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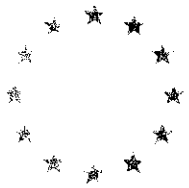

The situation, conservation needs and reintroduction of lynx in Europe

Environmental Encounters, No. 11

The situation, conservation needs and reintroduction of lynx in Europe

17 to 19 October 1990, Neuchâtel, Switzerland
Faculté des Lettres, University of Neuchâtel

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of European Wildlife and Natural Habitats

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9. Seminar on nature museums: tools for learning about, promoting and protecting the natural heritage of Europe, 1990
10. Colloquy on the Berne Convention invertebrates and their conservation, 1990

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1. Introduction

In past years the convention on the conservation of European Wildlife and Natural Habitats (Bern Convention) has carried out reviews (through reports, meetings and workshops) on a number of threatened European carnivores.

The following publications have been produced or are in hand:

1989 Monk seal Monachus monachus Nature & Environment Series No. 41
1989 Brown bear Ursus arctos Environmental Encounters Series No. 6
1990 European Lynx Lynx lynx Nature & Environment Series No. 45
1990 Grey wolf Canis lupus Nature & Environment Series No. 47
1991 Pardel lynx Lynx pardinus Nature & Environment Series (printing)
1991 European mink Mustela lutreola Nature & Environment Series (printing)

This work reflects the intention of the Standing Committee of the Convention to work for a better implementation of the Convention regarding these species. To meet the same purpose, the Committee has also produced a series of recommendations to the Contracting Parties concerning the Monk seal [Recommendation No. 6 (1986)], the bear [Recommendation No. 10 (1988)], the common seal [Recommendation No. 11 (1988)], the wolf [Recommendation No. 17 (1988)] and - hopefully - both recommendations on the pardel lynx and the European lynx which are tabled for adoption in January 1991.

The Seminar on the situation, conservation needs and reintroduction of lynx in Europe was held, at the invitation of the Swiss authorities, in Neuchâtel from 17 to 19 October 1990. Two days were used for discussion and a third for a field trip to see the areas where lynx had been introduced in Switzerland. The Secretariat of the Council of Europe wants to thank here the Swiss Federal Authorities and the Neuchâtel Cantonal Authorities for the excellent preparation of the meeting, their warm welcome and the most instructive excursion.

2. Meeting report

Most of what was said in the meeting is contained in the written summaries presented by the speakers. Thus the Secretariat estimates that a lengthy report on interventions is not needed to understand the main points made. Yet there were several discussions or suggstions which require some comment, apart from the suggestions on the two recommendations made. These are treated very summarily here:

- Status. The conservation status of Lynx pardinus is very worrying, as its range has been reduced to a third of that fifty years ago. Some populations of Lynx lynx (in Sweden or Poland, for instance) keep decreasing in numbers while hunting of the species is still authorised. It seems convenient to draw up plans to permit that threatened populations of both species may recover to former levels.

- Monitoring. Appropriate monitoring of lynx is more the exception than the rule in most of the states. Much more research is needed to understand the biology of the species and to register its population trends. Notwithstanding what is presented in the following pages, there is still a fair degree of uncertainty on the presence of lynx in the Pyrenees.

- Hunting. In many European regions the lynx does have a certain effect on species - such as roedeer - which are also shot by hunters. It is estimated that lynx can take as much as 7% to 10% of the output of such species. This should be understood as a reasonable price to pay for the existence in the wild of this cat, but also as a potential source of conflict with hunting communities. The effect on wild birds, such as the capercaillie Tetrao urogallus is negligible. Lynx cull on wild game should not be considered as a factor deterring new lynx reintroductions.

- Livestock raising. In very localised areas (such as the French Jura mountains) the effect of lynx on livestock raising can be very serious for some farmers. There is a need to do more research on the indirect effects of lynx attacks on livestock in order to establish sounder compensation policies.

- Reintroductions. Historical data show that reintroduction programmes cannot be improvised. Actually most have failed due to insufficient preparation or inadequate follow-up work. Reintroduction should, nevertheless, be considered as an unavoidable conservation technique to improve the status of the different lynx species. It would be wise to examine more closely the possibility of carrying out a reintroduction programme for Lynx pardinus.

- Coordination. Many participants thought that more coordination of actions concerning lynx conservation should be sought at international level. The framework of the Bern Convention was suggested as an appropriate one. The Standing Committee is invited to discuss this issue.

- Compensation. Compensation for damage caused by lynx and other carnivores (bear, wolf, Monk seal, common seal, otter, etc) protected under the Bern Convention was suggested as an issue to be dealt with in the near future by the Bern Convention. These wild carnivores cause damage to a number of economic activities. It would be important to give international guidelines for compensation and, specially, to look out for more efficient ways and methods to deal with and pay this compensation (involvement of insurance companies, etc). The Standing Committee was invited to discuss this issue.

3. Recommendations

In the following pages are presented the two recommendations that participants asked the Standing Committee to examine, and the Committee adpted with small amendments.

CONVENTION ON THE CONSERVATION
OF EUROPEAN WILDLIFE
AND NATURAL HABITATS

Berne 19.IX.1979

STANDING COMMITTEE

RECOMMENDATION N° 19 (1991)

OF THE STANDING COMMITTEE

ON THE PROTECTION OF THE PARDEL LYNX (Lynx pardinus)
IN THE IBERIAN PENINSULA

(Adopted by the Standing Committee on 11 January 1991)

The Standing Committee of the Convention on the Conservation of European Wildlife and Natural Habitats, acting under the terms of Article 14 of the Convention,

Having regard to the aims of the Convention on the Conservation of European Wildlife and Natural Habitats to conserve wild flora and fauna and their natural habitats;

Considering that the pardel lynx (Lynx pardinus) is a fundamental part of the European natural heritage for its symbolic, scientific, ecological, educational, cultural, recreational, aesthetic and intrinsic value;

Recalling that Article 1, paragraph 2, of the convention requires that Contracting Parties give particular emphasis to the conservation of endangered and vulnerable species;

Recalling that the pardel lynx is listed in Appendix II to the convention as a strictly protected fauna species;

Considering that the pardel lynx is seriously threatened, having become extinct in two thirds of the territory it occupied thirty years ago;

Considering that habitat loss, reduction of rabbit population, progressive fragmentation of its populations and human-induced mortality have been the main causes of the sharp decrease in pardel lynx populations numbers;

Considering that the areas where the pardel lynx lives and also those areas which have the possibility of being recolonised by the species and may sustain stable populations (herein referred to as lynx areas) are of great biological importance;

Referring to Recommendation N° R (85) 15 of the Committee of Ministers of the Council of Europe on the reintroduction of wildlife species;

Referring to the IUCN (World Conservation Union) position statement on the translocation of living organisms, approved at the 22nd meeting of IUCN Council in 1987;

Recommends that Spain and Portugal take the following measures:

1. **Increasing public knowledge of the practical problems of the pardel lynx in the areas it occupies at present**

A data bank should be made which would gather information on relevant aspects of the areas occupied by pardel lynx, such as their habitat types, the use of land they are subject to, their economic rentability, the powers of the authority to influence their management, the projects that may alter them, the presence and number of potential prey populations, etc. This information should permit for appropriate solutions to be sought for pardel lynx survival in specific areas before problems worsen or become insoluble.

2. **Preventing regression of the species**

The following measures are proposed:

2.1 Habitat protection. It is suggested the impact on the pardel lynx populations be assessed of projects for public works, reafforestation, touristic use and any other development that may affect the habitat of the species. It is also suggested eliminating or limiting any unwanted negative effect on the pardel lynx populations when such projects are carried out.

2.2 Elimination of non-natural causes of mortality. Removing the risk of death by trapping would eliminate a high proportion of non-natural mortality. This would imply:

- banning the use of leg-traps or snares in the commercial exploitation of rabbits. Where rabbit farming is an important livelihood, preference should be given to alternative methods (eg netting) that do not increase the rate of mortality among pardel lynxes.

- refusing permission to use leg-traps or snares to capture predators. In regions where social pressures are still strong, other measures need to be applied in controlling fox populations (shooting, or unearthing the dens);

- reminding hunters of the total ban on shooting pardel lynxes during battues and of the heavy fines imposed on offenders;

- limiting touristic access to the most sensitive areas, in order to reduce disturbance to the pardel lynx.

Public authority should have the means of keeping a close watch on private hunting; at least one State-employed gamekeeper (or similar) would be needed for every 10,000 hectares of territory.

2.3 Encouragement of local support. The authorities should look for ways to assure and encourage pardel lynx conservation on private land, for instance by tax reductions or other measures such as economic or moral compensation.

3. Increasing the density of rabbit (Oryctolagus cuniculus) populations throughout the range of the pardel lynx

The following measures are proposed:

- building up new rabbit populations in places where they have disappeared or diminished, and taking measures to ensure their successful survival (for example by protecting warrens against excavation by predators);

- public authorities could purchase private hunting rights for small game in very important pardel lynx areas in so far as their resources allow, in order to organise the rational exploitation of game and so improve rabbit population densities;

- transforming the vegetation cover (wherever practicable) in order to increase rabbit populations. Management practice needs to include the clearing of zones of dense scrub and the plantation of crops on plots accessible to rabbits. Allowance must be made for the fact that the pardel lynx needs very dense scrub for use as a refuge and open areas for hunting.

4. Encouraging research on the situation of the pardel lynx

The following research is necessary in order to supplement the information already available:

a) monitoring of the status of the different populations, especially on the numbers and distribution the speies in its most important areas, so as to know populations trends and basic ecological needs of the pardel lynx in each region;

b) a telemetric study of the pardel lynx in important lynx areas in Portugal and Spain, to obtain the necessary data on density, territorial requirements, juvenile dispersal, mortality and the impact of major public works and afforestation programmes;

c) research into the reasons for the reduction of rabbit populations, especially in the south-western quarter of the Iberian Peninsula, and of the most appropriate methods for restocking and vegetation management. It would be advisable to include epidemiological research on the wild rabbit pests - especially myxomatosis and NHV virus - and the response of rabbit populations to them.

5. Environmental awareness

Campaigns to increase environmental awareness could be extended to cover the whole of the present range of the pardle lynx. It would be convenient to emphasise that the extinction of the species in Portugal and Spain would result in world extinction.

6. **Other measures**

- centralising the information at present available on the pardel lynx and that which will be obtainable when the recovery plans are implemented;

- preparing an enclosure for the care of wounded or sick lynx;

- exploring the possibility of starting a reproduction programme for the pardel lynx in captivity, with a view to a possible reintroduction in the wild.

CONVENTION ON THE CONSERVATION
OF EUROPEAN WILDLIFE
AND NATURAL HABITATS

Berne 19.IX.1979

STANDING COMMITTEE

RECOMMENDATION N° 20 (1991)

OF THE STANDING COMMITTEE

ON THE PROTECTION OF THE EUROPEAN LYNX (Lynx lynx)

(Adopted by the Standing Committee on 11 January 1991)

The Standing Committee of the Convention on the Conservation of European Wildlife and Natural Habitats, acting under the terms of Article 14 of the convention,

Having regard to the aims of the Convention for the Conservation of European Wildlife and Natural Habitats to conserve wild flora and fauna and their natural habitats;

Considering that the European lynx (Lynx lynx) (hereinafter referred to as "lynx") is a fundamental part of the European natural heritage for its symbolic, scientific, ecological, educational, cultural, recreational, aesthetic and intrinsic value;

Recalling that Article 1, paragraph 2, of the convention requires that Contracting Parties give particular emphasis to the conservation of endangered and vulnerable species;

Considering that the lynx is listed in Appendix III to the convention as a protected fauna species;

Considering that the lynx is seriously threatened throughout a substantial part of Western Europe, having become extinct in the territory of many Contracting Parties and reduced to small populations in some others;

Considering that habitat loss, shortage of prey, progressive fragmentation of its populations and human-induced mortality have been the main causes of its extinction (or the sharp decrease in lynx populations numbers) in Western Europe;

Conscious that the lynx is a species that in some circumstances may come in conflict with human activities;

Considering that the areas where the lynx lives and also those areas which have the possibility of being recolonised by the species and may sustain stable populations (herein referred to as lynx areas) are of great biological importance);

Referring to Recommendation N° R (85) 15 of the Committee of Ministers of the Council of Europe on the reintroduction of wildlife species;

Referring to the IUCN (World Conservation Union) position statement on the translocation of living organisms, approved at the 22nd meeting of the IUCN Council in 1987;

Recognising the conservation efforts carried out by some States, particularly by reintroducing the species;

A. Recommends that Contracting Parties:

1. Draw up management plans for the species in view of assuring viable populations at appropriate levels;

2. Establish, wherever absent, compensation schemes for damage caused by lynx to livestock and farm animals; improve them where such schemes already function, for instance by simplifying and accelerating administrative procedures for the payment of compensation, by informing livestock breeders on these procedures and by training game-wardens in recognising lynx kills;

3. Study the indirect damage that may be caused to stocks by lynx attacks, such as decrease in weight or in fertility rates;

4. Favour, in order to avoid conflict, the development of measures aimed at preventing lynx attacks on livestock, for instance, by encouraging herdsmen to guard their cattle at night, using electrical fences or dogs; encourage the maintenance and training of local races of shepherd dogs;

5. Strengthen the enforcement of the ban on the use of poison, poisoned or anaesthetic baits, and any other indiscriminate methods of killing;

6. Ban, in important lynx areas, where appropriate the use of leg-traps and snares for the capture of any animal;

7. Pay particular attention to habitat conservation by adopting preventive measures in lynx areas, integrating them if required in existing networks of protected areas;

8. Assess the impact on lynx populations of projects for public works, reafforestation, touristic use and any other development that may affect the habitat of the species;

9. Undertake the organisation of awareness campaigns, aimed at the rural population in lynx areas and other target groups (hunters, school children, local decision-makers);

10. Encourage research on all the aspects of the biology of the lynx, including behaviour; carry out in particular the monitoring of the size, biological characteristics and geographical distribution of the species;

11. In the areas where the lynx has been reintroduced, or has moved from neighbouring areas, take the following measures:

- careful monitoring of populations of lynx and its prey;
- establishment of appropriate coordinating structures to inform and discuss with farmers and hunters;
- launching of information campaigns;
- establishment of special compensation schemes (such as those referred to in point 2 of the recommendation);

12. Consider the possibility of carrying out captive breeding and reintroduction programmes in areas where the species has been extinct or is endangered; carry out the necessary genetic studies in order to avoid possible negative effects of introducing individuals from genetically different stocks;

13. Coordinate, within the framework of the convention, reintroduction projects between neighbouring states, especially where they may lead to the extension of a population across a frontier;

14. Develop, where appropriate for scientific or conservation purposes, bilateral or multilateral contacts with other states and conservation bodies and agencies, including those which are not based in the territory of Contracting Parties.

B. Recommends that France and Turkey:

1. Monitor and take adequate measures to conserve the following populations:

- Pyrenean Mountains : strengthen the research efforts to improve the knowledge on the status of lynx;
- Turkey: All populations in Turkey are threatened. Turkey has several endangered cat species (eg. Panthera pardus), and it is advisable to establish a conservation and education programme for these species.

C. Invites relevant European states which are not Contracting Parties to the convention to:

1. Consider the coordination and joint management of lynx populations in the Carpathian mountains, to be set up by the Czech and Slovak Federal Republic, Poland and the Soviet Union.

2. Consider the extension to the end of December of the close-period for hunting lynx in the Czech and Slovak Federal Republic.

3. Consider the carrying out of a more precise and scientific monitoring of lynx populations in Poland.

4. Consider the ban of lynx hunting in Poland for some years till appropriate scientific data show that the lynx population is not decreasing.

5. Consider monitoring more efficiently the Macedonia-Kosovo-Montenegro population in Yugoslavia.

D. Further recommends Contracting Parties to:

1. Strengthen collaboration with European states which are not Contracting Parties to the convention in order to achieve the recommendation and invitations above.

2. Collaborate with other European states in all relevant aspects of lynx conservation.

FROM EXTINCTION TO REAL LIFE FOR THE LYNX. FINNISH EXPERIENCES.

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The history of the lynx in Finland is typical of that of the great northern predators in Europe. Increased human rural settlement together with the increased need for food production and the disappearance of their forest prey populations resulted in intensified hunting of these predators. The campaign led first to a crash in the wolf population, after which the lynx population, which had even increased at the end of 19th century, soon suffered the same fate. Although small increases were recorded in its kill statistics during the first half of the present century, the total population was in general small.

Since the lynx belongs to the European faunal type, it has never been abundant in the northern parts of Finland where reindeer husbandry is practised, although some accidental individuals have been recorded in Häme, the core area for the species in southern Finland. Fortunately, however, the species had survived both in the Scandinavian Peninsula and in the Soviet Union, from which areas Finland received a nucleus for recolonisation.

The lynx was declared protected in Finland in 1968, after which the Ministry of Agriculture and Forestry has been able to grant special licences for hunting in areas where local populations have permitted this. The first kills took place in the southeastern corner of Finland, the area into which the most intense immigration took place in the 1960s, and by the 1980s some had also been killed in Northern Karelia, eastern Finland, and in Häme, southern Finland. The yearly kill in the 1970s was 10 - 20 individuals, while by 1985/86 - 1989/90 it had reached 76 and 160 - 210 special licences had even been granted for an open season (only 42 percent led to a kill). These high licence and kill numbers reflect an increase in the entire population from zero in the late 1950s to about 500 in the late 1980s. The density of this population is highest in the southeastern corner of the country, in Northern Karelia and most recently also in Häme, involving figures which mean that most of the potential territories are inhabited by male lynx. Lynx also occur in other parts of the southern half of the country and in scattered localities in the north.

The regulations attached to the special licences require the bodies of the lynx killed to be sent to the Department of Agricultural and Forest Zoology, University of Helsinki for examination, or alternatively in more recent years to the Department of Zoology, University of Oulu, where a total of 496 lynx were studied during the period 1980/81 - 1989/90. Analyses of the contents of the stomach have been carried out at both laboratories, and notes on body condition have been recorded at the latter. Thus we have exceptionally good data on the food economy of the lynx in Finland.

According to the present author's earlier research, the size of Felis lynx is an adaptation to its use of the roe deer (Capreolus capreolus) as its main food. The food availability situation of this lynx species in Finland is interesting, since there are very few roe deer in the continental areas where the lynx occurs. On the other hand the southwestern quarter of the country represented by Häme in our data, has a population of white-tailed deer (Odocoileus virginianus) introduced more than 50 years ago from North America, and this is reflected in the winter diet of the lynx, which consists of 43% white-tailed deer and 42% hares (Lepus spp.). The situation is totally different in the area where practically no white-tailed deer are available, hares making up four-fifths of the diet. Also, the lynx in the former area base their diet on mammals, while in the latter area they also kill birds, especially tetraonids (13%). The lynx will also kill other predators such as domestic cats and red fox (Vulpes vulpes) when an opportunity arises. The proportion of carrion in its diet is very low or nil.

In many places in Häme the white-tailed deer are artificially fed in winter, which mean that they are easy to catch at the feeding sites. Correspondingly the lynx killed in Häme were in exceptionally good physical condition, with large subcutaneous and visceral fat reserves. Although the renewal of forests in the southeastern part of the country and in Northern Karelia has led to an increase in biomass acceptable as winter food for hares, hare populations tend to vary from year to year, in addition to which there is considerable hunting pressure on the hare populations. Even when hare populations have been relatively sparse, however, the lynx have been able to catch enough food, to ensure that their body condition has not weakened very much. There is nevertheless a difference in mean body condition between the lynx caught in the white-tailed deer and hare areas.

