THE PAN-ALPINE CONSERVATION STRATEGY FOR THE LYNX

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* Monaco was not considered because there is no favourable habitat for lynx.

Preface

2001 marks the 30-year-anniversary of the first re-introduction of lynx in the Alps. While a superficial view of its present distribution would invite us to consider this as one of the most successful re-introductions of large carnivores in Europe, to be optimistically followed by the spontaneous re-colonising of the Alps by the wolf and the brown bear happening today, this would be short-sighted. Actually the future of the lynx is uncertain in the region, as the two existing populations in Switzerland and in Slovenia are still small and isolated and the conflicts that all these predators are causing with human interest (game, livestock raising) are far from solved.

At the Council of Europe we have always been in favour of initiatives aimed to build a better and peaceful European society, in which the marked wishes of the population for better environmental standards are harmoniously married with other legitimate interest for economic prosperity. For us the protection of our rich natural heritage has been a permanent value to be preserved and promoted. This is in the interest of European citizens and a legacy that we wish to transmit to the next generations of Europeans. For this reason the Council of Europe was particularly interested in the progress of the Alpine lynx population. We understood this initial re-introduction needed to be followed by a long-term commitment, by a long lasting programme. In 1990, the Bern Convention organised, in collaboration with the Swiss authorities, a seminar in Neuchâtel to review the status, conservation needs and re-introduction of lynx in Europe. As a result of this work, the Standing Committee of the Convention adopted its Recommendation No. 20 (1991) on the protection of the European lynx, in which the contracting parties were recommended to prepare management plans for the species. In the year 2000 the Standing Committee of the Bern Convention endorsed the "Action Plan for the Conservation of the Eurasian lynx in Europe (*Lynx lynx*)", aiming to promote conservation activities on international, national and regional levels. The action plan underlines the importance of focusing on populations as the fundamental management unit.

Such populations – as the Alpine lynx population – may stretch over several countries, stressing the importance of international co-operation, such as the one the Council of Europe has continuously supported throughout the Alps. In 1995, a seminar in Engelberg, Switzerland, concluded that a pan-Alpine conservation strategy for the lynx was needed. In December 2000, Recommendation No. 82 of the Standing Committee of the Convention supported the translocation of lynx within Switzerland and encouraged neighbouring Austria and Italy to co-operate in the process. In this "Pan-Alpine Conservation Strategy for the Lynx" on your hands, scientists from all Alpine countries outline the conservation needs for the lynx in their respective countries and in the whole Alpine arc, at the same time promoting a unified view of the whole territory.

The future of the lynx in the Alps depends on international co-operation. No Alpine country is large enough to host a long-term viable lynx population on its own, nor successful populations will fail to expand to neighbouring territories. It is our hope that as a consequence of this Pan-Alpine Conservation Strategy for the Lynx, a set of coherent and coordinated actions will be implemented, allowing the lynx to flourish throughout the Alps. The strategy serves also as a communication tool and its recommendations are to inspire both governments and non-governmental organisations alike at the regional, national and international level. We are fully aware that the conservation of a large carnivore is not an easy job. To be successful we need a common approach, an efficient co-operation between all the actors involved, including also scientists and other interested groups, and a stern foundation of mutual trust among the partners involved. This is a noble task that is worth the efforts of all.

Eladio Fernández-Galiano, Bern Convention, Council of Europe, F-67075 Strasbourg

Summary

This Pan-Alpine Conservation Strategy for the Lynx (PACS) bases on two ideas: (1) no Alpine country can host a viable lynx population in isolation – all regional populations will be transboundary; and (2) international co-operation is essential for the conservation of shared populations, and even more to solve the mutual problems. While brown bear show a considerable and wolf a high migration capacity - they are about to re-colonise the Alps naturally - the expansion of the lynx populations is slow. Neither the Slovenian nor the Swiss lynx population have expanded markedly during the past 10 years, although more suitable habitat would be available in uncolonised parts of the Alps. The area of lynx presence remained stable (Switzerland and eastern Alps), fragmented (French Alps) or has decreased (Austria), some local occurrences even went extinct (Trentino, Italy) during the 1990s. Only in the Bellunese (Italy), lynx presence was confirmed for a new area, and in the north-western Swiss Alps, the lynx abundance increased. The number of lynx in the whole Alps was estimated to be about 90-120 individuals.

The goal is to re-establish and maintain, in co-existence with people, a vital lynx population covering the whole of the Alpine arc. This general goal can be split in four objectives:

1) The lynx populations in Slovenia and Switzerland maintain their vitality and must be helped to expand.
2) The populations in Slovenia and Switzerland are joined through colonisation of the area in between (Alps of Austria, Germany, Italy and Liechtenstein).
3) This unified population in the central Alps is allowed to expand to the north-east (Austria) and the south-west (France, Italy).
4) Gene flow is assured between the Alpine sub-populations and the population of Slovenia and Croatia, the population of the Jura Mountains and the population of the Bohemian/Bavarian forest.

