Wildlife Detection Dogs in Flanders
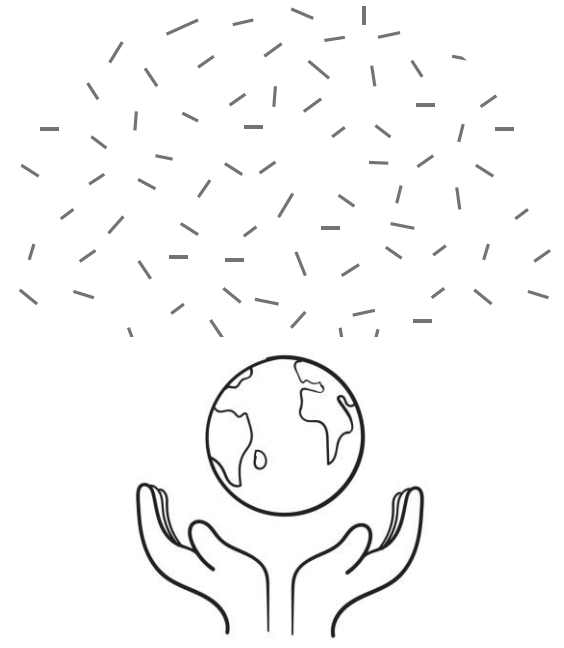
Hilde Vervaecke[1,3,4] & Ellen Van Krunkelsven[2,3,4] & Carina Depape[4] & Arno Thomaes[3,4]

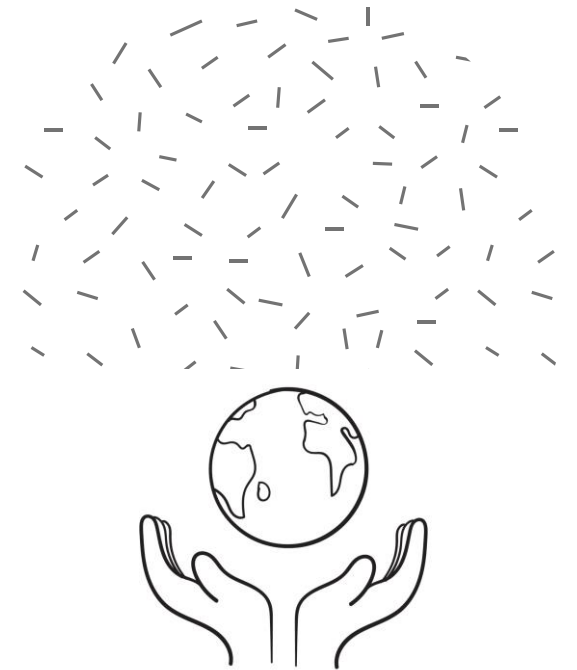1: Odisee University of Applied Sciences
2: Federal Police Belgium
3: INBO
4: VZW Noses for Nature

INSTITUUT NATUUR- EN BOSONDERZOEK

Odisee UNIVERSITY OF APPLIED SCIENCES

salto Research Group Agro-Bio

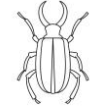1. INBO financed project on ecological detection dogs

2. Studies on ecological detection dogs

3. Studies with ecological detection dogs

Trial in 2016

Dog	Breed	Target species	English name	Target substance		Status	Studied by
Smokey	Malinois	*Lucanus cervus*	Stag beetle	Larva, Imago		ongoing	Ianthe Terpelle - Odisee
Peckie	Mixed breed	*Lucanus cervus*	Stag beetle	Larva		(+)	
Jimmi	Mixed breed	*Lucanus cervus*	Stag beetle	Larva		(+)	
Smokey	Malinois	*Lutra lutra*	Otter	Spraints		ongoing	Dorien Vercauteren - Vives
Blue	Australian shepherd	*Lutra lutra*	Otter	Spraints		(+)	

Zoektocht naar vliegend hert

od·see

Het gebruik van honden om larven van *Lucanus cervus* op te sporen

Training van een ecologische zoekhond

American bullfrog *(Lithobates catesbeianus)*

Scent Source: Living animal

Reason: Invasive exotic species → potential impact on native biodiversity

Name: Edgar
Breed: Basset Hound
Age: 2 years

Dog: No detection experience
Handler: Basic training experience

Name: Pippa
Breed: Belgian Malinois
Age: 3,5 years

Dog: Some detection experience
Handler: Professional detection instructor

Name: Niro
Breed: Belgian Malinois
Age: 4,5 years

Dog: Trained detection dog *(cash)*
Handler: Professional detection instructor

Bat fatalities at wind turbines

Scent Source: Carcass

Reason: Find out which species, how many, when and where → protective measures

Name: Lima
Breed: Crossbreed
Age: 3 years

Dog: No detection experience
Handler: Basic training experience

Name: Jules
Breed: Goldendoodle
Age: 5 years

Dog: No detection experience
Handler: Professional dog trainer

Stag Beetle *(Lucanus cervus)*

Scent Source: Larvae, living animal

Reason:
- Monitoring of N2000 species
- Endangered in Flanders
- Small scattered populations

Eurasian otter *(Lutra lutra)*

Scent Source: Scats

Reason:
- Monitoring of N2000 species
- Critically endangered in Flanders
- Discrete lifestyle → nocturnal

Name: Smokey
Breed: Belgian Malinois
Age: 3,5 years

Dog: Trained detection dog
Handler: Professional detection instructor

Hazel dormouse *(Muscardinus avellanarius)*

Scent Source: Nesting material

Reason:
- Monitoring of N2000 species
- Critically endangered in Flanders
- Distribution limited to one region

European hamster *(Cricetus cricetus)*

Scent Source: Nesting material

Reason:
- Monitoring of N2000 species
- Critically endangered in Flanders
- Protection program: habitat and reintroduction

Name: Kikki
Breed: English Springer Spaniël
Age: 1,5 years

Dog: Some detection experience
Handler: Detection training experience + dog trainer

