

Capercaillie population in the National Park Gesäuse Monitoring Concept

Master program Management of Conservation Areas – Course 08

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lekking capercaillie, © H. Marek

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Introduction of the conservation area

The National Park Gesäuse lies in the middle of Austria, in north of the federal state Styria. It was founded in 2002 and is the youngest national park in Austria. Since 2003 it is designated as IUCN category II. Furthermore, there is a Natura 2000 protected area called Ennstaler Alpen, which is protected under the Birds and Habitat Directive of the European Union. This area is nearly congruent with the national park area and also managed by the national park staff. The national park has a size of 120 km². About 52% of the surface are forest. The Gesäuse is a mountainous area in the very east of the Alps and belongs to the north-eastern limestone alps (1).

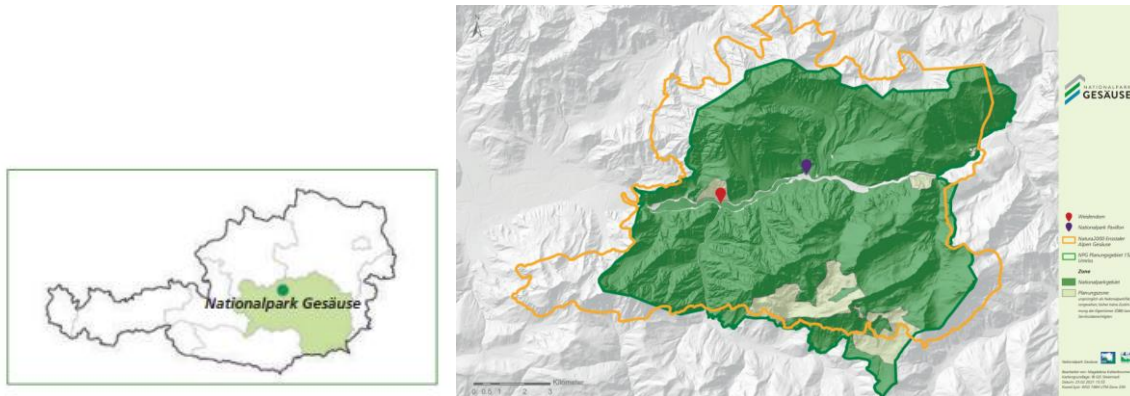


Figure 1: National Park Gesäuse on the Austrian map (1)

Figure 2: National Park and Natura 2000 borders (1)

Introduction to the monitoring object

The Western Capercaillie (*Tetrao urogallus*) is the biggest representative of grouse in Europe. In Austria approximately 25 000 individuals can be counted. In the National Park Gesäuse 10-15 males and slightly more females are living (2). They are diurnal and non-migratory. The lekking season starts in April and lasts until beginning of May. May to July is their breeding season. Especially during this season and as well during the harsh winter season this species is very sensitive to disturbance (3).

The typical habitat of the Capercaillie in the Alps are near-natural, richly structured, mountainous, mixed forests. The characteristics of such forests are (4):

- Open stand structures with loose crown closure
- different tree species (deciduous and coniferous)
- stepped forest structure
- good flyability (stand with low number of stems)
- well-developed dwarf shrub layer, mainly blueberry

Background, status quo and management plan

Since 2008 (with one year break) there is a monitoring programme running to analyse DNA data of the Capercaillie population at the Gscheidegger Kogel. Before, the aim of this samples was to study the stress level of the Capercaillie because of ski touring routes. Without significant results this analysis was stopped after two runs in 2010. However, since then excrement samples were collected and genetically analysed. Until now five different spots around and in the national park were monitored. This method should give insights in population development, habitat and lek changes and relationship between the individuals. Furthermore, the genetic analysis was compared with conventional lek census by hunters (5). Although the method offers many possibilities, in reality there are several variables which weaken the results. For example, samples were collected on different days on different locations, which relativises the information about the change of leks. Therefore, the park management is questioning the necessity to continue the monitoring in the same way. It is time to reconsider the goals of the Capercaillie monitoring and think about possible adaptations of methods to work more cost efficient. What information is relevant to fulfil the current management goals?

