Siberian Chipmunk

(Tamias sibiricus)

Experiment to regulate Siberian chipmunks in the Isère department

French Biodiversity Agency (OFB)

The French Biodiversity Agency is a public agency dedicated to preserving biodiversity. A main priority is to respond rapidly to serious issues concerning the preservation of plant and animal life. The agency was founded on 1 January 2020 by law number 2019-773, dated 24 July 2019, and it reports to both the Ecology Ministry and the Agriculture Ministry. OFB is the result of the merger of the former biodiversity agency (AFB) and the National Agency for Hunting and Wildlife (ONCFS). It is present in the regions via regional directorates. This new public agency has five complementary missions:

- provide knowledge, research and science advice on species, environments and their use;
- policing activities for the environment and wildlife (health concerns);
- support for public policies;
- manage and assist the managers of natural areas;
- mobilise society and support stakeholders.

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Intervention site

- The experiment was carried out in two towns located to the south of Grenoble (Isère department) where Siberian chipmunks have been regularly observed.
- The chipmunks were first observed in the town of Échirolles in 2002. The number of chipmunks is not known. However, given the long-standing observations, the fact that reproduction is clearly taking place and the size of the potential area of colonisation, it is thought that a maximum of 50 animals may inhabit the site (analysis in November 2017 by the Centre for Ecology and Conservation Science (CESCO), a part of the National Museum for Natural History (MNHN), team headed by Jean-Louis Chapuis). This finding is consistent with the average densities observed in other chipmunk populations introduced in France and notably the population in the Sénart Forest located in the south-east section of the Paris region, on a site straddling the Seine-et-Marne and Essonne departments (3 to 5 animals per hectare). The origin of the animals is not known, however two pet shops located nearby sold the species for a number of years.
- The chipmunks were first observed in the town of Pont-de-Claix (1.5 km distant from Échirolles) in 2017 and reported via the https://ecureuils.mnhn.fr/ site. The chipmunks may be part of the population from Échirolles (the animals spread by approximately 100 metres per year), but they may also have been released by a pet owner.

1. Intervention site (blue area) and the access points in the towns of Échirolles and Pont-de-Claix.

■ The intervention site is a riparian zone interspersed with rock outcrops along the right bank of the Drac River, over a distance of seven kilometres, along the edge of the two towns.

Disturbances and issues involved

Siberian chipmunks are rodents that were sold as pets starting in the 1960s. Most of the chipmunks observed in natural areas were released by people who had tired of keeping them, though in some cases they escaped from breeding farms. Ownership of the species is now severely regulated (see the section below on Regulations).

■ Ecological impacts

■ The Siberian chipmunk would not seem to be a serious competitor for rodents native to European forests (notably the wood mouse, *Apodemus sylvaticus*, and the bank vole, *Myodes glareolus*) that share the same trophic niche.

■ The wild chipmunk populations amplify health risks due to an increase in the circulation of pathogens carried by castor bean ticks (*Ixodes ricinus*), essentially in low-land forests in temperate, oceanic and continental climates. This is because red squirrels (*Sciurus vulgaris*), following contacts, can be contaminated by two intestinal nematodes that originated in S.E. Asia (*Brevistriata skrjabini* and *Strongyloides callosciureus*) and were imported via the chipmunks.

■ Competition between these two squirrel species is possible during years when acorn production is low in low-land oak forests.

■ Health impacts

■ The Siberian chipmunk is a significant carrier of the bacteria (*Borrelia spp.*) that cause borreliosis, a sickness that can be transmitted to humans (Lyme disease) through tick bites. In Sénart Forest (Faisanderie site, Essonne and Seine-et-Marne departments, spring and fall 2007-2010), 30 to 70% of chipmunks were estimated to carry the bacteria (Marsot *et al.*, 2013), compared to less than 30% for the native carriers, i.e. wood mice and bank voles. It was calculated that in Sénart Forest, the chipmunks contaminated up to eight times more ticks (nymph stage) than the mice and voles, highlighting the "amplification" of health risks caused by chipmunks.

■ Economic impact

■ No economic impacts have been documented in France.

Interventions

■ Prefectoral order

■ Following repeated observations of chipmunks in the two towns, OFB alerted in July 2017 the Isère Departmental Territorial Directorate (DDT 38). Given the small area and estimated population numbers, eradication of the population was recommended. Of the eight chipmunk populations currently in France, the Isère population was one of three for which eradication was considered feasible (Chapuis *et al.*, 2018). Consequently, DDT 38 requested the opinion of the Regional Scientific Council for Natural Heritage (CSRPN) in view of obtaining a prefectoral order. Following approval by CSRPN, prefectoral order 38-2018-03-20-008 was signed on 20 March 2018.

