



## The Pallas squirrel in Belgium, *a successful eradication action*

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## Introduction

- “Invasion” history
- Information gathering & organisation
- Control actions
- Monitoring & evaluation



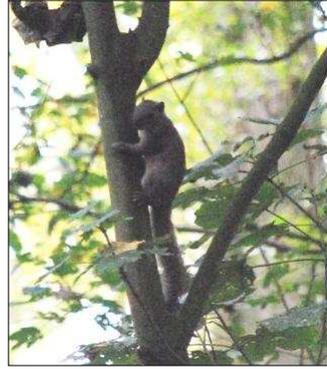
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## Invasion history



- In August 2005, bark stripping and cable gnawing was observed in a 5 hectare suburban park (Mariënstede) in Dadizele, Belgium. The damage was immediately linked to the occurrence of strange greyish squirrels.



## Invasion history



- The exact date of introduction of this population is unclear. The first years, nobody was alarmed by their presence.
- Initially suspected to be Chinese rock squirrels, *Sciurotamias davidianus* ([www.squirrelweb.co.uk](http://www.squirrelweb.co.uk)).
- Considering the damage, trapping efforts started in October 2005 (19 mesh wire life traps – gardener).
- An unexpected number of 45 squirrels was removed from the site during the first three months.



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**Invasion history** 

- Despite continuing trap efforts in 2006, sightings of squirrels in the park, surrounding gardens (9 ha) and the nearby abandoned fun-fair (Dadipark – 9.5 ha) were still numerous. In May 2006 already about 100 squirrels were trapped; in February 2007  $\pm$  130.
- May 2007 : Recognition of ‘the problem’:
  - Waste of time for gardener & costs for Mariënstede VZW
  - Not only a problem at Mariënstede
  - Involvement of local authorities & local forester
  - **Flemish authorities ANB & INBO**
- 9 - 23 July 2007 : 15 squirrels trapped by gardener and municipal worker. Then a ‘summer stop’ ...

**Information gathering & organisation** 

Contribution of INBO :