Lion's mane mushroom *(Hericium erinaceus)*

Scent Source: Mycelia

Reason:
- Endangered in Flanders
- Indicator of quality of N2000 forest habitats

Name: Otte
Breed: Labrador Retriever
Age: 3,5 years

Dog: Mantrailing experience
Handler: Dog trainer + mantrailing experience

European pine marten *(Martes martes)*

Scent Source: Scats

Reason:
- Monitoring of N2000 species
- Critically endangered in Flanders
- Discrete lifestyle → nocturnal
- Scattered habitat in Flanders

Name: Raya
Breed: French Water Dog
Age: 2,5 years

Dog: No detection experience
Handler: Animal behavioral therapist

Hermit beetle *(Osmoderma eremita)*

Scent Source: Larvae, scats

Reason:
- Monitoring of N2000 species
- Critically endangered in Flanders
- Highly specialised lifestyle → tree hollows

Name: Wietse
Breed: Flatcoated Retriever
Age: 5 years

Dog: Trained detection dog *(Boor taint)*
Handler: Detection training experience + dog trainer

INBO financed project

Dog	Breed	Target	English name	Substance
Smokey	Malinois	*Lucanus cervus*	Stag beetle	Larva, Imago
Smokey	Malinois	*Lutra lutra*	Otter	Spraints
Wietse	Flatcoated Retriever	*Osmoderma eremita*	Hermit beetle	Larva, faeces
Wietse	Flatcoated Retriever	*Canis lupus*	Wolf	Faeces
Kikki	English Springer Spaniel	*Muscardinus avellanarius*	Dormouse	Nest
Kikki	English Springer Spaniel	*Cricetus cricetus*	European hamster	Nest
Pippa	Malinois	*Lithobathes catesbeianus*	Bull frog	Living animal
Jules	Golden Doodle	*Chiroptera*	Bats	Carcas
Lima	Mixed breed	*Chiroptera*	Bats	Carcas
Raya	French Waterdog	*Martes martes*	Marten	Faeces
Otte	Labrador Retriever	*Hericium erinaceus*	Lion's mane	Fungus

Other

Dog	Breed	Target	English name	Substance
Smokey	Malinois	*Lampyris noctiluca*	Common glowworm	Larva
Wenske	Flatcoated Retriever	*Caprimulgus europaeus*	Nightjar	Eggshell
Rafale	Pyrenean Shepherd	*Lampyris noctiluca*	Common glowworm	Larva
Buda & Tayco	Malinois	*Astacus astacus*	Noble crayfish	Living animal
Leon	Lagotho	*Cimex lectularius*	Bed bugs	Living animal, eggs, …
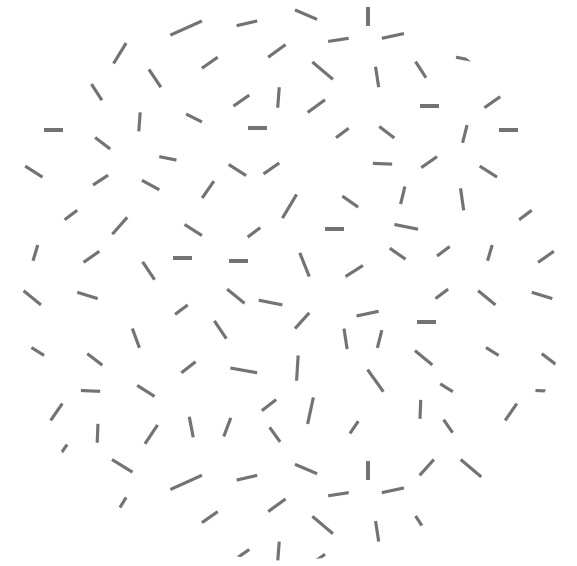
Odisee Student projects: ecodog hindrances & succes

SNIFFING FOR NATURE:
DETECTION DOG TRAINING IN REAL LIFE ENVIRONMENT

Bente Stockmans[1], Arno Thomaes[2], Ellen Van Krunkelsven[3], Hilde Vervaecke[1]

[1] Odisee University College, Agro-& Biotechnology, Salto Research Group, B-91000 Sint-Niklaas, Belgium; hilde.vervaecke@odisee.be
[2] Research Institute for Nature and Forest, Havenlaan 88 bus 73, B-1000 Brussels, Belgium; arno.thomaes@inbo.be
[3] VZW Teamsters, Geraardbergsestraat 72, 1541 Sint-Pieters-Kapelle, Belgium.

Scent detection dogs can provide a fast, reliable and non-invasive method for detection of a variety of target species for nature monitoring, offering a charismatic tool for communication. Therefore, it could be an ideal tool for the monitoring of N2000 species with a discrete lifestyle. However only limited experience is available in Europe. A volunteer program was set up where a professional scent dog trainer selected eight human-dog dyads and assisted them in scent training on different target species. We documented if the dogs could reliably detect the target species in a controlled as well as natural setting.

MATERIAL AND METHODS: We interviewed the volunteers and trainer (Ellen Van Krunkelsven) to identify which problems were encountered when the training proceeded from a controlled setting to a natural environment. Each dog was trained on one or two target species. Training experience of the volunteers ranged from very restricted to professional level.

RESULTS: All dogs of varying breeds, sexes and ages, manage to correctly discriminate the target species, with inter-individual differences in learning speed and drive. Detection problems in the field relate to species-specific natural history traits of the target species such as depth of hiding under ground, seasonality of markings and ease of possible detection of the target by humans.

Bente Stockmans. 2019. **Flemish eco-dog teams: hindrances & successes.** Dissertation Odisee University of Applied Sciences.

Longlist (top 10) of Flemish Scriptieprijs

Odisee Student projects: ecodog needs & future

Needs & future of Flemish Ecological detection dogs?
Laura De Kort, 2020. Dissertation Odisee University of Applied Sciences.

