



# Population dynamics of Red foxes (*Vulpes vulpes*) in Flanders

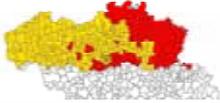
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Historical absence (yellow) of foxes (Waters en Bossen, 1981) in large parts of Flanders till about 1985



Location of the research areas in Flanders : Tielt = marginal biotope, Geraardsbergen = optimal biotope



After 150 years of absence in large parts of Flanders, in less than 10 years the fox filled up this unique gap in his distribution area since about half the eighties. As foxes are very controversial animals, simultaneously with the re-colonisation some problems have risen or are aggravated, a.o. the public health risk of *Echinococcus multilocularis*.

For this reason, in 1996, i.e. one decennium after the beginning of the re-colonisation, an intensive fox population research on landscape level was started both in a marginal and an optimal fox biotope, with research plots of 100 km<sup>2</sup> (+ 44 km<sup>2</sup> buffer zone).

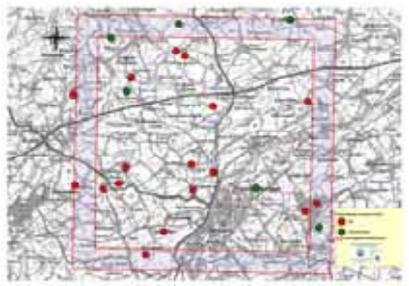
From 2001 on, the research concentrates in the optimal biotope, situated in the so called 'Flemish Ardennes' near Geraardsbergen, installing a permanent monitoring plot.

## Integration of multiple methods to document fox population dynamics

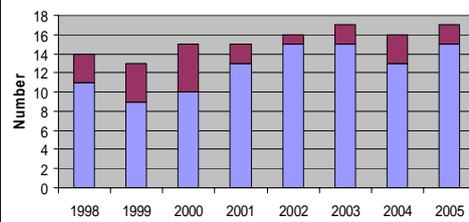
### Number of litters per 100 km<sup>2</sup>

From 1998 on, a full inventory of all possible breeding dens is yearly being carried out all over the research area, included a buffer zone of 1 km to interpret border dens. Active dens are discretely being controlled from march till the end of may to distinguish between successful and lost litters, as well as possible cases of litters that have been moved, split up or brought together by the vixen.

Successful (red dots) and unsuccessful (green dots) breeding dens in 2004



Number of fox litters / territories per 100km<sup>2</sup>  
Successful nest: blue, beginning nest: + red



In this intensively monitored area, an annual average of 12.3 ( $\pm 2.4$ ) successful litters was recorded per 100 km<sup>2</sup>, with a maximum of 15. When the unsuccessful litters are added, the average rises to 15 ( $\pm 1.4$ ), with a maximum of 17. As estimates within European studies range from 0.10 to 0.60 litters per km<sup>2</sup>, density of Flemish fox territories clearly is low. However, it has to be noticed that breeding den density easily varies with a factor 2 or even 3 when splitting up the surface of the study area. Therefore, reference area's should have a considerable surface (e.g. 100 km<sup>2</sup>) to be enough representative.

### Ecological autopsies

All over Flanders, more than 500 fox carcasses were collected between 1998 and 2002 to be autopsied for ecological parameters, a.o. reproduction status. Counting placental scars and/or embryo's gives a picture of litter sizes at birth. With a mean neo-natal litter size (n = 33) of 6.64 ( $\pm 1.71$ ), the Flemish fox reproduction rate clearly was quite high in that period.



Origin of fox carcasses autopsied for ecological parameters, 1998-2001 (purple flags : females with placental scars or embryo's)

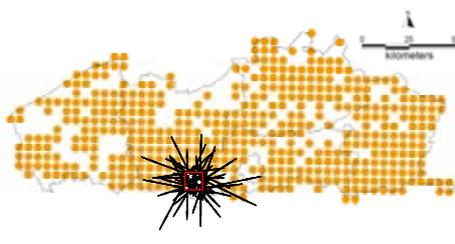


### Capture - mark - recapture

From 1996 till 2003, 309 fox cubs were live-captured in the study area, ear-tagged and released immediately on the place of capture after tagging. Sex-ratio of captured cubs was much less aberrant from the 1:1-ratio than usual in fox cubs, indicating a feeble intern concurrence. Dispersion of young foxes clearly starts at an age of 26 weeks. Almost all males (95 %) leave birth territory, while in females about 50 % is staying there. Surprisingly, no significant difference could be found in dispersion distance between dispersing males and females - giving a possible explanation for the quick and successful re-colonisation of Flanders.

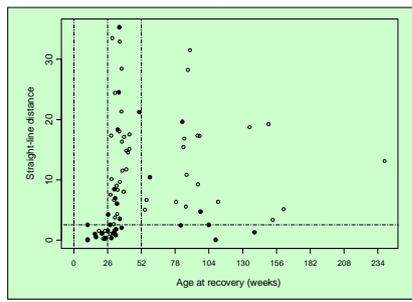
Mean annual dispersion (black arrows) per 100 km<sup>2</sup> based upon recapture findings

(orange dots : presence of foxes per 25 km<sup>2</sup> - according to the distribution map of the Flemish Mammal Atlas)



Straight-line distance versus age (weeks) at recovery

● = female ; ○ = male



### Radio tracking and spot light counting

Six adult foxes were radio-tracked during periods going from three months up to more than two years. Home range surfaces were varying from ca. 1 to more than 10 km<sup>2</sup>, and seemed to fit quite well with the irregular spread of the breeding territories. Spot light counting confirmed convincingly a low early-spring density, in comparison with a French region.

Example of a home range of 1 dominant female (March - November 1999) ; purple grid = 1 km<sup>2</sup>



With a maximum of 0.15 successful litters and a maximum of 0.17 territories per km<sup>2</sup>, a mean litter size of 6.64, and supposing 5 adults per territory (what is undoubtedly a high number), fox density remained below 1 animal/km<sup>2</sup> in early spring and below 2 animals/km<sup>2</sup> in summer during the period from 1998 till 2005. All methods used - autopsies, capturing cubs, radio tracking and spot light counting - supported the conclusion that fox density was rather low.

In spite of an increasing hunting pressure (annual game bag), the number of successful litters raised up to 0.18 in 2006 and to 0.19/km<sup>2</sup> in 2007, suggesting an ongoing restructuring of the fox population as a response to the additional artificial mortality.