Belg. J. Zool., 137 (1) : 33-39 January 2007

Current status of the Balkan chamois (*Rupicapra rupicapra balcanica*) in Greece : Implications for conservation

Haritakis I. Papaioannou & Vassiliki I. Kati

University of Ioannina, Department of Environmental and Natural Resources Management, Seferi 2, 30100 Agrinio, Greece
Corresponding author : Vassiliki I. Kati, E-mail : vkati@cc.uoi.gr, Tel : ++30-26510-70993

ABSTRACT. In this study, we carried out direct and indirect surveys in 30 Greek areas to clarify the current status of the Balkan chamois (*Rupicapra rupicapra balcanica)*. It is an important flagship species for conservation in Greece, protected by both National and European legislation. New chamois populations are recorded for the first time in 3 areas, direct sightings of chamois are found in 11 areas, and presence is reported by locals in a further 4 areas. The overall potential distribution area of the species is 1.663km^2. The chamois is considered extinct in 6 areas and its presence is doubtful in the remaining 6 areas. Chamois have a fragmented dispersal pattern in Greece and three blocks of populations are distinguished : Pindus, Sterea Ellada and Rhodopi populations. Population sizes do not usually exceed 30 individuals in each area, and the maximum population size recorded is 120-130 individuals (Mt. Timfi). Our preliminary estimate of the total Greek population size is between 477 and 750, which is slightly higher than previous estimates. Although most sites are within established reserves, protected by the Natura 2000 network, there is an urgent need for further conservation measures. Poaching is considered to be the major threat to this species, therefore effective protection is urgently needed, through the enhancement of guarding system against poaching, the control of roads usage within its core range, and the creation of protected natural corridors between chamois populations.

KEY WORDS : Chamois, conservation, distribution, habitat, management, poaching, flagship species.

INTRODUCTION

Choosing threatened and charismatic species to raise public interest in nature protection, and thus facilitating conservation decision and application, is a common practice in conservation policy (SIMBERLOFF, 1998). Besides, formal appraisal of the status of species of primary conservation interest (Annex II of Habitat Directive) (COUNCIL OF EUROPE, 1992) is a requirement across European countries. In this context the Balkan chamois (*Rupicapra rupicapra balcanica)*, a charismatic ungulate with an endangered status in Greece, could be used as an excellent flagship species for the conservation of mountainous ecosystems in this country. The chamois occurs in the Balkan peninsula, on sub-alpine meadows, in proximity with cliffs and rocky formations during summer, whereas it moves at lower altitudes in forested zones in winter. It is listed in the Lower Risk category of the IUCN Red List of Threatened Animals with a population size exceeding 17.000 individuals, and a stable or decreasing population trend (SHACKLETON, 1997). The status of the species is safe in the countries of former Yugoslavia (Bosnia-Herzegovina, Croatia, F.Y.R.O.M., Slovenia, Federal Republic of Yugoslavia) (>11.000 individuals), vulnerable in Albania (1.050 individuals), rare in Bulgaria (1.600 individuals) and endangered in Greece (400-500 individuals) (ADAMAKOPOULOS et al*.,* 1997; GIACOMETTI et al., 1997; GJIKNURI, 1997; KRYSTUFEK et al*.,* 1997; SPIRIDONOV & GENOV, 1997).

In Greece, the Balkan chamois is protected by both European and National legislation : it is listed in the Annexes II and IV of the Habitat Directive (COUNCIL OF EUROPE, 1992), classified as a rare species in the Red Data Book of Threatened Vertebrates of Greece (KARANDINOS & PARASCHI, 1992) and its shooting has been prohibited since 1969. Despite the endangered status of the species and its declining population trend (ADAMAKOPOULOS et al., 1997), data concerning its distribution pattern and population size in Greece are poor and based mainly on short surveys carried out in the 1980's (HATZIRVASSANIS, 1991; PAPAIOANNOU, 1991).

