

Roe deer population and harvest changes in Europe

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Abstract. Roe deer is the most abundant cervid species occurring in most of Europe. It has an increasing economic, cultural, and ecological importance. Therefore roe deer research programmes are essential for sustainable use of this species.

Our purpose was to analyse the changes in the roe deer population and harvest in Europe on the basis of available game management information. For this study we used published data for 1984 and the early 2000s. During these two decades the reported roe deer numbers (spring population) increased from 6.2 to 9.5 million and hunting bag from 1.7 to 2.7 million individuals. The population size (density) and hunting bag of roe deer increased almost all over Europe, but especially in its western part. The real population size may be around 1.5 times larger than the official data say.

Key words: *Capreolus capreolus*, population numbers, hunting bag, status.

INTRODUCTION

European roe deer (*Capreolus capreolus* L.) is the most abundant cervid occurring in most of Europe (with the exception of Ireland, Cyprus, Corsica, Sardinia, Sicily, and the majority of the smaller islands). They are also found in Asia (IUCN, 2007).

Historically, between the late 19th and early 20th centuries the roe deer distribution was reduced and their range was very fragmented as a consequence of almost uncontrolled hunting and other types of human activities (Baleišis et al., 2003). From the beginning of the 20th century the European roe deer population started to increase again (Andersen et al., 1998).

During the last half of the century roe deer became widespread and it is still expanding in many areas (Fig. 1). Total roe deer range covers 7.2 million km². Densities in the northern and southern parts of the range tend to be lower than in central parts of the range. The central European population is estimated to number about 15 million individuals (IUCN, 2007).

In Europe roe deer are a resource with great economic value for meat production and sport hunting. Roe deer also have a cultural value for recreational



Fig. 1. Distribution of roe deer in Europe (striped area).

activities, and ecological value as part of European biodiversity (Andersen et al., 1998). However, overabundant roe deer populations may cause serious damage to forest plantations and agricultural crops, may be involved in road traffic accidents and spread of diseases. As a consequence of density dependent regulation, at very high densities they can seriously compromise their own welfare (Speyside Deer Management Group, 2007).

As roe deer is a very important big game species in Europe, the estimates of its population sizes and the knowledge of annual harvests are essential wildlife management information. To contribute to the understanding of roe deer population changes we have collected such data. The purpose of our study was to:

- (1) evaluate the actual population status and harvest of roe deer in Europe;
- (2) compare the magnitude of population and harvest changes between 1984 and the early 2000s based on the available statistical information;
- (3) reveal the relationship between population size and harvest among European countries/regions.

MATERIAL AND METHODS

We collected roe deer population size and harvest data in Europe for two different periods, namely 1984 (Table 1) and the early 2000s (Table 2).

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Table 1. Roe deer population size and harvest in Europe in 1984 (if not shown otherwise)

Country	Population	Year	Harvest	Year
Austria	460 000		203 194	
Belarus	34 400		826	1995
Belgium	22 698		6 541	
Bulgaria	142 400		13 560	
Czechoslovakia	289 300		94 962	
Denmark	150 000		51 000	
Estonia	40 500		5 473	
Finland	5 000		1 645	1982
France	318 000		81 771	1982
Germany	2 050 000		841 103	
Hungary	219 600		41 302	
Italy	103 000		8 276*	
Latvia	40 600		4 038	
Lithuania	42 500		8 009	
Luxembourg	13 000 [?]		5 166	
Moldova	3 790	1989	171	1989
Netherlands	25 000		7 201	1983
Norway	50 000		11 500	
Poland	482 000		112 961	1983
Romania	287 000		NA	
Russia (European)	80 000	1990	NA	
Sweden	400 000		124 200	
Switzerland	110 800		43 531	
Ukraine	171 677		7 410	1995
United Kingdom	350 000	1980	12 344*	
Yugoslavia	310 400		41 329	1980
Total in Europe	6 201 665		1 727 513	

* – Data incomplete for the whole country.