The social responsibility of an adult lynx is reflected in its body condition. The adult males do not take care of the offspring, and catch prey only for themselves, in which they are usually successful enough, while the adult females also have to catch food for their young, which means catching at least two large hares per night. This "work" detracts from the body condition of the female lynx. Young lynx which lose their mothers before February often die of starvation, as they are unable to catch enough prey under the prevailing snow conditions, and deep, soft snow may also impede predation on the part of adult lynx.

DISTRIBUTION AND NUMBERS OF LYNX IN THE SOVIET UNION

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The lynx range that covered the whole of Euroasia two centuries ago has diminished considerably, especially in Europe. As a result of deforestation, increasing agriculture and direct elimination, lynx has survived only in a few countries (Kratochvil, 1968).

In the USSR lynx is one of the most widespread species of large predators. Its range extends from the Carpathians to Kamchatka. Cases are known when lynx was met as far to the north as 72° n.l. and in the south at 48° n.l. During the last two centuries the southern boundary of the area has moved to the north nearly 400 km (Matushkin, 1974). Nowadays lynx is not found in Moldova, the greater part of Ukraine and also in the southwestern and some central regions of Russia.

Lynx are changing. During the last 50-60 years a tendency for the predator to move from its usual inhabitations has been observed. For example, in the 1930s lynx invaded the peninsula of Kamchatka (Gribkov, 1967). It was also met in the Taymyr and Kolskiy tundra (Jakushkin, 1969, Makarova, 1979). A similar tendency exists in the southern part of the lynx area: it appears sometimes in forest-and-steppe regions of the Kazakhstan and West Siberia (Sludski, 1953, Azarov, 1975). Moreover, lynx assimilated sparsely wooded territories of Bryansk, Tambov, Kuybyshev, Orenburg regions and Tataria (Poliakova, 1975). Within the lynx area, territories of very high lynx numbers are distinguished. They include zones of southern taiga, deciduous forests and even forest-and-steppe zone. Moreover, the superposition of mountain relief and these zones is of great significance. Two thirds of all lynx numbers are estimated to live in these territories (Matushkin, 1974).

In the European part of the USSR the number of lynx varied in different areas. High density of these predators is observed in the regions where ungulates form the basis of their diet. First of all these are the mountain regions of the Caucasus. For example, in Borzhomi Nature Reserve (with an area of 180 km2) the lynx population numbers 30-35. In lowland areas covered by forest the highest density is found in the Biolovieza Forest and reaches almost 10 individuals per 100 km2 (Geptner, Sludski, 1972).

In the regions where the Alpine hare (Lepus timidus) forms the basis of lynx diet, lynx numbers are below four individuals per 100 km2. Such a situation is observed in the Southern and Central Urals and some neighbouring regions. A similar type of diet and hence the same number of lynx is found in Kirov, Vologda, Kostroma, Novgorod, Leningrad regions (Danilov, Rusakov, Tumanov, 1979). Generally, lynx numbers in the USSR are estimated to be 36-40 thousand.

In the Soviet Union lynx is a traditional object of hunting. Lynx furs make up 1% of the total fur trade in the country. The largest number of lynx was hunted in 1956 (5.8 thousand)and in 1986 (5.5 thousand) which makes more than 15% of the total lynx numbers. The hunting of lynx in the country is limited by regulations fixed for all fur-bearing animals. Though, for the whole country, the problem of lynx conservation does not exist, in some regions it is quite real. For example, lynx hunting is not permitted in Moscow, Ivanovo, Vladimir, Ulyanovsk and some other regions.

There is a number of factors limiting lynx numbers and distribution. Investigations carried out in Tver region, including the Central Forest Nature Reserve, showed that the main factors limiting lynx distribution are the extent of deforestation and abundance of its main prey - Alpine hare. The level of deforestation which provides permanent lynx population stability is 25%.

Increasing clear cutting areas negatively effects lynx numbers. The lowest lynx density (0.05 per 10 km of snow-tracking route) is observed in the areas where clear cuttings consist of more than 80% of the territory, whereas in the regions where mature forest makes up 40-50% of wooded area, the frequency of lynx tracks is 15 times higher. Tree species composition does not play an important role.

Similarly, like the structure of forest, hunting considerably influences lynx population condition as well. In the forests where the rate of hunting is high, the frequency of lynx tracks decreases sharply.

Among factors limiting number and distribution of lynx we should mention activity of the wolf which is a larger predator. This factor is evident in the Far East, Eastern Siberia, Central Urals as well as in the Caucasus ie where ungulates form the major part of the diet for both species. Wolf, as a larger predator, forces out lynx.

In the regions where food competition is not distinctly manifested, these two species can peacefully coexist in the same area. Such a situation is typical of the Central Forest Nature Reserve and within Tver region (fig.).

Thus lynx shows wide adaptive possibilities in utilising different habitats including anthropogenic ones. Numerous sightings of lynx near human settlements, constant inhabitation of densely populated areas in disturbed forest ecosystems, confirm high adaptability of this species. This is why lynx is a species for prospective reintroduction and preserving in recreation zones.

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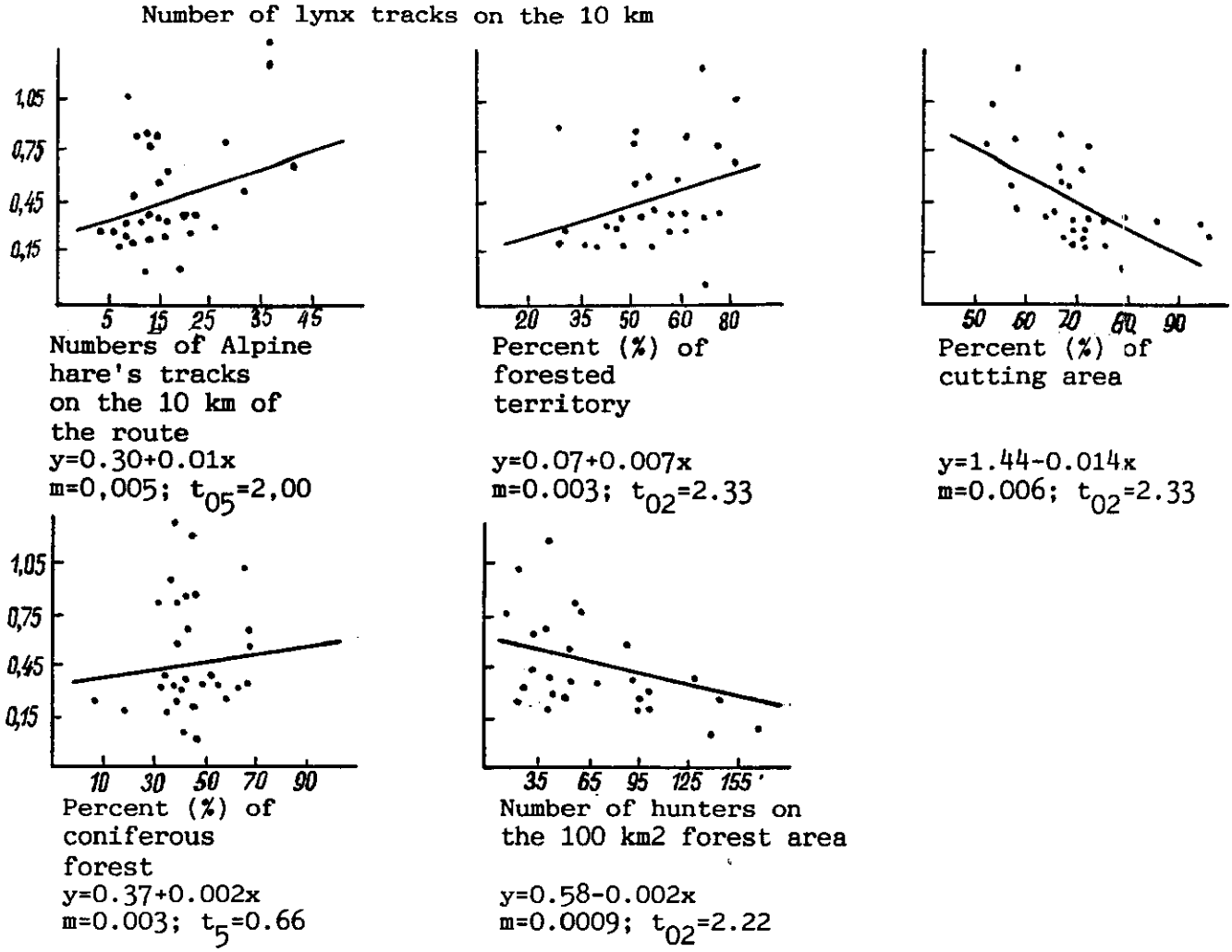
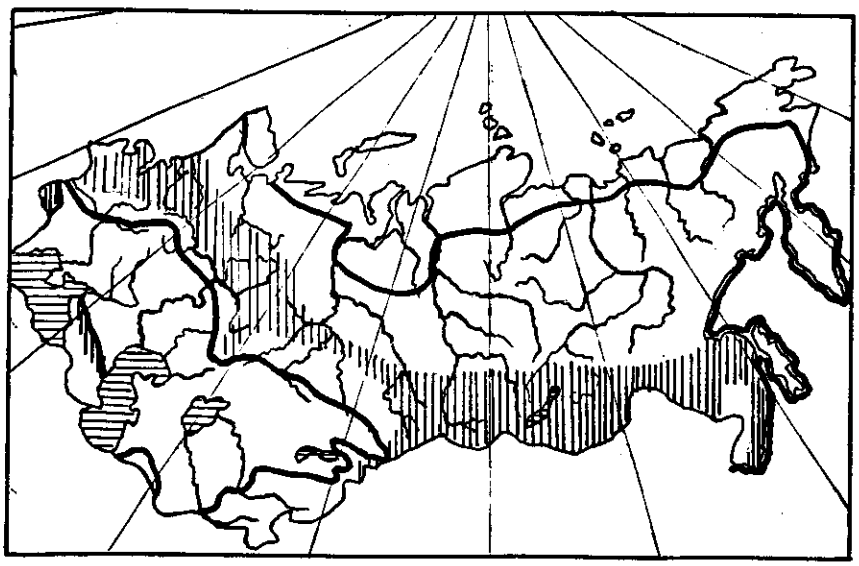


Fig. Influence of different factors of the lynx's numbers in Tver region



Distribution of the lynx in the USSR

Vertical shading marks a zone of high numbers of the species (Matushkin, 1978)

STATUS, DISTRIBUTION AND NUMBERS OF LYNX IN POLAND

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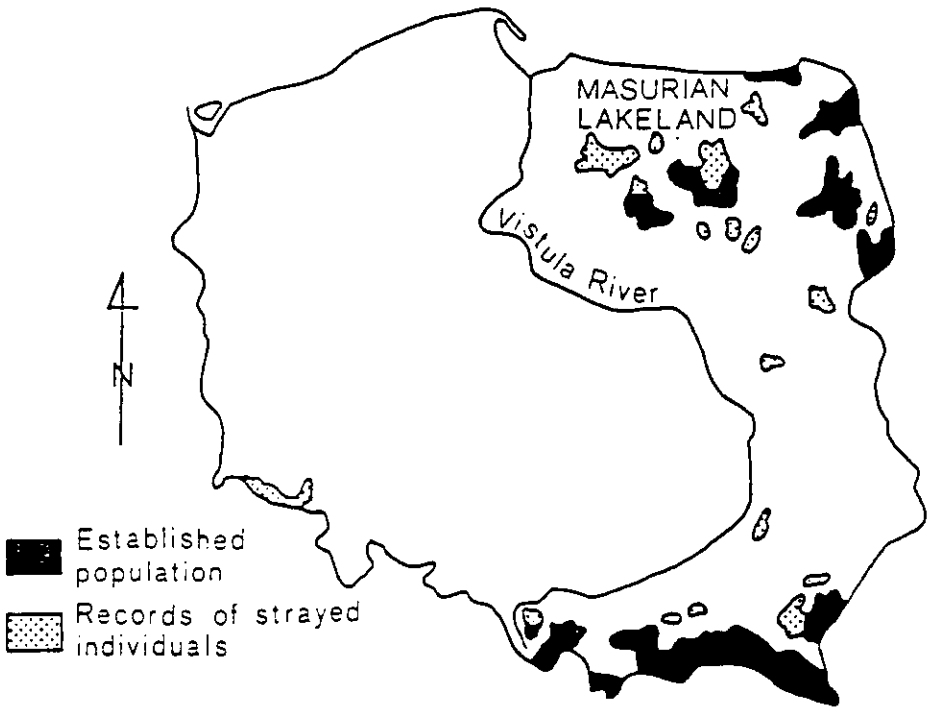
It was after the Middle Holocene Period, following the expansion of deciduous and mixed forests that the lynx (Lynx lynx Linnaeus, 1758) first invaded Poland. Since then, and up to the Middle Ages it had become widely distributed. Due to unfavourable changes in the habitat through expanding agriculture and intensive hunting, the lynx populations west of the Vistula river had become eradicated by the end of the 18th century. At the end of the 19th century the lynx range was restricted only to Masurian Lakeland, Bialowieza Primeval Forest and the Carpathian Mountains. At the turn of 20th century lynx was near to the verge of extinction, with results which culminated by declaring it a game species in 1927. Moreover, in 1931 a close season was declared for this predator.

Present status

After World War II lynx became so rare in Poland that it was under a year-long protection. Continuous increases in the lynx numbers resulted in opening a hunting season for this species in 1953. In 1955 a hunting season from 1 November to 31 March was declared, and is still valid today.

Hunting is allowed only be licensed hunters by shotgun or rifle. Pelt and skull are prestigious trophies which can also be sold for an extremely high price, and currently prices may reach about US $ 400 - which equals four to five months' average salary in Poland.

Fig. 1 Current distribution of lynx in Poland



Distribution

Two subspecies of lynx inhabit Poland. The nominative subspecies L. l. lynx (Linnaeus, 1758) occurs in the south-eastern part of the country, in the most inaccessible parts of the Carpathian Mountains. L. l. carpathicus Kratochvil et Stollmann, 1963 can be found in north-eastern Poland, in large forest complexes of Masurian Lakeland and Bialowieza Forest. Differences in body size, craniometrical characteristics, and behaviour have not yet been studied. The one distinctive feature is a different pattern of colouring in fur: lynx from mountain populations have fur with distinct black spots which, generally, are missing in lynx from lowland populations. These two subspecies inhabit areas not only of different altitudes and terrain, but also areas bearing different prey communities. Their ranges have been virtually separated for the last two centuries (Fig. 1).

Numbers

In Poland numbers of lynx are estimated on the basis of their "year-round observations". It means in fact that the official figures of their population size should be treated with due caution. According to data from the Ministry of Environment Protection, Natural Resources and Forestry there are about 500-600 lynx in Poland. However, the actual size of this population is probably about two to three times lower (about 200 specimens).

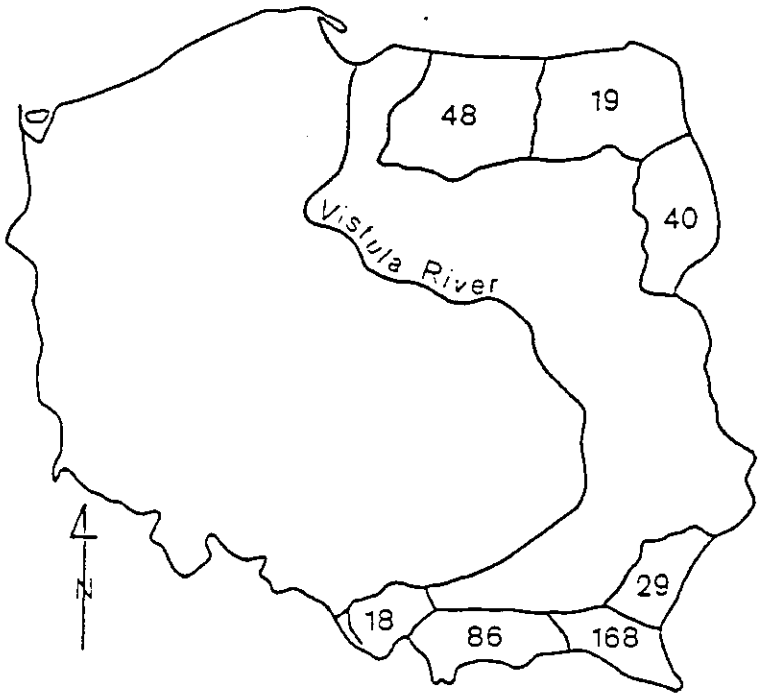
Every year, up to 60 animals are killed by hunters legally (Tab. 1); though there is considerable poaching as well, the extent of which is impossible to determine.

Tab. 1. Estimated population size and harvest of lynx in Poland during 1971-88.

Hunting season	Population estimates	Harvest	* *	Hunting season	Population estimates	Harvest
1971/72	255	21	*	1980/81	617	40
1972/73	212	22	*	1981/82	635	27
1973/74	415	28	*	1982/83	481	40
1974/75	471	34	*	1983/84	512	59
1975/76	-	-	*	1984/85	500	38
1976/77	563	32	*	1985/86	445	26
1977/78	544	22	*	1986/87	423	25
1978/79	604	30	*	1987/88	435	34
1979/80	641	36	*			

Estimations of population size show that the Carpathian population is much larger than the lowland one. This is confirmed by the number of lynx shot legally in these areas (Fig. 2).

Fig. 2. Numbers of lynx killed in Poland within administrative borders of particular provinces during 1976-89



Conclusions

(1) the lynx population in Poland is restricted to only a few areas
(2) official estimates of lynx numbers are too optimistic
(3) population size is decreasing (even according to inaccurate official estimations)
(4) high hunting pressure and poaching have forced this species to become endangered
(5) lynx should be protected in Poland.

EVOLUTION OF LYNX POPULATION IN TURKEY

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The forested area of Turkey is 20,199,296 hectares, and 26% of the country is composed of forests. Because of the irregular usage and destruction over hundreds of years, the boundaries of forests have become considerably narrowed vertically and horizontally, and many of our forests have abandoned their locations to their neighbours, such as maquis, sparsely vegetated plain and steppe flora, or else by becoming completely arid. This has led to the rapid decrease of the wild animal population especially over the last thirty to forty years in Turkey.

In Turkey the group "big carnivores" consists of the wolves (Canis lupus and Cuon alpinus hesperius), brown bear (Ursus arctos), lynx (Lynx lynx and Caracal caracal), fox (Vulpes vulpes), jackal (Canis aureus) and hyena (Hyaena hyaena).