In this study (1994-2003), we surveyed all the documented sites known to be occupied by chamois as well as additional areas of high altitude that include steep rock formations and could therefore fulfil the main habitat requirements of the species (ELSNER-SCHACK, 1985; ADAMAKOPOULOS-MATSOUKAS, 1991; MICHALLET et al., 1999; PAPAIOANNOU, 2003). Our main objectives were to investigate the presence of the species in these 30 areas and to produce the first distribution map of the species in Greece. Moreover, we briefly described its habitat, estimated population size in each area and evaluated the current threats on the species, thus providing baseline data for future management purposes.

MATERIALS AND METHODS

We visited thirty areas during 1994-2003 (Fig. 1) scanning them with the help of Nikon and Minolta binoculars (10 x 50 & 8-20 x 50) and a Swarowski telescope (20 x 60). Foot surveys were conducted, which were inevitably limited by accessibility (trails and footpaths) and access to vantage-points. The geographical points where we recorded the animals, their droppings or tracks, were plotted on 1 :50.000 maps (supplied by the Geographic Service of the Greek Army). The direct surveys entailed 2.928

man-hours. Various factors such as the suitability of the habitat for chamois, the difficulty of conducting transects, and the existence of historical data regarding chamois presence, determined the time spent in each area. Species presence was considered verified when we recorded chamois sightings, tracks or droppings. In three cases (pops.1, 4 and 28) more than two groups of researchers conducted simultaneous population counts in order to estimate the population density. Seven groups of two researchers simultaneously scanned Mt. Timfi (pop. 4) for three days during the autumn of 2002 (PAPAIOANNOU, 2003) and two groups of two researchers conducted a population count in Mt. Grammos (pop. 1) and Fracto forest (pop. 28) for 10 and 8 days respectively in autumn 1998.

Since we recognised that direct surveys were inevitably limited, we also carried out 297 interviews with permanent residents of the areas visited (mainly shepherds, hunters and loggers) (Table 1). Interviews were targeted to determine current chamois presence, the estimated local population size, its current and previous distribution, and its survival threats on a local scale. Reported sightings by locals were plotted on maps of scale 1 :50.000.

All the mapped points that indicated current chamois presence were enclosed by a boundary line giving the potential distribution of the species in each area (Fig. 1). Regarding those populations which are extinct, the boundary line indicates the previous chamois distribution as reported by local inhabitants.

Concerning all the cases of verified presence, the minimum population size refers to the individual count during our direct surveys, whereas the estimated population size refers to reports by local inhabitants or bibliographic data. In cases of unverified presence, the population size was estimated using local inhabitant's reports or bibliographic sources (HATZIRVASSANIS, 1991; PAPAIOANNOU, 1991; SFOUGARIS et al., 1999). When local people provided contrasting information, the presence of chamois was considered as doubtful (minimum population = size 0).