? – Numbers are informed guesses.

NA – Data not available.

Data sources and comments: Most data from (Gill, 1990), except Belarus (Savastenko & Yakovenko, 2003), Belgium (only for the Walloon region) (FACE, 2004a), Estonia (Tõnisson, J., 2007, pers. comm.), Latvia (Ozolinš, J., 2007, pers. comm.), Lithuania (Baleišis et al., 2003), Moldova (Galupa, 1997), Russia (Kuzyakin, 2007), Ukraine (Ministry for Environmental Protection and Nuclear Safety of Ukraine, 1998), and UK (population size was taken as an average from data of 1970 and 1990) (National Federation of Badger Groups, 2004).

In order to evaluate the current status of roe deer in Europe we collected recently published data from the national statistics websites, other internet sources, and published sources of information. It was not possible to find data for all countries for the same year; however, most of the data are for 2005–2006 (Table 2).

We found that the reliability of data sources is very different among various countries. In some cases poaching is a very important factor (Macedonia, European

Table 2. Roe deer population size in Europe in the early 2000s

Country	Population	Year	Harvest	Year
Albania	450	2001	NA	
Austria	750 000*	2002	258 264	2006
Belarus	51 190	2003	3 145	2003
Belgium	39 260	2002	16 989	2002
Bulgaria	71 000	2006	992	2000
Czechoslovakia (former):	380 216		141 654	
Czech Republic	295 092	2004	120 995	2004
Slovakia	85 124	2005	20 659	2005
Denmark	400 000*	2002	101 000	2005
Estonia	55 000	2005	10 215	2005
Finland	15 000	2003	2 932	2003
France	1 200 000*	2002	461 689	2002
Germany	3 000 000*	2002	1 077 441	2005
Hungary	310 852	2006	80 614	2006
Italy	310 500	2004	48 810	2004
Latvia	129 573	2005	21 042	2005
Lithuania	86 362	2006	16 590	2006
Luxembourg	23 972	2003	6 898	2002
Moldova	2 300	2002	NA	
Netherlands	50 000*	2002	NA	
Norway	105 000*	2003	25 100	2006
Poland	692 000	2005	147 000	2005
Romania	150 000	2006	NA	
Russia (European)	98 000	2007	2 500	2006
Sweden	600 000*	2002	129 700	2005
Switzerland	122 213	2006	38 582	2006
Turkey	17 500	2006	3	2006
Ukraine	120 900	1999	NA	
United Kingdom	501 000	2005	103 025	2003
Yugoslavia (former):	254 447		52 786	
Croatia	45 320	2005	8 127	2005
Macedonia	5 000	2002	NA	
Montenegro	1 627	2005	3	2005
Serbia	120 000	2006	10 000	2006
Slovenia	82 500	2005	34 656	2005
Total in Europe	9 536 735		2 746 971	

NA – Data not available.

* – All data listed are rough estimates on the population size (EFSA, 2004).