table 1: overview of Capercaillie monitoring methods in the National Park Gesäuse

frequency	monitoring
annual	simultaneous lek census of all occurrences; with the aim of record an objective minimum population level
annual	genetic analysis of all occurrences together with neighbouring territories
continuous	recording of sightings and dead; recording of all leks and clutches
every 10 years	habitat mapping in all occurrence areas

In the management plan of the national park for the period 2021 to 2031 the focus lies on natural process protection (1). Therefore, the question arises if this is enough to keep the Capercaillie population stable or if active species protection is necessary to comply with the Birds and Habitat Directives.

Another important goal in the management plan is research cooperation with universities and long-term monitoring. Moreover, since many years the national park management is trying achieve an extension of the Natura 2000 protected area to be congruent with the borders of the national park (1).

Mission statement

The goal of the Capercaillie monitoring programme in the area of the National Park Gesäuse is to enable a long-term time series for the recording of the populations. It should support the evaluation of measures and underline relevant statements for research, conservation, and visitor steering. The generated data should describe a development over time and allow an estimation of the conservation status in the context of the reporting for the Birds Directive. Furthermore, the monitoring aims to assess the effectiveness of the visitor steering measures especially during the ski touring season. The general goal of the national park is the protection of natural processes without active species management. Taking appropriate visitor steering as granted, is it enough to not interfere to keep the capercaillie population stable?

Establishment of a monitoring concept

table 2: concept overview

<p>Why establish a monitoring program?</p> <ul style="list-style-type: none"> - to fulfill Natura 2000 goals - to verify visitor steering success 	<p>Where shall monitoring take place?</p> <p>Population:</p> <ul style="list-style-type: none"> - Gscheidegger Kogel - Gstatterbodener Kessel - Besenberg - Radmer - Waag 	<p>When shall monitoring take place?</p> <ul style="list-style-type: none"> - Once a year for the trend monitoring - Constantly over a certain period for disturbance monitoring 	<p>How many resources are available for the monitoring program?</p> <ul style="list-style-type: none"> - National Park - Styrian government - EU LIFE
<p>What shall be monitored?</p> <ul style="list-style-type: none"> - population trends - anthropogenic disturbance - climate change influences 	<p>Tracking of individuals:</p> <ul style="list-style-type: none"> - Gscheidegger Kogel 	<p>Who is involved?</p> <ul style="list-style-type: none"> - National Park management - University of Life Sciences Vienna - Styrian hunting association 	

The aim of establishing a Capercaillie monitoring in the Gesäuse is to fulfil the Natura 2000 guidelines of the European Union. At the same time, appropriate visitor steering can be prepared, and impacts of impactful visitor activities will be detected at an early stage. Considering human and financial resources, the methods selected should be feasible on a regular basis and manageable in the long term.

The main measurable indicator for a stable population is the number of individuals counted. Furthermore, to monitor the exchange of leks and the stress or flight behavior of the Capercaillie individual specimen need to be tracked.

Finally, climate change is becoming a factor which needs to be considered. Hunters and rangers could observe a habitat shift of the Capercaillie population at the Gscheidegger Kogel, which is not yet scientifically verified. Some time ago the birds were mostly seen below the observation hut, but recently they moved upwards. The question arose if this movement is a permanent development and if they really move into higher altitudes because of climate change.

Until now the monitoring took place at five different sites. In 2008 it started at the Gscheidegger Kogel. Later on, other locations were also monitored: Besenberg, Radmer, Gstatterbodener Kessel and Waag. Only the Gstatterbodener Kessel and the Gscheidegger Kogel lie inside the national park and in the Natura 2000 protected area. The other three leks lie outside of the official borders. There have been sights of individuals at different locations in the park but usually they come to one of these sites to mate. The Gscheidegger Kogel is the most attractive place for the Capercaillie because of the habitat quality. However, the Gscheidegger Kogel is also a famous ski touring destination. Therefore, it is a place of high interest to study disturbances.

