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Abstract: In 1973, 6 lynxes, 3 males and 3 females, were released in Slovenia. The author here describes the evolution of the lynx population from the resettlement to 1990. Interestingly, research was conducted from the first day of resettlement to retrace their expansion and nutrition.
REVIEW OF THE RESETTLEMENT OF LYNX (LYNX LYNX L.) IN SLOVENIA (YU) 1973-1990

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INTRODUCTION

Considerable credit for the resettlement of lynx in Slovenia is due to Dr. Karl Weber, of Zürich, a long-standing guest of the "Medved" hunting preserve in Kočevje (43,000 ha). He offered to the director of the hunting preserve, L. Svigelj, to pay for the attempt to settle lynx in the forests of Kočevje, where native bear and wolf still reign. The last lynx was shot in this region in 1888, and in Slovenia as a whole in 1908. Dr Weber was certainly knowable about the resettlement of lynx in 1971 in the canton of Obwalden in his own state. His idea was immediately accepted with pleasure - Dr. Weber also financed the purchase of six lynx. Quarantine was situated in the district of Trnovec at an altitude of around 1000 m and in January 1973, the 6 lynx were released into it - 3 male and 3 female, which were separated after mating into three compartments in the quarantine and on March 2, 1973 were released directly into the open. The Forestry Institute in Ljubljana was commissioned to cooperate in the provision of the lynx from Slovakia, with the preparation of the quarantine and, after the release, to follow all events in connection with the lynx in freedom. Janez Čop, a member of the institute, was appointed project leader. We have undoubtedly been the only institute of any country in which lynx have been settled that has carried out research from the first days, when the lynx were transported from Slovakia (Czech and Slovak Federal Republic) to Slovenia until today (1973-1990), a full 17 years and in this time, we have also regularly presented new developments concerning our lynx at a number of symposia, congresses, etc. I will comment on the current situation, at a time when the lynx have already satisfactorily multiplied and spread in all directions.
General description of the area

The lynx were resettled in a very large complex of typical high-harst fir-beech (Abieti-Fagetum dinaricum) and beech forest.

ANALYSIS OF NATURAL SITES IN THE REGION

Bear – the symbol of the Kočevje forests. Photo Janez Konečnik
Kočevje forest management area lies in the south-east of Slovenia, in the area between Notranjski Snežnik, the valley of the Kolpa and the mountains of Kočevje Reg.

The geological base is mainly limestone and dolomite of Cretaceous, Jurassic and Triassic formation. The climate is moderately humid. Fir and beech forest predominate in the region and there are other beech forest communities. The forests are relatively well-preserved and it should be mentioned that primary forest complexes have also been retained.

The characteristic historical development of the Kočevje region is reflected in the landscape. There has been sparse settlement in all periods, with various different settlements in the 13th-14th century and generally unsuitable conditions for agriculture. Emigration since 1900 has had a considerable impact, especially during the second world war, when over 20,000 people moved out. The forest started to grow over the abandoned agricultural land so that the index of the increase of forest area is as much as 197.

The planned management of the forests of the Kočevje region began about a hundred years ago, in 1890, when the first management plans were made for the large forest estates of Count Auersberg. They were made by the forester Leopold Hufnagel, whose importance needs to be emphasized.

In the management of the Kočevje forests, Hufnagel firmly rejected the then generally accepted clear felling system of management.

As an alternative to this system, he quite independently developed and established in the Kočevje forests, the idea of selected forests and selective management and this was immediately accepted also in the large forest estates on Notranjska and Gorski Kotar and, later, in the remaining high karst forests in Croatia (Lika, Velebit) and even in Bosnia.
Hufnagel established selected forest and selective management as of equal validity to the then generally accepted fashion of cultivating pure, even-aged forests. Hufnagel gained general acceptance for selective forestry and he received wide recognition for his work, including the title of honorary doctor of forestry science from the Vienna College of Soil Culture. Hufnagel's work served as a basis for the development of the concept of selective management in the entire West Dinar region of Yugoslavia.