Data sources and comments: Albania (Kaphegyi, 2004); Austria (Statistics Austria, 2007); Belarus (Savastenko & Yakovenko, 2003); Belgium (only for the Walloon region) (FACE, 2004a); Bulgaria (Anonymous, 2007; Stoyanov & Stoyanova, 2005); data for Czechoslovakia and Yugoslavia are the sum of data from their former constitutive countries; Czech Republic (Czech Statistical Office, 2005); Slovakia (Statistical Office of the Slovak Republic, 2007); Denmark (FACE, 2004b); Estonia (Ministry of the Environment, 2006); Finland (Kojola & Ruusila, 2004); France (Saint-Andrieux & Leduc, 2003); Germany (Der Deutsche Jagdschutz Verband, 2006); Hungary (National Game Management Data Base, 2006); Italy (Apollonio et al., 2004); Latvia (Central Statistical Bureau of Latvia, 2006); Lithuania (Ministry of Environment, 2007); Luxembourg (approximate numbers from the graph) (Baghli et al., 2007); Moldova (National Institute of Ecology, 2003); Norway (Statistics Norway, 2006); Poland (Central Statistical Office, 2006); Romania (IBCOL, 2006); Russia (European part; harvest bag counted from population size and harvest rate) (Kuzyakin, 2007); Sweden (Statistics Sweden, 2006); Switzerland (BAFU, 2006); Turkey (population size counted as an average from two given numbers) (Yavuz, 2007); Ukraine (PROFOR, 2006); United Kingdom (reliability of the population estimate is within $\pm 50\%$) (DEFRA, 2005), (harvest is an average of two given numbers) (Marshall & McCormick, 2006); Croatia (Kusak, J., 2007, pers. comm.); Macedonia (hunting is forbidden) (Velevski et al., 2003); Montenegro (survey has been carried out on a two-year basis) (Statistical Office of Montenegro, 2006); Serbia (the data do not include any information about AP Kosovo and Metohija) (CIC, 2007); Slovenia (Statistical Office of the Republic of Slovenia, 2005; Žele et al., 2006).

Russia, Ukraine) and reported harvest numbers may strongly understate real values (Velevski et al., 2003; Kuzyakin, 2007; PROFOR, 2006).

The recent population size data for Austria, Denmark, France, Germany, Netherlands, Norway, and Sweden taken from (EFSA, 2004) are approximate values as stressed in that document. These data were used only because of the lack of more reliable information.

In some cases data were available only for part of the country. For example, we found data only for the Walloon region of Belgium while for the rest of the country (the Flemish Region) information is missing. In some sources data were inaccurate and erroneous (Moldova, Ukraine). Despite all the above-mentioned shortcomings, the data seemed acceptable for a general overview of the status of roe deer population in Europe. On the basis of the available numbers we calculated deer density and hunting rate for both periods and the magnitude of roe deer population and harvest changes during the last 20 years.

RESULTS AND DISCUSSION

According to the latest population status report, roe deer is common in 40 European countries (IUCN, 2007). In our study we managed to collect data for 33 countries, while data for Andorra, Bosnia and Herzegovina, Greece, Liechtenstein, Monaco, Portugal, and Spain are missing. As roe deer populations of these 7 countries are rather low, we assumed that the lack of information would not influence the overview of roe deer population status in Europe significantly.

During the last 20 years roe deer numbers increased to a great extent, from 6.2 million to 9.5 million. At the same time the hunting bag increased from 1.7 million to 2.7 individuals. Considering that spring population numbers were not available for several countries and these values may be seriously underestimated for others, it may be supposed that roe deer numbers reach 15 million for the whole studied range (EFSA, 2004; IUCN, 2007).

Roe deer populations showed a great variability in the extent of change among the countries studied. On the basis of these differences we could distinguish three groups of countries with characteristic changes: stable, increasing, and decreasing population. The roe deer population stayed quite stable only in Switzerland and European Russia. In most of Europe roe deer numbers increased. The largest increase in population numbers was shown by the following countries: France (277.36%), Latvia (219.15%), Italy (201.46%), Finland (200.0%), and Denmark (166.67%).

Roe deer populations declined only in a few countries, all belonging to the south-eastern part of Europe, namely in Bulgaria, Moldova, Romania, Ukraine, and the countries of former Yugoslavia (Fig. 2). Two possible reasons could be suggested for this: the data for these countries may not be reliable enough, and the level of poaching could be traditionally high. We should also note that these countries went through significant political changes during the period studied and the control of hunting could have also weakened there.

