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The Tourist Potential of Hunting Reserves in the Dehesas of Extremadura

El potencial del turismo cinegético en los cotos adehesados de Extremadura

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Abstract

Hunting is a widespread activity in Extremadura, affecting more than 80% of the total regional surface. This practice has become, at present, a major productive activity that generates wealth and employment in rural areas, characterized by population loss, aging and poor economic diversification. In the particular case of Extremadura, a large part of the hunting lands are located in the dehesa, a unique type of ecosystem in the world from which agricultural, livestock, forestry and hunting uses are obtained. In these areas, agrotourism is shown as a complement to agricultural income. In this sense, hunting is an agrotourism resource from which income is obtained. For this reason, this article has analysed the potential of dehesa areas for the development of hunting tourism through the application of geostatistics. This technique has made it possible to obtain very important results, among which are the following: to determine those areas with the greatest potential for the development of this type of tourism, to identify different groups with specific characteristics with respect to the predominance of game species, to represent the presence of tourist places and restaurants near the hunting reserves and, finally, to show the presence of tourist attractions in the study area.

Keywords: Hunting species; Dehesa; Hunting tourism; Sustainable development; Spatial statistics.

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Resumen

La caza es una actividad muy extendida en Extremadura, que afecta a más del 80% de la superficie total regional. Esta práctica se ha convertido, en la actualidad, en una importante actividad productiva generadora de riqueza y empleo en zonas rurales, caracterizadas por la pérdida de población, el envejecimiento y la escasa diversificación económica. En el caso particular de Extremadura, gran parte de los terrenos cinegéticos se encuentran en la dehesa, un tipo de ecosistema único en el mundo del que se obtienen aprovechamientos agrícolas, ganaderos, forestales y cinegéticos. En estas zonas, el agroturismo se muestra como un complemento a la renta agraria. En este sentido, la caza es un recurso agroturístico del que se obtienen rentas. Por este motivo, en este artículo se ha analizado el potencial de las zonas de dehesa para el desarrollo del turismo cinegético mediante la aplicación de la geoestadística. Esta técnica ha permitido obtener resultados muy importantes, entre los que destacan: determinar aquellas zonas con mayor potencial para el desarrollo de este tipo de turismo, identificar diferentes grupos con características específicas en cuanto al predominio de especies cinegéticas, representar la presencia de lugares turísticos y restaurantes próximos a los cotos de caza y, por último, mostrar la presencia de atracciones turísticas en el área de estudio.

Palabras clave: Especies de caza; Dehesa; Turismo cinegético; Desarrollo sostenible; Estadística espacial.

1. Introduction

Until recently, hunting has not been part of land use planning policies. Despite this, it is one of the main uses of natural resources in rural areas, along with agriculture, livestock and forestry (Neuman, y otros, 2022). Against this backdrop, hunting has become an economic resource that generates significant profits on a global scale. For this reason, the economics of hunting has been a subject addressed in different countries, a common element being the importance of the figures in developed countries such as the United States (U.S. Fish and Wildlife Service, 2016), France, Italy, Germany (Middleton, 2015), the United Kingdom (PACEC, 2014) and Spain (Andueza et al., 2018). In this sense, the global figure of 16,000 million euros of direct economic repercussion of hunting activity in Europe is increased by other benefits that are difficult to measure economically, such as cultural and heritage aspects, the promotion of tourism, volunteering for habitat and wildlife conservation and other activities that are difficult to value (Middleton, 2015). In Extremadura, the economic impact of hunting is estimated at 385 million euros (Gallardo et al., 2019). Therefore, hunting is seen as an activity that contributes to the development of rural areas (Lindsey, Roulet, &Romanach, 2007; Wall & Child, 2009; Matilainem, Keskinarkaus, & Törma, 2016), in a context of demographic regression and ageing, and to the conservation of game species, habitats and wildlife, provided that there is a sustainable management programme (Naidoo et al., 2016; Muphosi, Gandiwa, Bartels, & Makuza, 2016; Mbaiwa, 2018). This requires that the conservation of ecosystems and biodiversity is ensured and that net economic benefits are generated which in turn create relevant incentives (Wall & Child, 2009). The economic importance of hunting in Extremadura is determined by the high number of people who hunt. Statistics show that the number of hunting licences issued to residents in Extremadura in 2018/19 stood at 32,675 (Gallardo et al., 2020). To this number should be added a further 6,595 that were issued to hunters not resident in the region. A percentage of these hunters, especially those coming from outside the region, practice hunting tourism in Extremadura, which is considered one of the main hunting destinations in Spain (Andueza et al., 2018). The attractions of this autonomous community as a hunting destination are related to aspects as varied as a well preserved territory,

diversity of species, network of rural accommodation, good road accessibility, network of specialised hunting companies and unique hunting modalities.

In a global context, hunting tourism is a market segment that has experienced growth in recent decades (Rengifo, 2008) and is being researched at the level of countries and geographical areas such as Canada (Moghimehfar, Harwhaw, & Foote, 2017), Czech Republic (Kroupová, Naurátif, Picha, & Hasman, 2014), Finland (Matilainem, Keskinarkaus, & Törma, 2016), Romania (Oltean & Gabor, 2021), Turkey (Yayla, Yayla, & Günay Aktas, 2020), Spain (Rengifo-Gallego, 2009; Barceló, Seguí, &Rengifo, 2017); and Sub-Saharan Africa (Mamboleo, 2022).

The conception of hunting as an economic resource and generator of wealth has led to the introduction of measures for the management of its species and habitats, making it a very important mechanism for environmental conservation (Martínez-Garrido, Sánchez-Urrea, & Torija-Santos, 2010). This role played by hunting is recognised by numerous authors and research works (Rengifo, 2010; Heffelfinger, Geist & Wishart, 2013; Nelson, Lindsey, & Balme, 2013). Among the actions carried out by (Nelson, Lindsey, & Balme, 2013) hunters and game managers in terms of environmental management, the installation of drinking and feeding troughs, habitat improvement, population control, introduction of sanitary measures, selective control, etc. can be identified (Rengifo, 2010; Martín-Delgado, Rengifo-Gallego, & Sánchez-Martín, 2019).

A large part of these hunting grounds is located on pasture lands in Extremadura, which currently present certain problems in terms of their productive efficiency (De Muslera-Pardom & Cruz-Guzmán, 2011). In this scenario, these areas need the development of emerging activities that contribute to their economic diversification, since, due to their anthropic nature, the continuity of the rational use of their natural resources is essential to ensure their conservation over time (Leco-Berrocal, Pérez-Díaz, & Rodríguez-Mateos, 2008).

In this respect, the use of the hunting resource, with a view to promoting hunting tourism, could contribute to economic diversification, to complement agricultural income and maintain this type of cultural landscape. For this reason, and in the absence of research to determine the potential of the hunting grounds located in the dehesa habitat, the aim of this study is to delimit their distribution and analyse their hunting potential in Extremadura by applying spatial statistics.

2. Materials and Methods

2.1. Study area

Extremadura is an autonomous community geographically located in Spain and formed, at the same time, by two provinces: Cáceres and Badajoz. In Extremadura you can hunt in more than 3,300 hunting grounds covering more than 80% of its territory. This surface importance is also present on a national scale, as Spain is a country with a great hunting tradition. Therefore, if this high percentage is considered, it can be deduced that the hunting preserves in Extremadura are distributed over all types of landscape domains (Table 1), which in turn include 34 types and 314 landscape units (Mateos-Martín, 2015). Numerous habitats are distributed over these landscape domains, in which six big game species and more than 20 small game species are distributed. One of the most representative habitats is the dehesa, a singular and unique ecosystem in the south-west of the Iberian Peninsula, included in Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora with code 6.310 (Comunidades europeas, 1992). In

all of them, livestock farming is combined with agricultural, forestry and hunting uses, to which we should recently add those with an agritourism component (Sánchez-Martín, Blas-Morato, & Rengifo-Gallego, 2019).

Table 1. Landscape domains.

DOMAIN	AREA (km²)
Plains and peneplains	17,099
Sedimentary basins and floodplains	10,492
Saws	8,191
Piedemontes	2,308
Mountains and theirfoothills	2,062
River banks and river valleys	1,507

Source: own elaboration based on Mateos-Martín (2015).

About hunting reserves in Extremadura, it should be noted that there are different typologies, as described in the current law 14/2010 (Boletín Oficial del Estado Nº314, 2010), which can be grouped into two blocks according to their economic and social interest (Table 2):

- Private hunting preserves, where the main purpose is the exploitation of hunting resources for private or commercial purposes. Within these, a distinction is made between different subcategories (Lindsey, Roulet, & Romanach, 2007) according to the type of exploitation, together with other aspects. Thus, current legislation recognises the existence of extensive small game reserves, those where the presence of small game species is predominant; small game plus wild boar, where wild boar may be hunted in addition to small game species; intensive small game reserves, defined as those where a greater number of hunting days are spent. Finally, big game reserves can be distinguished as extensive or intensive, depending on how they are exploited; and open or closed, the latter being considered as those where more than 50% of the surface area has some kind of enclosure that prevents big game species from leaving:
- Social hunting grounds, managed by hunting associations whose main purpose is to facilitate access to hunting for all members on a nonprofit basis.

Table 2. Typologies of hunting grounds.

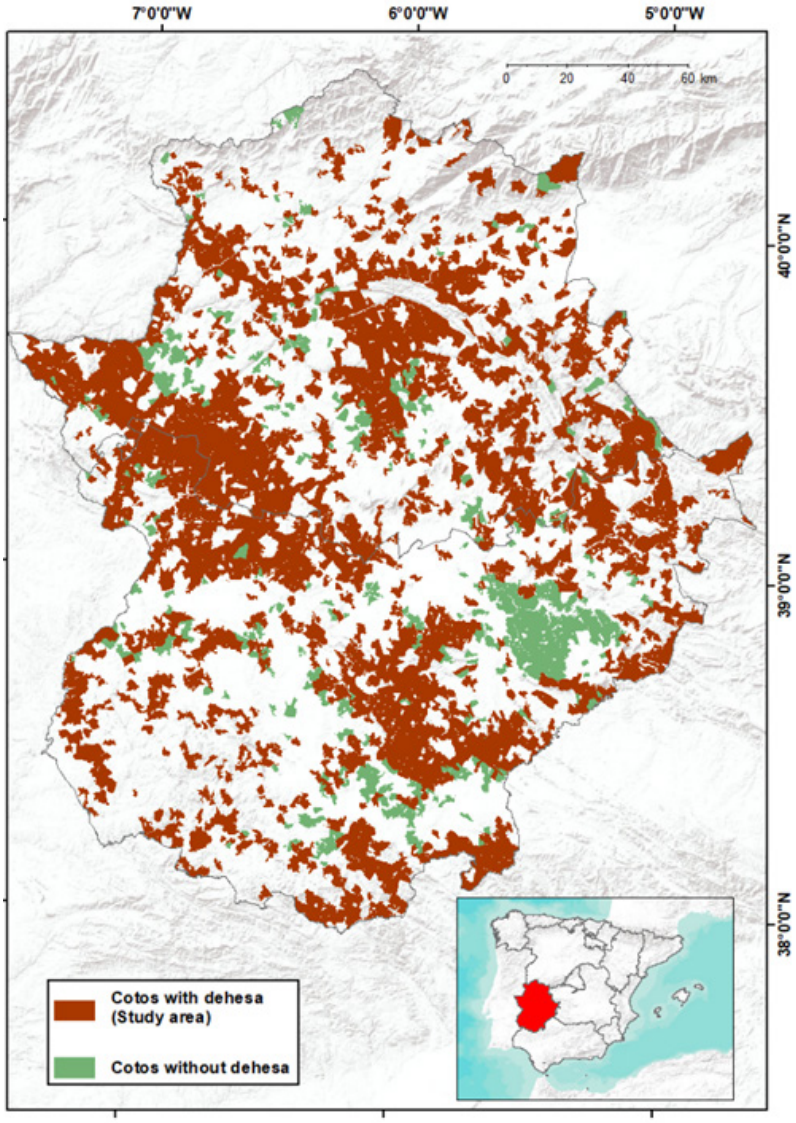
CATEGORY	SUBCATEGORY	SURFACE AREA (HA)	%
Social Hunting Preserves		1,681,470	50.10
PrivateHunting Preserves	Minor Extensive	577,282	16.78
	Intensive Minor	334,515	9.72
	Minor plus wild boar	100,494	2.93
	Open major	531,895	15.46
	Higher open more intensive of lower	31,428	0.91
	Major closed	167,728	4.87
	Higher closed more intensive of lower	7,689	0.23
	Total private reserves	1,751,031	50.90

Source: (Federación Extremeña de Caza, 2021)

The percentage of surface area covered by each of the two blocks of hunting reserves is very similar (49.10% and 50.90%), hence, in private reserves, an important economic activity is generated that has repercussions on the rural environment, because of the hunters' expenditure.

In relation to this article, the territorial framework of reference is that comprised by the private hunting reserves located within the dehesa areas. These reserves are characterised by the quality of the natural environment, as the dehesa is a unique ecosystem that has been created by man through interventions on the Mediterranean forest with the aim of obtaining agricultural, livestock, timber and hunting uses (Figure 1).

Figure 1. Distribution of dehesa areas and private hunting reserves.



Source: Dehesa (SITEX, 2017); Cotos (SITEX, 2020).

These environmental attributes are a competitive advantage for hunting reserves located in dehesas, from the point of view of demand, especially among nonresident hunters in Extremadura. The data reflected in the Table 3 above are indicative of the extensive territorial framework under study, as shown in Figure 1. The figures also show that the number of hectares occupied by private big game and small game preserves is very similar (47.2% and 52.8%).

Table 3. Data on the geographic area under study.