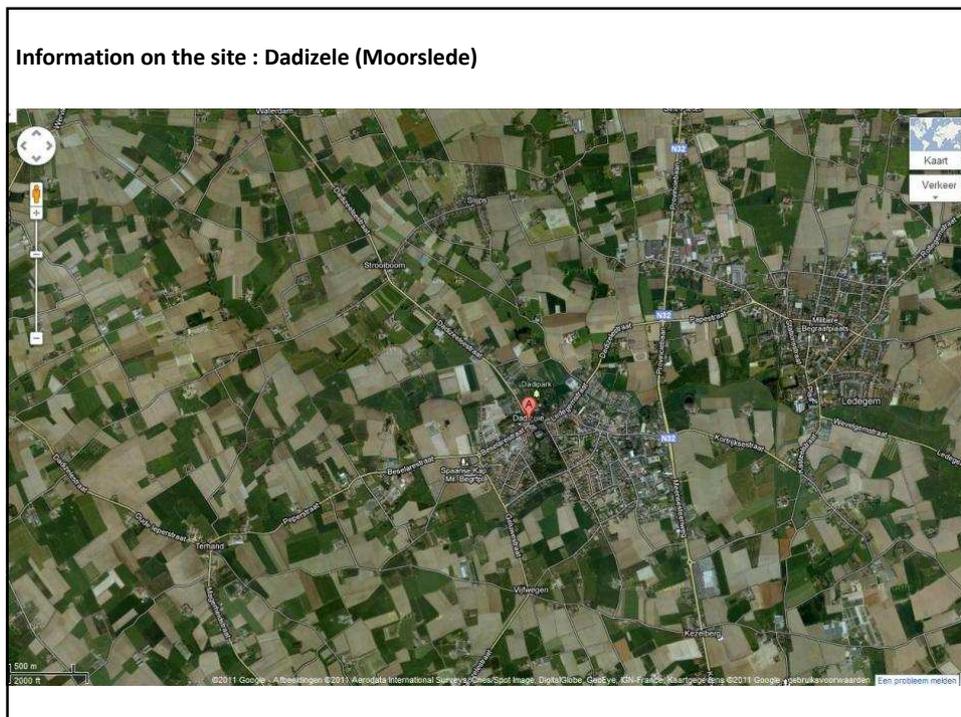
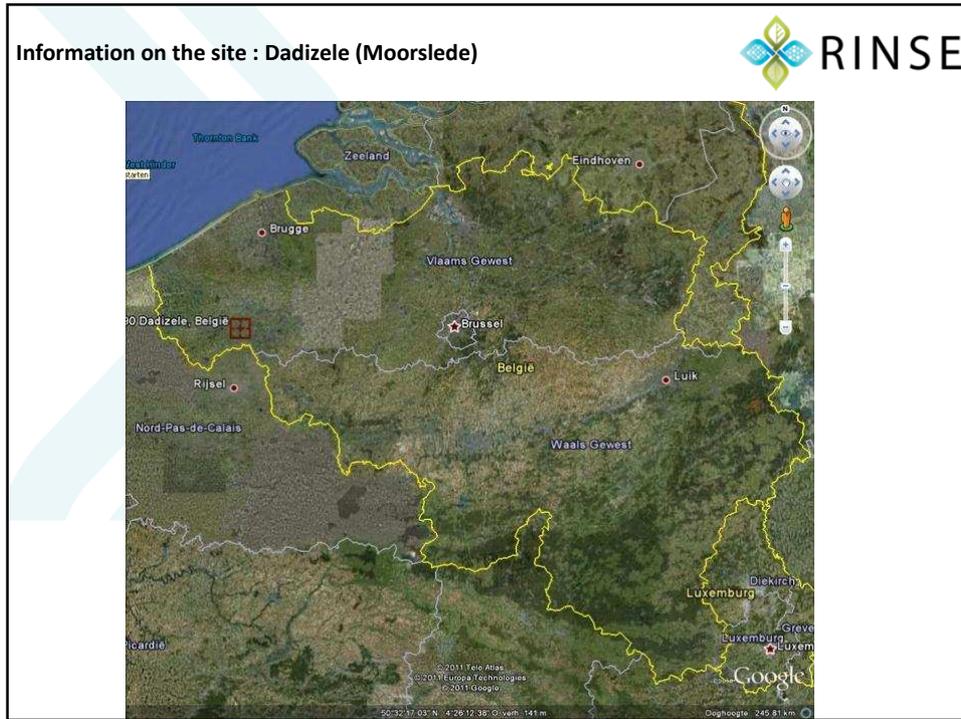
- Study of the site
- Estimation of squirrel density & damage
- Identification of the species
- Literature on invasiveness