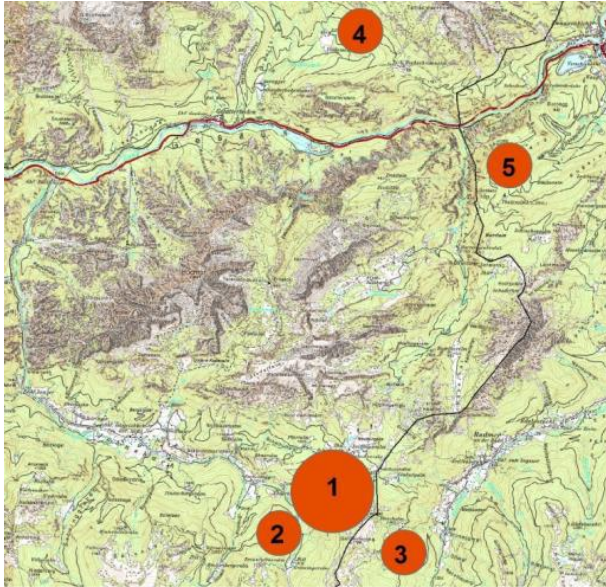


Figure 3: known leks of capercaillie (5)

Gscheidegger Kogel = 1, Besenberg = 2, Radmer = 3, Gstatterbodner Kessel = 4, Waag = 5

The aim is to have an annual monitoring over many years to observe population trends. Conventional lek census has a long tradition among hunters and therefore long time series are available. The counting of leks should happen every year beginning of May and should be conducted by the local hunters. Every second year a synchronous census supported by National Park staff is recommended to gain a reference figure. Furthermore, a continuous tracking of the birds via telemetry could be interesting to investigate the flight and stress behavior of Capercaillies close to the high frequented ski route. Furthermore, through continuous GPS data of the transmitters observed over several years, it might be possible to make conclusions about the habitat shift to higher altitudes. To take the lead of this project a scientific institution like the Viennese University of Life Sciences could be a suitable partner for the national park. Resource-wise, the National Park staff and the hunters are available to conduct or support monitoring measures. The Styrian government is mainly funding such projects. Furthermore, since the Capercaillie is protected under the European Birds Directive European funding, like LIFE could also be available.

Available methods and technologies to implement the monitoring programme

There are several methods and tools available to monitor Capercaillie populations. Depending on the monitoring goal and research question and also on the financial resources, different methods are suggested. A costly method is the genetic analysis of excrements. It allows to count individuals, to assess relationships and to measure the stress level of individuals. Which can be interesting regarding visitor steering measures. However, the results of the past years were not significant enough to make conclusions about the above-mentioned interests. However, to not lose the possibility to continue the time series of genetic analysis, which is available since 2008, it is recommended to continue collecting excrement samples and preserve them in a freezer. With this little effort it is possible to try a new, maybe more suitable method. If it turns out that the genetic information would still be important, it can be done in retrospect. From this point of view, there would be only one interesting question where genetic analysis could be applicable. If excrement samples are collected strategically sufficient at two sites (one site along the ski route and one reference site in the conservation zone) during one winter season, the stress hormone level of these samples could directly be compared and statements about the anthropogenic disturbance could be made.

Furthermore, conventional methods like camera traps or traditional lek census by hunters are applicable. These methods are simple regarding the technological requirements and offer data about population development and habitat preferences. Camera traps would be easy to set up and would not disturb the animals. However, they don't offer information about population size.

Furthermore, it is also difficult to make statements about stress behavior and habitat preferences only studying photos of individuals. It could be used as additional source of information. However, the effort to review the photos and to store the data is not to underestimate. Therefore, a more sensible option would be a synchronous lek census as an additional figure next to the conventional census. The lek census requires little financial resources, but experienced and well-trained people to count the birds.

