

Seroprevalence in target wildlife during the ORV in Lithuania (2010-2022)

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LITHUANIA

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NATIONAL FOOD AND VETERINARY RISK ASSESSMENT INSTITUTE OF LITHUANIA

The latest breaking news

First news: **the approved new logo as part of the ongoing evolution of our Institute.**

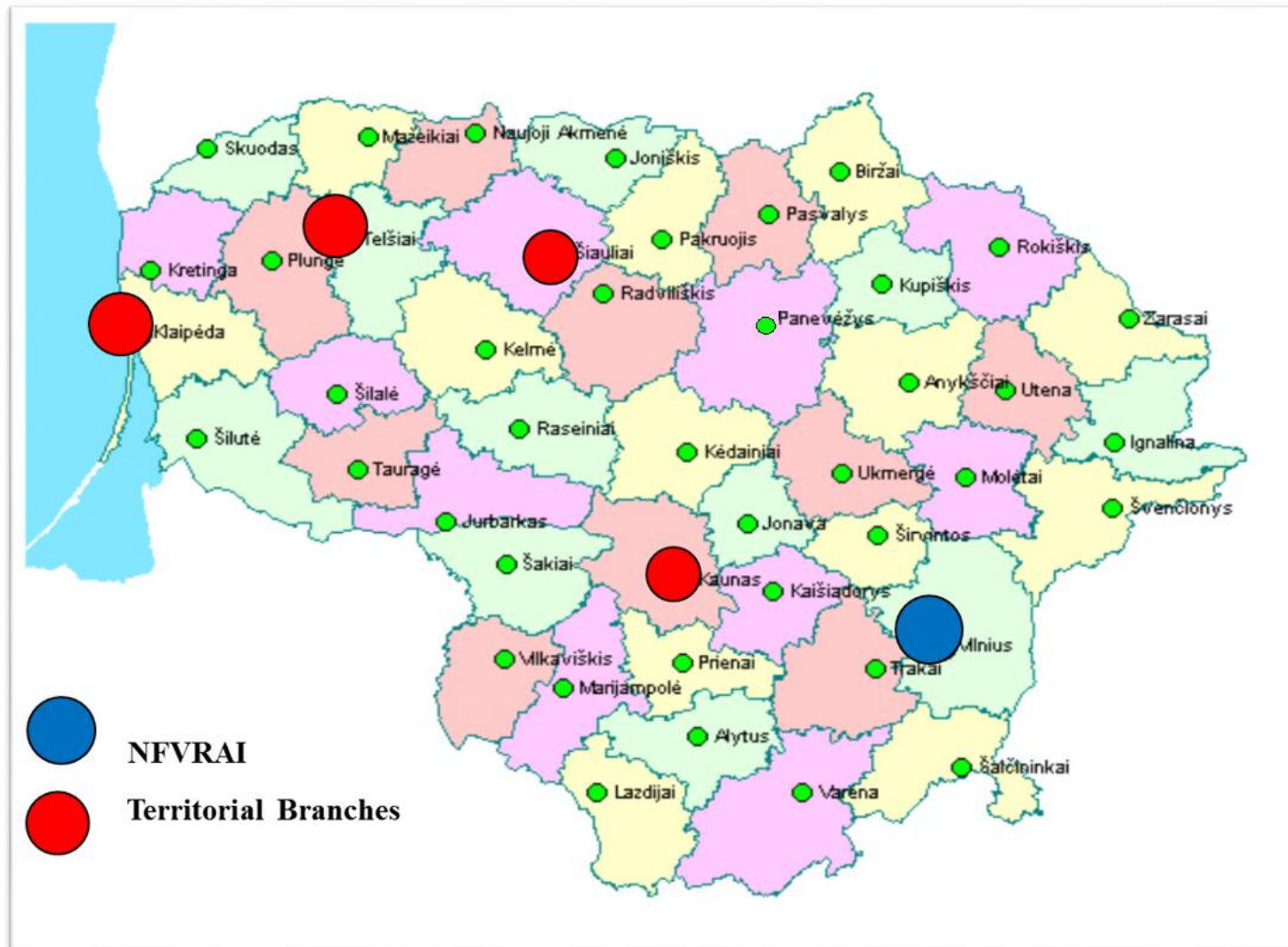


Second news: a newly director of the National Food and Veterinary Risk Assessment Institute

Since on 23th May 2022 Mr. Egidijus Pumputis has been appointed the new director of the National Food and Veterinary Risk Assessment Institute (NFVRAI), which is part of the State Food and Veterinary Service (SFVS). <https://vmvt.lt/naujienos/newly-appointed-director-national-food-and-veterinary-risk-assessment-institute?language=en>



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- ISO/IEC 17025 (Lithuanian National Accreditation Bureau (LA) from 6th May 2015);
- ✓ 412 accredited methods;
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Agenda



Rabies historical aspect in Lithuania



History of rabies eradication strategy in Lithuania



Current epidemiological data regarding rabies cases and seroconversion analysis



The efficiency of oral rabies vaccination (ORV) in the wild red fox and raccoon dog populations



Conclusion

The territory of Lithuania

The territorial features:

- Lies on the south of The Baltic sea
- The length of the border of the sea is 99,66 km
- The total length of the continental border is 1732 km
- Total area: 65 300 km²