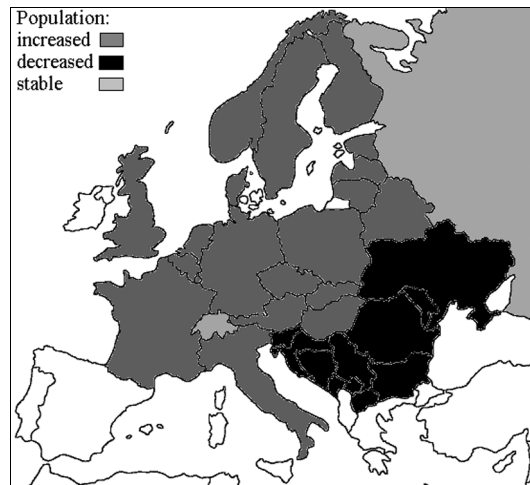


Fig. 2. Regions with different roe deer population changes in the period of 1984–2005.

Because of incomplete data, it is difficult to compare harvest changes in Europe during the last 20 years. For example, we do not have enough hunting data for both periods for Moldova, Romania, Ukraine, and European Russia. According to the available statistical data, the hunting bag of roe deer declined in Bulgaria and Switzerland. In Sweden it stayed at almost the same level (increased only by 4.43%). In all other countries the harvest of roe deer increased; for example, in Austria, Germany, Luxembourg, Poland, and countries of former Yugoslavia it increased by around 30%. The largest harvest increase occurred in the United Kingdom (734.62%), Italy (489.78%), France (464.61%), Latvia (421.10%), and Belarus (280.75%).

The harvest rates among countries were quite different for the two periods investigated. In 1984 it varied from 2.40% (Belarus) to 44.17% (Austria) with an average of 22.15%; in 2005 it varied from 0.02% (Turkey) to 43.27% (Walloon region of Belgium) with an average of 21.63%. The harvest rate declined in 9 countries, such as Austria, Bulgaria, Poland etc.; and increased in 12 countries, for example, Belarus, countries of former Czechoslovakia, Estonia, and Hungary. We found the smallest harvest rate in Turkey (0.02%), Montenegro (0.18%), Bulgaria (1.40%), European Russia (2.55%), Belarus (6.14%), and Serbia (8.33%). In 1984 the harvest rate throughout Europe was 27.86% and in 2005, 28.81%.

Roe deer density calculations for all countries showed a similar result with population numbers: roe deer was and still is the most abundant in western and central Europe (Fig. 3). These data also confirm the fact found in the literature that the densities in the central parts of the range are higher than in the northern and southern parts of the range (IUCN, 2007).

Roe deer density increased almost in all countries, in some of them even more than twice (France, Italy, Latvia). In 1984 the greatest roe deer density occurred

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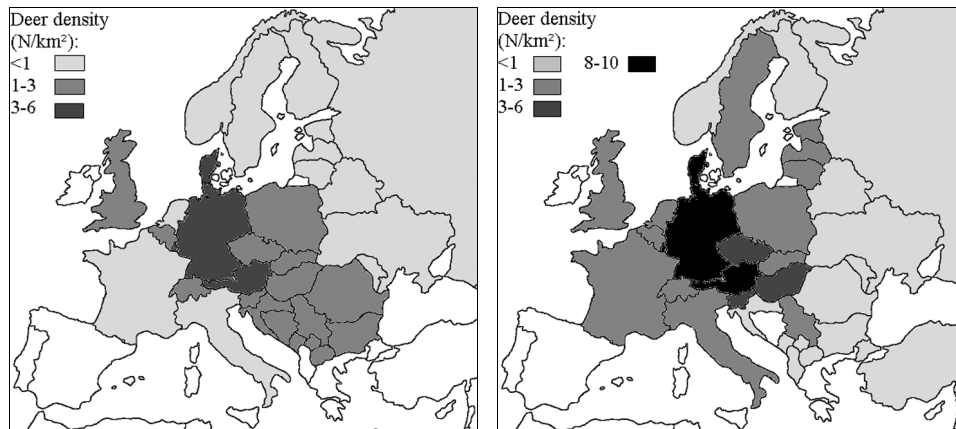


Fig. 3. Roe deer density in Europe in 1984 (*left*) and 2005 (*right*).

in Germany (5.74 animals per km²), Austria (5.48), Luxembourg (5.03), and Denmark (3.48). In 2005 the highest density was found in the same 4 countries: Denmark (9.28 animals per km²), Luxembourg (9.27), Austria (8.94), Germany (8.40). In 1984 the average roe deer density in Europe was 1.55 animals per km², while in 2005 it was 2.22 animals per km².

