SUPPLEMENTAL INFORMATION

"Can bear corridors support mammalian biodiversity? A case study on Central Italian Apennines"

Appendix SI- Estimation of REM intermediate parameters

Random Encounter Model (REM) uses the formula:

$$D = \frac{y}{t}\frac{\pi}{vr(2+a)} \quad [1]$$

where y is the number of independent encounters, t is total camera survey effort (in days), v is the average distance travelled by an individual during a day (i.e., day range, expressed in km/day), and r and α are the radius (metres) and angle (degrees) of the camera traps detection zone, respectively.

Day range is estimated as the product of speed (average travel speed while active) and activity rate (proportion of day that the population spent active).

For the speed estimate, we removed observations showing "Curiosity" behaviour (animals reacting to the camera trap, either scared or attracted by it), because they are not independent from the position of the camera traps, thus violating one of the assumptions of REM (Rowcliffe et al. 2016). We decided to also remove observations showing "Resting" behaviour (animal resting in front of the camera trap for a relatively long time), as these time intervals are not part of the activity time, over which speed was measured. We used the following formula to estimate the speed of each observation:

$$S = \frac{d}{(t1-t0)} \quad [2]$$

where S is the speed of the animals in front of the camera, d is the distance covered, $t0$ is the observation starting time and $t1$ is the observation end time.

29 To extract the distances, we positioned different poles at 1 m from each other, from the closest
30 visible point of the camera to the farthest one, in all the FOV. In this way, we obtained an image
31 of a grid for each camera trap (Fig. S1), from which we estimated all distances required to
32 parameterize the REM.
33 When more than one individual was observed in the same frame, we considered the first one
34 that entered the FOV for the distance travelled (Rowcliffe et al. 2016), while we considered the
35 closer one to the centre of the FOV for the distance from the camera. Finally, speed was
36 obtained by identifying different movement behaviours and then by estimating the average
37 speed for each behaviour (Palencia et al. 2021).
38 Activity was given by the frequency of observations during the day (Rowcliffe et al. 2014).
39 Thus, to consider the frequency, we replicated the observations based on the group size (e.g.,
40 four times for an observation with four individuals).
41 The camera traps' effective detection zone (EDZ; i.e., the area effectively monitored by
42 cameras) is defined by the effective detection radius (EDR) and the effective detection angle
43 (EDA).
44 EDR was estimated by using the distance from the camera trap of each encounter, extracted in
45 the same way described above for the speed (Fig. S1). Then, in a point-transect distance
46 sampling (Marques et al. 2001), we explored the suitability of two possible models to describe
47 the detection probability as a function of distance, namely half normal and hazard rate,
48 respectively:
49
50 $$a(y) = exp(\frac{-y^2}{2\alpha^2})$$ (Half normal) [3]
51 $$a(y) = 1 - exp(-(\frac{\alpha}{y})^{\gamma})$$ (Hazard rate) [4]
52

where *a(y)* is the detection probability at distance *y*, α defines the width of the function, and γ in the hazard model defines its shape (Rowcliffe et al. 2011). We tested models for all the combinations between "half-normal" and "hazard-rate" detection functions, cosine, Hermite polynomial and polynomial adjustments, and orders 0 and 2 (Palencia 2022). We chose to use different truncations for the species based on body mass and camera height (Rowcliffe et al. 2011). In particular, we decided to use a left truncation of 1 metre and a right truncation of 7 metre for smaller size species (European badger, hare, porcupine, red fox and wildcat) and none for the bigger size species (red deer, roe deer and wild boar). Then, we selected the best model based on the Akaike information criterion (AIC).

EDA was estimated by using the angle from the camera trap for each encounter. To extract the angles, we created grids of 50 columns, which represent the 50° of the FOV of the camera traps (25 per side starting from 0 in the middle) (Rowcliffe et al. 2011) (Fig.S1). We created two different angle grids for each camera trap, one for day mode and one for night mode, as the camera's zoom changes by a few degrees when switching from day to night mode. Then, we applied a line-transect distance sampling (Rowcliffe et al. 2011), and proceeded in a similar way than when estimating EDR. In this case the truncation used was the FOV of the camera traps (50°) in radians (Palencia 2022).