■ The use of non-lethal traps was authorised, in compliance with a protocol tested and validated by MNHN, in order to eliminate the population. A time limit was set for the intervention, from the day the order was signed to 31 December 2021. Captured animals were euthanised by a blow to the head, in compliance with directive 1099/2009 dated 24 September 2010 on "the protection of animals when put to death". Cadavers are conserved by MNHN for further study and analysis.

2a and b. The Drac River in the town of Échirolles.
3. A trap hidden in the vegetation.

Methods

The main objective of the experiment was to eradicate the Siberian chipmunks observed in the two sectors identified in 2017.

To ensure the best chances of success, it was imperative to undertake the capture of the animals immediately after their hibernation (February-March) and before the births of the young (before mid-April and in August), in order to significantly and rapidly reduce the numbers of reproducers. In addition, the work is facilitated at that time of year due to the less dense vegetation.

OFB personnel used two methods to capture the animals, trapping and shooting.

Non-lethal Sherman traps baited with sunflower seeds were set up every 20 to 30 metres depending on the site configuration (outcropping rocks, vegetation, trails, etc.), in one or two parallel lines depending on the width of the potential and observed habitat of the Siberian chipmunks. The traps were camouflaged using vegetation to make them less visible to the public. They were checked every three hours between 7 o'clock in the morning and 6 o'clock in the evening, then deactivated for the night. If a non-targeted species was captured (passerines, small rodents), it was immediately released. If a Siberian chipmunk was captured, it was put to death by a blow to the head and stored in an OFB freezer (-20°C) until it could be transported to the MNHN for later analysis. To avoid any possible contamination, the personnel wore nitrile gloves under bite-resistant gloves.

Concerning the shooting of the animals, following the authorisation by DDT 38 and the CSRPN, a number of small-calibre weapons were tested before selecting a 9-millimetre rifle. Specially authorised OFB personnel used the weapons in addition to trapping when the animals were directly visible and favourable conditions prevailed (site, weather, distance, etc.) and safety could be ensured.

4. A Siberian chipmunk captured in a trap.

Results and assessment

Technical results

In 2018, trapping and shooting took place during two periods, from 26 March to 24 April and from 6 to 24 August. A total of 23 chipmunks were captured, including two by shooting.

In 2019, two more interventions took place, from 25 March to 3 April and from 26 to 30 August. A total of 7 chipmunks were captured, including two by shooting.

During each intervention period in 2018 and 2019, between 95 and 200 traps were set. It appeared that the most favourable time for the captures was between 10 o'clock in the morning and 3 o'clock in the afternoon on days with good weather. The animals move about very little in case of rain, wind and very high or low temperatures.

Certain non-targeted species were regularly captured, e.g. wood mice, great tits, garden dormice, and others were occasionally captured, e.g. shrews, weasels, stoats. Each non-targeted animal was alive and in good health on being released. However, a number of wood mice were captured in March-April 2018 by the MNHN for a comparison of their parasite complex with that of the chipmunks.

Analysis of the cadavers revealed that the chipmunks were infested with parasites, including ticks (Ixodes ricinus). This result highlighted the risks, even if limited, of pathogens circulated by communities of small rodents living on periurban sites and subject to castor bean ticks (Mori et al., 2018). High levels of intestinal nematodes (Trichuris muris) were also found in some chipmunks,

signalling that they are susceptible to the parasites affecting native rodents (notably wood mice), a fact already observed in other populations in continental France.

■ The only parasite transmitted to Échirolles by the chipmunks (a lice, *Enderleinellus tamiasis*) does not represent a manifest risk for the local wildlife, particularly for red squirrels.

■ Financial aspects

■ Over the two years 2018 and 2019, the interventions represented a budget of 2 835 euros for the equipment and 85 man-days of work.

■ The equipment used to capture the animals was purchased thanks to the BOP 113 programme of the Isère DDT. A total of 105 Sherman traps (https://www.shermantraps.com/orderonline/product/42-lng-non-folding-trap) were purchased from the Wildcare company for 2 600 euros.

■ In addition to the traps, various elements of small equipment and supplies were purchased, notably given the necessary health precautions in handling the animals and storing the cadavers, and bait for the cages, for a total of 246 euros.

A detailed list of the small equipment and supplies.