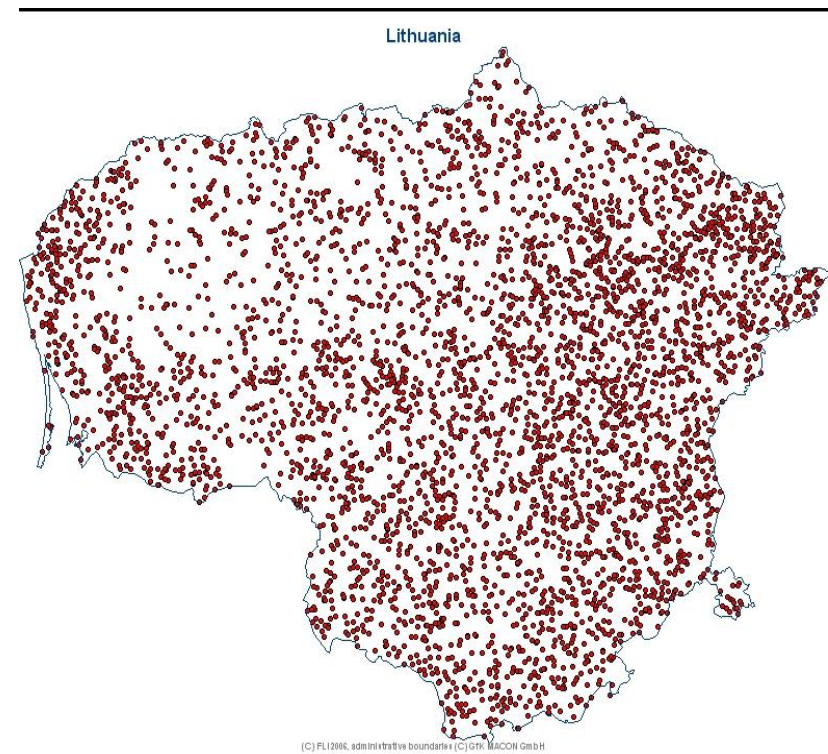
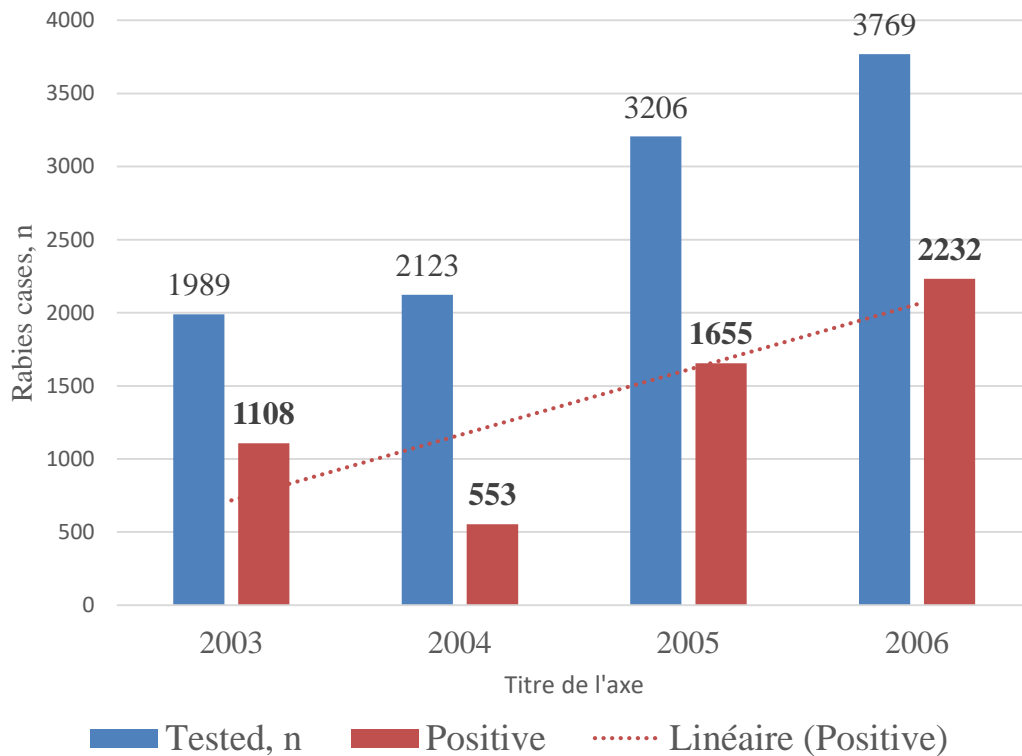
The length of terrestrial borders with:

- Belarus – 678,8 km
- Latvia – 588 km
- Russia (Kaliningrad region) – 255 km
- Poland – 103,7 km



Rabies history in Lithuania

Rabies epidemiological situation (2003-2006)