Trapping rate was obtained by the number of independent encounters over the survey effort (i.e., the collective time in which the camera traps were operative). The number of independent encounters was estimated with a threshold of 30 minutes. Thus, if two individuals appeared more than 30 minutes apart from each other, we considered them as two independent encounters (O'Brien et al. 2003, Miura et al. 2022). This approach was not applicable to wild boars, due to their highly gregarious nature. Thus, we first estimated group density by averaging the number of adults counted for each group, and then we multiplied our estimate by

78 the average group size, to obtain the individual density. The survey effort was calculated
79 separately for each camera trap, as they were deployed and removed on different days, there
80 were malfunctions (broken SDs, low batteries, cameras not shooting), and two cameras were
81 stolen and had to be replaced.

Figure S1. *Example of grid used to estimate the distance travelled by the animal, the distance from the camera and the angle from the camera of each encounter. The grid was obtained using pictures of poles placed at 1 meter of distance.*

Table S1. *Number of encounters for each mammal species detected by camera traps during the study. Species order is ranked by the number of encounters, from most to least frequent.*

Species	***Number of encounters***
Roe deer (*Capreolus capreolus*)	920
Red deer (*Cervus elaphus*)	*908*
Red fox (*Vulpes vulpes*)	489
Wild boar (*Sus scrofa*)	419
Squirrel (*Sciurus vulgaris*)	260
European badger (*Meles meles*)	256
Hare (*Lepus europaeus or Lepus corsicanus*)	232
Martes spp. (*Martes martes* or *Martes foina*)	208
Apennine wolf (*Canis lupus italicus*)	119
Porcupine (*Hystrix cristata*)	114
Wildcat (*Felis silvestris silvestris*)	42
Hedgehog (Erinaceus europaeus)	16
Bear (*Ursus arctos marsicanus*)	14
Apodemus spp.	4
Dormouse *(Glis glis)*	2

Table S2. *Intermediate parameters (day range, effective detection radius (EDR), effective detection angle (EDA)) with relatives standard errors, estimated for the application of Random Encounter Model (REM), for each of the eight species of meso- and macro-mammals analysed in the study. All the parameters were measured by using data from both Corridor 1 and Corridor 2.*

Species	Day range (Km/day) Corr1	Day range (Km/day) Corr2	Day range (Km/day) Corr1+2	EDR (m) Corr1	EDR (m) Corr2	EDR (m) Corr1+2	EDA (rad) Corr1	EDA (rad) Corr2	EDA (rad) Corr1+2
European badger (*Meles meles*)	8.61 ± 0.82	9.93 ± 1.34	9.64 ± 0.56	4.84 ± 0.16	4.85 ± 0.47	5.09 ± 0.14	0.17 ± 0.02	0.38 ± 0.02	0.44 ± 0
Hare (*Lepus spp.*)	6.46 ± 1.64	4.31 ± 0.74	5.91 ± 0.89	5.66 ± 0.65	4.96 ± 0.22	5.24 ± 0.26	0.20 ± 0.03	0.44 ± 0	0.30 ± 0.04
Porcupine (*Hystix cristata*)	7.87 ± 1.88	15.61 ± 2.51	10.82 ± 0.93	4.78 ± 0.25	6.93 ± 0	5.81 ± 0.21	0.23 ± 0.02	0.44 ± 0	0.28 ± 0.02
Red deer (*Cervus elaphus*)	11.15 ± 1.36	17.59 ± 1.36	14.38 ± 1.06	4.84 ± 0.42	4.85 ± 0.29	4.77 ± 0.22	0.44 ± 0	0.44 ± 0	0.44 ± 0
Red fox (*Vulpes vulpes*)	12.36 ± 1.35	22.70 ± 2.29	16.21 ± 1.49	5.94 ± 0.30	6.13 ± 0.18	6.03 ± 0.21	0.25 ± 0.02	0.39 ± 0.02	0.32 ± 0.14
Roe deer (*Capreolus capreolus*)	10.41 ± 1.03	10.35 ± 1.17	11.09 ± 0.68	5.62 ± 0.17	6.67 ± 0.18	6.12 ± 0.12	0.44 ± 0	0.35 ± 0.03	0.44 ± 0

Wild boar (*Sus scrofa*)	9.65 ± 0.55	11.14 ± 1.37	10.16 ± 0.61	4.85 ± 0.21	6.20 ± 0.33	5.33 ± 0.17	0.28 ± 0.04	0.44 ± 0	0.33 ± 0.03
Wildcat (*Felis silvestris silvestris*)	*NA*	*NA*	14.71 ± 2.27	*NA*	*NA*	4.46 ± 0.55	*NA*	*NA*	0.29 ± 0.03

***Table S3**. Trapping rates used for the application of the Random Encounter Model (REM) for each species and for each location of Corridor 1 and Corridor 2. Trapping rates were obtained by the number of independent encounters divided by survey effort (i.e., the time in which the camera traps were operative). The last row refers to the standard deviation (SD) of the trapping rates calculated for each species across all locations.*

