* spp. (20.35%) and *Canis aureus* (19.44%). Overall trap success for all species detected was 30.78% (recorded number/100 camera trapping days). It was detected that mammal species diversity was higher in the natural forested lands than in human affected areas. Species diversity in the study area was recorded to be significantly higher than the results of other studies from different parts of Turkey. We present here a detailed inventory, distribution data and contemporary diversity data for the study area, and comparative data for further studies.

Keywords: Detection rate, trapping success, conservation, carnivores, ungulates.

Acknowledgements: This study was supported by Bülent Ecevit University (Project No: 2013-84906727-07). This study was also conducted under the scope of the Voluntary Cooperation Protocol between Ministry of Forestry and Water Affairs - General Directorate of Nature Conservation and National Parks, Zonguldak and Bülent Ecevit University.

Açıklamalı [xx1]: The appropriateness depends on the purpose, if you wanted to research genetics or abundance, cameras wouldn't be appropriate, so best to specify inventory

Açıklamalı [WK2R1]: Understood and corrected.

Açıklamalı [xx3]: Better to report this as number of sites surveyed.

Açıklamalı [WK4R3]: Understood and corrected.

Açıklamalı [xx5]: Not totally clear. I don't think this is a necessary statistic. You could present it as the overall trap success % - which would be number of days with detections / 100 days.

Açıklamalı [WK6R5]: This number is overall trap success, the sentence was corrected

Açıklamalı [xx7]: As there aren't different time periods in this study, it's better to say it as a direct comparison

Açıklamalı [WK8R7]: Understood and corrected.

1. Introduction

The Mediterranean region hosts 321 mammal species (Temple and Cuttelod, 2009; Yiğit et al., 2016), 154 of which are found in Turkey including about 20 large and medium mammals (Kumerloeve, 1975; Doğramacı, 1989; Kurtonur et al., 1996; Kryštufek and Vohralík, 2001, 2005, 2009; Yiğit et al., 2006, 2016). One in six (16.5%) Mediterranean mammals are threatened with extinction at the regional scale, with a further 8% assessed as Near Threatened (Temple and Cuttelod, 2009). Additionally, about 27% of Mediterranean mammals have declining populations, 31% are stable, while for 40% the population trend is unknown; only 3% of mammal species populations are increasing (Temple and Cuttelod, 2009). Habitat destruction and degradation is the greatest threat to Mediterranean mammals, caused by a variety of factors including agricultural intensification, urbanization, pollution, and climate change. The other major threats are human disturbance, overexploitation and invasive species (Temple and Cuttelod, 2009).

Camera trapping has developed as the most effective method for mammal inventories in most habitats and conditions (Cutler and Swann, 1999; Silveria et al., 2003; Sanderson, 2004; Tobler et al., 2008). Camera traps allow scientists to monitor and detect wild species that are hard to monitor, without catching or physically handling them (Kelly and Holub, 2008).

Despite there being many studies about Turkish mammals, information on the ecology and distribution of many of mammal species is quite inadequate (Can and Togan, 2004; Can, 2008; İlemin, 2009; İlemin and Gürkan, 2010; Soyumert, 2010; Soyumert et al., 2010; Akbaba ve Ayaş, 2012; Albayrak et al., 2012; İlemin, 2014; Çoğal and Sözen, 2017). Though some records for large and medium mammal species for Zonguldak

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Açıklamalı [xx11]: Hopefully I didn't change your meaning here? Did you mean this or "Despite there being many studies about the presence of Turkish mammals"?

Açıklamalı [WK12R11]: It is all true that we meant. Thank you.

province have been provided by some researchers (Kumerloeve, 1967; Krystufek and Vohralik, 2009), no detailed studies have occurred and most of the distribution maps were estimated without any definite records. That is why updated data collection of mammal species' occurence was necessary for the region for further studies including protection, management and ecological purposes.

The aim of this study is to record medium and large mammal species distribution in Zonguldak province using camera traps. We also aimed to determine the detection rates and diversity of the species to create their distribution maps, to compare diversity of species of the study area with other parts of Turkey, and finally to provide an available inventory list for further studies.