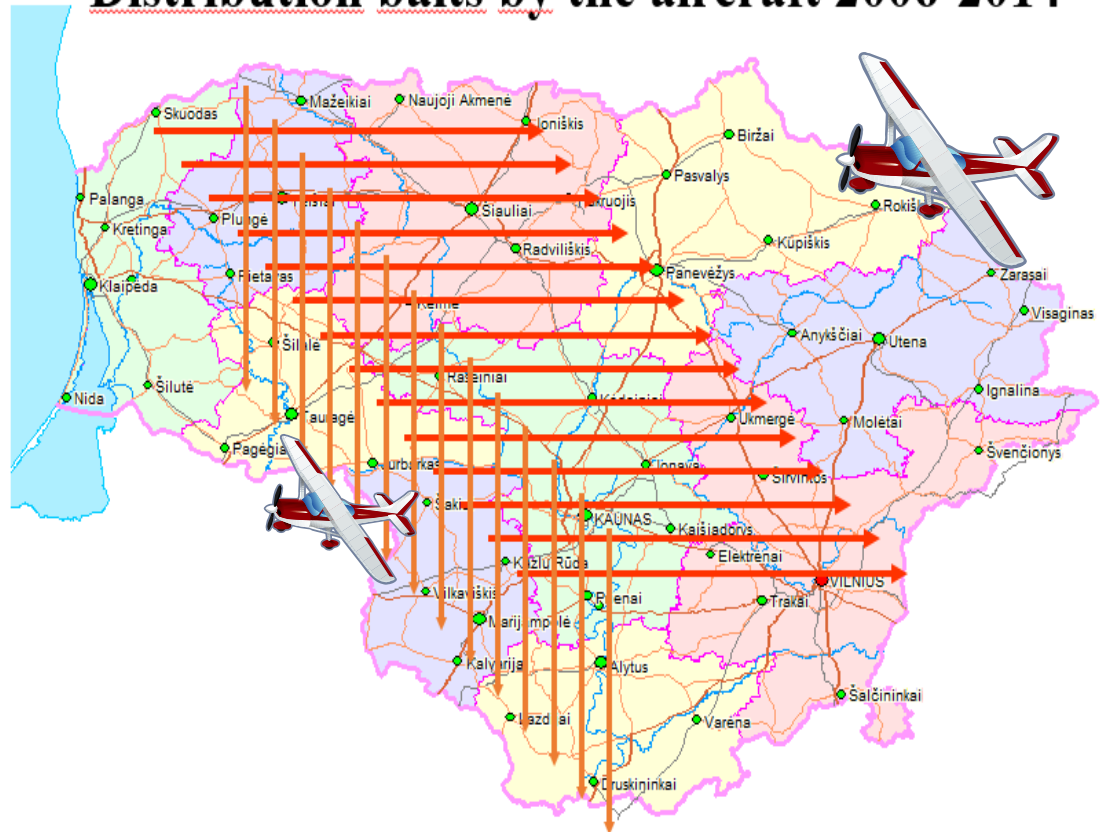


In 2003-2006 rabies was registered in all over Lithuania

History of wildlife oral vaccination in 2006-2014

- First large scale OV was conducted in **June-Nov 2006** (Bait drop from west to the eastern border) (**Lysvulpen**)
- **2007- 2010** twice in spring and autumn on total territory of Lithuania (65,000 km²) (**Lysvulpen**)
- Since **2011-2012** twice in spring and autumn on total territory of Lithuania (65,000 km²) (**Fuchsoral**)
- **2013- 2014** twice in spring and autumn on total territory of Lithuania (65,000 km²) (**Lysvulpen**)

Distribution baits by the aircraft 2006-2014

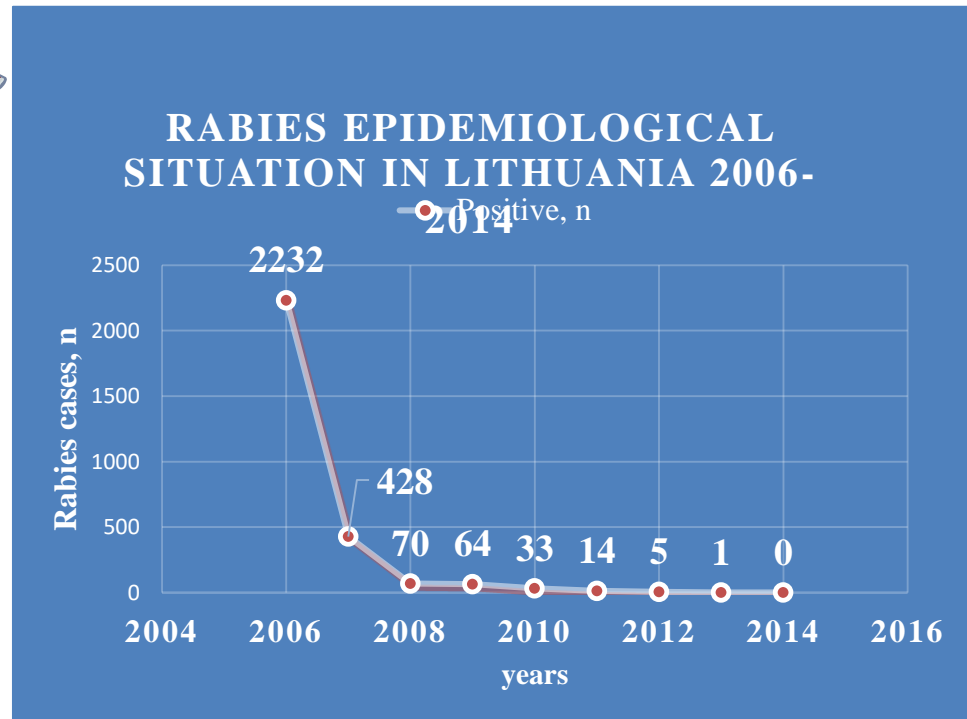
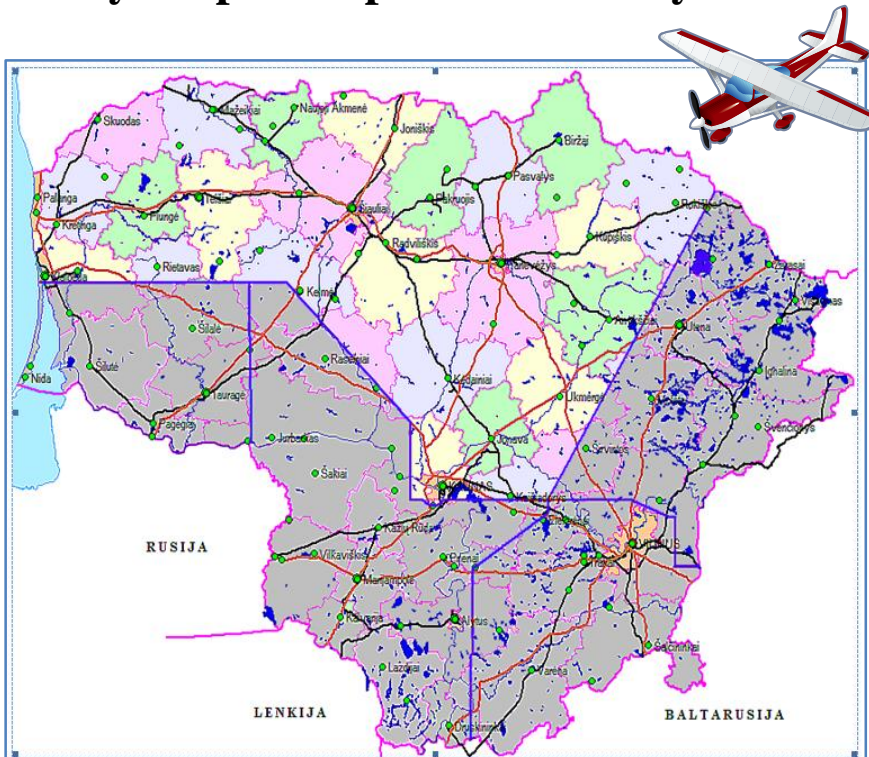




