

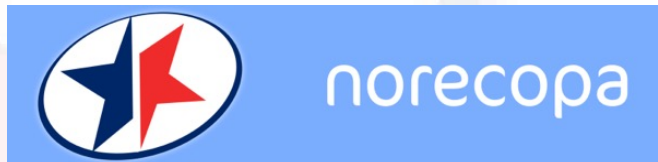
# Is wildlife research "second-rate science"? What can lab animal and field scientists learn from one another?

[norecopa.no/WC11-wildlife](https://norecopa.no/WC11-wildlife)

*The views expressed in this presentation are my own and not necessarily those of Norecopa*

Adrian Smith

[adrian.smith@norecopa.no](mailto:adrian.smith@norecopa.no)



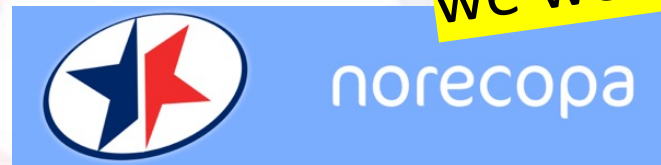
<https://norecopa.no>

Norecopa: PREPARE for better Science

# Norecopa

Norway's National Consensus Platform for the  
Three Rs: Replacement, Reduction and Refinement  
and a source of global 3R resources

we welcome more from you!



<https://norecopa.no>

Norecopa: PREPARE for better Science

## norecopa.no : an updated overview of global 3R resources



The screenshot shows the norecopa.no website interface. The header features the norecopa logo and navigation links: About Norecopa, Alternatives, Databases & Guidelines, Education & training, Legislation, Meetings, More resources, News, and PREPARE. A horizontal menu lists various topics such as Anaesthesia and analgesia, Animal facilities, Animal welfare organisations, Blood sampling, Culture, Email discussion lists, Environmental enrichment, Ethics, Experimental design and reporting, Harm, Health and safety, Health monitoring, Humane, Literature searches and systematic reviews, and Organisations. A breadcrumb trail shows the current page: norecopa.no / More resources / Experimental design and reporting. A search filters sidebar on the right includes sections for Search filters (Order by: Relevance, Typo tolerance: Default), Database (listing 10 databases with counts), Browse the databases (listing 7 categories with counts), and Search in the databases (listing 7 search criteria).

approx. 8,500 webpages  
300,000 hits annually  
7-8 detailed newsletters per year

### Design and reporting of animal experiments

This page supplements advice given in [Section 4 of the PREPARE guidelines](#). PREPARE covers all aspects of design (including animal and facility related issues).

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Search:

[About Norecopa](#) | [Alternatives](#) | [Databases & Guidelines](#) | [Education](#) | [Legislation](#) | [Meetings](#) | [More resources](#) | [News](#) | [PREPARE](#) | [Species](#) | [Wiki](#)

[Fish 2005](#) | [Wildlife 2008](#) | [Fish 2009](#) | [Agricultural animals](#) | [2017](#) | [Past meetings](#) | [Meetings Calendar](#) | [An informal guide to](#)

+ webpages for past meetings and recorded meetings

[norecopa.no/meetings/meetings-calendar](https://norecopa.no/meetings/meetings-calendar)

## Webinar and Meetings calendar

- > [Application of cardiac myocyte cell lines as models for heart diseases](#), webinar (Anna Koncz), 8 July 2021
- > [Berlin 3R seminar series: Refinement and Reduction](#), 8 July 2021
- > [How to perform a systematic review in biomedical research; lessons to improve reproducibility and rigour](#), webinar (Shona Lang), 9 July 2021
- > [Zebrafish as experimental model for research](#), webinar series, 8, 9, 15 & 16 July 2021
- > [VetBioNet Summer School: Animal Infectious Disease Research: Good Practice Approaches, Ethics & 3Rs by Design](#), 12-14 July 2021
- > [KALAS International Symposium](#), Jeju Island, 14-17 July 2021
- > [Berlin 3R seminar series: Replacement and Refinement](#), 17 July 2021
- > [Norecopa: A National Consensus Platform working to advance the 3Rs internationally](#), webinar (Adrian Smith), 19 July 2021
- > [Animal Research: Critical, Challenging & Creative Thinking Course](#), 19-22 July 2021

### August 2021

- > [Course in Animal, General, and Plant Biosafety and Biosecurity](#), Fort Collins, 2-6 August 2021
- > [ISAE2020 \(54th Congress of the International Society for Applied Biology\)](#), Bangalore, 2-6 August 2021
- > [4th International TCPF Preclinical Imaging Symposium](#), virtual event, 11-12 August 2021
- > [EPAA Satellite Training on Skin Sensitisation - Case Studies on DA](#), Maastricht, 22 August 2021
- > [11th World Congress on Alternatives and Animal Use in the Life Sciences](#), virtual event, 23 August - 2 September 2021
- > [ASAB Summer Virtual Meeting](#), 23-25 August 2021

## Pdf files of 80+ presentations held at Norecopa's meetings



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[Fish 2005](#) | 
 [Wildlife 2008](#) | 
 [Fish 2009](#) | 
 [Agricultural animals 2012](#) | 
 [Field research 2017](#) | 
 [Past meetings](#) | 
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 [An informal guide to arranging a scientific meeting](#) | 
 [Presentations](#)

## norecopa.no/meetings/presentations



Most of the presentations on this page are from events arranged by Norecopa. A few of them are from external events where Norecopa's staff have lectured.

They are grouped into

- > [General presentations](#)
- > [Care and use of animals in field research](#)
- > [Care and use of farm animals in research](#)
- > [Care and use of fish in research](#)

Title	Speaker	Affiliation	Year
<b>General presentations</b>			
<a href="#">Design of animal studies: Increasing reproducibility and animal welfare</a>	Adrian Smith	Norecopa	2020
<a href="#">PREPARE before you ARRIVE: Good reporting relies on good planning</a>	Adrian Smith	Norecopa	2019
<a href="#">Animal-free testing and humans-on-a-chip: How far have we come? </a>	Leopold Koenig	TissUse GMBH, Berlin, Germany	2017
<a href="#">Nordic 3R-Centres: What can we offer? </a>	Tom Bengtsen	Denmark's 3R-Center	2017
<a href="#">Prize-winning 3R activity in Norway </a>	Gøril Eide	University of Tromsø, Norway	2017
<a href="#">Have the 3Rs made any difference? </a>	Elliot Lilley	RSPCA, UK	2017



<https://norecopa.no/meetings>

## **International consensus meetings**

*Harmonisation of the Care and Use of:*

- *Fish (2005)*
- *Wildlife (2008)*
- *Fish (2009)*
- *Agricultural animals (2012)*
- *Wildlife (2017)*

**All the presentations and consensus statements  
on the web: a lasting resource**



## Databases & Guidelines

Published lists of resources are difficult to search and quickly become outdated. Lists on a website are easier to search, but do not enable the use of filters or intelligent search engines.