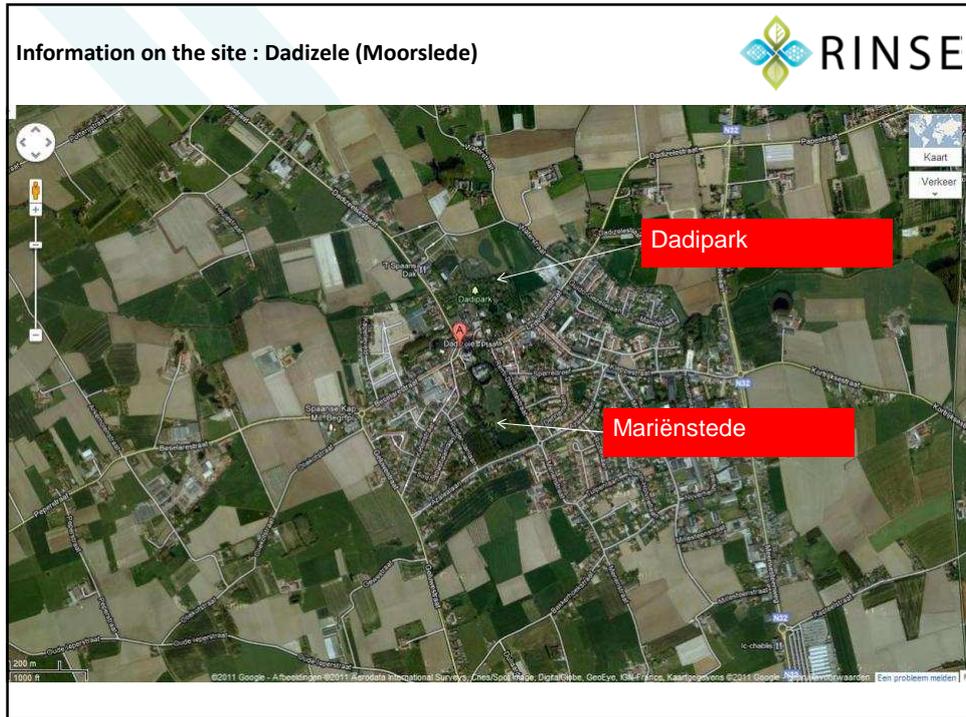
  

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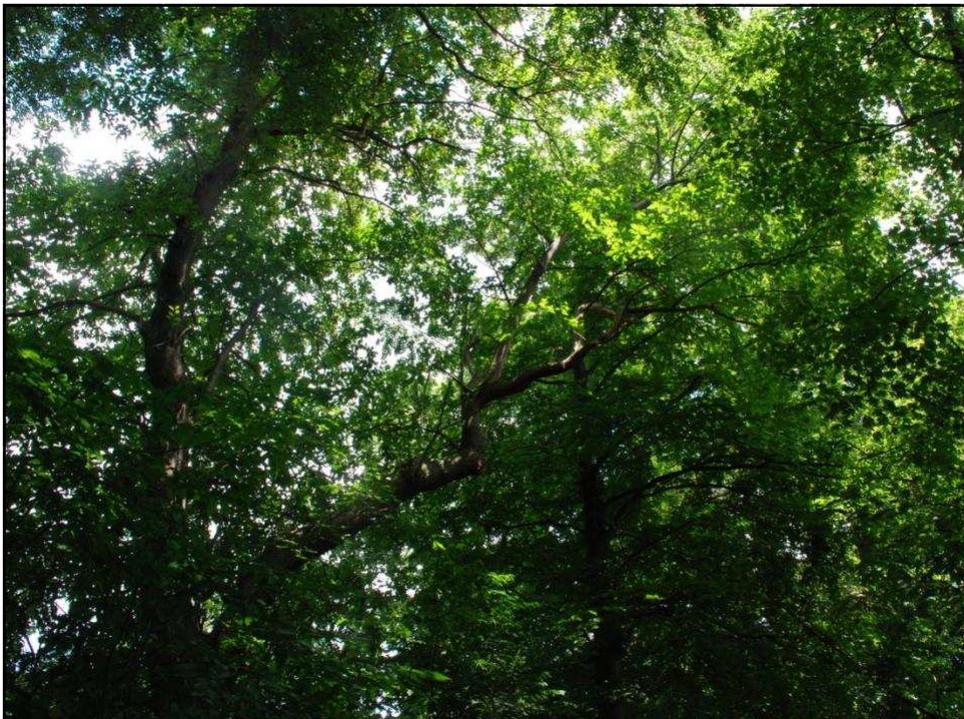
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Estimation of density & damage



- Sightings : transects
- Nests
- Marks of gnawing



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#### Identification of the squirrel



- At first recognised as Chinese rock squirrel, *Sciurotamias davidianus* (based on local information...).
- Further observations revealed important differences with data from the literature
  - behaviour
  - morphology of the male reproductive system
  - shape of the baculum