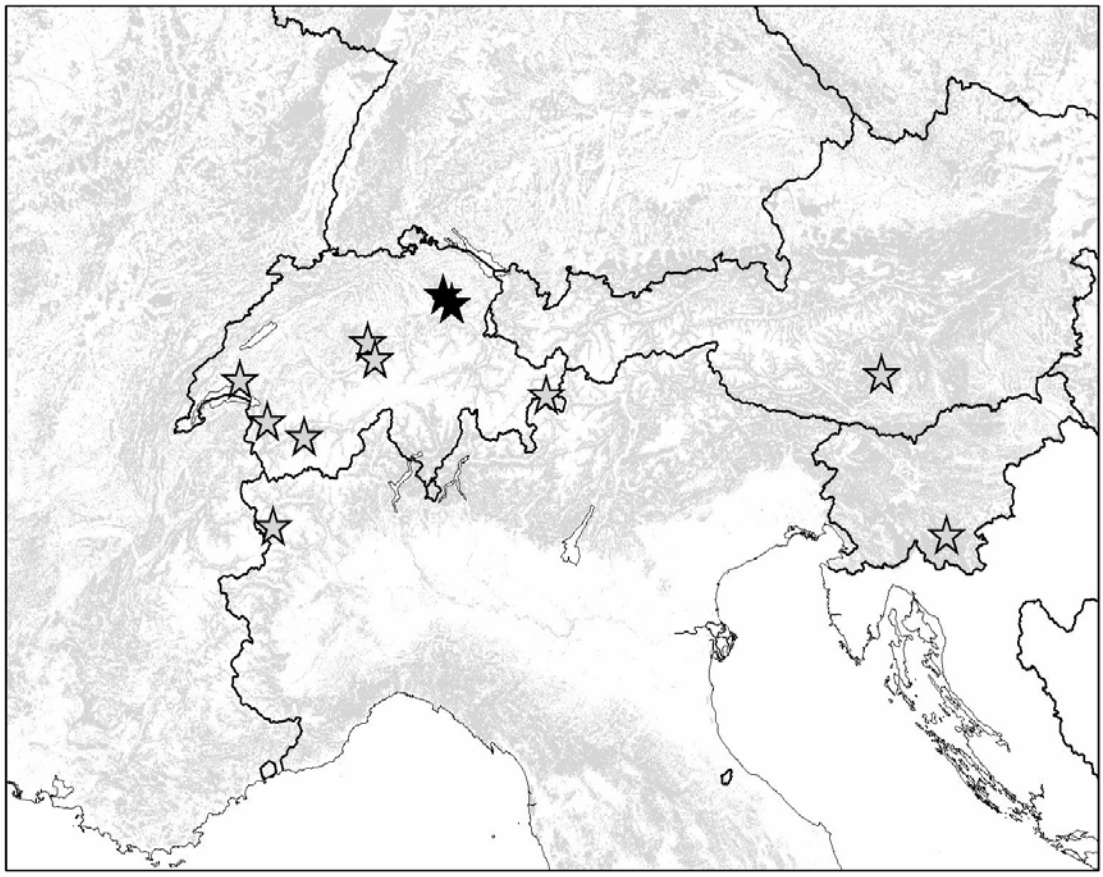
The SCALP experts propose conservation measures on the pan-Alpine as well as on national level. In all parts of the Alps, lynx have to live in a landscape of high human activities. Today, the Alps are a more suited living space for the lynx than in the 19th century, and the lynx has shown us that it can perfectly live in this human dominated landscape. We also present some background information about lynx life history in the Alps. However, the lynx needs support to regain the once lost territory and our tolerance to survive there. Therefore, the survival of the lynx in the Alps is less a question of the ecological conditions than of the co-existence with the people living in the same area. Any conservation or management strategy must consider human dimension aspects as a priority. For the future of the lynx in the Alps it is important that, besides cross-border co-operation between the Alpine countries, a consensus with all interest groups on a regional level is found. With this document, experts from all Alpine countries propose standards for a common strategy and aim to boost local, regional, national and international activities and cooperation.

Introduction

Although lynx is not endangered as a species in its whole area or in Europe, each population deserves to be conserved as an integral part of a local ecosystem. Regarding the extinction of the species in the Alps, the most important causes were (a) habitat loss through deforestation, (b) loss of the prey base through decline of the wild ungulate populations, and (c) direct persecution as a result of predator-livestock conflict and of negative attitude of people towards predators. Today, the lynx is legally protected in all Alpine countries, a demonstration that our society is willing to accept its return. However, legal protection alone is not enough to ensure the co-existence between people and large carnivores. Lynx, as any large predator, need vast forested areas and no nature reserve is big enough to host a vital lynx population. Therefore, lynx will always be in conflict with certain human activities, such as hunting and livestock breeding.

2001 marks the 30-year-anniversary of the first re-introduction of lynx in the Alps. In the 1970s, lynx were re-introduced into Switzerland, Slovenia, Italy and Austria (Fig. 1). These projects were neither co-ordinated nor accompanied by any research programme. Some releases were even clandestine and illegal. Only much later, monitoring programs have been established in most of the countries. With the initiative "*Status and Conservation of the Alpine Lynx Population*" – so called SCALP – an international expert group tried to revitalise the recovery of the lynx in the Alps. The objectives are (1) to regularly update the status reports of the existing sub-populations in the Alps; (2) to develop methods for the continued and comparable monitoring of the populations; (3) to propose measures to save local populations and develop a concept for the recovery of the lynx throughout the Alps; and (4) to invite local GOs and NGOs to co-operate in an international long-term programme to restore the Alpine lynx population. The SCALP expert group is able to provide knowledge and design conservation and management concepts. To implement those, however, we need the support of and the co-operation with GOs and NGOs.