M&M:
- 17 valid surveys (Qualtrics), mostly from Belgium (8), The Netherlands (2), Germany (4), Switzerland (1), UK (1), USA (1)
- Each respondent owned on average 2,6 dogs (range: 1-10).
- 70% trained and operational dogs - 30% in training
- 53% professionals - 47% volunteers

Results:
- Certification
- Professionalisation
- Online platform to share knowledge & experiences
- Science (efficacy, costs)

Odisee financed projects: wolf pilot

Training of Ecological Detection Dogs for Wolf Scat (*Canis lupus*)

Hilde VERVAECKE[1]*, Ellen VAN KRUNKELSVEN[1], Koen VAN DEN BERGE[2]

[1] Agro-and Biotechnology Research Group, Odisee University of Applied Sciences, Hospitaalstraat 21, 9100 Sint-Niklaas, Belgium
[2] Research Institute for Nature and Forest, Havenlaan 88 bus 73, B-1000 Brussels, Belgium
* Corresponding author: H. Vervaecke e-mail: hilde.vervaecke@odisee.be

RESEARCH ARTICLE

Abstract
Detection dogs for wolf scat can assist in conservation-monitoring of wolves. In this pilot project, the first encounters of experienced detection dogs with wolf scat were documented. It was tested how a dog, trained with only a few scat samples (minimally four, maximally six), could generalise towards new unknown wolf scats and discriminate them from distracting odours. Four dogs all showed a behavioural expression of aversion upon first presentation with wolf scat during their initial training to fixate on wolf scat. The dog that showed the least aversion to wolf scats was trained during two weeks. His ability to discriminate wolf scat from other odours and to generalise to new wolf samples was evaluated. He was presented a line-up with new wolf scat, dog scat and other distracting odours in eight boxes, seven trials and random rotations of odours. The test was conducted blindly without the dog handler knowing if or where a positive sample was present. The dog showed partial generalisation of wolf scat odour from only a few known training samples to new wolf samples. The test was evaluated for methodological improvements.

Keywords: *Canis lupus*; scat; detection dogs.

Wolf pilot

Figure: Smoke showing aversive behaviour to the wolf sample: she prefers to turn away

Figure: Pippa showing aversive behaviour to the wolf sample by reluctance to approach and point

Figure: Smoke showing aversive behaviour to the wolf sample, stepping by sideways, averting her head

Figure: Pippa correctly pointing. Notice her lifted back foot, possibly a sign of some conflict behaviour due to the aversive odour.

Wolf pilot

Odisee Student projects: certification test

Ecological detection dogs on wolves: testing a certification method.
Katrien Vrijdag. 2021. Dissertation Odisee University of Applied Sciences.

Shortlist of Vlaamse Scriptieprijs (3th)

M&M:
- Wietse & Carina Depape
- Testing feasibility of Certification test of Porritt et al. (2015)
- Testing outdoor plots & trajectories
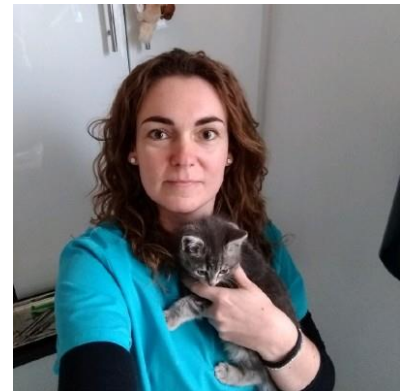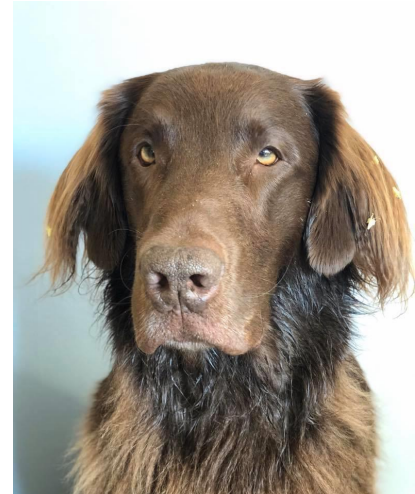
Odisee Student projects: certification test
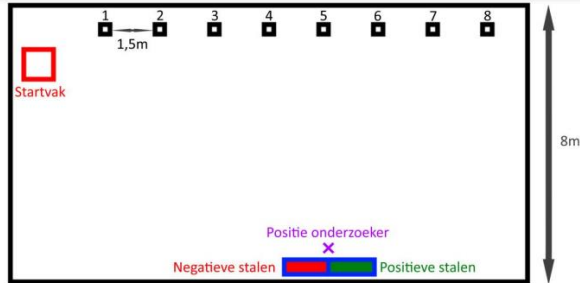
Figuur 1 Indeling en afmetingen testlokaal

Figuur 2 Line-up met acht containers

How: 6 runs double blind (1 blanco), on leash, one pass from left to right, handler says if dog alerts or if he "doubts"

Minimal target detection score

False alert score

Odisee Student projects: certification test
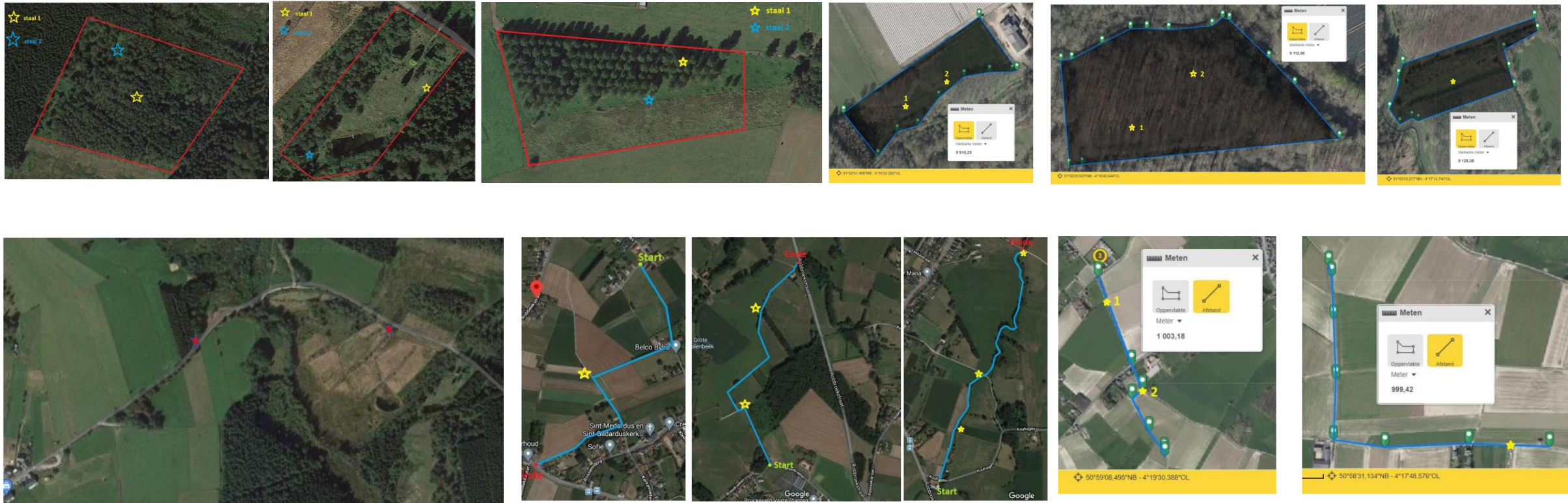
Outdoor test plots: 8/11 (73%)