Another promising monitoring method uses transmitting devices. Attached to selected individuals a lot of insights regarding activity, movement, exchange of leks or stress factors can be gained. This option is suggested instead of the genetic analysis of excrement samples with the expectation to gain more relevant information and save the costs of the expensive analysis at the same time. Since the habitat of the Gscheidegger Kogel is favoured by the Capercaillie and also because the ski route crosses there, it is the most interesting location to start the bird telemetry. It would be possible to study the size of the home ranges (Streifgebiete) of several specimen. During the lekking season it would offer interesting insights in their lekking behaviour. For example, if they visit several leks, or if they live close to the lek during the rest of the year or if they move seasonally. One disadvantage of the telemetry is that producing long times series require a lot of effort because the transmitters are only sending a limited time.

Total costs for one year of genetic analyses of the Capercaillie population in the National Park Gesäuse sums up to approximately 19 000€ (excluding staff costs; figure from the year 2019/2020). Usually, the employed hunters conduct the lek census during their shifts and now additional costs accrue. Based on the experience of doing telemetry for Eagle in the national park, one transmitter costs approximately 2500€. If it would be possible to equip six specimens from the 10-15 male individuals in the national park, the price for the gear would be around 15 000€.

Table 3: cost comparison of different monitoring methods (excluding staff costs); reference figures of the NP Gesäuse

Lek census	0€
Genetic analysis of excrement samples	19 000€
Telemetry	15 000€

To conclude with, the method should be chosen in such a way that they efficiently support the research and monitoring goals and that the disturbance of the animals caused by the method is kept to a minimum. Furthermore, it should be feasible in terms of financial and human resources to establish a regular and long-lasting concept. To fulfill the monitoring goals of the Capercaillie in the National Park Gesäuse two methods are recommended explicitly. The following chapter elaborates these tools in detail.

Tool descriptions & comparison of results of different methods

Tool 1: Lek census

a. Brief tool description

Lek census does not require any advanced technology or expensive equipment. This method has a long tradition and is used by hunters to define shooting numbers of grouse in their hunting grounds. There are two ways of conducting a lek census. The most common and logistically simpler one is the conventional census, which is done during the lekking season by the local hunters. Moreover, there is the method of the synchronous census at intensive investigation sites. This method requires a lot of experienced staff at the same time, because the counting is conducted at several places at the exact same time.

In Central Europe, lek census is a common method to estimate populations. With annually reoccurring counting population trends can be represented properly. Since this tool to monitor grouse populations has already a long tradition long time series are available and offer valuable data sets.

b. What are the requirements and limitations to use the tool?

The most important thing to gain good data through a lek census is to have experienced hunters or wildlife observers who know the leks and who properly count the specimen. However, of course one element of uncertainty is the exactness the person counting. Another limitation is the very short time available for the census, which is the lekking season in May. Furthermore, not to ignore is the fact that only lekking cocks can be counted. Young cocks and hens are not in the statistics. Therefore, the number of a population counted through a lek census is always lower than in reality. However, to monitor long-term population trends this aberrance can be neglected. Expected that it is always similar it will not influence a long-term trend.

c. Can the tool have a negative impact on habitats or species?

Generally, the lek census has very little influence on the birds. It is not necessary to physically touch or catch the animals. Usually, the person who does the counting hides and causes no disturbance on the habitat or the species.

d. Examples

Grouse species in Tyrol

In Tyrol, all known leks of Capercaillie and Black Grouse are investigated during the lekking season by hunters in five-year intervals since 2005. This monitoring is coordinated by the Tyrolian hunting association and follows a standardized method. All hunting grounds received count forms, special cadastral maps of the hunting area and instructions for the count. It was recommended to check each site only once. Only in case of unfavorable weather (wind, snowfall, fog, etc.) or other events (no lekking on the day of the counting), the counting should be repeated. In order to avoid double counting it was recommended that the count of leks at hunting ground borders was aligned with the neighbors. (6)

In the year of intensive study of the respective reference area synchronous counting at all known leks of Capercaillie and Black Grouse within the intensive investigation sites was carried out. This was done in cooperation with the local hunters and under the coordination of a monitoring team. These counts served as a reference during the study period. In the preparation meetings it was determined who would count at which lek and how many control bodies would be necessary. The counts took place once in spring (around May 1st for the Capercaillie; around May 10th for the Black Grouse) at all leks at the same time (synchronously). (6)

