USE OF RECIRCULATING AQUACULTURE SYSTEM IN SALMON AND SEA TROUT RESTOCKING IN LITHUANIA

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&
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Restocking of salmon and sea trout in Lithuania

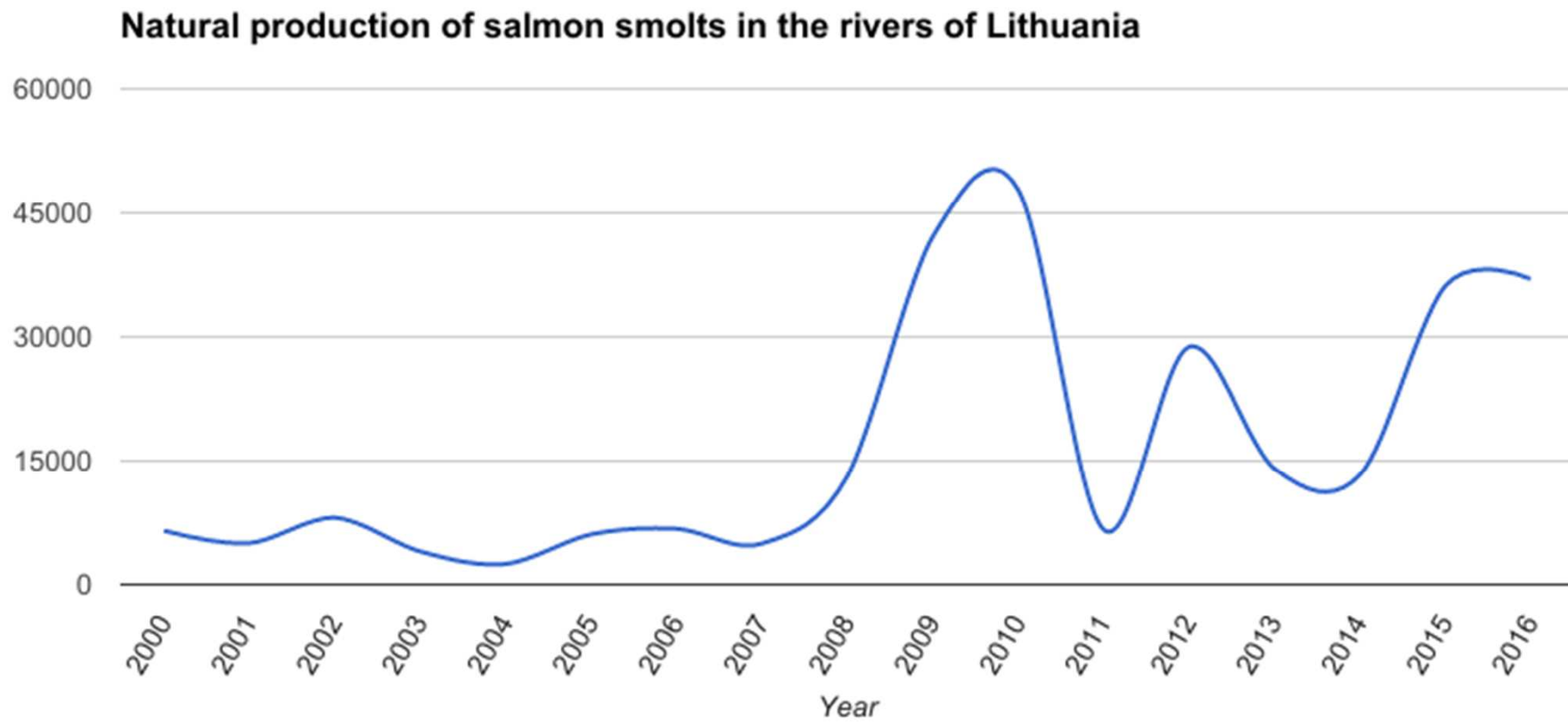*Main salmon and sea trout rivers in Lithuania*

Restocking of salmon and sea trout in Lithuania

Restocking of salmon and sea trout in Lithuania

Natural production of salmon smolts in the rivers of Lithuania

Restocking of salmon and sea trout in Lithuania

Salmon recovery program „Salmon Action Plan 1997 - 2010"

Legislative and institutional regulation

Protection of spawning grounds and migration routes, monitoring of spawning and habitat restoration

Research activities and monitoring

Information, training, and education

The organization and regulation framework for recreational fisheries in rivers

Construction of fish ladders

Restocking of salmon and sea trout in Lithuania

Salmonid species, reared in RAS equipped branches of the Fisheries Service

Salmo:
Atlantic salmon (*S. salar*)
Sea trout (*S. trutta*)

Salvelinus:
Brook trout (*S. fontinalis*)

Oncorhynchus:
Rainbow trout (*O. mykiss*)

Thymallus:
Greyling (*T. thymallus*)

Coregonus:
Euroean whitefish (*C. lavaretus*)
Vendace (*C. albula*)
Peled (*C. peled*)
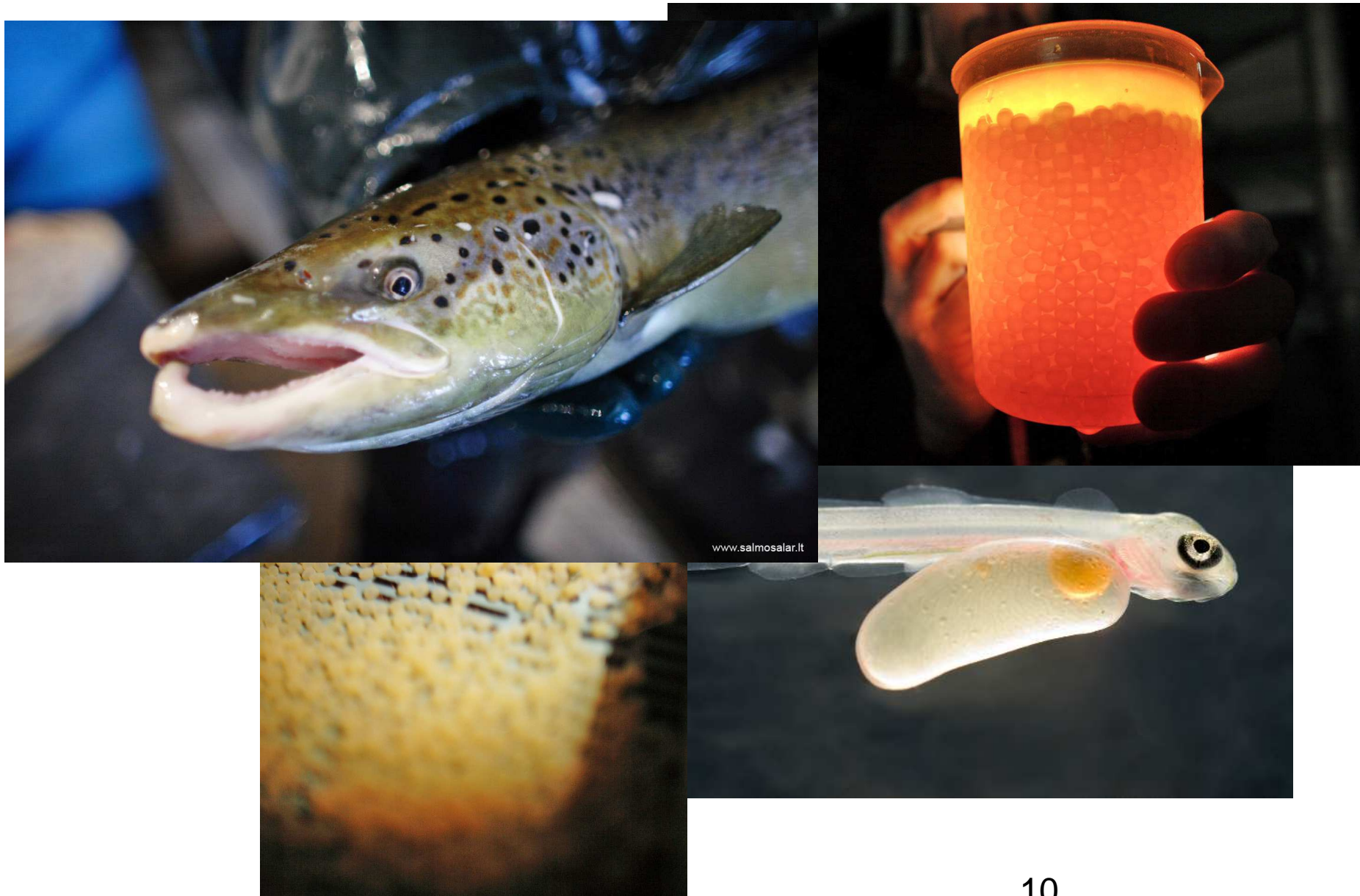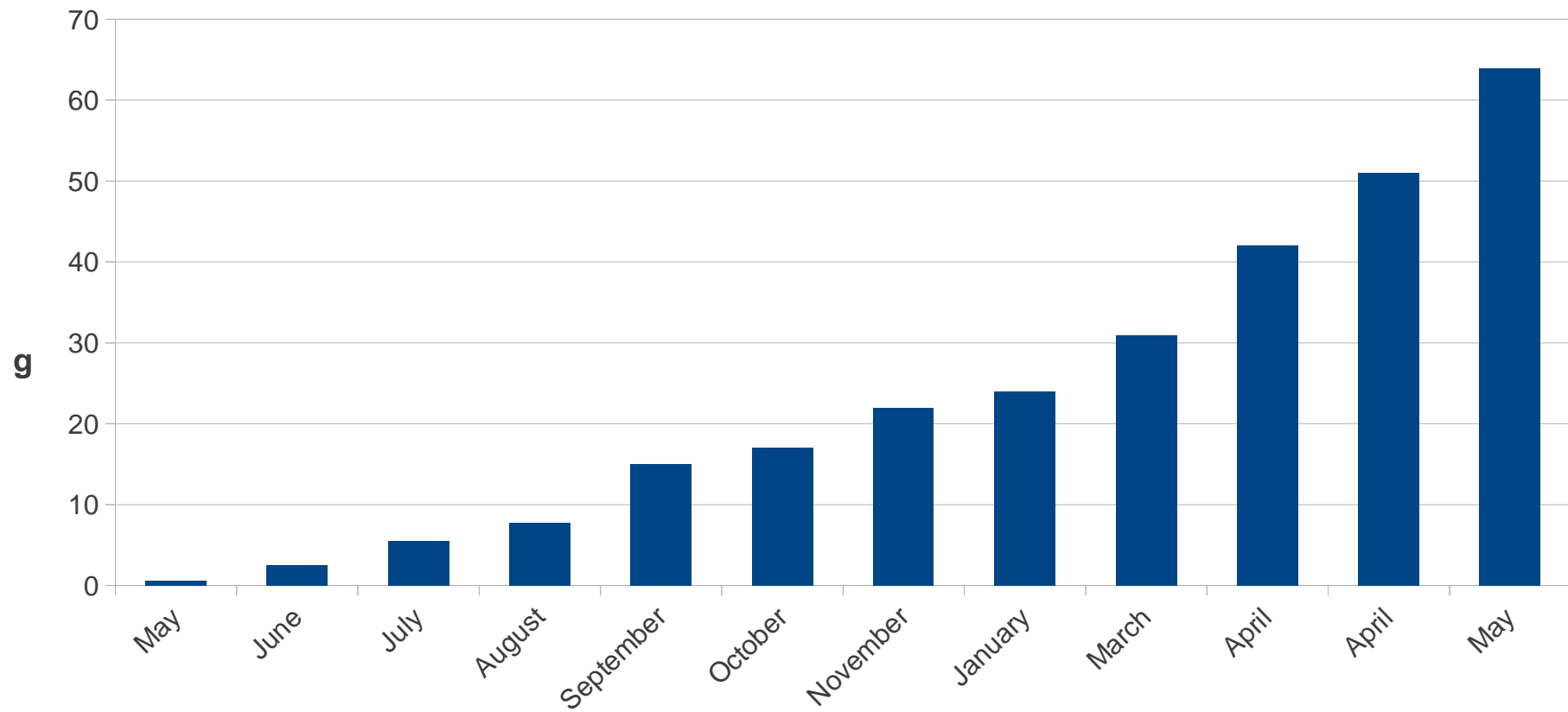
Artificial rearing of salmonids in Lithuania