Test trajectory 1 km: 8/11 (73%)

Wolf range: comparison dog 77% – human 50%

17 were only found by the dog not by the human, 4 were only found by the human and not by the dog

Odisee Student projects: ecodog data management

Ecological detection dogs in Flanders: evaluation of data collection.

Brian Mommers, 2022. Dissertation Odisee University of Applied Sciences.

Research question: How does it work now & what are the problems?

M&M:

- Interviews of 4 dog handlers & 4 matching species specialists
- Species: wolf, stag beetle, otter, pine marten, European hamster & dormouse
- Questions: frequency of search, when is search sufficient, type of data needed, how to report the data, how does communication go, are there guidelines, typical problems & questions, what goes well, efficacy dog versus human,…

Odisee Student projects: ecodog data management

Results:

- Most frequent problems:
  - communication
  - training samples
  - training time
- Most frequent questions about field searches:
  - Methodology (eg. verification of dog indication, should we score absence of target, trajectories/plots, entry permits, what to do with data, …)

- Solution?
  - protocols
  - good practice guidelines

Odisee financed projects: Nose Log
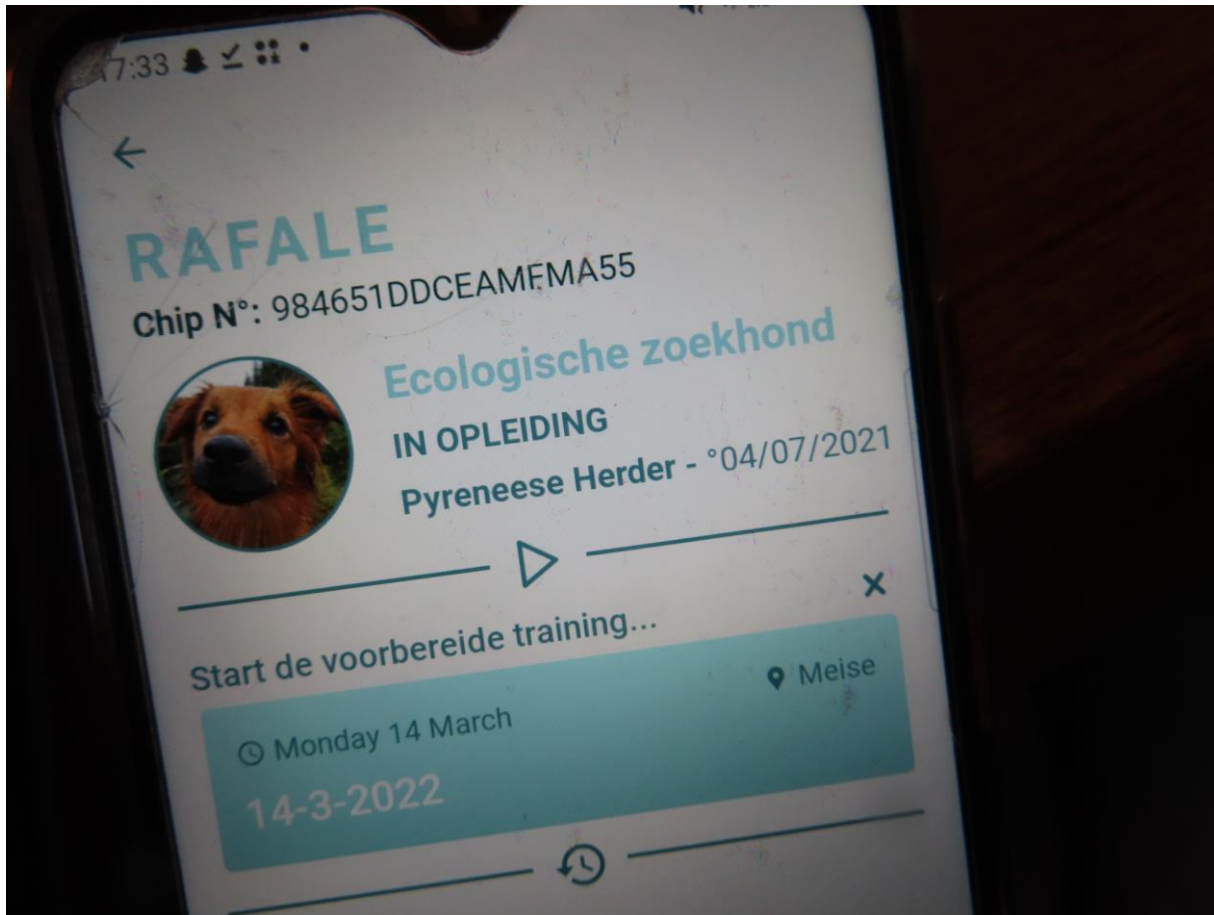
Training application for detection dogs. Testing and evaluating the prototype.
Caro Wouters. 2022. Dissertation Odisee University of Applied Sciences.