***Norecopa has therefore constructed four databases, which together with all the text on this website can be searched simultaneously using the search field at the top of every page.***

- > **3R Guide:** a global overview of **databases, guidelines, information centres, journals, email lists, regulations and policies** which may be of use when planning experiments which might include animals. [A quick overview of all the guidelines can be accessed here.](#) Norecopa has written several of these, including [the PREPARE guidelines for planning animal research and testing.](#)
- > **NORINA:** a global overview of audiovisual aids and other items which may be used as **alternatives or supplements to animals in education and training** at all levels from junior school to University, including [dissection alternatives](#) and surgical simulators.
- > **TextBase:** a global overview of **textbooks and other literature within laboratory animal science** and related topics.
- > **Classic AVs:** a subset of NORINA covering **audiovisual aids that are based on older technology.**

These databases are updated regularly. [Please give us feedback](#) if you discover errors or omissions.

The Norecopa website also includes four other collections:

- > **NAL:** a collection of literature references relating to [the 3Rs](#) from the US National Agricultural Library
- > European Commission datasets:
  - ▶ **3Rs Knowledge Sources:** over 800 resources collected by the Commission in 2016
  - ▶ **3Rs Education and Training Resources,** over 560 items collected in 2018
  - ▶ **Non-animal models for respiratory tract diseases,** over 280 models identified in a literature review of over 21,000 publications

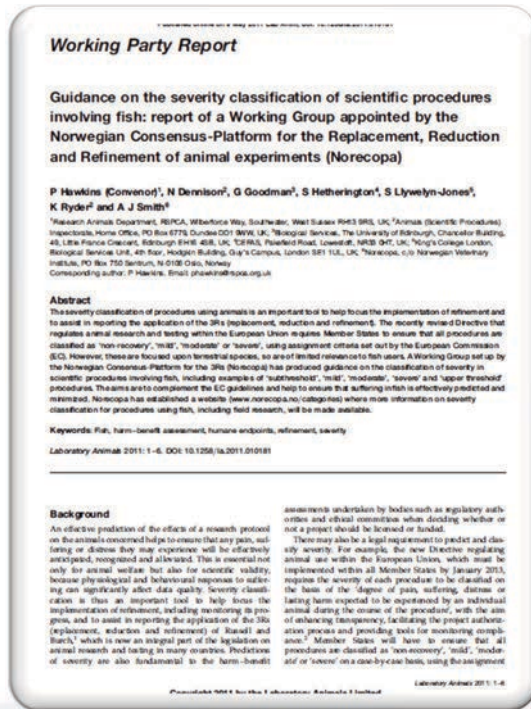
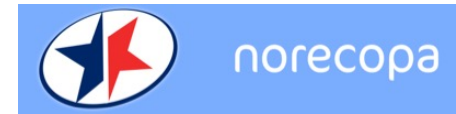
Here is [an alphabetical global list of all the databases](#) cited on the Norecopa website.

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[norecopa.no/databases-guidelines](https://norecopa.no/databases-guidelines)

links to over 70 other databases

From **3R-Guide** (380 guidelines for animal research and testing)  
[norecopa.no/3r-guide](http://norecopa.no/3r-guide)



## Guidance on the severity classification of procedures involving fish

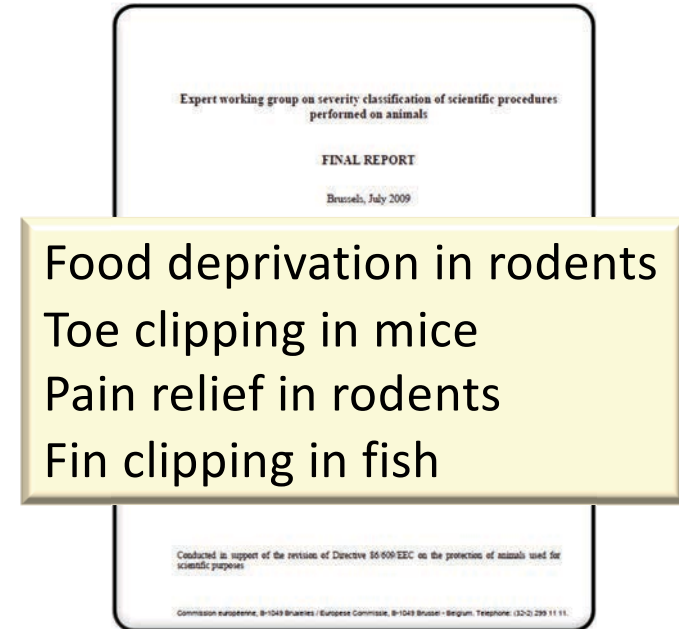
Report from a Working Group convened by Norecopa

P Hawkins, N Dennison, G Goodman, S Hetherington, S Llywelyn-Jones, K Ryder and AJ Smith

Laboratory Animals, 45: 219-224, 2011

Norecopa: PREPARE for better Science

[norecopa.no/categories](http://norecopa.no/categories)



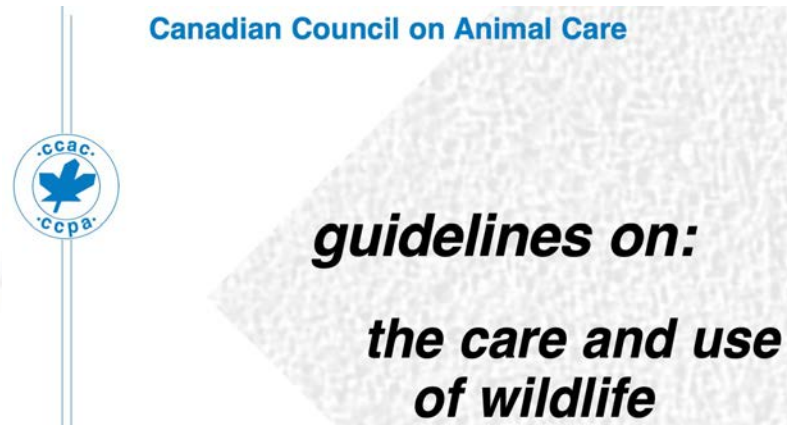
[http://ec.europa.eu/environment/chemicals/lab\\_animals/pdf/report\\_ewg.pdf](http://ec.europa.eu/environment/chemicals/lab_animals/pdf/report_ewg.pdf)



From **3R-Guide** (380 guidelines for animal research and testing)

[norecopa.no/3r-guide](http://norecopa.no/3r-guide)

**70 resources where wildlife are mentioned**



Open Access Article

## Refining Housing, Husbandry and Care for Animals Used in Studies Involving Biotelemetry

by  Penny Hawkins 

Trapping and Marking Terrestrial Mammals for Research: Integrating Ethics, Performance Criteria, Techniques, and Common Sense



Original Article

**PREPARE: guidelines for planning animal research and testing**

Adrian J Smith<sup>1</sup>, R Eddie Clutton<sup>2</sup>, Elliot Litley<sup>3</sup>, Kristine E Aa Hansen<sup>4</sup> and Trond Bratteli<sup>5</sup>

**Abstract**  
There is widespread concern about the quality, reproducibility and translatability of studies involving research animals. Although there are a number of reporting guidelines available, there is very little overarching guidance on how to plan animal experiments, despite the fact that this is the logical place to start ensuring quality. In this paper we present the PREPARE guidelines: Planning Research and Experimental Procedures on Animals: Recommendations for Excellence. PREPARE covers the three broad areas which determine the quality of the preparation for animal studies: formulation, dialogue between scientists and the animal facility, and quality control of the various components in the study. Some topics overlap and the PREPARE checklist should be adapted to suit specific needs, for example in field research. Advice on use of the checklist is available on the Norecopa website, with links to guidelines for animal research and testing, at <https://norecopa.no/PREPARE>.

