

Offshore wind and migratory fish - what do we know about fish migrations in the northern Bothnian Bay?

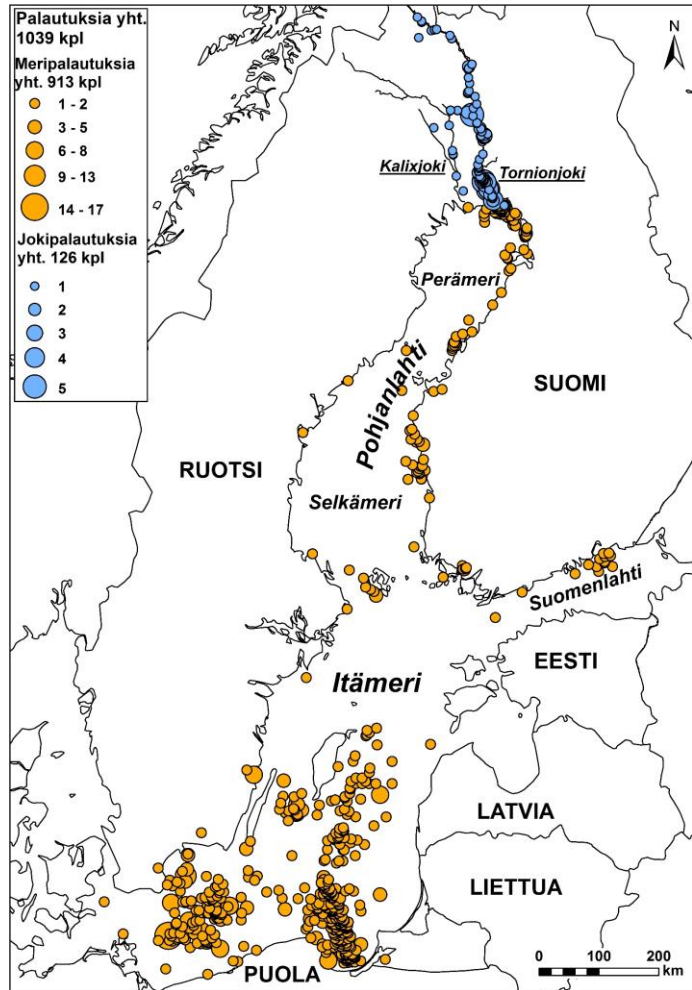
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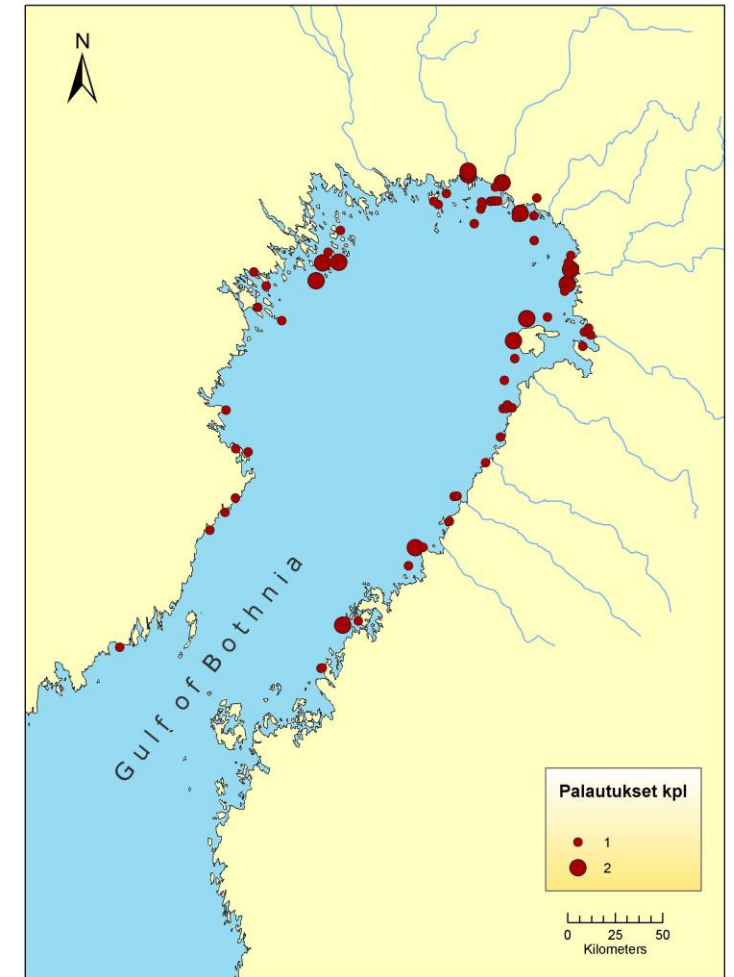
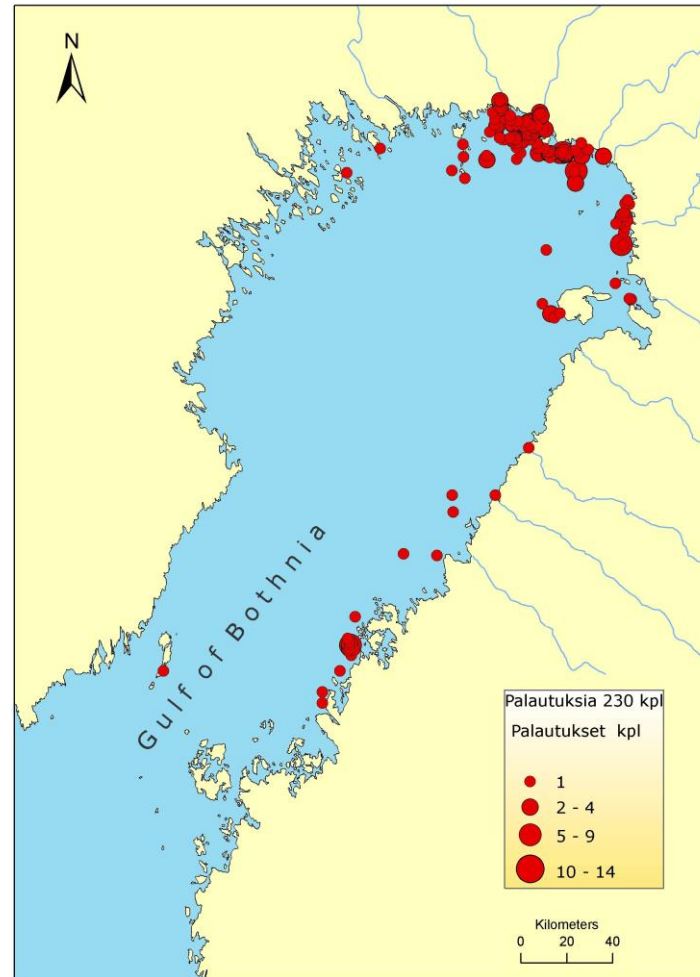