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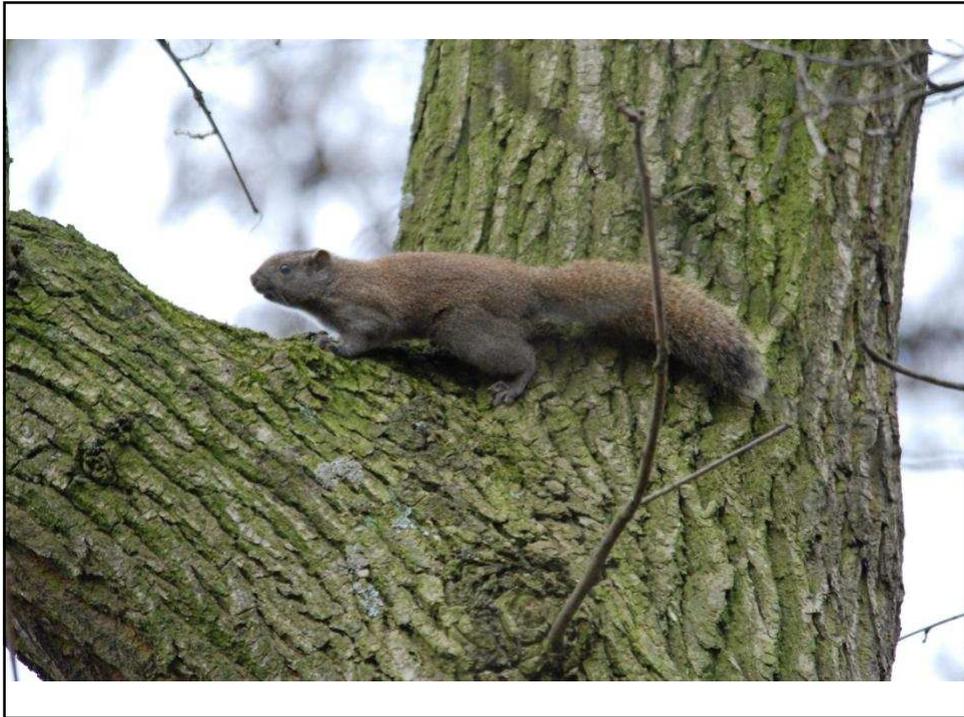


#### Identification of the squirrel



- Mainly based on skull features we identified the squirrel as Pallas's Squirrel, *Callosciurus erythraeus*, a species of Indochinese origin.