Restocking of salmon and sea trout in Lithuania

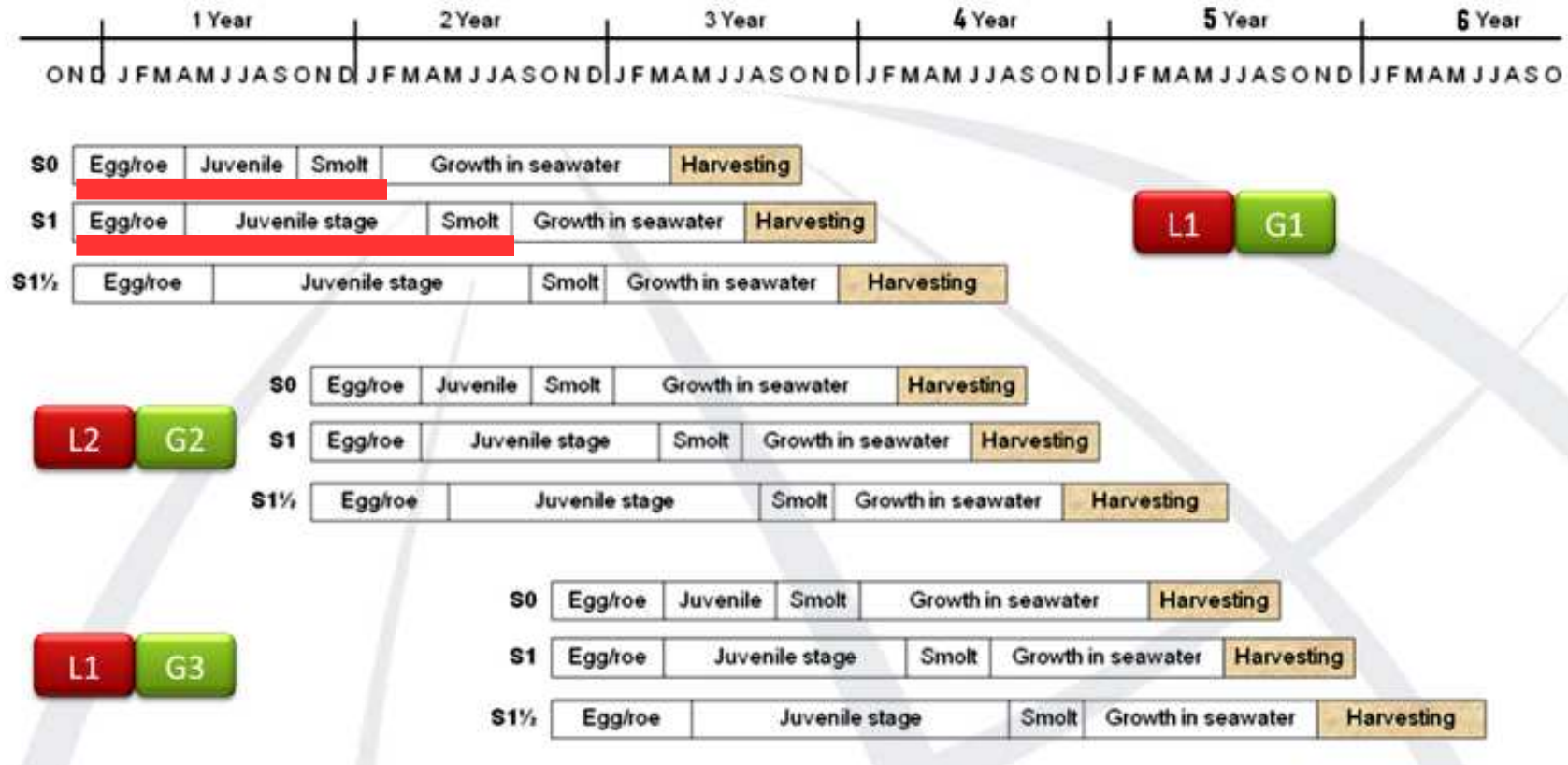# Restocking of salmon and sea trout in Lithuania
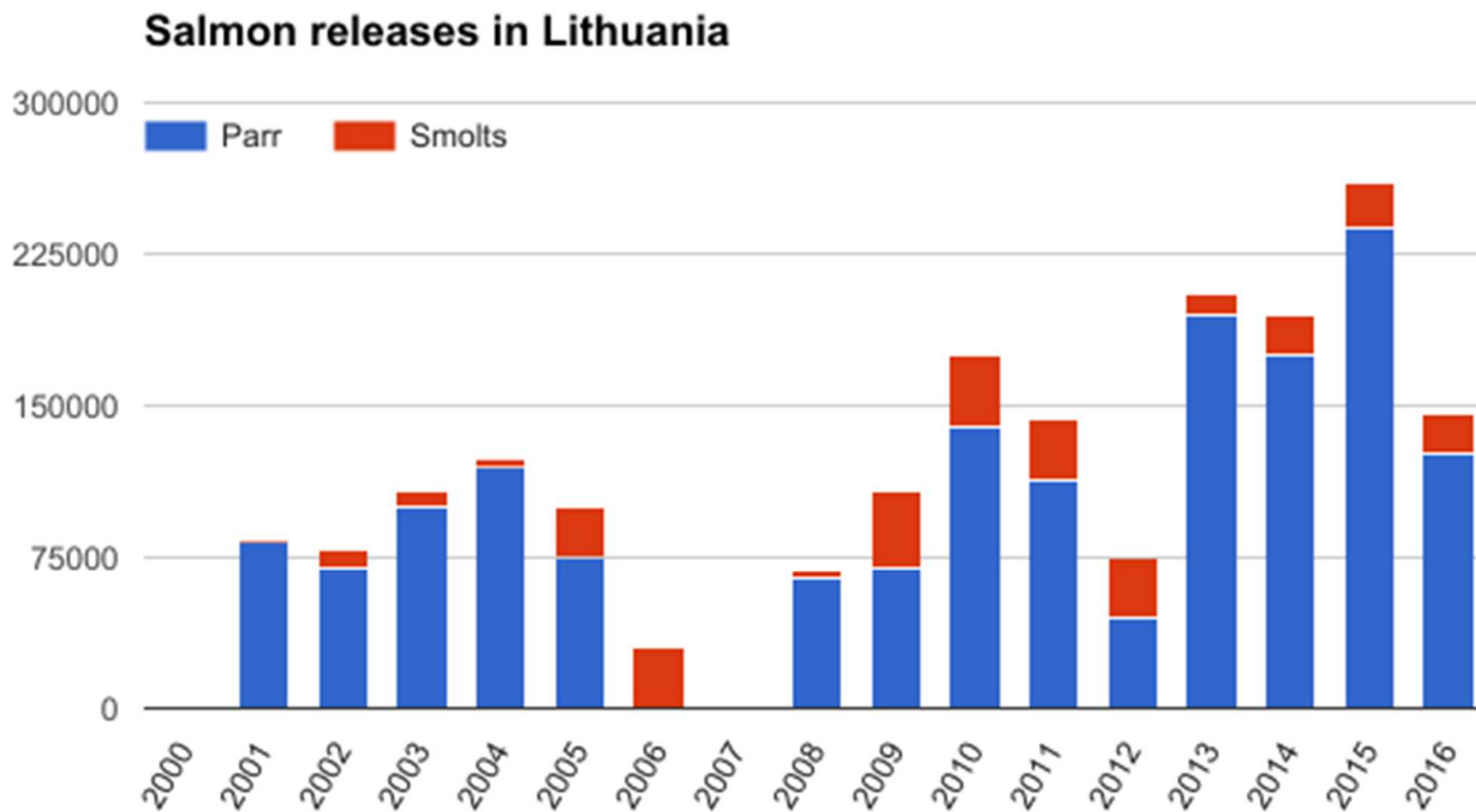
Restocking of salmon and sea trout in Lithuania