TYPE OF PRESERVE	PROVINCE	Number of hunting preserve in dehesa located	Surface área (ha)
Private Big Game Hunting	Cáceres	503	457,302
	Badajoz	301	263,023
Private Small Game Hunting Preserves	Cáceres	578	331,615
	Badajoz	809	473,301
Total		2,191	1,525,241

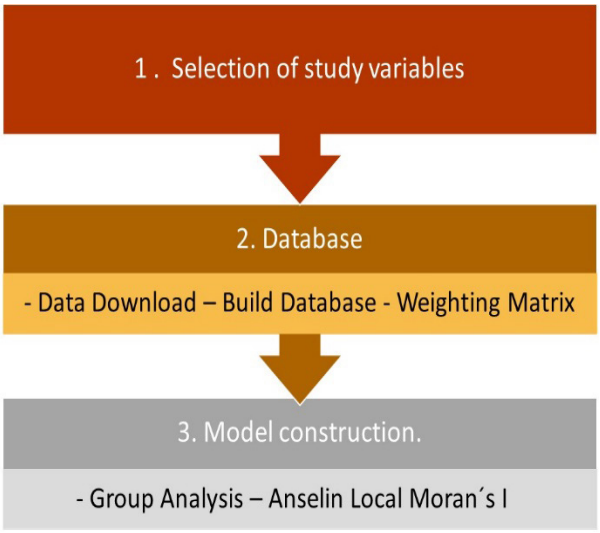
Source: prepared by authors.

2.2. Methodological process.

The methodological process carried out in this research has the following outline:

- Selection of study variables.
- Construction of the database and weighting matrix.
- Application of spatial statistical techniques, specifically, cluster analysis and Moran's I hot spot analysis to delimit those areas with potential for the development of hunting tourism. Likewise, Geographic Information Systems were used for the construction of the thematic cartography that allowed to know the disposition.

Figure 2. Methodological process.



Source: Prepared by authors.

2.2.1. Selection of study variables, construction of the database and weighting matrix.

The unit of analysis taken as a reference for the development of this research has been the private hunting reserve located in dehesa, in order to determine the potential of these spaces for the development of hunting tourism. For this, the presence of game species is fundamental, as they are the main resource for the development of hunting tourism. For this reason, game species are one of the main variables to be studied. Consultation of the specific bibliography on hunting has made it possible to determine the following as the main species of interest for hunting tourists

in Extremadura (*Álvarez*, Coca, & Hernández, 2007; Rengifo-Gallego, 2009): Capra pyrenaica, Capreolus capreolus, Dama dama, Cervus elaphus, Sus scrofa and Alectoris rufa. At the same time, these species have different economic values, as described in the current legislation. Thus, in order to delimit those areas with a higher aggregate of species with high economic values, a weighting matrix has been carried out. In this way, a range of values from 0 to 4 was established, which are assigned in Table 4, according to the economic valuations indicated for each species in the ORDEN of 27 March 2020 General de Vedas de Caza for the 2020/2021 season (Official Document of Extremadura (DOE) Nº63).

Table 4. Weighting of hunting species according to economic value.

SPECIES	ECONOMIC VALUE		WEIGHTING
Capra pyrenaica (Mountain goat)	Male	20,483.92€	4
	Female	924.36€	
Capreolus capreolus (Roe deer)	Male	3,413.99€	3
	Female	924.36€	
Dama dama (Fallowdeer)	Male	3,413.99€	3
	Vareto	554.62€	
	Female	198.59€	
Cervus Elaphus (Deer)	Male	3,413.99€	3
	Vareto	554.62€	
	Female	198.59€	
Sus Scrofa (Wild boar)	1,022.96€		2
Alectoris rufa (Red partridge)	67.79€		1
Does not contain significant species			0

Source: prepared by the authors based on data extracted from the closed season order (Documento Oficial de Extremadura (DOE) Nº63).

On the other hand, taking into account that the species are distributed irregularly throughout the territory because each of them inhabits areas with different physical characteristics depending on the availability of food, climate, altitude, etc., it is decided delimit the most representative land covers in the study area, using as surface criteria those that cover more than 100,000 ha and thus be able to determine which are the predominant land covers in the territories in which each of these species inhabits. Following this reasoning, the land covers used for the analysis were rainfed crops, irrigated areas, areas with sclerophyllous vegetation, hardwood forests, natural pastures, and agroforestry systems. Variables related to altitude and hydrography were also introduced.

On the other hand, for hunting tourism to be carried out in rural areas, these must have a series of basic infrastructures. For this reason, lodging and restaurants located at an optimum distance that allows transport from these infrastructures to the hunting area were added as study variables. Specifically, those located within the hunting area itself and those located at distances of 5, 10 and 15 kilometers were selected. In addition, due to the interest of hunting tourists in activities other than hunting during their trips (Martín-Delgado, Rengifo-Gallego, & Sánchez-Martín, 2019), it was decided to determine which of these areas also have the following tourist attractions: Sites of Cultural Interest (including historic sites) and protected areas. All these variables were integrated into a database that has been the main source of this research.

These study variables were extracted from different sources of information described in Table 5.

Table 5. Sources of information used.

SOURCE	DATA	DATE
Directorate General of Tourism (Regional Government of Extremadura)	Lodging (Junta de Extremadura (Dirección General de Turismo)	2021
	Restaurants (Junta de Extremadura (Dirección General de Turismo)	2021
Territorial Information System of Extremadura (Regional Government of Extremadura)	Hunting preserves	2020
	Dehesa	2020
	Historic Sites	2019
Consejería de Agricultura, Desarrollo Rural, Población y Territorio (Orden de Vedas, 2021)	Economic value of game species	2020
Regional Government of Extremadura	Assets of Cultural Interest(Junta de Extremadura)	2019
National Geographic Institute	Digital Terrain Model	2020
	Hydrographic network	2020
	Corine LandCover	2018
Minister of Ecological Transition and Demographic Challenge	Nature Data Bank (Ministerio de Transición Ecológica y)	2016
	Network of Protected Natural Spaces (Demográfico)	2021

Source: prepared by authors.

2.2.2. Study techniques.

The main technique used was spatial statistics, specifically, the use of cluster analysis and hot spot analysis tools (Anselin Local Moran's I). In the first case, the use of this tool allows the grouping of areas that present similar values of the different study variables (Deng, Liu, Cheng, & Shi, 2011; Zhu, Yang, Di, Zheng, & Zhang, 2020) and that, at the same time, are different from the rest of the study area. Although this technique provides different types of analysis, with or without spatial restriction, in this case it was decided to use spatial restriction because the distribution of the different game species is undoubtedly territorial in nature. Specifically, the Delaunay Triangulation option was selected, which consists of the grouping of different entities, in this case, polygonal that present similar values within the study area and that differentiate them from the rest of the groups (ESRI, 2021). This technique has been used in other studies aimed at detecting spatial groups with specific characteristics (French, 2020; Shen, 2021). The results obtained after the application of this tool make it possible to obtain an optimal number of differentiated groups in the study area that present similar characteristics. This optimal number of groups was obtained after calculating the F-Statistics Index using the following formula:

$$R^2 = ((SST-SSE))/SST$$

In this equation, SST represents the total sum of the observed squares of the variables analysed and determines the differences between groups; and SSE is the sum of the explanatory squares identifying the areas with similar values.

On the other hand, given the economic value that game species have acquired nowadays, it was decided to analyze whether there is spatial autocorrelation in the presence of game species with higher economic value. Thus, the following situations may occur:

- Positive spatial autocorrelation: there is a grouping of areas with similar characteristics with respect to a study variable.

- Negative spatial autocorrelation: occurs when geographically close regions have different characteristics on a variable.
- No spatial autocorrelation: this case is generated when the data are randomly distributed over the territory.

To measure spatial autocorrelation there are different global and local indicators, using in this study Moran's I Index (global) and Anselin's cluster and outlier analysis (LISA), taking the inverse distance as the neighborhood criterion, since this allows determining those areas that are closest to each other and contain similar values.

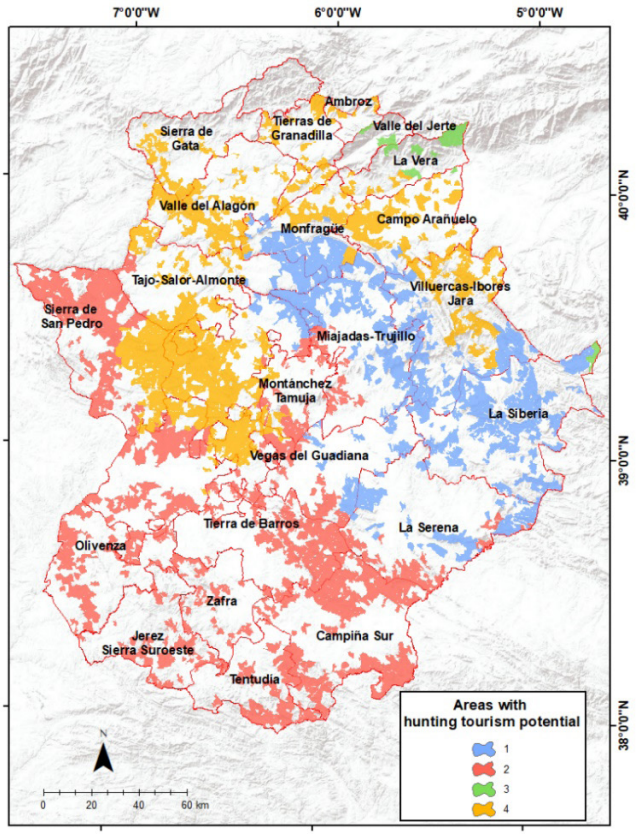
3. Results

3.1. Group analysis: Delaunay triangulation

The application of the group analysis technique has made it possible to obtain a series of hunting grounds with different characteristics in terms of the arrangement of game species, as well as the physical characteristics of the land in which they are located. Specifically, the application of the F-Statistics Index has made it possible to detect four groups in the study area that present similar values at different points in the area. Thus, some of these areas have the presence of all the species analysed, while in others, the predominance of a single species has been detected.

Figure 3 shows the geographic location of each of these areas defined as areas with potential for the development of hunting tourism, since every one of them has species considered of interest to hunting tourists.

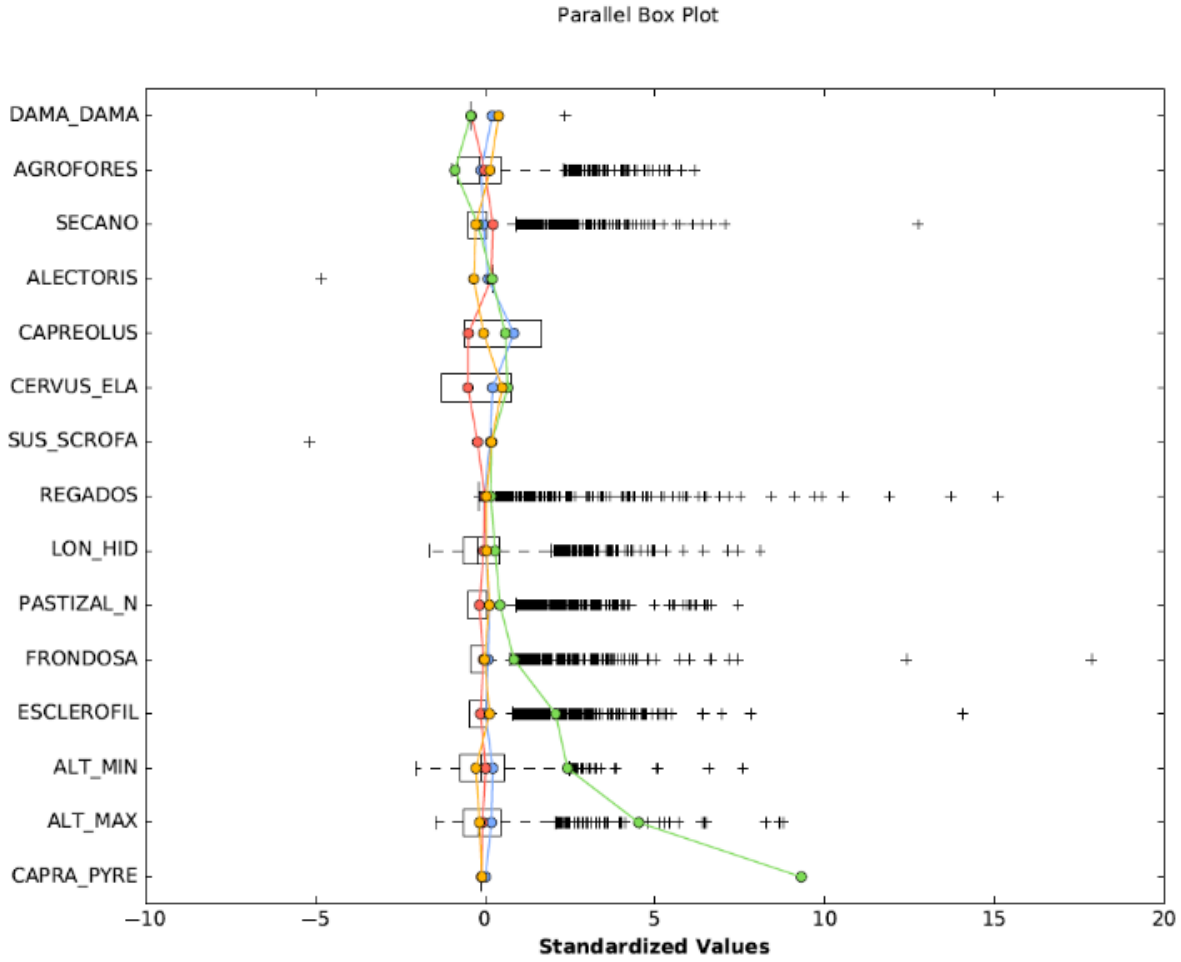
Figure 3. Grouped Zones.



Source: prepared by authors.

The box plot shows the trend of the standard deviation of each study variable in the groups detected (Figure 4). It can be seen how, in general, these variables have similar values in the different groups, except for the one represented in green, and which refers to Group 3 in the cartography. This situation is due to the physical characteristics of the grassland hunting reserves in Group 3. These data demonstrate the notable spatial connotations of the variables analysed.

Figure 4. Box plot of standard deviations of study variables.



Source: prepared by authors.

Table 6 shows the notable differences observed with respect to the incidence of each of the species analysed, as well as the total number of hunting grounds in the different groups. Among the main results, the high incidence of practically all the species analysed in groups 1, 3 and 4 stands out. This situation does not occur in the case of Group 2, where only three species appear, with the presence of deer being very low (37.5%). Despite this, the representativeness of each of these species is different in each of the groups detected. Therefore, it is necessary to know their characteristics.