Location	E. badger	E. Hare	Porcupine	Red deer	Red fox	Roe deer	Wild boar	Wildcat
Corridor 1								
Pescina	0.01	0.10	0	0.04	0.02	0.39	0.04	0
Cocullo	0	0.09	0	0.16	0.45	0.16	0.04	0
Carrito	0	0.02	0.02	0.05	0.03	0.40	0.07	0
Gabbietta	0.04	0.26	0	0.12	0.29	0.12	0.01	0
FS Giorgio	0	0.12	0	0.05	0.13	0.05	0.08	0
Secinaro	0.23	0	0.1	0.22	0.15	0.51	0.3	0.06
Ventrino	0.05	0.26	0.07	0.46	0.05	0.44	0.09	0.02
C. Subequo	0.03	0.02	0.09	0.15	0.15	0.24	0.09	0.01
La Curva	0.03	0	0	0.08	0.01	0.44	0.02	0
C. di Ieri	0.07	0	0.04	0.18	0.23	0.09	0.12	0.01
Cesoli	0.10	0	0.02	0.71	0.13	0.12	0.11	0.01
Marsicana	0.54	0	0.12	0.09	0.14	0.18	0.50	0.07
Madonna Pietrabona	0.02	0.05	0.02	0.03	0.03	0.19	0.16	0
Goriano	0.04	0.03	0.04	0.26	0.14	0.28	0.17	0
Corridor 2								
Monte Plaja	0.01	0	0	0.17	0.02	0.20	0.21	0
San Antonio	0.02	0	0	0.10	0.07	0.12	0.01	0.02

Introdacqua	0.03	0	0	0.03	0.04	0.09	0.02	0.01
Lago di Scanno	0.02	0	0	0.73	0.03	0.14	0.03	0.01
Prato Cupo	0	0.33	0	0.09	0.07	0.24	0.02	0
Frattura Nord	0.19	0.06	0	0.25	0	0.06	0.19	0
Valle Gentile	0	0	0	0.31	0.08	0.16	0.11	0.01
Il Lago	0	0.02	0	0.13	0.04	0.10	0.03	0
La Fascia	0	0.04	0	0.11	0.04	0.39	0.04	0
Valle Fredda	0	0.05	0	0.03	0	0.30	0.02	0.01
Valle S.ta Margherita	0.15	0.03	0.04	0.04	0.44	0.10	0.04	0.02
Valle Marsolina	0.01	0	0	0.09	0.04	0.09	0.09	0
Pinciara	0.12	0.10	0	1.03	0.08	0.36	0	0
Valle di Cutri	0.03	0.01	0	0.06	0	0.11	0.02	0
Colle delle Piche	0.03	0	0	0.26	0.04	0.71	0.03	0.07
Frattura Sud	0.01	0	0	0.27	0.09	0.11	0.01	0
Colle Nevara	0	0.26	0	0.20	0.04	0.16	0.06	0
Castrovalva	0.03	0.11	0	0.09	0.09	0.03	0.01	0
Anversa	0.08	0.11	0.27	0.26	0.25	0.04	0.47	0.01
Lago di San Domenico	0.04	0.01	0.05	0.41	0.03	0.03	0	0
SD	0.10	0.09	0.05	0.22	0.11	0.16	0.12	0.02