The Pan Alpine Conservation Strategy (PACS) for the lynx bases on two ideas: (1) No Alpine country can host a viable lynx population alone – all regional populations will be trans-boundary; and (2) international co-operation is essential for the conservation of shared populations, and even more to solve the mutual problems (see chapter 4). With this document, experts from all Alpine countries propose standards for a common strategy and aim to boost local, regional, national and international activities and co-operation. We first summarise the status and distribution of the lynx in the Alps, then present some background information about lynx life history in the Alps, and finally, we propose conservation measures to increase the chance that lynx will survive in the Alps in the long-term.



Status and distribution of the Alpine lynx population

Any sound implementation of management measures must be based on a precise knowledge of the distribution, status and trend for each subpopulation. The SCALP expert group agreed upon a common standard for the interpretation of the monitoring data on a pan-Alpine level, where three different levels of reliability are distinguished:

Quality 1 represent the “hard facts”, e.g. all reports of lynx killed or found dead, photographs of lynx as well as young orphaned lynx caught in the wild and put into captivity.

Quality 2 incorporate all records of livestock killed, wild prey remains, tracks and scats reported by people who attended special courses. These records are mostly an objective proof of lynx presence.

Quality 3 include all wild prey remains, scats and tracks reported by the general public as well as all sightings and vocalisations, e.g. signs that cannot be verified.

Due to the absence of major habitat barriers in Slovenia, data for the whole country are considered, whereas for all other countries, only the Alpine occurrences are presented.

Since lynx were re-introduced, Switzerland and Slovenia were the only countries that produced a substantial number of Q1 data (Table 1). Although it is clear that there must be many unknown mortalities, some striking differences appear from a comparison of the lynx found dead. From 1995 to 1999, the number of lynx found dead in Switzerland more than doubled compared to the previous five years, while in Slovenia, the reported lynx mortalities decreased considerably. Five years earlier, at the SCALP symposium in Engelberg (Swiss

Alps), the Slovenian population was considered the most dynamic one. The fact that now the Slovenian lynx population is idling shows how quickly the fate of small occurrences can change.

Table 1. Known lynx mortality in the Alps.

Year	France	Switzerland	Italy	Austria	Slovenia	Total
1970-84	2	20	1	3	33	59
1985-89	2	13	2	0	48	65
1990-94	2	15	0	0	38	58
1995-99	0	41	0	1	13	55
Total	6	89	3	4	132	237

Not in all areas where lynx occur, hard fact data can be produced (Fig. 2a). The absence of known lynx mortalities is not generally equivalent to the absence of lynx itself. Since, the quality 2 data become extremely important for the interpretation of the lynx distribution (Fig. 2b). The Q2 data shows an expansion of the Slovenian population into the south-eastern Italian Alps. Lynx presence was also confirmed in the province of Belluno, while the occurrence of unknown origin in the Trentino has gone extinct again. The Q2 data in the western Alps showed a continuous area of presence in the western Swiss Alps and scattered observations in the northern French Alps.

Q3 data stretched more or less scattered from the south-western to the eastern Alps (Fig 2c). Such a wide distribution would represent a vital population that should definitely produce hard fact data (Q1) such as lynx mortalities. The high number of isolated and scattered Q3 data stresses the importance of a network of trained people that cover the whole territory to ensure that kills and tracks reported by the general public are verified. This “professional” approach is crucial because the number of data reported by the general public can vary, e.g. the fluctuations in the number of observations may also reflect changes in public awareness. The Austrian experience has shown that intensified publicity can immediately produce more reports (Huber and Kaczensky 1998) without there being more lynx present. Therefore, we mainly used Q1 and Q2 data to interpret the lynx distribution. However, a low number of quality 2 records is not necessarily correlated with a low number of lynx. Apart from lynx abundance, the reports of Q1 and Q2 data also depend on several other factors such as monitoring effort, climatic conditions and habitat features. This makes the comparison of data on the pan-Alpine level more difficult. Nevertheless, the trends of Q1 and Q2 records showed that (1) the lynx population in the north-western Swiss Alps increased while the Slovenian population is at best stable, and (2) that there is hardly any expansion of the Slovenian and Swiss populations. From the newest status reports, we estimate the number of lynx in the whole Alps to be about 90-120 individuals (CH: approx 70, SLO: 40-50, of which around 10 in the Alps, Tarvisiano in Italy: 3-4, other areas: unknown number of isolated individuals). However, their distribution is split into small occurrences that cannot be considered viable yet.