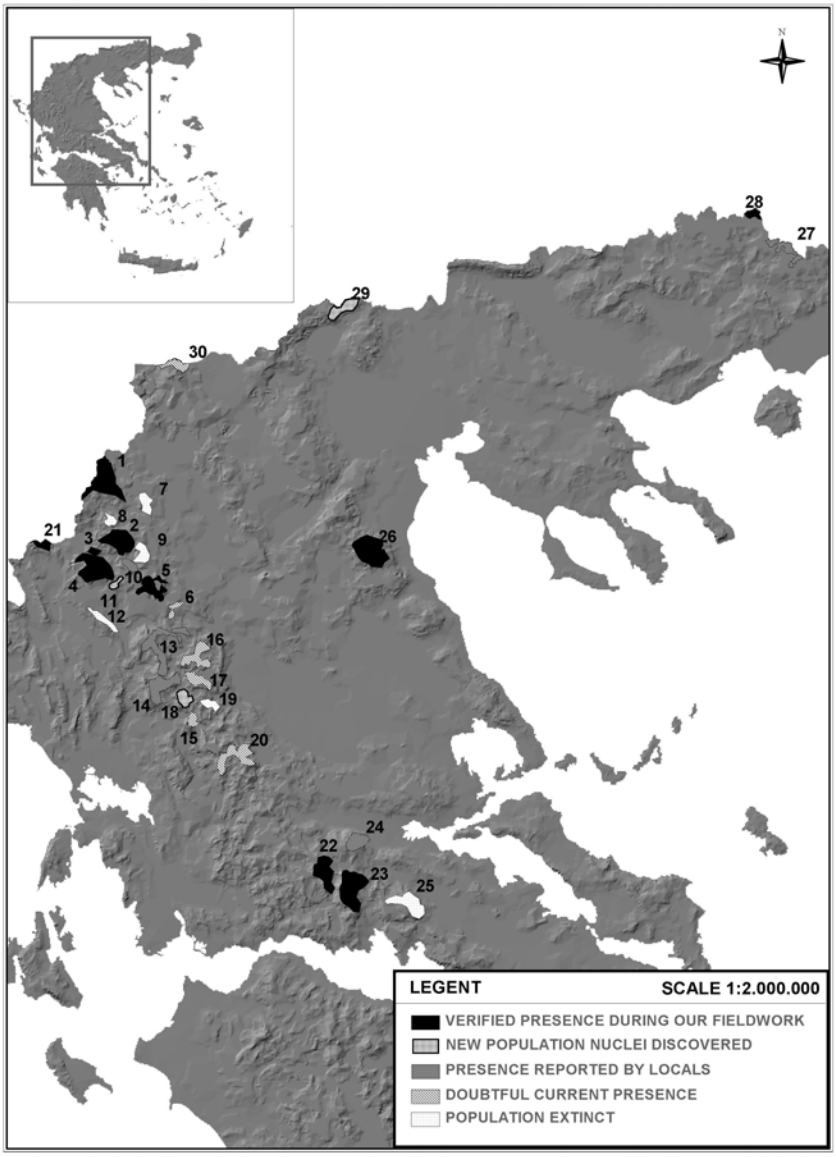

Fig. 1. – Distribution pattern of chamois populations throughout Greece.

TABLE 1

Sampling effort during direct (man-hours) and indirect surveys (number of local people interviewed), and year of sampling in the 30 mountains visited.

Site	Mountain	Direct surveys (hours)	No. of locals interviewed	Year of sampling
1.	Grammos	440	23	1994-95, 1997-2000
2.	Smolikas	120	16	1994-95, 1999- 2000
3.	Trapezitsa	48	7	1997-98, 2002
4.	Timfi	1280	43	1994-98, 2001-02
5.	Ligos-Tsouka Rossa	32	14	1997-98, 2000-03
6.	Zigos	0	6	2002
7.	Voio	0	6	1997-98
8.	Tambouri	48	5	1994-95
9.	Vassilitsa	16	7	1994-95, 1999-2000
10.	Kleftes- Flabouro	32	8	1994-95, 1997-98, 2001
11.	Central Zagori	144	12	1994-95, 1997-98, 2000-01
12.	Mitsikeli	0	4	1994-95
13.	Peristeri-Kakarditsa-Stefani	24	13	1994-95, 1998
14.	Tzoumerka-Pahtouri	24	11	1998
15.	Kokkinolakka	0	5	1998
16.	Trigia	0	9	1998
17.	Avgo	16	6	1998
18.	Hatzi	16	7	1998
19.	Axladias-Tsoukes	0	2	1998
20.	Agrafa	0	5	1999
21.	Nemertsika	16	7	1998
22.	Vardoussia	64	12	1999
23.	Giona	136	11	1999
24.	Iti	16	5	1999
25.	Parnassus	0	5	1999
26.	Olympus	112	16	1994, 1999
27.	Gyftocastro-Haidou	8	5	1998
28.	Fracto forest	232	9	1997-98
29.	Tzena-Pinovo	96	13	1999
30.	Varnountas	8	5	1994
	Total	2928	297	

RESULTS

Population status

New chamois populations were recorded for the first time in three areas (Central Zagori, Hatzi and Tzena-Pinovo) covering an estimated area of 132 km^2. The species presence was verified in 11 areas (1.183 km^2) and in 16 areas where the species was previously considered present, no individuals were recorded. In the latter case, local inhabitants reported chamois as present in four areas (349 km^2), provided contrasting reports for six areas (351 km^2), where current chamois presence was therefore regarded as doubtful, and reported the species as extinct in 6 areas (318 km^2) (Fig. 1 and Table 2).