Table 6. Incidence of each species in the reserves that make up the groups.

GROUP	SPECIES	NUMBER OF PRESERVES	% COUNTS
1	*Capra pyrenaica*(Mountain goat)	7	1.2
	Capreolus capreolus(Roe deer)	364	64.0
	Dama dama (Fallowdeer)	130	22.9
	Cervus elaphus(Deer)	413	72.7
	Sus scrofa(Wild boar)	563	99.1
	Alectoris rufa (Red partridge)	555	97.7
	Total	568	
2	*Capra pyrenaica*(Mountain goat)	0	0.0
	Capreolus capreolus(Roe deer)	46	4.9
	Dama dama (Fallowdeer)	7	0.7
	Cervus elaphus(Deer)	351	37.5
	Sus scrofa(Wild boar)	863	92.2
	Alectoris rufa (Red partridge)	931	99.5
	Total	936	
3	*Capra pyrenaica* (Mountain goat)	17	100.0
	Capreolus capreolus (Roe deer)	9	52.9
	Dama dama (Fallowdeer)	0	0.0
	Cervus elaphus (Deer)	16	94.1
	Sus scrofa (Wild boar)	17	100.0
	Alectoris rufa (Red partridge)	17	100.0
	Total	17	
4	*Capra pyrenaica* (Mountain goat)	1	0.1
	Capreolus capreolus (Roe deer)	165	24.6
	Dama dama (Fallowdeer)	198	29.5
	Cervus elaphus (Deer)	579	86.4
	Sus scrofa (Wild boar)	669	99.9
	Alectoris rufa (Red partridge)	598	89.3
	Total	670	

Source: prepared by authors.

3.1.1. Group 1.

This group is made up of a total of 568 preserves, representing 26.8% of the study sample. One of the main characteristics that determine its existence is the presence of all the hunting species analysed, although in some cases this is scarce. This situation is observed in the *Capra pyrenaica* (0.01) and the *Dama dama* (0.23), while the rest of the species are represented in more than 60% of the reserves that make up this group. On the other hand, with respect to the physical characteristics of the predominant habitats, the following can be determined:

- High differences between the minimum altitude (213 m) and the maximum altitude (1122 m).
- Predominance of the agroforestry system, with an average value of 262 hectares. This scenario is logical when considering that the reserves analysed are located in pasture areas where the combination of agroforestry activities prevails.
- The remaining uses are of lesser importance, the most representative being natural pastures, sclerophyllous vegetation, hardwood forests, as well as rainfed crop.

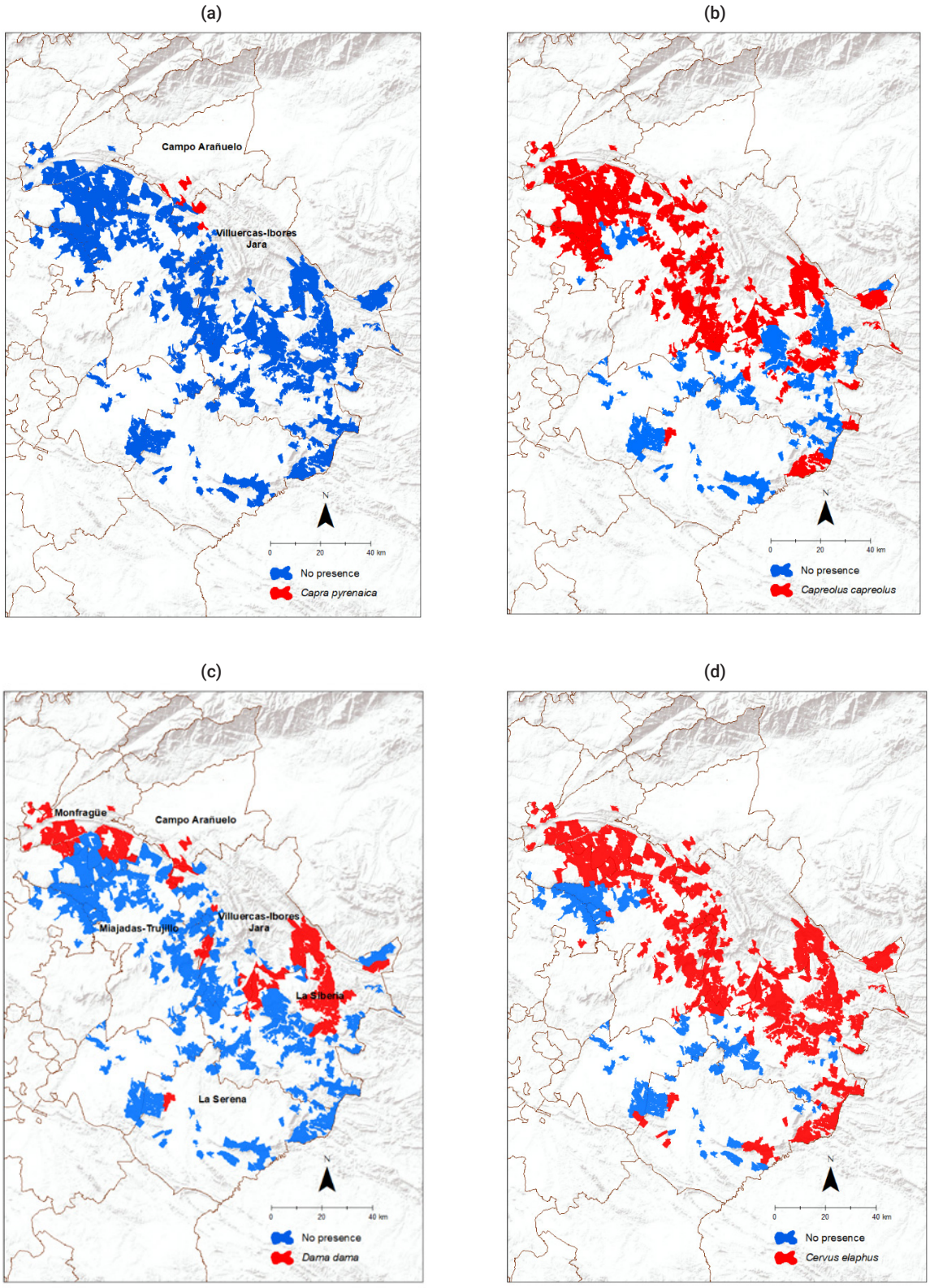
Table 7. Results obtained Group 1.

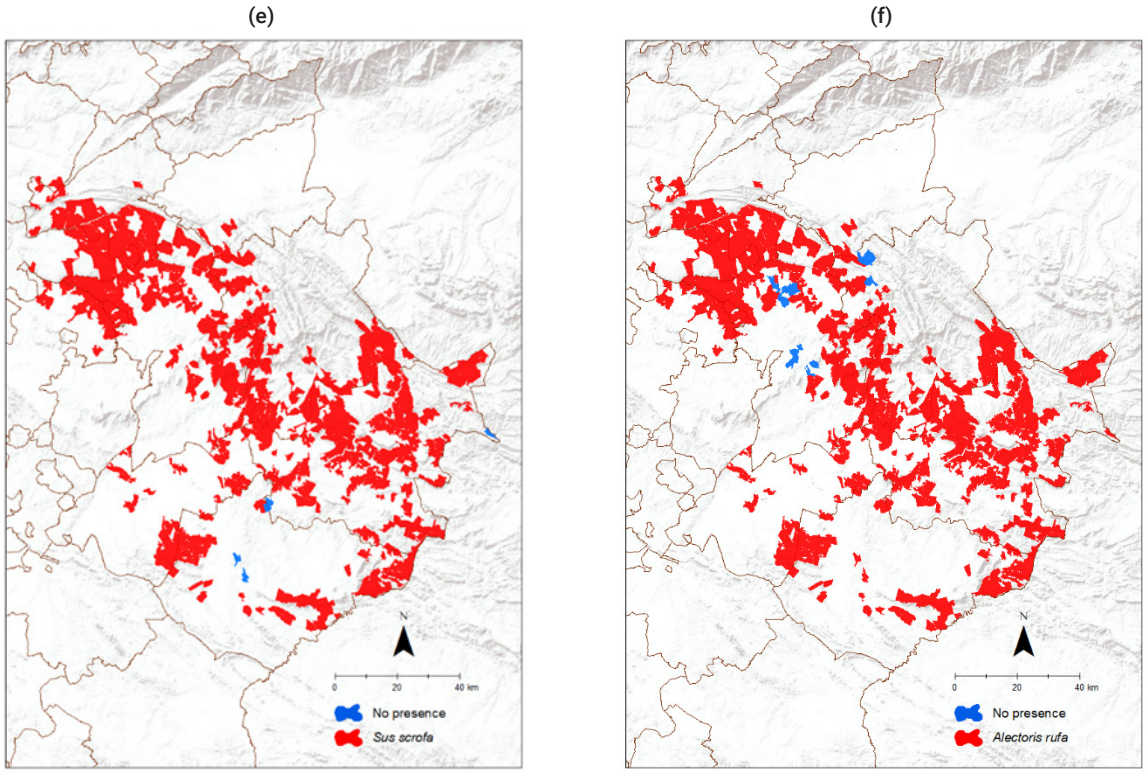
VARIABLE	MEAN	STANDARD DESVIATION	MIN.	MAX.	SHARE
Capra pyrenaica (Mountain goat)	0.01	0.11	0.00	1.00	1.00
Capreolus capreolus (Roe deer)	0.64	0.48	0.00	1.00	1.00
Dama dama (Fallowdeer)	0.23	0.42	0.00	1.00	1.00
Cervus elaphus (Deer)	0.72	0.44	0.00	1.00	1.00
Sus scrofa (Wild boar)	0.99	0.09	0.00	1.00	1.00
Alectoris rufa (Red partridge)	0.97	0.15	0.00	1.00	1.00
Maximum altitude	528.25	165.34	248.71	1,122.16	0.40
Minimum a ltitude	368.98	93.92	213.78	725.93	0.47
Hydrographic length	17,168.63	11,169.83	0.00	101,102.92	1.00
Agroforestry system	262.59	265.07	0.00	1,914.00	0.89
Natural pastures	80.03	53.30	0.00	1,001.00	1.00
Sclerophyllous	76.48	179.75	0.00	2,259.00	1.00
Hardwoodforest	68.53	127.11	0.00	983.00	0.41
Rainfedcrops	57.61	116.97	0.00	783.00	0.46
Irrigatedland	10.20	50.44	0.00	604.00	0.60

Source: prepared by authors.

After this analysis, it has been possible to appreciate the scarce presence in this group of some of the hunting species taken as a reference in this study. Given this scenario, it is interesting to determine the geographic distribution of each one of them (Figure 5). Among the results obtained, the presence of the *Capra pyrenaica* in this territory is striking, considering that its traditional habitat is characterized by the presence of high altitudes (1,200-2,500 m) (Granados, 2001). However, this is very reduced, and it can be observed how its distribution is in nearby geographic areas. These reserves are in small redoubts in the Villuercas-Ibores-Jara region, as well as in the Campo Arañuelo area. According to information provided by the Extremadura Hunting Federation(Federación Extremeña de Caza, 2017) this situation may be due to the introduction of this species in several preserves in the Campo Arañuelo region during 2017, according to data collected in the different technical hunting plans. This scenario may have led to its current expansion into nearby territories. In the case of the *Dama dama*, the second least representative species of this group, it only appears in 23% of the preserves that comprise it. However, unlike the *Capra pyrenaica*, this species is distributed in practically all the regions that make up this group, with a notable presence in the Monfragüe, Siberia and Villuercas-Ibores-Jara areas. The rest of the species studied are widely distributed throughout all the dehesa that appear in Group 1.

Figure 5. Geographical distribution of *Capra pyrenaica* (a), *Capreolus capreolus* (b), *Dama dama* (c), *Cervus elaphus* (d), *Sus scrofa* (e) and *Alectoris rufa* (f) in Group 1.





Source: prepared by authors.

3.1.2. Group 2.

Group 2 is made up of a total of 936 preserves, representing 44.2% of the land comprising the study sample. Despite covering a greater number of reserves than Group 1, in this case the variability of hunting species of interest located in this territory is reduced, where only the *Sus scrofa* and the *Alectoris rufa* are widely distributed. The rest of the species have a testimonial character, with the *Cervus elaphus* being the most important (37%). On the other hand, the results obtained show the nonexistence of Capra pyrenaica due to the physical characteristics of the terrain, which make its presence difficult. In this sense, the average altitudes of these terrains are between 345 and 475 meters. The most representative land cover is the agroforestry system (294 hectares), which is logical, as was the case in Group 1, because all the reserves studied are integrated into pasture landscapes. On the other hand, the incidence of rainfed crops in this territory is noteworthy.

Table 8. Results obtained in Group 2.

VARIABLE	MEAN	STANDARD DEVIATION	MIN.	MAX.	SHARE
Capra pyrenaica (Mountain goat)	0.00	0.00	0.00	0.00	0.00
Capreolus capreolus (Roe deer)	0.05	0.21	0.00	1.00	1.00
Dama dama (Fallowdeer)	0.01	0.08	0.00	1.00	1.00
Cervus elaphus (Deer)	0.37	0.48	0.00	1.00	1.00
Sus scrofa (Wild boar)	0.92	0.27	0.00	1.00	1.00
Alectoris rufa (Red partridge)	0.99	0.07	0.00	1.00	1.00
Maximum altitude	475.52	162.29	193.49	1,068.37	0.44

VARIABLE	MEAN	STANDARD DEVIATION	MIN.	MAX.	SHARE
Minimum altitude	345.73	121.67	115.61	692.09	0.53
Hydrographic length	16,579.91	9,636.79	0.00	94,431.39	0.93
Agroforestry system	294.14	305.07	0.00	2,032.00	0.95
Natural pastures	43.67	93.13	0.00	875.00	0.87
Sclerophyllous	53.48	114.50	0.00	1,075.00	0.47
Hardwoodforest	50.58	135.65	0.00	2,359.00	1.00
Rainfedcrops	92.97	147.44	0.00	1,687.00	1.00
Irrigatedland	12.03	64.57	0.00	903.00	0.91

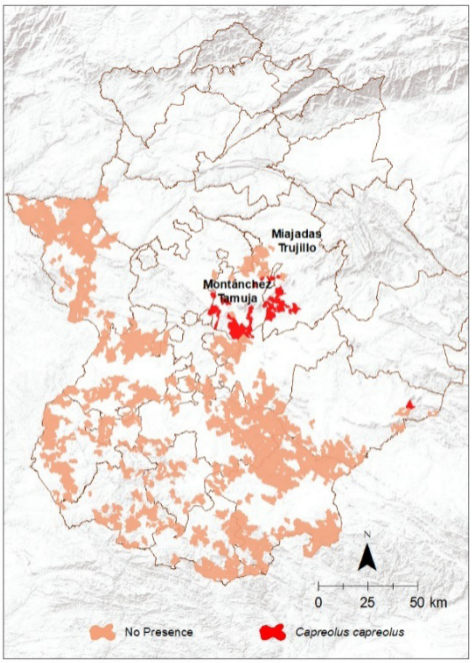
Source: prepared by authors.