Wildlife oral vaccination in 2015-2017

2015 -2017 twice in spring and autumn
Lysvulpen on part of territory of Lithuania

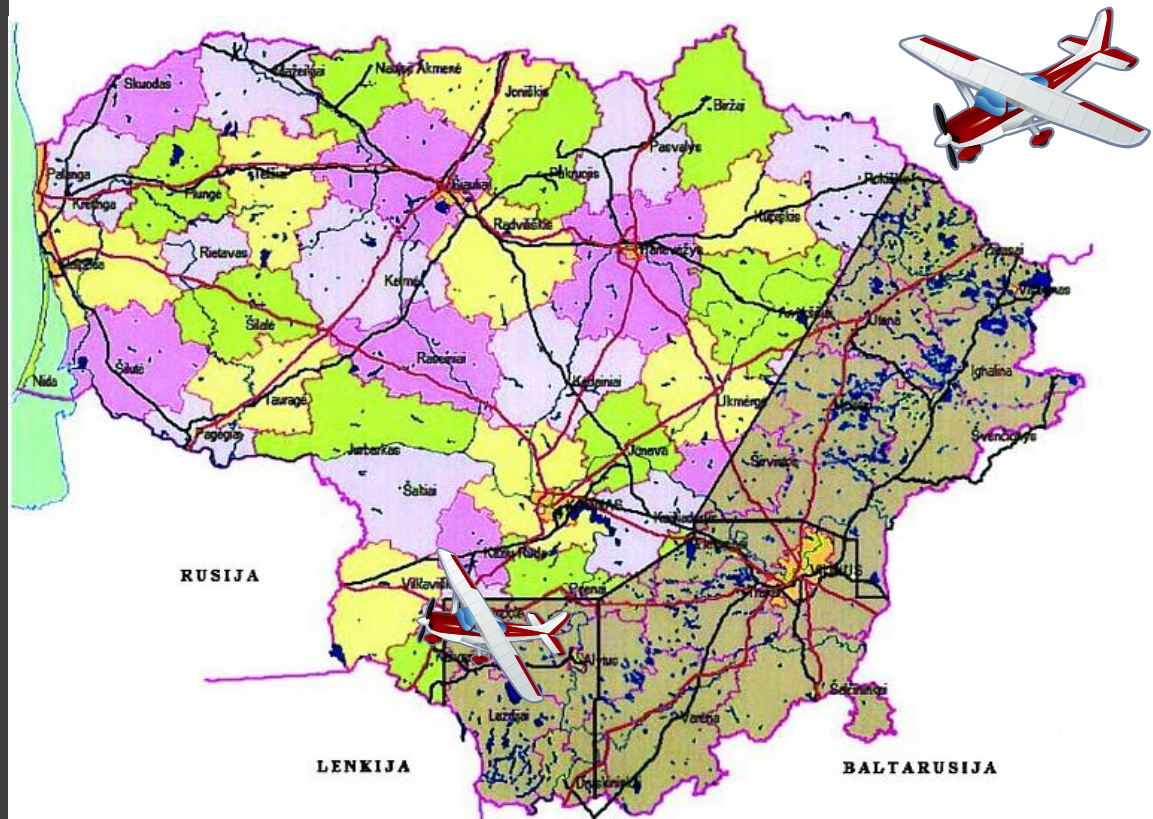
Rabies cases after vaccination (2006-2014)



Wildlife oral vaccination in 2018-2022

- Since 2018-2022 scale ORV twice in spring and autumn
Bait was drop to the eastern part border (Lysvulpen) on territory of Lithuania (20,400 km²)

Distribution baits by the aircraft 2018-2022



Surveillance and monitoring 2010-2022

- Passive surveillance – all suspected animals (wildlife + domestic) submitted to NFVRAI (NRL) in Vilnius for testing to rabies virus.
- Program of road kills surveillance were enforced since the 2006.
- To ensure vaccination efficiency control - hunted foxes and raccoon dogs from vaccinated area were purchased from hunters and submitted to NRL for testing to bait uptake (**TTC**) and seroconversion (**ELISA**) *since June 2019, samples that are TTC negative also tested in ELISA*

Methods for rabies diagnosis in animal suspicious:

- Fluorescent Antibody Test (**FAT**) (gold standard)
- Rabies Tissue Culture Infection Test (**RTCIT**)
- Real-Time (**RT-PCR**) since **2020**

Methods for ORV efficiency control:

- analysing the tetracycline teeth **TTC** and seroconversion (Bio-RAD Platelia **Rabies II** kit is an **ELISA** for detection and titration of IgG anti-rabies virus glycoprotein in animal sera and plasma)

RESEARCH

Open Access

Analysis of seroprevalence in target wildlife during the oral rabies vaccination programme in Lithuania

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Abstract

Background: Rabies vaccination of wildlife carnivores is a powerful tool to prevent, control and eliminate rabies. The presence of neutralizing rabies antibodies in blood is considered a reliable indicator of adequate vaccination. The main purpose of the present study was to analyze the seroprevalence of specific antibodies in target populations of Lithuanian red fox (RF) and raccoon dog (RD) during the oral rabies vaccination (ORV) campaigns during the 2010–2019 period.