The current estimate of the total chamois population size in Greece is between 477 and 750 individuals. Specific population density data are available for the three areas that were surveyed in detail (Timfi, Grammos and Fracto forest) (Table 2). Of the areas surveyed only one population exceeds 120 individuals (pop. 4) and only three populations exceed 60 individuals (pops. 23, 26, 28), whereas 14 populations comprise less than 15 individuals (Fig. 2).

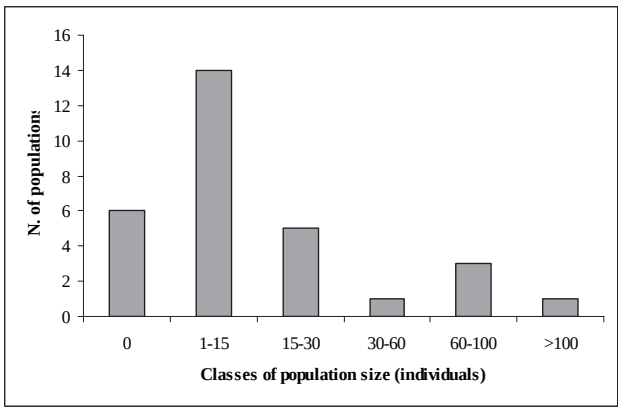

Fig. 2. – Distribution of population sizes of chamois in Greece. Extinct populations are referred as zero.

TABLE 2

Catalogue of Balkan chamois populations in Greece, potential local dispersal area, minimum and estimated population sizes, years of report, proportion of chamois area under protection status, number and type of protected areas.

N	Mountain	Presence	Potential dispersal area (km^2)	Year of last report	Minimum population size	Estimated population size	Population density	Year of population estimation	Protected chamois area (%)	Protection status
1.	Grammos	●	184	2002	40	50	0.24	1998	25-50	4 W, Na
2.	Smolikas	●	129	2001	20	30		B	25-50	2 W, Na
3.	Trapezitsa	●	17	2002	10	20		1998	>75	1 W, NP, Na
4.	Timfi	●	169	2003	120	130	0.74	2002	50-75	3 W, NP, Na
5.	Ligos-Tsouka Rossa	●	93	2003	15	30		B	50-75	4 W, NP, Na
6.	Zigos	?	24	80s	0	10		B	0	–
7.	Voio	E	47	70s				1998	< 25	2 W
8.	Tambouri	E	25	70s				1995	< 25	1 W
9.	Vassilitsa	E	52	60s				1999	< 25	1 W, Na
10	Kleftes- Flabouro	+	30	1998	1	10		1998	0	–
11.	Central Zagori	●N	19	1995	1	10		1995	0	Na
12	Mitsikeli	E	45	60s				1992	0	Na
13	Peristeri-Kakarditsa-Stefani	+	145	1998	5	15		1998	< 25	2 W, Na
14	Tzoumerka-Pahtouri	+	109	1998	5	15		1998	0	1 W
15	Kokkinolakka	?	27	1998	0	5		1998	< 25	–
16	Trigia	?	89	80s	0	15		B	>75	1 W, H
17	Avgo	?	55	1992	0	10		1992	50-75	H
18	Hatzi	●N	45	1998	15	20		1998	25-50	1 W
19	Axladias-Tsoukes	E	33	70s				1999	< 25	1 W
20	Agrafa	?	116	1999	0	15		1999	< 25	3 W
21	Nemertsika	●	27	1994	15	15		B	0	–
22	Vardoussia	●	114	1999	10	10		B	25-50	H, Na
23	Giona	●	176	1999	70	100		B	50-75	2 W, H, Na
24	Iti	●	65	1999	10	30		B	25-50	NP, Na
25	Parnassus	E	116	70s				1999	25-50	1 W, NP, Na
26	Olympus	●	184	1999	60	100		B	50-75	2 W, NP, Na
27	Gyftocastro-Haidou	+	65	1998	10	30		1998, B	25-50	1 W, Na
28	Fracto forest	●	25	1998	60	65	2,5	1998	>75	1W,PNM,Na
29	Tzena-Pinovo	●N	68	1999	10	15		1999	>75	1 W, Na
30	Varnountas	?	41	1994	0	5		1994	0	–

