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REPUBLIC OF ESTONIA  
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ENVIRONMENTAL INVESTMENT  
CENTRE

# Prevention and control of non-indigenous crayfish species in Estonian freshwaters

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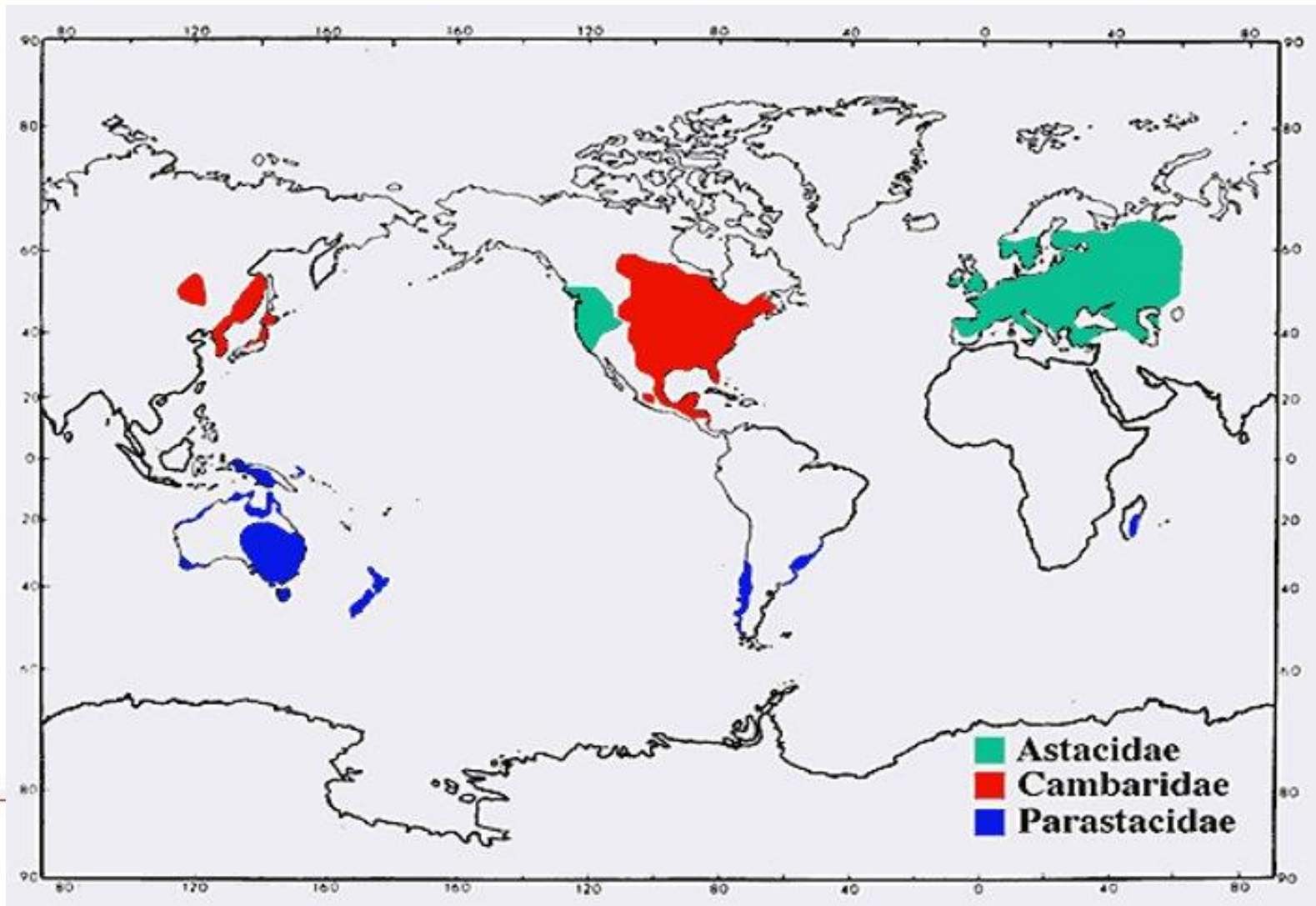
04.06.2024 Prague



Veterinærinstituttet  
Norwegian Veterinary Institute

# Background

World distributions of the three freshwater crayfish families



# Europe is home to five species of crayfish in the genera *Astacus*, *Pontastacus* and *Austropotamobius*



Noble crayfish  
(*Astacus astacus*)



Narrow-clawed crayfish  
(*Pontastacus leptodactylus*)



White-clawed crayfish  
(*Austropotamobius pallipes*)



Thick-clawed crayfish  
(*Astacus pachypus*)