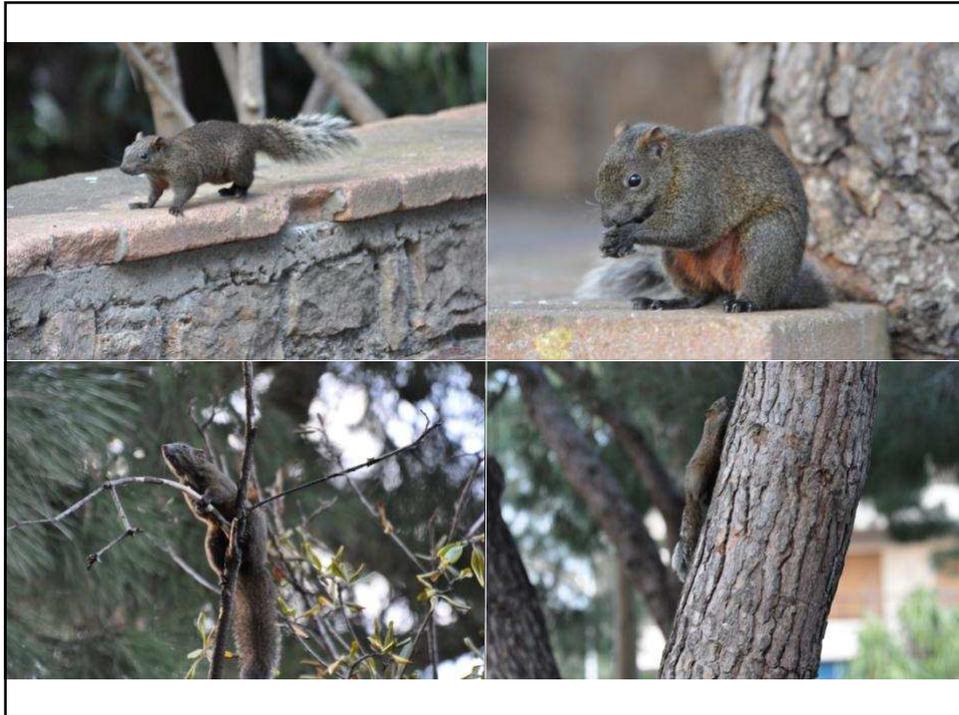


Identification of the squirrel



- Number of subspecies.
- Although the colour of the belly is often thought to be a diagnostic feature, individual variation in the pelage colour was considerable.





#### Identification of the squirrel



- To validate our species determination, sequence analysis of two nuclear genes (c-myc and RAG1) was performed (Steppan et al, 2004).
- Homology searches (megablast search) against other known sequences showed an almost perfect match with *Callosciurus erythraeus*.



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**Available info on the Pallas squirrel**



- Studies have shown Pallas squirrels to disperse easily and achieve relatively high population densities (5-10 ind/ha) **which was consistent with the high number of animals caught in Dadizele.**
- The species is supposed to be a food competitor of the native red squirrel *Sciurus vulgaris* and may outcompete it. **Normal densities of native red squirrel in Flanders are around 1 ind/ha.**
- Furthermore it damages trees by bark stripping and may be the cause of substantial economic loss in tree plantations (Kuo & Ku, 1987).
- This species was introduced to Japan (Setoguchi, 1990) and Argentina (Guichon & Doncaster, 2008) where it is invasive. In France there is a viable population in Cap d'Antibes since the early 1970 (Jouanin, 1986) as well as in Italy.



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**What to do with the population ?**



- The population was still increasing and more damage was to be expected if the species would further expand its range to other urban areas or forest ecosystems.
- Following the IUCN guidelines on AIS we applied the precautionary principle and we insisted on systematic eradication and monitoring of the whole population.
- We advised to increase trapping efforts before the next breeding season. Priority on control rather than on research.



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**Control actions**



- Meetings with
  - Agency for Nature and Forest (ANB)
  - Municipality
  - Local people (owners, residents, gardener ...)
  - Research Institute for Nature and Forest (INBO)
- on
  - Objective
  - Responsibility and financial issues
  - Ethical points and animal welfare
  - Legal framework and procedures !!!
  - Communication and public support



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**Control actions**



- Agreement on
  - trying to eradicate the population (approval signed by the competent Minister).
  - a communication line via Flemish Administration (ANB - Agency for Nature and Forest).
  - information on AIS control in different journals of Natuurpunt (NGO)
  - involvement of the village people via a message of the town council in the local newspaper + contact person in the town hall.
  - a procedure for control measures !!!