105

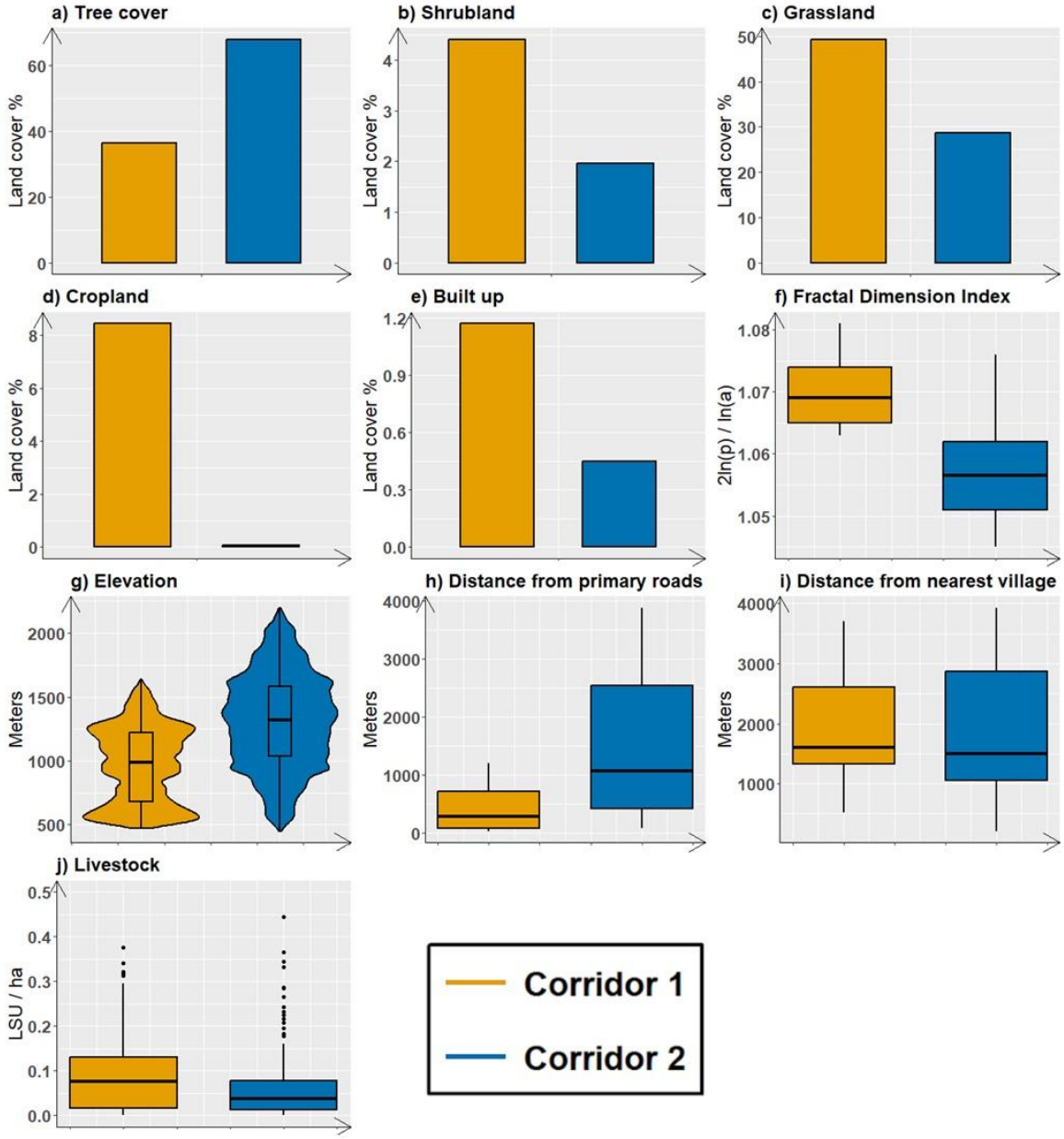

Figure S2. *Comparison between the environmental and anthropogenic variables considered for the spatial analysis of Corridor 1 and Corridor 2. The land cover (i.e. tree cover, shrubland, grassland, cropland and built up) histograms were created using the percentage values calculated within the corridor, the elevation violin plots were created taking into consideration all the pixels in the study area, while boxplots of the other variables were created extracting the values for each location considered. Livestock was calculated as the density of Livestock units (LSU)/hectares.*