We compared countries with the largest roe deer population, hunting bag, and harvest rate in 1984 and 2005 (Tables 3, 4).

Table 3. Countries with the largest roe deer population, hunting bag, and harvest rate in 1984

	Population, <i>N</i>		Hunting bag, <i>N</i>		Harvest rate, %	
1.	Germany	2 050 000	Germany	841 103	Austria	44.17
2.	Poland	482 000	Austria	203 194	Germany	41.03
3.	Austria	460 000	Sweden	124 200	Luxembourg	39.74
4.	Sweden	400 000	Poland	112 961	Switzerland	39.29
5.	United Kingdom	350 000	Czechoslovakia	94 962	Denmark	34.00

Table 4. Countries with the largest roe deer population, hunting bag, and harvest rate in 2005

	Population, <i>N</i>		Hunting bag, <i>N</i>		Harvest rate, %	
1.	Germany	3 000 000	Germany	1 077 441	Belgium (Wallonia)	43.27
2.	France	1 200 000	France	461 689	France	38.47
3.	Austria	750 000	Austria	258 264	Czechoslovakia (former) ^a	37.26
4.	Poland	692 000	Poland	147 000	Germany	35.91
5.	Sweden	600 000	Czechoslovakia (former) ^a	141 654	Austria	34.44

^a For calculations the data of the Czech Republic and Slovakia were used.

On the basis of these numbers, the largest roe deer population, the largest harvest bag, and one of the highest harvest rates were found in Germany for both periods. Our data show that 31.6% of the European roe deer population lives in Germany and 37% of roe deer are shot there. Other countries with very large roe deer numbers and hunting bags are Austria and France. Nearly all countries from the two last tables are neighbouring countries in the west-central part of Europe. It is also important to note that Germany and Austria belong to the core group of countries following the “German game management traditions” and their long tradition of strict hunting control might be the reason of their very high population numbers and harvests. In addition, the territories of France and Germany are among the largest in Europe and both of them offer prime habitats for this game.

On the basis of the size of roe deer population and harvest changes between 1984 and 2005 we distinguished two main groups: (1) countries where the population increased more than the hunting bag and (2) countries where the population grew less than the hunting bag. Only Lithuania and Norway do not fall into either of these two groups, as their rates of changes were quite similar (differences are only a few per cent).

Mainly western and northern European countries belong to the group where the roe deer population increased more than the hunting bag (Table 5).

In the southern and eastern parts of Europe the hunting bags typically increased more than the populations (Table 6). Most probably, in these countries the roe deer population is more underestimated and consequently, even when the harvest increased much more than the population, the population was still growing.

Table 5. Some countries where the population increased more than the hunting bag

Country	Change of population, %	Change of hunting bag, %
Austria	63.04	27.10
Denmark	166.67	98.04
Finland	200.00	78.24
Germany	46.34	28.10
Luxembourg	84.40	33.53
Sweden	50.00	4.43

Table 6. Some countries where the hunting bag grew more than the population

Country	Change of population, %	Change of hunting bag, %
Belgium (Wallonia)	72.97	159.73
Estonia	35.80	86.64
Former Czechoslovakia	31.43	49.17
Former Yugoslavia	-18.03	27.72
Hungary	46.34	95.18
Italy	201.46	489.78

Table 7. Roe deer number changes in 1984–2005 throughout Europe

Year	Population, <i>N</i>	Hunting bag, <i>N</i>	Harvest rate, %	Average harvest rate, %	Population change, %	Hunting bag change, %
1984	6 201 665	1 727 513	27.86	22.15	53.77	59.01
2005	9 536 735	2 746 971	28.81	21.63		

Finally, on the European level, some changes in the roe deer population and harvest numbers between 1984 and 2005 are rather similar and seem consistent in the pattern of change (Table 7).