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**Control actions**

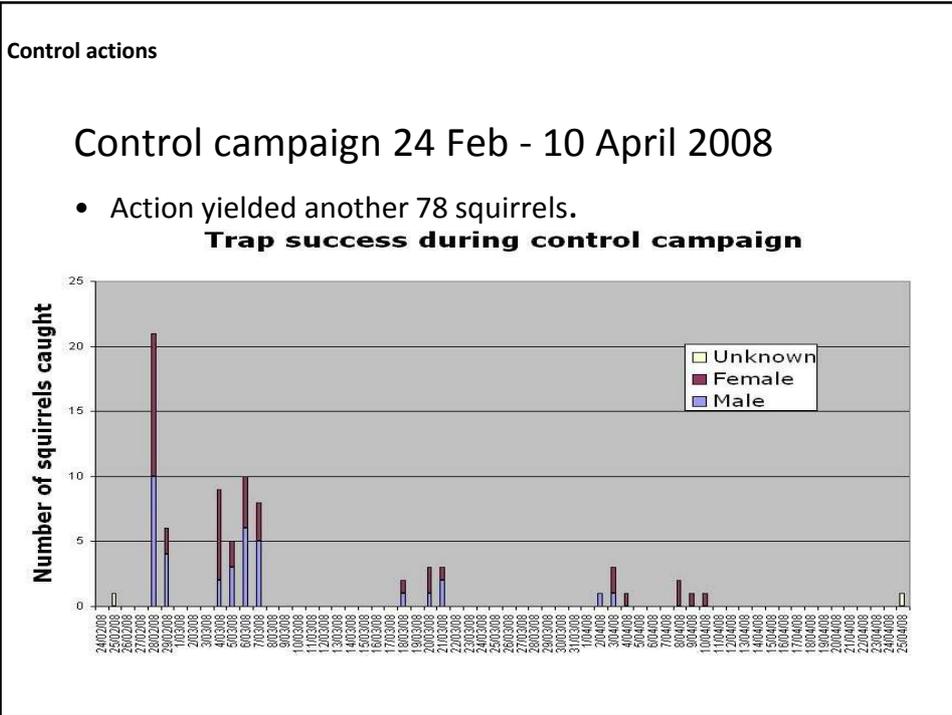


- **Planned control campaign :**
  - **WHAT :** Intensified life trapping
  - **WHEN :** Start before next breeding season (spring)
  - **WHO :** Fieldworker of the Flemish administration (Agency for Nature and Forest - ANB) assisted by municipal worker and gardener Mariënstede.
  - **WHERE :** Mariënstede and Dadipark.
  - **HOW :**
    - Mesh wire life traps (max 44 traps).
    - Baited with unshelled peanuts or walnuts.
    - On the ground near tree trunks.
    - Euthanized with CO<sub>2</sub>.
    - Keep low profile.



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**Control actions**



- Period without further sightings until 09/2009.
- Restart of actions by INBO :
  - Improvement of traps
  - Use of an equipped van
  - Installation of photo traps