●, verified presence during direct surveys; ●N, new population nuclei discovered; +, presence reported by locals; ?, doubtful current presence; E, population extinct, B, bibliographical source referring data of 80s. H, controlled hunting area; Na, Natura network; PNM, protected natural monument; NP, national park; W, wildlife reserve.

Habitat

Extensive steep rock formations and sub-alpine plateaus with open pastures above the timberline (1.600-2.000 m) mostly characterize the chamois distribution area in the mountains of Pindus, Sterea Ellada and Olympus. The northern part of Mt. Pindus (pops. 1-12) comprises oak woodlands up to 1.000 m, pure forests of fir *(Abies borisii-regis)*, black pine (*Pinus nigra)* and beech *(Fagus sylvatica*) from 1.000-1.600 m, and forests of Bosnian pine *(Pinus leucodermis*) at altitudes usually up to 2.000 m. Extensive forests of pure fir and beech woods at altitudes of 1.000-2.000 m characterize the southern part of Mt. Pindus (pops. 13-20). The chamois distribution area in Sterea Ellada (pops. 22-25) consists of similar habitat types to those in southern Pindus, with the difference that Greek fir *(Abies cephalonica)* is the dominant tree species above 1.000 m. The chamois populations in Rhodopi mountain range (pops. 27-28) occur in quite different habitats, including lower altitudes and smoother forested slopes of beech, pure fir, black pine, Scottish pine *(Pinus sylvestris)* and Norway spruce *(Picea abies)*.

Threats

Interviewed local inhabitants reported a decline in chamois population size and a restriction of its distribution area in all the 24 mountains the species inhabits or may inhabit since the 1950's. They also reported that the main reason for this decline was legal shooting, which occurred until the 1960's, and poaching carried out after this date. In most cases, residents reported that poaching increased after the construction of a dense mountain road network that gives easier access to chamois habitats. Tourism and livestock breeding were not considered as threats for chamois survival.

During our nine year survey, we noted only one possible case of sarcoptic mange infection (Mt. Timfi, 1998). Besides, the local inhabitants interviewed never reported the presence of infected chamois by any parasitic disease during the last 30 years. In addition, we never found carcasses of chamois that were dead by natural causes or diseases. On the other hand, we have quite often found remains of chamois shot by poachers (e.g. hide).

Protection status

Chamois hunting is prohibited throughout Greece. Considering as protected areas those where hunting activity is prohibited or is under strict control (National Park core areas, natural monuments, wildlife reserves and controlled hunting areas), we compare the map of protected/unprotected areas (after TRIANTAFILAKOS, 1998, 2001, 2002 a, b) with he map of the chamois distribution (Fig. 1). We find that chamois populations are completely unprotected in seven mountains, they are poorly protected in seven additional mountains (less than 25% of the established range overlaps with protected areas), while in a further seven mountains less than half (25-50%) of the occupied chamois range fell within a protected area. Finally, in five of the mountains surveyed, chamois area is protected (50-75%) and in four mountains the greatest part of the occupied area is protected (>75%) (Table 2).

DISCUSSION

Population status

Based on our estimates, Greece has a total population of 477-750 chamois, the smallest national population size in the Balkans. This estimate is greater than previous counts (300-500 individuals estimated by ADAMAKOPOULOS et al., 1997; HATZIRVASSANIS, 1991), but we attribute this to our more extensive survey rather than to actual population increase. Likewise, we consider that the new populations discovered pre-existed in the three areas and didn't colonise them recently.