1. Lynx lynx

1.1 Distribution and status of stocks

The lynx occurs in all wooded regions of Turkey, except in the plains of Aegean and central Anatolia, along the central Black Sea coast and SE Anatolia (Akin and Kumerloeve, 1975). Today Lynx lynx exists south of Marmara, in forested areas of the Aegean region, especially northern Aegean, west of central Anatolia, eastern Anatolia, east of Mediterranean region and forests of Black Sea mountains in Turkey. Some of them are: Denizli, Bolu, Kastamonu,

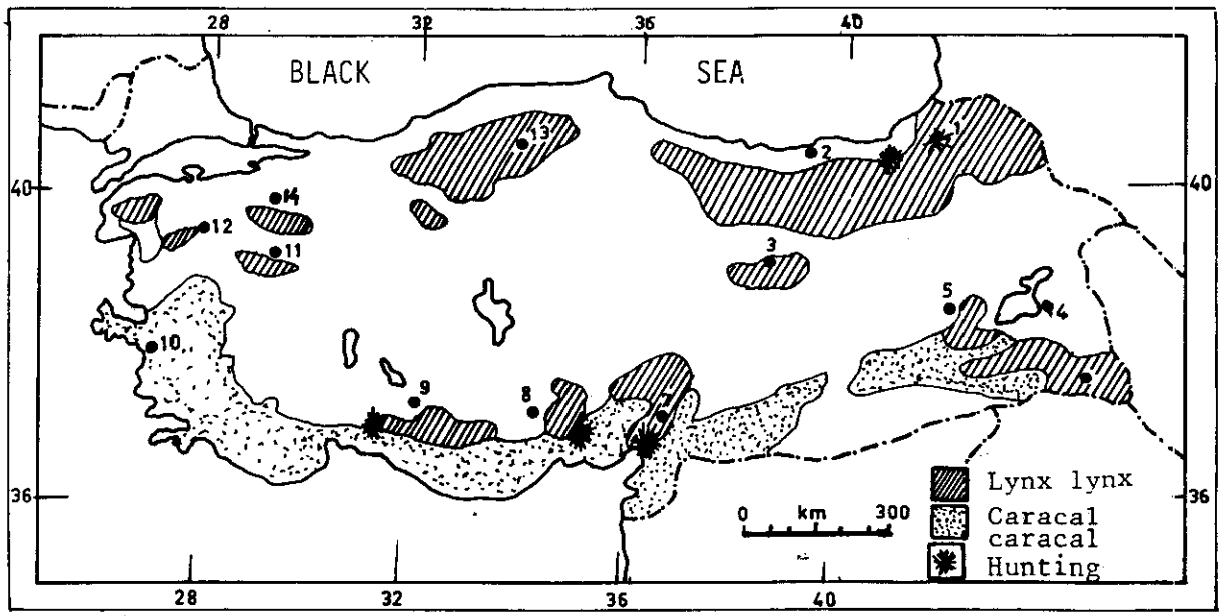

Fig. 1: Map of Turkey showing recent distribution of Lynx lynx and of Caracal caracal

1. Artvin
2. Trabzon
3. Erzincan
4. Van
5. Mus
6. Hakkari
7. Pozanti
8. Bolkar Daglari
9. Isparta
10. Izmir
11. Kütahya
12. Balikesir
13. Kastamonu
14. Bursa

Zonguldak, Samsun, Ordu, Giresun, Trabzon, Kars, Erzurum, Bitlis, Bingöl, Siirt, Hakkari, Afyon (Eber and Karamuk), Ankara (Sulakyurt, Keskin, Kizilçahamam and Çamlidere), Artvin (Borçka and Çankurtaran, Hatila, Savsat, Yusufeli and Murgul), Aydin (Söke-Gümüs mountain, Çine-Besparmak and Germencik mountains), Antalya (Gidengelmez mountains), Adana (Pozanti-Karanfil and Demirkazik mountains), Eskisehir-Somdiken mountain, Kahramanmaras (Afsin-Domuzderesi, Göksun-Sarioyak, Findikli, Ericek, Ahirdagi, Beskonak dagi, Colak, Yavsan, Gözlek and Tömek), Mersin (Tarsus-Cehennem deresi) and Rize (Camlihemsin-Kaçkar mountains) (Hus, 1974; Turan, 1984).

There are no data or estimates on population size, but all indications have been decreasing. There are no data available for the Thrace region (Kumerloeve, 1975). It probably occurred along the northern border to Bulgaria (fig. 1).

1.2 Historical evolution

In the last centuries lynx has been hunted by both Greek and Turkish hunters. This also lasted in Turkey until recently so that there has been a decline in the lynx population in Turkey.

Firstly Temminck (1824) also Ainsworth (1842) and Gonzenbach (1860) recorded that there were a few Lynx lynx pardinus in south and west of Turkey. Turan (1984) also believes that there is still Lynx lynx pardinus in northwest of Anatolia and Black Sea region.

Boessneck and Driesch (19è(0 have reported, based on excavations in Korucutepe (Elazig), that Turkish population came into being by hybridising between two subspecies, Lynx lynx orientalis Satunin 1905 and Lynx lynx dinniki Satunin 1915.

It is known that 295 bird species, thousands of insect, fish, reptile, and 22 wild goat, leopard, wolf fox, otter and also Lynx have been taken from western Anatolia by foreign researchers after archaeological and anthropological excavations.

According to Atanassov (1963), the last lynx in Bulgaria were hunted in March 1935. Thus there is no longer lynx in Thrace. Boessneck and Driesch (1974 and 1980) have conducted excavations in many different places in Anatolia over ten years. They have found and identified the bones of lynx during their research.

Acording to Payne (1973), an English researcher, bone materials of lynx could be found in excavations in Anatolia in 1975.

1.3 Hunting and conservation legislation

The duties of conservation and development of game and wildlife in Turkey and organisation of hunting have been given to Forestry organisation by the Land Hunting Law No. 3167.

Until 1989 lynx hunting was free all the year round by the General Directorate of Forestry because the official strategy in Turkey was to promote ungulate populations and to suppress carnivores. Turkish hunters hunted lynx for its skin or fur. This is an important factor in decreasing lynx population. However lynx hunting has been prohibited in Turkey by G.D.F. since 1990. Hunting is allowed only for a limited period, from 1 August to 31 March.

In the following localities of Turkey lynx has been offered for hunting in a restricted period since 1990:

Antalya-Cevizli Gidengelmez mountains, Adana-Pozanti Karanfil and Demirkazik mountains, Mersin-Tarsus Cehennemderesi, Rize-Çamlihemsin Kaçkar mountains and Artvin-Yusufeli forests.

In addition, each hunter may shoot only one lynx in one day. Tukish hunters pay 150 US dollars for one lynx. Foreign hunters pay 50 US dollars for one lynx. They pay 750 US dollars for every hunting day. They pay 1500 US dollars for shot lynx and 750 dollars for an injured lynx. Lynx trophies are given to hunters starting from 30 US dollars.

There are 83 game conservation and reproduction areas in Turkey. These areas have reached approximately 1.5 million hectares up to 1987. Every kind of hunting including lynx hunting is prohibited in turn in these areas. The aim is to reproduce game and wildlife species so that they reach their natural population numbers. These precautions have had a great effect on conservation of lynx.

2. Caracal caracal

2.1 Distribution and status of stocks

Caracal caracal in Turkey lives in western Anatolia, northeast of Anatolia, central Anatolia, especially the plateau of Tokat (Çaglar, 1963; Kumerloeve, 1967 and 1970). Besides, it is estimated that Caracal caracal aharonii Matschie 1912 may be found in the same places.

According to Danford (1877) Caracal caracal has a smaller distribution area than Lynx lynx and its proper habitats are in southern Anatolia. According to Turan (1984) Caracal caracal in Turkey exists in Çanakkale, Izmir, Mugla, Antalya, Içel, Adana, Kahramanmaras, Adiyaman, Malatya, Hatay, Gaziantep, Diyarbakir, Siirt, Bingöl and Hakkari.

2.2 Historial evolution

Boessneck and Driesch (1974/80) who have executed some excavations in Anatolia could not find any bones of Caracal caracal. Turkish researchers also could not have found any indication of Caracal caracal until 1975. However, it is known that Caracal caracal lives in Iran, Iraq and Syria. In 1984 Turan reported that it lives in the above-mentioned localities.

2.3 Identification

Çaglar (1975) identified a Caracal caracal shot in Fethiye southwest of Anatolia as follows:

Body length is 86.5 cm, tail 28.5 cm, general colour greyish-brown. Sides and underside of chin is white. Some of hairs on the back, from head to end of the tail, are partly or absolutely black. There are two large black marks on both sides of the upper lip. A black strip lies from nose to eyes. There are two black marks on the upper sides of eyes. Both ears and tassels are completely black. Ear bottoms are surrounded by a black ring. Body is thinner, legs are longer, ear tassels are thicker and longer than that of Lynx lynx.

2.4 Hunting

Caracal caracal hunting is prohibited throughout the year.

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STATUS AND CONSERVATION PROBLEMS OF THE IBERIAN LYNX IN SPAIN

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Taxonomic identity of the Iberian lynx

For some time the Iberian lynx (Lynx pardinus) has been considered by European authors as a mere subspecies of Boreal lynx (Lynx lynx), following the criteria of Ellerman & Morrison-Scott (1951) and Corbet (1978). Pfeffer (1979) resumes the most widespread point of view: "in our opinion only one psecies of lynx exists, the habitat of which ranges from the south of Spain and Portugal to North America, and which divides into various races or populations formerly contiguous, but nowadays separated from each other". Within this context, the delicate situation of the Iberian lynx was simply interpreted as just another episode in the virtual disappearance of lynx from Western Europe.

Nevertheless, facts seem to be very different, as both the European and Iberian lynx have overlapped their ranges in Central Europe without any evidence of interbreeding (Kurten, 1968). All the authors familiarised with the species have claimed the Iberian lynx to be an independent species (see Beltrán, 1987, for a revision) and lately a specialist in the study of lynx evolution has definitely stated: "The distinction between Lynx lynx and Lynx pardinus is based on ample evidence, both from morphology and palaeontology", and also: "there is little doubt, based on current research, that Lynx pardinus is a valid species, and one of the rarest living felid species" (Werdelin, 1990).

The Iberian lynx probably is the most endangered carnivore in Europe (Mallinson, 1978).

Distribution

The most accurate study on the Iberian lynx distribution ever carried out has just been finished by Rodríguez & Delibes (1988). According to them there are still lynxes in at least ten central and southwestern areas in Spain (fig. 1), covering from ten to fifteen thousand square kilometres in all. Some of those areas are very small (eg Gredos and Alto Alberche, numbers 9 and 10 in figure) each one of them probably containing little more than a dozen individuals, while others, such as Sierra Morena and Montes de Toledo (numbers 5 and 6), are still relatively large and contain from 70% to 80% of the total lynx population on the whole.

Lynx distribution in each area is not continuous but patchy. This means that the trend to population fragmentation is kept even within the ten cited nuclei, up to the point that Rodríguez & Delibes (1988) distinguish 48 areas of stable presence more or less separated among themselves (fig. 2b).

There is quite a number of references not easily verifiable about lynx presence in other zones, both in northern, central and southern Spain. Jordán et al. (1988) and Ruiz Olmo et al. (in press) have supplied information on the lynx in Aragón and Catalonia respectively. Some of their data may correspond to Lynx lynx.

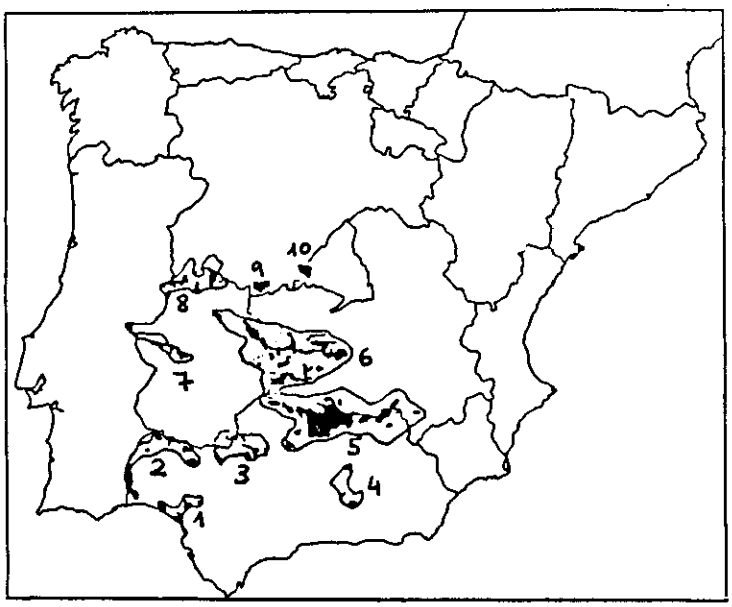

Fig. 1. Range of the Lynx in Spain. Ten nuclei are differentiated (from Rodríguez and Delibes, 1988).

Numbers

It is very difficult to estimate the abundance of carnivores scarce and with large and fragmented distribution areas, as it is with the Iberian lynx. The studies started at Doñana in 1983 by Delibes and colleagues, using radio-telemetric techniques, have led to estimating the population size in that zone and relating it with sign presence and the amount of available data from other sources. By extrapolating the results from Doñana to the rest of Spain, Rodríguez & Delibes (1988) estimate that there exist between 1000 and 1200 individuals in Spain, including juveniles. It may correspond to some 300 breeding females.

Population trends

The estimated population size exceeds the one presumed before (eg ICONA, 1986), but it is due more to sampling effort than to an actual increase in lynx numbers. In fact, decrease is the general trend in all the populations. In figures 2a and 2b (taken from Rodríguez & Delibes, 1988) are represented the areas where habitual lynx reproduction in Spain in 1960 and 1988 was supposed to take place. It can be observed that both surface reduction and increasing fragmentation are very noticeable. In fact, the lynx has disappeared as an habitual breeding species from 80% of the range it occupied thirty years ago.

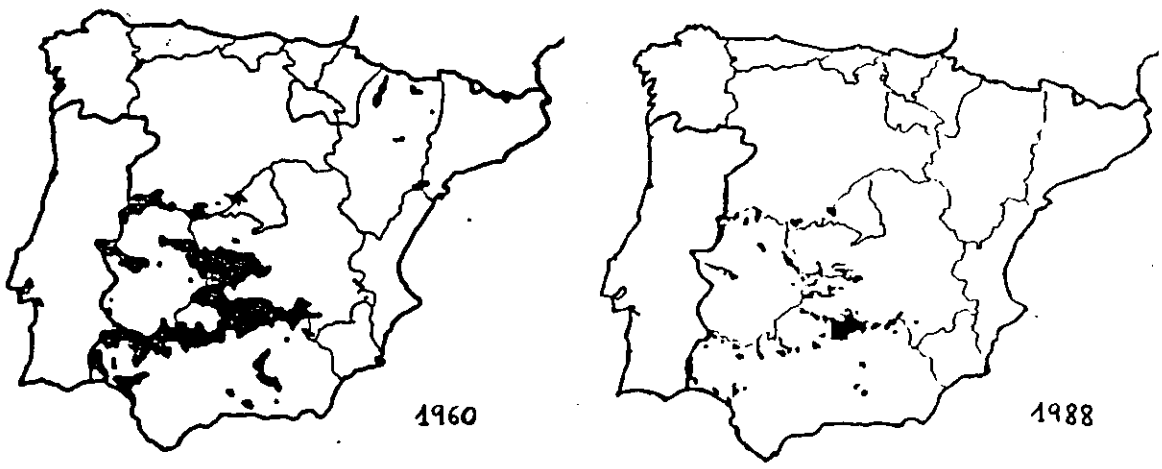

Fig. 2a, 2b. Estimated breeding areas of the Lynx in Spain in 1960 and 1988 (from Rodríguez and Delibes, 1988).

Problems in survival

The Iberian lynx is a predator specialised in capturing rabbits (Oryctolagus cuniculus), which as well needs dense shrubbery to rest and breed (Palomares et al., in press). On the other hand, this species is very sensitive to alterations in its habitat caused by humans, as it can easily die by being run over by cars, trapped, drowned in wells, captured by dogs, etc. So, the more serious problems for its survival affect habitat destruction and fragmentation, food shortage (rabbits) and mortality not sought for but due to human actions.

Habitat destruction, mainly during the last forty years, has fragmented populations as can be seen in figure 2b. As is well known, the probability of the disappearance of a population is inversely proportional to its size. Therefore, at present most small populations of Iberian lynx are exposed to a very high extinction risk.

Myxomatosis and other diseases, together with the changes in land use, have made populations of wild rabbit diminish. Attempts to increase their numbers in lynx areas appear to be a priority measure.

Much of the unnatural mortality of lynx is due to involuntary but preventable actions. Thus, more than half of the individuals killed are caught in steel-foot traps for rabbits and foxes, and in the Doñana area being run over by cars is an important cause of mortality (Rodríguez & Delibes, 1988). The Iberian lynx does not attack cattle and is not especially hunted, though it is sometimes illegally shot as a hunting trophy.

Finally, to guarantee the survival of the species it is necessary to consider lynx presence as a basic judgment element when planning great public works and evaluating environmental impacts.

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MANAGEMENT OF A LYNX POPULATION IN THE DOÑANA NATIONAL PARK

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Introduction

The Donãna National Park straddles the provinces of Seville and Huelva (south-east Spain). Over half its total area of 51,000 hectares is covered in "marismas", the marshlands which have earned it international renown.

The "dry" areas can be divided into two basic kinds of habitat: shifting sands (rows of dunes running from the beach towards the "marisma") and stabilised sands, covered in where "maquis" or scrub ("monte blanco" in the drier areas and "monte negro" where the groundwater is closer to the surface), a home for large cork oaks. The buffer zone between the "marisma" and the sands, called "vera", is the richest, as it is kept fairly wet throughout the year by the groundwater. This is where most of the park's land vertebrates live.

The lynx has been known to be present at Donãna for a long time, as it was a common hunting prey there. From the end of the last century to the 1930 an average of two lynxes were killed each year during battues. Numbers then seemed to decline sharply, though the trend was reversed following the creation of the Biology Reserve (1964) and, a few years later (in 1969), the National Park. A hunting ban as well as direct protection of the species and its habitat helped the lynx to prosper in the 1970s, to the point where it was considered abundant in all areas of the park suited to its survival. Since 1980, however, researchers into the lynx have recorded far fewer signs of its presence (droppings, tracks, etc) in the areas furthest from the "vera". These findings have been confirmed by the initial results of the radiotelemetric investigations begun in 1982.

There are three main causes for this decline:

1. loss of potential habitat and nutritional resources, due to the widespread planting of rapid-growth tree species (eucalyptus and pine), a decrease in crop cultivation and the outbreak of fires leading to an ageing of the "maquis" (with the result that rabbits are far less likely to survive there) and a reduction in the populations of lagomorpha (increased competition with other herbivores, drought, disease, etc);

2. higher mortality due to human intervention (road accidents, drowning in irrigation wells, poaching, etc);

3. low reproduction rate, the exact reasons for which are still little known.

The censuses of 1986-87 put the size of the park's lynx population at about 40. In fact there are probably two isolated populations, most of the lynxes being concentrated in the two most favourable areas (the "Dehesa de Matasgordas," in the north of the park, and along the "vera"). Furthermore the Donãna lynx population is apparently completely cut off from other stable population nuclei.

Much is already known about the biology and habitat of the lynx, largely thanks to research by Dr Miguel Delibes and his team. In the light of this knowledge and the situation described above, a working party, composed of two researchers and two administrators, was set up in 1986. It drew up a management plan which was submitted for approval to the park's authorities.

The management plan

The ultimate objective of the management plan is achieve optimum density of the lynx population throughout the park with a view to colonisation of the favourable surrounding areas as well as communication with the nearest population nuclei. For this purpose it is aimed at:

1. **Regenerating habitats favourable rabbits and lynxes by implementing the following measures:**

   1.1 Rejuvenation and partial elimination of the scrub by burning or clearing of small plots.

   The particular composition of this scrub and its adaptability to fire would require the treatment to be repeated in cycles of roughly 20 years.