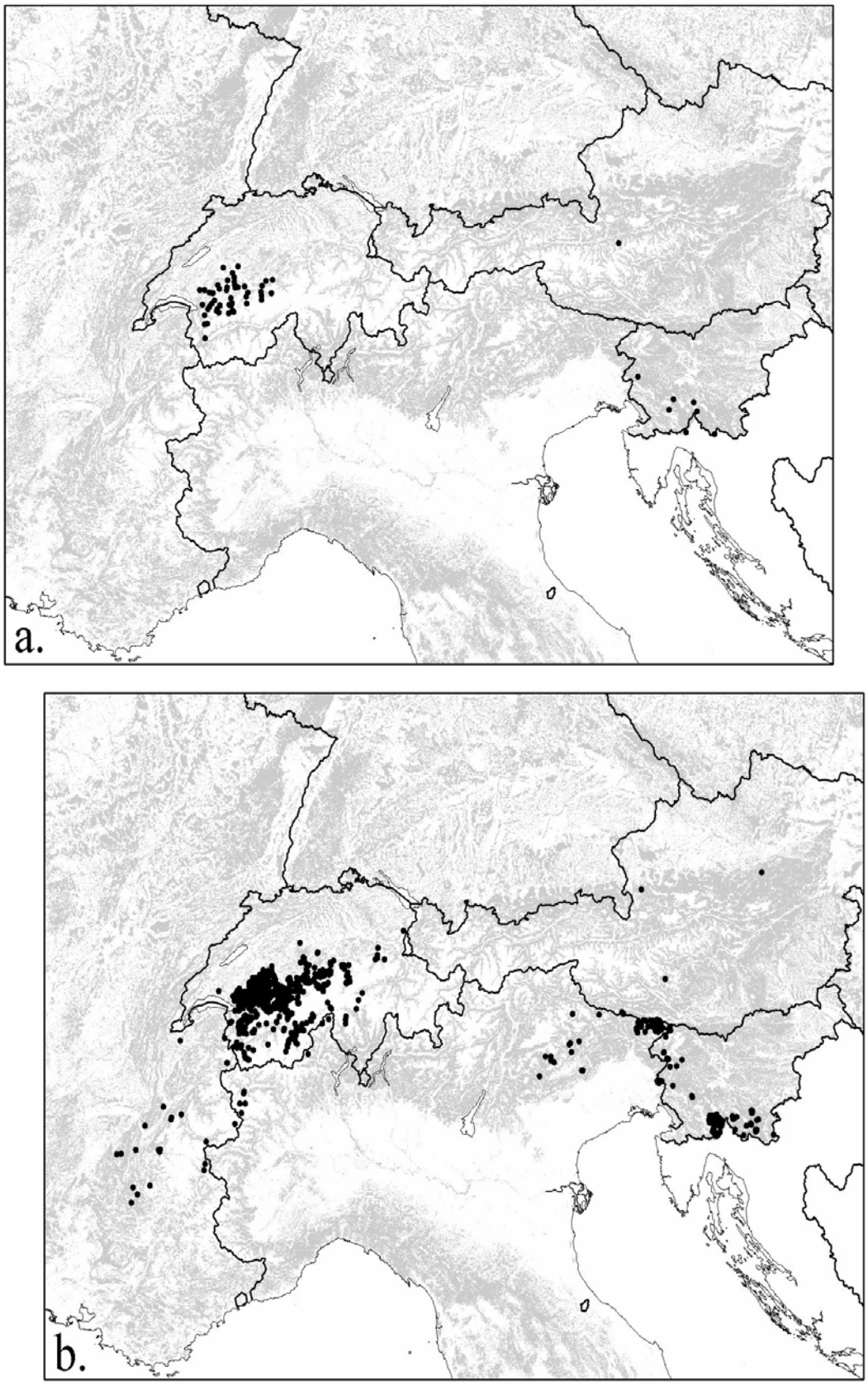
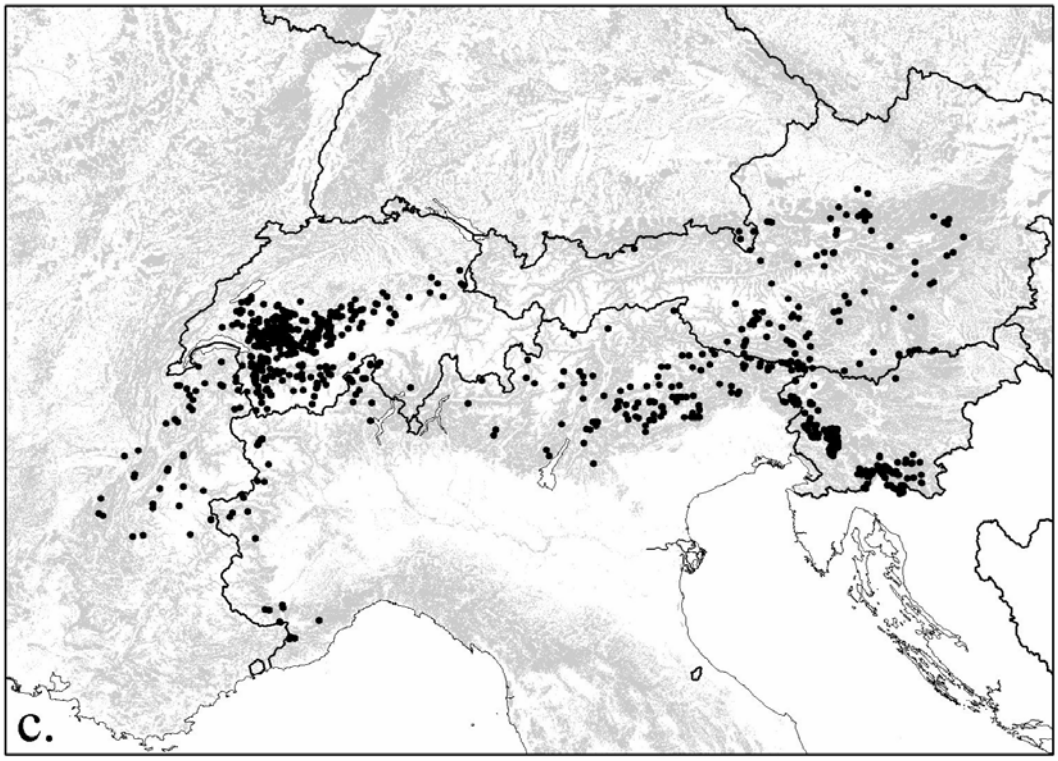


Fig. 2. Distribution of sign of presence recorded in the Alps. (a) quality 1 records, (b) quality 2 records, and (c) quality 3 records. Lynx occurrences in adjacent ranges are not shown.