The distribution pattern of Balkan chamois in Greece is rather fragmented (Fig. 1) and chamois usually occur in small, scattered, populations of less than 30 individuals (n = 18), thus pinpointing the vulnerability of the species throughout the mainland. However, a limited gene flow may occur, mostly in the form of wandering males (HAMR, 1984), within three populations groups which we therefore consider as three potential metapopulations : Pindus (pops. 1-20), Sterea Ellada (pops. 22-24) and Rhodopi mountains (pops. 27-28).

The northern part of Pindus mountain range (pops. 1-12) is the most important area for the conservation of the Balkan chamois in Greece, as it hosts approximately 40% (207-290 ind.) of the national population and includes the largest populations. On the contrary, urgent conservation action should be taken in Southern Pindus (pops. 13-20), where few small populations occur (about 15 individuals each) and are directly threatened with extinction, even if a gene flow exists between these and the Northern Pindus populations. The mountains of Sterea Ellada (90-140 individuals) host the second largest Greek chamois population (Mt. Giona), and two smaller populations in neighbouring mountains. Finally, Mt Rhodopi (pops 27-28) contains 70-95 individuals, and the population of Mt. Olympus is relatively large (60-100 individuals) but geographically isolated.

Regarding the chamois populations on the borderlines of northern Greece, Mt. Nemertsika (pop. 21) may have a larger population size than that recorded, given that the largest part of this mountain lies in Albania. Likewise, Mt Grammos (pop. 1) may have a slightly larger population size, because chamois are recorded in the Albanian part of Mt Grammos as well (GJIKNURI, 1997). The chamois population in Mt. Varnountas (pop. 30) is probably part of a larger neighbouring population in Mt. Pelistel (KRYSTUFEK et al., 1997) in F.Y.R.O.M. Finally, the distribution range of the populations of Mt. Tzena-Pinovo (pop. 29) and Mt Rhodopi (pops 27-28) extends probably over the Greek borders, but no populations are reported near the bordeline in the neibouring countries (KRYSTUFEK et al., 1997; SPIRIDONOV & GENOV, 1997).

Threats

Although sarcoptic mange, a parasitic disease transferred by livestock, is one of the most important short-term mortality factors for chamois in Europe (FERNANDEZ-MORAN et al., 1997; PENCE & UECKERMANN, 2002), the disease does not seem to affect substantially the chamois population dynamics in Greece. Likewise, this disease has never been reported to infect Balkan chamois in former Yugoslavia (e.g. KRYSTUFEK et al., 1997). Livestock breeding is not currently a serious threat for chamois populations, especially given its decreasing trend during the last decades. However, we observed that chamois withdrew to more remote habitats after the arrival of transhuman livestock in summer, on Mts Timfi and Grammos.

The major threat to chamois survival in Greece is considered to be poaching, enhanced by the dense mountain road network constructed either for livestock breeding activities or logging. Some of the local inhabitants interviewed were poachers themselves and in Mt. Mitsikeli they reported to have killed the last animal. Poachers were aware of the illegal nature of their activity, but not of the endangered status of Balkan chamois in Greece. Chamois populations in Europe have a higher population density in areas where hunting is prohibited compared with those where hunting is allowed. Examples of this are noted in the National Park of Ecrins in the French Alps (CORTI et al., 1985), the National Park of Ordesa in the Pyreneans (GARCIA-GONZALEZ & HIDALGO, 1988), and

the National Park of Grand Paradiso in Italy (FRAMARIN, 1985). However, in Greece poaching occurs both inside and outside protected areas, as there is no efficient system to eliminate illegal activities in the country's National Parks. We assume however that in tourist areas such as the National Parks of Mt. Olympus (Olympus National Park) and Mt. Timfi (Vikos-Aoos National Park), the presence of hikers occasionally discourages poaching activity.