   1.2 Felling of pine saplings to thin out the forests and encourage rabbits to prosper.

   1.3 Complete eradication of the eucalyptuses and replacement thereof with indigenous species.

2. **Reducing food competition from other herbivores for the rabbit populations**

   2.1 Culling of wild herbivores.

   2.2 Reduction of livestock

   2.3 Erection of selective fences to allow rabbits and lynxes to pass and keep ungulates out.

3. **Reducing the killing of rabbits by certain general predators**

   3.1 Control of fox populations and eradication of feral dogs

   3.2 Protecting warrens from excavation by predators and creating refuges around plots of land where the vegetation is being treated.

These various measures, which mostly began to be implemented in 1987, will no doubt affect the eco-system as a whole, necessitating monitoring, analysis and possibly correction. However, further knowledge about the ecology of the lynx is still needed, particularly with regard to the less well-known aspects of its biology (dispersal of the young, communication between the two possible sub-populations, etc). The following additional research is therefore planned:

4. **Research into the lynx and its habitat as a continuation of the radiotelemetric studies conducted so far**

5. **Monitoring of the effects of the management plan on:**

5.1 Lynx populations.

5.2 Rabbit populations.

5.3 Fox populations.

5.4 Plant life.

5.5 Biological diversity.

The management plan also includes other measures in the park's neighbourhood for reducing lynxes mortality due to human intervention. Some of the main ones are protection from road accidents, combating of poaching, guarding of wells and provision of refuge plots on neighbouring cultivated land.

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MANAGING THE LYNX POPULATION IN CZECHOSLOVAKIA

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I have produced a number of descriptions of the lynx situation in Czechoslovakia [Hell 1978 a,b]. This time, I wish to focus on trends in our lynx population, its conservation and hunting controls.

Stollman was the first person to classify the lynx of the Slovakian Carpathians. He and Kratochvil included it in the sub-species "orientalis" as Lynx lynx orientalis natio carpathicus [Krat. and Stoll., 1963]. Hell and Sladek [1980] have shown that the Carpathian lynx is much larger than the Scandinavian lynx and that it can be distinguished from the latter by its more varied colouring, resulting its the prominent spots (approximately 90% of animals). The average dimensions for the skulls of males and females respectively are as follows: total length of skull 157.32 mm/149.86 mm, condylar-basal length 140.52 mm/135.18 mm, zygomatic width 109.56mm/ 104.76 mm. The equivalent average body dimensions are as follows: weight 24,120 g/18,800 g, body length 1,095 mm/1025 mm, length of tail 187 mm/185 mm, length of hind foot 232 mm/220 mm, length of ear 86mm/82 mm. Geptner and Sludskij [1972] identified it as an independent sub-species F.(L)1. carpathica Krat and Stoll. 1963, and this was also later established by Sevcenko and Hell [1983] in their comparative study.

Habitat and numbers

The lynx is native to Czechoslovakia, but was exterminated in the Western part of the country during the last century and has only survived on a permanent basis in the Slovakian Carpathians. Even there it was practically exterminated by hunters in the first third of this century. It was permitted to hunt lynx throughout the year, not only with guns but also using gin traps, which represented a very serious threat since lynx follow set paths. For this reason, from 1936 to 1955 the lynx was protected between 1 March and 31 July. Its numbers increased considerably and it re-established itself in mountains from which it had disappeared. The protection was once more withdrawn. Numbers had reached more than 500 individuals over an area of 1.4 million hectares of forest. In 1958, there were even 17 individuals in the north-east of Moravia, in the Moravian and Silesian Beskids, but this population was rapidly exterminated by hunters. Overpopulation occurred, as shown by the increasing numbers approaching human habitation (often young starving beasts which had lost their mother) and by their migration towards the West and South (for example to Austria, Hungary, Bohemia etc). The number of lynx killed by hunters increased from an annual average of 18 individuals between 1927 and 1929 to between 80 and 113 individuals in each of the years 1961 to 1966. Between 1955 and 1971, hunters accounted for 1,227 lynx!

The lynx's reproduction rate has not been sufficient to compensate for this fall and after 1972 the population again started to diminish while the western edge of its territory receded towards the north east. Between 1975 and 1982 the population reached a new low, with only 52 to 67 individuals hunted each year. As a result, a protected season was again introduced: between 1 March and 15 September in Slovakia and throughout the year in the Czech Republic. On the basis of the number of lynx hunted, we can state that the population is once more slowly increasing and has regained its level of 20 years ago. The lynx is about to become reestablished in the Moravian and Silesian Beskids in the north-east of Moravia and there is also an isolated population in the north-west of Moravia in the Jesenik mountains. Another isolated group has been introduced into south-west Bohemia in the forests of Sumava, but this has not yet stabilised.

According to official statistics, there are currently 895 lynx in Czechoslovakia: 24 in the Czech Republic and 871 in the Slovak Republic. However, this is only a rough estimate produced by hunters and is probably somewhat exaggerated since there have been no scientifically conducted censuses. I would personally estimate the number of lynx in this country as between 500 and 550 individuals. In the years 1987 to 1989, an average of 87.3 individuals were hunted each year, of which 3.33 were taken alive.

Feeding and economic significance

In the west Carpathians, lynx mainly feed on red deer (whose remains have been found in 52.3% of the full stomachs examined) and roe deer, particularly the young and does (12.3%); other prey included boars (1.53%), other cloven-hooved game (1.53%), hares (3.06%), foxes (1.53%), sheep (1.53%), small rodents (32.29%), and grouse (4.61%).

After the war, during the period of rapid increase in the lynx population, the numbers of roe deer, boars and red deer rose commensurately. This means that deer progressively adjust to the presence of lynx and their population stabiliser. Only the number of grouse fell, but this was not a consequence of the lynx's predatory activities, since the declien was much greater in areas where there were no lynx. The number of foxes increased; nor was the number of wild cats affected by the lynx and there has so far been no explanation put forward for their current rapid decline. The lynx poses a serious threat to wild sheep and fallow-deer, which should therefore not be introduced into their territory. The result of lynx penetration into the breeding areas for such game is catastrophic. On occasions, the lynx also eats chamois and stray dogs. The large increase in the numbers of wolves and bears has had no negative effect on the lynx population in Slovakia. We can confirm that the current density of the lynx population in the western Carpathians is not sufficient to obviate hunting improvement measures imnplemented for ecological reasons.

Damage caused to sheep in high pastures is at a tolerable level and less significant than that attributable to bears or wolves. The lynx is a wary animal which runs away from humans and therefore constitutes no threat to tourism. Similarly, there is no significant risk of transmission of rabies following contamination by foxes. For example, Ursiny only identified 6 cases of rabies in the lynx in Slovakia before 1971 [Hell 1974] The rabid lynx loses its timidity, but is not nearly so aggressive or prone to rabies as the wolf and does not range over such a large area.

Protection and control of hunting

As has already been stated, the lynx is currently protected in the Czech Republic throughout the year, but following the stabilisation of the populations in northern of Moravia and the Sumava mountains it is becoming necessary to regulate its numbers. In the Slovak Republic it is protected from 1 March to 15 September, which we do not consider satisfactory. We have proposed that the protected period be extended until the end of December. This would result in a fall in the number of lynx hunted, since most hunting - for red deer and boar - takes place towards the end of the year and many small lynx could be saved, for example those that cannot survive if their mother is killed too early. On the other hand, the end of the hunting season for lynx could be extended to 15 March. We are thus proposing that the number of lynx hunted be restricted (as is the case with bears in this country); however, our governing bodies have not yet agreed to this. We believe that these proposals are very important if the lynx is to survive, since in the western Carpathians, hunting, which is often excessive, is the main, or even the sole, factor limiting the number of lynx. It is strictly prohibited to hunt lynx with gin traps or to poison them. The fine for killing a lynx illegally is 9,000 Kcs, the equivalent of 3 months' average earnings.

Our aim is to persuade hunters to try to catch lynx alive rather than shoot them. The problem here is that they are difficult to catch and hunters want some form of trophy. Nevertheless, we have suceeded in providing several dozen lynx for reintroduction into Switzerland, Yugoslavia, the Federal Republic of Germany, France, Italy and Bohemia. This is above all thanks to the efforts of the Ostrava and, more recently, Bratislava, zoos. We have thus helped to extend this species in Europe.

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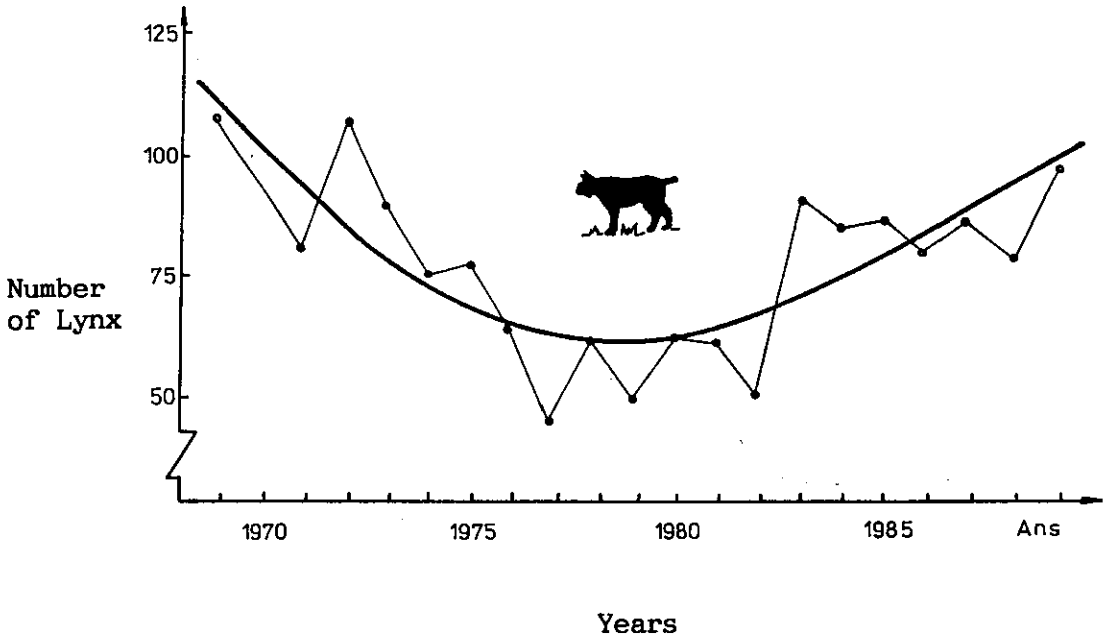

Figure 1. Number of lynx taken in the Czech and Slovak Federal Republic from 1969 to 1989

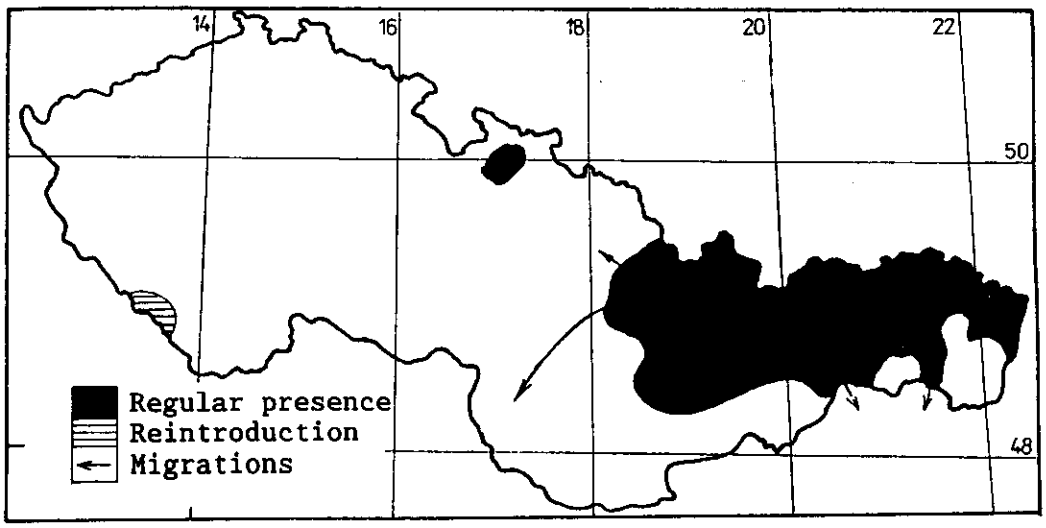

Figure 2. Lynx distribution in the Czech and Slovak Federal Republic

LYNX AND REINDEER MANAGEMENT IN SWEDEN

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There have been marked changes in the distribution, probably also in the abundance, of the lynx in Sweden during the last 150 years. In the early and mid nineteenth century the species was distributed over most of south and central Sweden. The harvest was surprisingly high - during the 10-year period 1827-1836 it averaged more that 250 individuals per year (Lönnberg 1930). Mountain hare and gallinaceous birds were primary prey and predation on semi-domestic reindeer certainly negligible.

During the latter part of that century the population decreased drastically. The species more or less disappeared from most of its southern range and harvest dropped - by the turn of the century it was only about one tenth of what it had been 70 years earlier. According to the official statistics no lynxes were shot south of the four northernmost counties during the five-year period 1911-1915.

Between 1928 and 1943 the lynx was fully protected and under cover of that protection the population was restored, particularly in the north. During the late 1940s and especially the 1950s the species spread over previously unoccupied areas here, even to alpine areas above the tree-line. This brought the lynx in contact with semi-domestic reindeer.

The lynx as a predator of reindeer

Haglund (1966) studied the lynx by snow-tracking and found that in the middle of the winter the reindeer formed the essential part of the prey in northern Sweden. He also found that the lynx was quite successful - of 64 attacks on reindeer, 45 resulted in kills. A comparison with lynx and roe-deer further south in Sweden, indicated that the reindeer did not seem to be as observant as the roe-deer to the danger. Haglund attributed this to the fact that Swedish reindeer are semi-domestic and sometimes herded by dogs, which under certain conditions might cause reindeer to mistake a lynx for a dog. He further reported that in some single cases it appeared as if a certain lynx had specialised in killing reindeer calves. Finally he concluded that the consistency of the snow was of great importance for the result of the hunt. Slightly frozen snow covered with a crust not strong enough to carry the lynx made successful hunting impossible.

Between 1982 and 1986 the Environmental Protection Agency in cooperation with the Swedish University of Agricultural Sciences and the National Veterinary Institute made a study of relations between reindeer and carnivores. The study was concentrated on the calves and the objective was to determine first-year mortality and the role of different carnivore species - wolverine, lynx, brown bear and golden eagle - in that mortality.

A total of 1615 calves were equipped with mortality-transmitters - around 200 per year during four years in two different areas. Moreover there were control-calves (marked only with ear-tags), radio-collared cows and cows marked only with numbered plastic collars. Principally the areas monitored from fixed-wing aircraft in summer and snow-mobile in winter.

First-year mortality had to be studied in two stages. From calving and until early July it had to be monitored indirectly via the collared cows. From early July, when the reindeer are corralled for marking purposes, the calves could be radio-equipped.

The mortality in May-June was estimated at 4.5-6.5%. Since these losses were indirectly verified the reasons for them are unknown. The mortality during the remaining 10 months of the first year of the calves was estimated at 11.0-14.3%. The difference is due to whether calves missing after this first year were dead with malfunctioning transmitters or alive but absent from the study areas.

Wild carnivores were responsible for 58 and 65% of the verified losses of calves between July one year and April next year in the two areas. Other causes of death were eg dogs, starvation, drowning, diseases and traffic accidents. For 13 and 14% of the losses cause of death was unknown. Assuming that carnivores play the same role before as after July and also assuming that they are responsible for 58 and 65% of the unknown losses, they accounted for 66 and 75% of the total loss of calves.

Lynxes and wolverines were together responsible for 94% of the predation in one area, 88% in the other. Other predators - golden eagle and brown bear - thus played a minor role.

As to the total number of prey taken, the wolverine slightly dominated over the lynx. Of the carnivore-killed calves 54% were killed by wolverine, 40% by lynx. In both study areas the wolverine was estimated to be about twice as abundant as the lynx. Thus a lynx is a much more important predator than a wolverine on reindeer calves.

Further results could be mentioned. In the total material there is no selection by sex but among the calves killed by lynxes, females dominate. This should be considered as selection by weight rather than by sex, since the female calves constitute the lightest part of the population.

Predator-killed calves were distributed all over the year with a slight peak in October-December. This peak was essentially caused by wolverines, while the lynx was the dominating predator after the turn of the year. This accords well with Haglund's (1966) report that the hunting intensity of the lynx in the reindeer herds increased greatly after February 1.

Finally, the geographic distribution of the carnivore-killed calves gave basic information about the ecological separation between the two main predators. Wolverine-killed calves dominated in the western, more alpine parts of the study areas whereas the lynx had killed most of the calves in the eastern, more forested parts.

Management considerations

From 1943 to 1985 there was an open mid-winter season on the lynx all over Sweden. During some periods it was up to three months in northern reindeer management areas.

Towards the mid 1980s there was conclusive evidence that the population was decreasing. From Norrbotten, the northernmost county of Sweden, shooting statistics showed a clear downward trend, the number of reindeer reported killed by lynxes declined and a track-count survey indicated a 50% reduction between 1974 and 1983 (Bjärvall & Lindström 1984). Also from central Sweden there were reports about decreasing lynx numbers. Too heavy hunting pressure was supposed to be the main reason but sarcoptic mange, possibly also feline panleucopenia, are other factors which probably were involved.

Fig. Number of lynxes per 100 survey squares (solid line) and per square with lynx (unbroken line).

On that account the lynx was fully protected from 1986 outside the reindeer management areas. Inside these areas the species causes damage for which the Lapps are compensated. Thus, it is more expensive to keep lynxes here than outside the reindeer management areas where wild animals are dominating prey. Applications for lynx hunting outside the reindeer management areas have so far been rejected. Should, however, the lynx population here recover, hunting might be allowed again. Correspondingly, if the population fails to recover and the decrease continues, the Environmental Protection Agency would be prepared to stop hunting also within the reindeer management areas.

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SUMMARY OF EXPERIENCES ON LYNX REINTRODUCTION IN EUROPE

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I was asked to give a review of the reintroduction activities for the lynx during the past years. That means, I am referring to the past 20 years exactly. During that time lynxes have been released in different countries of Europe. I do not refer to years earlier than that time.

I am aware of the fact that there may have been additional actions which we did not get to know. As I will show you later, many lynxes have been released illegally, and it was hard and sometimes impossible to get reliable data. I would like to remind you of the reason for founding the Luchsgruppe (lynx group 15 years ago: there as lack of knowledge, but overwhelming interest and activity to restore lynx populations wherever one thought a single lynx could live. Summarising the results of reintroduction activities like this group, with the goal to coordinate the activities and to give advice if necessary, is needed badly. In the meantime, however, the Cat Group of the IUCN has taken over a part of the "responsibility" for this species. Nevertheless, the pool of knowledge which we tried to offer with this group, is continuously needed. The Luchsgruppe is situated in the Wildbiologische Gesellschaft since 1983.