**Keywords**  
guidelines, planning, design, animal experiments, animal research

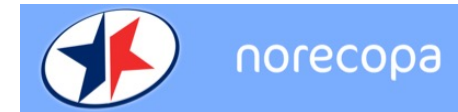
Date received: 5 April 2017; accepted: 27 June 2017

**Introduction**  
The quality of animal-based studies is under increasing scrutiny, for good scientific and ethical reasons. Studies of papers reporting animal experiments have revealed alarming deficiencies in the information provided,<sup>1,2</sup> even after the production and journal endorsement of reporting guidelines.<sup>3</sup> There is also widespread concern about the lack of reproducibility and translatability of laboratory animal research.<sup>4-7</sup> This can, for example, contribute towards the failure of drugs when they enter human trials.<sup>8</sup> These issues come in addition to other concerns, not unique to animal research, about publication bias, which tends to favour the reporting of positive results and can lead to the acceptance of claims as fact.<sup>9</sup> This has understandably sparked a demand for reduced waste when planning experiments involving animals.<sup>10-12</sup> Reporting guidelines alone cannot solve the problem of wasteful experimentation, but thorough planning will increase the likelihood of success and is an important step in the implementation of the 3Rs of Russell & Burch (replacement, reduction, refinement).<sup>13</sup> The importance of attention to detail at all stages is,

in our experience, often underestimated by scientists. Even small practical details can cause omissions or artefacts that can ruin experiments which in all other respects have been well-designed, and generate health risks for all involved. There is therefore, in our opinion, an urgent need for detailed but overarching guidelines for researchers on how to plan animal experiments which are safe and scientifically sound, address animal

Laboratory Animals  
0011-7  
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DOI: 10.1177/0023677217724823  
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laboratory animals



Pre-published under Open Access on 3 August 2017 in *Laboratory Animals*, sponsored by the Universities Federation for Animal Welfare (UFAW), UK



<https://doi.org/10.1177/0023677217724823>

Over 19,000 downloads from the journal website so far

Also downloadable from

[norecopa.no/PREPARE](https://norecopa.no/PREPARE)

Norecopa: PREPARE for better Science

## **PREPARE:**

Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

PREPARE covers 15 topics:

### **Formulation of the study**

1. Literature searches
2. Legal issues
3. Ethical issues, harm-benefit assessment and humane endpoints
4. Experimental design and statistical analysis

### **Dialogue between scientists and the animal facility**

5. Objectives and timescale, funding and division of labour
6. Facility evaluation
7. Education and training
8. Health risks, waste disposal and decontamination

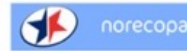
### **Methods**

9. Test substances and procedures
10. Experimental animals
11. Quarantine and health monitoring
12. Housing and husbandry
13. Experimental procedures
14. Humane killing, release, reuse or rehoming
15. Necropsy

Items in pink are not typically highlighted in reporting guidelines



# PREPARE



## The PREPARE Guidelines Checklist

### Planning Research and Experimental Procedures on Animals: Recommendations for Excellence

Adrian J. Smith<sup>1</sup>, R. Eddie Clutton<sup>2</sup>, Elliot Lilley<sup>3</sup>, Kristine E. Aa. Hansen<sup>4</sup> & Trond Brattelid<sup>5</sup>

<sup>1</sup>Norecopa, c/o Norwegian Veterinary Institute, P.O. Box 750 Sentrum, 0106 Oslo, Norway; <sup>2</sup>Royal (Dick) School of Veterinary Studies, Easter Bush, Midlothian, EH25 9RG, U.K.; <sup>3</sup>Research Animals Department, Science Group, RSPCA, Wiberforce Way, Southwater, Horsham, West Sussex, RH13 9RS, U.K.; <sup>4</sup>Section of Experimental Biomedicine, Department of Production Animal Clinical Sciences, Faculty of Veterinary Medicine, Norwegian University of Life Sciences, P.O. Box #140 Dep., 0033 Oslo, Norway; <sup>5</sup>Division for Research Management and External Funding, Western Norway University of Applied Sciences, 5020 Bergen, Norway.

PREPARE<sup>®</sup> consists of planning guidelines which are complementary to reporting guidelines such as ARRIVE<sup>®</sup>. PREPARE covers the three broad areas which determine the quality of the preparation for animal studies:

1. Formulation of the study
2. Dialogue between scientists and the animal facility
3. Quality control of the components in the study

The topics will not always be addressed in the order in which they are presented here, and some topics in the checklist can be adapted to meet special needs, such as field studies. PREPARE includes guidance on facilities, since in-house experiments are dependent upon their quality. The full version of the guideline is available on the norecopa website, with links to global resources, at <https://norecopa.no/PREPARE>.

The PREPARE guidelines are a dynamic set which will evolve as more species- and situation-specific guidelines are produced, and as best practice within Laboratory Animal Science progresses.

Topic	Recommendation
<b>(A) Formulation of the study</b>	
1. Literature searches	<input type="checkbox"/> Form a clear hypothesis, with primary and secondary outcomes. <input type="checkbox"/> Consider the use of systematic reviews. <input type="checkbox"/> Identify upon databases and information specialists to be consulted, and construct search terms. <input type="checkbox"/> Assess the relevance of the species to be used, its biology and suitability to answer the experimental questions with the least suffering, and to welfare needs. <input type="checkbox"/> Assess the reproducibility and translatability of the project.
2. Legal issues	<input type="checkbox"/> Consider how the research is affected by relevant legislation for animal research and other areas such as animal transport, occupational health and safety. <input type="checkbox"/> Locate relevant guidance documents for animal research.
3. Ethical issues	<input type="checkbox"/> Consider the ethical implications of the research, good sense, and the potential for harm to the animals. <input type="checkbox"/> Perform a harm-benefit assessment and justify any likely animal harm. <input type="checkbox"/> Discuss the learning objectives, if the animal use is for educational or training purposes. <input type="checkbox"/> Avoid a merely descriptive or descriptive project. <input type="checkbox"/> Define objective, easily measurable and unequivocal humane endpoints. <input type="checkbox"/> Discuss the justification, if any, for death as an end-point.
4. Experimental design and statistical analysis	<input type="checkbox"/> Consider pilot studies, statistical power and significance levels. <input type="checkbox"/> Define the experimental unit and decide upon animal numbers. <input type="checkbox"/> Choose methods of randomisation, prevent observer bias, and decide upon inclusion and exclusion criteria.

Three Rs!

Let us know if you would like another language!