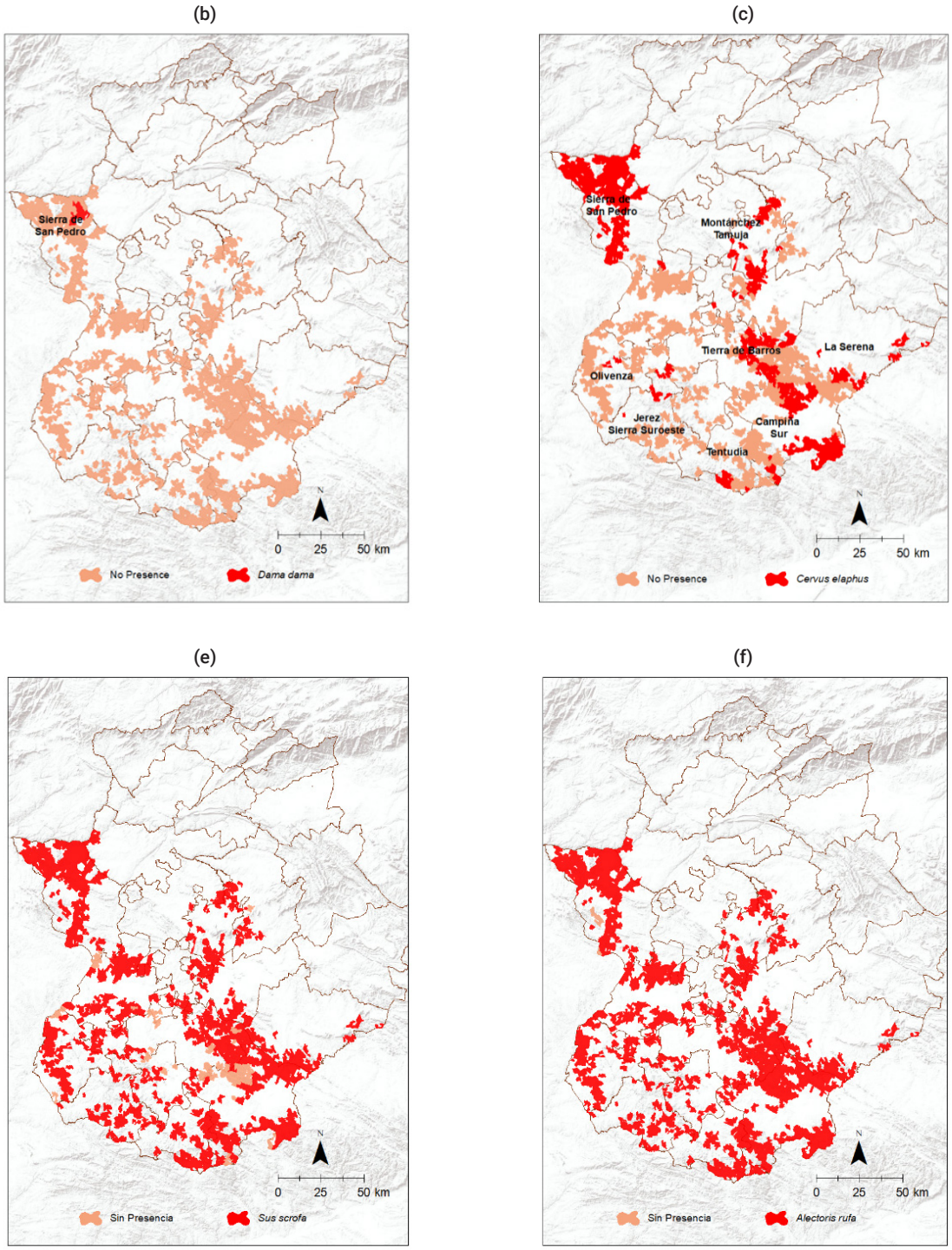
Figure 6 shows the geographic location of the different game species in the study area where the following issues stand out:

- Despite the reduced presence of *Dama dama*, this species is concentrated in the reserves located in the Sierra de San Pedro region, where there is also a high incidence of other species such as *Cervus elaphus*, *Sus scrofa* and *Alectoris rufa*. This scenario is not surprising, considering that this area is characterized as one of the traditional hunting areas in Extremadura (Martín-Delgado, Rengifo-Gallego, & Sánchez-Martín, 2020).
- The presence of the *Capreolus capreolus* is reduced to the Montánchez-Tamuja and Miajadas-Trujillo areas, a situation caused by the expansion that this species has experienced in recent years from its original areas, which were located mainly in the Siberia and Villuercas, Ibores and Jara regions (2*)*.
- Wide distribution of *Sus scrofa* and *Alectoris rufa* throughout the dehesa pastures that make up Group 2.

Figure 6. Geographic location of *Capreolus capreolus*(a), *Dama dama (*b), *Cervus elaphus* (c), *Sus scrofa* (d) and *Alectoris rufa*(e) in Group 2.

(a)





Source: prepared by authors.

3.1.3. Group 3.

Group 3 is characterized by a very small number of dehesa hunting reserve (17), representing only 0.8% of the study sample. This situation can be explained by the fact that this group has very particular physical characteristics that differ from the rest of the territories analysed. Among them is the high altitude present in the area, where maximum altitudes reach values of up to 2,264 meters. This characteristic of the relief conditions the ground cover, resulting in a predominance of sclerophyllous vegetation, hardwood forests and natural grasslands, as opposed to the rest of

the groups, where the agroforestry system was the most common cover. This situation generates an ideal habitat for the presence of the *Capra pyrenaica*. For this reason, this species appears in all the dehesa hunting reserves that make up this group, a situation that is not observed in any other case. On the other hand, together with this species, there are other species with a high level of representation, such as the *Cervus elaphus*, the *Sus scrofa* and the *Alectoris rufa*. The presence of the *Capreolus capreolus* can be observed in slightly more than 50% of the reserves that make up this group, although this is not the traditional habitat in which this species usually lives (Delibes, 1996), its expansion throughout the Extremadura region has led it to colonize these areas.

Table 9. Results obtained Group 3.

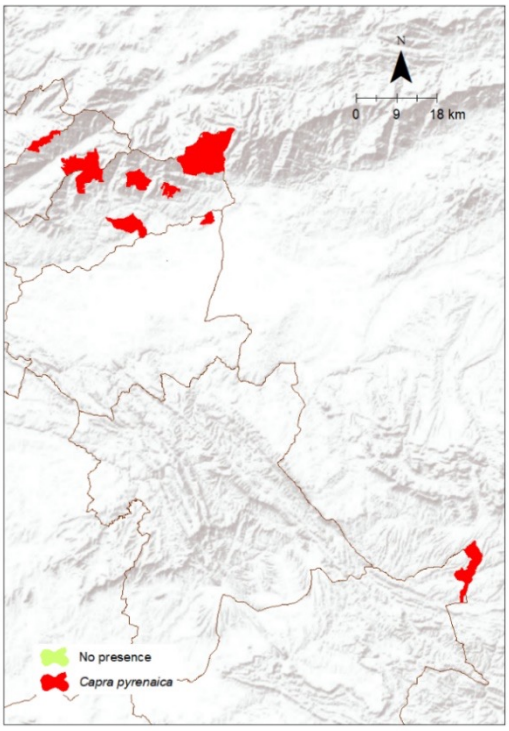
VARIABLE	MEAN	STANDARD DEVIATION	MIN.	MAX.	SHARE
Capra pyrenaica (Mountain goat)	1.00	0.00	1.00	1.00	0.00
Capreolus capreolus (Roe deer)	0.52	0.50	0.00	1.00	1.00
Dama dama (Fallowdeer)	0.00	0.00	0.00	0.00	0.00
Cervus elaphus (Deer)	0.94	0.23	0.00	1.00	1.00
Sus scrofa (Wild boar)	1.00	0.00	1.00	1.00	0.00
Alectoris rufa (Red partridge)	1.00	0.00	1.00	1.00	0.00
Maximum altitude	1,403.20	664.07	373.84	2,264.24	0.91
Minimum altitude	616.37	244.20	248.41	1,197.61	0.87
Length hydrography	20,088.54	10,253.77	1,478.95	41,260.00	0.39
Sclerophyllous	397.11	277.48	69.00	902.00	0.37
Hardwoodforest	166.94	199.91	0.00	796.00	0.33
Natural pastures	119.82	146.77	0.00	489.00	0.49
Agroforestry system	31.52	51.45	0.00	168.00	0.08
Rainfedcrops	36.70	84.20	0.00	291.00	0.17
Permanently irrigatedland	23.35	69.93	0.00	281.00	0.28

Source: prepared by authors.

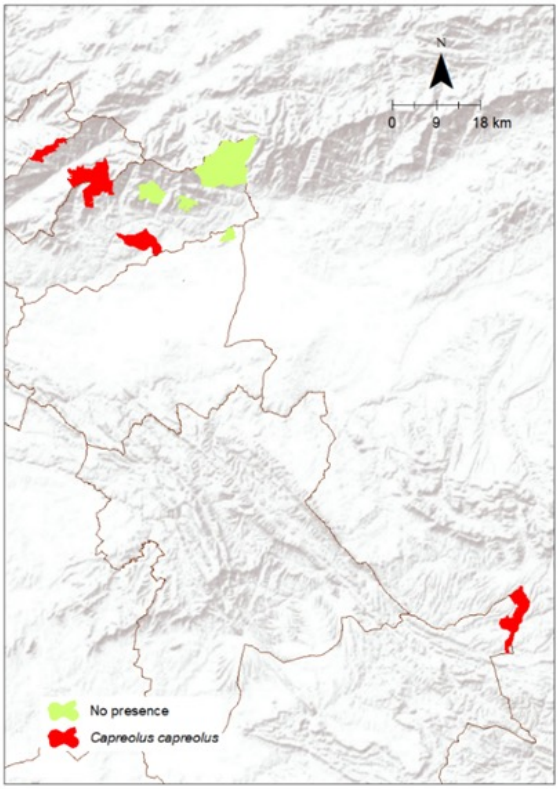
The geographic distribution of this area is mainly related to the foothills of the Sierra de Gredos, an area where the *Capra pyrenaica* is distributed. In spite of the reduced surface representation of this group with respect to the rest, it is necessary to delimit it due to its singularities. The distribution of the species detected in this area is very wide in all the reserves, except for the particular case of the *Capreolus capreolus*, which only appears in 50% of them.

Figure 7. Geographical location of *Capra pyrenaica* (a), *Capreolus capreolus*(b), *Cervus elaphus* (c), *Sus scrofa* (d) and *Alectoris rufa* (e) in Group 3.

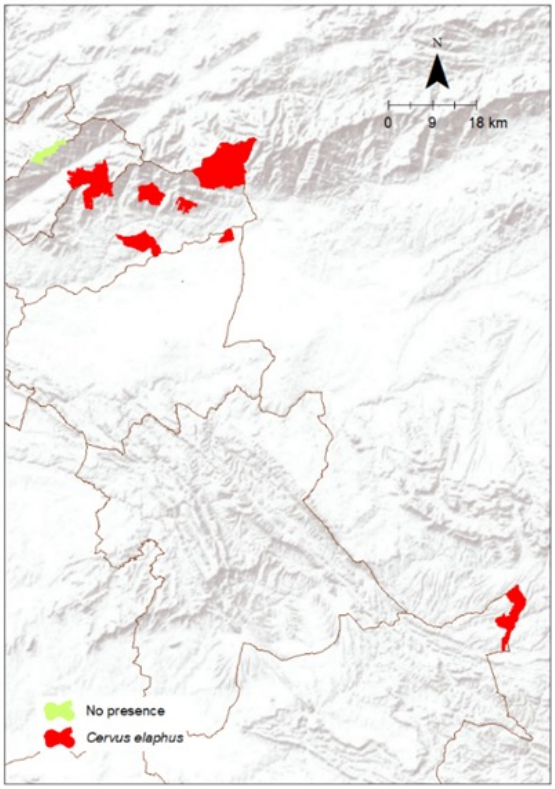
(a)

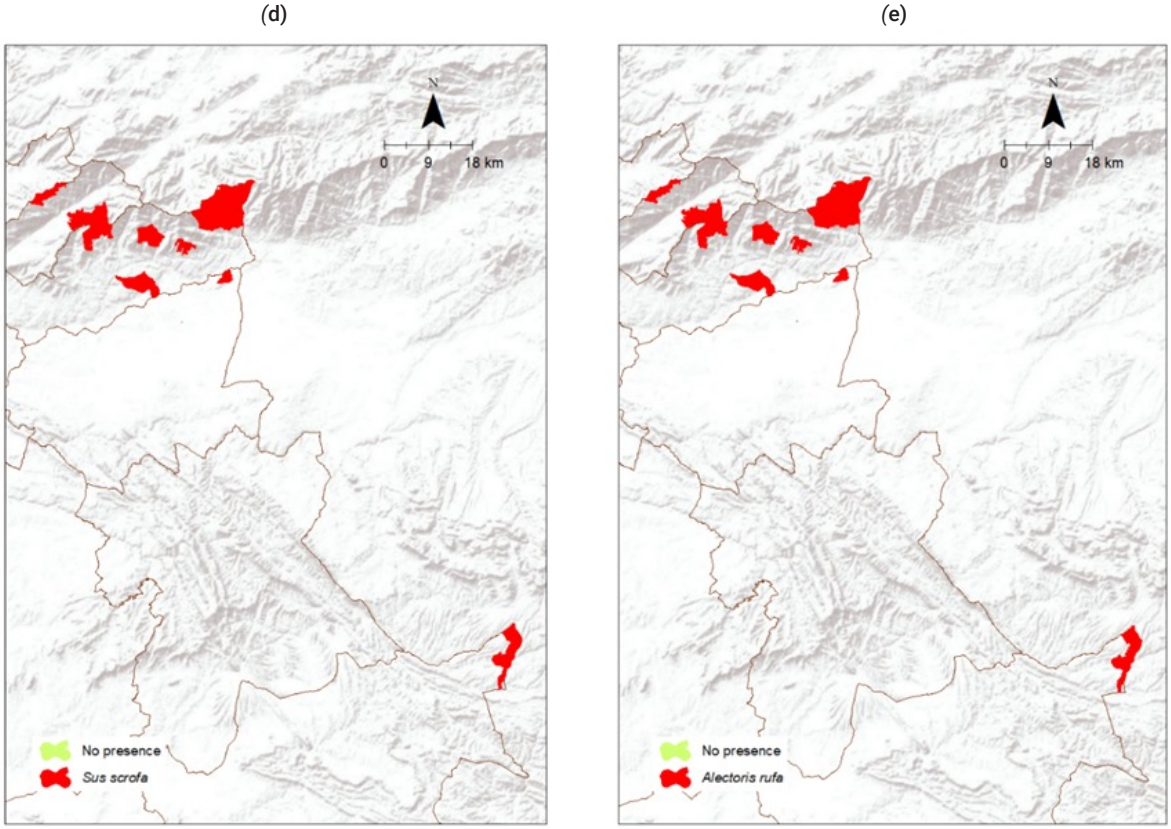


(b)



(c)





Source: prepared by authors.