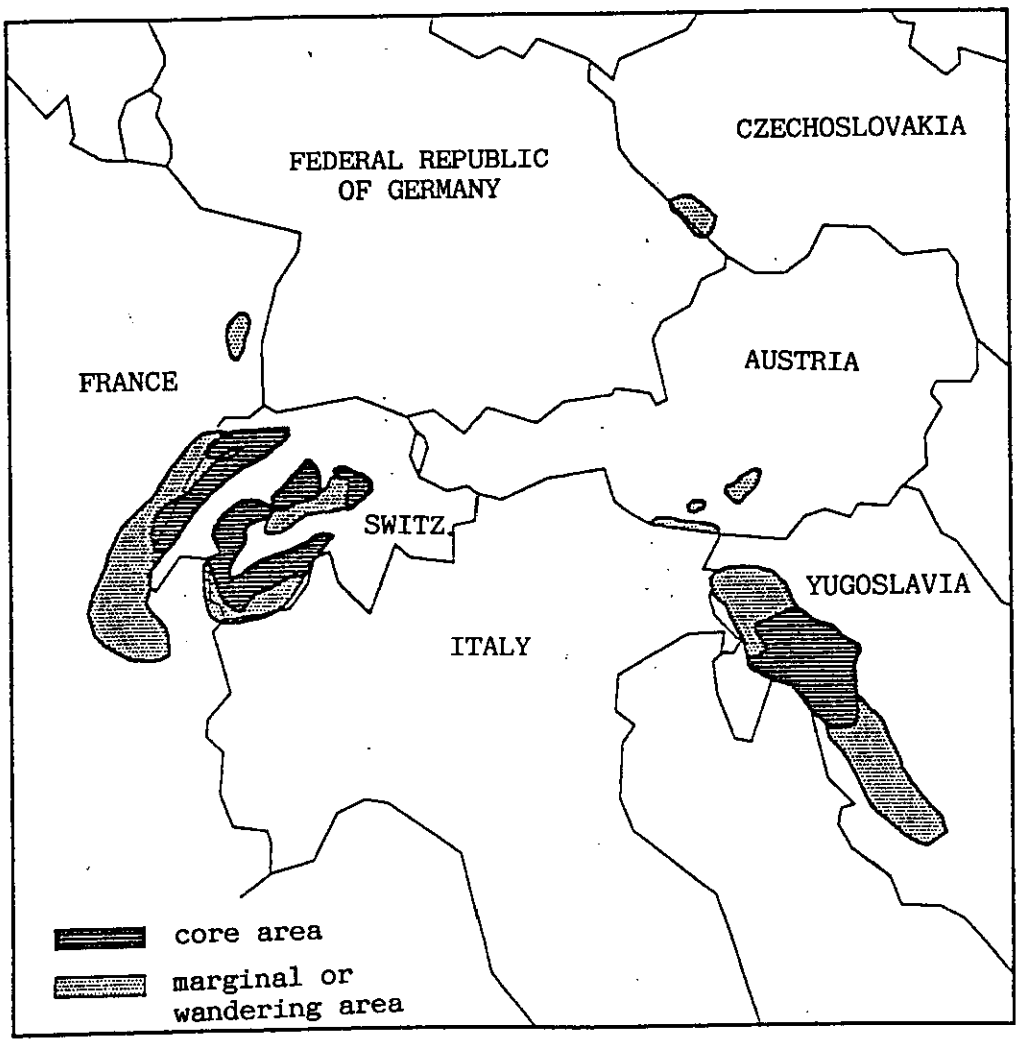


Figure 1. Dispersal of lynx in Central Europe up to 1989

The following review is based on a thesis carried out by Götz Kerger with the Institute of Wildlife research at the University of Munich. Götz evaluated 136 reintroductions of different species, including lynx. His conclusions are based on questionnaires and personal communication with the reintroducers in charge. He evaluated 105 different criteria: fulfilled - plus; done but not sufficient - neutral; and not done at all - minus.

The bases for the evaluation were different international statements (Manifest of Rome, WWF 1976; IUCN Position statement 1987; ANL-Kolloquium 1981; Zoological society of London, 1984; Symposium Virginia, USA, 1975) which are rather like each other. He divided this huge number of criteria into three main blocks: preparation, implementation and control. Each of these blocks was again divided into minor blocks, eg motivation, scientific aid, management, preconditions for to start, and so on. I will not go into more details but show the results of this evaluation (Fig. 1).

Götz found ten projects carried out since 1970. Only three of them are considered successful, two of them in Switzerland (Obwalden and Jura), the third one in slovenia. Final statements are impossible to give for the projects in the Alsace and in Sumava. The other ones failed completed. It is worth mentioning that not less than four releases, probably some more, were at least partly illegal; two of them failed. Also all projects carried out in NP failed. Furthermore, some projects can hardly be considered serious: it is obvious that the release of only males is useless (Waadt, Gran Paradiso).

Let us take a look at the evaluation done by Götz Kerger. What do I want to show with these graphs? (Fig. 2)

Götz collected positive points for every project evaluated. Imagine that we find one which has been ideally prepared, carried out, and controlled. In this case we would only find positive points. The bar would be shaded completely.

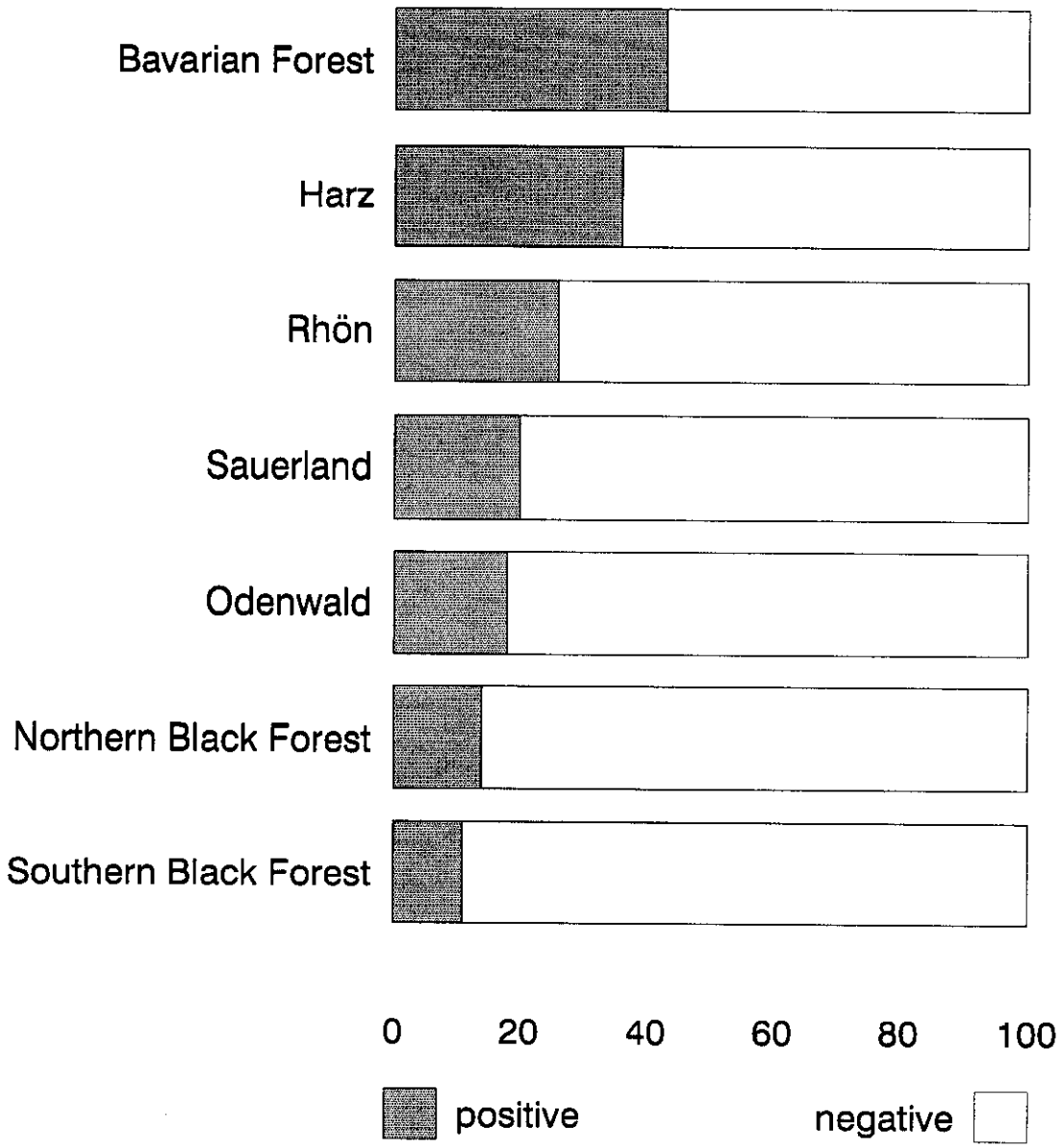
As you might expect, Götz did not find such a project - neither with lynx nor with any other species. this is not surprising. Surprising, indeed, is the small shaded portion (positive points) in all lynx bars. This means: taking international recommendations into account, the quality of lynx reintroduction is alarmingly poor.

One might think that the scale used was too stringent. Maybe that lynx reintroduction does not need such detailed preparation, implementation and control. Maybe reintroductions do not need to be judged at all as critically as we or as international institutions such as WWF or IUCN are doing. We should discuss this point later. We shuld compare the lynx reintroductions with the most highly ranked project Bearded Vulture (Gypaetus barbatus). Or let us compare lynx and the ill-reputed capercaillie (Tetrao urogallus) projects: this evaluation does not show any significant difference. (Fig. 3)

What are the biggest mistakes in lynx reintroductions? Götz compared the results of the three blocks mentioned - preparation, implementation and control - and he found that in many cases "preparationé was even worse than the whole. To say it in simple terms: lynx releasers take out animals first, and start thinking about research, management, legislation, damage to livestock, public relation and so on afterwards.

What are the biggest or the most common mistakes?

Evaluation of CAPERCAILLE reintroduction
(Germany)



Evaluation of BEARDED VULTURE
(Gypaetus barbatus)

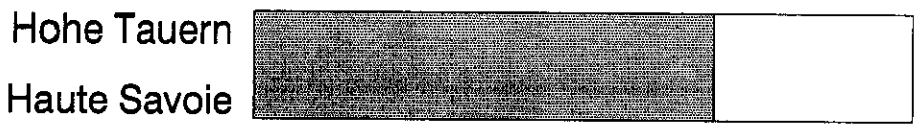


Figure 2

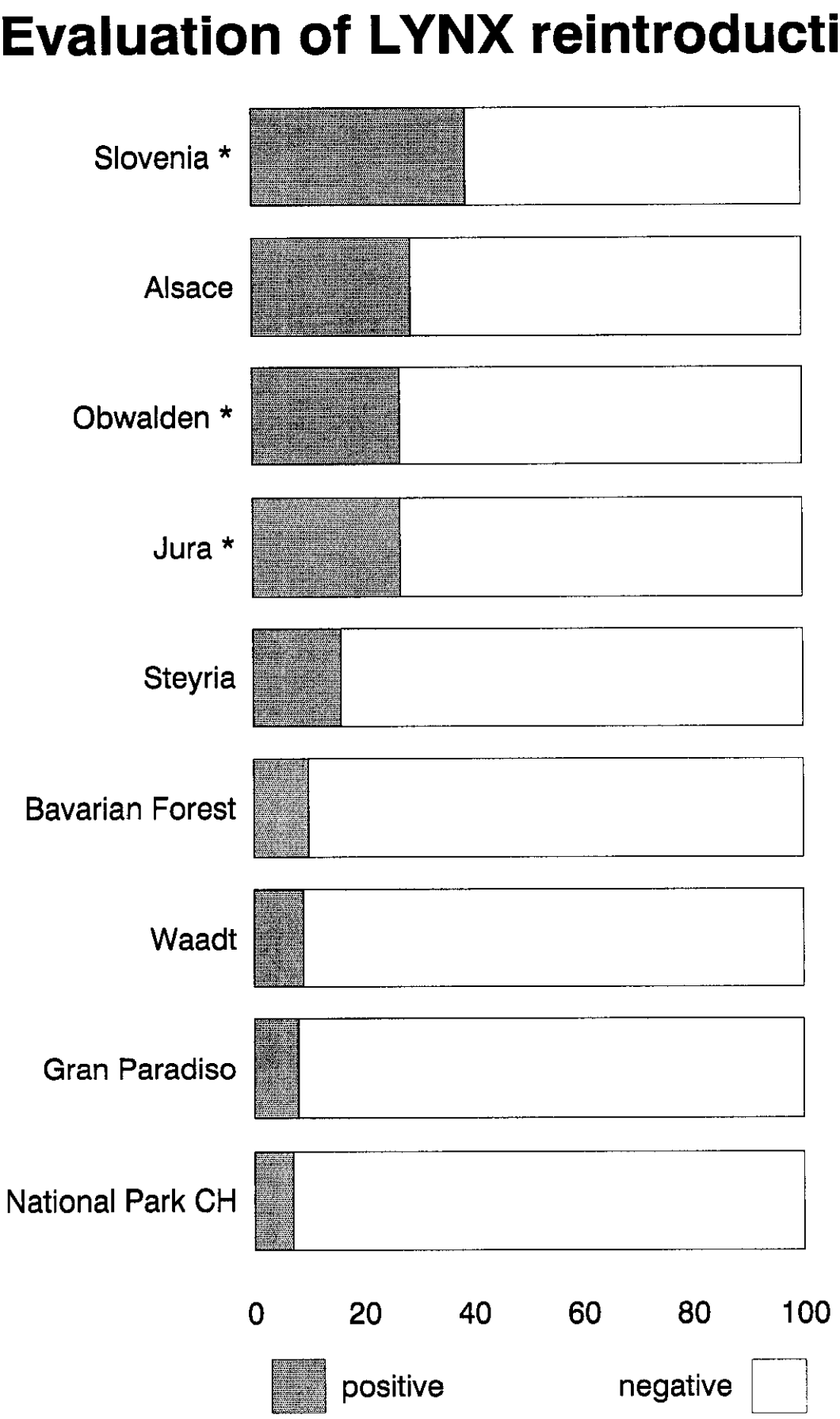

Evaluation of LYNX reintroduction
Slovenia *
Alsace
Obwalden *
Jura *
Steyria
Bavarian Forest
Waadt
Gran Paradiso
National Park CH
0
20
40
60
80
100
positive
negative

Figure 3

During the first part, preparation, the people in charge were often unfamiliar with the demands of the species. They did not bother about genetic variability, and they obviously were unaware of the population dymanics. Therefore, they released too few animals. The population could not build up within a short time. Peole did not consider adaptability, migration, home-range size, or quality of the animals being released. So the animals left the area (Gran Paradiso, Swiss National Park, Bavarian Forest National Park) because it was too small or too rich in snow. Outside the refuges they were shot or killed by traffic. Reintroducers did not consider the lack of tolerance by hunters and sheep farmers. Preparatory work began after release, if at all, and not before. Efforts in public relations during the preparation were minimal, with exception of the Alsace project (and possibly Sumava). There was no management plan to solve personal and financial problems in any project.

In our opinion, there are two essentials during the period of preparation for any reintroduction: first, habitat quality for a self-sustaining population is needed. Second, the reasons for extinction of the species must be removed.

Habitat quality does not seem crucial for lynx reintroducton: this species is highly adaptable, and prey is abundant. So, if there is only a large forested landscape (very large, thinking of the huge home-ranges and the territorial behaviour of the lynx) this species has no ecological problems to survive and to build up a viable population. This contrasts with many reintroduction problems with other species such as tetraonids, ibex and otter. Regarding the lynx, habitat quality turns out to be a problem of habitat quantity. this is the first key to successful lynx reintroduction.

The second key is removing the causes of extinction. Nobody succeeded completely in solving this problem. Every lynx project has been troulbed by shooting (or call it poaching). Some projects most likely failed only because too many animals were killed illegally. This is not a problem of legislation: wherever lynxes were released, killing was illegal. Despite this, lynxes were killed.

During the second part, implementation, aspects of genetics and population growth were usually ignored, as was done during the preparation. Too few animals were released. Obviously, this is partly a financial problem. Partly it is a problem of catpuring a sufficient number of lynxes within a short time (two, three years). And third, it might be partly a problem of convincing decision-makers (politicians) that it is necessary for the initiation of viable population to release many lynxes (many of these dangerous big cats!). At that moment, reintroduction of lynx turns out to be a problem of public relations.

Control, the third part, should document success or failure of any project. Control is needed to decide, whether a project should be considered as finished - this means: nothing more has to be done; or to be continued - this means: we need more animals, more efforts in public relations, better scientific aid, more money, or anything else; or to be cancelled - this means: the animals should be captured or killed. A precondition of control is documentation. But most projects lack documentation.

Okay - I am talking about failures, lapses, mistakes rather than success. This could create a wrong picture. We do not need intensive scientific research to state that the lynx population in the Alps is growing in a satisfying way; that the population in Slovenia outgrows any expectation; that there are good chances for a viable population both in Sumava and - hopefully - in the Vosges in Alsace. And we are sure that lynxes released in the Bavarian Alps would have a fair chance to survive and to reproduce successfully. So, the future of the lynx appears to be quite hopeful.

At a first glance, success or failure of lynx reintroductions seem to be independent of serious wildlife management - including research, legislation, public relations, just to mention a few of the pieces creating this Wildlife Management Puzzle. Currently, success or failure appear to be a matter of coincidence rather than of serious nature conservation.

Does that mean that we do not need serious efforts to prepare, carry out, and finally control a lynx reintroduction? The answer is "No!". We need to extend our efforts to get better results more consistently and use money and manpower more wisely. Last, but not least, we need to improve the image of lynx activists and of nature conservation.

Let me tell you of some urgent problems we have to solve in the near future.

First of all, we have to complete projects which are not yet finished. In the Alsace and in Sumava we need some more lynxes to make the populations grow.

Second, we should try to fill the gaps in the slowly growing Alpine lynx population. Therefore animals have to be released somewhere between Slovenia in the East and Switzerland in the West. The Wildbiologische Gesellschaft München recommended starting reintroduction in the central part of the Bavarian Alps, between the Lech and the Inn rivers (Kluth et al., 1989). According to aspects of genetics and population dynamics, 20 animals should be released with a sex ratio of 1 : 2 within a few years. We believe that lynxes from this population nucleus could quickly join the Swiss population and could build up subpopulations in the adjacent parts of the Bavarian and Austrian Alps.

We do not have sufficient data from Sumava, but people there say that there are bout 20 or 25 lynxes already. Some animals immagrated to Bavaria, where the hunters still react agressively and do not agree with a restoration of a lynx population. Efforts are badly needed in public relations in the Bavarian part of this region. Documentation is being compiled, but the results are not available.

Some new projects are under discussion. In the Black Forest, people have asked the government to reintroduce the lynx. Goßmann-Köllner and Eisfeld (1989) evaluated the possibilities. They believe that there is space for more than 40 animals in the Black Forest. This seems to be a number too small for a viable population, in case contact with the growing Alpine populations cannot be made. Furthermore, highranking people in the Ministry of Forestry in Rheinland-Pfalz think about a reintroduction in the Palatine Forest. We think that this project should have support, because the area is not far away from the Alsace, and the animals released in the Palatine Forest could easily join the population there - if this population finally builds up.

To finish, I would like to mention the idea of the director of the Abruzzo National Park in Italy to reintroduce the lynx even there. The area is famous for populations of both wolf and bear which seem to be growing. However, it is doubtful whether this area belongs to Lynx lynx or to Lynx pardinus.

There are lots of things to do. During this symposium I would like to ask all lynx activists to join in a meeting in order to make something like a plan for the coming ten years. It is necessary to set priorities, to avoid competition, and to improve our activities.

TRANSLOCATION OF LIVING ORGANISMS

Extract from IUCN POSITION STATEMENT
4 September 1987

Foreword

This statement sets out IUCN's position on translocation of living organisms, covering introductions, re-introductions and re-stocking. The implications of these three sorts of translocation are very different so the paper is divided into four parts dealing with Introductions, Re-introductions, Re-stocking and Administrative Implications, respectively.