Salmon growth rate at the Žeimena RAS

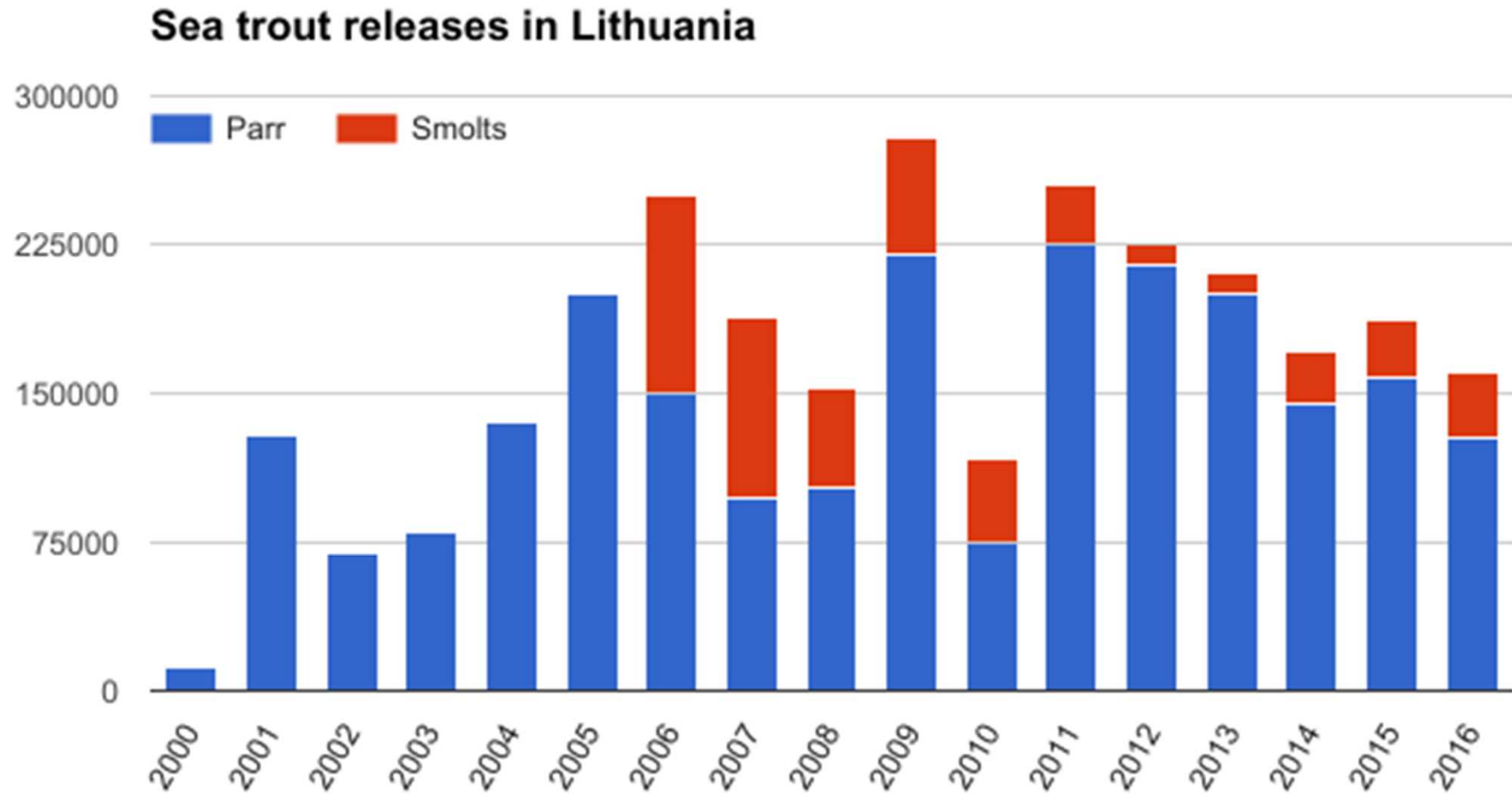# Restocking of salmon and sea trout in Lithuania

Marine Harvest 2010. Salmon Farming Industry Handbook.