Nose Log
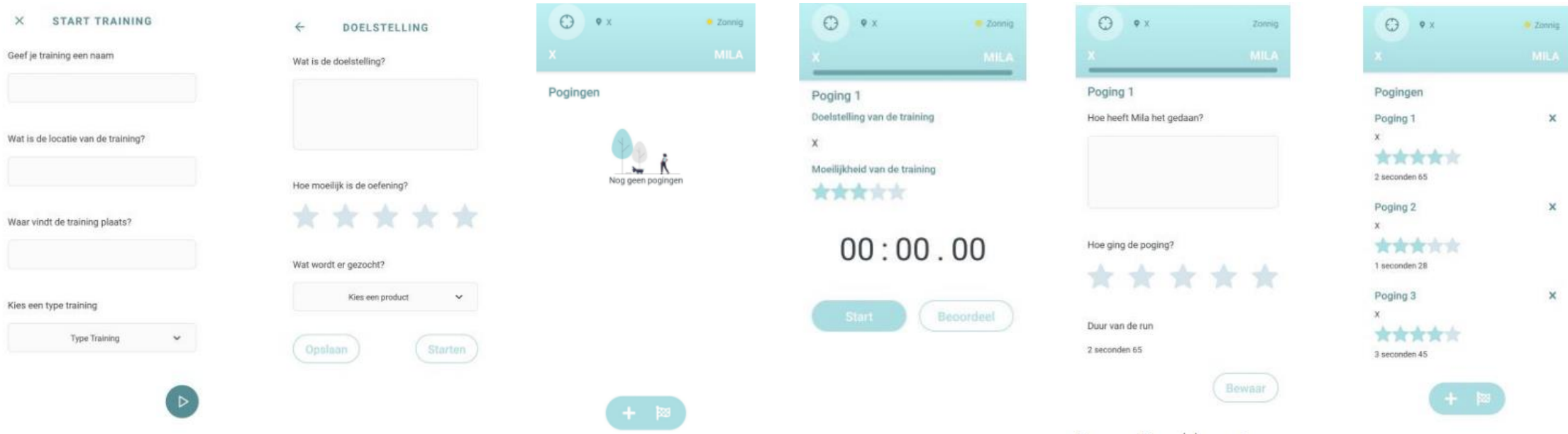
Evaluated with SUS (System Usability Scale) – in further development

Odisee financed - SnuffelSensor

- Can we develop a sniffing time measuring device & use it to accurately measure sniffing duration?

SnuffelSensor
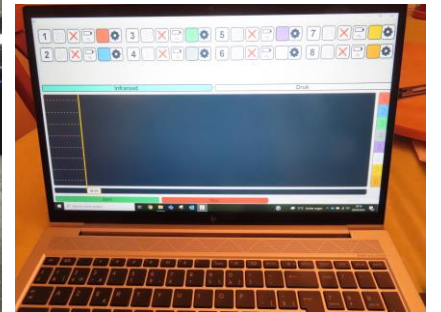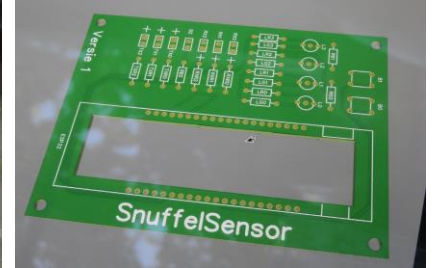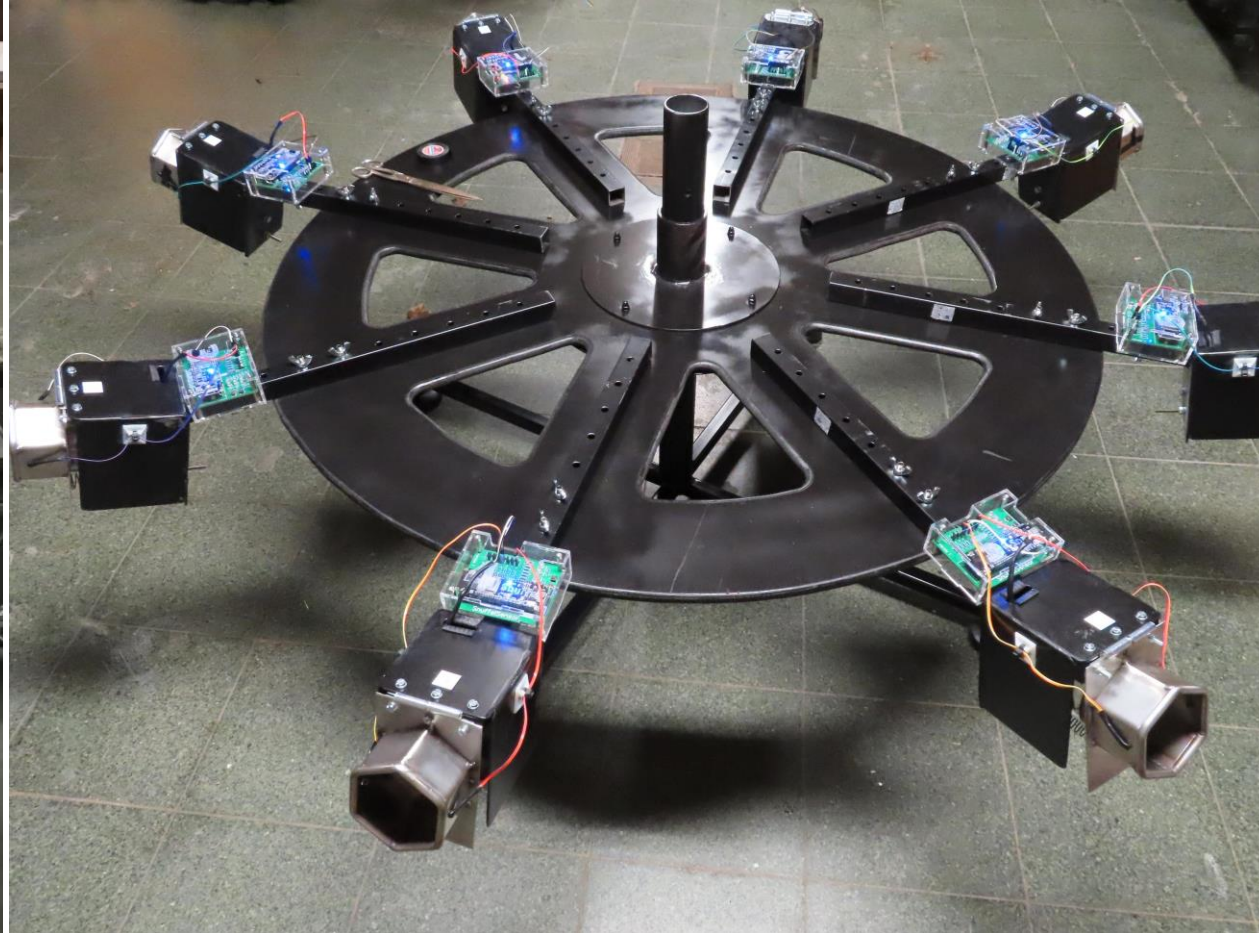
Odisee financed - SnuffelSensor

- Can we develop a sniffing time measuring device & use it to accurately measure sniffing duration? Yes, we can!