2. Materials and Methods

2.1. Study Area

The study was conducted in about a 3,500 km^2 area covering Zonguldak province and close surroundings in the Western Black Sea Region in the Anatolian part of Turkey. According to the ecological regions defined by Olson and Dinerstein (2002), the area covering Zonguldak, coded PA0422, is defined as the Euxine-Colchic Deciduous Forests. This region is dominated by *Fagus orientalis* and *Pinus nigra* forests. Forests of oak species and bushes also cover a significant part of the region. The study area was ecologically divided into two region; Region A is a human populated area of villages and agricultural fields. Forest is mostly destroyed in this area and open areas such as agricultural fields are dominant. Land use changes have significantly affected this region. The altitude in this area ranges from 0 to 650 meters a.s.l. This area extends along the coastal zone of study area (Figure). The stations Tepeören, Ilıksu, Dağlıca1,

Açıklamalı [xx13]: The word 'data' is plural, that's why I deleted 'an.' You could leave 'an' in and say 'dataset' instead, which is singular.

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Açıklamalı [xx15]: Don't need to be too precise here, 1 decimal point is fine

Açıklamalı [WK16R15]: This is 3 thousand 5 hundred, not 3 point 5

Dağlıca2, Dağlıca3, Dağlıca4, Kurtköy1, Kurtköy2, Kurtköy3 and Kurtköy4 are located in region A.

Region B: This area is located behind the coastal zone. The area is mostly natural and covered mostly by old deciduous forest, and is mostly higher than Region A, with altitudes from 250 to 1420 meters a.s.l. (Figure) The stations Belen1, Belen2, Belen3, Belen4, Gümeli1, Gümeli2, Gümeli3, Gümeli4, Sütlüce1, Sütlüce2, Sütlüce3, Sütlüce4, Beldibi1, Beldibi2, Beldibi3, Beldibi4 are located in region B.

2.2. Camera trap study

The camera trap study was conducted between May 2014 and May 2015, for a year trapping period, by using a total of 62 camera traps (29 Bushnell NatureView Cam, and 33 Bushnell Trophy Cam; Bushnell, Kansas, USA) (Figure, Appendix 1). 26 camera traps were left in the same station for a year during the study. An opportunistic camera trap sampling was also carried out to check the accuracy of records taken from prior surveys conducted in the region: 36 camera traps were placed in diverse stations for different time periods (26 camera traps were set at least 2 months to 5 months for medium and large mammals and 10 camera traps were set at least 20 days to 2 months at different river edges for Eurasian otter). Since habitats across Zonguldak are mostly similar, areas selected from different regions were divided into 4 km^2 grid cells and 1 camera trap was placed into the middle of each cell (Sanderson, 2004). At the beginning of the study, the central point of each cell was attempted to be reached, and then the most appropriate point was determined based on wildlife paths, trace (footprint) and signs (feces, hair, food remains, etc.) within 200 m diameter of the point. The camera trap was set here. Based on this point, the distance between 2 camera traps was aimed to be 2 km, and the distance between 2 camera traps was rendered to have a smaller

Açıklamalı [WK17]: The camera traps were set an opportunistic sampling in study area.

coverage than the home range of the species (O'Brien 2011). Camera traps were set 30-50 cm higher than the ground level. The altitude of the stations was ranged between 15 m and 1,416 m. a.s.l. All camera trap settings were adjusted to remain at the maximum sensitivity, which was trigger interval set for 1 second and 2 pictures taken each trigger, to detect all species even with small sizes, such as squirrels (Silver at al., 2004; Sanderson, 2004).

[Figure]

2.3. Data Analysis

We summarized the total number of photographs taken, identifiable animals in photographs (events), and trap-nights of effort after subtracting days where cameras malfunctioned or ran out of SD (Secure digital) card or batteries. Individual events for each species were separated by a minimum of 30 minutes (Silver et al., 2004; Kelly, 2008). Shannon Weiner (H), index was used to determine species diversity (The proportion of species i relative to the total number of species (pi) is calculated, and then multiplied by the natural logarithm of this proportion (lnpi). The resulting product is summed across species, and multiplied by -1). Detection rate (total number of records/total number of camera trapping days*100) of the species was calculated as given by Kays et al. (2009).

3. Results

3.1. Species distribution

A total of 16 mammal species were detected (Table 1). During the study 3,653 photos of large and medium mammals were recorded as a result of 11,868 camera trapping days (Appendix 2). To determine *M. foina* and *M. martes* from photos was impossible in

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Açıklamalı [WK19R18]: We added the reference, "According to chapter of book, we meant that closer spacing of cameras closes the gaps and increases the probability of detecting individual animals by increasing the
number of cameras in a home range"

Açıklamalı [xx20]: Please also include details on the number of images per trigger and whether there was a delay between triggers

Açıklamalı [WK21R20]: Added information about trigger settings

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Açıklamalı [WK23R22]: we added how the detection rate was calculated.