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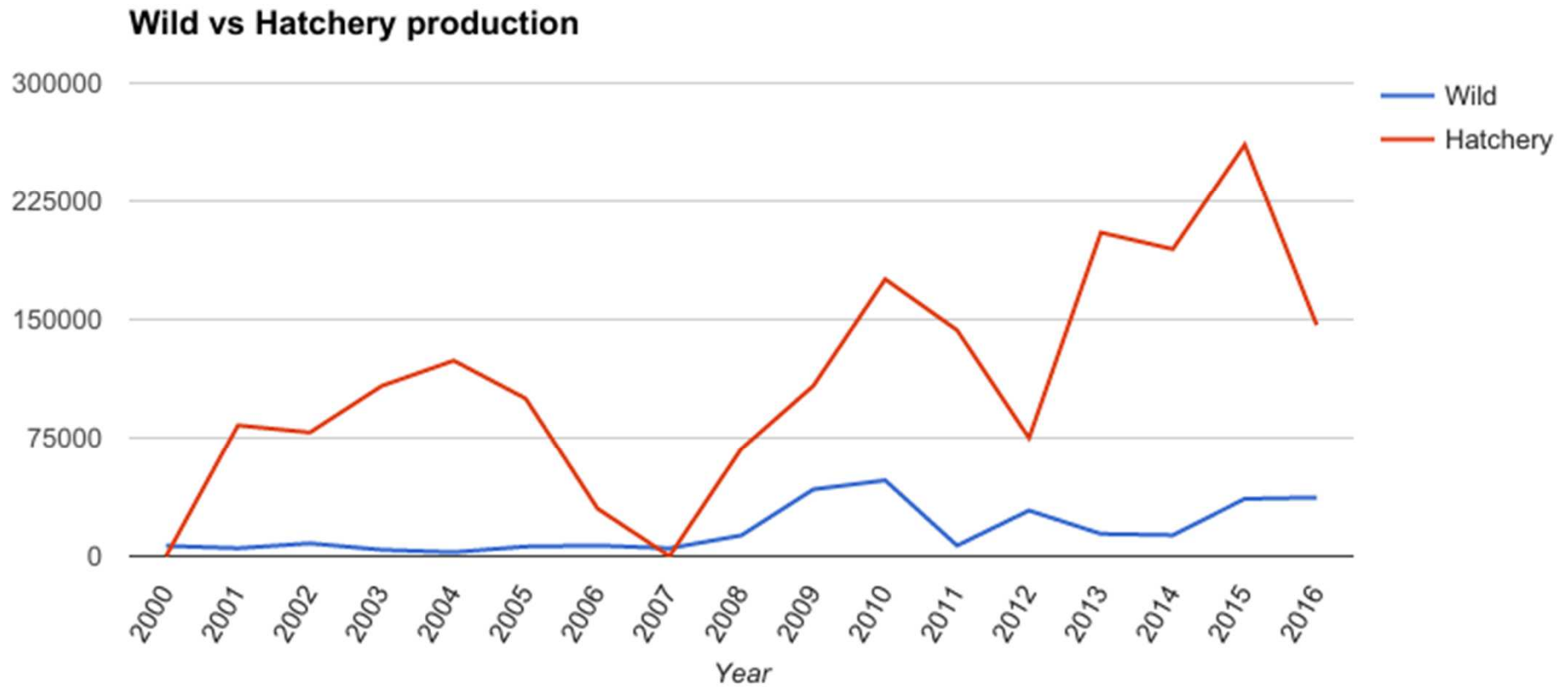
Restocking of salmon and sea trout in Lithuania
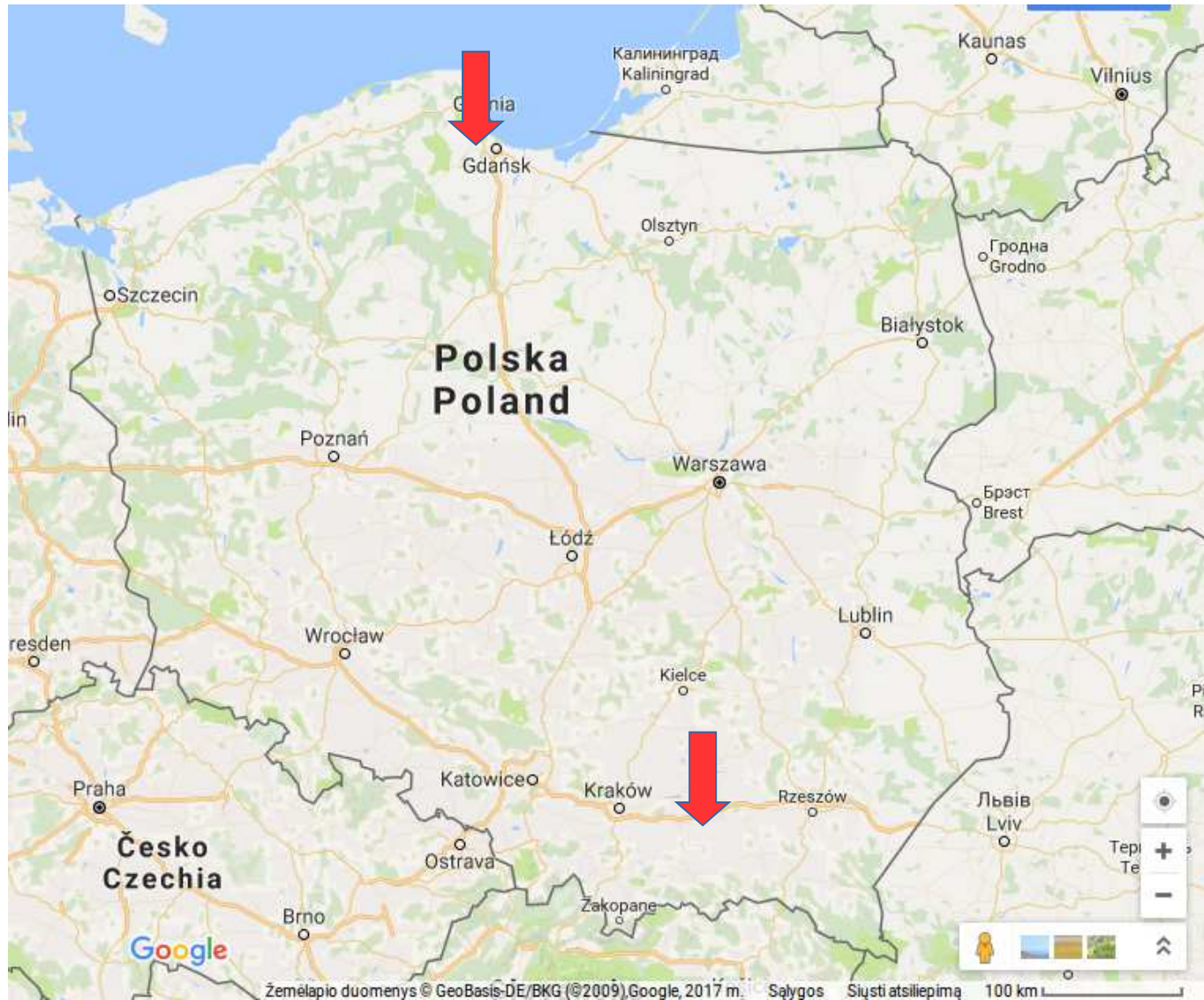

Salmon releases in Lithuania

Restocking of salmon and sea trout in Lithuania

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Restocking of salmon and sea trout in Lithuania

Wild vs Hatchery production

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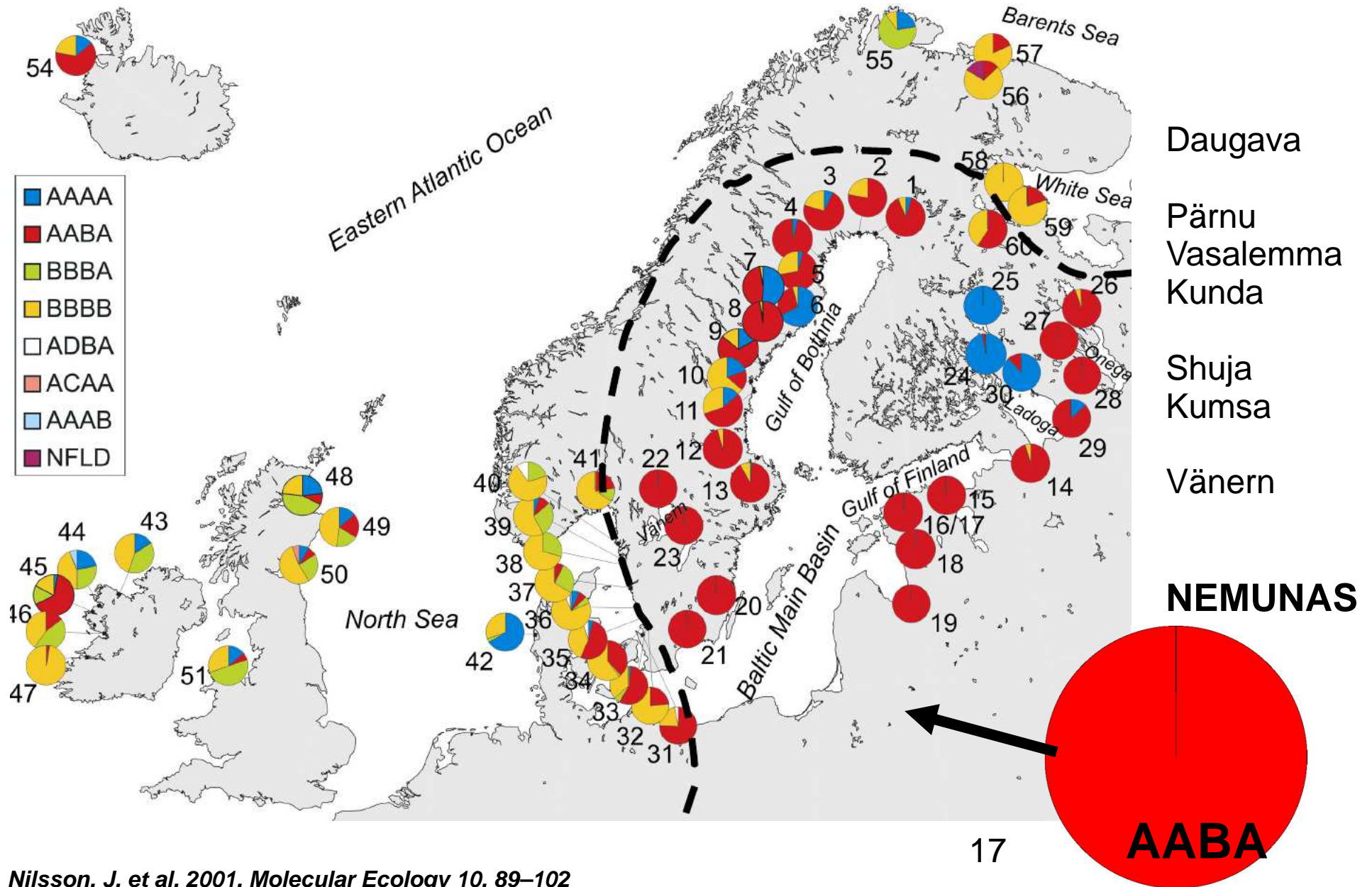# Restocking of salmon and sea trout in Lithuania