If Hufnagel's decision of a hundred year's ago is evaluated on the basis of modern knowledge of forestry, it can be said to have made a decisive contribution to the co-natural and natural protective concept of silviculture. Hufnagel, with his work, appeared just at the time when planned forest management was introduced in the Dinar region of Slovenia and Croatia. It is questionable as to what the situation would be had it not been for Hufnagel's authority. It is quite possible that our high karst forest would have quite a different appearance. In the Kocevje forests, Hufnagel protected ten primary forest remains, six of which are still preserved today and enable the study of the development of forest under virgin conditions.

THE COURSE OF RESETTLEMENT

The following conditions were important for our resettlement:
1. that the lynx were released at mating time - reproduction
2. that after the release they remained in the vicinity of the quarantine
3. that all three females were pregnant
4. that in August 1973, four young were observed in the direct vicinity of the release, one female having had two cubs, the other two, one each. This was the first indication that the attempted resettlement might succeed.

An increase was observed each year. We arranged for hunters and foresters to send us a specially prepared questionnaire when they sighted lynx or found traces in their reserves: traces, direct sightings of lynx, the finding of game mauled by lynx, increases in numbers, etc.
The lynx gradually spread in all directions:
1. towards the southeast into hunting reserves of the adjacent Republic of Croatia, where the first lynx were traced in autumn 1974, actually in the National Park of Risnjak, in Gorska Kotar. The last lynx had been captured here in 1903 at Bukov vrh (1167 m) in Sneznik. Young were sighted in the same place the following year (1975). It should be mentioned that the hunting reserve of Gorska Kotar, which is linked to Kokevje and the Notranjska forests, is settled by native bear, as well as a number of wolves. The same applies along Velebit, the mountain range above the Adriatic Sea. Lynx crossed over Kapela and Lika in 1984 into the hunting grounds of the Republic of Bosnia, where four lynx have been shot to date, and two found run over. The furthest known migration of lynx in this direction is almost 300 km from Risnjak, a lynx was shot by Zavidovic in a mouflon reserve.

A possible reason put forward for such a long migration from the core, central area is that there is much less food in these hunting grounds than occurs in Slovenia and even in the region of Gorska Kotar. The hunting grounds of Bosnia are without red deer, roe deer are scarce, but some man-made colonies of resettled chamois and mouflon exist, all since 1960. Unfortunately we have inadequate data on what happened to the lynx in this extreme southeastern position. Wolf are a great nuisance in Bosnia, and bear also worry the sheep and goats, so there is little sympathy for a new predator - the lynx.

2. Towards the southwest, migration took place over the region of Notranjska - Brkinov, Cicarija at Slavnik (1029 m), where the first lynx was sighted in 1981. in 1984, also a pregnant female with one cub. Six lynx had been shot in this area in by 1989.

3. More to the north and west, the new population of lynx expanded in two directions:
   - over Velika gora, to Javornik towards Postojna, where the first lynx was sighted in 1978 quite close to the town of Postojna. Lynx with cubs have regularly been sighted above all on the Javorniki, above Cerkno lake. Migration continued beyond there from 1985 over Hrušica, Nanos to Trnovo forest (a powerful male was shot on 18.12.1988 close to the town of Grčar, right by the Yugoslav-Italian border (Nova Gorica), which is 120 km as the crow flies from the point of release. We have information (Dr. Perco from Trieste) that for some years there have been regular lynx traces in the region of northern Venetia in Italy.
Range of lynx 1989 -
Central area of settlement,
showing furthest migration
where lynx have been killed
- the other direction of migration has been over Mala gora, Menasija and Krim over the Ljubljana-Razdrto motorway, over the region of the forests of Poljanksa and Sevska dolina and Idrija and Jelovica in the Julian Alps, where in 1987 they were found in Triglav National Park. These migration paths to some extent follow the same trails as bear.