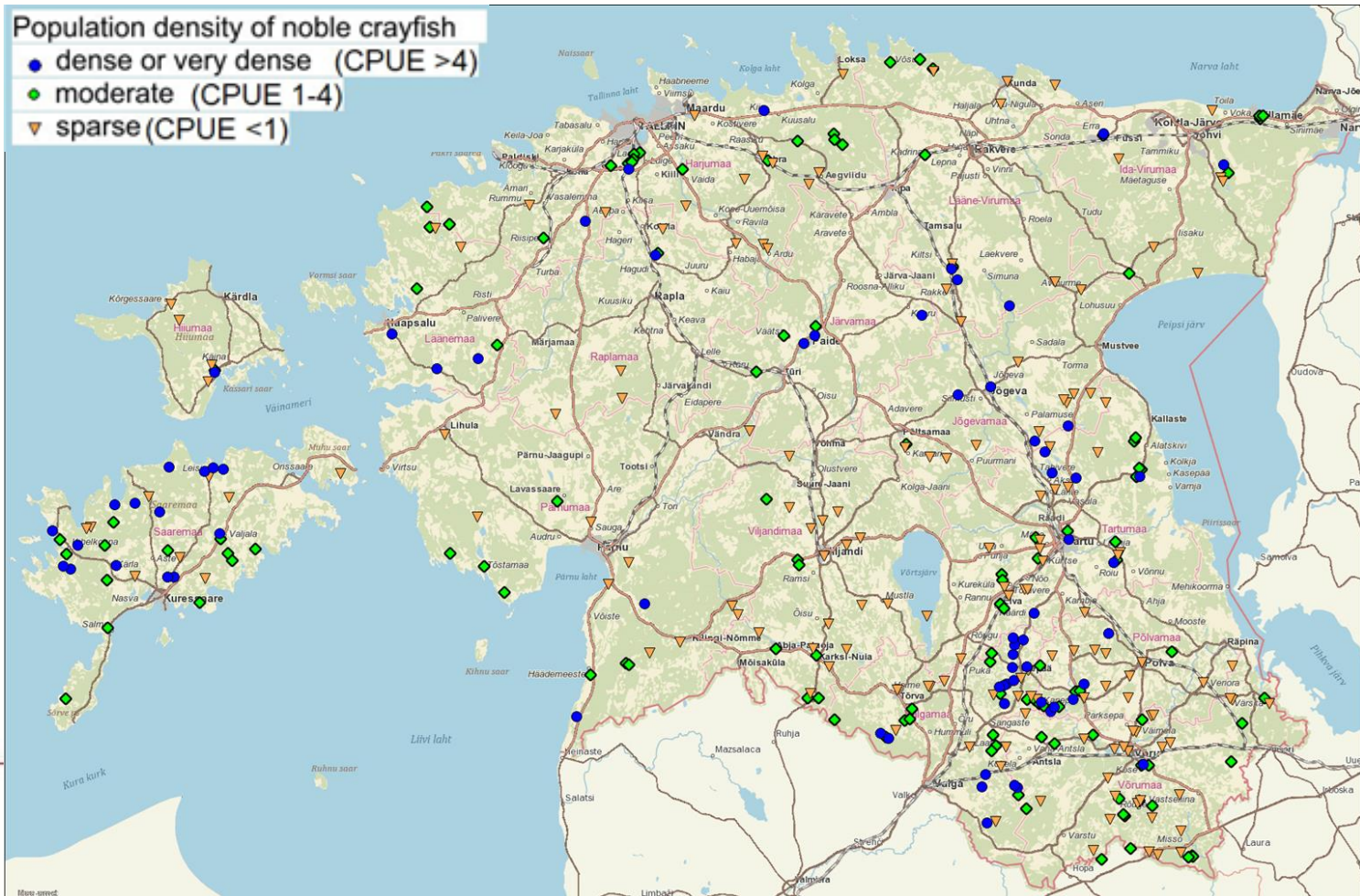


Stone crayfish  
(*Austropotamobius torrentium*)

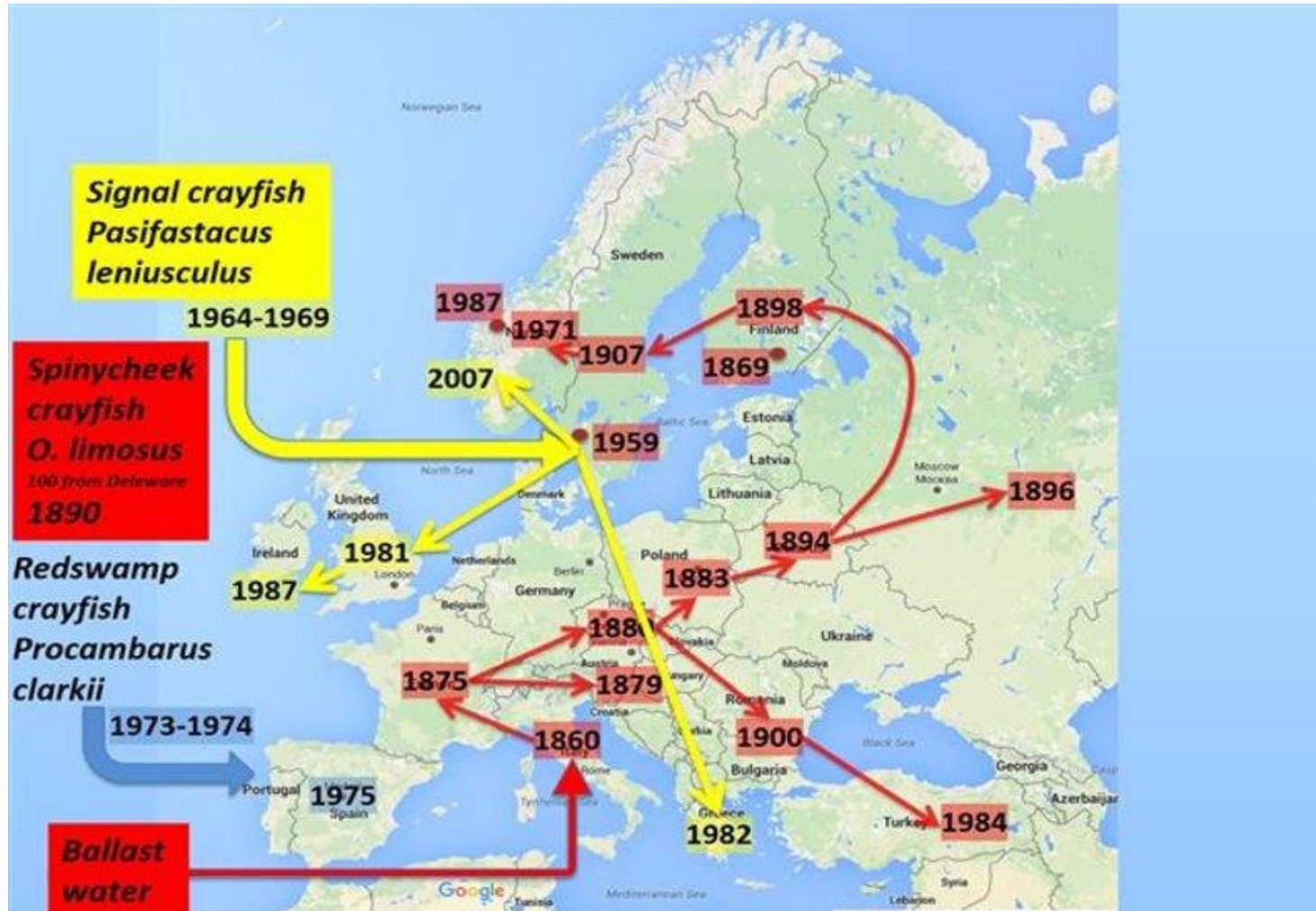
# The noble crayfish is the only indigenous decapod crayfish species in Estonia