Traditional tag recaps from fishing

Adult Tornionjoki salmon recaptures



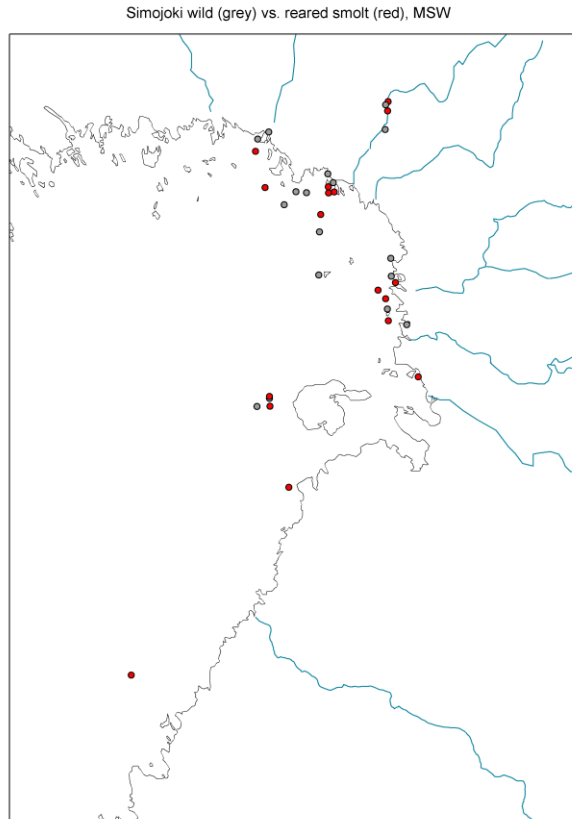
Tornionjoki trout recaptures



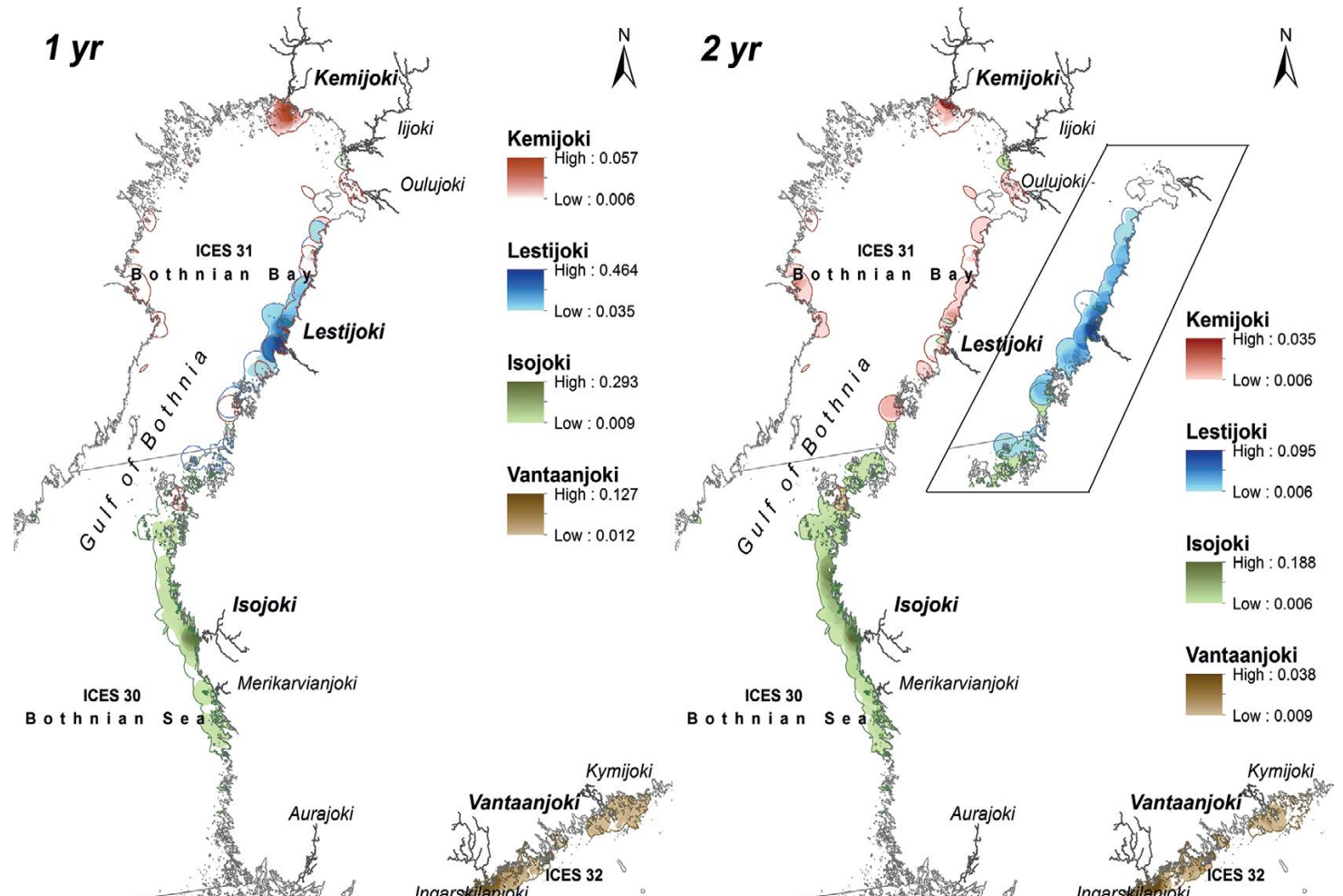
Salmon returning to rivers located further south than Råne-Kalix-Kemi rivers do not cross Swe-Fin border

Sea trout disperse mostly within ~100-150 km from home river

Simojoki tag returns (example)