3.1.4. Group 4.

Group 4 is made up of a total of 670 hunting grounds in pasture areas, representing 31.6% of the study sample. Among other aspects, the great variety of game species present in this territory is noteworthy, although it is worth mentioning that the distribution of the *Capra pyrenaica* is testimonial (1% of the land comprising this group). With a greater presence than this, the *Capreolus capreolus* (25%) and the *Dama dama* (30%) are in a reduced percentage of these hunting reserves, so it is necessary to carry out a more indepth analysis of their geographic location. However, this situation does not apply to the rest of the game species, which are found in most of the areas that make up the group (*Cervus elaphus, Sus scrofa* and *Alectoris rufa*). This diversity of species is the result of the physical characteristics of the territory, where altitudes vary greatly (131 to 1,639 meters). Among these, the presence of land covers linked to the agroforestry system predominates with respect to the rest of the variables (342 hectares). This situation occurs in other groups studied, although in no other case does it reach such a high average.

Table 10. Results obtained in Group 4.

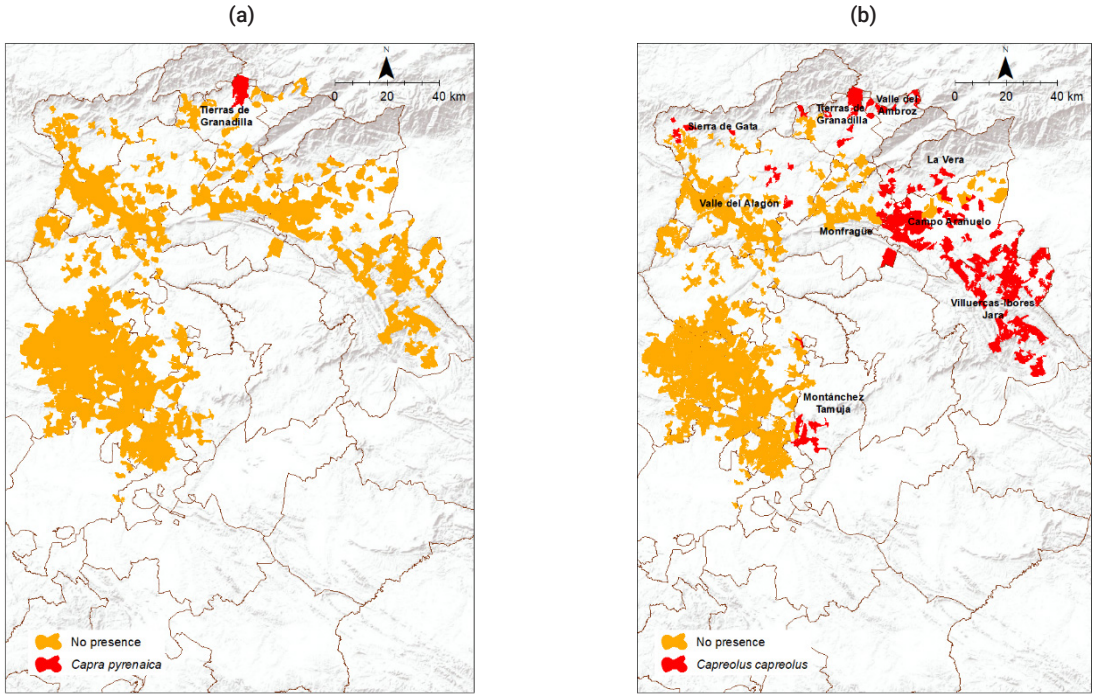
VARIABLE	MEAN	STANDARD DEVIATION	MIN.	MAX.	SHARE
Capra pyrenaica (Mountain goat)	0.01	0.03	0.00	1.00	1.00
Capreolus capreolus (Roe deer)	0.25	0.43	0.00	1.00	1.00
Dama dama (Fallowdeer)	0.30	0.45	0.00	1.00	1.00
Cervus elaphus (Deer)	0.86	0.34	0.00	1.00	1.00
Sus scrofa (Wild boar)	0.99	0.03	0.00	1.00	1.00

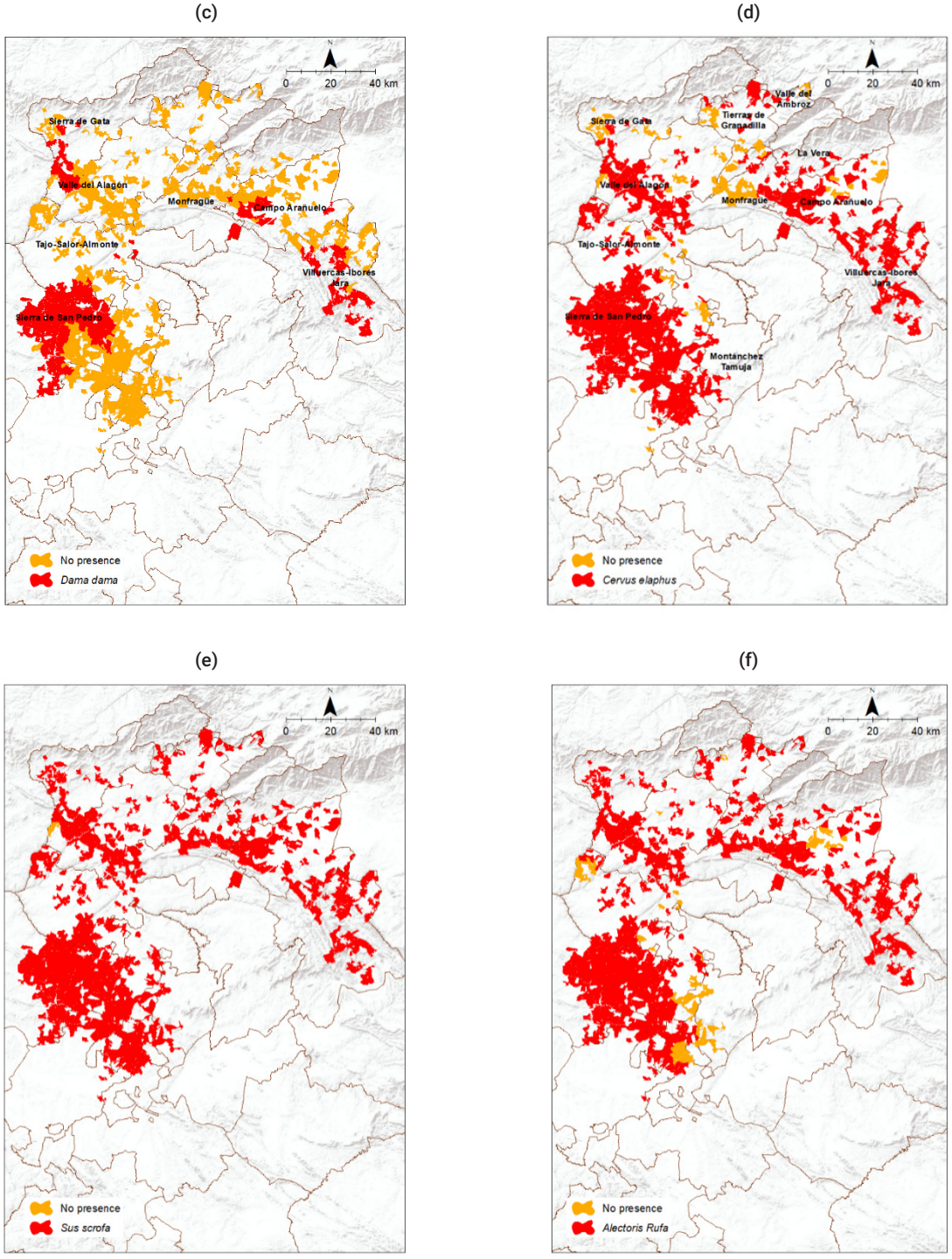
VARIABLE	MEAN	STANDARD DEVIATION	MIN.	MAX.	SHARE
Alectoris rufa (Red partridge)	0.89	0.31	0.00	1.00	1.00
Maximum altitude	457.65	195.40	232.91	1,639.72	0.68
Minimum altitude	313.36	91.06	131.07	914.42	0.72
Length hydrography	17,495.48	10,622.69	313.60	83,746.00	0.82
Agroforestry system	342.26	315.44	0.00	2,150.00	1.00
Sclerophyllous	95.06	166.00	0.00	927.00	0.41
Natural pastures	80.15	133.83	0.00	902.00	0.90
Hardwoodforest	54.95	116.03	0.00	1019.00	0.43
Rainfedcrops	28.70	91.51	131.07	914.42	0.72
Permanently irrigatedland	14.94	75.39	0.00	994.00	1.00

Source: prepared by authors.

Figure 8 shows the geographic distribution of each of the hunting species within the hunting reserves that make up this group. Among the main results obtained, the testimonial presence of the *Capra pyrenaica*, which is limited to a specific area in the region of Tierras de Granadilla, is noteworthy. This may be due to its proximity to the Batuecas, a preferred place for this hunting species. On the other hand, with respect to the *Capreolus capreolus*, this species is distributed throughout different regions that make up this group. In the case of the *Dama dama* it is more representative than in the rest of the groups, covering up to 30% of the reserves that make up this group, especially in the Sierra de San Pedro and Villuercas-Ibores-Jara. The rest of the species are very widespread.

Figure 8. Geographic distribution of *Capra pyrenaica* (a), *Capreolus capreolus* (b), *Dama dama* (c), *Cervus elaphus* (d), *Sus scrofa* (e) and *Alectoris rufa* (f) in Group 4.





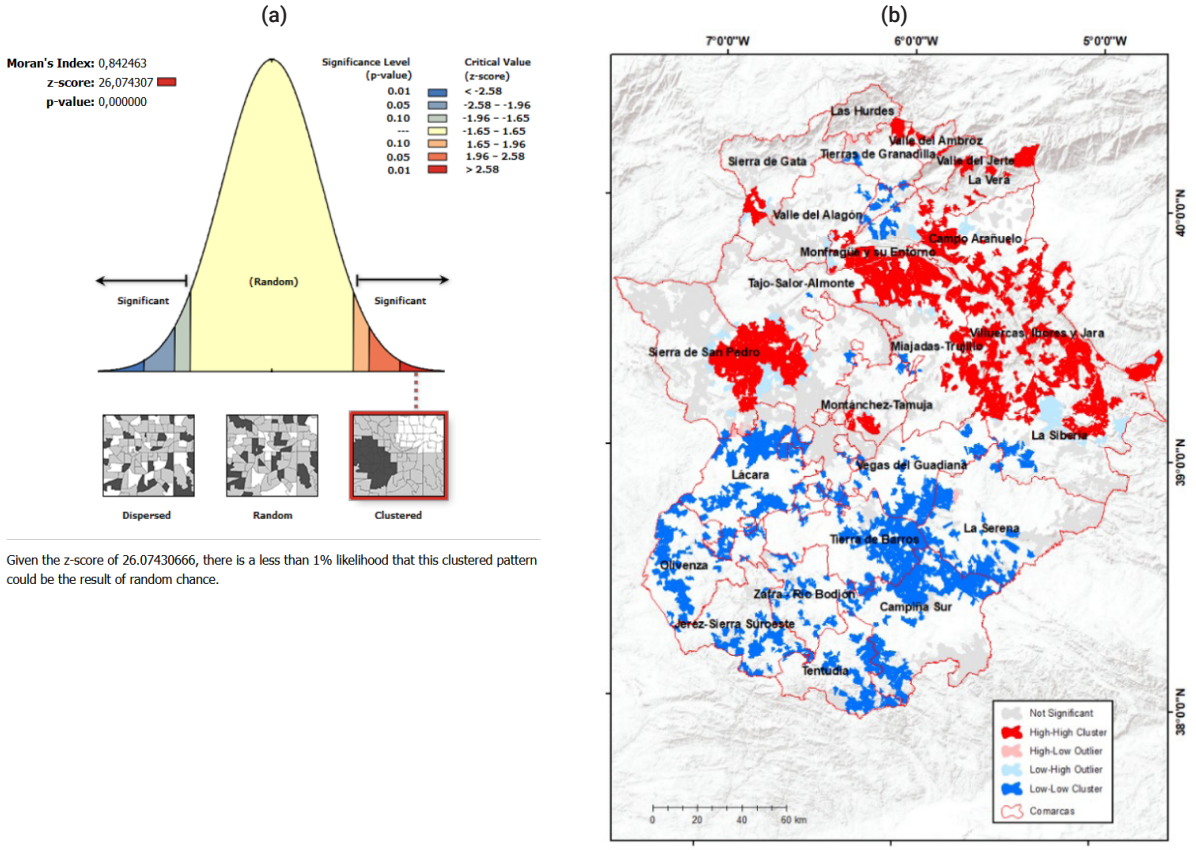
Source: prepared by authors.