Genetic studies of salmon and sea trout populations
Salmon, mtDNA ND1 RFLP

Legend:
- AAAA
- AABA
- BBBA
- BBBB
- ADBA
- ACAA
- AAAB
- NFLD

Daugava

Pärnu
Vasalemma
Kunda

Shuja
Kumsa

Vänern

NEMUNAS

AABA

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Genetic studies of salmon and sea trout populations
Salmon, SNP

Populations of salmon, investigated with SNP's

Genetic studies of salmon and sea trout populations
Salmon, SNP

Main genetic indices

| Population	Nb individuals	Nb polymorphic loci	Mean nb alleles	Ho	He	Nb loci deviating from HWE*	After Bonferroni correction	F_{is}
PHA	28	2654	1.825	0.330	0.327	23	5	−0.00517
PHG	28	2620	1.814	0.339	0.331	68	2	−0.02221
LN	28	2461	1.765	0.339	0.323	83	6	−0.04648
SM	28	3030	1.942	0.325	0.325	85	2	−0.00038
PS	28	2645	1.822	0.337	0.327	88	6	−0.02486

Genetic studies of salmon and sea trout populations
Salmon, SNP

Fst values for pairwise comparisons of salmon PL, LN and SM populations based on geographical location (below the diagonal) and average number of pairwise differences within populations (on the diagonal)

	PL	LN	SM
PL	876.431		
LN	0.218	795.614	
SM	0.217	0.275	983.046

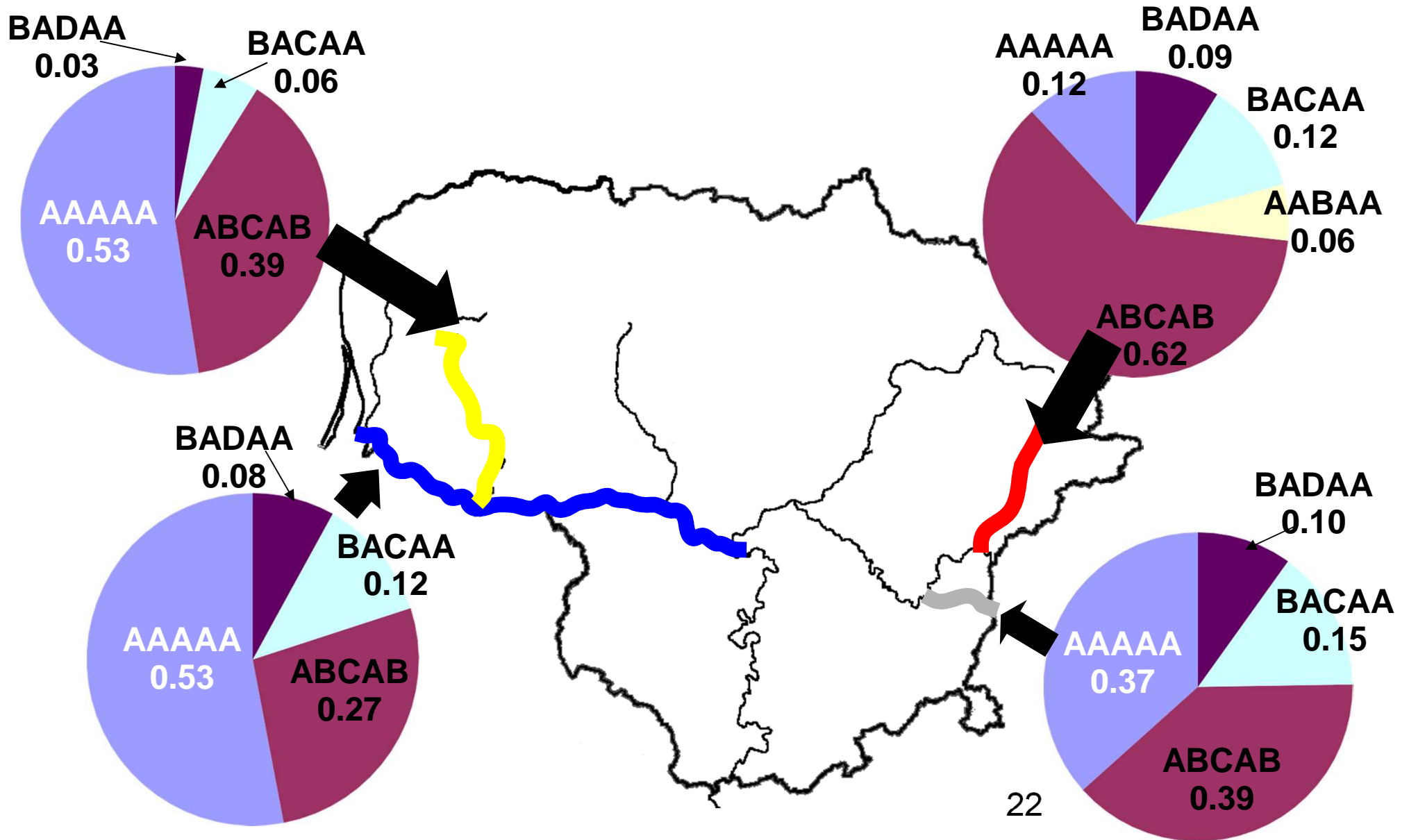# Genetic studies of salmon and sea trout populations
Sea trout
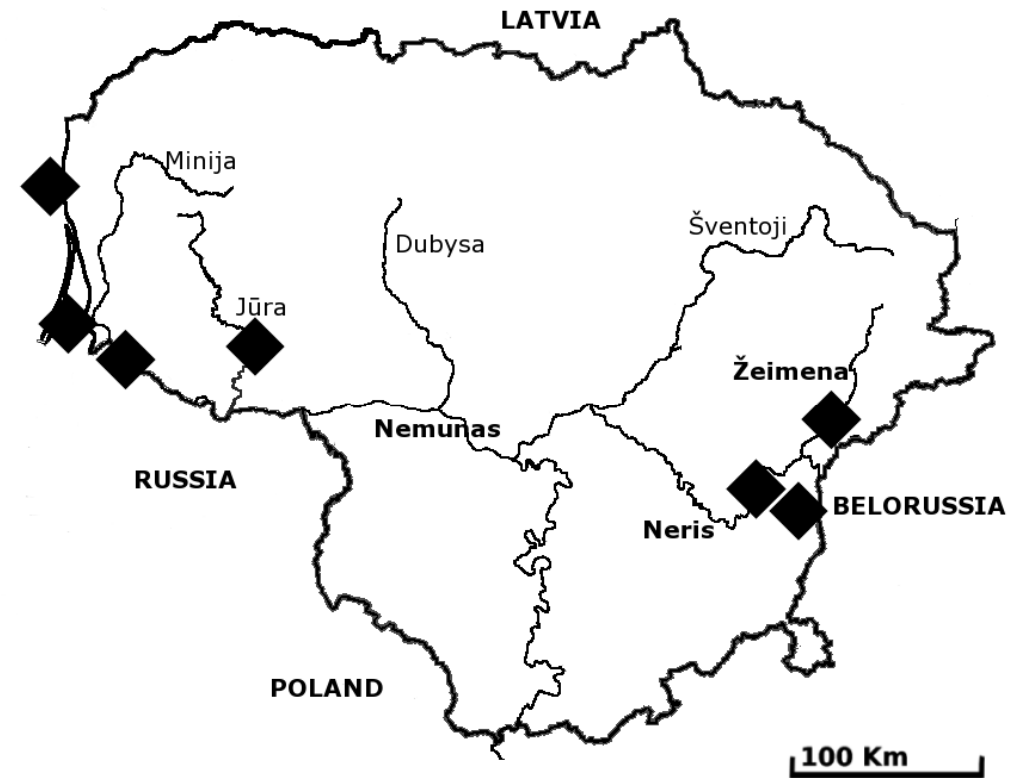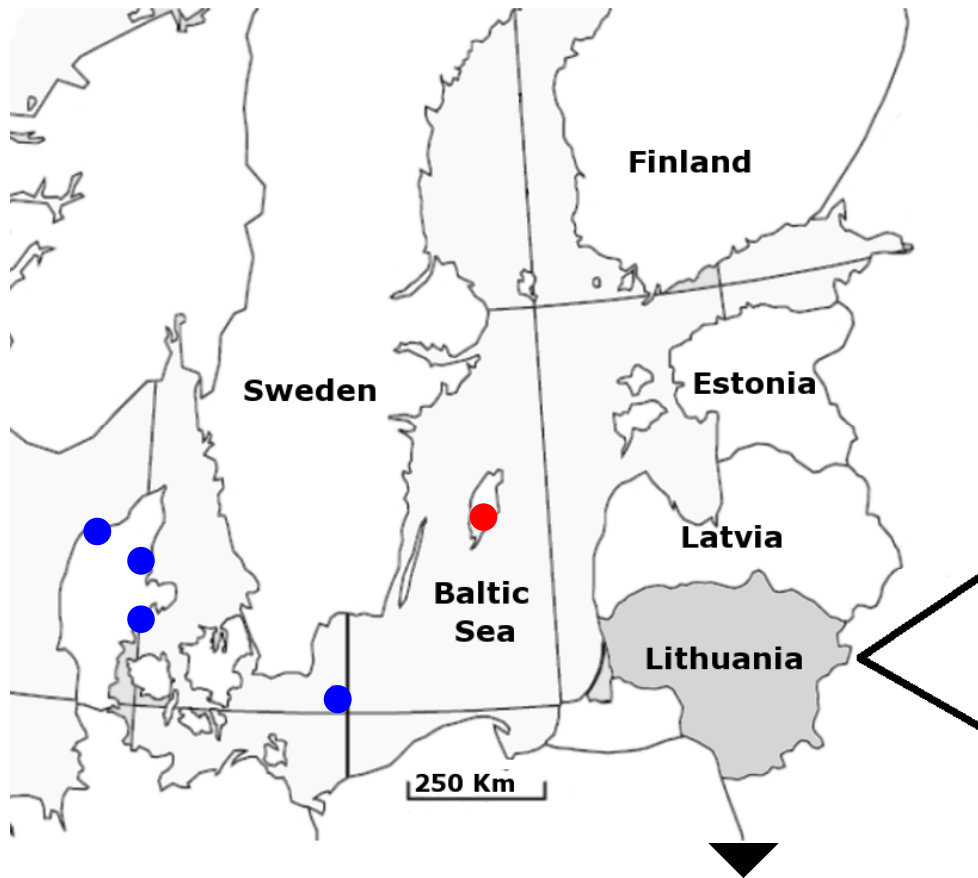
Mėginių paėmimo vietos