Further potential threats to the chamois could be the continuing development of adventure tourism activities, given their increasing trend in Greece and their known negative impact on chamois behaviour and activity (CEDERNA & LOVARI, 1985; GANDER & INGOLD, 1997; SCHNIDRIG et al., 1992).

Conservation implications

Formal attention should be drawn to the need to eliminate poaching, which is the main threat to the survival of the Balkan chamois in Greece. Although a significant proportion of chamois habitats are included in protected areas where hunting is theoretically prohibited or controlled, no efficient enforcement system exists in these areas. Access to the mountain road network in chamois habitats should also be controlled. The main conservation measure we propose for the survival of the species is the funding of a national body of rangers to guard the Greek reserve network and to control road use.

The construction of new mountain roads in close proximity to chamois habitats above the timberline or within winter habitats should be avoided. New hunting-prohibited corridors should be established under the form of wildlife reserves to guarantee the undisturbed movements of chamois within the three metapopulations in Pindus, Sterea Ellada and Rhodopi. This action would hopefully combat the potential local extinction of small populations due to geographic and genetic isolation.

Further conservation measures should involve : the establishment of a permanent monitoring programme on chamois population trends, the control of tourist activities within chamois distribution areas, the creation of environmental education programmes targeting local communities, and the funding of conservation-oriented research on chamois population density, home range and genetics.

ACKNOWLEDGEMENTS

We are grateful to the following non-governmental organizations that partially sponsored our research : WWF-Greece, Arcturos, Hellenic Ornithological Society and Pindos Perivallontiki. Thanks are also due to Prof. R. Putman and to Prof. Ch. Goldspink for their valuable comments on the manuscript, as well as to Prof. Ph. Lebrun for his kind support.

REFERENCES

ADAMAKOPOULOS T, HABLUTZEL Ch & HATZIRVASSANIS V (1997). Status and distribution of Caprinae in Greece. In : SHACKLETON DM (ed), Wild Sheep and Goats and their Relatives, IUCN, Cambridge, UK : 104-108.

ADAMAKOPOULOS-MATSOUKAS P (1991). Chamois environment in Greece. In : SPITZ F, JANEAU G, GONZALEZ G & AULAGNIER S (eds), Ongulés/Ungulates 91, IRGM – INRA, Toulouse, France : 295-298.

CEDERNA A & LOVARI S (1985). The impact of tourism on chamois feeding activities in an area of the Abruzzo National Park, Italy. In : LOVARI S (ed), The Biology and Management of Mountain Ungulates, Croom Helm, UK : 216-225.

CORTI R, GIBERT Ph, GINDRE R, LANDRY Ph & SARRAZIN C (1985). Données sur la biometrie et l'état sanitaire du chamois dans le nord – est du massif ders Ecrins (Hautes – Alpes). Bull. Office Nat. De La Chasse, 93 : 43-48.

COUNCIL OF EUROPE (1992). Council Directive 92/43/EEC of 21 May on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Communities 206 : 7-50.

ELSNER-SCHACK I (1985). What is Good Chamois Habitat? In : LOVARI S (ed), The Biology and Management of Mountain Ungulates, Croom Helm, UK : 71-76.

FERNANDEZ-MORAN J, GOMEZ S, BALLESTEROS F, QUIROS P, BENITO JL, FELIU C & NIETO JM (1997). Epizootiology of sarcoptic mange in a population of cantabrian chamois (*Rupicapra pyrenaica parva*) in Northwestern Spain. Veterinary Parasitology, 73 : 163-171.

FRAMARIN F (1985). The population density of chamois and ibex in the Grand Paradiso National Park, Italy. Biological Conservation, 32 : 51-57.

GANDER H & INGOLD P (1997). Reactions of male alpine chamois *Rupicapra r. rupicapra* to hikers, joggers and mountain bikers. Biological Conservation, 79 : 107-109.

GARCIA-GONZALEZ R & HIDALGO R (1988). Census and summer-autumn distribution of Pyrenean chamois in "Los Valles" national hunting reserve (Spain). In : Symposium on Chamois.Conseil International de la Chasse, Paris : 225-241.

