

Using camera traps to monitor the presence of non-flying mammals in Luxembourg forest landscapes.



INSPIRATION

Through the Habitats Directive 92/43/EEC and the Invasive Alien Species Regulation 1143/2014, the European Commission has acknowledged the need to collect field observations in the long term to assess the conservation status of protected species and detect the presence of harmful invasive alien species. In 2011, LIST launched two monitoring schemes in Luxembourg with the aim of targeting the [wildcat](#) (*Felis silvestris silvestris*) and pine marten (*Martes martes*), based on the combined use of hair traps and trail cameras. Since 2017, the wildcat monitoring scheme has been broadened to cover a larger set of species including the polecat (*Mustela putorius*) and invasive alien species of EU concern such as the raccoon (*Procyon lotor*) and raccoon dog (*Nyctereutes procyonoides*), fallow deer (*Dama dama*), sika deer (*Cervus nippon*) and mouflon (*Ovis musimon*).

INNOVATION

The Luxembourg monitoring scheme of non-flying mammals in forests is based on a stratified random selection of 72 1km-resolution sampling squares with at least 10 hectares of forest area. This sample is considered representative of the main forest landscapes found in Luxembourg and is surveyed every 3 years (24 sampling squares per year). Each square includes 4 sampling sites equipped with a trail camera and a hair trap). Using cameras for mammal monitoring has many advantages: it is a non-invasive method allowing a large variety of animal species to be detected, even those that are shy and nocturnal, without affecting their behaviour; they can be installed and checked quickly; and they provide precise information on the location and time of the observation, allowing the continuous sampling of multiple sites throughout the country at the same time. As it is difficult to distinguish “pure” wild cats from hybrids with the domestic cat, the hair trap allows the non-intrusive collection of hair samples, which are then genetically analysed by Single-Nucleotide Polymorphisms (SNPs). The hair trap is a wooden stick planted vertically in the ground and soaked with valerian extract, which not only encourages [cats to rub against the stick](#) but also arouses the curiosity (sniffing) of many other mammals, allowing them to be detected by the camera trap. Hairs are collected every two weeks from January to May, while camera traps are left on site until June.

IMPACT

Camera traps provide valuable insights into the distribution of many mammal species in forests and their surroundings, and also enable the early detection of invasive alien species. Using data time-series from camera traps allows the occupancy of the species to be modelled across large areas, which provides an estimation of the number of sites occupied by the species over several years, and therefore information on site colonizations and extinctions. To save time analysing the thousands of pictures collected annually, AI-based methods have been developed to automatically determine the species present in the images on [Agouti.eu](#). Genetic analyses of hair samples from hair traps allow the differentiation between sites occupied by pure wild cats (*F. silvestris silvestris*), domestic cats (*F. silvestris catus*) and their hybrids. The outcomes of this monitoring scheme are used in the reporting procedure under the European Habitats Directive and the Regulation on Invasive Alien Species to assess the conservation status of protected species and the invasion status of alien species of EU concern, respectively.

Partners

Marc Moes (GeoData s.c.) , University of Liège (GeCoLAB)

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Contact

5, avenue des Hauts-Fourneaux
L-4362 Esch-sur-Alzette
phone: +352 275 888 - 1 | [LIST.lu](https://www.list.lu)

Nicolas TITEUX (nicolas.titeux@list.lu)
Xavier MESTDAGH (xavier.mestdagh@list.lu)
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