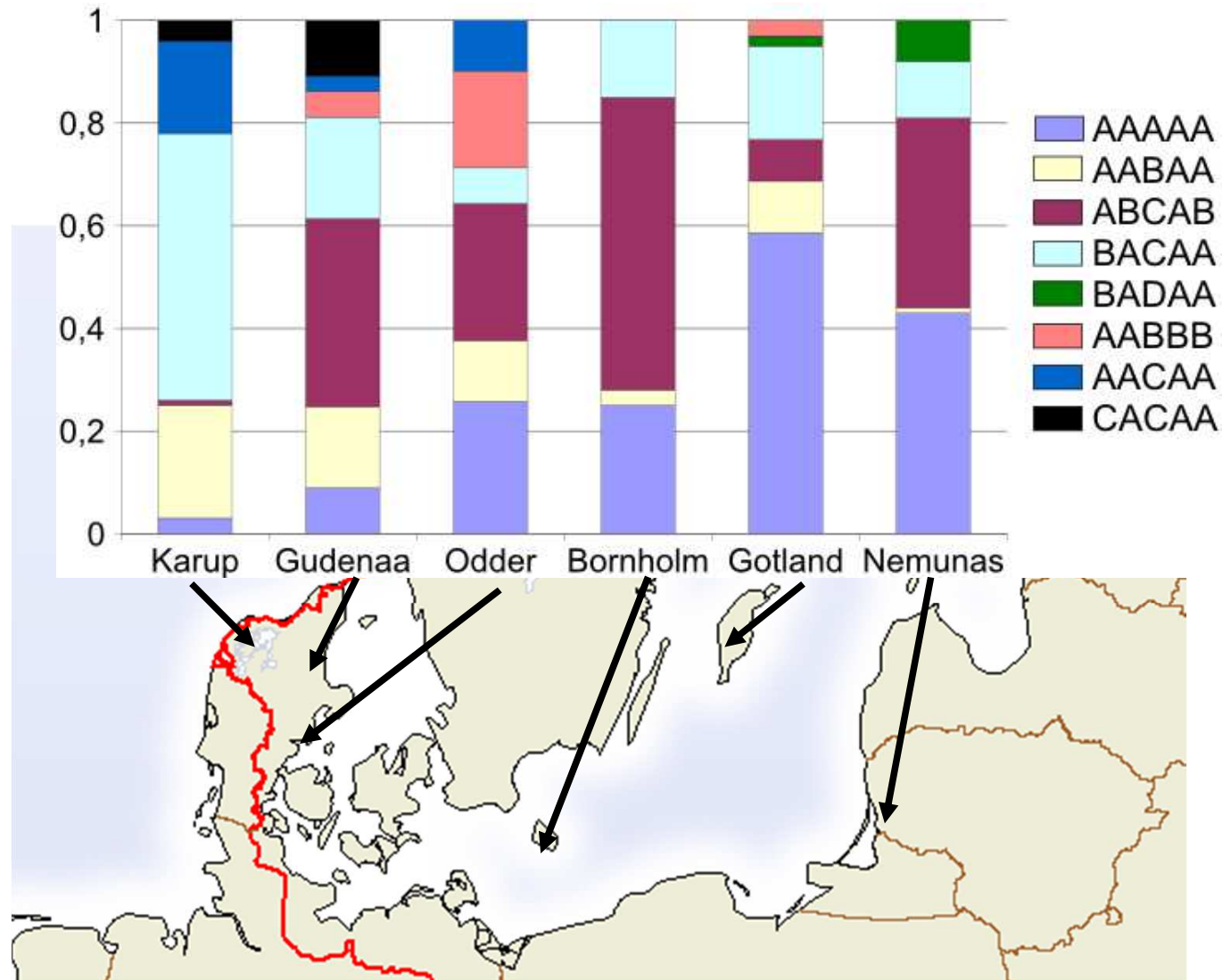🔴 - Laikre *et al.* 2002   🔵 - Hansen & Loeschcke 1996; Hansen & Mensberg 1996, 1998