Results: Over the ten-year period, 7,261 RF and 2,146 RD sera samples were collected post-mortem in field conditions and tested using a commercial standardized enzyme-linked immunosorbent assay (ELISA) kit in Lithuania. In the ORV spring and autumn vaccination periods, 31.8% (20.3–43.4 95% CI – 95% confidence interval) and 31.7% (21.2–42.1 95% CI) of RF, and 34.1% (22.5–45.7 95% CI) and 34.7% (22.7–46.7 95% CI) of RD sera samples, respectively, were identified as ELISA-positive (seroconversion ≥ 0.5 EU/mL—Equivalent Units per Millilitre). The seroprevalence analysis in adult/ juvenile animal subpopulations indicated that 34.9% (27.2–42.5 95% CI) and 29.2% (20.3–37.9 95% CI) of RF, and 35.6% (25.2–46.0 95% CI) and 30.6% (20.2–40.9 95% CI) of RD sera samples, respectively, were identified as ELISA-positive (seroconversion ≥ 0.5 EU/mL). Statistically strong determinate correlations (r) between the serological results (pos.%) in RF adult/juvenile animal subpopulations ($r=0.937$) and between RF and RD positive seroconversion (pos.%) sera samples during the spring vaccinations ($r=0.864$) were demonstrated. In different ORV periods, 14–29% of RF and 7–25% of RD sera samples were identified as ELISA-negative (seroconversion < 0.5 EU/mL), but with low (0.125 < 0.49 EU/mL) antibody (Abs) titres.

Conclusions: The 2010–2019 ORV programme has been an effective tool in both RF and RD populations in Lithuania. The rabies-free status of Lithuania was self-declared in 2015 with only three rabies cases identified in buffer zones since then. The percentage of ELISA-positive serum samples (seroconversion ≥ 0.5 EU/mL) during the different periods of vaccination was similar in RF and RD populations—32% and 34% respectively. The identified seroconversion average of 21.5% in RF and 16% in RD sera samples were officially identified as ELISA-negative (seroconversion < 0.5 EU/mL), but with low 0.125 < 0.49 EU/mL Abs titres. That low, but positive seroconversion participated in the formation of populations overall immune status and can influence the interpretation of oral vaccination efficacy.

Keywords: Rabies, Lithuania, Raccoon dog, Red fox, ELISA, Seroconversion, Vaccination

Background

Laboratory and epidemiological investigations of rabies cases in wildlife show that red foxes (RF, *Vulpes vulpes*) and raccoon dogs (RD, *Nyctereutes procyonoides*) are