Topic	Recommendation
<b>(B) Dialogue between scientists and the animal facility</b>	
5. Objectives and timescale, funding and division of labour	<input type="checkbox"/> Arrange meetings with all relevant staff when early plans for the project exist. <input type="checkbox"/> Construct an approximate timescale for the project, indicating the need for assistance with preparation, animal care, procedures and waste disposal/decontamination. <input type="checkbox"/> Discuss and disclose all expected and potential costs. <input type="checkbox"/> Construct a detailed plan for division of labour and expenses at all stages of the study.
6. Facility selection	<input type="checkbox"/> Conduct a physical inspection of the facilities, to evaluate building and equipment standards and needs. <input type="checkbox"/> Discuss staffing levels at times of extra risk.
7. Staffing and training	<input type="checkbox"/> Assess the current competence of staff members and the need for further education or training prior to the study.
8. Risk assessment	<input type="checkbox"/> Perform a risk assessment, in collaboration with the animal facility, for all persons and animals affected by the study. <input type="checkbox"/> Assess, and if necessary produce, specific guidance for all stages of the project. <input type="checkbox"/> Discuss means for containment, decontamination, and disposal of all items in the study.
<b>(C) Quality control of the components in the study</b>	
9. Test substances and procedures	<input type="checkbox"/> Provide as much information as possible about test substances. <input type="checkbox"/> Consider the feasibility and validity of test procedures and the skills needed to perform them.
10. Experimental animals	<input type="checkbox"/> Decide upon the characteristics of the animals that are essential for the study and for reporting. <input type="checkbox"/> Avoid generation of surplus animals.
11. Quarantine and health monitoring	<input type="checkbox"/> Discuss the animals' health and welfare needs.
12. Procedures for capture, immobilisation, marking, and release or rehoming	<input type="checkbox"/> Develop refined procedures for capture, immobilisation, marking, and release or rehoming. <input type="checkbox"/> Develop refined procedures for substance administration, sampling, sedation and anaesthesia, surgery and other techniques.
14. Humane killing, release, reuse or rehoming	<input type="checkbox"/> Consult relevant legislation and guidelines well in advance of the study. <input type="checkbox"/> Define primary and emergency methods for humane killing. <input type="checkbox"/> Assess the competence of those who may have to perform these tasks.
15. Necropsy	<input type="checkbox"/> Construct a systematic plan for all stages of necropsy, including location, and identification of all animals and samples.

#### References

1. Smith AJ, Clutton RE, Lilley E, Hansen KEA & Brattelid T. PREPARE Guidelines for Planning Animal Research and Testing. *Laboratory Animals*, 2017, DOI: 10.1177/002367721724423.
2. Kilkenny C, Browne WJ, Cuthill IC et al. Improving Bioscience Research Reporting: The ARRIVE Guidelines for Reporting Animal Research. *PLoS Biology* 2010; DOI: 10.1371/journal.pbio.1000412.

Further information  
<https://norecopa.no/PREPARE> | [post@norecopa.no](mailto:post@norecopa.no) | [@norecopa](https://twitter.com/norecopa)



- 3-Ethical issues, harm-benefit assessment and humane endpoints
  - 3a Construct a lay summary.
  - 3b In dialogue with ethics committees, consider whether statements about this type of research have already been produced.
  - 3c Address the 3Rs (Replacement, Reduction, Refinement) and the 3Ss (Good Science, Good Sense, Good Sensibilities).
  - 3d Assessment and justify any likely animal harm.
  - 3f Discuss the learning objectives, if the animal use is for educational or training purposes.
  - 3g Allocate a severity classification to the project.
  - 3h Define objective, easily measurable and unequivocal humane endpoints.
  - 3i Discuss the justification, if any, for death as an end-point.
- 4-Experimental design and statistical analysis

- 5. Have the experiments been carried out before, and is any repetition justifiable?
- 6. What [approaches to reduce distress](#) have been considered?

3a Construct a lay summary.

- General principles
- For fish researchers
- For field researchers

1. Have national or local research ethics committees already produced statements relevant to the research being planned? Consideration should also be paid to the broader context of the research. For example, research directed at increasing the productivity of farming at the expense of (or without improving) individual animal welfare, or wildlife research whose primary aim is population management.

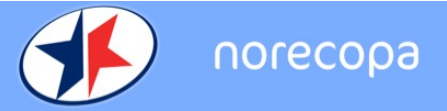
Links to quality guidelines and scientific papers worldwide on e.g. blood sampling, injection volumes, housing and husbandry, analgesia, humane endpoints, experimental design

and will any advances in this cases only index the title and rejected?

- 3. Have the Three S's ([Good Science, Good Sense and Good Sensibilities](#)) been addressed? Sufficient time should be allocated to this point, since two of the three S's are highly subjective, but equally important. The use of commonsense and critical anthropomorphism are justifiably part of the work to assess the impact of research on animals, not least when a scientific evidence base does not exist.
- 4. Does the proposed study have a clear rationale and scientific relevance, and what will be the next step if the hypothesis is supported or rejected?
- 5. Have the experiments been carried out before and is any repetition justifiable?
- 6. What [approaches to reduce distress](#) have been considered?
- 7. Will the project undergo [pre-registration](#) and will negative results be published, to avoid publication bias?

Many more [links to resources on ethics are available here](#). Details about pre-registration of animal studies and reporting of critical incidents are to be found in the section on [Experimental Design and Statistical Analysis](#).

Harm-Benefit Assessment



The header of the Norecoba website features a blue background. On the left is the Norecoba logo, a stylized star in a circle. To its right is the text 'norecoba'. Further right are language options 'NORSK' and 'ENGLISH'. Below these is a search bar with the text 'Search: Q'. At the bottom of the header is a navigation menu with the following items: 'About Norecoba', 'Alternatives', 'Databases & Guidelines', 'Education & training', 'Legislation', 'Meetings', 'More resources', 'News', 'PREPARE', 'Species', and 'Wiki'.

[Fish](#) | [Farm animals](#) | [Laboratory animals](#) | [Wildlife and wild fish](#) | [Cephalopods](#) | [Other aquatic animals](#)

[norecoba.no](#) / [Species](#) / [Wildlife and wild fish](#)

## Research on wildlife and wild fish

Research on wild-living animals places special demands on experimental design, since it takes place under uncontrollable environmental conditions. There are also a range of ethical problems in addition to those which apply to all animal research.

Norecoba arranged an international consensus meeting in May 2008 entitled:

[Harmonisation of the Care and Use of Animals in Wildlife Research](#)

All the presentations from the meeting, as well as [a consensus document](#) written by the participants, can be downloaded. The document describes the status and challenges related to wildlife research. At the meeting, Dr. Penny Hawkins presented an overview of [guidelines for wildlife research](#).

A follow-up to this meeting, entitled [Harmonisation of the Care and Use of Wild and Domestic Mammals and Birds in Field Research](#), was held at Oslo Airport on 26-27 October 2017.

Norecoba's database 3R Guide contains [a list of guidelines for wildlife research](#).

Guidance on planning experiments is available in [the PREPARE guidelines](#).

The [STRANGE](#) guidelines may be used to identify, and mitigate, potential sampling

[norecoba.no/species/wildlife-and-wild-fish](https://norecoba.no/species/wildlife-and-wild-fish)

Norecoba: PREPARE for better Science

[wiki.norecopa.no](http://wiki.norecopa.no)

## The Refinement Wiki

Born from the knowledge that a lot of good ideas on refinement circulate on discussion forums, but never get published.