Item	Price (incl. VAT)
Sunflower seeds (40 kg)	€ 63.80
Bite-resistant gloves (2 pair)	€ 80.62
Storage and depollution boxes (x 2)	€ 13.90
Plastifying spray (x 2)	€ 18
Paper bags 18 x 25 cm (x 100)	€ 3.55
Nitrile gloves, size L (x 100)	€ 4.74
Nitrile gloves, size M (x 100)	€ 4.91
FFP2 masks (x 20)	€ 10.09
Self-adhesive labels	€ 3.28
UGAP delivery	€ 8.40
Paint sprays (x 2)	€ 34.50
Total	€ **245.79**

■ In terms of the human resources involved, 85 man days were required to eliminate 30 chipmunks over a period of two years. The table below provides information on the trapping work per month and the number of chipmunks captured. On the basis of a daily rate of 348 euros (ONCFS tariff 2019 for an environmental technician), the human resources represented a total investment of 29 410 euros.

Trapping results from March 2018 to April 2020.

Session	Number of trapping days	Number of traps set per day	Man-days	Number of chipmunks captured
March 2018	4	162	25	10
April 2018	15	108	21	5
August 2018	12	37	16	8
April 2019	8	81	13	3
August 2019	5	60	10	4
April 2020	No work done due to Covid-19.			

Information on the project

■ The DDT 38 made an effort to inform the municipalities, the law enforcement agencies (police and gendarmerie) and the DDPP (Departmental Directorate for the Protection of the Population).

■ OFB published a brochure to explain the project to the general public. The brochure was available on the MNHN site and on the intervention site for any interested persons.

Conclusion and outlook

■ A total of 30 animals were captured during the first two years of the experiment. It would appear that the population, initially estimated at approximately 50 animals, was in fact somewhat smaller.

■ Each part of the intervention zone was monitored in September and October 2019 by the OFB Isère local office in an effort to shoot at least one of the remaining animals on each site, before they began their hibernation, but without success. In April 2020, the experiment was interrupted due to the Covid-19 lockdown. However, the work will resume at the end of the summer in 2020 and be pursued in 2021, the year at the end of which the prefectoral authorisation ends.

■ In spite of the theoretically favourable conditions for the eradication of the Siberian chipmunks, given the small population and its limited habitat (between the Drac River to the west and a shopping centre to the east) reducing the potential expansion, four trapping operations were not sufficient to completely eliminate the rodents. These results highlight the need to intervene immediately following the initial observations, before the population (even if very small at first) can establish itself and develop, in order to enhance the chances of success in eliminating Sciuridae species that are highly proficient at establishing a population once they have been introduced to a natural environment. They also make clear that it is necessary to plan eradication work over the long term. Several years are often required to achieve the objective in semi-natural environments (that are not islands).

Regulations

■ It has been forbidden to release Siberian chipmunks to the natural environment since 2010. Its introduction in France has been prohibited since the decree dated 14 February 2018, including transit under customs monitoring, release to the natural environment, ownership, transport, trade, use, exchange, sale or purchase. This reinforcement in the prohibition followed the EU regulation 1143/2014 listing the species of Union concern.

■ The animals may no longer be held, except by zoos and parks with special authorisation. All Siberian chipmunks but be identified. Private persons may no longer purchase a Siberian chipmunk and those already possessed may not reproduce and must be declared to the Prefecture of the department of the owner.

Author: Isabelle Losinger-Chabod, OFB, Benoit Pisanu, MNHN, and Doriane Blottière, IUCN French committee, for the Resource Centre on invasive alien species. May 2020. Published by the French Biodiversity Agency.

This management report fills out the collection already published in the second and third volumes of the book titled "Invasive alien species in aquatic environments, Practical knowledge and management insights", in the Knowledge for action series published by the French Biodiversity Agency.
(http://especes-exotiques-envahissantes.fr/best-practices-guide/?lang=en)

5. Brochure on the Siberian chipmunks. (In French)

For more information...

■ https://ecureuils.mnhn.fr/ecureuil-de-coree/dossiers-scientifiques/gestion

■ Brochure on the Siberian chipmunks (in French): https://ecureuils.mnhn.fr/sites/default/files/documents/plaquette_oncfs_tamia_de_siberie.pdf

■ Chapuis *et al.*, 2018. Management of invasive alien species and the case of squirrels in France. (In French) Revue Faune sauvage n° 321. P45-51. https://ecureuils.mnhn.fr/sites/default/files/documents/chapuis_et_al._2018_gestion_ecureuils_exo.pdf

■ Marsot *et al.* 2013. Introduced Siberian Chipmunks (*Tamias sibiricus barberi*) Contribute More to Lyme Borreliosis Risk than Native Reservoir Rodents. Plos One January 2013, Volume 8, Issue 1 https://ecureuils.mnhn.fr/sites/default/files/documents/marsot_et_al_plos_one_2013.pdf

■ Mori, E., Pisanu, B., Zozzoli, R. *et al.* 2018. Arthropods and associated pathogens from native and introduced rodents in Northeastern Italy. Parasitol Res 117, 3237–3243. https://doi.org/10.1007/s00436-018-6022-4.