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Abstract: Information about the presence of lynx was very poor during the first decade after this species had been re-introduced in Switzerland at the beginning of the 1970s. All lynx had been released untagged and no systematic collection of observations took place. Today, two spatially separated lynx populations exist in Switzerland in the Alps and the Jura mountains, numbering 70 to 80 resident adults in total. Several methods are now used to monitor lynx populations in Switzerland: (1) registration of all evident signs of lynx presence such as lynx found dead, captured, or killed; (2) collecting of single observations such as sightings, tracks, and killed prey; (3) recording of all livestock killed by lynx, (4) lynx caught in order to radio-collar them; (5) Compilation and analysis of simple annual questionnaires distributed to state game wardens. Methods 1 to 4 prove to be of good use in areas with more or less established lynx populations. In zones where lynx have not yet settled, method 5 may be more promising. Trained state game wardens form a relatively stable, reliable and competent network of observers. In order to obtain a negative control, game wardens were explicitly asked to fill in and return the questionnaire even if no lynx observation had been recorded. Two years of investigation confirm the actual knowledge of lynx distribution in Switzerland. Lynx are regularly observed in the western part of the Alps, with decreasing frequency in the central part and never or very rarely in the eastern part.

Monitoring the Lynx Population in Switzerland

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Abstract. Information about the presence of lynx was very poor during the first decade after this species had been re-introduced in Switzerland at the beginning of the 1970s. All lynx had been released untagged and no systematic collection of observations took place. Today, two spatially separated lynx populations exist in Switzerland in the Alps and the Jura mountains, numbering 70 to 80 resident adults in total. Several methods are now used to monitor lynx populations in Switzerland: (1) registration of all evident signs of lynx presence such as lynx found dead, captured, or killed; (2) collecting of single observations such as sightings, tracks, and killed prey; (3) recording of all livestock killed by lynx, (4) lynx caught in order to radio-collar them; (5) Compilation and analysis of simple annual questionnaires distributed to state game wardens. Methods 1 to 4 prove to be of good use in areas with more or less established lynx populations. In zones where lynx have not yet settled, method 5 may be more promising. Trained state game wardens form a relatively stable, reliable and competent network of observers. In order to obtain a negative control, game wardens were explicitly asked to fill in and return the questionnaire even if no lynx observation had been recorded. Two years of investigation confirm the actual knowledge of lynx distribution in Switzerland. Lynx are regularly observed in the western part of the Alps, with decreasing frequency in the central part and never or very rarely in the eastern part.

Introduction

The best evidence of lynx presence is a lynx found dead or killed. Shall we then conclude that only a dead lynx is a good lynx? Our knowledge of the historic range and the history of the eradication of lynx in Switzerland as well as in other countries of Europe during the last centuries is in fact almost exclusively based on reports about lynx killed or found dead. The same type of information about the presence of lynx forms the main amount of available data for the first decade after the re-introduction of lynx into Switzerland at the beginning of the 1970s (Breitenmoser et al. 1997). Maps showing the distribution of lynx for this time period contain mostly data on dead lynx and some sites of livestock depredation. The initial survey of the re-introduction program of lynx in Switzerland was indeed very poor. All the lynx were released untagged and no systematic collecting of observations took place. A first review of the status and the distribution of lynx was established only in the early 1980s (Breitenmoser 1983), followed later by a publication on the situation of the lynx in the Swiss Jura mountains (Breitenmoser & Bättig 1992).

Today, two spatially separated lynx populations exist in Switzerland in the Alps and the Jura mountains, numbering 70 to 80 resident adults in total. There is good evidence that these populations have ceased their expansion during recent years and have even abandoned some parts of their range. Information, confirmation or interpretation concerning these observations could be much more pertinent, if a systematic long-term monitoring had been initiated earlier.

Long-term survey of lynx in Switzerland

The systematic monitoring of a rare and endangered species such as the lynx is of great importance. Practical experience of long-term monitoring of lynx and large predators is still rare.