3.2. Areas with the greatest economic value for hunting in the enclosed dehesa of Extremadura.

Figure 9 shows the values obtained after the application of the global and local spatial autocorrelation index on the study variable "economic value of the hunting resource". The application of Moran's global index I has allowed us to determine the existence of positive spatial autocorrelation on the distribution of this variable in the study area which, at the same time, presents aggregates in different subsets of the sample. The application of the local LISA index has made

it possible to detect those areas where this phenomenon of spatial concentration of high values occurs, as well as other areas characterized by the presence of low values. In this sense, it can be seen how there are areas where the great variety of hunting species influences the fact that they appear as areas with a high economic value for hunting. These include the districts of Villuercas-Ibores-Jara, as well as the hunting reserves bordering this district with those of Monfragüe and its surroundings, Campo Arañuelo, Miajadas-Trujillo and La Siberia. At the same time, this concentration of high values is also observed in the regions of Sierra de San Pedro, Valle del Jerte and La Vera and those enclosures located at higher altitudes in the regions of Tierra de Granadilla and Valle del Ambroz. On the other hand, in spite of the existence of different hunting species in the rest of the areas, their variety is reduced, and, in some cases, they have little economic value. This situation generates the presence of clusters of low values, mainly in the province of Badajoz. These results agree with the areas established in the previous group analysis, where those areas with a greater variety of hunting species coincide with areas with high economic values, while those with low values coincide with areas where the variety of species is lower.

Figure 9. Economic value of the hunting resource global index (a) and local index (b).



Source: prepared by authors.

3.3. Availability of infrastructures in the hunting reserves

3.3.1. Tourist accommodations

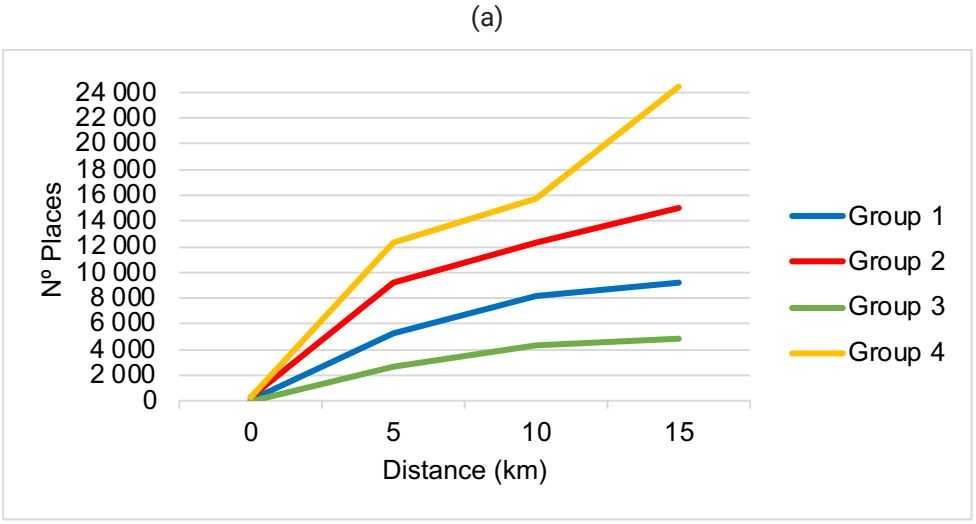
Tourist lodging is the basic infrastructure that allows for the development of tourism in a place, since without it, tourists would not be able to stay overnight. Therefore, it is of interest to determine the presence of lodging in the study area, taking as a reference those that are preferred by

hunting tourists. In relation to the established groups, given that they can be considered hunting destinations differentiated by their characteristics, the presence of lodging is essential for their incorporation into the tourist market. In this sense, the offer of the hunting destination would be made up of the hunting grounds, spaces that host the different species of game, together with the tourist facilities and basic infrastructures that allow accessibility. Furthermore, as hunting tourism works like any other segment of the tourism market, it is necessary to have companies that connect supply and demand, whose purpose is to provide services aimed at satisfying the needs of consumers.

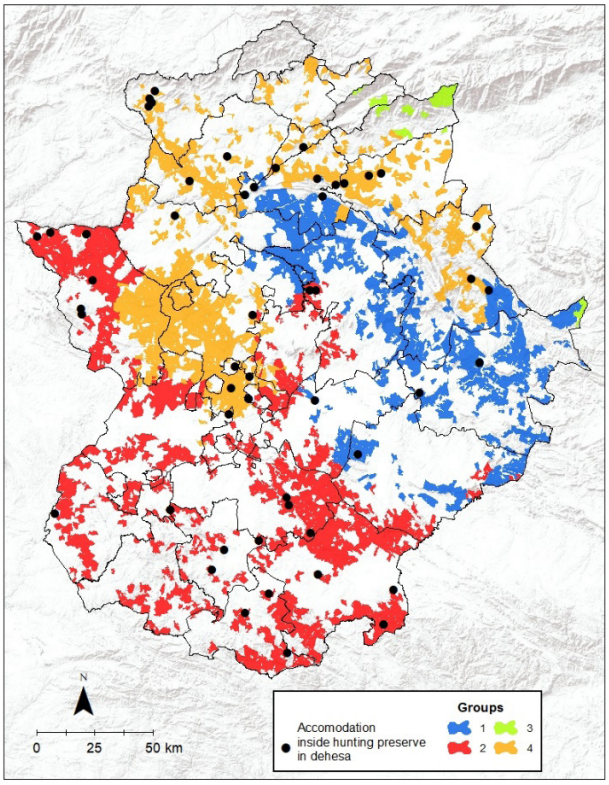
Figure 10 shows the positive correlation between the number of vacancies and the distance to the preserve. The following trends can be observed:

- On the one hand, the number of places available within the enclosed area itself is very small in all the study groups.
- On the other hand, this growth in the number of sites in relation to the increase in the distance from the enclosure is different in each of the groups. Thus, there is a significant increase in Group 4, which registers 315 sites within the enclosure itself, reaching more than 24,000 at 15 km.

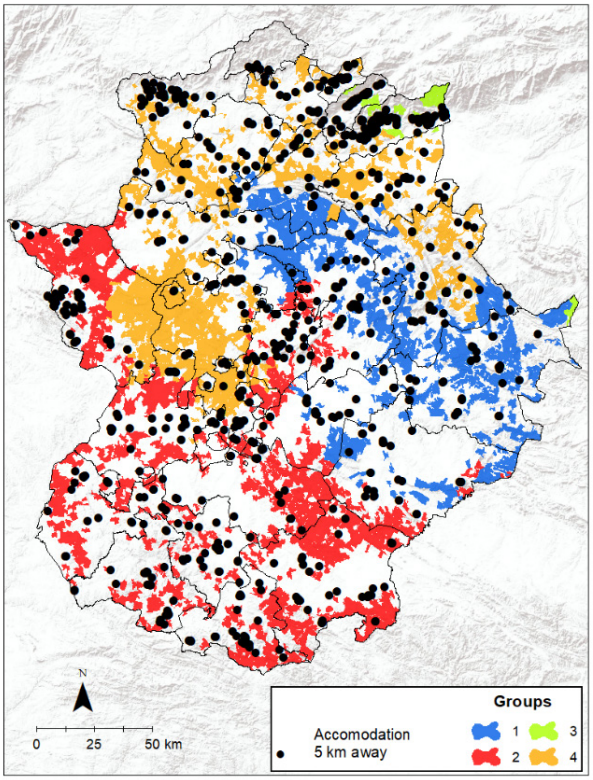
Figure 10. Trend increase in the number of tourist vacancies according to distance to the reserve (a) and location within the reserve (b), 5 km (c), 10 km (d) and 15 km (e).



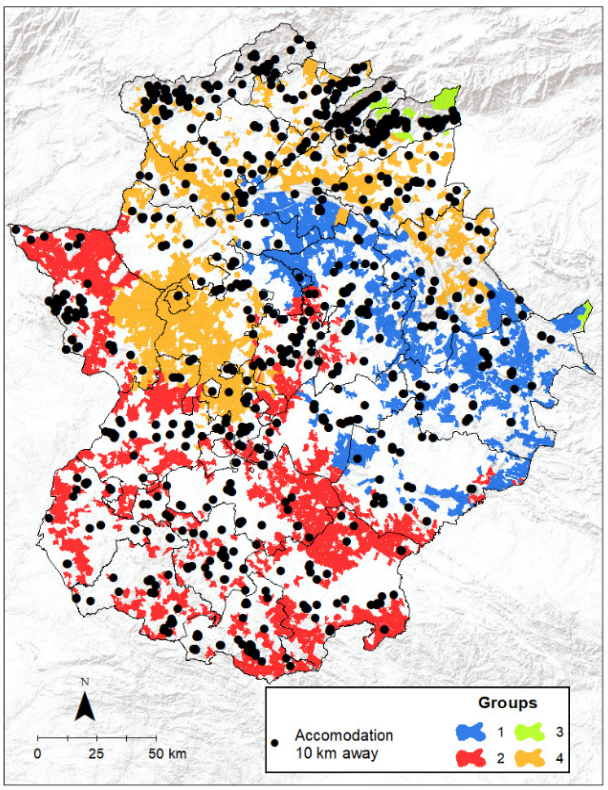
(b)



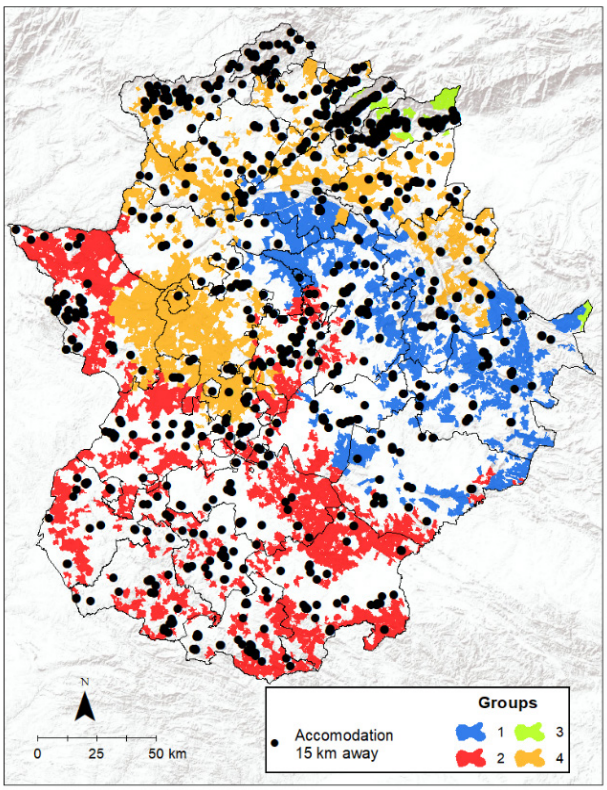
(c)



(d)



(e)



Source: prepared by authors.

On the other hand, it is interesting to determine the predominance of one type of lodging in each of the groups. Table 11 shows the data obtained, showing the notable differences that occur in the different groups, both in the total number of available vacancies and in the greater presence of a specific type of lodging. In the first case, this difference may be due to the number of hunting grounds that make up each of these groups. With respect to the supremacy of the different types of lodging studied, hotel accommodation stands out, regardless of its category (1 and 5 stars). Specifically, these comprise more than 50% of the total in each group, reaching their maximum in Group 2 (64%). However, in Group 3, rural houses have the highest percentage (51.6%).

Table 11. Places available by type of lodging in each study group.

GROUP	TYPE OF ACCOMODATION	NUMBER ACCOMODATION	ACCOMODA-TION PLACES	ACCOMODA-TION PLACES %
1	Rural house	218	2,005	21.6
	Rural hotel	15	354	3.8
	Hostel	79	1,875	20.2
	Pension	19	248	2.7
	1- and 3-star hotel	44	2,567	27.7
	4- and 5-star hotel	17	2,212	23.9
	Total	392	9,261	100
2	Rural house	289	2,364	15.8
	Rural hotel	24	545	3.6
	Hostel	117	2,509	16.8
	Pension	17	271	1.8
	1- and 3-star hotel	72	4,897	32.7
	4- and 5-star hotel	32	4,688	31.3
	Total	551	14,974	100
3	Rural house	269	2,504	51.6
	Rural hotel	23	648	13.3
	Hostel	25	508	10.5
	Pension	0	0	0
	1- and 3-star hotel	12	605	12.5
	4- and 5-star hotel	7	587	12.1
	Total	336	4,852	100
4	Rural house	633	5,559	22.8
	Rural hotel	46	1,251	5.1
	Hostel	117	2,721	11.1
	Pension	17	2,29	0.9
	1- and 3-star hotel	64	7,329	30.0
	4- and 5-star hotel	36	7,317	29.9
	Total	913	24,406	100

Source: prepared by authors.

The number of available places in each group is high, so that in general it could be determined that there is a high number of available infrastructures that would allow the development of hunting tourism in the study area. However, in order to establish a clear analysis of the presence of tourist places, it is necessary to consider the number of hunting grounds existing in each of these groups in order to determine the average number of places available in each of them. In this scenario, Table 12 shows the lack of infrastructures close to the dehesa enclosures in Extremadura,

with the exception of the specific case of group 3, where a good number of places are available. However, a general trend can be observed in which, as the distance from the enclosed areas increases, there is a gradual increase in the number of places. Thus, in the case of groups 1, 2 and 4, the number of places can be estimated as low, as the physical characteristics of these areas mean that the most common modalities practised by hunting tourists are those of a collective nature, such as big game and red-legged partridge shooting (Rengifo, 2003; Álvarez, Coca, & Hernández, 2007).