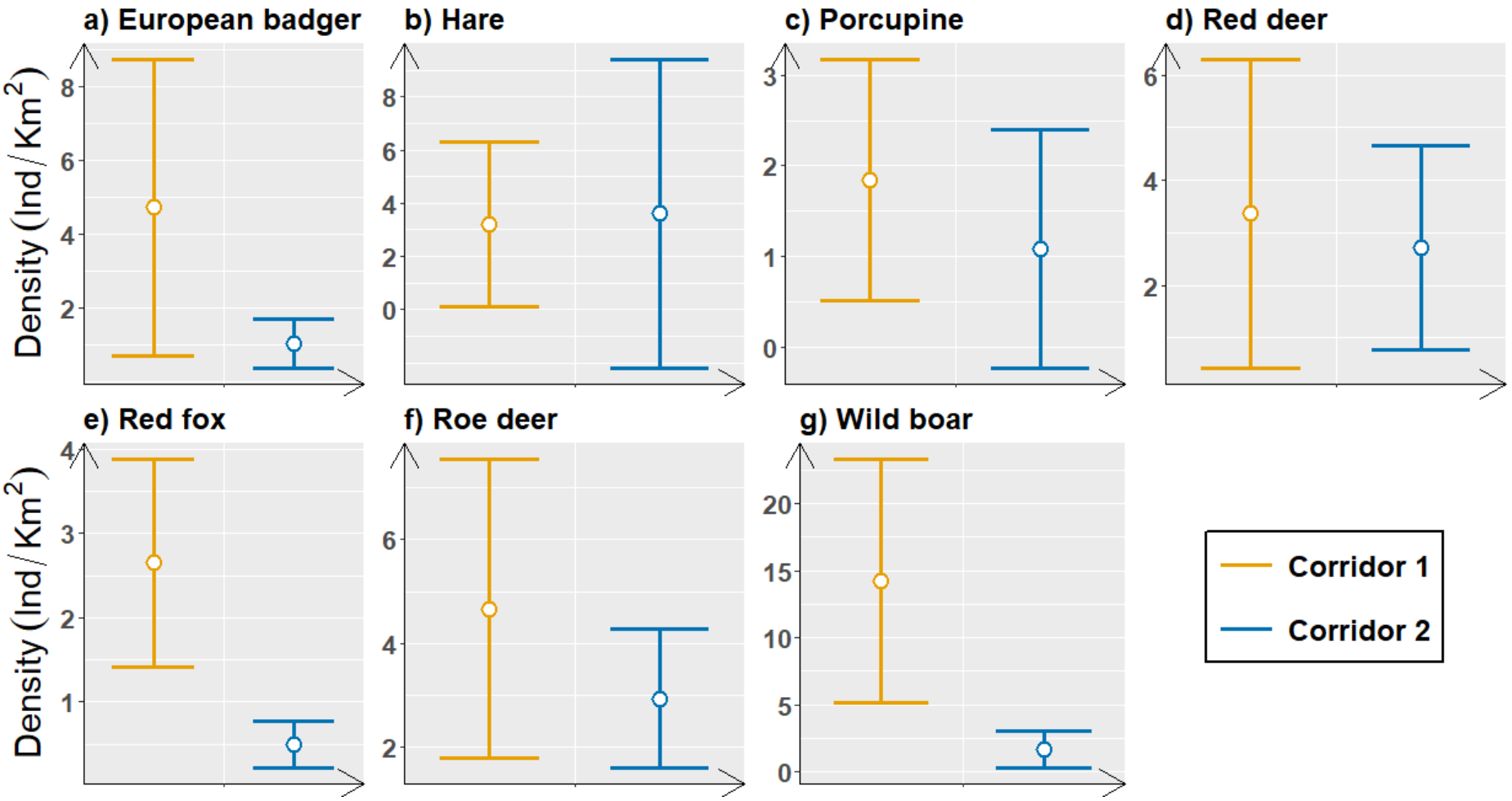

Figure S3. *Comparison between the densities of all the species estimated with the Random Encounter Model (REM) in Corridor 1 (orange) and in Corridor 2 (blue), with the whiskers representing the Confidence Intervals (CI).*

***Table S4**: Density values found in literature for each species. The relative uncertainty (CI= confidence interval, SE=standard error), the area of the study, the year of data collection and the reference are reported.*

Species	Method	Area	Density estimate	Year	Reference
E. Badger	Setts observation-survey by farmers	Luxemburg	0.78 ind/km^2 (95% CI 0.65–0.91)	1997	Schley et al. 2004
	Setts observation with camera traps	River Po plain (Italy)	0.93–1.4 ind/km^2	2013-2014	Balestrieri et al. 2016
	Radio tracking	Virolahti (Finland)	0.26 ind/km^2	2003	Kauhala et al. 2006
	Radio-tracking	Jura Mountains (Switzerland)	0.4-1.5 ind/km^2	1993-1996	Do Linh San et al. 2007
	Radio-tracking	Serra de Grândola (Portugal)	0.36–0.48 ind/km^2	2001	Rosalino et al. 2004
	Literature review	Europe	0.16-11.90 ind/km^2	2011	Lara-Romero et al. 2011
	Spatial predictive model	Asturias province (Spain)	3.81± SE 1.6 ind/km^2	2013	Acevedo et al. 2013
Hare	Spotlights count	Northern Apennines-(Italy)	0.0025 ± SE 0.0005 ind/km^2	1996-1997	Genghini, M. & Capizzi, D. 2005
	Literature review	Europe	1.4-116 ind/km^2	1952-2003	Smith et al. 2005
Porcupine	Camera trap distance sampling (CTDS)	Lombardy (Italy)	0.49 ± SE 0.33 ind/km^2	2023	Palencia et al. 2024
	Camera traps-presence only data	Tuscany (Italy)	0.44 ind/km^2 SD=0.001 (CI 0.102-0.108)	2013	Franchini et al. 2022