At quite the other end of Slovenia, in the Karavanke, lynx have appeared on our side of the border from Austria, where they were resettled in 1977 by Murau in Steiermark. Nine lynx were released, according to our information, 3 female and 6 male. Unfortunately the first was shot 5.12.1979 at Preval, another two in 1989, on 15.1.1989 at Koprivna and 24.10.89 below Kosuta. All three were powerful males.

We estimate that the central territory of the lynx today extends to some 600,000 ha, of which half is in the Republic of Slovenia and the other half in the Republic of Croatia. The lynx would undoubtedly have expanded more in our surrounding had not shooting been permitted since 1978.

Our findings show that lynx migrated towards the west into areas:
- where there was denser population
- where there was more disturbance *
- where the climate was noticeable warmer with exceptionally little snow
- where there is no longer such formal forest complexes as in Kočejeve and Notranjska
- that hunters noticed, or found traces, at the furthest extremes where lynx reappeared, invariably of individual lynx and not two or more
- pregnant females were never sighted in these extreme locations.
NUTRITION
One of the main elements of our research program was to discover whether the lynx were distinctively carnivorous in our hunting reserves. We followed two routes:

1. the collection of information of finds of game maulled in a lynx manner, i.e., data from the questionnaire which we received from hunters and foresters in the hunting reserve.

This method is not the best, in the broken karst world it is not easy to find torn game and it is also questionable whether it was always taken by lynx. It has to be recognised that it is not easy to ascertain who was the first — lynx, wolf or jackal and if the cadaver is not fresh, it is exceptionally difficult, if not almost impossible to ascertain the real culprit. In snow or mud, tracks can help. In the case of sheep, one must add bear and roaming dogs. This problem has not been resolved in any country in which lynx have been resettled.

We only obtained data from the questionnaire on the kind of game and domestic animals which lynx take, not the quantity.

2. the other method was an analysis of the food in the stomachs of lynx killed.

This method of ascertaining the feeding habits of lynx was more exact, but this only covered the constitution of the diet for five months, i.e., in the hunting season, from 1st October to 1st March, mainly the winter months.

According to the questionnaire (No.1), we concluded the following "menu" for lynx in the hunting reserves of Croatia and Slovenia.

Of game:

- roe deer
- red deer
- mouflon
- fallow deer
- wild boar
- chamois
- badger (3 cases)
- brown hare (2 cases)
- wild cat (3 cases)
- capercaillie (3 cases)
- partridge (1 case)
- fat dormouse

Capreolus capreolus
Cervus elaphus
Ovis ammon musimon
Dama dama
Sus scrofa
Rupicapra rupicapra
Meles meles
Lepus europaeus
Felix silvestris
Tetrao urogallus
Tetrastes bonasia
Glis glis
Of domestic animals:
  - domestic sheep
  - goats
  - dogs
  - domestic cats
  - chickens

Thus 12 varieties of game and 5 of domestic animals.

We were also concerned with the influence of lynx on mouflon. In Kocevje, close to the quarantine where the lynx were released, there are two pens (each of about 1000 ha.) Mouflon, fallow deer and wild boar were resettled in them after 1971. Even before the release we had been warned from Slovakia that lynx very much favoured mouflon and this was also demonstrated in our environment. Over the years, the lynx destroyed the entire population of mouflon - their numbers were estimated at 250-300 head. The last ram remained until 1982.

It is interesting that in one of the pens there were also fallow deer and wild boar. The lynx did not persecute these as much as mouflon. Mauled remains were found of some young, corpses or skins of fallow deer, but not enough to cause a reduction in numbers as was the case with mouflon. The evidence of this is that 42 fallow deer from Hungary were released in one of the pens in 1985. We also have mouflon free in nature, but the lynx do not so selectively favour these, although the latest data from hunters show that there are some such developments in the foothills of Trnovo forest at Goriska. We must study conditions thoroughly in the coming years.