*Astacus astacus*



# Distribution of North American non-indigenous crayfish species (NICS) to Europe and spreading of crayfish plague



Today, 10 NICS are spreading in Europe

# EU Regulation 1143/2014 on Invasive Alien Species

- Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species
- The spread of alien species mentioned in the list of alien species threatening the ecosystem (adopted on 07.10.2004 No. 126) must be prevented and if possible, eradicated



## **Project „Eradication of aquatic invasive species in Estonian freshwaters“ (11.10.2021 - 30.04.2024) goals**

1. To assess the risk of introduction, survival and spread of ten invasive non-indigenous crayfish species (NICS) in Estonia that are of concern in the EU
2. To assess and control the spread of NICS and Nuttall's waterweed in Estonia and implement more effective measures for the detection (incl. application of eDNA-based methodology) and eradication of alien species
3. To raise public awareness and competence of officials of the threats of alien species and control measures

# Project activities

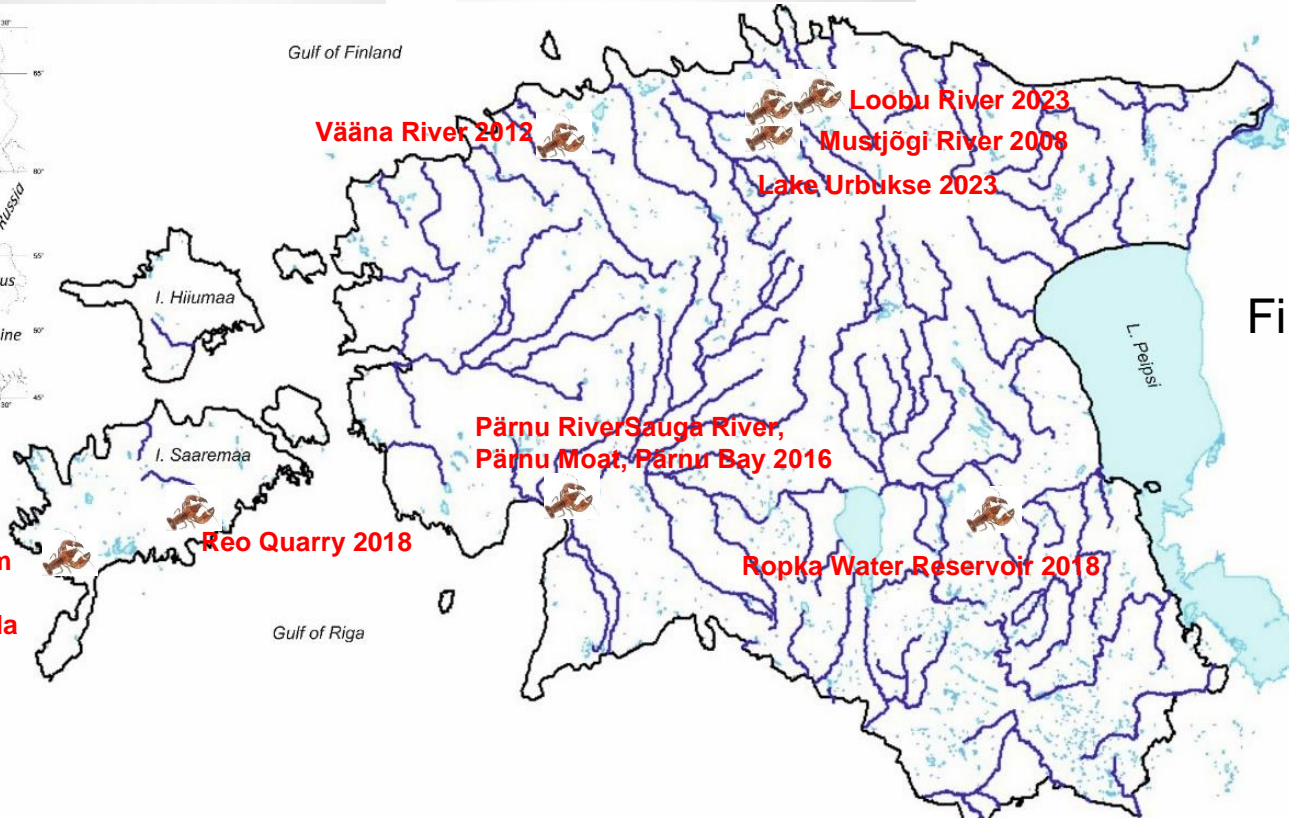
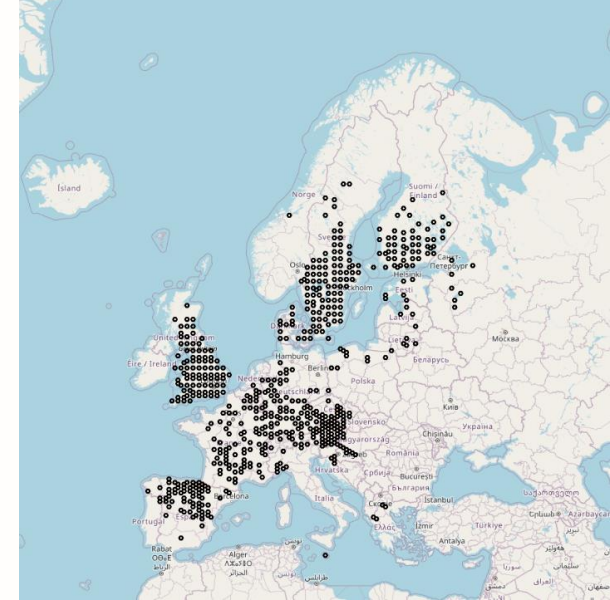
- Mapping of the spread of NICS including the application of eDNA methods in the detection of invasive crayfish species
- Research and developing eradication methods
- Carrying out the eradication and evaluating the effectiveness of eradication, using eDNA methodology in addition to catching, at least in 20 sites