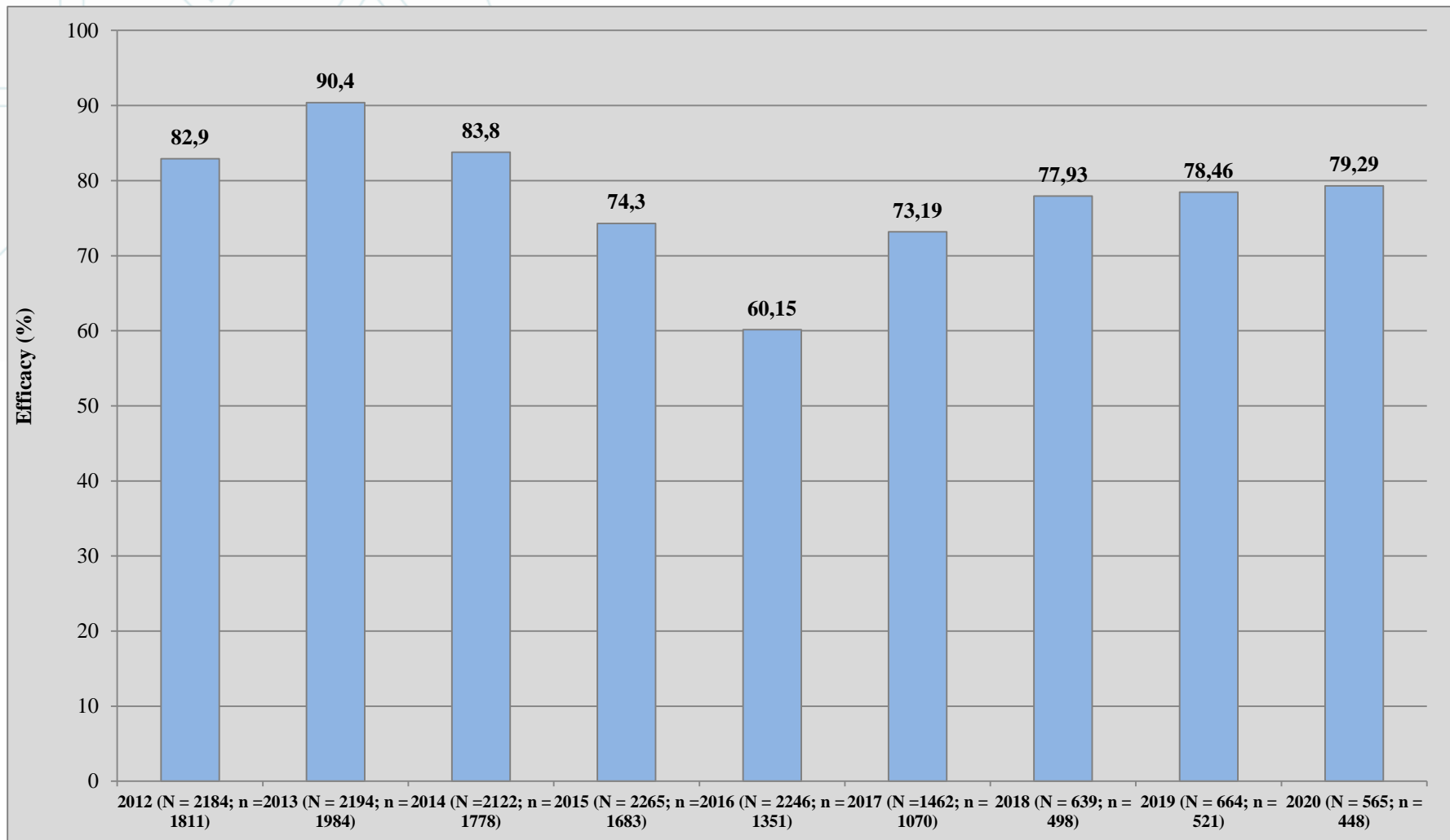
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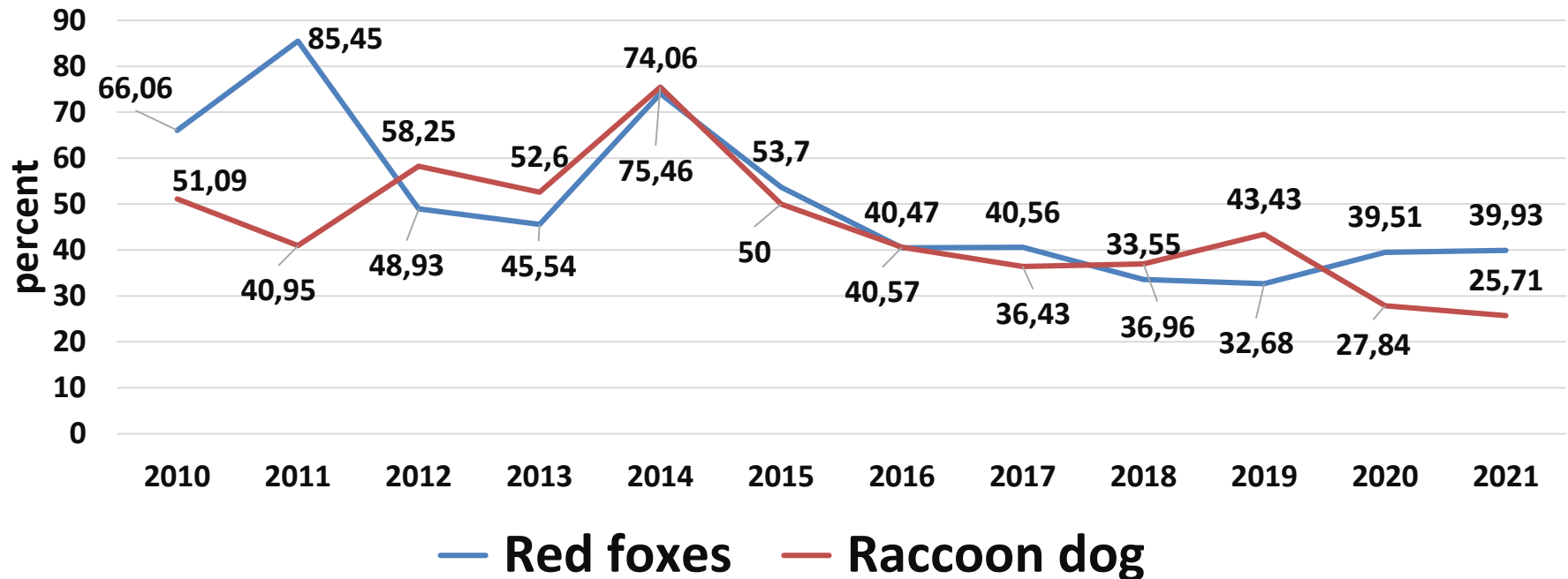
The objective of the present study was to analyze the status of seroconversion of Lithuanian ORV campaigns during the 2010–2019 period using seroprevalence studies of rabies-specific Abs in RD and RF sera samples collected from vaccination areas in the field.

EFFICACY OF INTAKE OF BAITS WITH VACCINE BY WILD ANIMALS IN 2012 – 2020 IN LITHUANIA



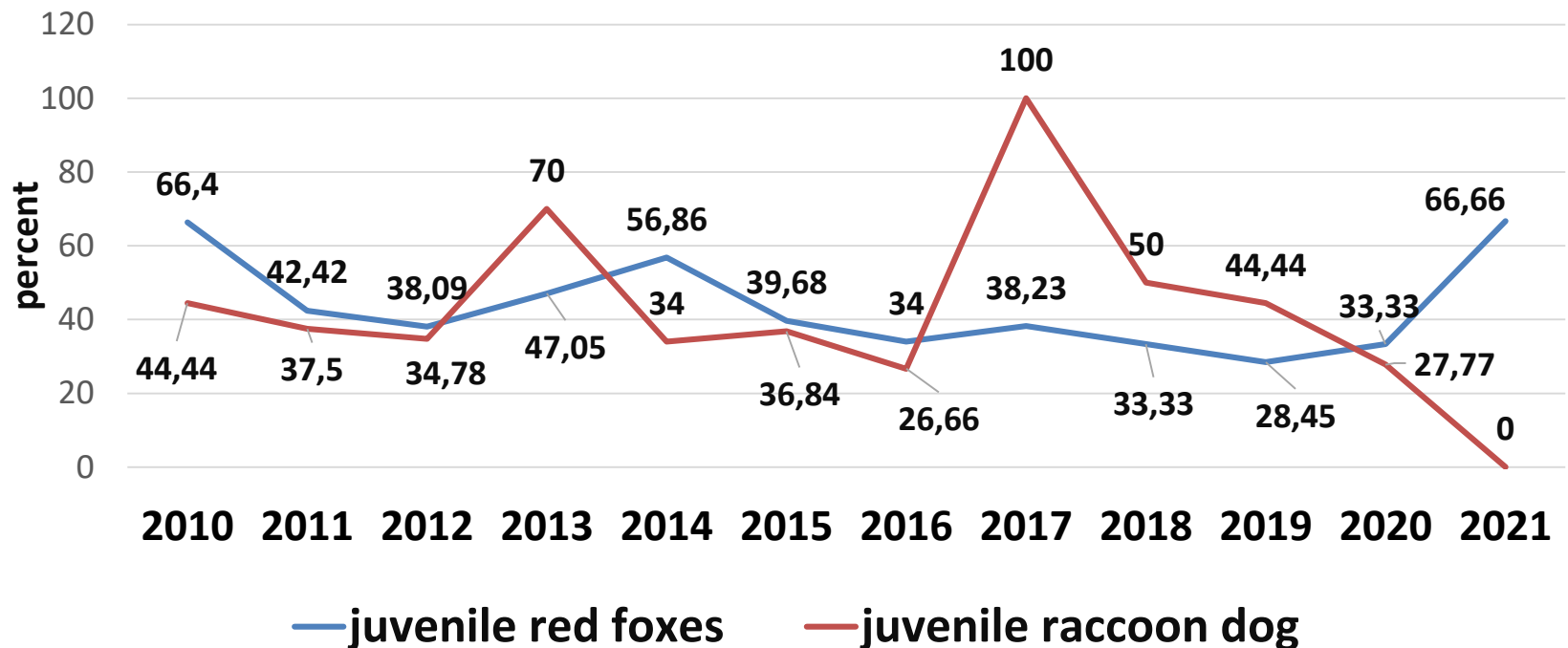
ORV seroconversion level in target population 2010-2021