Table 12. Average number of places per preserve, group and distance.

GROUP	NUMBER OF PRESERVES	DISTANCE (KM)	NUMBER OF ACCOMODATION	NUMBER OF PLACES	AVERAGE NUMBER OF PLACES PER PRESERVE
1	568	0	11	1,010	1.77
		5	259	2,819	4.96
		10	347	4,371	7.69
		15	392	9,261	16.30
2	936	0	24	118	0.12
		5	404	4,974	5.31
		10	500	6,719	7.17
		15	551	14,964	15.69
3	17	0	0	0	0
		5	196	1,404	83.70
		10	284	2,282	134.23
		15	336	4,852	285.29
4	670	0	22	159	0.20
		5	548	6,644	9.91
		10	787	8,385	12.50
		15	913	24,406	36.42

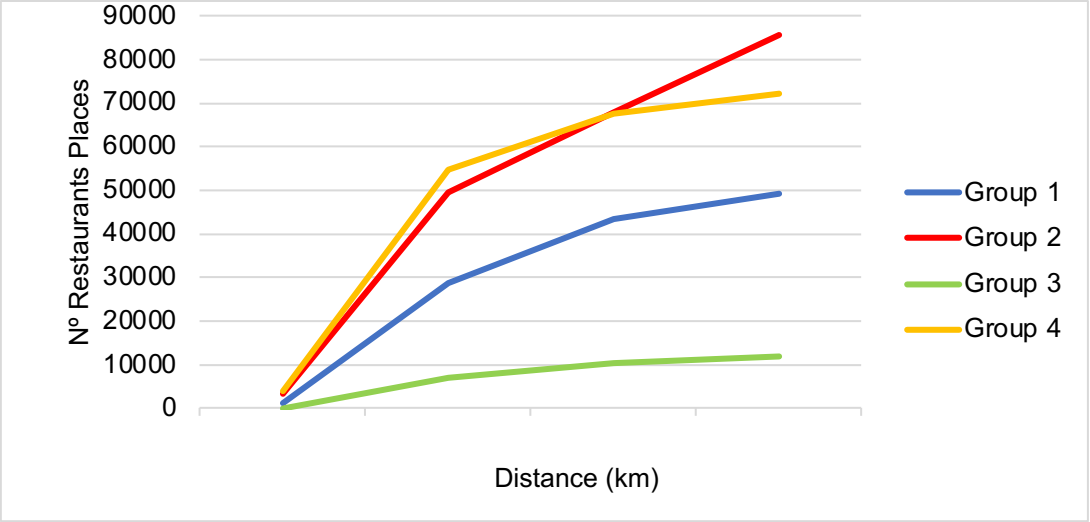
Source: prepared by authors.

3.3.2. Restaurants

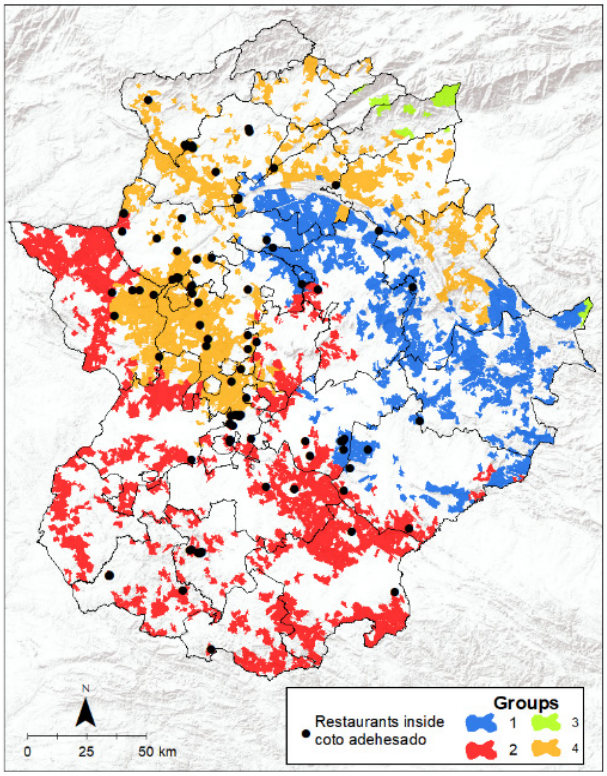
Hunting tourists are inclined to enjoy activities linked to local gastronomy, and at the same time demand specialized restaurant services (Martín-Delgado, Rengifo-Gallego, & Sánchez-Martín, 2019). For this reason, an analysis was carried out on the presence of restaurants located between 0 and 15 km from the hunting area. The results obtained (Figure 11) show a general trend towards an increase in the number of seats as the distance from the hunting ground increases, a logical fact because there is a clear relationship between the demand for hunting activity and restaurants, but not a dependence. On the other hand, Group 3 appears as the group with the lowest number of restaurant places, coinciding with the area with the fewest hunting grounds. Although Groups 2 and 4 stand out for their high number of seats, there are differences between them. Specifically, Group 2 experiences a greater growth in the number of seats from 5 km, while in the case of Group 4, the greatest growth is observed between 10 and 15 km distance.

Figure 11. Restaurants according to distance to the preserve (a) and location according to distance within (b), 5 km (c), 10 km (d) and 15 km (e).

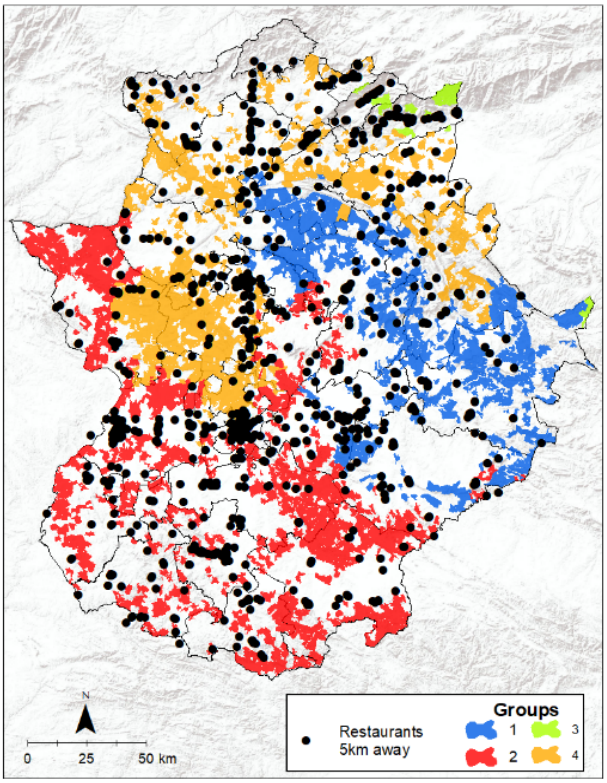
(a)

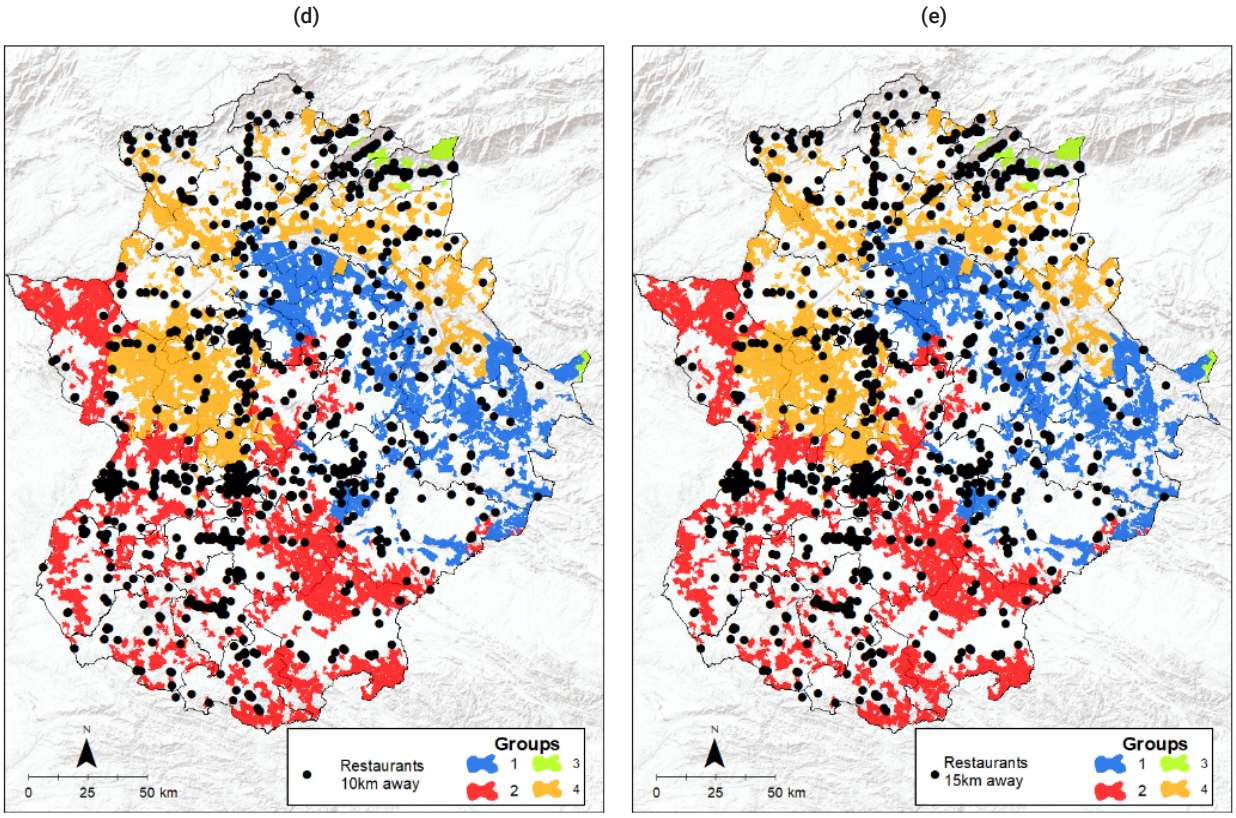


(b)



(c)





Source: prepared by authors.

Finally, it is interesting to determine the average number of restaurant seats per number of hunting grounds. Table 13 shows that in Group 3, the average number of restaurant places in Group 3 is high, due to the scarcity of hunting preserves that comprise it. However, in the rest of the groups, the available places are lower, considering that the hunting modalities preferred by hunting tourists are of a collective nature (redlegged partridge and hunting in the mountains) (Rengifo, 2003; Álvarez, Coca, & Hernández, 2007).

Table 13. Average number of restaurant seats available depending on the distance to the dehesa woodland.

GROUP	NUMBER OF PRESERVES	DISTANCE (KM)	NUMBER OF RESTAURANTS	NUMBER OF PLACES	AVERAGE NUMBER OF PLACES PER PRESERVE
1	568	0	12	1,025	1.8
		5	342	28,636	50.4
		10	546	43,414	76.4
		15	611	49,243	86.7
2	936	0	40	3,277	3.5
		5	568	49,652	53.0
		10	798	68,013	72.7
		15	1,033	85,529	91.4
3	17	0	0	0	0.0
		5	92	7,063	415.5
		10	135	10,261	603.6
		15	150	11,746	690.9

GROUP	NUMBER OF PRESERVES	DISTANCE (KM)	NUMBER OF RESTAURANTS	NUMBER OF PLACES	AVERAGE NUMBER OF PLACES PER PRESERVE
4	670	0	59	4,062	6.1
		5	713	54,825	81.8
		10	857	67,501	100.7
		15	917	72,021	107.5

Source: prepared by authors.

3.3.3. Tourist attractions near the hunting reserves

The trips made by hunting tourists are characterized by the development of activities complementary to hunting (Martín-Delgado, Rengifo-Gallego, & Sánchez-Martín, 2019). In addition, these trips are usually accompanied by non-hunters (Boletín Oficial del Estado, 2014). For these reasons, it is interesting to know whether the hunting reserves in Extremadura have tourist attractions at an optimum distance, allowing the offer of complementary tourism products. Table 14 shows the wide variety of tourist attractions that exist within 15 km of the reserves. Among them, the high presence of Sites of Cultural Interest (BIC), including historic sites, can be seen in all the groups detected except in Group 3, probably due to the small number of preserves that make it up, as well as the physical characteristics of the terrain. This circumstance is due to the great wealth of heritage that characterizes the Extremadura region. The presence of these two types of tourist attractions allows the development of a parallel product to the hunting activity, consisting of cultural visits. Something similar occurs with the Protected Areas, whose extension affects 30% of Extremadura's surface area, a high percentage of which coincides with the areas dedicated to hunting. In this context, Groups 2 and 4 are those with a high presence of protected areas in their vicinity.