# Signal crayfish

*Pacifastacus leniusculus*



First found in 2008

Riksu Stream  
2010, Lake  
Riksu, Koimla  
Ditch

Reo Quarry 2018

Pärnu River, Sauga River,  
Pärnu Moat, Pärnu Bay 2016

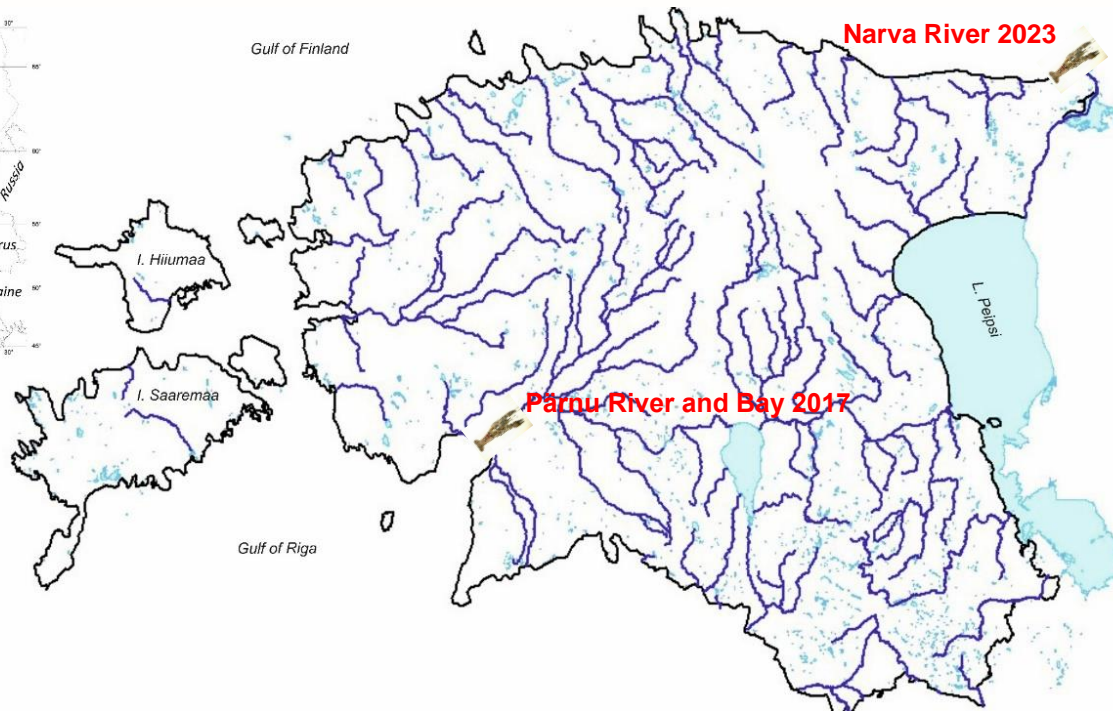
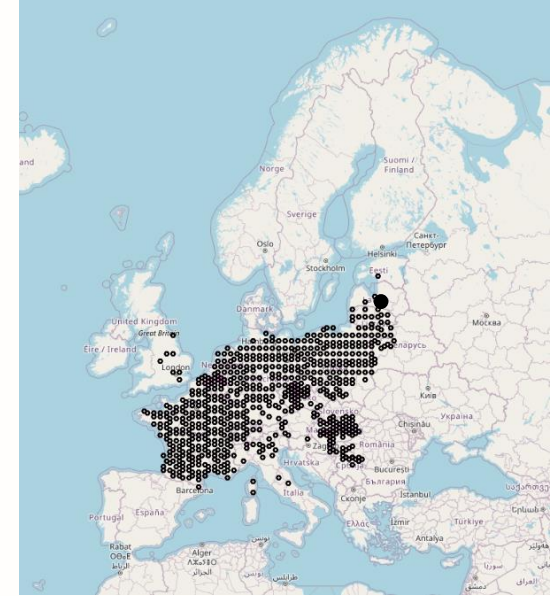
Ropka Water Reservoir 2018