Açıklamalı [xx26]: This list is unnecessary as the reader can just refer to the table

Açıklamalı [WK27R26]: Understood and corrected.

most cases. In such cases the records was indicated as *Martes* spp. In definite photos the exact species were indicated as *M. foina* or *M. martes*.

Cervus elaphus and *L. europaeus* records were taken only from region B. *Capreolus capreolus*, *U. arctos*, and *C. lupus* records were taken mostly from B region, and only once from region A (locality 52, 53).

All other species were common and recorded from most parts of the study area, however, *S. scrofa* (52.72%), *C. aureus* (26.79%), *E. concolor* (7.15%) and *M. meles* (3.91%) were more common in region A (N=1049).

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Açıklamalı [WK29R28]: As we mentioned above (Under Data analysis Title); Calculations of diversity of species was made for 6 regions that represent Zonguldak province. There were 4 camera trapping stations in each region, and these camera traps were left in place and functioning for the entire period between May and December 2014 (the most suitable records taken during the initial 8-months period were included in the calculation in order to avoid any possible flaws).
We added total number of record in Region A.

3.2. Detection Rates of Species

The detection rate the number of records (filtered data) over the total camera trapping days (sum of the days they operated flawlessly) is 30.78 for each 100 camera trapping days (CTD). Among the 3,653 records, the highest detection rate belongs to *Sus scrofa* (29.14%), *Martes* spp. (20.35%) and *Canis aureus* (15.35%), and the detection rates of all other species constitutes only 10.79% of the total detection rate (Table 1).

3.3. Species diversity in the study area

Shannon_H index for the whole study area is 2.04. The Shannon_H index for the six regions that represent Zonguldak province in terms of calculations of species diversity; Beldibi (H= 2), Belen (H= 1.9), Sütlüce (H= 1.7), Gümeli (H= 1.7), Kurtköy (H= 1.6) and Dağlıca (H= 1.3).

According to the Shannon_H analysis outcomes of species diversity in region B (H= 2) is higher than in Region A (H= 1.49).

4. Discussion

147 The camera trapping survey revealed the presence of carnivores, herbivores, an
148 insectivore in Zonguldak in West north Black Sea Region. Possible records of jungle
149 cat, fallow deer, wild goat and Marbled polecat had been suggested in the area
150 (Kumerloeve 1967; Krystufek and Vohralik 2009), however, despite the high camera
151 trapping effort and extended survey period no sign of these species were detected in this
152 study. Soyumert (2010) did not record these species in her study area in Bartın which
153 borders Zonguldak. A number of researchers stated that the Lynx shows a probable
154 distribution in this region (Kumerloeve, 1967; Turan 1984; Krystufek and Vohralik,
155 2009). Lynx were recorded from west of Ankara as the closest locality to Zonguldak
156 (Ambarlı et al., 2010; Mengülloğlu, 2010; Akbaba and Ayaş, 2012). Can (2008) did not
157 detect this species in a photo trap study performed in Yenice Forests close to Zonguldak
158 Province.

159 Wild boar was the most frequently detected species with 29.15% of the approximate
160 detection rates of the species detected in Zonguldak. Similarly, this species has also
161 been recorded from some other parts of Turkey as the most frequently detected species
162 (İlemin, 2010; Megüllüoğlu, 2010; Akbaba and Ayaş, 2012 (Table 2). Kazanki and
163 Perzanowski (1997) stated that the detection rate of the wild boar depends on the
164 abundance of gray wolf and golden jackal. Lanszki et al (2006) explained that golden
165 jackals feed on piglets, and Mattioli et al. (1995) and Jedrzejewski et al. (2002)
166 explained that wolves feed both on offspring and young pigs. Mengüllüoğlu (2010)
167 suggested that the low density of the wild boar was due to the rarity of food in the study
168 area, which was low in humidity, and hunting which takes place in low altitudes.
169 According to our findings, the Gray wolf is rare in Zonguldak. On the other hand,
170 though there is a dense Golden jackal population, milder winters, humid forests and rich

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Açıklamalı [WK31R30]: Understood and deleted.

food resources supports the high density of Wild boars in the area. Zonguldak province provides suitable weather conditions (average winter temperature is about 7 °C) for this species (TC-MGM-1950-2015).

Among the detected carnivore species, Golden jackal has the second highest detection rate. The detection rate of this species is 1.38 in Beypazarı forests (Mengüllüoğlu, 2010). Gupta et al. (2014) recorded that Golden jackal is the least affected wild mammal species by human influence and roams in open fields during daytime.