Black Grouse in the Wölzer Tauern/Styria

To compare the impact of disturbance on Black Grouse two study sites in the research area of the Wölzer Tauern were selected. In the area of Oberzeiring a wind park with 13 wind wheels was established in 2002 and formed the first study site. The second study site was the skiing area "Lachtal". Since 2002 synchronous lek census are performed at both sites. The result was drastic decrease of lekking birds at the study site with the disturbance of the wind wheels. In the study site of the skiing area the population remained constant (7).

e. What are the lessons learned?

Lek census is still a valuable and contemporary method for the determination of population trends and provide solid data on minimum population sizes. With adherence to certain minimum methodological standards and sufficient suitable counting personnel, data can be collected over a large area. If this standardized method is conducted over longer periods of time and accompanied by reference studies, sufficient information will be available in order to take appropriate conservation measures for grouse species.

Tool 2: Telemetry

a. Brief tool description

Telemetry means that it is possible to acquire data from a sensor which is far from the data processing unit. For wildlife tracking telemetry can be an extremely useful tool to receive regular GPS data and study their movement. Through that, statements about habitats, home range, habits

and behavior can be made. Usually, the animal needs to be caught once to attach the transmitter. After that the system should run without maintenance for a certain time.

Focusing on the Capercaillie telemetry could help to acquire information about their lekking behavior if they stay at the same lek during the whole season or if they try their luck at different places. Furthermore, information about the size of their home range would be valuable and if they show stress reactions due to human disturbance.

b. What are the requirements and limitations to use the tool?

The most important requirement is to gain special data over an enough long time to be able to make conclusions. Furthermore, it needs to be considered how many individuals need to be transmitted to have enough reference figures. There might be a drop-out rate among the transmitters due to death of the animal or due to technical problems. Finally, one limitation is that it is only possible to study several individuals but not a whole population. Therefore, this tool is not suitable to overlook large bird populations, for example.

c. Can the tool have a negative impact on habitats or species?

Catching the animals to mount the device is obviously a stress situation for them and therefore impacting their life. Moreover, they will carry the transmitter on their body for some time. Therefore, it needs careful planning to estimate the maximum weight an animal can handle without discomfort.

d. Examples

Golden Eagle in National Park Gesäuse

In 2021 young Golden Eagles in Germany, Austria and Switzerland were transmitted by a project of the project of the Konrad-Lorenz research foundation. The aim was to investigate the dispersal area of young specimen and their habitation and hunting behavior. The transmitters were individually designed via 3D printing and had a maximum weight of 60g. GPS data was received through the mobile network. Three Eagles born in the National Park Gesäuse were transmitted (8). Unfortunately, probably due to technical problems the signal of all three devices was lost.

Capercaillie in the Black Forest

To study the special use and the habitat preferences of Capercaillie in relation to high and low frequented winter sport areas telemetry was applied as research method. The study took place in the south-west Black Forest in a core habitat of the Capercaillie. In 2003 and 2004 seven male and eight female specimens were captured with ground nets, ringed and equipped with a transmitter. These individuals were regularly tracked during three winters between 2003 and 2006. To test whether the spatial use of Capercaillie was influenced by winter sports activities they defined six habitat types according to two variables (slope and intensity of human activity) and compared the effective use of these types before and during the ski season separately. Beginning of the winter (before the ski season) the Capercaillie used a larger part of the area and the GPS points were more evenly distributed. During the ski season only smaller parts of the area were used by the birds and the points were concentrated on certain areas (9).

e. What are the lessons learned?

To gain reliable data it is required to equip a sufficient number of individuals with transmitters. There are many reasons that a transmitter is excluded, technical problems or death of the animal are just some examples which are not to be neglected. A minimum of three years of maintenance-free running of the transmitter and the battery should be guaranteed to achieve comparable results. In case of technical malfunctioning, the birds would be disturbed through repairs and it would increase the costs of the method drastically.

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