The data presented here show that roe deer is a very abundant big game species in Europe. For the 7 million European hunters (FACE, 2007) roe deer are the most available game and their trophy (antlers) and meat represent an important asset. The patterns found here indicate that in spite of increasing harvests roe deer populations could generally grow. This may be related to the underestimation of spring populations and/or recruitment rates. At the same time this phenomenon can be the consequence of careful population management resulting in lower harvest rates necessary to halt population growth in many areas. We have found a definite population decline only in south-eastern Europe where recent political changes and socio-economic turmoil might have caused temporary slackening of the control of hunting. These findings indicate that further research could be focused on the socio-cultural and economic factors influencing roe deer population and harvest management as it was done in the case of red deer (Milner et al., 2006).

CONCLUSIONS

During the last two decades roe deer population numbers in Europe increased to a great extent, from 6.2 to 9.5 million, and the hunting bag changed from 1.7 to 2.7 million individuals. In most of Europe roe deer populations were increasing, except for the south-eastern part of the continent. As to the hunting bags we could not confirm this pattern because of the lack of data.

The density of roe deer increased nearly in all countries studied. The highest density occurred in western and central Europe. From 1984 to 2005 the average roe deer density in Europe increased from 1.55 animals per km² to 2.22 animals per km².

Although harvest rates were variable among countries, the average harvest rates were similar in the two periods studied: 22.15% in 1984 and 21.63% in 2005. According to available data, harvest rates declined in 9 countries and increased in 12 countries. Throughout Europe 27.86% of the roe deer population was harvested in 1984 and 28.81% in 2005.

Our data set shows that the largest roe deer population, the largest harvest bag, one of the highest harvest rates and densities between 1984 and 2005 belong to Germany. Actually, 31.6% of the whole European roe deer population lived there and 37% of all roe deer was hunted there.

The population grew faster than the harvest in northern and western Europe. The hunting bag increased faster than the population in eastern and central Europe. Between 1984 and 2005 the European roe deer population increased by 53.8% and harvest by 59.0%.

The patterns found here indicate that in spite of increasing harvests roe deer populations could generally grow. This may be related to the underestimation of spring populations and/or recruitment rates, it could also be the consequence of careful population management. We have found a definite population decline only in south-eastern Europe where recent political changes and socio-economic turmoil might have resulted in lack of hunting control. These findings indicate that further research could be focused on the socio-cultural and economic factors influencing roe deer population and harvest management.

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Metskitse asurkond ja küttimine Euroopas

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Metskits levib suuremal osal Euroopast. Ta on mandri arvukaim hirvlane ja tema tähtsus majanduses, kultuurikontekstis ning ökosüsteemides suureneb pidevalt. Metskitse kahjustused põllumajanduses ja metsanduses võivad olla märkimisväärsed ning ta võib olla oluline liiklusohu põhjustaja ja haiguste levitaja. See kõik rõhutab metskitseuuringute tähtsust tema asurkondade kasutamise jätkusuutlikkuse tagamisel.

Uuringu eesmärgiks on analüüsida olemasolevat ametlikku ulukistatistikat ja tuua välja muutused metskitse Euroopa asurkonna seisundis ning küttimise määrades. On kasutatud riikide ametlikke, 1984. aasta andmeid ja neid on võrreldud selle aastatuhande algusaastate omadega. Kahe aastakümne jooksul on metskitse arvukus (kevadise seire andmete põhjal) tõusnud 6,2 miljonilt 9,5 miljonini. Kütitud loomade arv on tõusnud 1,7 miljonilt 2,7 miljonini. Nii metskitse arvukus kui ka tema küttimine on suurenenud peaaegu kõikjal Euroopas, eriti aga mandri lääneosas. On põhjust arvata, et tegelik asurkonna arvukus on 1,5 korda suurem, kui ilmneb ametlikest andmetest.