Similarly, Golden jackal was found as common in region A in Zonguldak. Lanszki et al. (2006) informed that golden jackal and red fox distribute sympatrically. These two species were detected sympatrically in Zonguldak during our surveys.

The detection index of the Red fox is lower in Zonguldak than the results from other studies in other parts of Turkey (Can, 2008; Mengüllüoğlu, 2010; İlemin, 2010). This may be because of the high frequency of Golden jackal which has similar ecological requirements.

Though they are small in size, the Hedgehog and Caucasian squirrel are also recorded by camera traps. Since the camera trap setup was not designed for these smaller species, detectability was likely low, explaining low density values in contrast to other studies.

Brown bear was recorded as rare in Zonguldak in contrary to other studies performed in nearby localities (Can, 2008; Soyumert, 2010) (Table 2); this may be due to lower altitudes and greater human pressure in Zonguldak. In contrast, Burton et al. (2018) found very high densities of the species in neighbouring Armenia using camera traps.

Camera traps records for Brown hare, Eurasian otter, Pine marten, Gray wolf, and Red deer were limited. Out of these species, Eurasian otter and Weasel were not easily

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Açıklamalı [WK33R32]: Corrected.

Açıklamalı [xx34]: Depending on the setup, you could definitely use camera traps for these species

Açıklamalı [WK35R34]: Of course, it is also important to adjust the photo-trap height for these species. However, since all medium and large species in the area were targeted, no special settings were made for these species.

detected by all camera traps because they have a habitat specific and/or area-specific distribution. 10 opportunistic camera traps were thus set up specifically for these species.

Martes spp. whose species idenfication is challenging, has the second highest detection rate (6.26 number of records/100 CTD) among the detected species. Discerning between the two species was challenging. This study provided the best record of the Pine marten, whose distribution in Turkey is not known well, since most of the records may belongs to Beech marten. Only 7% (0.93%) of all marten records (N= 754) were confidently identified as Pine marten, and only 4% of the other records were confidently identified as Beech marten. Considering the species similar morphology, camera trapping may not be appropriate to distinguish between these species. Similarly, Soyumert (2010) also suggested that a precise identification of *Martes* spp. with the photographs was not possible. Can (2008) recorded a 0.66% detection rate for Pine marten in Yenice Forests. This rate is high compared to the outcome of our research. On the other hand, Can (2008) has recorded only Pine marten and did not mention Beech marten. However, no doubt some of his records should to Beech marten. He mentioned to us that, since taxonomic literature mentioned generally martens in the area as Pine marten, he also accepted all marten records as Pine marten without noted about the details of the photos (pers. com.). The fact that pine marten has a low detection rate and a disputed taxonomic status in Turkey that makes it necessary to do more research on this species.

Gray wolf is commonly distributed in Turkey, however, population density is very low (Ertürk, 2010). This species proved only 0.21% (N=3653) of the all records from Zonguldak. *C. lupus* is regarded as “dangerous” in Turkey for domestic animals, is under much human pressure. That is why, its population is under threat of decreasing

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Açıklamalı [WK37R36]: Understood and corrected.

(Can, 2001). Considering that the minimum altitude suitable for the distribution of wolves in Turkey is 800-900 meters (Can, 2001), it can be concluded that a large part of Zonguldak is not suitable for wolf distribution as our findings also show. On the other hand, Buzbaş (2002) detected wolves in areas between 40m to 800m a.s.l. in western Thrace. According to Massolo and Meriggi (1998) the main reason why wolves prefer areas with high altitudes is that such places are further from human pressure and are therefore safer.

Red deer, which is the largest wild herbivore mammal in Turkey comprised only 0.021% (N= 6) of the total number of species records (N=3653) detected in Zonguldak. Distribution of this species in Zonguldak is very scarce. Records of this species were obtained from Zonguldak- Karabük borderline. This species, which used to be common in the past, is represented in small populations and almost extinct due to overhunting in most areas in Turkey (Mengüllüoğlu and Bilgin, 2010). Can (2008) did not record any Red deer from Karabük. On the other hand, Soyumert (2010) recorded the species from Bartın and Karabük. Mengüllüoğlu (2010) reported the species with the second highest detection rate from Karabük. The researcher highlighted the fact that this rate depended on the quality of habitat and the high reproductive capacity of the species in this protected area.