Some methods such as radiotelemetry, tagging and capture and recapture, mentioned by Clevenger (1993) and which he calls intrusive, are considered to be of low utility. These methods are expensive and are used mainly in the case of intensive field studies limited in time and in space. The same author mentions the existence of non-intrusive methods that show good applicability for larger carnivores. These are the systematic census of tracks and traces, the use of attractants (scent stations), photo traps, and others. This kind of survey provides the opportunity of indicating on the presence or absence of a species, and allows the collection of ecological data and information on the relative density of species. These methods are cost-effective and simple in application, but they require trained and experienced personnel. But even these methods are difficult to put in practice when very large areas have to be investigated. For this reason, we propose for the case of the lynx to also use questionnaires sent out to a network of potential observers.

The success of the re-establishment of a re-introduced population depends mainly on its capacity and speed of expanding and its ability to persevere in already occupied ranges. This demands a systematic survey covering the whole range of the population, independent of national boundaries. Coordination on an international level should receive high priority to permit as much standardization as possible of the different methods applied. Accurate knowledge of the actual distribution range may not only allow to identify population sizes and potential contact zones for genetic exchange between neighbouring populations, but also to detect critical zones with alarming changes where management actions deserve first priority.

In Switzerland, several methods are now integrated to monitor the lynx population at a national level: (1) registration of all evident signs of lynx presence such as lynx found dead, captured, or killed; (2) collection of single observations like sightings, tracks, and killed prey; (3) recording of all livestock killed by lynx; (4) lynx caught in order to radio-collar them; (5) compilation and analysis of simple annual questionnaires distributed to state game wardens. Methods 1 to 4 prove to be of good use in areas with more or less established lynx populations. In zones where lynx have not yet settled, method 5 may be more. Trained state game wardens form a relatively stable, reliable and competent network of observers. By joining all ranges of game wardens involved, almost the entire area of the Swiss Alps and the Jura Mountains, the potential habitat for lynx, was integrated into the survey. The average size of a game warden's range covers 180 km². In order to motivate these persons, they are regularly informed about the results of monitoring activities. In addition, training courses are offered to improve their ability to recognize signs of lynx in the field.

Using lynx observations forms and questionnaires for the survey

For a first census, lynx-observation forms were sent out to potential observers in the lynx areas of Switzerland (mainly game wardens) in 1991/1992 (Capt 1995). Altogether, 63 different observations were reported, with direct observations, sighting of tracks and, kills of prey species found being equally represented in the sample. This method did not produce negative observations because it was not possible to distinguish between the categories 'no report' and 'no observation'. Starting from 1993, simple annual questionnaires allowing negative observations have been sent out to the state game wardens in order to achieve a more systematic monitoring of the Swiss lynx populations. Game wardens based their answers on their own observations and on reliable reports by other people. Generally, game wardens did not search for lynx signs systematically; the observations are rather the result of their routine outdoor patrolling. This allowed a direct comparison of the different game wardens' reports.