Seroprevalence in total target wildlife during the ORV



ORV seroconversion level in target population 2010-2021

Seroprevalence in target wildlife during the ORV



Effectiveness of intake of baits with vaccine and seroconversion

Effectiveness of ORV in 2020

- **Tetracycline 565 (79,29%) samples (482 foxes and 83 raccoon dogs)**

- **Foxes:**
 - young – 76.49%
 - adult – 93.68%
- Raccoon dogs:**
 - young – 76.32%
 - adult – 71.43%

- **Serology 532 (40.31%) samples (453 foxes and 79 raccoon dogs)**

- **Foxes:**
 - young – 33.33%
 - adult – 40.68%
- Raccoon dogs:**
 - young – 27.78%
 - adult – 27.87%

Effectiveness of ORV in 2021

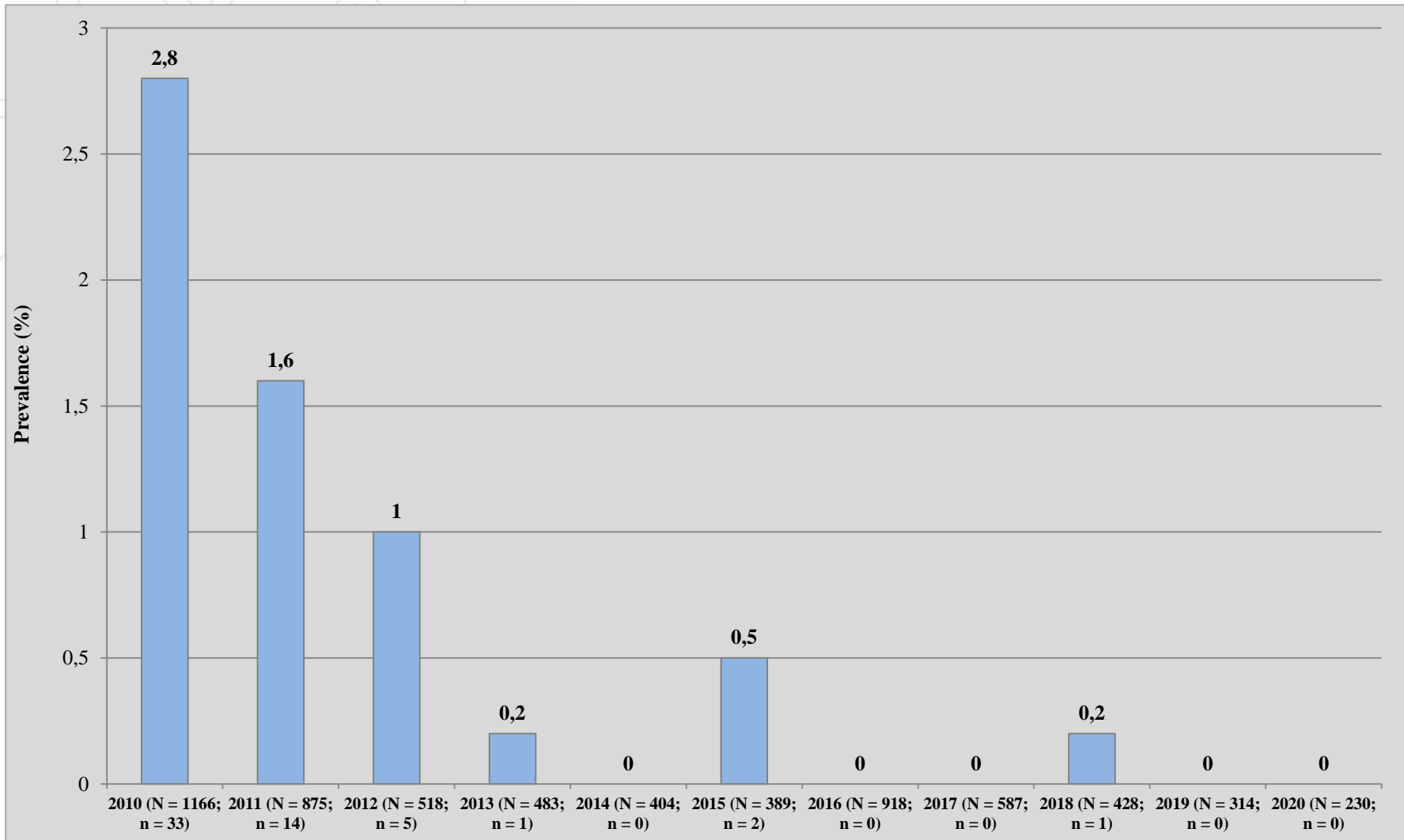
- **Tetracycline 651 (81,57%) samples (580 foxes and 71 raccoon dogs)**