Albayrak et al. (2012) suggested that 26 days would be sufficient to detect all carnivore species in habitats similar to the Beydağları in Turkey by the camera trapping. Zielinski et al. (1995) informed that minimum 28 days were required for the detection of rare carnivore species in camera trapping studies. However, during the study in Zonguldak only six (Wildcat, Red fox, Eurasian badger, Golden jackal, Beech marten and Brown bear) out of 10 carnivores species were recorded in the first 26 camera trapping days.

This result shows that 26 days are not sufficient to detect all carnivore species in Black Sea Euxine-Colchic Deciduous Forests. On the other hand, the other carnivores that could not be determined in the first 26 days are Gray wolf, Eurasian otter, Weasel and Pine marten. Gray wolf is a rare species in Zonguldak region and only winter time recorded. Eurasian otters lives around the riverside and seaside, and to get their records a specific photo trap setting is needed. Weasels are very small and very fast, making it less easy to record it by camera traps. After the first day, a lot of marten records were taken, however, a definite Pine marten was recorded in the 46 day. However, most probably some of previous marten records could be Pine marten. So, to say that 26 days is enough to record all carnivore species in an area by camera traps is logical, if excluding very small, seasonal visitors or species that require special effort such as the Eurasian otter.

The distribution of species in regions A and B in Zonguldak shows that Brown bear, Red deer, Roe deer, Red fox and Brown hare prefer natural, unchanged areas where human pressure also low, on the other hand Golden jackal, Wild boar, Porcupine, Eurasian badger prefer agricultural areas and urban areas where they can find more food produced or discarded by humans. The most important factors that determine the species diversity seem to be human pressure and habitat alteration that mostly effected the area A.

Considering the camera trapping days until the first detection of each species (calculation was made for the first 26 days and as of the time when these camera traps started to operate simultaneously), the 9 species whose camera trap records were taken at the initial times of setting up camera traps (Table 1). The Weasel has a low detection rate due to its small body size and its fast movement, and its time to first detection is so

Açıklamalı [xx38]: As this wasn't directly assessed, best save it for the discussion.

Açıklamalı [WK39R38]: This sentence in the previous section (**Species diversity in the study area)** has been moved to the discussion section.

long. Tobler et al. (2008) suggests that the camera trapping success is proportionate to body size, so animals of small size can escape the camera trap trigger.

When compared to other studies from different parts of Turkey (Table 2), Zonguldak has a higher diversity of mammal species because of large natural habitats and old forests, less human pressure across the Province. Mammalian diversity is also richer in natural areas (region B) than in modified and human populated areas (region A) in Zonguldak.

While this study provides a detailed inventory of medium and large mammal species' distributional data for Zonguldak Province, it also highlights the need for further studies to help understand the factors driving these species' distributions.

Açıklamalı [xx40]: I didn't get figure 2?

Açıklamalı [WK41R40]: We wanted to refer Figure. We deleted it against the confusion of meaning.

Açıklamalı [xx42]: This was a bit too broad

Açıklamalı [WK43R42]: Understood and corrected.

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409 Table 1. Detected species; number of camera traps where species were detected, number
410 of records, camera trapping days of stations, detection rates (total number of records/
411 total number of camera trapping days*100) and camera trapping days until the first
412 detection of the species.

Species (Common name)	Number of Camera traps that species was captured	Number of records	CTD of stations where the species was detected	Detection rate	CTD until the first detection of the species
Sus scrofa (Wild boar)	47	1,064	11,268	8.97	1
Martes spp. (Martens)	41	744	10,813	6.27	1
Canis aureus (Golden jackal)	43	565	9,949	4.76	2
Erinaceus concolor (Hedgehog)	26	261	7,371	2.20	1
Capreolus capreolus (European Roe Deer)	23	235	6,203	1.98	2
Felis silvestris (Wildcat)	32	221	9,319	1.86	1
Meles meles (Eurasian badger)	22	218	6,862	1.84	1
Vulpes vulpes (Red fox)	30	129	7,810	1.09	11
Sciurus anomalus (Caucasian squirrel)	13	127	3,584	1.07	2
Ursus arctos (Brown bear)	16	39	4,911	0.33	25
Lepus europaeus (Brown hare)	4	14	521	0.12	-
Lutra lutra (Eurasian otter)	4	10	105	0.08	-
Martes martes (Pine marten)	5	7	1,633	0.06	26
Canis lupus (Gray wolf)	5	6	1,482	0.05	-
Cervus elaphus (Red deer)	4	6	881	0.05	-
Martes foina (Beech marten)	3	4	558	0.03	3
Mustela nivalis (Weasel)	2	3	394	0.03	-
Total no of Camera Trapping Days	11,868				
Total no of records	3,653				
Total detection rate (NR/Total number of camera trapping days*100)				30.78	