Definitions

Translocation is the movement of living organisms from one area with free release in another. The three main classes of translocation distinguished in this document are defined as follows:

- **Introduction** of an organism is the intentional or accidental dispersal by human agency of a living organism outside its historically known native range.
- **Re-introduction** of an organism is the intentional movement of an organism into a part of its native range from which it has disappeared or become extirpated in historic times as a result of human activities or natural catastrophe.
- **Re-stocking** is the movement of numbers of plants or animals of a species with the intention of building up the number of individuals of that species in an original habitat.

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Translocations are powerful tools for the management of the natural and man made environment which, properly used, can bring great benefits to natural biological systems and to man, but like other powerful tools they have the potential to cause enormous damage if misused. This IUCN statement describes the advantageous uses of translocations and the work and precautions needed to avoid the disastrous consequences of poorly planned translocations.

PART II

THE RE-INTRODUCTION OF SPECIES

1. Re-introduction is the release of a species of animal or plant into an area in which it was indigenous before extermination by human activities or natural catastrophe. Re-introduction is a particularly useful tool for restoring a species to an original habitat where it has become extinct due to human persecution, over-collecting, over-harvesting or habitat deterioration, but where these factors can now be controlled.

2. Re-introductions should only take place where the original causes of extinction have been removed.

3. Re-introductions should only take place where the habitat requirements of the species are satisfied. There should be no re-introduction if a species became extinct because of habitat change which remains unremedied, or where significant habitat deterioration has occurred since the extinction.

The species should only be re-introduced if measures have been taken to reconstitute the habitat to a state suitable for the species.

4. The basic programme for re-introduction should consist of:

- a feasibility study;
- a preparation phase;
- release or introduction phase;
- follow-up phase.

The feasibility study

An ecological study should assess the previous relationship of the species to the habitat into which the re-introduction is to take place, and the extent that the habitat has changed since the local extinction of the species. If individuals to be re-introduced have been captive-bred or cultivated, changes in the species should also be taken into account and allowances made for new features liable to affect the ability of the animal or plant to re-adapt to its traditional habitat.

The attitudes of local people must be taken into account especially if the re-introduction of a species that was persecuted, over-hunted or over collected is proposed. If the attitude of local people is unfavourable an education and interpretive programme emphasizing the benefits to them of the re-introduction, or other inducement, should be used to improve their attitude before re-introduction takes place.

The animals or plants involved in the re-introduction must be of the closest available race or type to the original stock and preferably be the same race as that previously occurring in the area.

Before commencing a re-introduction project, sufficient funds must be available to ensure that the project can be completed, including the follow-up phase.

The preparation and release or introductory phases

The successful re-introduction of an animal or plant requires that the biological needs of the species be fulfilled in the area where the release is planned. This requires a detailed knowledge of both the needs of the animal or plant and the ecological dynamics of the area of re-introduction. For this reason the best available scientific advice should be taken at all stages of a species re-introduction.

This need for clear analysis of a number of factors can be clearly seen with reference to introductions of ungulates such as ibex, antelope and deer where re-introduction involves understanding and applying the significance of factors such as the ideal age for re-introducing individuals, ideal sex ratio, season, specifying capture techniques and mode of transport to re-introduction site, freedom of both the species and the area of introduction from disease and parasites, acclimatisation, helping animals to learn to forage in the wild, adjustment of the gut flora to deal with new forage, 'imprinting' on the home range, prevention of wandering of individuals from the site on re-introduction, and on-site breeding in enclosures before release to expand the released population and acclimatise the animals to the site. The re-introduction of other taxa of plants and animals can be expected to be similarly complex.

Follow-up phase

Monitoring of released animals must be an integral part of any re-introduction programme. Where possible there should be long-term research to determine the rate of adaptation and dispersal, the need for further releases and identification of the reasons for success or failure of the programme.

The species impact on the habitat should be monitored and any action needed to improve conditions identified and taken.

Efforts should be made to make available information on both successful and unsuccessful re-introduction programmes through publications, seminars and other communications.

THE REINTRODUCTION OF LYNX IN SWITZERLAND

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In the last two centuries, almost all big game species have become extinct in Switzerland. First the ungulates, such as ibex, red deer and roe deer disappeared; later, the big carnivores such as brown bear, wolf and lynx. In the past 80 years, the ungulate populations have increased as a result of natural repopulation and releases. The most spectacular rescue saved the alpine ibex.

In 1962, the lynx was given protection by federal law in Switzerland. This was the first step towards reintroducing the species. Between 1971 and 1976, at least 20 lynx from the Carpathians Mountains (CSSR) were released in the Swiss Alps and in the Jura Mountains. The releases have not been successful everywhere, but in the cantons of Obwalden and Neuenburg two small populations grew and spread out. Today a total area of some 10,000 km2 in the Northern and Central Alps and 5,000 km2 in the Jura has been recolonised by lynx. We estimate the number of lynx in Switzerland now to be about 50 to 100 individuals.

The lynx project

The reintroduction of the lynx in Switzerland was not accompanied by a research programme, and there was little reliable information on the lynx population. It was only in 1982, after a series of lynx attacks on sheep in the Bernese Oberland, that a field study started in collaboration with the University of Berne. Since 1983, radio telemetry is used to survey the lynx, this allowed us to collect information about spatial organisation activity and food (please check the bibliography at the end of this text). Up to now, 26 lynx have been captured and more than 4,000 daily localisations have been made in three different regions: the Jura Mountains (cantons of Vaud, Neuchâtel, Jura, Berne and Solothurn), in the Northern Alps (cantons of Berne and Obwalden) and in the Central Alps (Valais canton).

Spatial organisation

The study showed us that the lynx do need very large home ranges. In the established populations in the Jura Mountains and the Northern Alps, we found home ranges of 100 to 150 km2 for females and of 200 to 400 km2 for males. The density reaches not more than 1 ind./100 km2 in the best habitats of the Jura and the Alps.

Occasionally, lynx roamed outside their home ranges, especially males during the mating season. They may travel on that occasion distances up to 50 km. The home range of a male and of a female overlap almost completely. Within this area, no other lynx live permanently.

The lynx prey

The lynx hunts a large number of prey species, from small prey, such as mouse or squirrel, up to a red deer fawn of 70 kg (tab. 1). But the main prey are the smaller ungulates. And where they are as abundant, as in Switzerland, it is not surprising to find almost 85% of lynx prey to be roe deer or chamois.

It returns several nights to a prey, often during a whole week. At the end there remains only the head, the legs and the hide. We estimate the yearly consumption of a lynx to be about 50 to 60 small ungulates.

Table 1. Prey items of the Lynx in Switzerland found during the field studies (N = 281)

Chevreuil	Roe Deer	C. capreolus	125
Chamois	Chamois	R. rupicapra	100
Bouquetin	Ibex	Capra ibex	2
Cerf	Red Deer	Cervus elaphus	1
Renard	Red Fox	V. vulpes	6
Fouine	Stone Marten	Martes foina	1
Lièvre brun	Brown Hare	Lepus capensis	6
Lièvre vari.	Blue Hare	Lepus timidus	7
Marmotte	Marmot	M. marmotta	3
Ecureuil	Red Squirrel	Sciurus vulgaris	1
Loir	Fat Dormouse	G. glis	1
Mulot	Fieldmouse	Apodemus sp.	1
Grand tétras	Capercaillie	Tetrao urogallus	1
Tétras lyre	Black grouse	Tetrao tetrix	1
Mouton	Sheep	Ovis "domesticus"	11
Chèvre	Goat	Capra "domesticus"	1
Chat domest.	Domestic Cat	Felis "domesticus"	4

Colonisation and readaptation

Among the established population we observed a very economic exploitation of prey. In the first years after reintroduction, the lynx often left a kill after eating a couple of haunches to kill again because the prey was so easy to catch. The ungulates had not yet readapted to the presence of a large predator. To this lack of vigilance, lynx showed not only a functional response, but also a numerical response. We have already seen that in the centre of the population, in the Northern Alps, the total ranges of the lynx are larger than in the Central Alps, at the leading edge of the population. And if we look at the distribution of the kills, we find it to be widespread in the Northern Alps, but very concentrated in the Central Alps. Some years later, lynx enlarged their home ranges in the Central Alps and density decreased.

Stabilisation

We know there is a kind of self-regulation, but we do not know how exactly it works. Probably important factors are the need for large home ranges and the dispersal and mortality of sub-adult lynx. Most of the juvenile lynx we surveyed did not survive.

Impact on livestock

From 1973 to 1989 a total of 533 domestic animals, mainly sheep, have been recognised as killed by the lynx. Until 1988 the costs for the losses have been covered by a private nature protection society ("Ligue suisse pour la protection de la nature"). It paid an amount of 100,000 Swiss francs. Since April 1988 the payment has been taken over by the cantons concerned and the federal state. During recent years, the annual loss of domestic animals has stabilised at 50 animals. The economic loss for Switzerland is quite small.

Impact on roe deer and chamois population

Under established conditions, the impact of the lynx on prey populations is not excessively heavy. We estimated this impact for the Niedersimmental, where we followed a couple of lynx for almost three years. In this area, where both lynx hunted, there are at least 700 roe deer and about the same number of chamois. The predation rate of the lynx is about 100 (7%) out of 1,400. The number of ungulates killed by hunters in the same area is, with 490 animals killed, five times higher and even the number of animals found dead with 278 (20%) cases exceeds the total killed by lynx.

Nevertheless, even under established conditions, the lynx has a considerable influence on ungulate populations. Prey and predator have co-evolved for hundreds of thousands of years. They have influenced each other in their morphology, social structure and behaviour. The hunting tactics of the lynx correspond with the return of the natural regulator. This changed the unnatural behaviour we had known in recent times, the distribution and the intra-specific competition of the roe deer. Even if the prey population decreases, the reactivated natural selection will be an advantage in the future. "Natural selection" not only means that a predator eats old and weak prey animals. Nature is a complex and dynamic system, wherein numerous mechanisms control and influence each other.

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THE REAPPEARANCE OF THE LYNX IN FRANCE
Biological and sociological aspects

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Although very rare in France since the 17th century, the lynx did not officially disappear from this country until the early 20th century.

The last individual is said to have been killed in 1957. This was in the Pyrenees, a region from which some people think, judging by recent clues, that the lynx may never have vanished completely.

In 1990, the lynx inhabits eastern France as well, partly as a result of a reintroduction programme carried out in the Vosges, and partly by progressive colonisation of the French Jura and Alps from Switzerland.

The reappearance of the lynx in France was organised in circumstances where the perception of the species varied from one social category concerned to another. Thus the sociological and scientific aspects of the phenomenon have become hard to dissociate.

The Vosges

The operation was conducted in three distinct phases.

From 1972 to 1985, the operation was managed by an informal group (1972 to 1983) and later by an association (1983 to 1985) which prepared the ground for the actual release of the first animals (three males and two females). From 1983 to 1985, the research techniques were applied experimentally. The results showed that the released individuals travel over wider areas than was previously thought and feed on roe deer regularly. The time of year when the release takes place seems to make little difference. The illegal killing of a lynx in 1984 shows how difficult it is for information to penetrate the Vosges valleys and what misconceptions prevail within the hunting community.

The second period lasted from 1985 to 1989. The operation was given the official stamp and entrusted to a public body whose duties were to answer the hunters' queries and continue releasing lynxes into the wild. Scientific findings during this period are derived from investigation of:

- the quantitative effect of predation by lynx on a roe deer population monitored over a 5,000 hectare study area; the density of roe deer is put at five to six individuals per 100 hectares before reproduction. The rate of capture attributable to the lynx is somewhere between 3 and 6% (female with young);

- the qualitative effect of predation. A study conducted over the same area seems to show that lynx predation, hunting, illness and hunger, normally regarded as independent causes of mortality, can in some circumstances act in different ways as selection factors;

- habitat occupation. It is confirmed that an individual requires a minimum range of activity of 10,000 to 20,000 hectares. This means that the reintroduction of lynx otherwise than on an experimental basis can no longer be justified except in very large forest massifs (more than one million hectares) or in small massifs where interchange is possible with other forests offering the necessary habitat conditions. The Vosges meet these requirements.

The operation continued with the release into the wild of six individuals (four males and two females). During this second period, information was disseminated nationwide and throughout the region by the press, talks, films, childrens' competitions and the creation of a regional research commission.

In 1987, a further incident involving poachers led to the institution of a sociological investigation into the local populations' attitude to the reintroduction. The findings revealed a grave lack of local information.

A third period is to begin in 1990 with:

- the release of further lynx (two males and two females);
- a more adaptable system of scientific monitoring with the creation of a network of observers thoughout the massif;
- an information campaign in every locality;
- the creation of Info-Lynx-Europe, an association providing regional and national information.

The Jura

The authorities introduced the lynx into the Swiss Jura in 1974.

In the French Jura, the first attacks on sheep were reported in 1984.

Sheep killed by lynx numbered four in 1984, four in 1985, six in 1986, 29 in 1987, 158 in 1988 and 429 in 1989. No biological explanation for this phenomenon has yet been found.

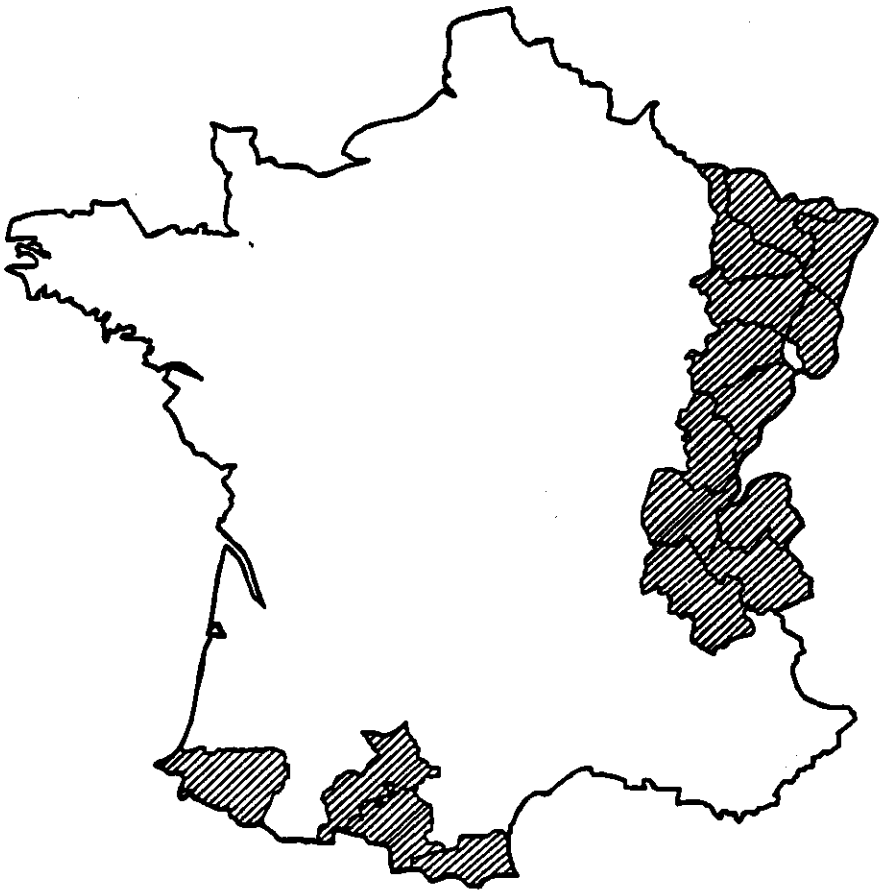
The scientific study, initially concerned with the causes and characteristics of these attacks, show that they occur in clusters. For instance, three localities of the Jura mountains covering less than 5,000 hectares altogether accounted for 37% of all attacks reported in 1989.

Counter-measures were of two kinds:

- In 1986 a system was set up for assessing the damage and compensating the farmers concerned. In each department, about 30 correspondents were trained to carry out damage surveys in places where attacks took place. The cost of compensating the farmers is borne by the WWF.

- A programme to reduce the number of attacks has been launched: either the flock is protected by placing special collars round the sheep's necks, or the predators attacking sheep are selectively eliminated from the cluster sites. The methods in include trapping, shooting and in some cases, poisoning. In 1989, a thousand sheep were given protective collars, and in 1990, between three and five adult lynxes were eliminated. Fewer sheep were killed: on 1 October 1990, the number stood at 147 head.

In view of these problems, it is indispensable in a western country such as France that a structure be set up by agreement with the farming community to conduct surveys prior to any reintroduction programme involving major predators.



DISTRIBUTION OF THE LYNX IN FRANCE AT THE PRESENT TIME

SYNOPTIC TABLE OF LYNX RELEASED IN THE VOSGES

Name of lynx	Sex	Weight (kg)	Date of release	Subsequent developments
Xénie *	Female	16.5	3.5.83	Monitored by radio tracking until 4.6.83.
Boric *	Male	19.0	3.5.83	Monitored by radio tracking until 14.7.83. Found dead on 30.1.84 in the forest at Willer-sur-Thur, 35 km south of the place of release, as the crow flies.
Alex *	Male	21.0	4.6.83	Monitored by radio tracking until 28.10.83, cranium found on 24.3.86 in the Ribeauvillé state forest not far from the place of release.
Oska *	Female	17.0	8.3.84	Monitored by radio tracking until 18.7.85. Captured on 25.3.86 and provided with a new transmitter. Monitored from 1.11.86 to 1.7.87.
Pavel *	Male	?	8.3.84	Not monitored.
Choko *	Male	18.0	2.7.84	Monitored by radio tracking until 7.2.85.
Sixty **	Male	22.5	27.3.87	Monitored by radio tracking until September 1987.
Aloyse **	Female	23.0	27.3.87	Monitored by radio tracking until June 1988.
Hectorine **	Female	19.2	27.3.87	Monitored by radio tracking until October 1987.
Elisa *	Female	16.0	27.3.87	Monitored by radio tracking until October 1987.
Thibor *	Male	22.5	30.6.87	Monitored by radio tracking until January 1988.
Jack *	Male	17.5	30.6.87	Monitored by radio tracking until February 1988.
Jacynthe *	Female	15.3	18.4.90	Monitored by radio tracking until 19.5.90, the day of her death.

No mention is made of the two lynx purchased from Birmingham Zoo
* Place of release: Ribeauvillé state forest (Haut-Rhin)
** Place of release: Bruche valley (Bas-Rhin)

REINTRODUCTION OF LYNX IN YUGOSLAVIA

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Two separate populations of lynx live in Yugoslavia. An aboriginal group inhabits the high mountains of Korab, Sara and Prokletija in the region of Macedonia, Kosova and Montenegro by the Yugoslav-Albanian border. Today, this Balkan population of lynx is isolated, occupying a territory of about 600,000 ha with an estimated 200 head. Despite the ban on hunting since 1945, they have not extended their territory.

In March 1973, a group of lynx was reintroduced about 700 km north of there, in the region of Kocevje forest, 60 km from Ljubljana. Slovenia lies in the northern part of Yugoslavia, bordering on Italy and Austria. The last lynx in Slovenia had been caught in 1912.

Six lynx were transported from Slovakia (Czech and Slovak Republic), in a 1:1 sex ratio, and released in January 1973, quarantined in the vicinity of Trnovec pod Rogom (1099 m above sea level), in the "Medved" hunting preserve in Kocevje, from which the suggestion for reintroduction had come. After 46 days quarantine, on March 2, 1973, the lynx were freed. The release of the lynx at mating time appeared successful since some months later four young were spotted, which was at least a partial guarantee that the reintroduction could be successful.