Populations of sea trout, investigated with mtDNA RFLP

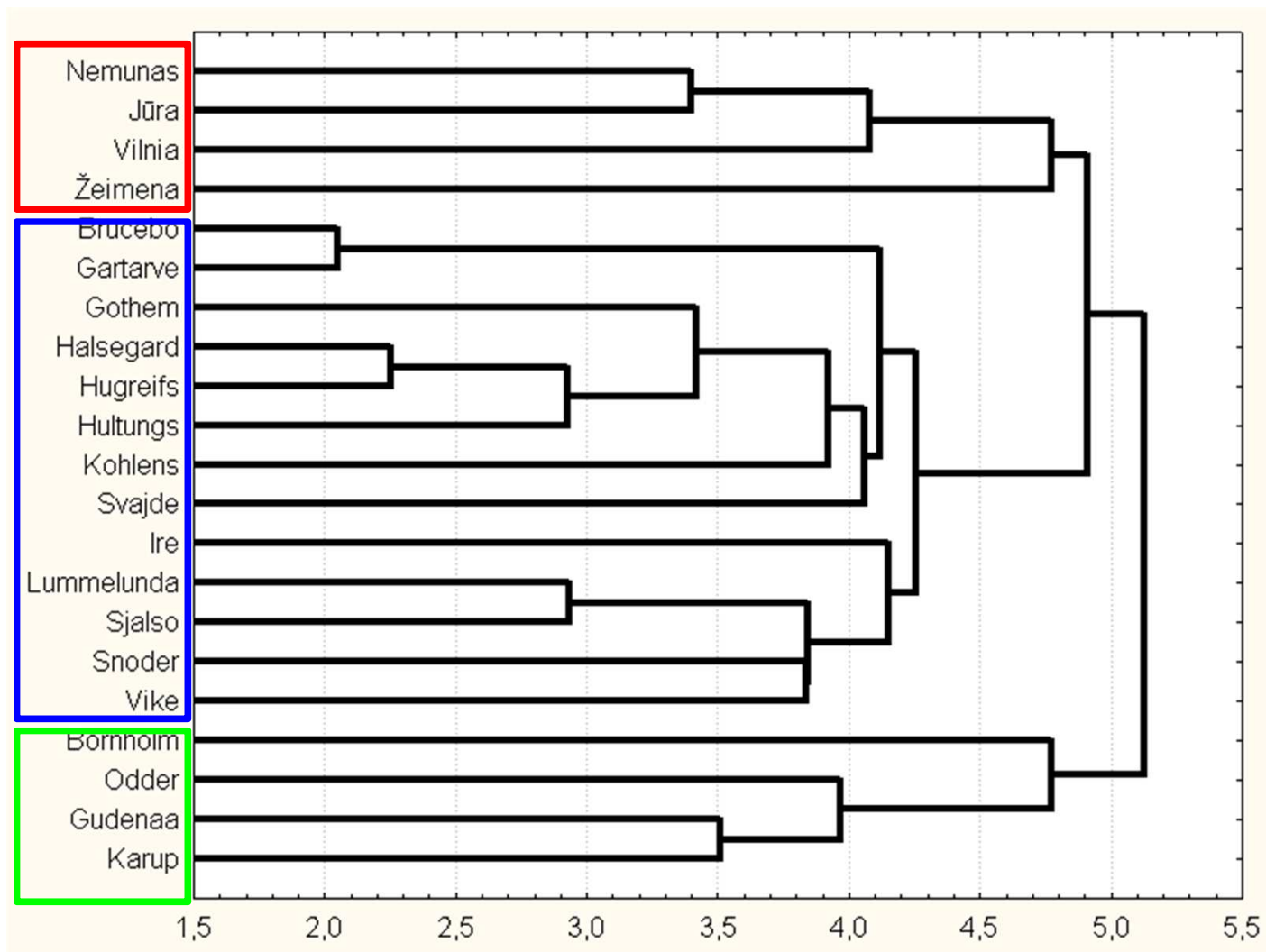# Genetic studies of salmon and sea trout populations
Sea trout, mtDNA RFLP of ND1, ND3/4 and ND5/6

Genetic studies of salmon and sea trout populations
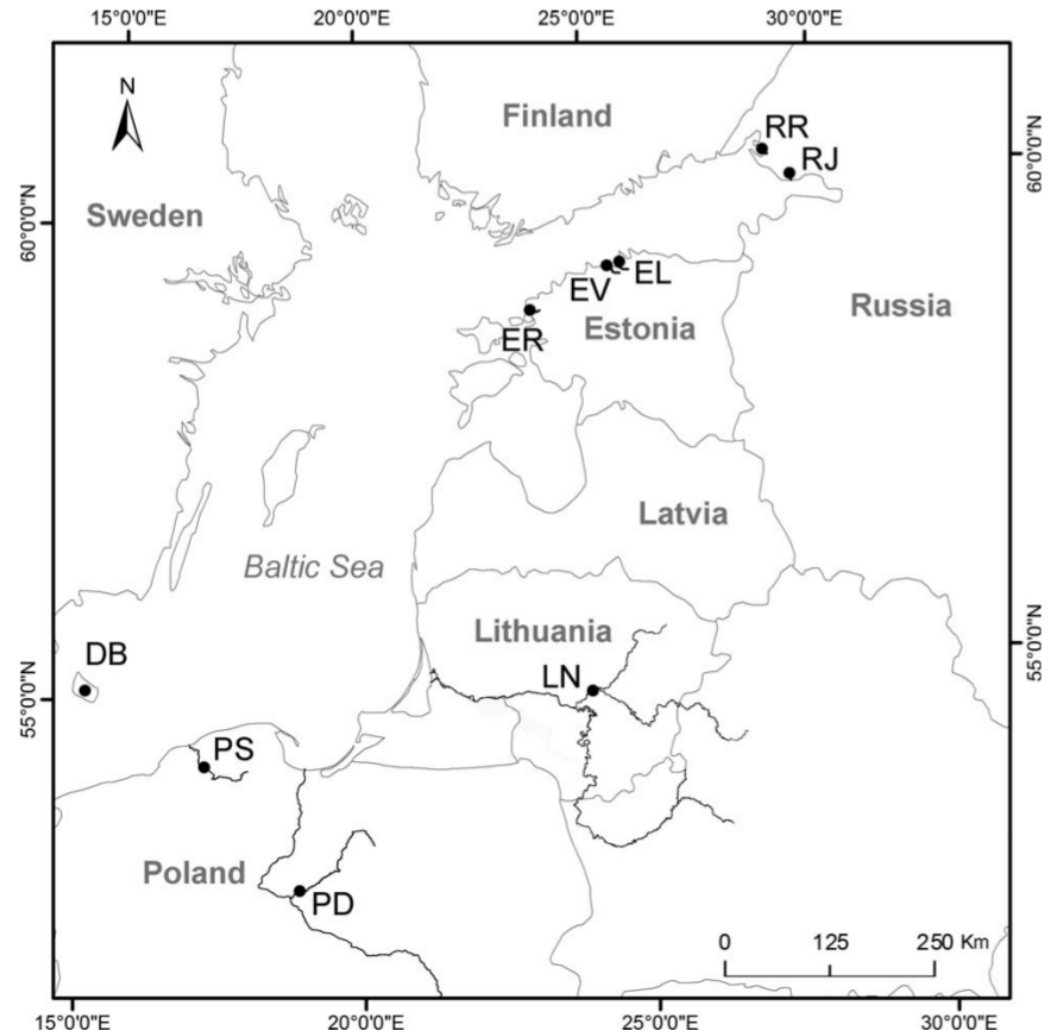## *Sea trout, mtDNA RFLP of ND1, ND3/4 and ND5/6*

Genetic studies of salmon and sea trout populations
Sea trout, mtDNA RFLP of ND1, ND3/4 and ND5/6

Genetic studies of salmon and sea trout populations
Sea trout, SNP

Population name	n	Sampling site	Meta-population
DB	50	Bornholm, Denmark	Main Basin
PS	50	Slupia River, Poland	
PD	49	Vistula River, Poland	
LN	50	Neman River, Lithuania	
ER	50	Riguldi River, Estonia	West and Central Gulf of Finland
EL	50	Loo River, Estonia	
EV	50	Valkla River, Estonia	
RJ	50	Jukkola River, Russia	East Gulf of Finland
RR	50	Rompeti River, Russia	
	$\Sigma = 449$		

Populations of sea trout, investigated with SNP's

Genetic studies of salmon and sea trout populations
Sea trout, SNP

Population	No. of individuals	No. of polymorphic loci	Mean number of alleles	H_o	H_e	Ne (CI 95%)
DB	50	20	1.870	0.267	0.256	103.3
PS	50	22	1.957	0.261	0.269	159.2
PD	49	21	1.913	0.266	0.270	185.2
LN	50	22	1.957	0.199	0.219	26.5
ER	50	21	1.913	0.247	0.246	71.2
EL	50	18	1.783	0.354	0.345	56.8
EV	50	18	1.783	0.298	0.305	197.6
RJ	50	19	1.826	0.257	0.271*	51
RR	50	19	1.826	0.293	0.290	450.7

Genetic variability and effective population size in populations of sea trout from the Baltic Sea basin

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Genetic studies of salmon and sea trout populations
Sea trout, SNP

|	Bornholm	Slupia	Vistula	Neman	Riguldi	Loo	Valkla	Jukkola	Rompoti
Bornholm	4.8891[a]	0.0852	0.0636	0.0889	0.0229	0.0845	0.0712	0.1264	0.1570
Slupia	*	5.4647[a]	0.0098	0.0297	0.0782	0.1289	0.0776	0.1012	0.1742
Vistula	*	NS	5.2523[a]	0.0082	0.0614	0.0986	0.0637	0.0912	0.1626
Neman	*	*	NS	4.4295[a]	0.0648	0.1160	0.0498	0.0652	0.1409
Riguldi	NS	*	*	*	5.0705[a]	0.0929	0.0562	0.0887	0.1403
Loo	*	*	*	*	*	6.0154[a]	0.0516	0.1315	0.1163
Valkla	*	*	*	*	*	*	5.4398[a]	0.0633	0.0894
Jukkola	*	*	*	*	*	*	*	4.9743[a]	0.0731
Rompoti	*	*	*	*	*	*	*	*	5.2232[a]

[a] Average number of pairwise differences within population
* Significant for a $\alpha = 0.05$, NS = Non-Significant

Above diagonal: Fst values for pairwise comparisons
Below diagonal: significance level for genetic differentiation among pairs of populations
On diagonal: average number of pairwise difference within population.