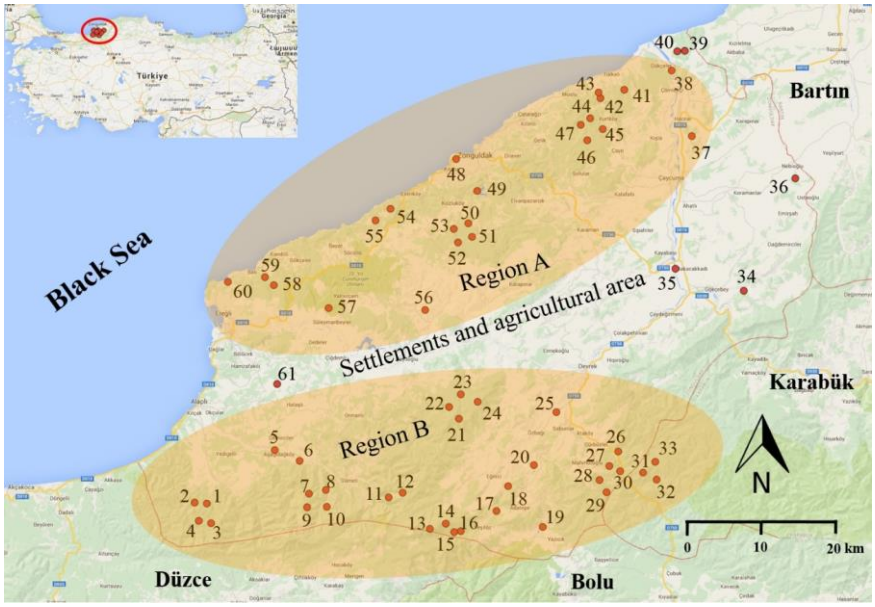
Table 2. Detection rate (number of records/total number of records*100), Total Trap success frequency (number of records/Total number of records), Species richness (Shannon_H) of Yenice, Karabük (Can, 2008), Beypazarı, Ankara Mengüllüoğlu, 2010), Datça and Burun (A= Firigana, 2=Maki, 3=Kızılçam) (İlemin, 2010) and Ankara (Akbaba and Ayaş, 2012).

Species	Zonguldak (This study)	Yenice (Can, 2008)	Beypazarı (Mengüllüoğlu, 2010)	Datça (İlemin, 2010)	Bozburun (İlemin, 2010)	Çamlıdere, (Akbaba and Ayaş, 2012)	Bartın (Soyumert, 2010)
Sus scrofa	8.97	12.66	1.65	8.66	7.69	0.47	28.44
Martes spp.	6.26						2.78
Canis aureus	4.76		1.38				0.9
Erinaceus concolor	2.20		0.08		0.04		0.51
Capreolus capreolus	1.98	2.83					28.51
Felis silvestris	1.86	1.75			0.32		3.08
Meles meles	1.84		1.97	0.18	0.94	0.09	1.68
Vulpes vulpes	1.09	2.83	4.76	1.91	3.66	1.05	12.61
Sciurus anomalus	1.07		1.32		0.12		0.34
Ursus arctos	0.33	1.08	0.03	0.05		0.28	9.29
Lepus europeus	0.12		8.59	0.94	1.56	4.78	3.79
Lutra lutra	0.08						

Martes martes	0.06	0.66									
Canis lupus	0.05	0.75	1.49							1.24	3.08
Cervus elaphus	0.05		5.16							1.33	1.92
Martes foina	0.03		0.86	0.13			0.86				
Mustela nivalis	0.03						0.04				0.02
Total number of Phototrap	50	16	30	36			36			21	
Total number of camera trapping days	11,868	1,200	3,699	6,853			6,853			1,046	31,063
Number of species	16	12	13	13			13			8	12
Total number of records	3,653	271	1,020	1,043			1,043			114	4,640
Total Trap success frequency	0.31	0.23	0.28	0.15			0.15			0.11	0.15
				A	B	C	A	B	C		
Species richness (Shannon_H)	2.04	1.27	1.97	0.41	0.34	0.31	0.58	0.33	0.36		

Legends to the figure

Figure. Camera traps points (●) in study area.



Appendixes

Appendix 1. Location information (related districts. UTM coordinates and altitudes) of camera trapping stations.

