Endangered Landscapes & Seascapes Programme | Cambridge Conservation Initiative

# Red Deer

**Objective: Increase abundance**

Carpathian Mountains
status: data collection in progress

**Problem:** Legal and illegal sport and trophy hunting as well as disturbance from logging have led to a decline in populations of wild ungulates, including red deer.

**Action:** Foundation Conservation Carpathia has leased hunting concessions in which hunting has been halted, and has also purchased forest land where they have ceased logging and started to restore native mixed forest. Over time, the cessation of hunting and reduction in disturbance, as well as improved connectivity through habitat restoration, should lead to an increase in red deer populations.

**Indicator:** An increase in red deer numbers indicates increased ecological integrity and intact food webs, with greater prey abundance for large carnivores such as wolves.

Red deer (Cervus elaphus). Photo: Barbara and Christoph Promberger.

## Methods

The population size of red deer was estimated within the hunting-free area of the project. A baseline population survey was conducted by analysing DNA from faecal pellets collected from three connected hunting concessions where hunting is banned, covering 500 km$^2$. Samples were collected in summer 2019 and 2020, returning 629 samples. Monitoring locations were recorded using GPS tracking. Samples were preserved in ethanol before being sent to the University of Ljubljana in Slovenia for genetic analysis. To account for spatial autocorrelation of samples, samples collected from the same individual on the same day less than 0.3 km apart were removed them from the analysis. This approach was repeated in summer 2024 to assess whether population density has changed over the period. For the 2024 survey, the

sampling approach was adapted by applying sampling filters in known feeding grounds, to avoid autocorrelated detections of the same individuals and improve estimate accuracy.

DNA sampling. Photo: Foundation Conservation Carpathia.

DNA sample collection. Photo: Claudiu Toanta.

In 2023, a new approach was used based on camera trapping instead of DNA collection. This consisted of a camera trap array of 127 cameras across a smaller area of approximately 250 $km^2$. Cameras were deployed in the centre of grid cells measuring 1 $km^2$. Grid cells were chosen based on habitat, excluding those dominated by human settlements or alpine areas. Every remaining cell in the sampling area was included, providing it was possible to access for camera deployment. Cameras recorded continuously for 12 months between June 2023 and June 2024.

The resulted pictures were labelled using AI and, where precision was low, by human observers. Pictures classified as detecting red deer were processed and distance from the camera to the animal was extracted and used in a distance sampling modelling approach. This approach is intended to correct for the fact that the likelihood of detecting animals depends on their distance from the camera, by using a mathematical function to calculate the probability of detecting an animal based on its distance from the camera. Comparing the two density estimates which were obtained for 2024, using camera trapping versus DNA sampling, was used to determine the most efficient population estimation methods for this species in Carpathia.

Installing camera traps. Photo: Madalin Mocanu.

Installing camera traps. Photo: Madalin Mocanu.

## Results

Baseline surveys in summer 2019 and 2020 identified 181 individual red deer (92 females and 89 males; Fig. 1). Modelling using mark-recapture models estimated the population density at around 400 individuals, but the confidence intervals around this estimate were too large to make it reliable. This was due to the high abundance of deer leading to relatively low recapture rates. Follow-up samples using refined methods were collected between June and September 2024 and are now being analysed. It is hoped that these data will allow a more reliable assessment of abundance and density for this species.