The SnuffelSensor: does it accurately measure sniffing duration? Does sniffing duration differ among individuals, and between correct and false indications?
Océane Marville. 2022. Dissertation Odisee University of Applied Sciences.

SnuffelSensor

Using Sniffing Behavior to Differentiate True Negative from False Negative Responses in Trained Scent-Detection Dogs

Astrid Concha[1], Daniel S. Mills[1], Alexandre Feugier[2], Helen Zulch[1], Claire Guest[3], Rob Harris[3] and Thomas W. Pike[1]

[1]School of Life Sciences, University of Lincoln, Joseph Banks Building, Lincoln LN6 7DL, UK, [2]Royal Canin SAS, Avenue de la petite Camargue, Aimargues F-30470, France and [3]Medical Detection Dogs, 3 Millfield, Greenway Business Park, Great Horwood, Milton Keynes MK17 0NP, UK

Correspondence to be sent to: Astrid Concha, School of Life Sciences, University of Lincoln, Joseph Banks Building, Lincoln, LN6 7DL, UK. e-mail: aconcharamirez@lincoln.ac.uk

Abstract

False negatives are recorded in every chemical detection system, but when animals are used as a scent detector, some false negatives can arise as a result of a failure in the link between detection and the trained alert response, or a failure of the handler to identify the positive alert. A false negative response can be critical in certain scenarios, such as searching for a live person or detecting explosives. In this study, we investigated whether the nature of sniffing behavior in trained detection dogs during a controlled scent-detection task differs in response to true positives, true negatives, false positives, and false negatives. A total of 200 videos of 10 working detection dogs were pseudorandomly selected and analyzed frame by frame to quantify sniffing duration and the number of sniffing episodes recorded in a Go/No-Go single scent-detection task using an eight-choice test apparatus. We found that the sniffing duration of true negatives is significantly shorter than false negatives, true positives, and false positives. Furthermore, dogs only ever performed one sniffing episode towards true negatives, but two sniffing episodes commonly occurred in the other situations. These results demonstrate how the nature of sniffing can be used to more effectively assess odor detection by dogs used as biological detection devices.

Key words: detection dogs, false negative, false positive, sniffing behavior, target odor
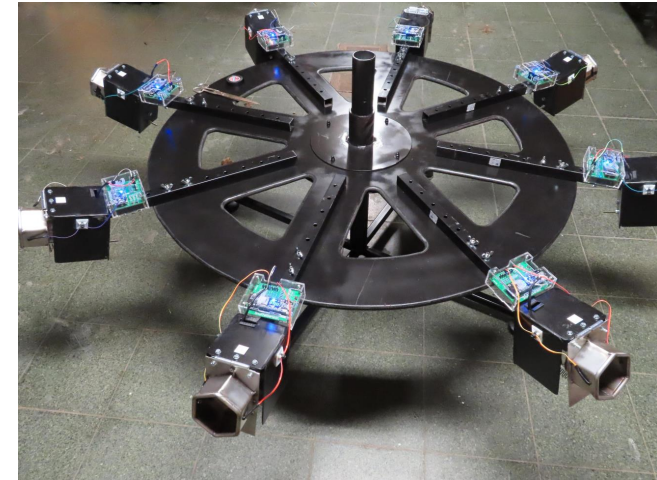
SnuffelSensor

1. Is there an individual difference in duration?

2. Is there a difference among types of score in sniffing duration?

3. Does nose enters more than once and if so when?

- Rafale – glowworm larvae - fixate

- Smoke – glowworm larvae - fixate

- Wietse – wolf scat - sit

1 &2: Mixed linear model with the natural log of duration to comply with normality. Fixed effects: dog, type of score; random effects: day, session.

SnuffelSensor

1. Is there an individual difference in duration?

Dogs show significant difference in duration (p <0.0001).
- Rafale & Wietse: p < 0.0001
- Smoke & Wietse: p <0.0001
- Smoke & Rafale: NS (p=0.1911)
- Duration is significantly lower in Wietse