GIACOMETTI M, HARTL GB & VOLK F (1997). Status and distribution of Caprinae in Europe, Regional summary. In : SHACKLETON DM (ed), Wild Sheep and Goats and their Relatives, IUCN, Cambridge, UK : 143-147.

GJIKNURI L (1997). Status and distribution of Caprinae in Albania. In : SHACKLETON DM (ed), Wild Sheep and Goats and their Relatives, IUCN, Cambridge, UK : 79-80.

HAMR J (1984). Home range sizes of male chamois *Rupicapra rupicapra* in the Tyrolean Alps, Austria. Acta Zoologica, 171 : 293-296.

HATZIRVASSANIS V (1991). The status of chamois (*R. r. balcanica*) in Greece. Biologia Gallo-hellenica, 18 : 31-44.

KARANDINOS M & PARASCHI L (1992). The Red Data Book of Threatened Vertebrates of Greece. Hellenic Zoological Society & Hellenic Ornithological Society, Athens, Greece.

KRYSTUFEK B, MILENKOVIC M, RAPAIC Z & TVRTKOVIC N (1997). Status and distribution of Caprinae in Former Yugoslavia. In : SHACKLETON DM (ed), Wild Sheep and Goats and their Relatives, IUCN, Cambridge, UK : 138-143.

MICHALLET J, GAILLARD J-M, TOIGO C & YOCCOZ NG (1999). Sélection des quartiers d'hivernage par le chamois, *Rupicapra rupicapra,* dans les massifs montagnards de l'Isère (France). La Terre et la Vie, 54 : 351-363.

PAPAIOANNOU D-H (2003). Habitat use, population status and conservation of the Balkan Chamois (*Rupicapra rupicapra*) on Mount Timfi, in the Vikos Aoos National Park, Greece (M.Sc. Thesis). Manchester Metropolitan University, UK.

PAPAIOANNOU H (1991). The chamois (*R. rupicapra*) in the Epirus mountains. Biologia Gallo-hellenica, 18 : 53-66.

PENCE DB & UECKERMANN E (2002). Sarcoptic mange in wildlife. Revue Scientifique et Technique de l'Office International des Epizooties, 21 : 385-398.

SCHNIDRIG R, MARBACHER H & INGOLD P (1992). How is paragliding affecting the behavior and general condition of cham-

ois (*Rupicapra rupicapra)*? A study in the Swiss Alps In : SPITZ F, JANEAU G, GONZALEZ G & AULAGNIER S (eds), Ongulés/Ungulates 91, IRGM – INRA, Toulouse, France : 609-610.

SFOUGARIS AI, GIANNAKOPOULOS A, GOUMAS H & TSACHALIDIS E (1999). Status and management needs of a Balkan chamois population in the Rodopi Mountains. Caprinae News : 4-5.

SHACKLETON DM (1997). Conservation Priorities and Options. In : SHACKLETON DM (ed), Wild Sheep and Goats and their Relatives, IUCN, Cambridge, UK : 318-330.

SIMBERLOFF D (1998). Flagships, Umbrellas and Keystones : A single species management passé in the landscape era? Biological Conservation, 83 : 247-257.

SPIRIDONOV J & GENOV P (1997). Status and distribution of Caprinae in Bulgaria. In : SHACKLETON DM (ed), Wild Sheep and Goats and their Relatives, IUCN, Cambridge, UK : 86-89.

TRIANTAFILAKOS P (1998). Hunting Guide of Epirus : 1998-1999. Triantafilakos, Athens, Greece.

TRIANTAFILAKOS P (2001). Hunting Guide of Thessaly : 2001-2002. Triantafilakos, Athens, Greece.

TRIANTAFILAKOS P (2002a). Hunting Guide of Makedonia-Thraki : 2002-2003. Triantafilakos, Athens, Greece.

TRIANTAFILAKOS P (2002b). Hunting Guide of Sterea-Ellada : 2002-2003. Triantafilakos, Athens, Greece.

Received: October 4, 2005
Accepted: December 18, 2006