Väina River 2012

Loobu River 2023  
Mustjõgi River 2008  
Lake Urbukse 2023

# Spiny-cheek crayfish

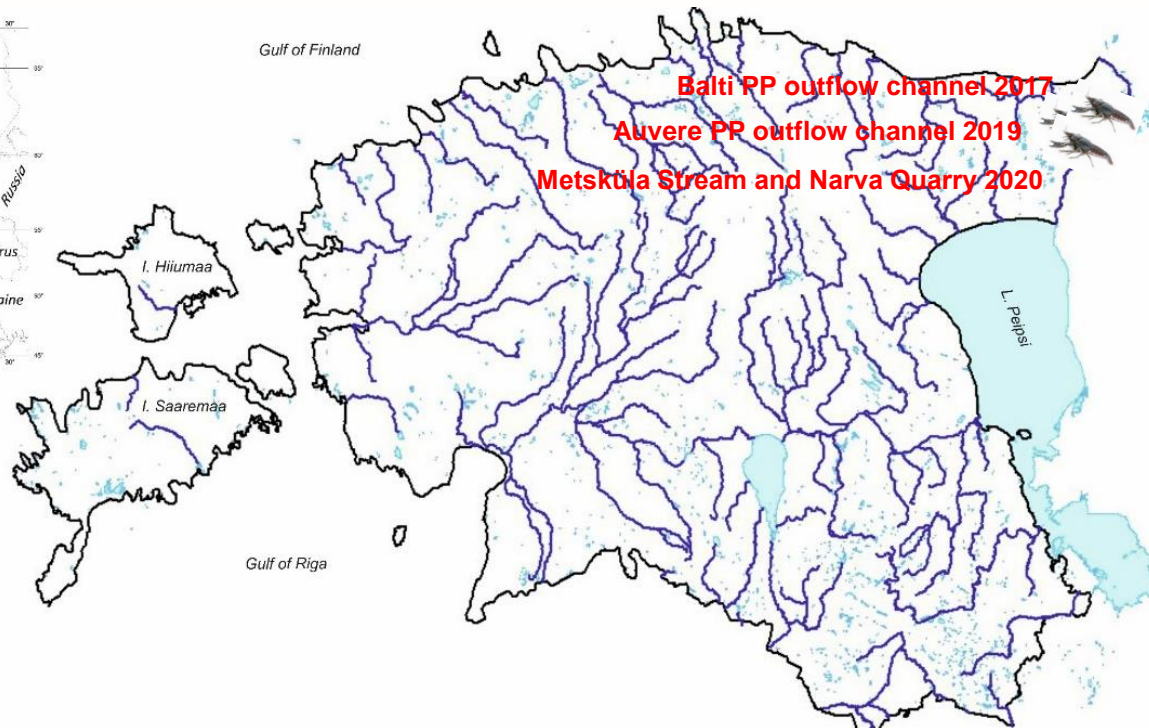
## *Faxonius limosus*



First found in 2017

# Marbled crayfish

## *Procambarus virginalis*



First found in 2017

# Consultations with project partner from Norway (NVI)

Chemical eradication was planned in Reo Quarry and Ropka Water Reservoir

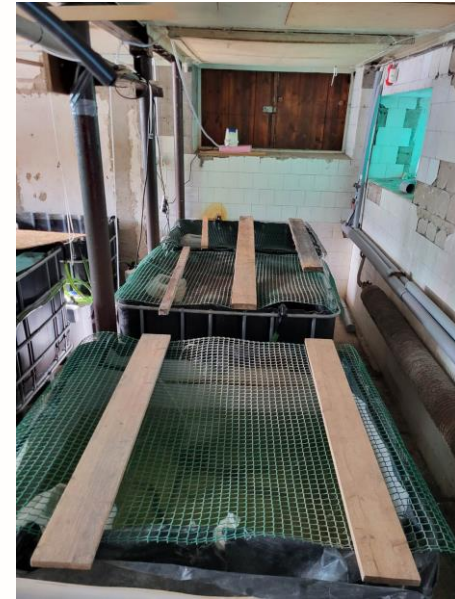


# Electrofishing in Riksu Stream in 2023

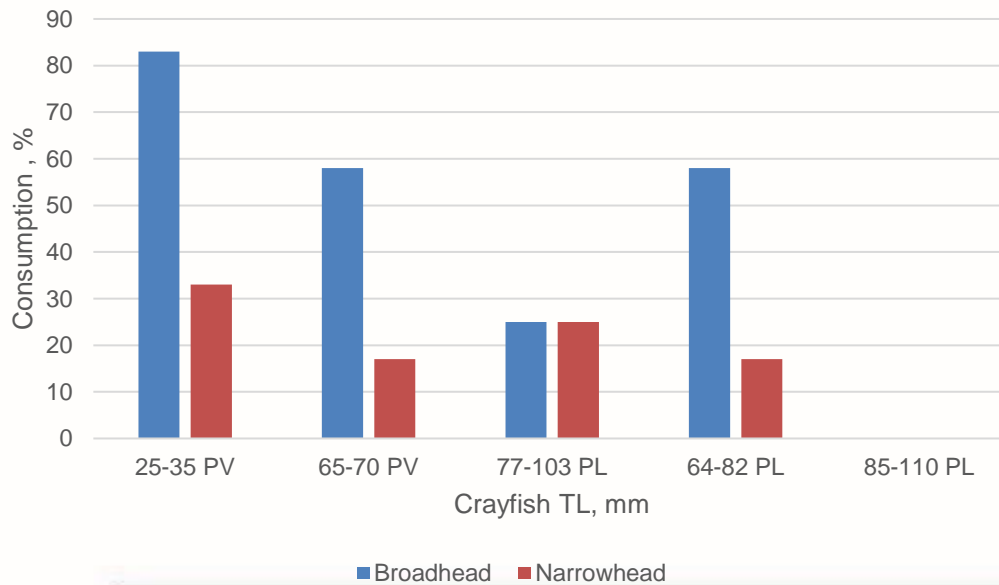


# Stocking of eels into the Reo Quarry and Ropka Water Reservoir

- Experiment with 30 farmed eels (~400 g)
- 1000 eels (~250 g) were stocked to Ropka Water Reservoir in 2023 spring
- 200 eels (~250 g) were stocked to Reo Quarry in 2023 spring



# Crayfish diet experiment of broadhead and narrowhead eels



# Trapping of crayfish



- Baited traps with frozen fish according to the standard Swedish protocol remained the main fishing method
- Trappings were carried out from April to November each year
- In Reo Quarry and Ropka Water Reservoir the traps were constantly in the water and emptied two times per week
- Crayfish were counted, measured (total length) and weighed
- The trapped NICS were frozen (killed) and sent for incineration
- The catch per unit effort (CPUE) was calculated and recorded



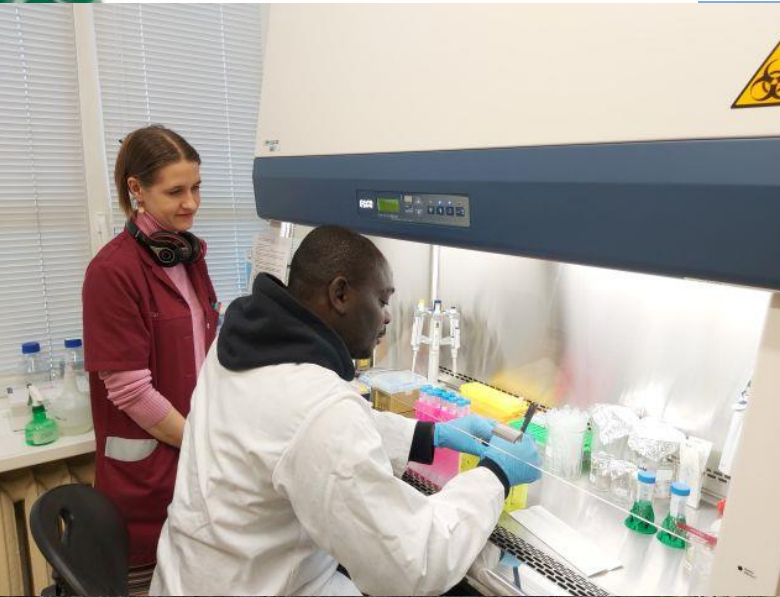
# The volume of catches by trap nights

Waterbodies	2021	2022	2023	Total
Riksu Stream, Lake Riksu, Koimla Ditch	100	3000	6290	9390
Reo Quarry		2600	4200	6800
Ropka Water Reservoir, Ilmatsalu River	80	1310	1520	2910
Mustjõgi River	40	460	820	1320
Vääna River	80	960	1500	2540
Pärnu River, Reiu River, Sauga River, Pärnu Moat	160	620	680	1460
Narva PP waterbodies	240	950	680	1870
Narva River plus 2 tributaries			270	270
Lake Urbukse + 3 of Lake Nelijärve			640	640
Loobu River			220	220
Vahi Pond			9	9
<b>Total of 28 waterbody</b>	<b>700</b>	<b>9900</b>	<b>16829</b>	<b>27429</b>