Designed to be

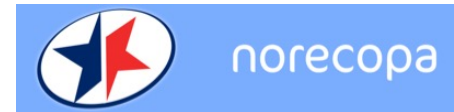
- a portal for rapid publication and dissemination of these ideas
- a place to identify experts on specific refinement techniques
- an aid to finding collaborators for multi-lab studies on refinement

# Refinement Wiki



- Main page
- Recent changes
- Random page
- Help about MediaWiki
- Tools
- What links here
- Related changes
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## Clicker training

Clicker training is an operant conditioning based on positive reinforcement. When the animal offers the desired behavior, a *click* or another distinctive sound (secondary reinforcer) is delivered and within the following few seconds the reward is presented (primary reinforcer)<sup>[1]</sup>. The *click* bridges the time between the desired behavior and the presentation of the reward<sup>[1]</sup>. A target stick providing a visual guide for the animal can be used for the training.

Animals are usually trained individually, though it is also possible to perform clicker training in a groups, e.g. in mice, rats, and rabbits. For rats, it was demonstrated that they learned tasks by observing the clicker training of their cage mates<sup>[2]</sup>.

Clicker training can be used to train animals in a stress-free way. The following behaviours are examples for what this technique can be used for:

**Mice:** entering a tunnel, following a target stick, climbing on the palm of the hand<sup>[3]</sup>

**Rats:** following a target stick, voluntarily change to a cage, observational learning<sup>[2]</sup>

**Rabbits:** following a target stick, rearing/standing up to inspect the abdomen, approaching a human, being touched and lifted by a human, trimming nails, coming on command

**Pigs:** Pigs can be easily trained to cooperate if they are treated empathetically and desired behavior is reinforced by providing food stuff in form of treats and apple juice<sup>[4]</sup>.



**Clicker training with mice using a target stick.** *Left:* The mouse is following the target stick and is climbing on the experimenter's hand. If the hand is lifted, the mouse will remain on the palm of the hand. *Right:* The mice are trained in a group. Two mice are following the target stick on the palm of the experimenter's hand.

- <sup>1</sup> <sup>1.0</sup> <sup>1.1</sup> Feng, Lynna C.; Howell, Tiffani J.; Bennett, Pauleen C. (1 August 2016). "How clicker training works: Comparing Reinforcing, Marking, and Bridging Hypotheses". *Applied Animal Behaviour Science*. **181**: 34–40. doi:10.1016/j.applanim.2016.05.012. ISSN 0168-1591.
- <sup>2</sup> <sup>2.0</sup> <sup>2.1</sup> Leidinger, Charlotte Sophie; Kaiser, Nadine; Baumgart, Nadine; Baumgart, Jan (25 October 2018). "Using Clicker Training and Social Observation to Teach Rats to Voluntarily Change Cages". *JoVE (Journal of Visualized Experiments)* (140): e58511. doi:10.3791/58511. ISSN 1940-087X. PMC 6235608. PMID 30417890.
- <sup>3</sup> Leidinger, Charlotte; Herrmann, Felix; Thöne-Reineke, Christa; Baumgart, Nadine; Baumgart, Jan (6 March 2017). "Introducing Clicker Training as a Cognitive Enrichment for Laboratory Mice". *JoVE (Journal of Visualized Experiments)* (121): e55415. doi:10.3791/55415. ISSN 1940-087X. PMC 5408971. PMID 28287586.
- <sup>4</sup> "Positive Reinforcement Training in Large Experimental Animals" (PDF).

**Experts for clicker training in mice and rats:** TARC, Mainz, Germany

This page was created and edited by KH191219 (talk).

This page was last edited on 27 May 2020, at 11:23.

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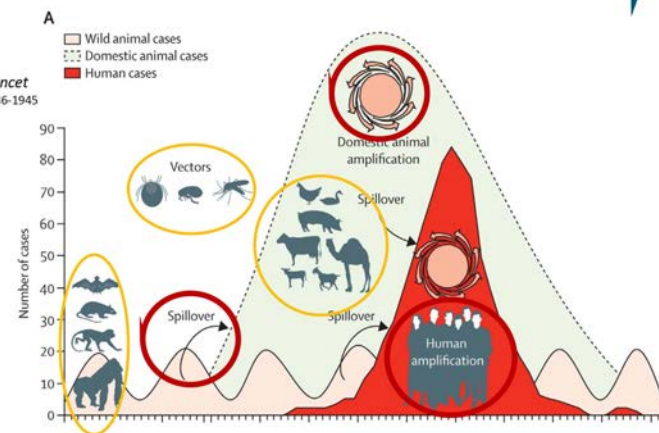
Norecopa: PREPARE for better Science



'Wildlife research is now recognised as part of the One Health concept, as the study of disease transmission and population movements becomes more important'



Karesh et al., 2012. *The Lancet*  
Volume 380, Issue 9857, Pages 1936-1945



From Carlos das Neves: <https://norecopa.no/media/8059/carlos-das-neves.pdf>

## ***Some of the major challenges***

- Dissemination of advances within the 3Rs
- Research or Population Management?
- Severity assessment
- The role of the veterinarian
- Education and competence

## ***Research or Population Management?***

- Permission?



[bobhayesyukon.com](http://bobhayesyukon.com)

## ***Research or Population Management?***

- Capture of wild animals shall be carried out only by competent persons using methods which do not cause the animals avoidable pain, suffering, distress or lasting harm (article 9(3), 2010/63)
- Capture *per se* (regardless of the purpose) is not a regulated procedure when performed by competent persons using methods which do not cause avoidable pain, suffering, distress or lasting harm (*is this possible from a helicopter?*)
- 2010/63 does not apply to practices undertaken for the primary purpose of identification of an animal (article 1.5(3). Bird ringing is used as an example.
- The use of anaesthesia in itself is likely to be a regulated procedure
- But usually data is collected which subsequently can be used for scientific research
- If these samples are taken for a scientific purpose by a method which reaches the Directive's threshold, then the procedure falls within the scope
- Regardless, who conducts a harm-benefit assessment?
- Does the wolf experience any difference?
- Can the animal instead be tracked by non-invasive methods? (visual observations, footprints, eDNA - analysis of faeces, hair etc.)



# Novel Collars Aid in Assessing Disease Risks

By Dr. Larry Clark, NWRC Director, USDA APHIS Wildlife Services

*Posted on February 6, 2015*



A white-tailed deer sports several devices used to capture contact rates among individuals.  
Image Credit: Michael Lavelle, USDA Wildlife Services

[wildlife.org/measuring-contact-novel-collars-aid-in-assessing-disease-risks](http://wildlife.org/measuring-contact-novel-collars-aid-in-assessing-disease-risks)

[norecopa.no/meetings/nordic-webinars](http://norecopa.no/meetings/nordic-webinars)



**Nordic 3R webinars, 5-6 May 2021**

organised by

- ArcticLAS
- Danish 3R-Center
- Finnish 3R Centre
- Finnish Centre for Alternative Methods (FICAM)
- Karolinska Institutet
- Norecopa
- Swedish 3Rs Center
- Swedish Centre for Animal Welfare (SCAW)
- Swedish University of Agricultural Sciences (SLU)
- University of Copenhagen
- University of Helsinki
- University of Oulu