At the start of this project, the institute was given the task of following the reintroduction and research was continuous from 1973 to 1990. J. Cop was given responsibility for the project.

The lynx have constantly extended their territory in three directions:

- towards the southeast over Gorska Kotar in hunting grounds along the mountains by the Adriatic coast in Croatia; in Lika, a lynx was found in 1984 in hunting preserves of the Republic of Bosnia where it was run over in the valley of the river Una. Further south, a lynx was shot in a mouflon pen at Kamenica, close to Zavidovic, some 300 km from the site of reintroduction;

- towards the southwest, in the direction of Slavnik and Postojna, and Trnovo forest in the direction of Italy (in 1988, one was shot near Grgar close to the Italian border, 120 km from release);

- towards the northwest over Jelovica into the region of the Julian Alps.

Lynx have come into the Karavanke here from Austria. Nine (9) were reintroduced near Murau in Steiemark in 1977.

The central territory of the reintroduced lynx in 1990 is estimated to be about 600,000 ha with about half of it in Slovenia and the remainder in Croatia.

Shooting of lynx began in 1978, with annual permits issued by the Ministry of Forestry. To date legal shootings have been:

- in Slovenia 85
- in Croatia 102
- in Bosnia and Herzegovina 5

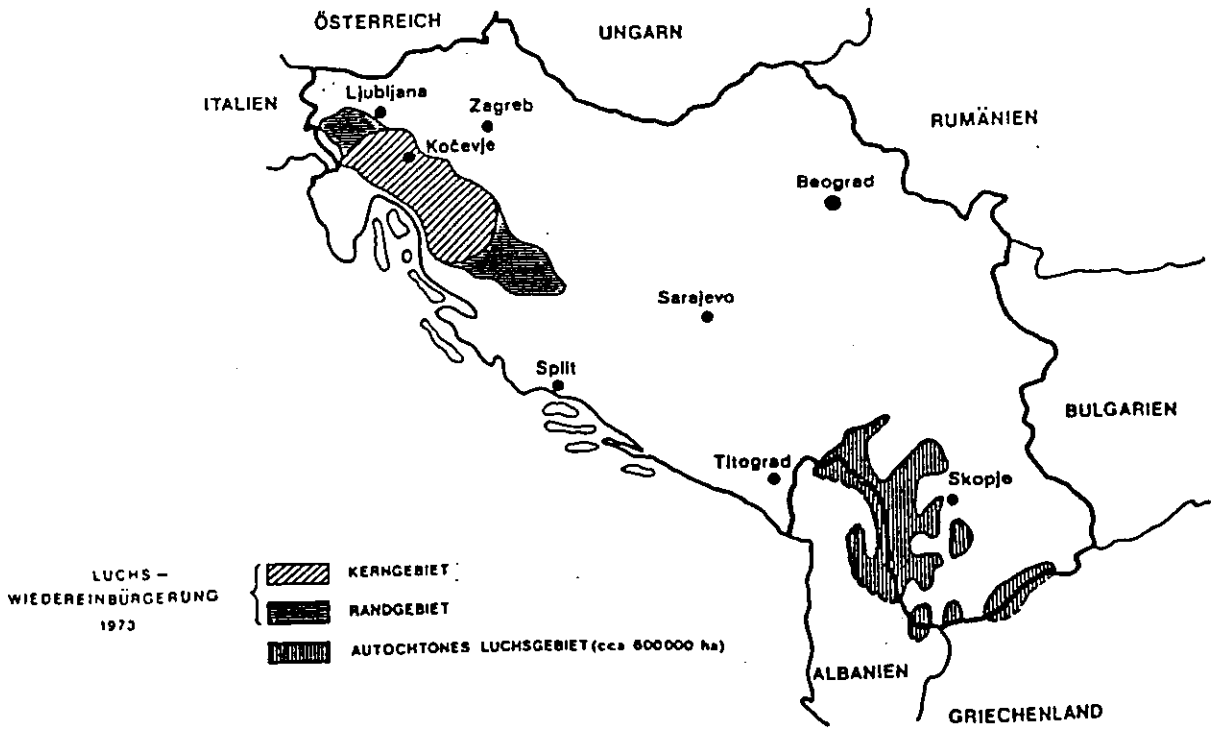
Altogether 192 lynx.

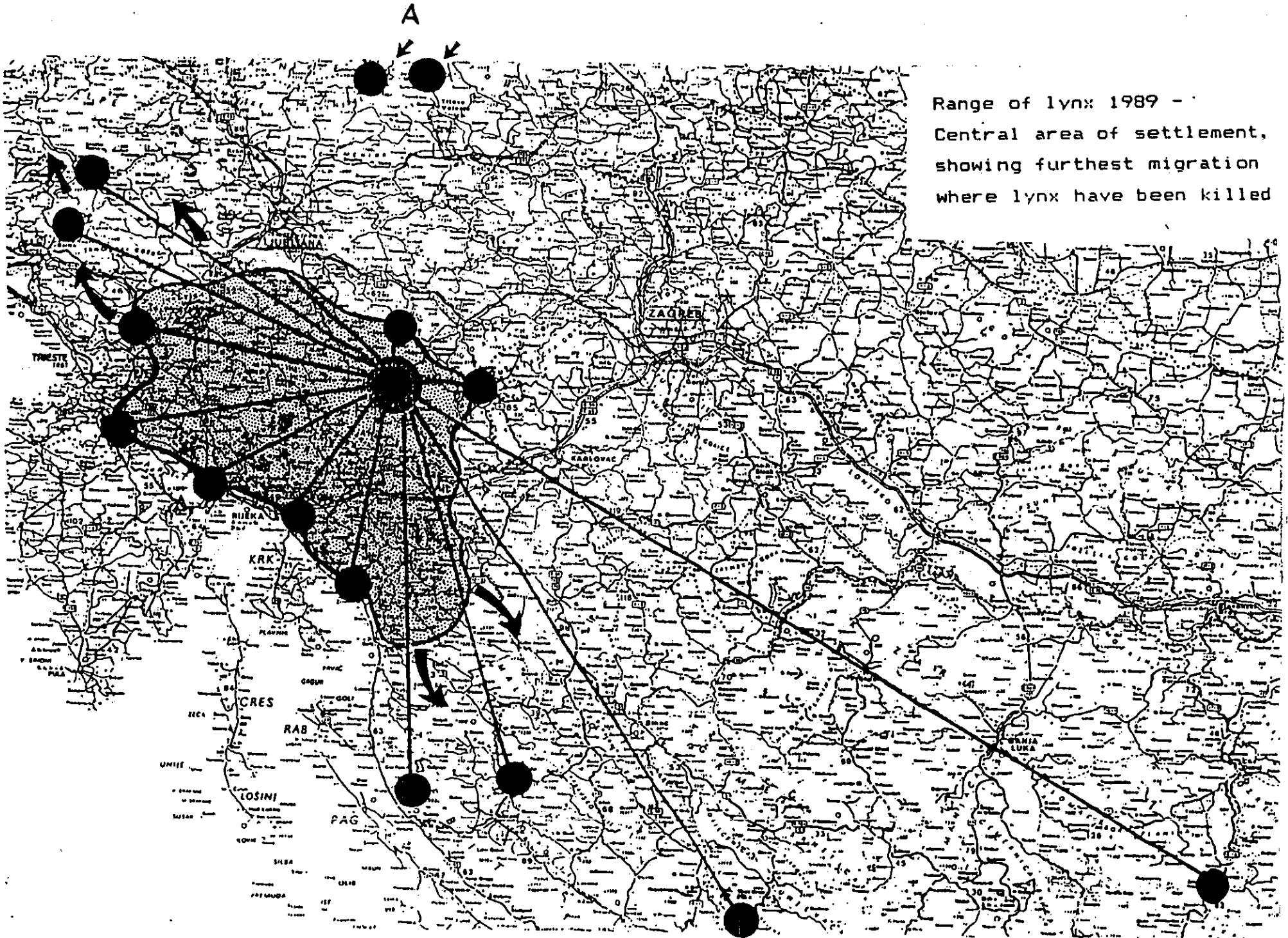
If illegal shooting is also taken into account, more than 200 lynx have probably been eliminated from the territory.

The results of our study show that the main prey of lynx is roe-deer, with red deer in second place. In two areas of more than 1000 ha, lynx have exterminated an entire colony of mouflon (between 250-300 head). There is not for the moment a major problem with sheep, since there are very few sheep farms in the central territory, although migration of lynx is occurring into areas in which sheep farming is important. Of 21 lynx shot outside the central territory, all have been single males (as with bear). Despite the existence of rabies in the area in which the lynx live, there has been no sign of this disease in the lynx shot to date.

Hunters in some areas are opposed to the lynx in the belief that the lynx will exterminate the deer. Our research suggests otherwise - deer shot in hunting preserves in which most lynx live is on the increase!

The author believes that the reintroduction has been successful, although it is estimated that the population of lynx is not yet stabilised (genetic and isolation problems, etc). Unfortunately, financial resources for the continuation of the study are lacking.





Range of lynx 1989 -
Central area of settlement,
showing furthest migration
where lynx have been killed

THE LYNX AND HUNTING

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1. Introduction

It is hard for a hunter to tackle and discuss a burning issue like this one. Because I know that this is one of the media's favourite topics and because I am unwilling either to fuel a controversy which does wildlife little good or to give way to a fake anthropomorphism, I feel that we must set both the lynx and the hunter in the context of hunting at the end of the 20th century.

I think this necessary because man has been a hunter for millions of years and because hunting is still a part of his genetic heritage, however limited or infrequent his normal contacts with nature may be.

It is also my feeling that nature must be safeguarded and one aspect of our ancestral culture preserved. Hunting must continue to play the economic and social role that it has always played.

2. Hunting from its origins to the 19th century

Over the centuries hunting has been closely linked with civilisation, and more especially agriculture. It was essential to defending villages against wolves, crops against the larger game, and flocks against the lynx and bear. Playing such a vital role, its organisation was determined by the thinking of the rulers and the liberties accorded the ruled. It was closely regulated when it was the aristocracy's prerogative, and, completely unregulated whenever ordinary people were able to practise it. At all times, however, hunting has been a random thing, with "culling" as its guiding principle.

Originally, the lynx was well integrated in its milieu relying, among our other indigenous wild animals, on food sources which other species contested. In the second half of the 19th century it died out in our country, its disappearance wrongly blamed solely on hunters supposedly anxious to eliminate a rival! In fact, although the causes are many and varied, they all point to one central factor: the lynx's favourite and essential prey (roe-deer and chamois) had become scarce, depriving newborn and young animals of the means of survival.

3. Hunting today

Important changes affecting the natural environment have taken place in the second half of the 20th century:

- A rift has developed between farming and hunting Hunting, once the farmer's "natural" ally in regard to game, now has to protect game against new farming methods and the notion that only the useful has a right to exist.

- Rapid urbanisation, bringing counltess existential problems in its wake, has generated a host of ideas concerning ecology, the search for happiness and the rejection of death, to mention only the main ones.

- Although the balance of nature is very precarious, hunting, an essential mainstay of that balance, is frequently contested.

All of these are new factors which are forcing hunters to adapt themselves to a new social context. They also underline the thinking of those who have had the idea of reintroducing a predator, lynx, to compete with hunters.

4. The reintroduction of the lynx

Before looking at the ways in which the introduction of a new predator has affected our wildlife, we may usefully review the fluctuating fortunes of this operation.

In 1967 the Federal Council gave cantons wishing to do so permission to introduce the lynx on their territory; this made it possible for hunters in the Canton of Obwald to release deer, while the Forestry Office reintroduced the lynx, the former operation being dependent on the latter!

This was done in 1970 on the basis of the following arguments:

- the lynx is "good for the forest" dispersing the larger herbivorous fauna and reducing damage to young trees;

- it helps to improve the quality of game.

The lynx was therefore introduced as preying on deer although its normal prey is roe-deer and chamois, numbers of which were estimated in 1972 to be low (1040 and 1580)!

In the 1970s, lynx were also released in the Cantons of Vaud and Neuchâtel, without the Federal Hunting Service being given the details. In the Canton of Neuchâtel, the authorities waited for over a year before admitting the fact. Lynx were also reintroduced secretly in the Cantons of Grisons and Valais. In 1988, another lynx was "freed" near Lausanne, from a car registered in the Canton of Aargau.

Clearly, reintroduction of the lynx has not been concerted by the cantonal hunting authorities, and there has been no overall plan.

Following the release of all these animals - and also thanks to its vitality and the existence of favourable conditions in the Alps and Jura, the lynx has colonised the whole of Switzerland in under ten years!

5. Effects on wild life

In our fragile natural environment, the reintroduction of a new predator with no immediate rivals is a further destabilising factor at a time when efforts are being made to save certain species, such as the capercaillie and the hazel grouse from extinction.

More seriously, the arguments used 20 years ago are no longer consistent what we know today about the impact of the lynx on roe-deer and chamois populations.

Biologists generally agree that the lynx accounts for 50 to 60 head of game every year. On the basis of these figures and an estimated lynx population of between 50 and 100, many calculations have been made in an effort to show that this toll is no higher than that for animals killed on the road, and can easily be accepted by hunters.

This argument overlooks two facts:

- The lynx kills at random: fawns are left parentless and foetuses killed in the womb;

- Its erratic behaviour has a disruptive effect on roe-deer and chamois herds, obliging females to give birth in unsuitable places, with a consequent rise in kid and fawn mortality.

6. The position of Swiss hunters

For some decades now, hunters have thought in terms of "game management", rather than "culling", general acceptance of this concept being due to the total commitment of those responsible for hunting. These authorities are convinced that the lynx is no substitute for the hunter who has long since ceased killing game at times crucial for the animals Unlike the lynx, the hunter respects the mating and breeding seasons. He is also unaffected by epizootic diseases, of which the lynx is a potential victim.

Adding to all this what we have seen concerning the mortality of newborn and young animals, we can safely say that the lynx has not - yet? - found its place in the balance of Swiss wildlife.

7. What Swiss hunters propose

- Since studies dealing exclusively with the lynx fail to provide an overall picture of its reintroduction in Switzerland, we would ask the Federal Hunting Service to make a study of the behaviour, distribution and numbers of the ungulates on which the lynx preys.

- Since hunters have helped, by their cooperation and understanding, to increase the population of larger game animals, and since they also help to protect and ensure the survival of small game, they are calling for a management plan for the lynx.

8. Conclusion

Through these proposals we affirm our wish:

- to continue playing a full and active part in the work of protecting nature;

- to manage a game "capital" and draw "interest" on it.

IMPACT OF LYNX ON FARMING

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It was in the 19th century that the last lynx disappeared from the Ain, an area which covers the southern Jura and forms a pocket bordered to the south by the Rhone and extending westwards from Switzerland to the Bresse plain. Since the 18th century the species had been present in that area only extremely rarely by accident.

In 1974 a lynx reappeared for the first time and was killed at Thoiry in the Pays de Gex on the Swiss border. Ten years later, sheep farmers recorded strange killings, which were found to have been carried out by lynx. The Worldwide Fund for Nature offered compensation to the shepherds who had lost sheep during the attacks. An enquiry committee was set up and a full protocol procedure established. The latter subsequently needed to be adapted in the face of the increasing number of attacks, but there has always been unanimous support for the seriousness with which of the autopsies have been carried out the and verdicts established even if, as a farmer, I sometimes deplore the excessive rigour.

The number of sheep killed by lynx in the Ain district rose from four to twelve between 1984 and 1988, reaching a total of 150 in 1988. We consider there are several reasons or explanations for this very sharp increase:

- probably the success of clandestine releases,
- the explosion of a pioneer population that originated in Switzerland and has discovered an ideal biotope,
- finally, and possibly in particular, the initial failure of farmers to realise the true nature of the early attacks.

Allow me to explain: the lynx is a discreet and invisible animal, a kind of mythical resurrection or living legend. Never heard nor seen, the animal was always elsewhere, at higher altitude, further away, on the other side of the mountains or across the river, but never in our midst. Because little was known of its distribution or lifestyle, the early sheep killings were, in most cases, initially attributed to other causes. Moreover, some shepherds thought they could solve the problem unaided. That, however, proved unrealistic.

The disaster worsened in 1989: 350 sheep killed in the Ain district, bringing the total to nearly 500 with the neighbouring cantons in the Jura district, which represented the only direction in which the now well-established colony could spread.

How did such a situation arise?

- One determining factor for the reappearance of the lynx is the trend towards removing land from cultivation and its various consequences:

. decline in the sedentary rural population,
. abandoning of remote farms,
. emergence of wide expanses of uncultivated areas, devoid of human activity
. large increase in woodland areas.

Plots of farmland are still disappearing at the rate of 1.5% per year. Grasslands now stand out as "postage stamps" in the middle of a mass of undergrowth, trees and cliffs.

- Regular arrivals of large colonies of wild ungulates.

- The increase in flock size as a result of open-air farming. Enclosures enable sheep to be left both day and night in folds that are sometimes a long way from any dwelling.

- The fact that sheep-farming areas often coincide with roe-deer biotopes. Sheep are reared on the steepest sloping and least productive land. It would seem that lynx track down herds of roe-deer and that the killing of sheep is a secondary occupation. There are lynx because there are roe-deer, not because there are sheep.

- Finally, the drop in the number of trappers and the remarkable ability of the lynx to escape both from potentially hostile hunters and from benevolent observers.

After this modest and brief description of events, which is intended to be objective - although naturalists may add other factors, more or less plausible - I shall simply present my own personal account and observations.

It is impossible for an account by a farmer to be anything but subjective, or impassioned. While we are, a priori and by necessity in favour of a nature that is living, rich in variety and whole, since we live off the land and are surrounded by nature, the problem of the lynx is disastrous. Responsibility lies not with the animal itself but with ecologists who, for reasons that were possibly well-intentioned but undoubtedly ill-considered, successfully campaigned for the reintroduction and protection of the species. Lynx attacks, which are cyclical and repetitive, condemn farmers in high-risk areas to work in agonising desperation. Imagine the state of mind of a shepherd whose supervision of a fold is reduced to a nose-to-wind search for carcasses, and an infernal race against vultures. Direct losses that are accounted for are merely the tip of the iceberg. Farmers suffer because of the rapid decomposition of their sheep and the ravages caused by creatures hungry for blood as well as the actual loss of their smallest lambs.

Our most serious problems are the indirect losses connected with stress caused by the attacks (drop in fertility, staggered lambing season, refusal to graze in certain folds, drop in growth rate, disturbed flock behaviour, extra work, etc ...), as they are very difficult to prove and have taken into account. They represent an insiduous threat to the fragile economic balance of sheep farms. They are the last straw, made all the more unbearable by the fact that our being victim to ecological mutterings is a cruel irony, since mountain sheep farming does not pollute, favours a harmonious balance between fauna and flora, and, thanks to grazing, is a defence against conifer domination. As we see from the South of France, now ravaged by burning forests and beginning to bemoan its sheep, it is also a form of production that serves as a firebreak. In addition, however, it is feeling the full force of the inconsistencies of Community policy.

Reference has already been made to experts' reports. In the field, they are carried out by persons who have completed an ad hoc training course. The group of experts comprises a vet, although in most cases not the vet who usually cares for the flock, a warden from the Office National de la Chasse (national hunt office) and a representative of one of the nature protection associations. However, faced with the growing number of attacks and the travelling involved, participation of representatives from nature associations is now very rare.