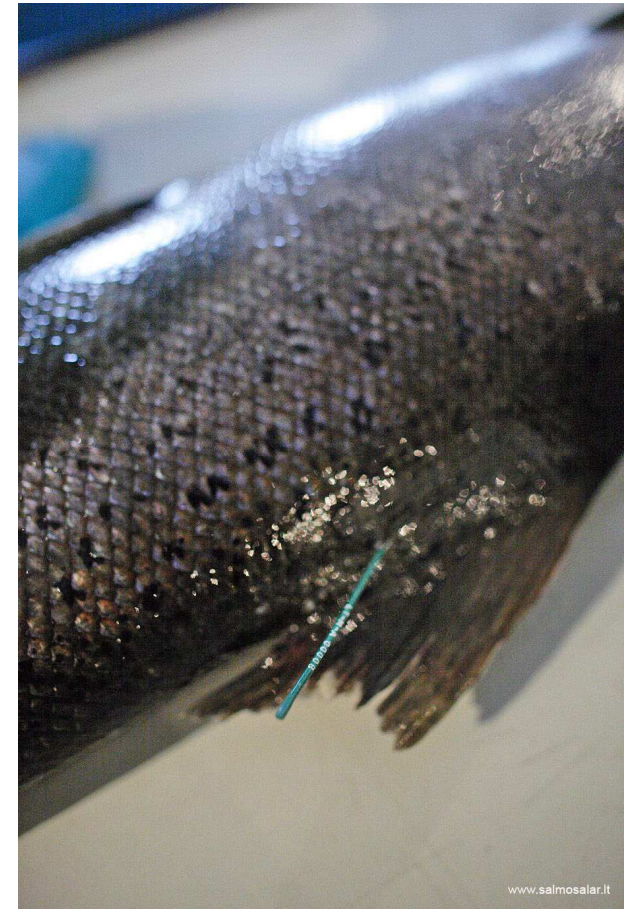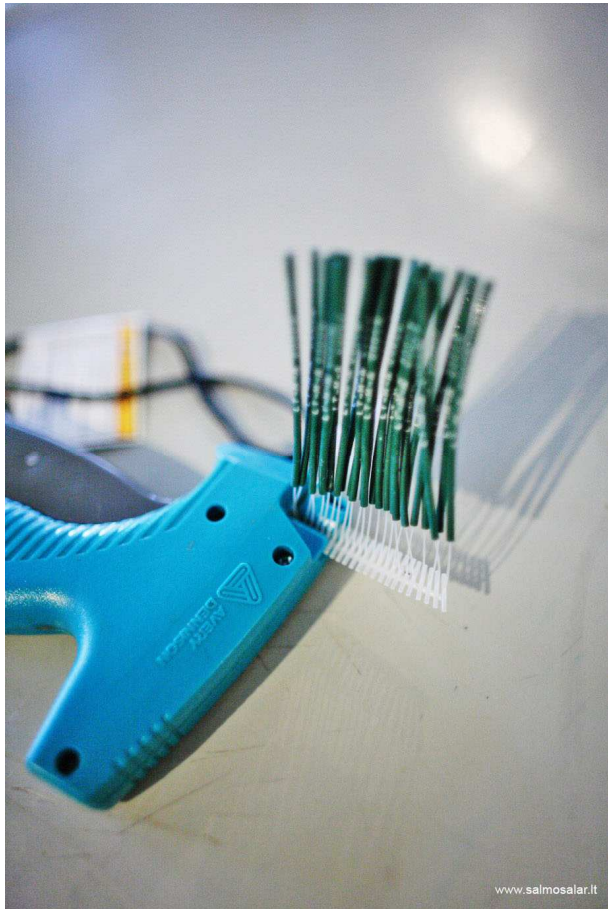# Genetic studies of salmon and sea trout populations
Sea trout, SNP
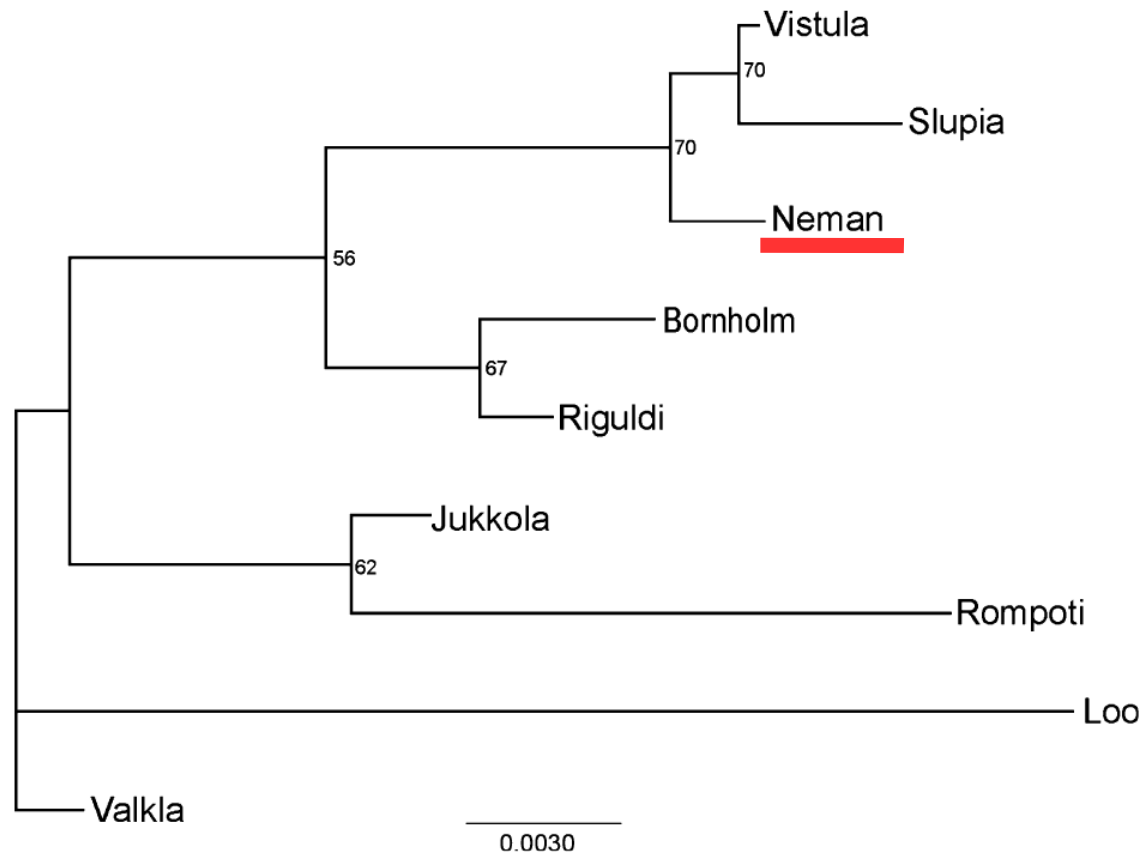
A neighbor-joining tree constructed using the Nei's distances between the nine sea trout populations
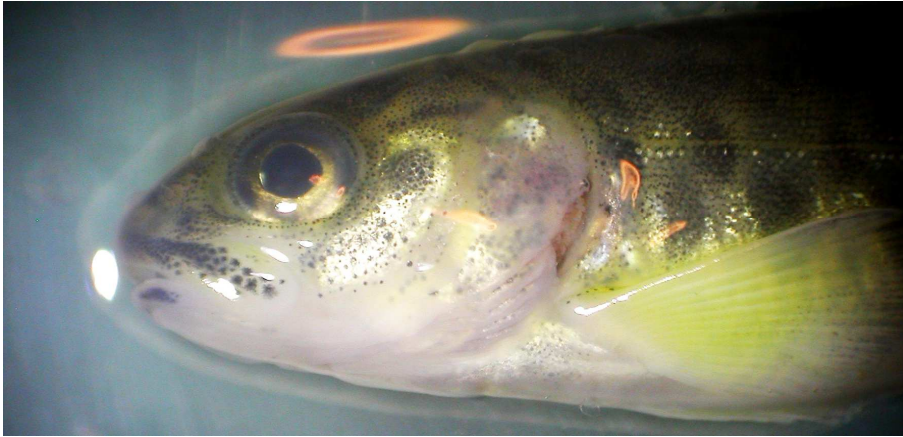
No fish tagging program – future plans!

Restocking of salmon and sea trout in Lithuania
Problems and future plans

Some RAS related developmental disorders

Thank you!

Спасибо за внимание!