## Using DNA technology to monitor the movement of wildlife without invasive tracking and tagging systems



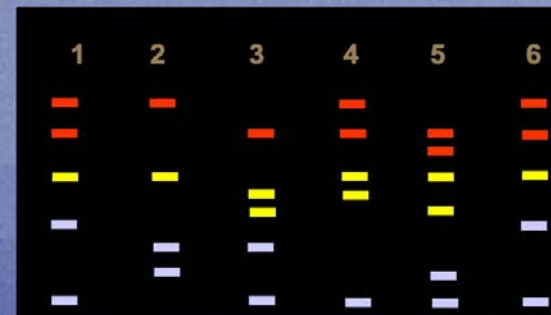
**Øystein Flagstad**



## DNA-based monitoring Scandinavian carnivores

DNA-profiles from the scat samples provide unique ID-codes (1=6), that can be traced back to certain individuals in the target population(s)

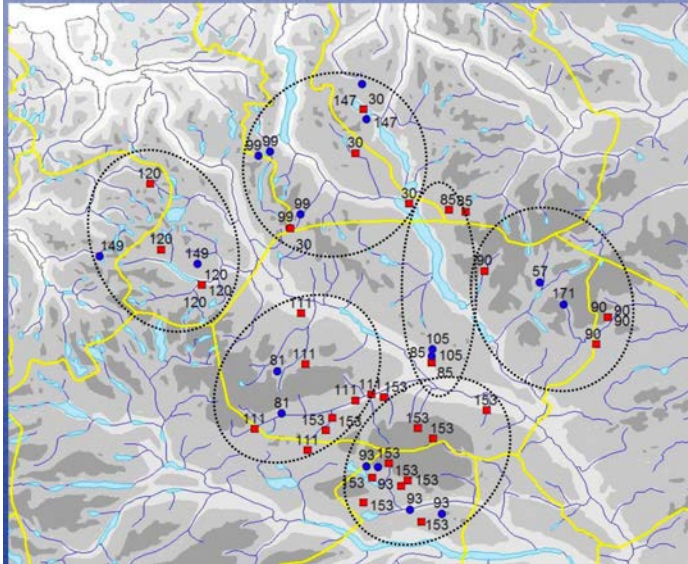
Yearly sample collection allow us to follow the same individuals during a period of several years



- home range and territories
- reproduction
- dispersal and migration patterns
- population size and - dynamics
- genetic structure; levels of isolation

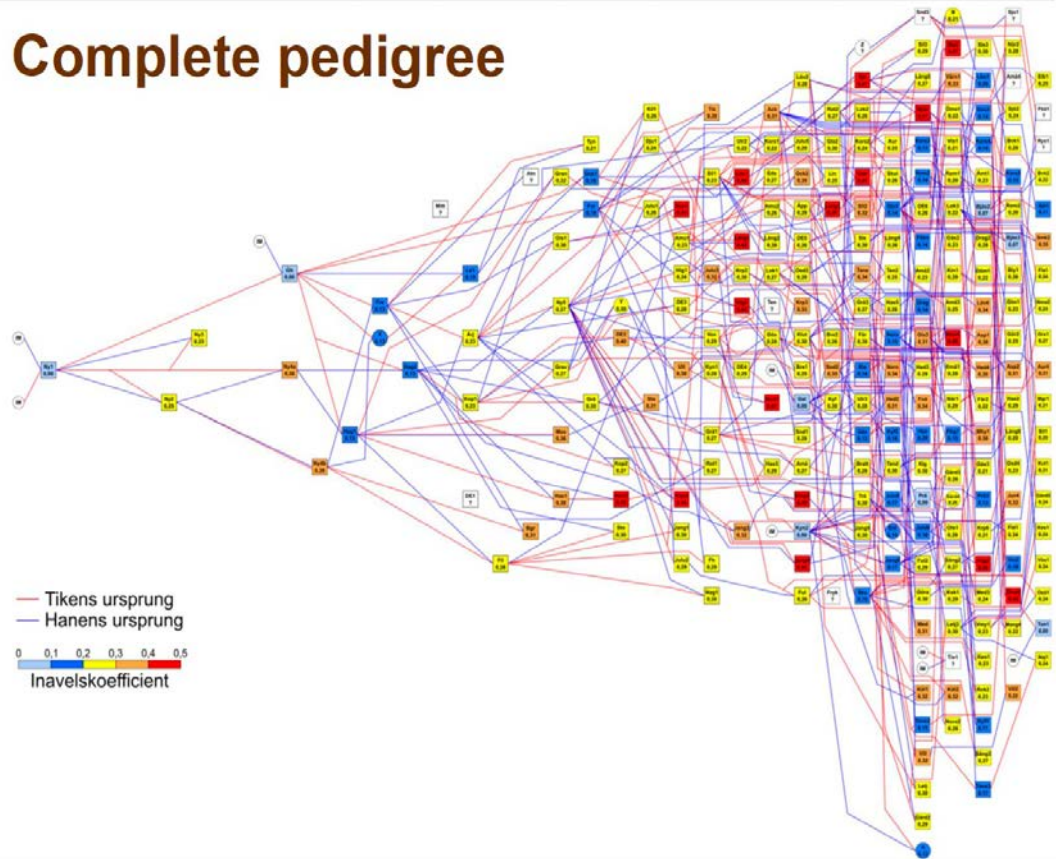
Screenshot

# Mapping territorial wolverines



År 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16

# Complete pedigree





## *A 4th R: Reality (John Linnell)*



From Jon M. Arnemo: [norecopa.no/media/7996/arnemo.pdf](https://norecopa.no/media/7996/arnemo.pdf)

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## Severity classification for procedures in field research...?



photo: Svalbardposten



SMERTER: Denne villreinen måtte avlives i Nordfjella. En isklump på GPS halsbåndet hadde vokst seg større enn hodet på reinen.

Av TOR-HARTVIG BONDO og LINN K. YTTERVIK  
(VG) 22.01.2016 20:27

49

annonse

photo: vg.no

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## CIRS-LAS Portal

Critical incident reporting system in laboratory animal science

**Refine - Reduce - Replace**

What if things go wrong?

Detect  
a critical  
incident

Anonymous  
report

CIRS-LAS.de

**MUTUAL LEARNING** from errors, near misses, critical or even adverse events occurring in the context of animal experimentation prevents unnecessary repetition of unsuccessful experiments