Life history

Habitat

The common belief that lynx inhabit only forested areas is only partly true. In Europe and Siberia, they live indeed in large deciduous, mixed, or coniferous forests. In central Asia, however, lynx also inhabit quite open and sparsely wooded regions, including areas outside the wooded belt and above the permanent timberline (Breitenmoser et al. 2000). In the Alps, the extended forests of the montane and sub-alpine zones are the lynx' preferred living space. Areas above the timberline are not permanently occupied, and the high Alpine ridges with permanent snow and glaciers are considerable barriers to the expansion of the existing adapt to the more open parts of the Alps. Females in the north-western Swiss Alps have reproduced in home-ranges with a forest cover of not more than 25-30 per cent (Breitenmoser-Würsten et al. in press). This semi-open landscape provides still good cover habitat and – compared to the bottom of the valleys – a reduced human presence. In addition, this altitude corresponds very often with the highest chamois abundance; a good prey base is at least as important as forest cover.

Land tenure system

Lynx are solitary living animals, except for females with the offspring of the year. Usually home ranges of males overlap at the edges to a certain extent, whereas ranges of neighbouring females overlap only slightly if ever (Haller and Breitenmoser 1986, Haller 1992). Generally, adult males share their home ranges with one or two, rarely more females. Home range sizes vary considerably depending on habitat type, composition of prey community, and density of prey. Studies based on telemetry resulted in precise estimates of lynx home ranges in the Swiss Alps: 71 – 450 km 2 for males and 45 – 197 km 2 for females

(100% convex polygon; Haller and Breitenmoser 1986, Breitenmoser-Würsten et al. in press). In southern Slovenia, home ranges of 2 male and 2 female lynx ranged from 132 – 222 km 2 (Stanisa 1996).

Food ecology

Many different items can be found in the lynx' diet, however, the staple food of lynx in the Alps are ungulates, mainly roe deer and chamois (Breitenmoser and Haller 1987). In the eastern Alps, lynx predation on red deer has been observed regularly (Gossow and Honsigerlenburg 1988, Molinari 1998). Lynx prey also on livestock, mainly sheep, goats and farmed fallow deer (Angst et al. 2000; see also status reports of Switzerland and Slovenia). A lynx' consumption rate averages 1-2.5 kg of meat per day. If undisturbed, they return to a kill until all edible parts are consumed. On average, lynx kill between 50-70 ungulates a year, depending on species, age and sex of the prey. The influence of lynx predation on a local ungulate community depends on the structure of the prey community, number and social structure of the lynx population, other causes of prey mortality like disease or hunting, presence of competitors and scavengers as well as landscape. In addition, the impact of predation may change considerably over time. Recent studies (Filonov 1980, Breitenmoser und Haller 1987, Okarma et al. 1997, Jobin 1998) have shown that roe deer mortality caused by lynx predation can be as low as 2%, but may reach locally 41%. The predation mortality needs to be interpreted in a wider context though; it has to be compared to all other mortalities or the prey population dynamics. Even a predation mortality of 30% does not necessarily lead to a decrease in roe deer density, if the population can compensate for this mortality. Nevertheless, few studies (e.g. Haller 1992) have shown that the quantitative impact of the lynx may cause locally a great reduction of the roe deer density. In other regions, the development of a lynx population did not hinder a considerable increase in roe deer populations (Stahl et al. 2001a). Besides, predation may also have a qualitative impact on prey populations. In the presence of predators prey individuals may change their dispersion, their social organisation and behaviour. By influencing behavioural mechanisms – e.g. by inducing competition for predator-safe space – indirect effects of predation may reduce the carrying capacity for prey. However, at the time being we do not have enough case studies to draw a general picture about the significance of lynx predation for the prey populations.

Reproduction and mortality

Mating takes place from February to mid-April. Kittens are born after 67-74 days, usually in late May. Litter size is generally 2 or 3 (range 0-5). Kittens follow their mother until the next mating season. They leave the mother at the age of around 11 months, when they have a weight of 9-14 kg. Mean dispersal distance of lynx in the Swiss Alps averaged 26 km (Zimmermann, unpubl. data). In nature, lynx were reported to live up to 15 years, but the average age of adult lynx is 4.5 years (n = 52, KORA, unpubl. data). Besides, the natural mortality among juvenile lynx is high (Breitenmoser et al. 2000). Currently, the most important known mortality factors of lynx in the Alps are traffic accidents and illegal killings (Table 2). Even though a viable lynx population will tolerate a controlled harvest, in Switzerland and Slovenia over-hunting or illegal killing have been considered to be the reason for the halt of the expansion or even the decline of local populations.

Table 2. Known causes of lynx mortality in the Alps from 1970 to 1999

Mortality	France	Switzerland	Italy	Austria	Slovenia	Total
Illegal killing	0	20	2	1	4	27
Shot legally	0	5	0	0	109	114
Traffic accidents	5	16	1	1	10	33
Disease/starving	0	12	0	0	1	13
Accidents[1]	0	17	0	0	0	17
Unknown	1	19	0	2	8	30
Total	6	89	3	4	132	234

[1] avalanche, drowning…

Population dynamics

Under natural conditions, lynx density is obviously regulated by prey availability and social interactions among lynx. Up to now, there is no evidence for the effect of diseases or intrinsic factors on the population dynamics of lynx in the Alps, although, in the Swiss Alps, sarcoptic mange (*Sarcoptes scabies*) caused a few losses. In the Alps, illegal killings are the most important limiting factor of lynx density.