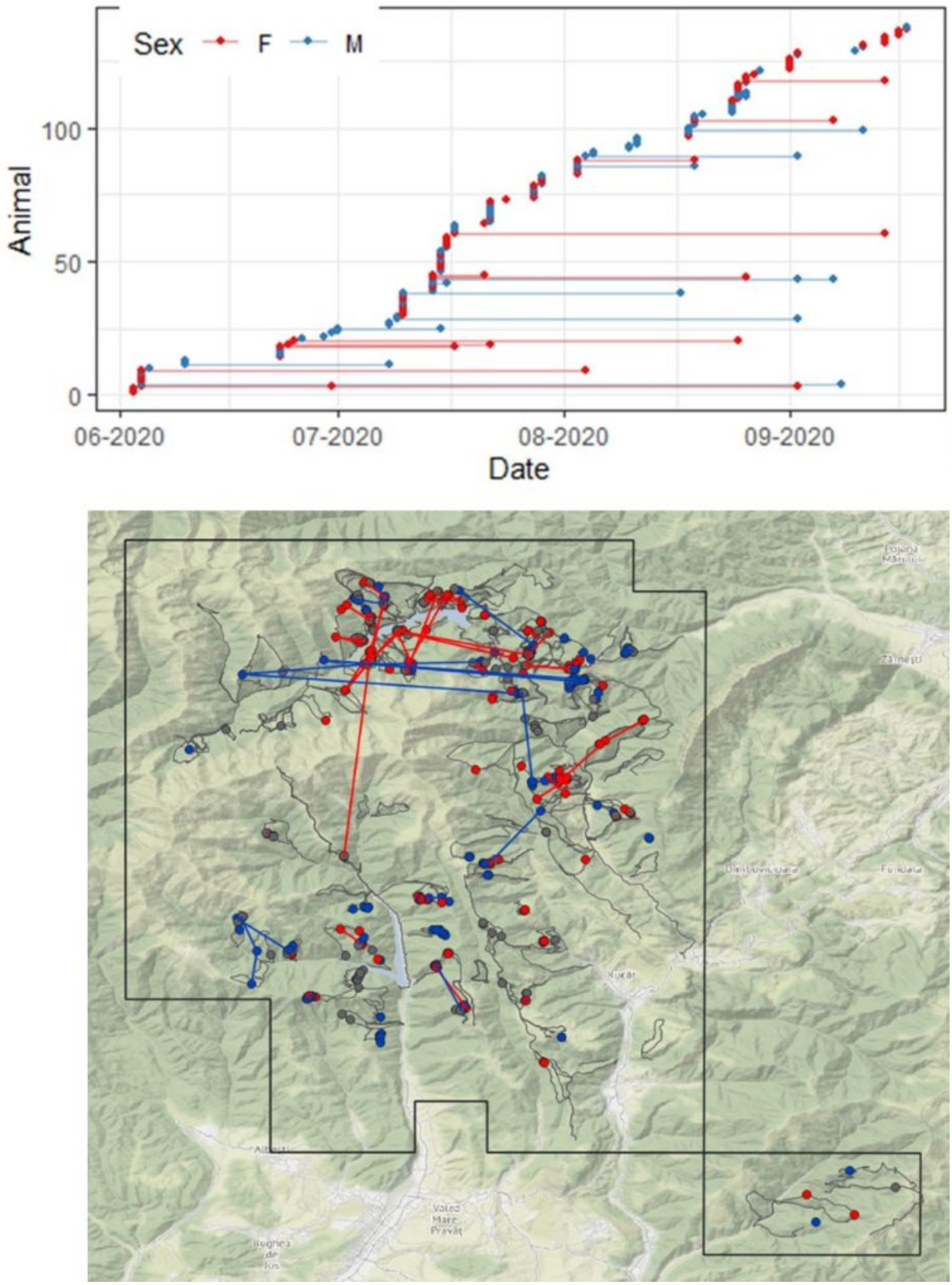


Figure 1: Individual red deer genotyped during baseline surveys in 2020. Each dot represents one capture (males in blue, females in red) and lines connect the same individual over successive months as it was recaptured.

Data from camera trap sampling are still being analysed, and this page will be updated once results are available.

## Lessons learned

Baseline surveys showed that finding fresh red deer DNA samples is possible even in the complex Carpathian topography. However, the high abundance of deer resulted in a low mark-recapture rate, leading to a review of the way sampling was conducted, with the aim of increasing recapture rates. Comparing these data with results from the camera trap surveys will enable refinement of future monitoring.

### Partners

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