In the event of a dispute, a larger appeal committee returns the final decision, under the authority of the district Director of Agriculture. The verdict relies essentially on traces of bites on the neck of the animal, and therefore calls for prompt veterinary reports before the existence of teeth-marks can be refuted.

In cases where responsibility of the lynx is confirmed, compensation takes the form of a fixed amount and is therefore unfair. It varies between 600 and 1,500 French francs depending on the categories, in addition to which farmers receive an indemnity which was set at between 150 and 500 francs in 1989 depending on the size of the flock. Veterinary fees are also covered.

The experts' reports are a considerable waste of time and payment is issued almost a year later. Compensation was initially funded by the Worldwide Fund for Nature, but the Ministry of the Environment is to take over. However, we have yet to receive a written protocol or assurances, and are therefore still in a state of uncertainty and at the mercy of the good intentions of our interlocutors.

In view of the legitimacy of the arguments put forward by farmers and the extent of damage caused, the Ministry of the Environment has given permission for the removal of lynx termed "deviant", ie those that eat sheep. This is a measure that claims to have scientific objectives!

The lengths to which people will go to clear their consciences is amazing. I must stress that "deviant" is, in our view, a strictly euphemistic term, since, on the contrary, it would be "abnormal" for lynx <u>not</u> to eat sheep.

Lynx may be "removed" from the worst affected breeding areas by traps or shooting. Since spring 1989 it has also been possible to remove them by the fitting of some of the flock with American collars containing a stock of poison that explodes in the predator's mouth as it slits its victim's throat.

The techniques of shooting and poison are intended to eliminate those animals that kill the most sheep. Shooting, carried out by federal wardens, is still a matter of chance. After almost 200 nights of lying-in-wait, only one lynx has been shot dead, on 24 April 1990, in the middle of a flock of sheep regularly disturbed in the municipality of LEYSSARD. Despite the concept of basic self-defence, farmers no longer have permission to shoot.

Trapping, which has so far claimed four victims, has only started giving results since the introduction of Canadian traps. The advantage of this method, as far as those who seek to protect the lynx are concerned, is that it does not kill the animal. However, it is still a problem as lynx very rarely return to the remains of their victims and the flock must be evacuated from the fold. Moreover, other animals may be caught in the traps.

The advantage of poisoned collars is that identification of the predator is easier inasmuch as the motives of the animals that bite the collars are clear. However, sheep do not take kindly to wearing them in hot weather, one animal must be sacrificed as bait, and it has proved impossible to trace the two lynx killed by this method. It takes about six hours for the poison to take effect after the attack, by which time the predator has had the chance to disappear, depriving us of a scientific post mortem!

Permission to remove lynx from breeding areas, which is granted only very rarely and renewed grudgingly, leaves us in a state of extreme uncertainty. Furthermore, permission is granted only after heavy losses.

I agreed to come to this seminar so that I might stress - if it needs to be stressed - that nature is the environment, tool and livelihood of farmers. While others may harm or disfigure nature, we are content with using it as grazing land for our animals, and with gently maintaining and taming it. As shepherds, we are guardians vis-à-vis our fellow citizens of a small area of mountain land and we cannot be left out of the management of the mountain, of which we are a living component. It cannot be left to scientists, naturalists, ecologists, whether informed or merely dabbling, nostalgic nature lovers passing themselves off as experts, or town people who dream of a Nature thirsty for blood. They must never forget that Nature's fragile balance precludes any errors likely to threaten the agro-pastoral activities on which the rich variety of flora and fauna of the Southern Jura depends. Need I point out that England, an island, was able to breed sheep in the open air two centuries before the rest of Europe, thanks to eradication of the wolf.

Lynx are all well and good, but not just anywhere, and not as an enemy, intent on causing our ruin. The mutterings of the modern ecology movement provide food for thought and must be a revelation for the future. We should not have to foot the bill.

In reintroducing a major predator, a wildcat, and initially obtaining its complete protection, after two centuries of almost total absence from an environment that has been disrupted by change, we are not "reintroducing" but, more to the point, introducing the lynx. It is an experiment carried out by sorcerers' apprentices with all the ensuing hazards and disappointments.

Did we actually <u>know</u> the lynx?
Who foresaw the lynx population boom?
Did we ever think it would kill so many sheep, most of the time without even feeding on them afterwards?
Had provision been made for financial compensation for those who suffered as a result of its reintroduction?
NO.

On the contrary, the problem was (first of all) ignored, in the vain hope that it would simply disappear. Since then we have been treated to empty promises, false and even defamatory assertions, visions of prancing caracal in the report of Mr LECOMTE, official representative of the Ministry of the Environment, deceptive, so-called "prevention" or "protection" systems, all more or less misleading. For instance, protective collars do not protect but merely prevent the predator on being identified.

The file looked set simply to gather dust until 1,500 of us met to demonstrate at BOURG-EN-BRESSE. Ain district's peaceful Préfecture had never known such a large crowd. As a result, the press has modified its simplistic and placatory language vis-à-vis the lynx and the various parties involved have tempered their views.

In conclusion, and as I have said before, lynx have not been reintroduced but simply introduced haphazardly.

- A decision of such importance should have been based on extensive study of the lynx and not taken by people blinded by emotion.

- Any form of absolute protection, whatever nature fanatics may say, is a mistake, since the survival of a species and its total acceptance cannot be prolonged without careful management of the numbers involved, even if it means admitting that in certain circumstances the species is incompatible with the environment.

- Lastly, surely Europe must pay the price for the luxury of reintroducing such a savage and outdated animal.

In the meantime, we are the victims of an appalling waste and tremendous accumulation of blunders that are equally as harmful to the image of would-be environmental protectionists as to sheep farming.

THE LYNX IN THE FRENCH PYRENEES - THE SITUATION TO DATE

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Officially, the last lynx of the French Pyrenees were killed in 1917 on Canigou. L. Lavauden, however, thought it probable that the species had survived (1930). Despite this conclusion, the total extinction theory prevailed until the end of the 1970s.

Yet four animals had been trapped between 1919 and 1936 by a hunter in the valley of Ossau. This hunter, who was well-known locally, attempted to capture lynx live in 1942, which proves that he knew of animals living in the Ossau valley at that time.

A lynx killed found in the upper Ossau valley in 1957 and a complete recent skeleton was found in a chasm near the col d'Aran in 1962. This item was sent to Professor F de Beaufort of the National Museum of Natural History, who identified it as Lynx lynx. Between 1960 and 1967, lynx were observed on several occasions and traces found, again in the upper Ossau valley.

In 1967, Mr Henri Navarre took the first photograph of lynx tracks in the Pyrenees. In 1973, 1974 and 1975, we found evidence in the middle Ossau valley. Finally, in 1976, the affair received a fresh impetus with another photograph of tracks taken by Mr Henri Navarre in the Gey valley. This photograph was again examined and positively identified by the same Mr de Beaufort.

Beginning of the research

1976 marked the beginning of our research, and in particular the gathering of reports along with an assessment of their credibility. This data base enabled us to draw up a map of the areas in which lynx had been sighted, an essential document for the organisation of field surveys. These surveys enabled us to discover traces, collect faeces and hairs and, later, examine remains of prey.

In 1980/1981, proof was obtained of the existence of a western population group, whose range extended from the Ossau valley to the forest of Iraty and the borders of the Basque country and Béarn.

In 1982, proof was obtained of the existence of a central population group, whose range extended over the mountains situated to the south of the town of St Girons.

Finally, in 1984, the existence of a third, "eastern" group, situated between the eastern Ariège and Canigou was ascertained.

Biological environment

The biotopes inhabited are all woodland areas, although the lynx shows no preference for a particular tree variety. Evidence has been collected in Abies, Fagus and Pinus (sylvestris and uncinata) woodlands, and more rarely in Quercus and Betulus woodlands.

The vast majority of the evidence was collected between 1,100 and 1,800 metres, with an overall altitude range of between 1,100 and 2,680 metres. The latter would seem to be a European record, although only one piece of evidence was found at that altitude.

The areas frequented are very sparsely populated or totally uninhabited. In general, access to them is very difficult or even virtually impossible. Their characteristic feature is the presence of rock in the form of scree, cliffs etc.

Mating and reproduction

Evidence collected from the breeding areas suggests that activity is most intense in January and February. It may therefore be said that the peak of the breeding season is in the first two months of the year. Thereafter, because snow is infrequent or patchy, it is difficult to monitor the reproduction and recruitment rate with as much precision as would be desirable.

According to the not yet entirely conclusive data available to us, there is every indication that the reproduction and recruitment rates are low. Since winter 1987-1988, a slight extension of the central population group towards the West has been noticeable. This might be due to the colonisation of new territory by young animals.

Territoriality

Little is known about this aspect. Only the central population group has really been studied from this point of view. In the case of two females in the Ariège, the area covered seems to be about 8,000 to 9,000 hectares. A male appears to cover 18,000 to 23,000 hectares.

Diet

Ungulates (Rupicapra rupicapra ssp pyrenaica and Capreolus capreolus) are sometimes attacked. In the case of Sus scrofa, very young specimens are caught.

Yet the faeces collected suggest that the bulk of the diet consists of small and medium sized prey (Sorex, Talpa, Pitymys, Microtus, Sciurus, Marmota, Glis, Lepus, Martes, Vulpes, Mustela, etc). These account for approximately 80% of the total.

Attacks on domestic animals are rare, but are an established fact in the case of sheep. Poultry are occasionally consumed, as are domestic cats and small dogs.

The data currently available therefore suggest a wide dietary range, opportunism being a main factor in this.

Lynx and man

In the Pyrenees, the lynx is either a forgotten or an unknown animal. Glass and Besson (1978) point out that it appears never to have been very common, which may be begin to explain the phenomenon. But the animal's extreme discretion obviously plays a part in this situation. Furthermore, perceptions of the lynx are very different from those of the bear. Although mistakes are often made, the signs

of Ursus arctos are well-known to the people of the valleys, who report them. We think that there are almost as many sightings of lynx in the Pyrenees as there are of bears, but the story spreads very quickly in the latter case, whereas a lynx sighting remains a personal experience, shared only with a few friends or relatives, and enjoys no media success.

In our surveys we found that the presence of lynx is always reported in the next valley. It is never a local animal. But whenever severe damage is done to flocks, thoughts turn to the lynx, which, by a paradox typical of sentimental illogicality, becomes a local species again. What we may learn from all this is that the lynx, about which very little is known, lives in the prestigious shadow of the brown bear and that, with the disappearance of the trappers and other woodsmen, a source of information has dried up, thus contributing greatly to the animal's anonymity and virtually mythical status.

Conclusion

Our study has shown that the lynx has never disappeared from the Pyrenees. Data relating to it existed, but had never been collected. In the absence of any form of scientific monitoring, the scene was set for this discreet species to be regarded as extinct.

The first, vital contribution made by our findings so far is therefore to have established beyond all doubt the survival of a residual population in the Pyrenees.

STATUS OF THE LYNX IN ITALY

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The Italian population of autochtonous lynx, Lynx lynx, disappeared in the Alps between the end of XIX century and the first decades of this century (Guidali et al. in p., Ragni et al. 1987). The factors responsible for this extinction are mainly of anthropic origin, ie alteration and reduction of the habitat and direct, systematic destruction. The most recently known biological records of the species in Sicily and in the Peninsula are confined in the Neolithic age (Ragni 1988).

Between 1971 and 1987 reintroductions of the Euro-asiatic lynx have been carried out on the Alpine regions of Switzerland, Slovenia, Austria and the establishment of permanent populations of the felid occurred. Attempts of spontaneous colonisation of the Italian Alpine region by the newly-established populations from neighbouring countries have been recorded since 1981.

Central-Eastern Alps (Ragni, Possenti)

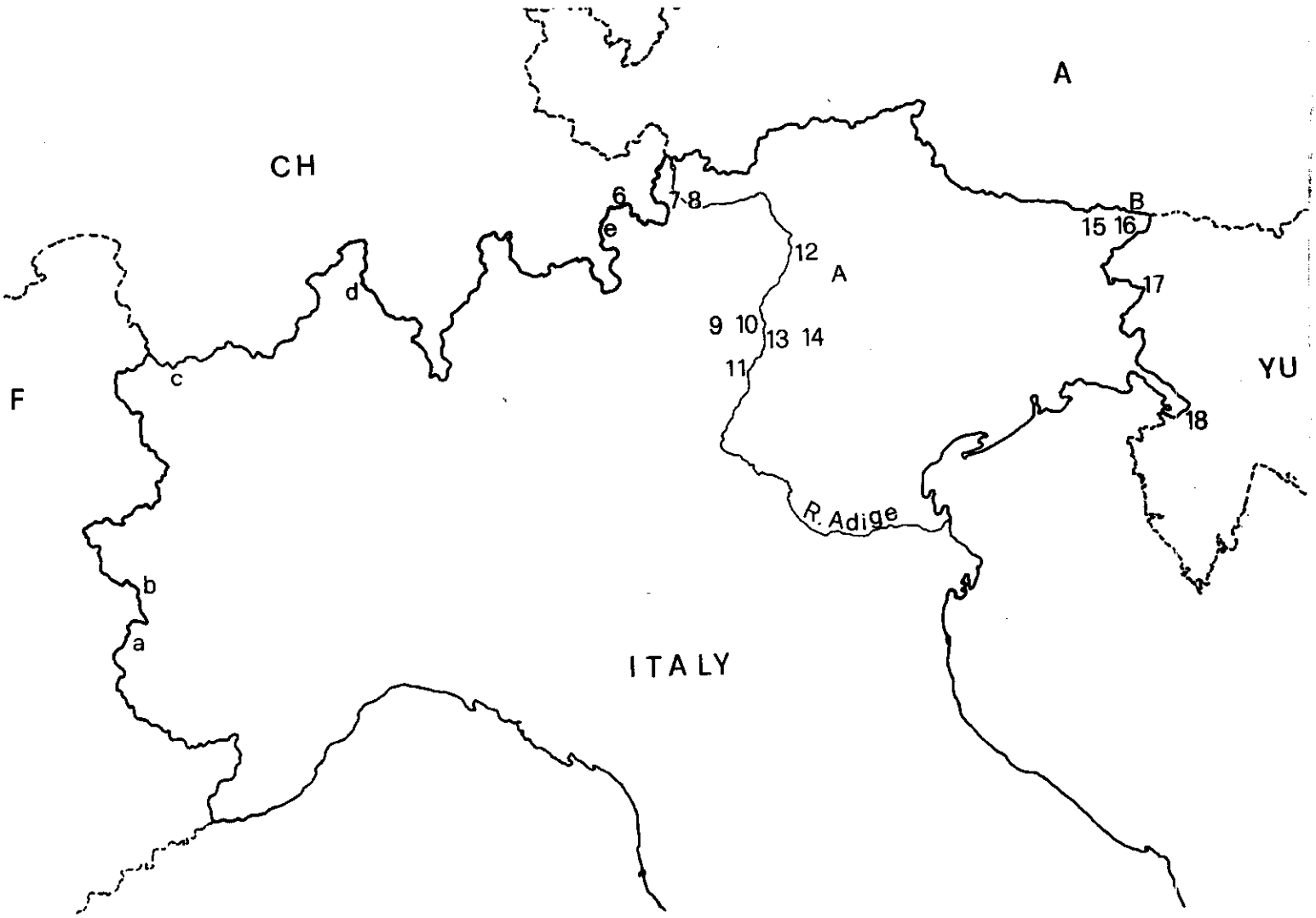
The study, employing all procedures of the naturalistic method, based upon collection of objective records of the species presence and activity (OR), is still in progress (Ragni & Possenti, in press). The area subjected to extensive monitoring is located in the Alpine region, east of the Stelvio massif. The area of intensive research, where we observe a time-space continuity of the OR, is located in the southern Dolomites. In this area 149 OR distributed within a minimal convex polygon of 429 km2 have been collected. This surface represents the maximal range of the lynx between 1982 and 1989.

During the 1988 and 1989 snowy seasons we tried to estimate the minimum number of lynx present in the intensive study area. We found that the area has been inhabited by at least four lynx for variable periods. An adult male was present for all the time considered; its home range covered 207 km2. An adult female was undoubtedly present in November and December 1988, roaming adjacently to the male's range. A second female was also found in a 66 km2 home range on the north-west side of the male's range. During November and December 1989, the presence of at least a yearling lynx has been documented in an area of 15,5 km2, superimposed on the south-west border of the male's range.

The minimal density of the lynx population calculated over the intensive study area (1200 km2) during the snowy seasons was found to vary between 0,8 and 2,5 individuals/1000 km2.

From the analysis of 102 feeding behaviour indexes, it was found that all prey is made of homeotherm vertebrates: 97% mammals and 3% birds. The roe deer (Capreolus capreolus) by itself represents 43% of feeding preference.

The correspondence between certain OR of the lynx and specific ecological factors shows that the felid makes an active habitat selection. Wild ungulates (roe deer, red deer and chamois) were found in the same space-unit as the lynx in 80% of the cases. This association occurred at a rate 30% higher than the expected value. In the areas covered with wood, the lynx was found at a rate 1,75 times higher than expected. 80% of the 169 OR were observed between 1000 and 2000 m of altitude where most of the spontaneous woody vegetation is concentrated. The presence of the felid is not dependent on the exposition.



Present distribution of lynx in Italy

A: continuous objective records between 1982 and 1989.
B: continuous objective records between 1985 and 1989.
6-18: discontinuous objective records between 1982 and 1989.
a-e: discontinuous records between 1981 and 1989.

West of the Adige river the distribution of OR does not show time-space continuity and evolution (6,7,8,9,10); in the area east of this river, the presence of the lynx appears a more dynamic phenomenon. All round the range occupied from 1982, OR external to the intensive study area were found: Blatterbach valley (12), mountains south of Trento, between Val Sugana and Val d'Adige (13,14). Further east OR were collected in the Carnic Alps, Julian Alps and Prealps, next to Trieste Karst (15,16,17,18). In a narrow area of the Tarvisian Forest (B), in ecological continuity with the Austrian-Slovenian range, the presence of the lynx was constantly observed since 1985.

Central-Western Alps (Guidali, Mingozzi, Tosi)

All recent records of lynx, consisting in sightings or tracks were not made by researchers but were reported by third parties. All records have been checked (Guidalie et al. in press). The pattern of records of lynx is present in four main areas of the western Alps. Mon Viso Valleys (a,b): most observations which provide no evidence; come from the period 1981-86 and are not matched by similar records on the French side of the Alps. Aosta Valley (c): four alleged observations in this valley were reported in 1986, 1987 and 1988; three of these occurred within a restricted mid-valley area, 3-5 km from the Swiss border at an altitude of between 1300 and 1700 m. Ossola Valley (d): some of the most reliable records obtained in 1986 and 1987 from a mid-valley site approximately 3 km from the Swiss border. Valtellina Valley (e): alleged observation were made in 1988 and 1989, three of which were in one area in the upper part of the Valley on the Italian-Swiss border over 20 km and at an altitude of between 1800 and 2700 m.

Conclusion

At present the only known permanent and reproductive population of lynx in Italy is represented by a small deme established in the southern Trentine Dolomites (A). During 1989, dispersion of subadults were observed; this could result in an increase of Italian range of the felid. For the time being, the difference between the availability of trophic and refuge resources and the esiguity of the lynx population still remains. Lack of legal protection and killings (three known cases in 1982, 1988, 1989) add to the already numerous difficulties for a spontaneous recolonisation.

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