Red deer	Literature review	Central Italy	1.72 ind/km^2	1998	Mattioli et al. 2001
	Pellet count	Abruzzo, Lazio, Molise National Park (Italy)	2.4 ind/km² (CI 95% = 2.2-2.5)	2015	*Latini, not published data*
	Individual recognition through camera-trapping	Monte Genzana Alto Gizio (Italy)	1.3–2.5 ind./km²	2011	(Fabrizio et al. 2012)
	Explicit capture-recapture modelling SECR+ CAPWIRE from faeces collection	South-west Germany	3.3 (2.5–4.4 CI) and 8.5 (6.4–11.3 CI) ind/km^2	2015	Ebert et al. 2021
Red Fox	Faecal density count	Great Britain	0.21 ind/km^2 (0.05-0.37 CI) to 2.23 ind/km^2 (1.03-3.43 CI)	1999-2000	Webbon et al. 2004
	Camera traps-SCR and Live traps	Ciudad Real (Spain)	1.60 ind/km^2 (SD 0.32) and 0.28 ind/km^2 (SD 0.06)	2016	Jimenez et al. 2019
	Nonspatial capture–recapture	Serra de malcata (Portugal)	0.40 ± SE 0.02 ind/km^2 to 0.91 ± SE 0.12 ind/km^2	2005-2007	Sarmento et al. 2009
	Spatially explicit capture-recapture (SCR), mark-resight (SMR) and spatial count (SC) models	Valdecigüeñas, Badajoz (Spain)	0.41 ind/km^2 (95% BCI = 0.208–0.724; CV = 0.32)	2013	Jiménez, Nuñez-Arjona et al. (2017)
	Capture-ricapture-camera traps	Czempiñ (Poland)	1.02 ind/km^2 SD=0.09	1997-2000	Marek Panek & Wojciech Bresiński 2002
	Based on home range/ Snow tracks counts	(Virolahti) Finland	0.35 ind/km^2-4.4 ind/km^2	2003	Kauhala et al. 2006
Roe deer	Drive counts	Ticino national park (Italy)	30.7 ± 4.1 (CI) ind/km^2	2014-2016	De pasquale et al. 2019
	Pellet count	Abruzzo, Lazio, Molise National Park (Italy)	0,21ind/km^2 (CI 95% = 0,19-0,24)	2015	*Latini, not published data*

	Literature review	Europe	0.11 ind/km^2 to 53.80 ind/km^2	2009	Melis et al.2009
Wild boar	Camera traps (REM)	Europe	0.35 ± SE 0.24 - 15.25 ± SE 2.41 ind/km^2	2019-2021	ENETWILD-consortium 2022
	Pellet Count Groups. - Fecal Standing Crop (PCG-FSC)	Regional Natural Park Taburno-Camposauro (Italy)	47 ind/km^2	2017	Di Brita et al. 2018
Wildcat	SECR camera-trapping-SECR scat-collection-REM	Etna, Sicily	0.32 ± SE 0.1 ind/km^2 1.36 ± SE 0.73 ind/km^2 0.39 ± SE 0.03 ind/km^2	2010	Anile et al. 2014
	spatially explicit capture-recapture (SCR) models	Andalusia (Spain)	0.069 ± SE 0.0019 ind/km^2	2011-2015	Gil-Sánchez et al. 2020
	Camera traps-spatial capture–recapture model	Jura Mountains (Switzerland)	0.26 (95%CI 0.17–0.36) ind/km^2	2016	Maronde et al. 2020
	camera trapping and spatially explicit capture-recapture models	Carnic Prealps (Italy)	0.35 ± SE 0.12 ind/km^2	2015	Fonda et al. 2021

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Appendix SII -Density comparison for individual species

European badger

The badger density (1.83 ± 0.82 ind/km^2) in our study area was comparable with the literature, with values higher on average than other estimates (Table S4). In particular, our density falls within the range of those estimated from another European study that used camera trap data (Lara-Romero et al. 2012). Other studies have estimated group size rather than individual density (e.g., Goszczynski and Skoczynska 1996, Rosalino et al. 2004, Acevedo et al. 2014), but for social species like European badgers, accurate density estimates require combining territory size assessments with social group size measurements (Tuyttens et al. 2001, Scheppers et al. 2007, Balestrieri et al. 2016).