- Rafale: x=803,47 ms; SD=832,69, range=55-3955
- Smoke: x=1021,14 ms; SD= 1442,92; range=56-6905
- Wietse: x=272,52 ms; SD= 234,17; range=1-1403
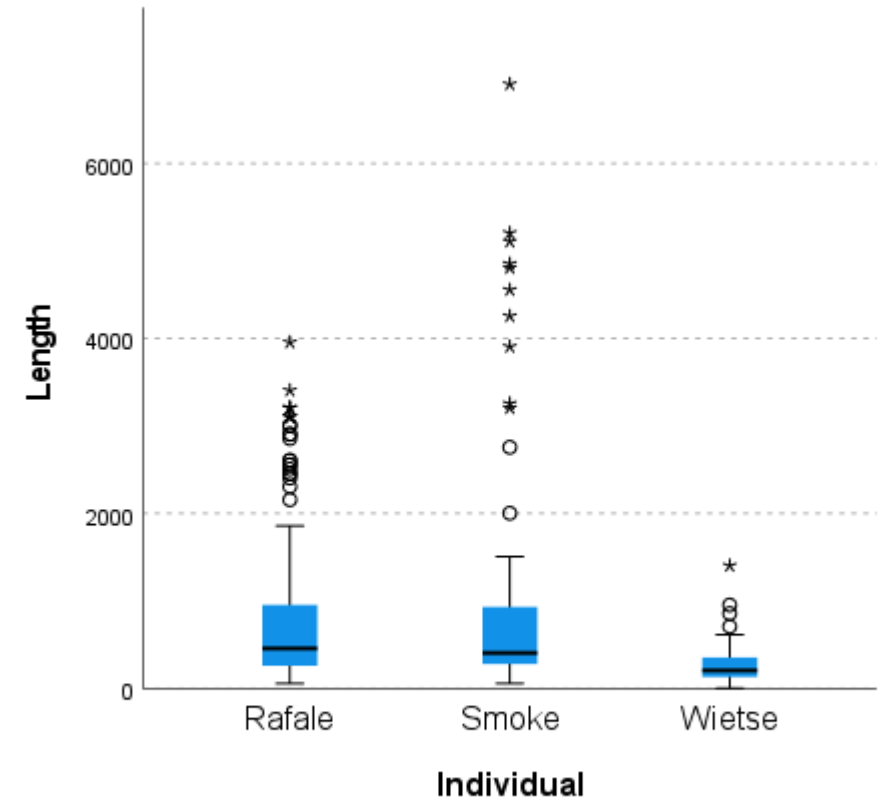
SnuffelSensor

2. Is there a difference among types of score in sniffing duration?

- CN: x=415,85; SD=316,32; range=1-2756, n=227
- CP: x=1294,52; SD=1358,23; range=52-6905, n=108
- FN: x=600,50;SD=527,52; range=104-1606, n=10
- FP: x=2194,86; SD=1549,56; range=106-4806, n=14

Types of scores show significant difference in duration (p <0.0001).
- CN - CP: p < 0.0001 → CN is shorter
- CN - FP: p <0.0001 → CN is shorter
- CP - FN: NS (p= 0.9382).
- CN - FN: trend (p<.08)
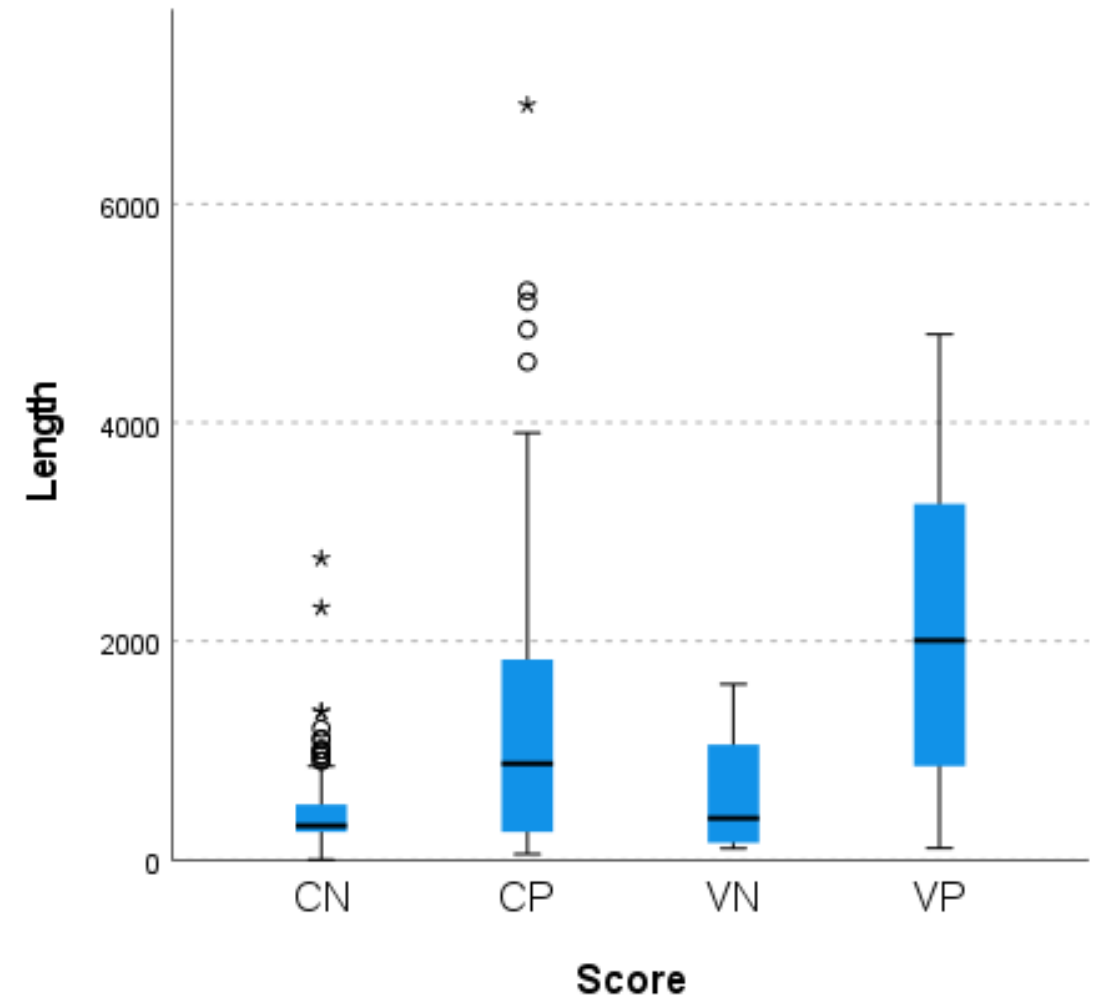
SnuffelSensor

3. Do they enter the nose more than once and if so, when?

45 times on 359 scores

Repeated nose in pot

CN	CP	FN	FP	total
13	29	0	3	45
28.89%	64.44%	0%	6.67%	100%

Distribution of scores

CN	CP	FN	FP	total
227	108	10	14	359
63.23%	30.08%	2.79%	3.90%	100%

Collaboration Odisee – University of Antwerp

- Can sniffer dogs become a new tool for glow-worm monitoring?

Mira Van den Broeck. PhD-project on the effect of light pollution on glow-worms (since 2021). Dept. of Biology, University of Antwerp.