**CRITICAL DISCUSSIONS** on causes and approaches to solutions lead to an increase in animal welfare

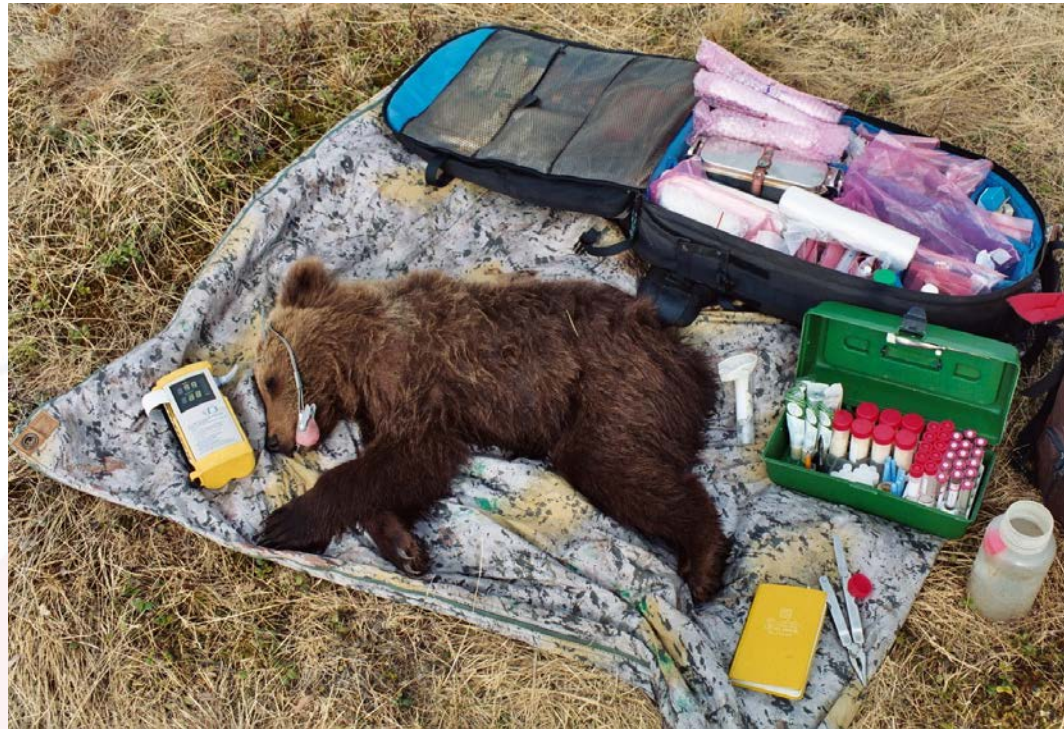
**OPEN DIALOGUE** ensures transparency in laboratory animal science

We all  
learn  
from it!

Get involved!

Expert  
analysis

## Monitoring, emergencies & treatment

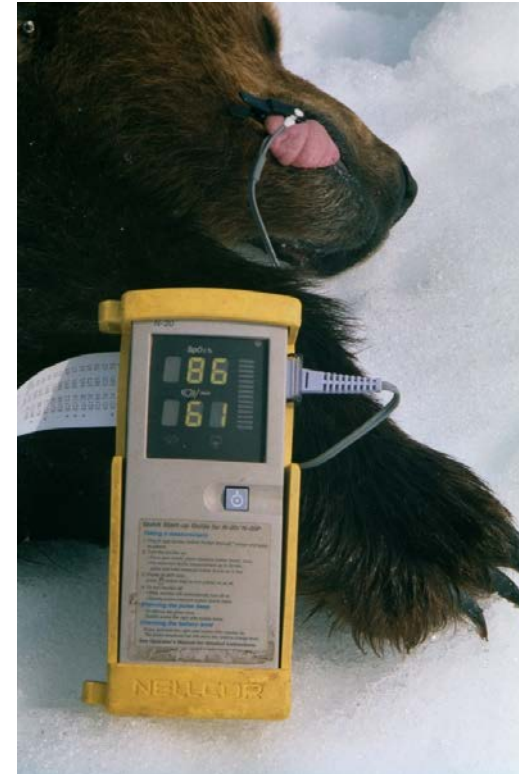


From Jon M. Arnemo: [norecopa.no/media/7996/arnemo.pdf](https://norecopa.no/media/7996/arnemo.pdf)



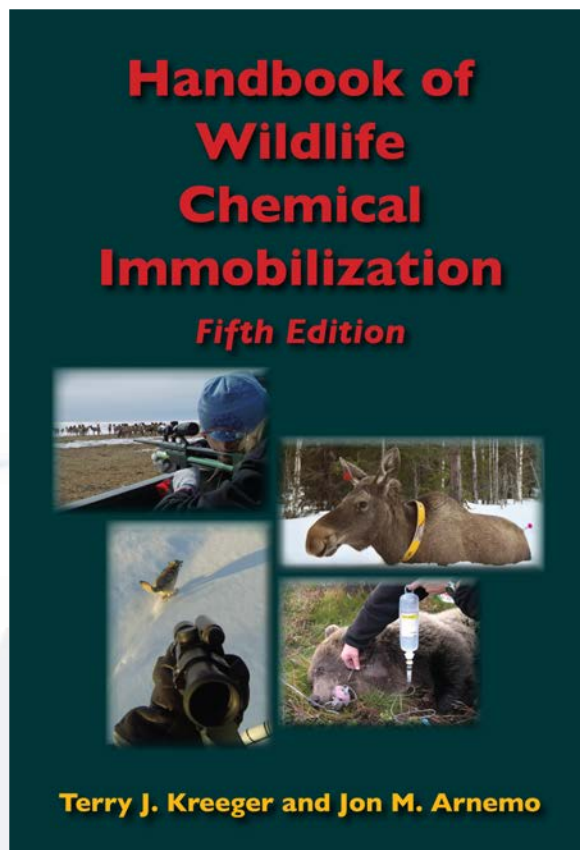
## Equipment

- Handling (eye ointment & cover)
- Carrying and positioning
- Vitals (T, HR, RR, CRT)
- Anesthetic depth (safety)
- Blood oxygenation (pulse oximeter)
- Blood gases (iStat)
- Oxygen (tubes or concentrator)
- ET tubes, bag
- Heart monitor (ECG)
- Blood pressure
- Stomach tube, rumen trochar
- Fluids, IV line
- Surgical kit (wound treatment)
- Antibiotics, emergency drugs
- Euthanasia (firearm, drugs)



From Jon M. Arnemo: [norecopa.no/media/7996/arnemo.pdf](https://norecopa.no/media/7996/arnemo.pdf)

# Sharing best practice



[norecopa.no/Arnemo](http://norecopa.no/Arnemo)

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## Biomedical Protocols for Free-ranging Brown Bears, Wolves, Wolverines and Lynx

Jon M. Arnemo & Alina L. Evans



Inland Norway University of Applied Sciences  
Campus Evenstad

2017





*Journal of Insect Science*, (2020) 20(6): 5; 1–19  
doi: 10.1093/jisesa/ieaa028  
Protocols

---

## **Practical Guide to Trapping *Peromyscus leucopus* (Rodentia: Cricetidae) and *Peromyscus maniculatus* for Vector and Vector-Borne Pathogen Surveillance and Ecology**

Erika T. Machtinger<sup>1,3,•</sup> and Scott C. Williams<sup>2</sup>



'If possible, methods can be practiced on laboratory mice before performing these functions in the field and to learn the potential risks and unintended results that may require mitigation (i.e., respiration depression, hemorrhage during blood draws, etc.).'

'Death by exsanguination is not a requirement of the cardiac puncture technique and smaller blood volumes can be easily obtained without harm to the animal.'

## ***Unforeseen effects***

Drag occurs in water as well as in the air...