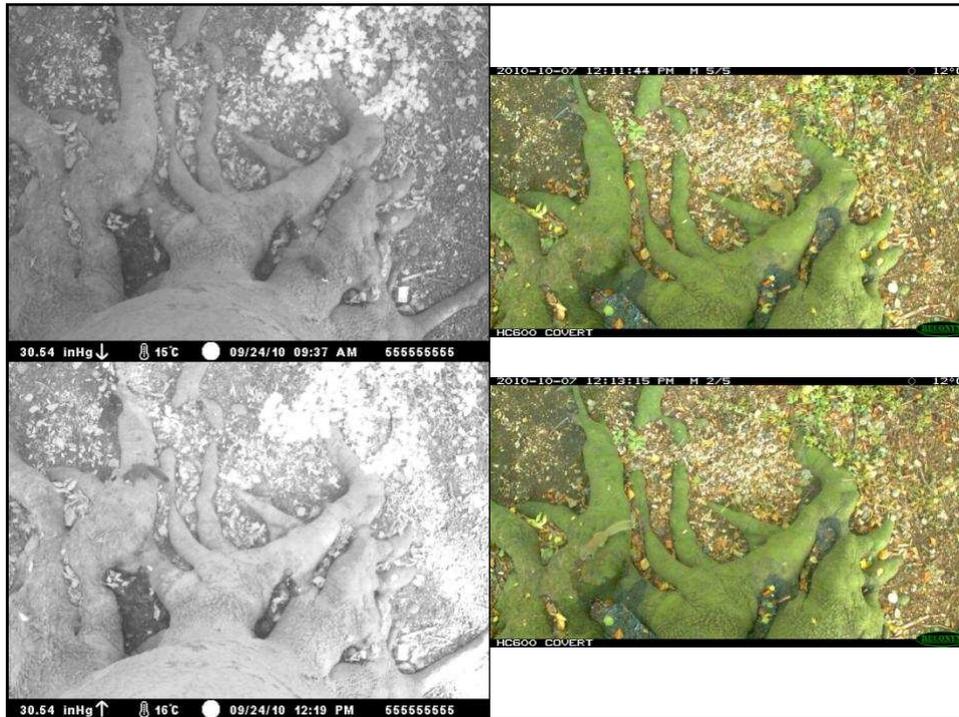

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Control actions



- Control campaign 15 Mar – 22 April 2010 with another 19 squirrels trapped (23 Mar – 9 Apr).
- Weekly follow up from 4 Aug 2010 on.
- Control campaign 6 Sept – 26 Nov 2010 with 5 catches (3 Oct – 4 Nov).
- Winter stop with snow & holidays.
- Follow-up with photo traps and last squirrel trapped on 12 Jan 2011.



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### Summary - Time line

- Introduction unknown
- Aug 2005 : damage noticed
- Oct 2005 – May 2007 : 130 sq.
  - 19 traps – Mariënstede – gardener
  - Living squirrels to VOC (Bird and wild animal rehabilitation centre)
- 9 – 23 Jul 2007 : +15    145
  - 30 traps – Mariënstede & Dadipark – gardener & municipal worker
  - Killed for research INBO
- 24 Feb – 10 Apr 2008 : +78    223
  - Max 44 traps – Mariënstede & Dadipark – fieldworker ANB
- 5 Mar – 22 April 2010 : +19    242
  - Max 15 traps – Mariënstede & Dadipark – INBO
- 6 Sept – 26 Nov 2010 : +5    247
- Follow-up with photo traps : +1    248

⇒ Consecutive bottle-necks



### Monitoring & evaluation

- Monitoring :
  - Photo traps
  - Bait points
  - Hair tubes/-traps (not used here)
  - Installation of bait - nest boxes / traps
  - Regular enquiries of local people
  - Inspections
- Decision when to stop actions :
  - Lazarus animals
  - Risk assessment

Stopped end June 2012






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## Evaluation – lessons :



- Early warning : This case illustrates that even in a densely urbanized area it is not at all obvious that the settlement of an alien species is readily observed and recognized as problematic.
  - The public needs to be informed on the problems with AIS.
- Every report on alien squirrels (rodents) should receive proper attention. Time flies !
  - We recommend prompt actions (monitoring, control) in case of suspected invasiveness and associated impact.



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## Evaluation



- Black lists : Meanwhile, this species has been classified on the blacklist of the Belgian Forum on Invasive Species (BFIS) and received the highest impact score (ISEIA - Branquart et al, 2009).
  - 07/12/2001 Forbidden to keep *C. erythraeus* as a pet in Belgium (not on the positive list).
  - 15/05/2009 Resolution of Flemish Government on species conservation and management. Minister still has to made further orders implementing this new decree.
- European initiatives to avoid introductions and further increase of Pallas squirrels in Europe.



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**Evaluation**



- Adaptations to the legal framework are advisable to facilitate the procedure (responsibilities, budgeting, paperwork...) and to facilitate the fieldwork (accessibility of private grounds and nature reserves, derogation on game acts, control tools ...).
  - High risk that actions will end up in court.
  - Most appropriate or efficient control tools are inaccessible.
- Difficult to counter opposition
  - Sabotage of traps : theft and destruction - liberation
  - Restocking – translocation : **stop trade**
- Difficult to predict the course of eradication process
  - Time schedule – **don' stop actions before the job is finished**
  - Costs
  - Use reproduction data



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