The density of self-provisioning lynx ranged from 1,2-2.1 individuals/100 km² in a local occurrence of the Swiss Alps (Haller and Breitenmoser 1986, Breitenmoser-Würsten et al. in press). As a consequence of its specialised feeding habits, the lynx shows numeric reaction to changes in prey base (KORA, unpubl. data, Stanisa, pers. com.).

Problems

While brown bear show a considerable and wolf an even higher migration capacity – they are about to re-colonise the Alps naturally – the expansion of the lynx populations is contrary. The smallest of the three large carnivores seems to be the most vulnerable one. In 1995, experts from all Alpine countries met in Engelberg (Swiss Alps) to evaluate the status and distribution of the Alpine lynx population. A critical analysis showed methodological, biological and anthropogenic problems.

Methodological problems

All countries agreed on a common method and data interpretation to evaluate the status and distribution of lynx in the respective countries. Nevertheless, there remain some important gaps to be filled, as the monitoring system needs to be improved in Austria, Italy and Slovenia by expanding the network of lynx experts. In the German Alps, a monitoring system needs to be set up. These efforts will allow to more precisely differentiate between permanent and temporal presence, or between fragmented and continuous areas of presence.

Biological problems

The small, isolated lynx populations have a limited capacity to expand in the highly fragmented landscape of the Alps. Although more suitable habitat would be available in uncolonised parts of the Alps, neither the Slovenian nor the Swiss lynx population have expanded markedly during the past 10 years. The area of lynx presence remained stable (Switzerland and eastern Alps), fragmented (French Alps) or decreased (Austria), some local occurrences even went extinct (Trentino). Only in the Bellunese (Italy), lynx presence was confirmed for a new area, and in the north-western Swiss Alps, the lynx abundance increased. However, it is too early to consider these new records the start of an expansion wave.

It has been argued that re-introduced lynx populations in the Alps may suffer from inbreeding, as all populations were founded by few individuals only. This hypothesis is currently being tested (Breitenmoser-Würsten et al. 2001).

Anthropogenic and management problems

The Alps are the largest near to natural landscape in Central and Western Europe – 200.000 km² of forests, pastures and alpine peaks. But the Alps are also the mountain range most heavily used by humans throughout the world. Even though lynx are not dangerous for humans, conflicts arise between human activities and large carnivores. Hunters regard lynx as competitor for game. Matter of discussion among hunters, game managers and scientists is the quantitative effect of the lynx on its prey populations, which is not fully understood yet. However, lynx presence in a given area will not question the hunting activity per se. In addition, lynx are also capable to kill livestock, mainly sheep, goats and farmed fallow deer.

The losses are usually not economically important. High damages, due to environmental factors or the presence of some habitual livestock raiders were only locally reported (Stahl et al. 2001a, b). Recent studies in the Swiss Alps have shown that only 0.04% of the sheep available were killed by lynx, whereas other mortality factors were much higher (Angst et al. 2000).

Experiences of the past 30 years have shown that the magnitude of these conflicts depends on (1) the perception of lynx by local people, (2) the suspected - and not necessarily true – impact of lynx on hunted wild ungulates, and (3) the presence and magnitude of predation upon livestock in connection with the livestock husbandry system. This situation calls for an adapted management approach. Each of these factors needs to be considered before suggesting any management implication.

Goal and objectives

Re-establish and maintain, in co-existence with people, a vital lynx population covering the whole of the Alpine arc. This general goal can be split in four objectives:

1) The lynx populations in Slovenia and Switzerland maintain their vitality and must be helped to expand.
2) The populations in Slovenia and Switzerland are joined through colonisation of the area in between (Alps of Austria, Germany, Italy and Liechtenstein).
3) This unified population in the central Alps is allowed to expand to the north-east (Austria) and the south-west (France, Italy).
4) Gene flow is assured between the Alpine sub-populations and the population of Slovenia and Croatia, the population of the Jura Mountains and the population of the Bohemian/Bavarian forest.

Actions

Pan-Alpine actions

The lynx populations will only be viable, if they are allowed to expand over a large area. Consequently, a pan-Alpine approach is essential.

Due to the low dispersal rate of lynx, the expansion capacity is limited. Lynx tend to colonise areas close to occupied home ranges. A natural expansion of the area occupied occurs only when surplus individuals are produced and this population pressure is hold up over several years.

The aim is to have inter-connected lynx populations in the Alps, in order to assure the long-term conservation of the species. Since lynx have a low capacity to expand in the modern, highly fragmented landscape, the spread of the populations may have to be supported by means of further translocations and re-introductions. Re-introductions must follow international guidelines (Council of Europe, IUCN/SSC Re-introduction specialist group), have the support of regional authorities and involve local interest groups. Premature re-introductions are counter-productive.

In all parts of the Alps, lynx have to live in a landscape of high human activities. Public awareness must be raised for the fate of the lynx in the Alps where the species is non-existent or threatened.