Italy particularly lacks sufficient data on badger numbers and population trends. We found only one study that calculated badger density with camera traps in Italy, with values of 0.93–1.4 ind/km^2 in a hilly area of the River Po plain (Balestrieri et al. 2016). Other available information on sett density varies by region, with approximately 0.2 setts/km² in the plains of northern Italy, and higher densities in hilly areas (1.32 setts/km²; Remonti et al. 2006) and Alpine regions (7.1 setts/km²; Prigioni and Deflorian 2005).

Hare

Regarding the hare, a review of European hare densities reported values ranging from 5.6 ind/km^2 to 82 ind/km^2 (Smith et al. 2005) from studies published after 2000. Our result (3.39 ± 0.86 ind/km²) is lower, but most of these studies are old and published as local reports. Furthermore, we did not find other studies that assess the density with camera traps. Densities of hares have been assessed by clearance netting of hares driven out of known areas (e.g., Albirgard et al. 1972), transect counts (e.g., Lewandowski and Nowakowski 1993), dawn or dusk counts (e.g., Frylestam 1976), and nocturnal spotlight counts (e.g., Frylestam 1979).

147 The only study we found that estimated hare density in Italy (Genghini and Capizzi 2005)
148 reported values lower than ours (0.0027 ± 0.0007 ind/km^2) but used a different sampling
149 method.

150 Porcupine

151 Porcupine density value estimated in this study (1.40 ± 0.47 ind/km²), was higher on average
152 than other estimates (Table S4). This is the only species for which we found a recent
153 comparative study conducted in Italy using camera traps. Palencia et al. (2024) estimated the
154 density in a Lombardy area through distance sampling, finding 0.49 ind/km² (SE ± 0.33). This
155 estimate is lower than ours but was calculated outside the porcupine's distribution area, where
156 our study is located. Another study by Franchini et al. (2022) estimated porcupine density in
157 the centre of their distribution area using presence-only data, reporting 0.44 ind/km² at a
158 regional scale (17,111 km²). However, due to the different scales of this study and the different
159 methodologies applied, our results are not directly comparable. Our estimate is also higher than
160 those found in the rest of the literature, for several reasons. The crested porcupine (*Hystrix*
161 *cristata*) is an emblematic example of a species expanding its range in Europe (Mori et al. 2017,
162 2021). The crested porcupine is predicted to colonize mountainous regions in the south of Italy
163 in the future. Here, global warming and the abandonment of traditional agriculture are altering
164 mountain habitats, facilitating the reforestation of many areas (Stanisci et al. 2005, Rogora et
165 al. 2018), thus providing essential shelter for porcupines (Monetti et al. 2005, Lovari et al.
166 2016, Mori and Assandri 2019). Furthermore, decreased snow cover contributes to facilitate
167 the porcupine's range expansion (Mori et al. 2017, 2018). Given that porcupines are considered
168 potentially problematic due to crop damage (Laurenzi et al. 2016), this expansion is
169 noteworthy.

170 Interestingly, the porcupine showed null trapping rates in corridor 2, except for three locations.
171 Specifically in one of these locations, the trapping rate was quite high (0.27 total

encounters/time). This result suggests a potential bias due to the positioning of this camera trap in probable proximity to a den.

Red deer

Red deer estimated density (3.16 ± 0.92 ind/km²) showed similar values to other estimates founded in the literature (Table S4). Mattioli *et al.* 2001 reports a density of 1.72 ind/km^2 in central Italy in 1990, with an increasing trend. The density we estimated is also comparable with the one calculated within the PNALM with the pellet count method (3,8 ind/km² (IF 95% = 3,6-4,2) (Latini 2019).

Roe deer

Roe deer density we estimated (3.41 ± 0.70 ind/km^2) falls within the medium-low range of European densities (0.11-53.80 ind/km^2 according to Melis et al. 2009). We did not find other estimates in the literature that used camera traps data. The lower density in our area can be attributed to the presence of predators such as wolves and bears, which are absent in many other European regions (Melis et al. 2009). For instance, Ticino National Park's favorable conditions and lack of large predators, such as red deer, result in a high roe deer density of 30.7 ind/km2 (De Pasquale et al. 2019). We compared our estimate with a regional estimate, calculated with the pellet count method within the PNALM (Latini 2019). Here, the average density of roe deer is quite low (0.5 ind/km^2 (95% CI = 0.4-0.6)), with higher densities recorded in the peripheral layers, close to our study area. Our estimate would therefore appear to be much higher than that of the nearest protected area. However, we must consider this comparison carefully, as the estimate in the PNALM is an unpublished report and pellet-count has generally low accuracy, especially if compared to any camera trap methodology (Plhal et al. 2014).