Can sniffer dogs become a new tool for glow-worm monitoring?

M&M:

Training of one naïve dog : November 2021 – April 2022.

Indoor tests

Carrousel, 1 new larva for each trial, each session new distracting odours, 6 sessions of about 6 trials, (n_{tot}= 37 trials). Position larva blinded to handler. Free search by dog.

Results:

Sessions	trials	CP	CN	FP	FN
6	37	37	145	3	6

Accuracy (overall proportion of correct indications)
⇨ (CP + CN)/total sniffed pots = **95%**

Probability that all 37 CP were due to **chance** =

$$\frac{n!}{x!(n-x)!}\pi^x(1-\pi)^{n-x} = \textbf{1.93 x 10}^{-18}$$

Can sniffer dogs become a new tool for glow-worm monitoring?

RESULTS:

Field tests
By day: A larva was placed in a 1m² in grass. Detection time was scored for handler (visual search) and dog, max. 3 min./square.

Larva found in :
   12/12 trials by dog
   (after 55.33 seconds on average)
   3/12 trials by handler

By night: When larval glow was seen, the dog was asked to search about 1m² .
Larva found in :
   3/12 trials in forest litter
   1/1 trials in grass substrate

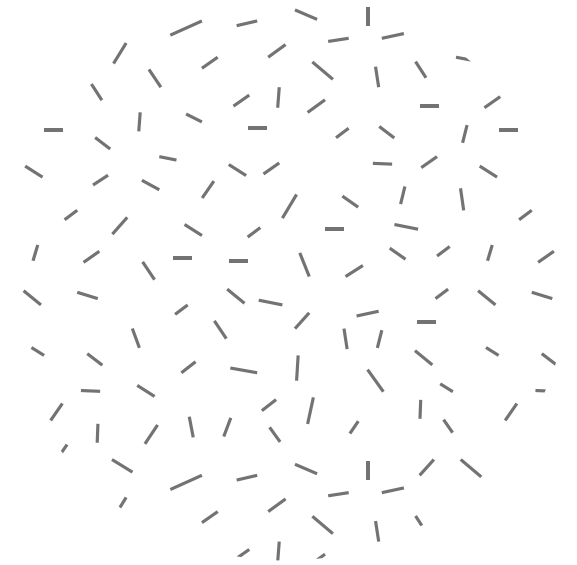# Can sniffer dogs become a new tool for glowworm monitoring?

Not practical but interesting…

1. INBO financed project on ecological detection dogs

2. Studies on ecological detection dogs

3. Studies with ecological detection dogs

Research with ecodog data

Wolf: INBO Jan Gouwy, Koen VDBerge
Monitoring: LIKONA European hamster, WWF otter

Hopes for the future :
- Monitoring Stag beetle: Arno Thomaes

What sets them apart?
- Handler invests a lot
- Species suitable for ecodog & samples for training
- Target finding efficacy is higher
- High demand

Diet of the first settled wolves (*Canis lupus*) in Flanders, Belgium

Timo Van Der Veken, Koen Van Den Berge, Jan Gouwy, Filip Berlengee & Kurt Schamp

Department of Wildlife management and Invasive Species, Research Institute of Forest and Nature, Gaverstraat 4, 9500 Geraardsbergen, Belgium, e-mail: timovanderveken@gmail.com

In addition, a dog called Wietse was used to actively search for scats starting from December 2020. This dog was trained to recognise the scent of wolf scats and to discriminate them from other species under different treatments: e.g. age of scats, different locations, leashed or unleashed. Reliability was successfully demonstrated by means of a blind test. Expert judgement was used as a double check in the field, but there were no disagreements.

Conference 19 nov 2022

CONFERENCE ON ECOLOGICAL DETECTION DOGS
Odisee University of Applied Sciences, Hospitaalstraat 23 in Sint-Niklaas, Belgium

Voorlopig programma:

- Science of ecological detection dogs - Annegret Grimm-Seyfarth

- Ecologische zoekhonden in Vlaanderen - Ellen Van Krunkelsven

- Het vliegend hert en zoekhonden - Arno Thomaes

- Wolvenmonitoring door de neus van Wietse- Jan Gouwy & Carina Depape

- Zoekhonden in Nederland - Hotsche Luik

- Detection in smuggled wildlife products - Isabelle Szott

- Detectie van glimwormlarven met zoekhonden - Mira Van den Broeck

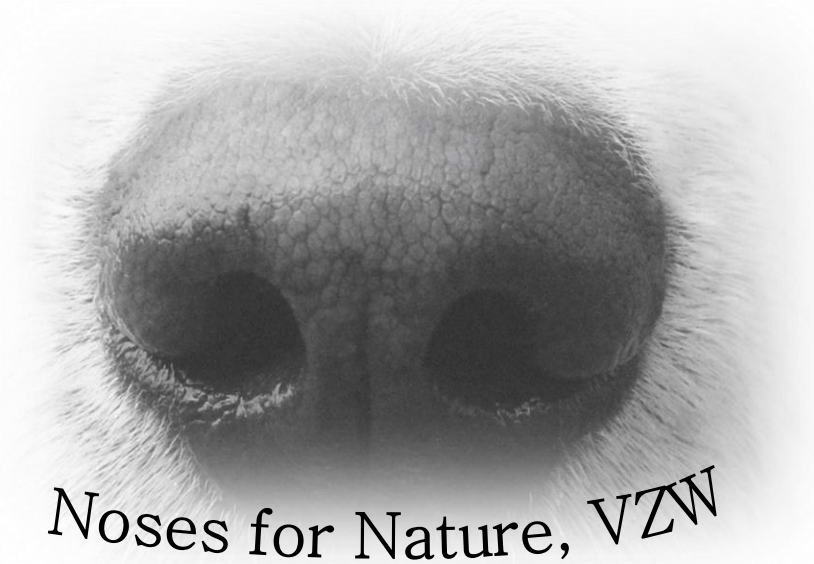- Zoekhondenprojecten in Odisee - Hilde Vervaecke

Future

Research & search for good practices
Connecting
Sharing
www.zoekdieren.odisee.be

Noses for Nature, VZW

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