Actions recommended:

a. The authorities of the Alpine countries agree upon the principle of a pan-Alpine conservation strategy for the lynx and take the necessary actions to adopt the PACS in their Alpine area.

b. Invite the GOs to discuss the PACS with all relevant partners and experts, to define a schedule for further actions and to outline the co-operation between all groups involved.

c. Assure the information and involvement of the interest groups, the local people and the general public at all states of the process.

d. Establish, improve or maintain a permanent monitoring and produce a regular update of the status reports on regional and pan-Alpine level and initiate adequate research projects to close obvious gaps of knowledge.

e. Investigate the impact of lynx on its prey populations and devise management recommendations for the national and regional wildlife management boards.

f. Reduce the conflicts arising from depredation (lynx killing livestock) through (1) compensation of losses, (2) application of preventive measures, and (3) removal of problem individuals.

g. Set up a genetic surveillance of the lynx sub-populations.

h. Support the PACS by means of expansion models and habitat models.

i. Organise regular meetings between the SCALP expert group, the relevant GOs and interested NGOs in order to review the PACS and adapt it as needed.

j. Incorporate the PACS into regional or national conservation plans (and vice-versa), and organise the constant exchange of information between regional, national and international working groups.

k. Improve the communication between and among GOs, NGOs and scientists to avoid competition and to integrate scientific knowledge into management and public relation.
National GOs implement the actions adopted in the European action plan for the lynx (Breitenmoser *et al*. 2000).

Actions by countries

France

Even if the true lynx range is underestimated in the French Alps, the presence of a large lynx population in the French Alps is still improbable. Nothing indicates an « abnormal » illegal killing rate of lynx in this region. Low immigration rates from the Jura or from the Swiss Alps, and strong ecological constraints in the northern French Alpine valleys (e.g. marked linearity of the forested habitats, presence of extensive high-alpine regions and urbanized areas) are the most obvious factors that could have limited the development of a lynx population during the last decades. In the next future, a viable lynx population will probably not become established before the lynx colonise the large forested regions of the southern Alps. Such a natural process is improbable or will take a long time without an active conservation plan, including translocations or re-introductions in a few favourable sites. These actions must necessarily have the support of regional authorities and involve local interest groups.

Actions recommended

a. Maintain a permanent monitoring system and investigate lynx dispersion from the Jura and between the main regions of the northern French Alps to assess the French-Alps habitat suitability for lynx more precisely.

b. Maintain a permanent procedure to investigate any possible lynx depredation events on livestock and to allow the payment of compensation.

c. Assure the information and involvement of the interest groups, the local people and the general public in lynx conservation and management plans.

Switzerland

The lynx abundance in the north-western Alps increased in the past five years and the gap between the attitudes of conservationists on the one side and of hunters and sheep breeders on the other side has become broader, whereas the general public took generally a supportive, but locally also ambivalent position. As a consequence, after consultation of all interest groups, the Swiss management authorities implemented a management plan (BUWAL 2000).

Accordingly, lynx are translocated from the high-density area to the eastern Alps, where lynx occur only sporadically. The basic idea is to trade lynx abundance in the north-western Alps for expansion of the population. This compromise helps to overcome the low capacity of lynx to expand and at the same time to improve the acceptance of the predator through local management. If once the lynx population is considered viable, it is planned to allow limited harvest of local populations in Switzerland.

Actions recommended:

a. Cross-border cooperation is established with the countries concerned by the translocation (Austria, Liechtenstein and Italy).

b. Local people are included in decisions concerning lynx management.

c. Law enforcement is intensified where poaching occurs.

d. Criteria for further interventions (translocations, elimination of problem individuals, quota hunting) are developed and their application is stepwise implemented.

e. The development of methods to evaluate the genetic status of the Alpine population is continued.

Liechtenstein

The country-surface of Liechtenstein (160 km^2) is not big enough for a lynx-habitat. Liechtenstein will always be a part of the habitats in the neighbouring countries especially of the canton of Grisons/Switzerland and the Vorarlberg/Austria. A close cooperation with these neighbours will be important in the field of reintroduction. Liechtenstein also participates actively in all activities of the SCALP-expert group.

Actions recommended

a. Inform the general public about the behaviour and the distribution of the lynx.

b. Inform hunters and NGOs about the biology and distribution of the lynx with special reference to the impact of lynx on roe deer, red deer and chamois.

c. Educate relevant people in the identification of lynx signs of presence.

Austria

The Austrian Alps form a major link between the two apparently striving alpine lynx populations in Slovenia and Switzerland, both populations being based on re-introductions in the 1970'ties. At the same time lynx were re-introduced into Austria. Nevertheless the Austrian Alps still seem to be inhabited by some individual lynx rather than by a continuous lynx population. But as data on the Austrian population is poor, there has to be some uncertainty about the status and distribution of this lynx population. At the first Conference on the Status and Conservation of the Alpine Lynx Population (SCALP) in Engelberg (Council of Europe 1998) in 1995 the need for more careful and intensive monitoring schemes was stressed. Such a monitoring system still has yet to be established for Austria.

While monitoring the lynx population is in most countries of the Alpine arc coordinated nationwide by a governmental or governmental-related organization, there is no such structure for a nationwide uniform collection of records of lynx presence in Austria. Efforts to monitor the distribution and the development of the Austrian lynx population are currently conducted by regional hunting associations, locally operating NGOs or are dependent on voluntary, private initiatives. Therefore, the setting up of a uniform monitoring system should be a priority.