- **Foxes:**
 - young – 82.18%
 - adult – 89.31%
- Raccoon dogs:**
 - young – 57.63%
 - adult – 91.67%

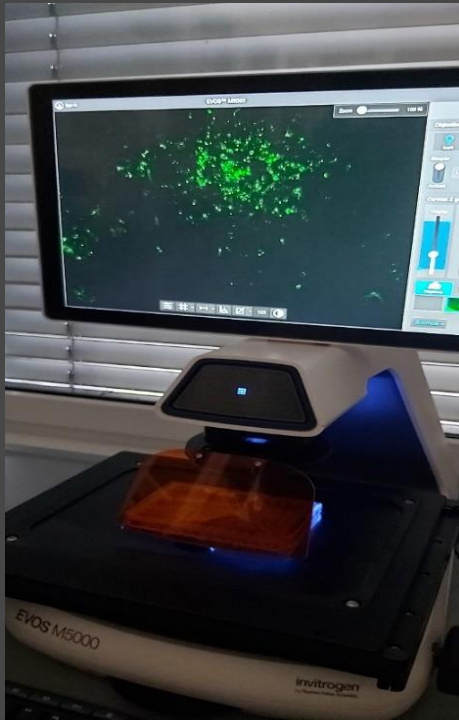
- **Serology 651 (38.40%) samples (581 foxes and 70 raccoon dogs)**

- **Foxes:**
 - young – 66.67%
 - adult – 39.08%
- Raccoon dogs:**
 - young – 0%
 - adult – 26.87%

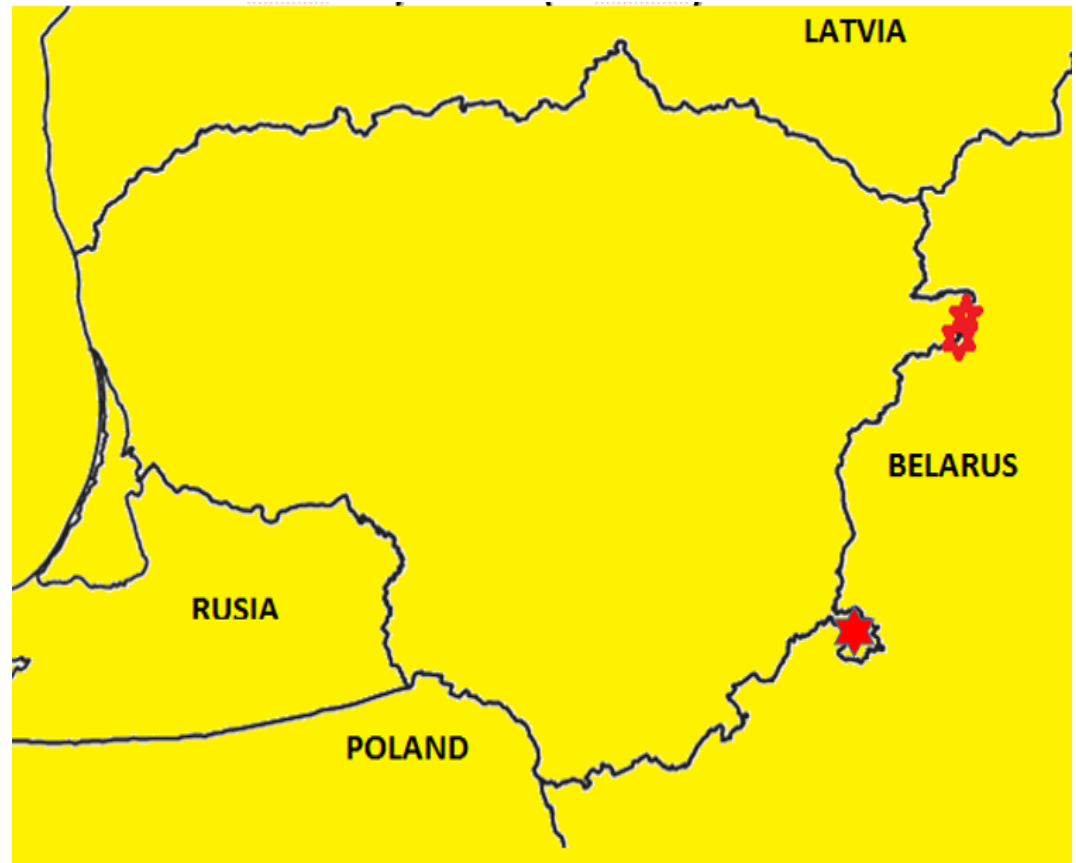
PREVALENCE OF RABIES IN 2010-2021 IN LITHUANIA



Situation of rabies in 2015 and 2018



The location of the rabies in 11/2015 (2 cases) and 09/2018 (1 case)



CONCLUSION

- The 2010–2019 ORV programme has been an effective tool in both RF and RD populations in Lithuania.
- During 2010 -2019 have been detected three (3) rabies cases (2015 and 2018) from the border area with Belarus. Since 2019-2022 till June not detected rabies.
- The percentage of ELISA-positive serum samples (seroconversion ≥ 0.5 EU/mL) during the different periods of vaccination was similar in RF and RD populations—32% and 34% respectively.
- The identified seroconversion average of 21.5% in RF and 16% in RD sera samples were officially identified as ELISA-negative (seronversion < 0.5 EU/mL), but with low $0.125 < 0.49$ EU/mL
- That low, but positive seroconversion participated in the formation of populations overall immune status and can influence the interpretation of oral vaccination efficacy

*THANK YOU
FOR YOUR
ATTENTION !*