Map No	District	Station Name	Coordinates (UTM)	Altitude (m)
1	Alaplı	Belen1	N 41.07072. E 031.39638	301
2	Alaplı	Belen2	N 41.07133. E 031.37867	152
3	Alaplı	Belen3	N 41.04878. E 031.40351	273
4	Alaplı	Belen4	N 41.04887. E 031.38321	255
5	Alaplı	Alaplı1	N 41.129367. E 31.495750	78
6	Alaplı	Alaplı2	N 41.117517. E 31.532133	124
7	Alaplı	Gümeli4	N 41.08157. E 031.54575	691
8	Alaplı	Gümeli1	N 41.08532. E 031.57065	370
9	Alaplı	Gümeli3	N 41.06626. E 031.54286	816
10	Alaplı	Gümeli2	N 41.06674. E 031.57190	509
11	Alaplı	YukarıGümeli1	N 41.082648. E 31.683405	944
12	Alaplı	GümeliYukarı2	N 41.077116. E 31.662642	651
13	Devrek	Yeşilöz4	N 41.039200. E 031.758683	770
14	Devrek	Yeşilöz3	N 41.040150. E 031.768350	763
15	Devrek	Yeşilöz1	N 41.042733. E 031.722967	1,416
16	Devrek	Yeşilöz2	N 41048350. E 031.746483	1,245
17	Devrek	Yeşilöz5	N 41.062417. E 031.820783	368
18	Devrek	Yeşilöz6	N 41.089533. E 031.837917	303
19	Devrek	Akçabey	N 41.044850. E 31.888833	218
20	Devrek	Yağmurca	N 41.112985. E 31.875715	163
21	Alaplı	Sütlüce3	N 41.19118. E 031.76890	646
22	Devrek	Sütlüce4	N 41.18240. E 031.79306	1,008
23	Alaplı	Sütlüce1	N 41.17707. E 031.75227	735
24	Devrek	Sütlüce2	N 41.16542. E 031.76678	851
25	Devrek	Özpınar	N 41.171166. E 31.908372	117
26	Devrek	DevrekOdunD	N 41.127936. E 31.99897	431
27	Devrek	Beldibi4	N 41.11189. E 031.98604	584
28	Devrek	Beldibi3	N 41.09631. E 031.97211	673
29	Devrek	Beldibi2	N 41.08274. E 031.98170	522
30	Devrek	Beldibi1	N 41.10614. E 032.00134	433
31	Devrek	Dorukan1	N 41.10456. E 32.035439	752
32	Devrek	Dorukan2	N 41.096756. E 32.055028	671
33	Devrek	Dorukan3	N 41.116562. 32.053142	898
34	Devrek	Yasıören	N 41.298960. E 31.947216	520
35	Gökçebey	Örmeciköyü	N 41.329515. E 32.082581	52
36	Gökçebey	Gökçebey1	N 41.30510. E 32.18326	105

37	Çaycuma	Nebioğlu1	N 41.42617. E 32.25794	189
38	Çaycuma	Çorak	N 41.503865. E 32.118274	53
39	Zonguldak	Derecikören	N 41.546950. E 32.077350	15
40	Çaycuma	Sazköy2	N 41.56849. E 32.09651	191
41	Çaycuma	Sazköy1	N 41.56823, E 32.08560	148
42	Zonguldak	Türkali	N 41.526017, E 32.007817	93
43	Zonguldak	Göbü2	N 41.522867, E 31.970417	33
44	Zonguldak	Göbü1	N 41.516750, E 31.973067	51
45	Zonguldak	Kurtköy2	N 41.49432, E 031.95759	353
46	Zonguldak	Kurtköy1	N 41.48234, E 031.97594	288
47	Zonguldak	Kurtköy4	N 41.47143, E 031.95460	496
48	Zonguldak	Kurtköy3	N 41.48947, E 031.94437	280
49	Kozlu	Değirmenağzı	N 41.245569, E 031.431938	66
50	Kozlu	Ulutan	N 41.41335, E 031.79116	191
51	Kozlu	Dağlıca4	N 41.37995, E 031.77895	594
52	Kozlu	Dağlıca1	N 41.36486, E 031.78524	644
53	Kozlu	Dağlıca2	N 41.35836, E 031.76407	467
54	Kozlu	Dağlıca3	N 41.37294, E 031.75831	547
55	Kozlu	Ilıksu	N 41.39528, E 031.66542	238
56	Ereğli	Tepeoren	N 41.38236, E 031.64357	169
57	Ereğli	Güllük	N 41.278237, E 31.720322	370
58	Ereğli	Süleymanbeyler	N 41.284139, E 31.576460	178
59	Ereğli	Keşkek	N 41.31182, E 031.49075	430
60	Ereğli	Balı	N 41.30837, E 031.46579	364
61	Ereğli	Ereğli1	N 41.185905, E 031.23401	71
62	Ereğli	Işıklı	N 41.201519, E 31.510077	124

Appendix 2. Detected species, number of camera trap stations (map no) and total number of records.