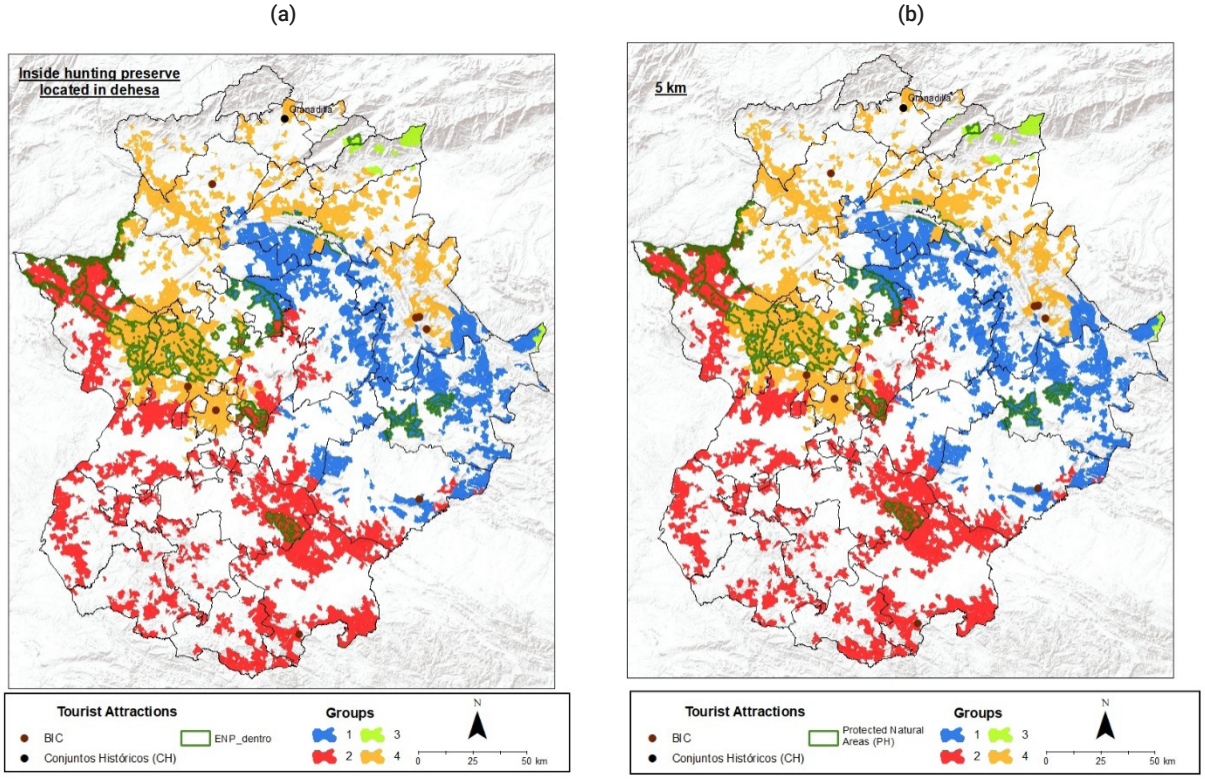
Table 14. Tourist attractions present in the different groups analysed for the development of hunting tourism.

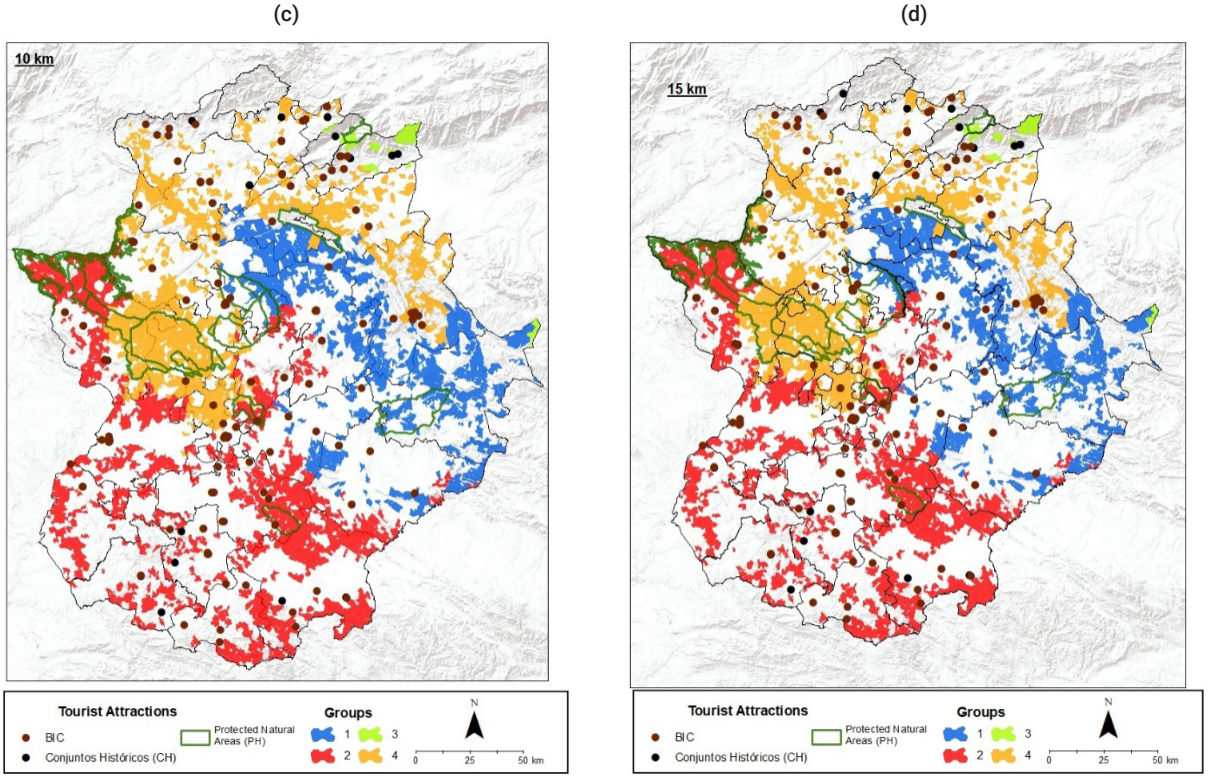
GROUP	NUMBER OF PRESERVES	DISTANCE (KM)	NUMBER OF BIC	NUMBER OF HISTORIC SITES	NUMBER OF PROTECTED NATURAL AREAS
1	568	0	1	0	3
		5	36	5	7
		10	45	6	7
		15	45	7	7
2	936	0	1	0	3
		5	61	12	10
		10	81	13	10
		15	81	15	10
3	17	0	0	0	1
		5	2	6	1
		10	6	6	2
		15	6	7	2
4	670	0	6	1	3
		5	82	11	11
		10	89	16	11
		15	89	18	11

Source: prepared by authors.

Figure 12 represents the geographic location of these attractions located above the groups detected at an optimal distance (5, 10 and 15 km). Under this scenario, the specific situation of the Sierra de San Pedro and the Sierra Grande de Hornachos is striking, where practically all of these areas are affected by the presence of private hunting reserves with dehesa. As the distance to the preserve increases, there is a gradual increase in the presence of Protected Areas. One of the most characteristic issues is the specific case of Monfragüe National Park where, despite the fact that hunting activity has been prohibited since December 5, 2020 (Boletín Oficial del Estado, 2014), the cartography shows the high incidence of hunting activity in the vicinity of the park boundaries, with hunting preserves belonging to Groups 1 and 4. Heritage resources (BIC) show a similar trend, as the distance to the hunting grounds increases, there is a constant increase in the number of existing resources. The high wealth of heritage resources characteristic of the Extremadura region generates the large presence of this type of tourist attractions throughout the study area.

Figure 12. Presence of tourist attractions within the reserve (a), 5 km (b), 10 km (c) and 15 km (d).





Source: prepared by authors.

4. Discussion

Hunting is one of the most widespread land uses, and is currently an economic activity that generates wealth and contributes to the direct and indirect generation of employment in rural areas (Andueza et al., 2018). One of the sectors that benefits most from hunting is tourism, since hunters are forced to travel between their place of residence and the hunting grounds. During these trips they demand specific and general tourist services, according to their profile (Martín-Delgado, Rengifo-Gallego, Sánchez-Martín, 2019; Roldán, J.D., Caridad, Ocerín, Pérez, 2017), among which are lodging, transportation, guides, restaurants, etc. As a consequence, this generates an expense that benefits the companies located in rural areas, in a context in which the rural areas need to increase employment opportunities in order to fix the population.

Likewise, hunters are not only attracted to hunt a game species, but also value other attributes related to experience, intellectual, biological, and social aspects (Radder, 2005; Sigursteinsdòttir & Bjarnadòttir, 2010), as well as complementary activities (Martín-Delgado, Rengifo-Gallego, & Sánchez-Martín, 2019). One aspect to consider, as a competitive advantage of the hunting destination, is the uniqueness and conservation of the natural environment. In this context, the dehesa is a unique ecosystem in the world, formed by human intervention to obtain different agricultural, livestock and forestry uses to which hunting should be added. For this reason, the attraction of hunting native species in this ecosystem, which also has great scenic value, is unquestionable. For this reason, these reserves should be provided with hunting quality certifications that respond to duly standardized methodologies (Linares & Carranza, 2019; Linares & Carranza, 2021 a; Linares & Carranza, 2021b), so that the farms can obtain complementary income (Campos-Palacín, 2019), while contributing to the conservation of the natural environment.

This article highlights the great potential of hunting as a tourist resource of the Extremadura dehesa, as well as the extensive network of accommodation and restaurants that exist in its area of influence, making it possible for the resulting groups to become destinations with their own personality. If we consider that the period of greatest demand for hunting is between October and February, coinciding with the period when accommodation occupancy is lowest, the interest of the hunters market has a double value. Moreover, the arrival of hunters in rural areas is an opportunity for them to get to know other cultural and natural resources, serving as promoters when they return to their places of origin. Thus, the use of this natural resource could contribute to the diversification of depressed areas (Bielsa, 1987) and break with the seasonality characteristic of other forms of tourism. However, at present there are few political initiatives that contribute to the promotion of this type of tourism in the Autonomous Community of Extremadura, nor are there any figures that count the flow generated by this specific type of tourism. For this reason, it would be necessary a greater involvement by the public administration in the implementation of policies to promote this type of tourism in view of the economic, environmental, and social benefits it generates (Lindsey, Roulet, & Romanach, 2007; Wall & Child, 2009; Matilainem, Keskinarkaus, & Törma, 2016; Muphosi, Gandiwa, Bartels, & Makuza, 2016; Andueza et al., 2018; Gallardo et al., 2019; Martín-Delgado, Rengifo-Gallego, & Sánchez-Martín, 2019; Martín-Delgado, Rengifo-Gallego, & Sánchez-Martín, 2019). In this way, a common strategy could be designed involving public administrations, hunting reserve managers, tourist accommodation and restaurants with the aim of creating sustainable hunting tourism where the wealth derived from this activity would contribute to the social, economic, and environmental conservation of these areas. The implementation of such strategies elsewhere has generated benefits(Ullah & Kim, 2020), although it must be borne in mind that the hunter's expenditure must benefit the local population, which is not always the case(Morais, Bunn, Hoogendoorn, & KC, 2018).

Finally, it must be borne in mind that hunting is a consumptive activity that makes use of natural resources and must therefore be practised in a sustainable manner, i.e. guaranteeing the presence of populations for future generations. In Spain, specifically in Extremadura, this practice is carried out under these characteristics of sustainability due to the extensive legislation that regulates it. In fact, every year the managers of the reserves themselves must submit a hunting plan, which must subsequently be approved by the regional government. At the same time, the regional government also approves an annual closed season order, which sets out the species that can be considered game species, as well as the conditions for hunting them (number of catches, closed season, etc.). In this sense, the dynamics of growth in this market segment must not tend towards overcrowding, as an increase in this could be detrimental to game species(Marchand, 2014; Rashid, 2020).

5. Conclusions

- The main conclusions obtained from this study are as follows:
- Hunting tourism has a remarkable potential in Extremadura's dehesa due to the great wealth of species that coexist in it.
- There are four well differentiated geographical areas, due to the physical characteristics and the variety of hunting species that coexist in them.
- Group 1 consists of 568 hunting reserves representing more than 26% of the study sample. This group is characterized by the presence of all the main game species, although mountain goat and fallow deer are of little relevance. This group is characterized by the presence of alti-

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tude reliefs with notable differences, being the minimum altitude (213m) and the maximum (1,122m), highlighting the amplitude reached by the agroforestry system with respect to the rest of the coverages. Therefore, hunters interested in species such as *Capreolus capreolus*, *Cervus elaphus*, *Sus scrofa* and *Alectoris rufa* should choose this group as their destination.

- Group 2 is made up of 936 enclosed pasture lands where 5 of the 6 species taken as reference for this analysis coexist. In spite of this Dama dama and roe Capreolus capreolus are of little importance. The former is only found in some enclosures in the Sierra de San Pedro, while the latter appears in the Montánchez-Tamuja area. This group is ideal for specialising in the hunting of *Cervus elaphus*, *Sus scrofa* and *Alectoris rufa*.
- Group 3 is made up of a small number of reserves (17) but has unique characteristics. These include the presence of all the main game species, apart from fallow deer. Among the main physical characteristics, we can mention the presence of high altitudes, as well as the scarcity of the agroforestry system as peculiarities that differentiate it from the rest of the groups. For this reason, the reserves that make up this area are ideal for hunting *Capra pyrenaica*.
- The last group detected (Group 4) is composed of 670 reserves. All the types of species studied live in this group, with a predominance of agroforestry systems. However, in the case of the mountain goat, its representation is very low, being reduced to a small area located in Tierras de Granadilla. On the other hand, there is the case of roe deer and fallow deer which, despite covering a reduced area of the study sample, is geographically located in a series of areas that can be chosen for the exploitation of this hunting resource. In the first case, the high presence of this species in all the reserves located in the region of Villuercas-Ibores-Jara stands out because this is its original habitat in Extremadura, from where it has moved to other areas, including the foothills of the Sierra de Gredos or the area of Montánchez-Tamuja. With respect to the fallow deer, its presence in the reserves that make up the Sierra de San Pedro and the Villuercas-Ibores-Jara area is noteworthy. Although there is a high presence of other species, this territory is characterised by the greater presence of*Capreolus capreolus* and *Dama dama* in its surroundings, unlike what occurs in the rest of the groups.
- Game species have nowadays acquired an economic value, so that the presence of a high variety of game species that, at the same time have a high economic value, can generate considerable wealth in the territory. Thus, the application of Moran's Local Index (LISA) has made it possible to define the following areas as those with the greatest economic value with respect to the hunting resource: Valle del Ambroz, the foothills of the Sierra de Gredos (Jerte and La Vera), Monfragüe, Villuercas-Ibores-Jara, Campo Arañuelo, la Siberia, Montánchez-Tamuja, Sierra de San Pedro and a small area of the Valle del Alagón.
- Despite the remarkable potential for the development of hunting tourism in the groups detected, the analysis carried out on the availability of infrastructure shows the insufficient number of places in lodging and restaurants in all groups, except for Group 3.
- Finally, all groups have a high presence of tourist attractions that allow the creation of a specific tourist product that considers the demand of hunting tourists.

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Authorship Contributions

All authors have contributed to the complete drafting and revision of each of the parts. J.I.R.G. did most of the translation; J.M.M.S. collaborated in the drafting of the methodology and revision of the article; L.M.M.D. developed the sections on the results, cartography, conclusions, discussion, as well as the layout and revision of the article.

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