# Trapping results of NICS

Distribution area and number of waterbodies	Trap nights	CPUE		Signal crayfish		Spiny-cheek crayfish		Marbled crayfish	
		2022	2023	No	kg	No	kg	No	kg
Reo Quarry, 1	6800	0.11	0.04	452	11.3				
Ropka Water Reservoir, 1	1780	0.06	0.03	106	2.5				
Riksu Stream System, 3	9290	1.9	2.2	19808	466				
Mustjõgi River, 1	1280	0.02	0.03	36	1.1				
Vääna River, 1	2460	1.6	1.05	3095	107.7				
Pärnu River System, 4	1300	0.2	0.1	2	0.1	241	5.7		
Narva PP System, 6	1590	0.07	0.25					241	5.7
Narva River, 1	250					27	0.5		
Lake Urbukse, 1	560		0.1	58	2.5				
Loobu River, 1	220		0.3	68	2.1				
<b>Total, 20</b>	<b>25530</b>			<b>23625</b>	<b>593.3</b>	<b>268</b>	<b>6.2</b>	<b>241</b>	<b>5.7</b>

# eDNA studies



# eDNA studies

## Study area

16 water bodies were sampled across Estonia

Sampling period:

Round I- Aug-  
Sept 2022

Round II- Aug-  
Sept 2023

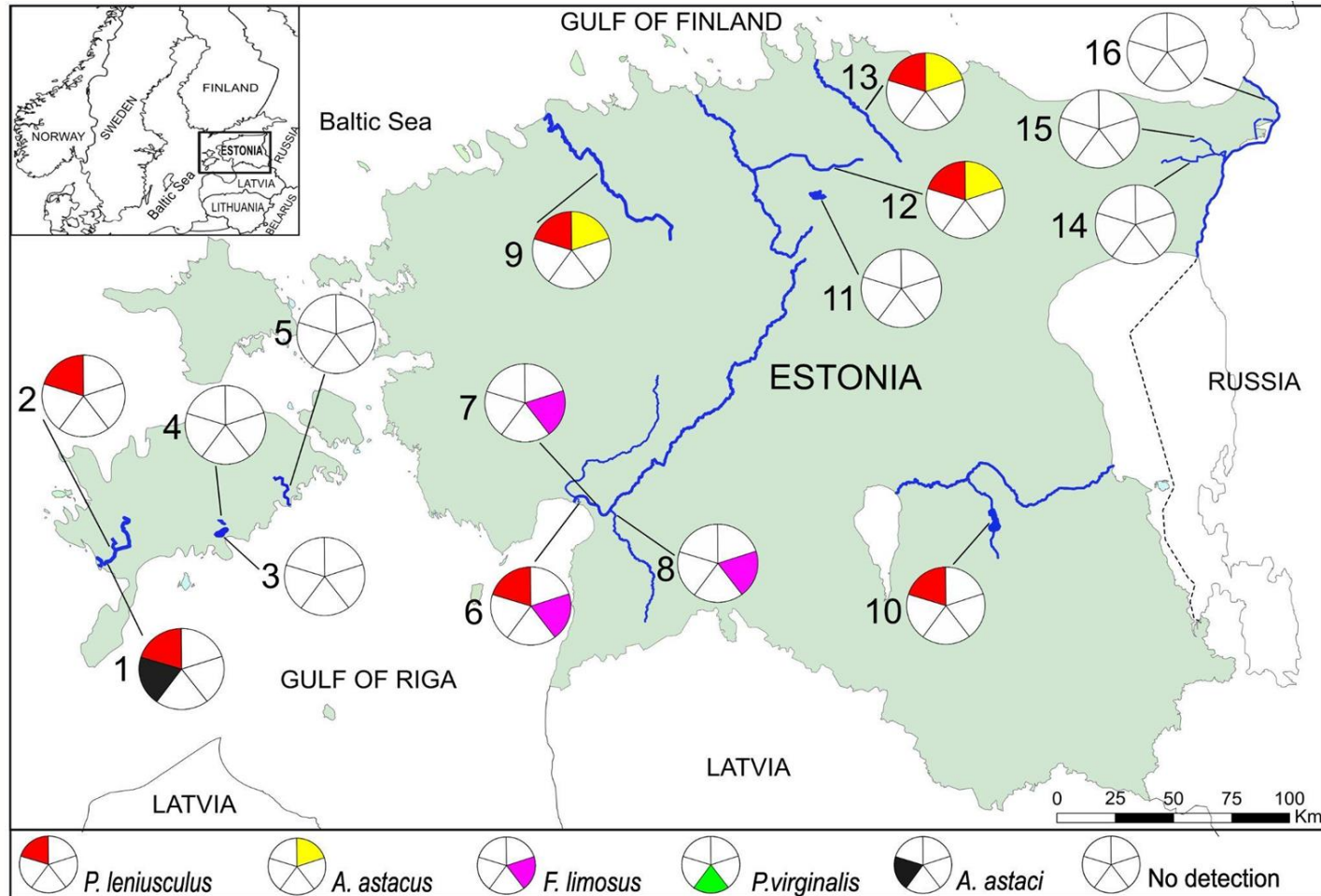
A total of 118 eDNA water samples and 21 repeat samples were collected