When shooting of lynx began in 1978. the Ministry for Forestry ordered that all lynx shot must be brought to our Institute in Ljubljana, and then to the Veterinary Faculty: for physical measurement and for food analysis of the contents of the stomach, examination for rabies and other illnesses, etc.
From the examination of 50 lynx, we received the following data: (examination of stomach)
in 72% there was hoofed game
in 12% we got remains of squirrel, dormouse, brown hare, mouse
and domestic sheep
16% were empty

If we consider only ungulates, the composition was the following:
- roe deer 64%
- red deer 28%
- moufflon 8%

From the questionnaire we extracted the following data on 97 roe deer evidently taken by lynx:

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th></th>
<th></th>
<th></th>
<th>doe</th>
<th>buck</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>To 1 yr</td>
<td>2-yr</td>
<td>3-yr</td>
<td>4-yr</td>
<td>5+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25</td>
<td>12</td>
<td>37</td>
</tr>
<tr>
<td>10</td>
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<td></td>
<td></td>
<td>6</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
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<td></td>
<td>6</td>
<td>5</td>
<td>11</td>
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<td>10</td>
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<td></td>
<td>7</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>29</td>
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<td></td>
<td></td>
<td>25</td>
<td>4</td>
<td>29</td>
</tr>
<tr>
<td>68</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>28</td>
<td>10</td>
<td>97</td>
</tr>
</tbody>
</table>

LYNX SHOT

Shooting began in 1978, when we decided that the new population had grown in the five years to 50 head. The Ministry for Forestry issued permits each year at the start of the hunting season. To the end of the 1988/1989 hunting season, the following numbers of lynx had been shot, run over or found dead:

<table>
<thead>
<tr>
<th>Republic</th>
<th>Number</th>
<th>Sex</th>
<th>NN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slovenia</td>
<td>76</td>
<td>34</td>
<td>41</td>
</tr>
<tr>
<td>Croatia</td>
<td>64</td>
<td>36</td>
<td>49</td>
</tr>
<tr>
<td>Bosnia</td>
<td>6</td>
<td>2</td>
<td>?</td>
</tr>
<tr>
<td>Total</td>
<td>176</td>
<td>72</td>
<td>90</td>
</tr>
</tbody>
</table>
Our study was intended to cover the lynx territories in Slovenia, although with the assistance of dist. ing. Alojzij Frković from the Delnice Forest Management Area. We also received data concerning lynx in Croatian hunting reserves.

In Slovenia there were: shot 68 lynx, run over 5 lynx (2 of them young), found dead 3 lynx (2 of them young) = 76.

The breakdown by sex was:

male 35: female 40 = 75
(the sex of one was unknown)

Breakdown into old: young 65:20 = 74%:16%

The situation to October 1990:

Shot in Slovenia 86
Shot in Croatia 102
Shot in Bosnia and Herzegovina 5
Total 193

We must also consider illegal shooting, so more than 200 lynx were certainly eliminated from the hunting reserves. According to hunters, more than 300 lynx currently live in the total area of the new population. Our own view is that there are less than half as many, around 130 lynx.

It is interesting to note that all the lynx shot in the most peripheral regions of the hunting grounds, outside the core, central area, have to date been grown males. This shows that males are the first to seek new territories, and we have the same experience with bears. 24 lynx had been shot outside the central territory by September 1990.

It is exceptionally important that all the shot lynx were examined at the Veterinary Faculty in the department of virology (Dr Železnik) because of suspicion of rabies. In all cases, the findings were negative. I stress that rabies is strongly present in the region of the lynx in Slovenia!
LYNX - SHEEP

We are acquainted with the problem of lynx attacking sheep in France, Switzerland and in neighbouring Carinthia in Austria. For the moment we do not have this difficulty since sheep are only in transit in the central area, although herds of sheep (there are a total of 2500 in Kocevje) are tended by shepherds and enclosed in the evening. Only since 1985 have lynx settled in the Alpine areas of Slovenia, where sheep farming is more developed and traditional and herds of sheep graze untended. So far only a few sheep have appeared on the menu in areas of Croatia and fewer still in Slovenia.