Photo: T. Poppe, NMBU

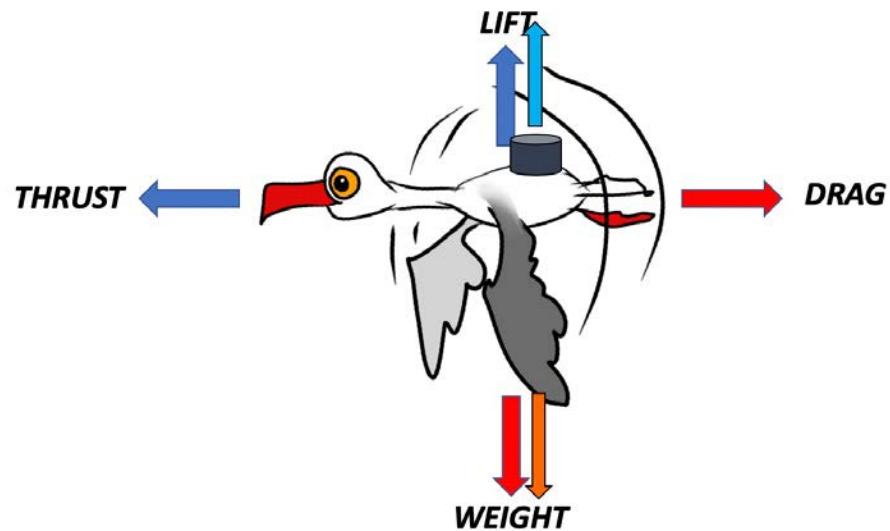


<https://www.nationalgeographic.com/science/article/flipper-bands-impair-penguin-survival-and-breeding-success>

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Primary effects

The increased lift balances the extra force from the tag weight



From Rory Wilson: [norecopa.no/media/8018/rory-wilson.pdf](http://norecopa.no/media/8018/rory-wilson.pdf)

### ***Action Points from the Consensus Meeting:***

- Ensure that decisions on capture, marking and tracking are made with input from the central animal research authorities, regardless as to whether it is science or management
- More species- and situation-specific guidelines need to be developed, and the National Committees must share best practice
- Capture and restraint should be reduced to a minimum, and their replacement by non-invasive methods encouraged
- Pay more attention to the effects of external devices
- Liase with industry to produce better devices
- Create an accessible inventory of field methods
- Collect examples of severity classification
- Develop more modules for education in field research

## ***Who should be doing what?***

Regulators:

- Work with other competent authorities to decide whether procedures fall within the scope of 2010/63, or within the jurisdiction of other legislation
- Share best practice nationally and internationally



## Field researchers:

- Ensure implementation of the legislation
- Encourage harm-benefit assessment, even if the procedure falls outside the scope of 2010/63
- Apply the 3Rs systematically at all stages
- Promote advances in the 3Rs at their scientific meetings
- Publish failures as well as successes

Norecopa (*and therefore also other 3R Centres*):

- Arrange regular meetings with all stakeholders
- Collect, review and stimulate the production of guidelines and protocols
- Encourage other 3R Centres to do the same

## ***General conclusions***

[Amazon.com](https://www.amazon.com)

- Communicate
- Show mutual respect and humility
- Avoid turning this into a conflict of professions
- Agree upon implementation of the 3Rs
- PREPARE
- Be transparent about the results
- Share best practice nationally and internationally


# 3rswildlife.info

**3Rs** PRINCIPLES IN WILDLIFE RESEARCH

BACKGROUND ▾ EXAMPLES OF 3RS IMPLEMENTATION ▾ FAQ LINKS AUTHOR CONTACT

## 3Rs PRINCIPLES IN WILDLIFE RESEARCH

This site has been created to provide information about the 3Rs principles of animal use and guide their application in wildlife research. It contains examples of peer-reviewed studies that implemented non-lethal or non-invasive methods and that could be used as a guidance. It is the first online resource of its kind developed specifically for wildlife biologists, ecologists, and conservation managers.

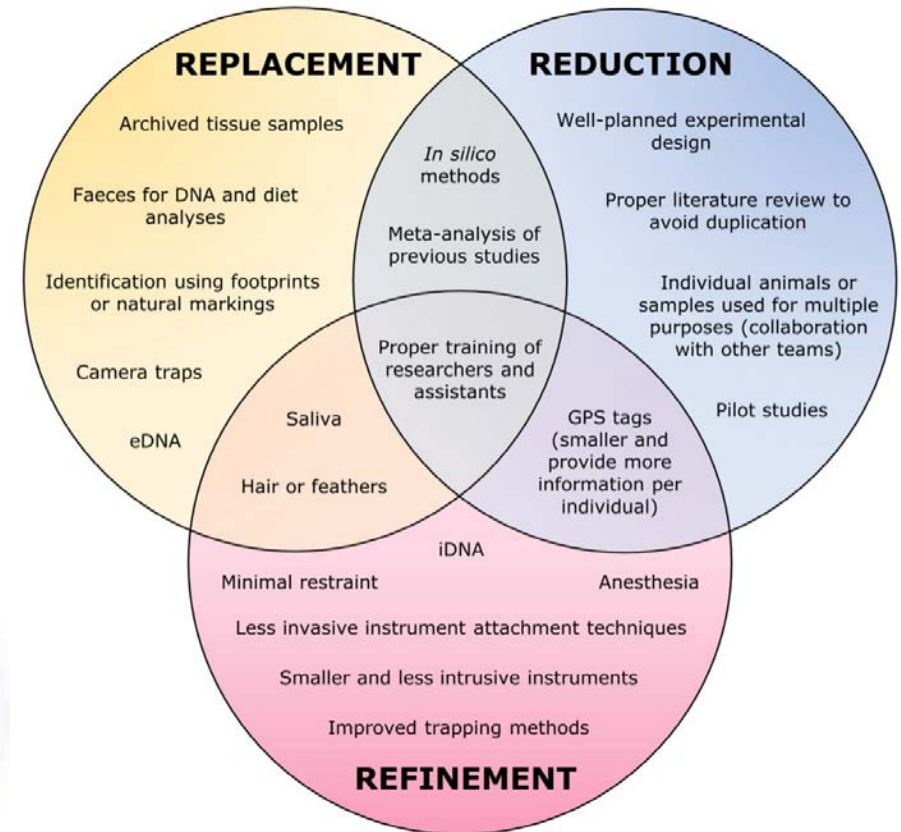


**Featured so far:**

<b>71</b>	<b>937</b>	<b>603</b>
NON-INVASIVE METHODS	SPECIES	PEER-REVIEWED STUDIES

THIS WORK HAS BEEN KINDLY SUPPORTED BY:

Animalfree Research  
Eva Husi-Stiftung für Tierschutz



Source: Zemanova 2020

# Miriam Zemanova

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*This newsletter contains the following items (if some links do not work, check that your mail program has opened the whole of the newsletter):*

- [Overview of 3R Education and Training Courses](#)
- [Covid-19 and Contingency Plans](#)
- [Resources for home learning](#)
- [Update on the Refinement Wiki](#)
- [Update on PREPARE](#)
- [News from other 3R Centres](#)
- [News of other 3R initiatives](#)
- [Update on the World Congress in Maastricht](#)
- [Glimpses from research](#)
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*(Monday 23 August Session S200, 3.30-5.30 p.m.)*

**Norecopa [norecopa.no/WC11](http://norecopa.no/WC11)**

*(Thursday 26 August Session S311, 3.00-5.00 p.m.)*

**The PREPARE guidelines [norecopa.no/WC11-PREPARE](http://norecopa.no/WC11-PREPARE)**

*Tuesday 31 August Session S301, 6.30-8.30 p.m.*

**The Refinement Wiki [norecopa.no/WC11-wiki](http://norecopa.no/WC11-wiki)**