# Result of eDNA study

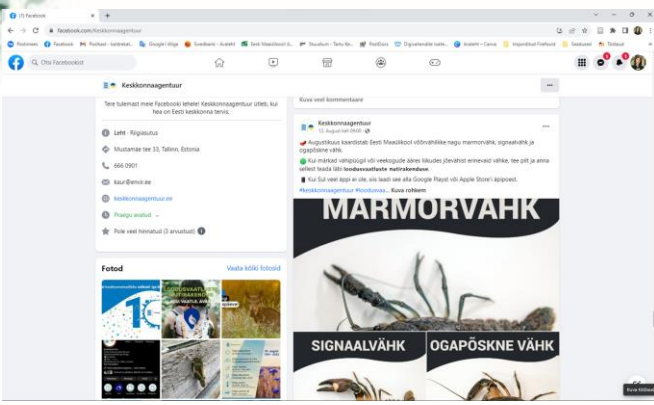
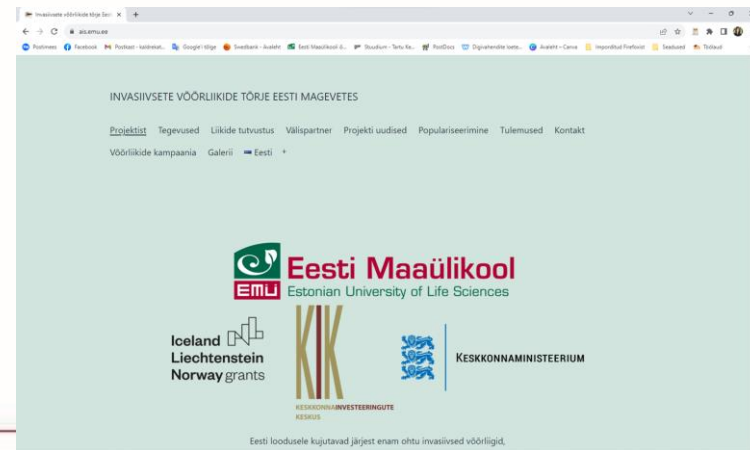
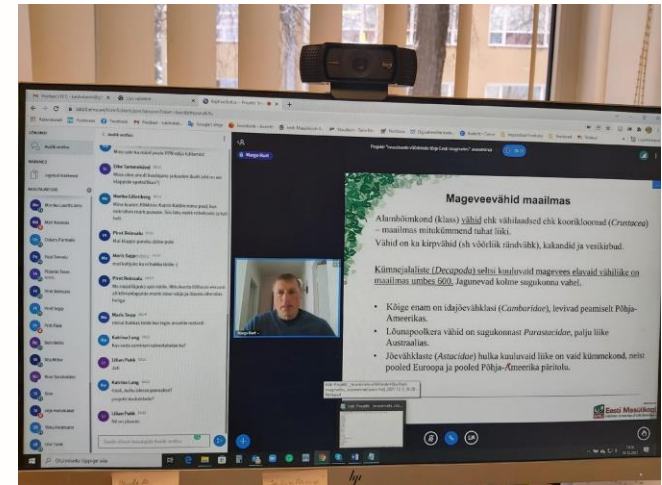
No	Waterbody	CPUE			
		PL	AA	FL	PV
1	Riksu Stream	2.2			
2	Koimla	0.7			
3	Reo Quarry I	0.2			
4	Reo Quarry II				
5	Kuke Stream	---			
6	Vallikraav	0.1		0.3	
7	Pärnu River			1.7	
8	Reiu River			0.3	
9	Vääna River	1.4	2.2		
10	Ropka Res.	0.1			
11	Urbukse lake	0.7			
12	Mustjõgi River	0.1	0.1		
13	Loobu River	0.3	1.2		
14	EPP outflow				0.1
15	BPP outflow				0.1
16	Narva River			0.4	

**CPUE < 1 (Low density)**  
**CPUE = 1- 4 (moderate)**  
**CPUE > 4 (High density)**



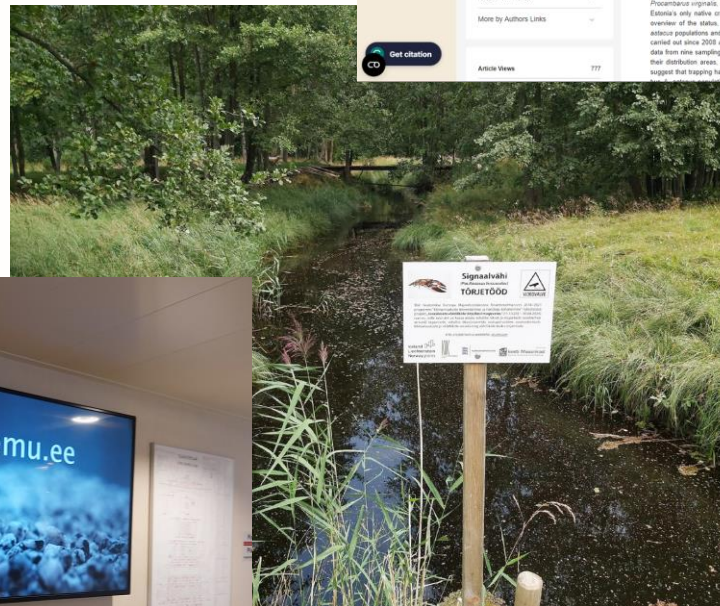
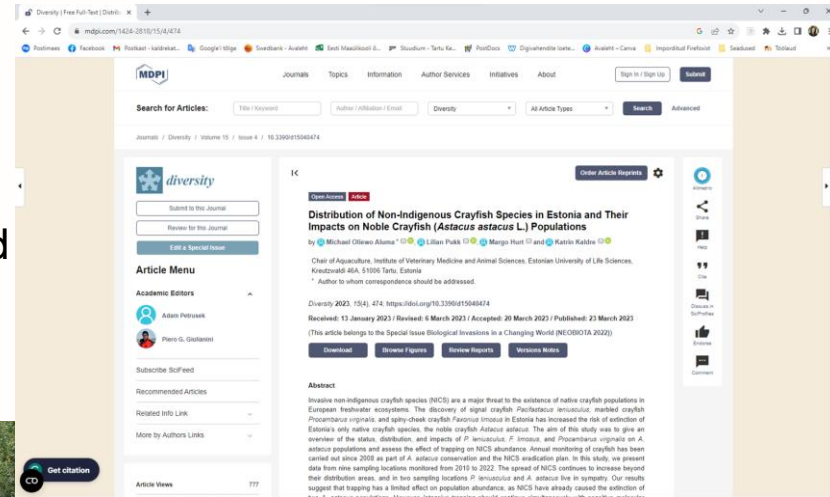
# Raising public awareness

- Opening seminar and final conference of the project
- Project homepage [ais.emu.ee](http://ais.emu.ee)
- Calls through the media to notice and report on NICS (social media, articles in journals, TV shows and news)
- Workshops in schools and presentations at seminars