Actions recommended:

a. Establish an efficient nationwide monitoring scheme for Austria.

b. A national body to organise and coordinate efforts to conserve, support and study the Austrian lynx population has to be formed.

c. A nationwide network of people educated in the identification of signs of lynx presence – as already established in Switzerland and France - has to be set up in order to obtain reliable data on lynx presence and distribution.

d. There is need for a renewed effort to inform the general public, interest groups and hunters about the biology of lynx and efforts undertaken to ensure the survival on this species, especially in regions where lynx occur only recently or where expansion is very likely.

e. All efforts have to be undertaken to reduce poaching on lynx, as we believe that poaching is still the most important single cause for lynx mortality and the slow spread of the alpine populations.

f. Close cooperation with neighbouring countries, managers and scientists has to be maintained and eventually intensified. Especially in regions close to recently established or expanding lynx-populations that could eventually expand into previously uninhabited areas in Austria, local people and especially hunters need to be prepared in advance; therefore awareness for possible immigration is essential.

g. Evaluate the feasibility of eventual re-introductions by assessing attitudes and habitats in potential regions of Austria.

Germany

Compared to other countries, Germany shares a very small portion of the Alpine arc. However, Germany could play an important role in the long-term goal to re-establish lynx over the whole Alpine arc by linking the two existing populations in the East (Slovenia) and West (Switzerland/France). Because of its central location, it would be important that Germany starts to play a more active role in lynx conservation in the Alps. Conservation strategies and possible actions need to be assessed in the near future.

Actions recommended:

a. Urge German/Bavarian Government to play a more active role in lynx conservation.

b. Establish a network of trained people to verify possible lynx presence in the German part of the Alps.

c. Initiate a feasibility study to evaluate habitat suitability and public attitudes towards the return of the lynx.

Italy

Italy plays an important role for the future of the lynx in the Alps, as its territory connects the two vital populations from Slovenia and Switzerland. Up to today, few individuals immigrated into Italy where they established two occurrences in the south-eastern and in the north-western Italian Alps. The immigration from Slovenia and Switzerland is rather slow, that's why re-introductions should be considered as a necessary step to establish a vital

population in Italy. Such a process needs time, as it cannot be carried out without the large consent of rural people, especially hunters and sheep breeders. Priority should be given to the expansion of the existing occurrences.

Actions recommended

a. Improve and maintain a permanent monitoring system according to the guidelines established for the *Ministero dell'Ambiente* (Molinari et al. in press).

b. Initiate and coordinate applied research on lynx occurrence especially to study the dispersal and immigration dynamics.

c. Evaluate habitat connectivity and needs for improvement.

d. Assess the impact of lynx on wild prey and formulate ungulate management recommendations on local levels.

e. Work out a lynx action plan by involving GOs, NGOs and scientists.

f. Investigate the possibility of a further lynx re-introduction.

Slovenia

The lynx occurrence of Slovenia is of great importance for the natural re-colonisation of the Alps. Apart from the freeways, there are no barriers to hinder lynx dispersal. However, we estimated the number of lynx in the Slovenian Alps at 10 individuals only. The future of the lynx in the Slovenian Alps depends on the immigration from southern Slovenia, the Kocevsko and Notranjska where lynx have been re-introduced, as well as from the situation in neighbouring Croatia. Recently, the core area of the lynx population has shifted slightly westwards. However, the size of the area permanently occupied has not increased. In contrast, the fact that the hunting quota has not been reached since 1992 even though the quotas were set considerably lower than in the previous pentad indicates that the number of lynx has decreased. In the Slovenian Alps west of the freeway Jesenice-Ljubljana-Trst livestock husbandry is most common. This is also the area where lynx predation on sheep occurs more often than in southern Slovenia. There is a great need to prepare a national action and management plan for the conservation of the lynx.

Actions recommended:

a. Establish cooperation between scientists, GOs and NGOs on national and international level to include the recommendations of the PACS in the national action plan.

b. Prepare a national strategy for the management of the lynx population.

c. Enforce the adopted protection system of lynx in border areas of Italy, Austria and Croatia and participate actively in the international efforts to restore the Alpine lynx population.

d. Improve the existing monitoring system and expand it over the whole Slovenian territory.

e. Evaluate the habitat and dispersal possibilities of lynx.

f. Re-establish scientific cooperation on national and international level especially in regard to genetic analyses, illnesses and damage prevention.

g. Update the existing livestock compensation system according to international recommendations and the new Slovenian legislation and encourage traditional livestock protection measures.

h. Inform the public, especially shepherds and hunters, about the conservation needs of lynx in the Alps on national and international level.

i. In regions where lynx regularly kill livestock allow hunting of lynx or the capture for further re-introductions.

Conclusions

For conflict species such as the lynx, the definition of its legal status is not enough for a proper management aiming to conserve the species in a given area, as conflicts about lynx always lead to illegal killings. At the time being, poaching is the greatest threat to the persistence/expansion of all lynx occurrences in the Alps.

In the past 100 years, many parts of the Alps have seen a decline in the human presence and the prey base can again be considered excellent. Today, the Alps are a more suited living space for the lynx than in the 19th century, and the lynx has shown us that it can perfectly live in this human dominated landscape. However, the lynx needs support to regain the once lost territory and our tolerance to survive there. Therefore, the survival of the lynx in the Alps is less a question of the ecological conditions than of the co-existence with the people living in the same area. Any conservation or management strategy must consider human dimension aspects as a priority. The future of the lynx in the Alps depends on cross-border co-operation between the Alpine countries. But most importantly, the success will depend on the ability to find a consensus with all interest groups on a local level!

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