LYNX - HUNTERS

We have found over a number of years that hunters are not enthusiastic about lynx - that is a fact. They claim that the lynx will destroy all the roe deer. Anywhere where they disturb chamois is not a typical forest hunting reserve. The fact is, and this has also been shown by our study, that in all hunting reserves of the central region, the number of roe deer shot has increased in comparison with 1973 - so also in the Kocevje, Notranjska and Krim regions, where lynx have been for longest. Lynx have had a minimal influence on red deer and there has been an exceptionally intensive growth in the number of these game in Kocevje, despite the increase in shooting each year. Wolf is much more selective towards red deer than lynx.

MORE ABOUT HUNTING POLICIES TO LYNX

Until 1980, shooting of lynx was only allowed in the narrower central region of the hunting reserve of Kocevje. From 1982-86 the hunting area was greatly extended and in the 1986/87 hunting season, it was decided on the part of the hunting organizations that it should be the same territory as for bear, covering 250,000 ha. Within this, permission was granted each year to shoot only a predetermined number of lynx, 6-8, but outside, the number of lynx shot from the year mentioned was unlimited, although it was forbidden to shoot pregnant females. So in the 1988/89 hunting season in Slovenia 7 lynx from 8 permits were taken in the territory, outside a further 6. Altogether 15. In the following hunting season (1989/90) altogether 9 lynx fell - 6 within the territory and 2 outside. The ill-feeling towards lynx shows also in the role of the Hunting Society of Slovenia in the Ministry, in allowing shooting of lynx outside the territory throughout the year.
Location of lynx shot in Slovenia (76) up to the 1989
* mesto izpusta
# rajon
Fortunately, in the intervention of foresters, conservationists and above all our institute, this requirement of a dual policy to shooting of lynx within and without the territory was withdrawn from the draft of the new hunting law. We must establish a unified shooting policy, as with bear.

CONCLUSION

We find that:
the resettlement was successful. lynx in Slovenia have become like bear and wolf, hunted game, with open and closed seasons. Lynx have extended towards the east and above all towards the west and we hope that they will make contact with the Austrian lynx population. The problem remains of the isolation of the new population, also in the genetic sense, so we cannot yet talk about a stable population.

POSTSCRIPT

I would like to thank the organisers of this seminar and Mr. Jean-Pierre RIBAULT that since 1978, following Strasbourg, all those professionally or scientifically concerned with the resettlement of lynx in Europe have gathered together again.

I would like to propose to the organisers - The Council of Europe, that it undertakes and coordinates a group action - a project of cooperation for further research and recording of settlements to date in Europe, as well as new plans. We must make possible through this project contact between the currently isolated populations of lynx in the total Alpine area, where there are still conditions for this game animal. All that is needed for the realisation of this project is actually the financial resources.
My second proposal is that, in the framework of the Alpe-Adria working community, we discuss all three National Parks: Triglav National Park (Slovenia, YU), Hohe Tauern National Park (Kärnten and Salzburg, Austria) and Berchtesgaden National Park (Bavaria, Germany) in relation to the protection of lynx. Lynx are present in both the first two parks (in the Julian Alps, YU, and in the Carnic Alps, Kärnten, Austria), and there is evidence that lynx has already migrated into the Canal region (Tarvisio, Italy). The purpose of this action would be to allow the lynx a natural path (migration) from the existing new populations of lynx in Yugoslavia and Austria to settle in the Central Alps as far as Bavaria (Germany). The offer for this would have to be accepted by Berchtesgaden (Germany). A team would need to be formed from the three mentioned national parks and from hunting organizations in Slovenia, Carinthia, Salzburg and Bavaria, and financial resources secured for carrying out this task. It will also be necessary to establish a fund to indemnify damage which the lynx may cause to sheep, goats etc.

Our institute in Ljubljana would also wish to be actively involved in research in the mentioned programme.