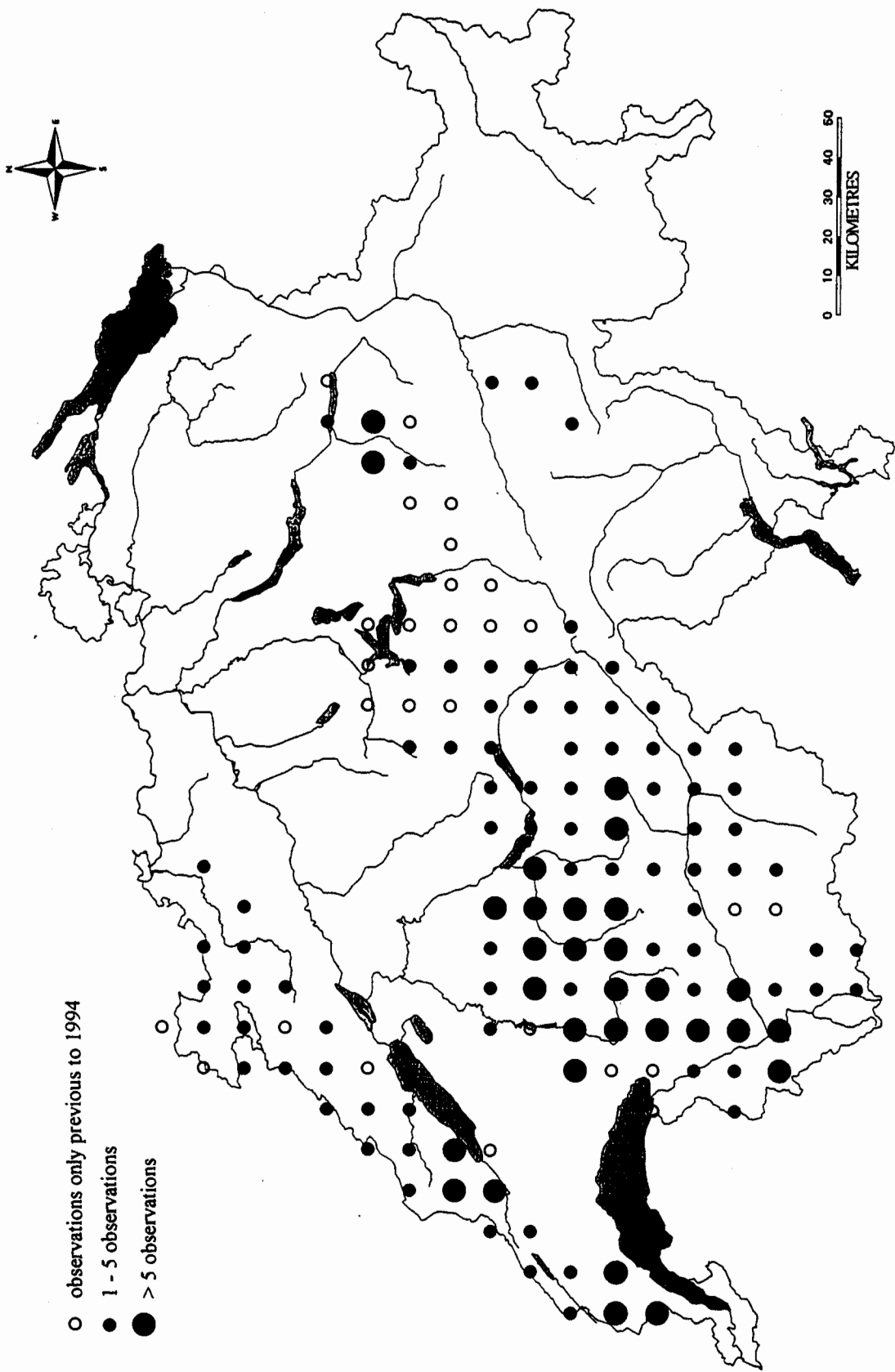


Figure 1. Lynx observations in Switzerland as reported by game wardens in 1994 (grid 10x10 km).

The questionnaire required an answer to the question whether there have or have not been any reliable direct or indirect observations of lynx recorded in the game warden's individual survey range during the last 12 months. Other questions concern the number and the type (direct observations, observations of young animals, tracks, prey, dead animals) of the observations. Game wardens were also asked to subjectively assess whether the lynx population was increasing or decreasing in their region. In 1993, about two-thirds of the game wardens involved returned the questionnaire, and the following year nearly all took part in the survey. Table 1 shows that the ability to recognize tracks and kills of lynx were of great importance in proving the presence of lynx. By summarizing the reports of game wardens, we observed a relatively high frequency of observations in the western part of the Swiss Alps (Fig. 1). Observations were scarcer towards the east and were more or less absent from the eastern part of Switzerland. In 1994, 12 game wardens, all living in western Switzerland or the Jura Mountains, reported increasing lynx activity. Another 46 reported that the situation was stable and 27 reported that the population was decreasing. This last category of people lived mostly in the central and eastern part of the Alps. The presence of young lynx was only reported from a few places in the western region.

Table 1. Type of lynx observations recorded by game wardens.

| | Direct observations | Tracks | Prey | Reproduction |
|------|---------------------|--------|------|--------------|
| 1993 | 16 | 22 | 24 | 3 |
| 1994 | 31 | 47 | 34 | 8 |

Taking into account that almost all the game wardens took part in this investigation, we can assume that the core area of the lynx population in the Swiss Alps is situated in the western part and that the eastern edge is scattered and spatially limited. This investigation by questionnaires provided a realistic image of the situation and also allowed a better assessment of isolated observations. With an increasing number of surveys, we expect to gain more information on the temporal dynamics of the population.

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