195 Red fox

196 Our density (1.27 ± 0.27 ind/km^2), appears to be higher on average than other estimates (Table
197 S4). In Great Britain, in the years 1999-2000, with the faecal counts method, Webbon et al.
198 (2004) estimated a density ranging from 0.21 ind/km^2 (0.05-0.37 CI) to 2.23 ind/km^2 (1.03-
199 3.43 CI) depending on the different landscape strata. Comparing our results with other studies
200 in the Mediterranean area, Jimenez et al. (2019) found similar values in two areas of Central
201 Spain (1.62 (1.03–2.37) ind/km^2 and 0.23 (0.18–0.33) ind/km^2), using camera traps with the
202 capture–recapture (SCR) models and telemetry data. Sarmento et al. (2009) estimated densities
203 of 0.61 (0.54–0.69) ind/km^2 in Portugal using non spatial capture–recapture methods and
204 identifying all individuals by natural marks, while Jimenez et al. (2019) estimated 0.41 (0.21–
205 0.72) ind/km^2 using spatial mark–resight (SMR) in southern Spain.
206 Red fox's density is more than double in corridor 1 compared to corridor 2. Corridor 1 shows
207 a greater degree of anthropization than corridor 2 (albeit minimal), with less proximity to roads
208 and a lower elevation. Red fox, being a generalist species well adapted even to high levels of
209 anthropization, could therefore be favoured by these conditions (Alexandre et al. 2020). In this
210 sense, it is hard to use this density estimate to prove the effectiveness of the corridor area for
211 the red fox. However, our result can still be useful for future studies, especially considering the
212 scarce information present in the area.

213 Wild boar

214 Wild boar density (7.34 ± 1.78 ind/km^2) is similar compared to the other estimates we found
215 in the literature (Table S4). Wild boar is the only species for which we found 19 estimates
216 calculated with the same method (i.e., REM using camera traps) (ENETWILD-consortium et
217 al. 2022). Densities of these 19 European sites ranged from 0.35 ind/km^2 in Biokovo (Croatia)
218 to 15.25 ± 2.41 (SE) ind/km^2 in La Mandria (Italy), while the other Italian site (Valli Maira and
219 Grana alpine district) showed densities of 5.84 ± 2.12 ind/km^2 . Due to their high rate of

220 reproduction, their gregarious nature, their nocturnal activity (Lemel et al. 2003), migration
221 over long distances, and feeding behaviour, the wild boar is a problematic species to develop
222 accurate population estimates compared to other wild-living ungulates (ENETWILD
223 consortium et al. 2018). Regarding the REM application, the main problem is the estimate of
224 the effective detection zone, which could have been biased by considering every time just the
225 closer individual of the group (Guerrasio et al. 2022). However, our estimate may reflect a truly
226 high density of wild boar in the area, considering also the high trapping rate of the species.
227 Wild boar is a species that in recent decades has colonised urban and peri-urban environments,
228 establishing a permanent presence in many European cities, mostly because of an easy access
229 to food sources, a low hunting pressure and an expanding urbanisation into the countryside
230 (Amendolia et al. 2019).

231 Wildcat

232 For the wildcat we could only estimate the density in the entire study area and not for individual
233 corridors, since we had too few observations (only 21 for Corridor 1 and 21 for Corridor 2).
234 Our result (0.43 ± 0.17 ind/km^2) is in line with previous estimates in Europe, showing similar
235 values (Table S4). This is one of the few species for which we found many studies in the
236 literature that estimated densities using camera traps. Anile et al. (2014) assessed wildcat
237 density on Etna (Sicily, Italy) using Spatially Explicit Capture-Recapture (SECR) method by
238 camera-trapping (0.32 ± 0.1 ind/km^2), SECR scat-collection (1.36 ± 0.73 ind/km^2) and REM
239 (0.39 ± 0.03 ind/km^2). In particular, the one estimated via REM is close to ours. Two other
240 estimates from the literature can be compared with ours, as both were calculated through the
241 use of camera traps (spatial capture–recapture model) and both in a mountain study area (i.e.,
242 Maronde et al. 2020, Fonda et al. 2022). Those studies estimated 0.26 (95%CI 0.17–0.36)
243 ind/km^2 and 0.35 ± SE 0.12 ind/km^2, respectively.
244 Looking at our estimate and comparing it with the literature, we believe that the use of camera

245 traps, and in particular the application of REM, is a particularly suitable method for estimating
246 the density of elusive and rare species, such as the wildcat (Rowcliffe et al. 2008, Rovero et al.
247 2013).

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