Map No	Camera trap stations	*Sus scrofa*	*Martes* spp.	*Canis aureus*	*Erinaceus concolor*	*Capreolus capreolus*	*Felis silvestris*	*Meles meles*	*Vulpes vulpes*	*Sciurus anomalus*	*Ursus arctos*	*Lepus europaeus*	*Lutra lutra*	*Martes martes*	*Canis lupus*	*Cervus elaphus*	*Martes foina*	*Mustela nivalis*	TOTAL
55	Iliksu	162	22	206			7	37	2	6				1				2	445
51	Daglica4	82	26	13	58		27	71	1										278
10	Gümeli2	74	68	6	1	30	21	1	1		1			2			1		206
41	Sazkoy1	77	37	24	1	3	18	1	3	27									191
30	Beldibi1	22	16	37	31	13	19	4	4	40	2			1					189
52	Daglica1	108	7	9	45				1						2				172
36	Gökçebey	16	42	36			10	23	16		3								146
53	Daglica2	88	22	14	7	1	6		1		1				1				141
2	Belen2	19	63	15	2	3	10	5	17		5								139
29	Beldibi2	15	42	18	15	13	6	3	1		2			1	1	1			118
1	Belen1	41	60	1	2		3	1	4	3	2								117
23	Sutluce1	43	5	1	2	30	9			18	7								115
7	Gümeli4	4	11	7	34	34	7		9	3	1								110
40	Sazkoy2	72	5	17	4	1	6		1										106
3	Belen3	2	24	3	2		15	44	10		5								105
54	Daglica3	37	46	4	4		4	1											96
37	Nebioglu	36	25	14			10	4	3										92
28	Beldibi3	16	16	4	1	25	1	1		1	1	3							69
27	Beldibi4	6	30			9			5	13									63
33	Dorukan3	23		20		4	1		7		2				1	1			59
45	Kurtkoy2	5	17	10	4		8	2		9									55
13	Yesiloz4	4	1	21			1	1	21		2	4							55
21	Sutluce3	8	26	4		2	7	1	3		1								52
8	Gümeli1	6	32	3		2								2			2		47
56	Tepeoren	9	8	7	14		4	2	1										45
32	Dorukan2	9	8	6		12	1	4		1						1			42
46	Kurtkoy1	5	11	5	13		1												35
17	Yesiloz5	17		10		1		1											29
4	Belen4	1	16				4	4	2	1									28
22	Sutluce4	1	6		1	20													28
60	Balı	8	1		6		5	6											26
31	Dorukan1	9		2	1	11										3			26

24	Sutluce2		7			12	2												21
26	DevrekOdunD	1	8	3		2	1		1	4									20
48	Kurtkoy3	3	3	2	8		3												19
47	Kurtkoy4		8	9			2												19
49	Degirmenagzi	10		7					1										18
9	Gümeli3	2	6			4	1	1			2								16
16	Yesiloz2	5	1		2	2			3						1				14
59	Keskek1	3	3	5															11
6	Alaplı2		3	5			1			1									10
5	Alaplı1																		0
50	Ulutanbaraji	4	1	2					3										10
15	Yesiloz1			2					4			3							9
36	GümeliYukari2	2	4			1			1										8
35	Ormecikoyu	1	4										3						8
14	Yesiloz3	1		2					1			4							8
61	Eregli1	1		4					1										6
44	Göbü1	3		3															6
25	Ozpinar												5						5
38	Çorak		1	1	1														3
43	Göbü2		2															1	3
57	Güllük				1				1										2
11	GümeliYukari1										2								2
62	Isikli	1		1															2
58	Süleymanbeyler			1	1														2
34	Yassioren	1		1															2
19	Akçabey																1		1
39	Derecikören												1						1
42	Türkali	1																	1
20	Yagmurca												1						1
	TOTAL	1,064	744	565	261	235	221	218	129	127	39	14	10	7	6	6	4	3	3,653