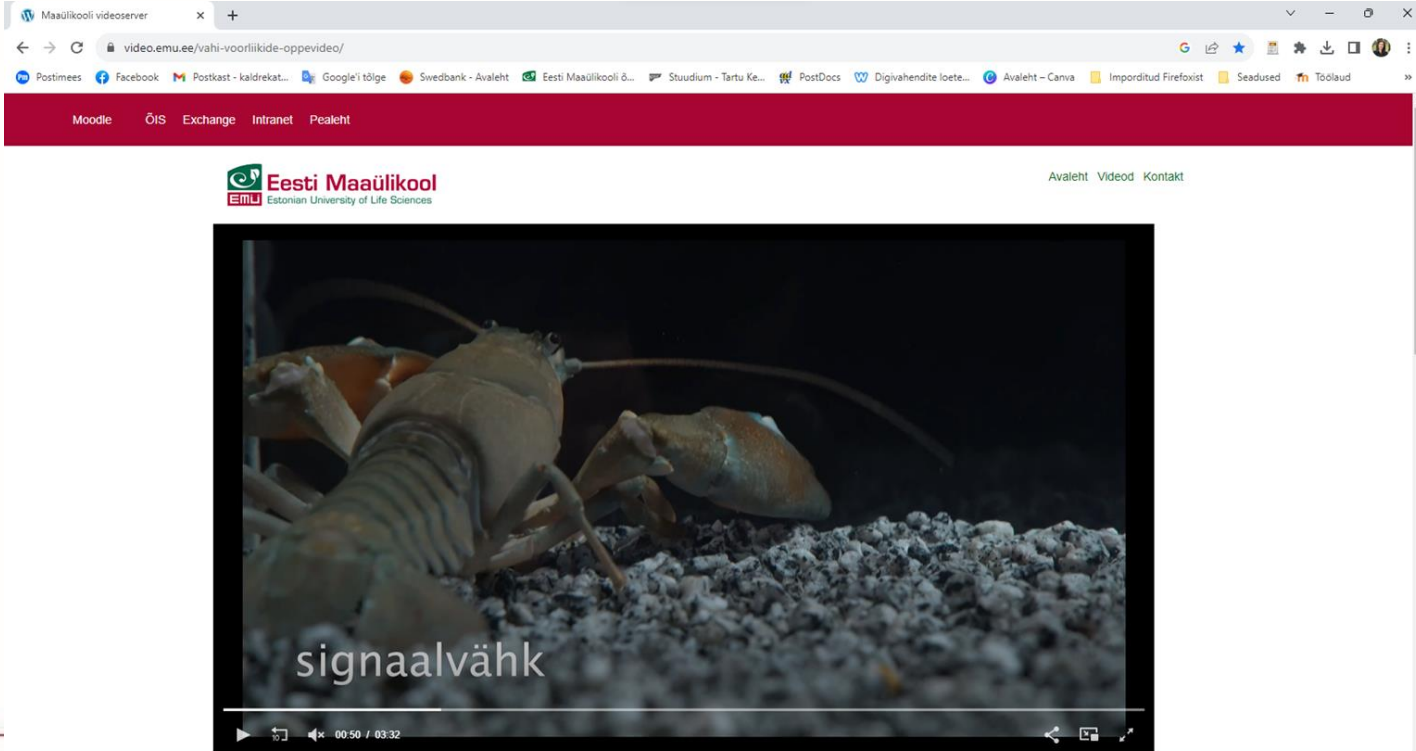
# Raising public awareness

- Information boards
- Leaflets
- Advertisement on ferries
- Participation in international conferences and seminars (NeoBiota, IAA23, CrayfIT)
- Science publication, MSc and BSc theses



# Raising public awareness

- Educational videos about the NICS
  - <https://video.emu.ee/vahi-voorliikide-oppevideo/>
  - <https://video.emu.ee/vahi-voorliikide-kampania-video/>



Maaülikooli videosever

video.emu.ee/vahi-voorliikide-oppevideo/

Moodle ÕIS Exchange Intranet Pealeht

**Eesti Maaülikool**  
EmU Estonian University of Life Sciences

Avaleht Videod Kontakt

signaalvähk

00:50 / 03:32

Vähi võrliikide õppevideo

Otsi ...

Avaleht

www.emu.ee

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# Training courses for officials on the prevention and practical control of the spread of aquatic alien species



# Conclusions

- Based on the decrease in the numbers of NICS, trapping was effective in only three of twenty waterbodies
  - Stocking broadhead eels as an additional control method of NICS may be more effective than using narrowhead eels
  - With optimization and development, the eDNA method can be employed to enhance the use of traps in the detection, monitoring, and control of invasive NICS
  - Continuous monitoring of the spread of NICS and raising people's awareness are still necessary
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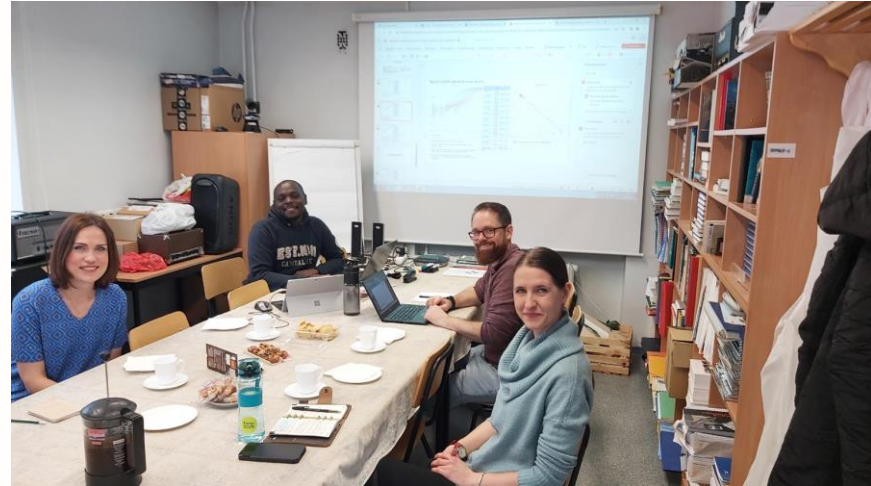
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