Kemi- ja Lestijoki (Kallio-Nyberg et al. 2017, example)



Do returning salmon use offshore areas?

Salmon from rivers Oulujoki-Tornionjoki often first 'hit the coast' around Maksniemi, then disperse north or south → some migration in open sea (Siira et al., 2007)

Non-fishery dependent data: some salmon migrate far from coast (Westerberg et al. 1999)

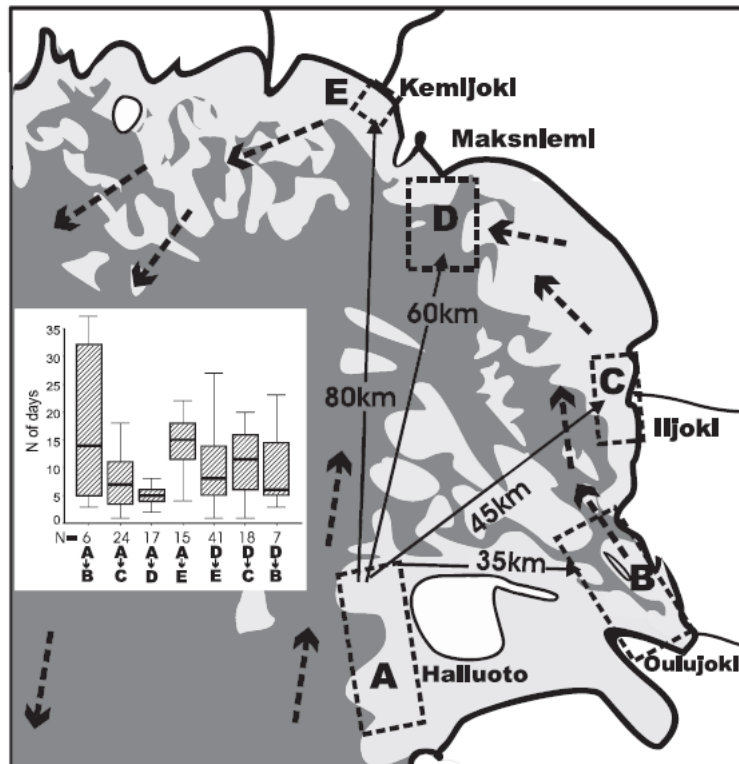


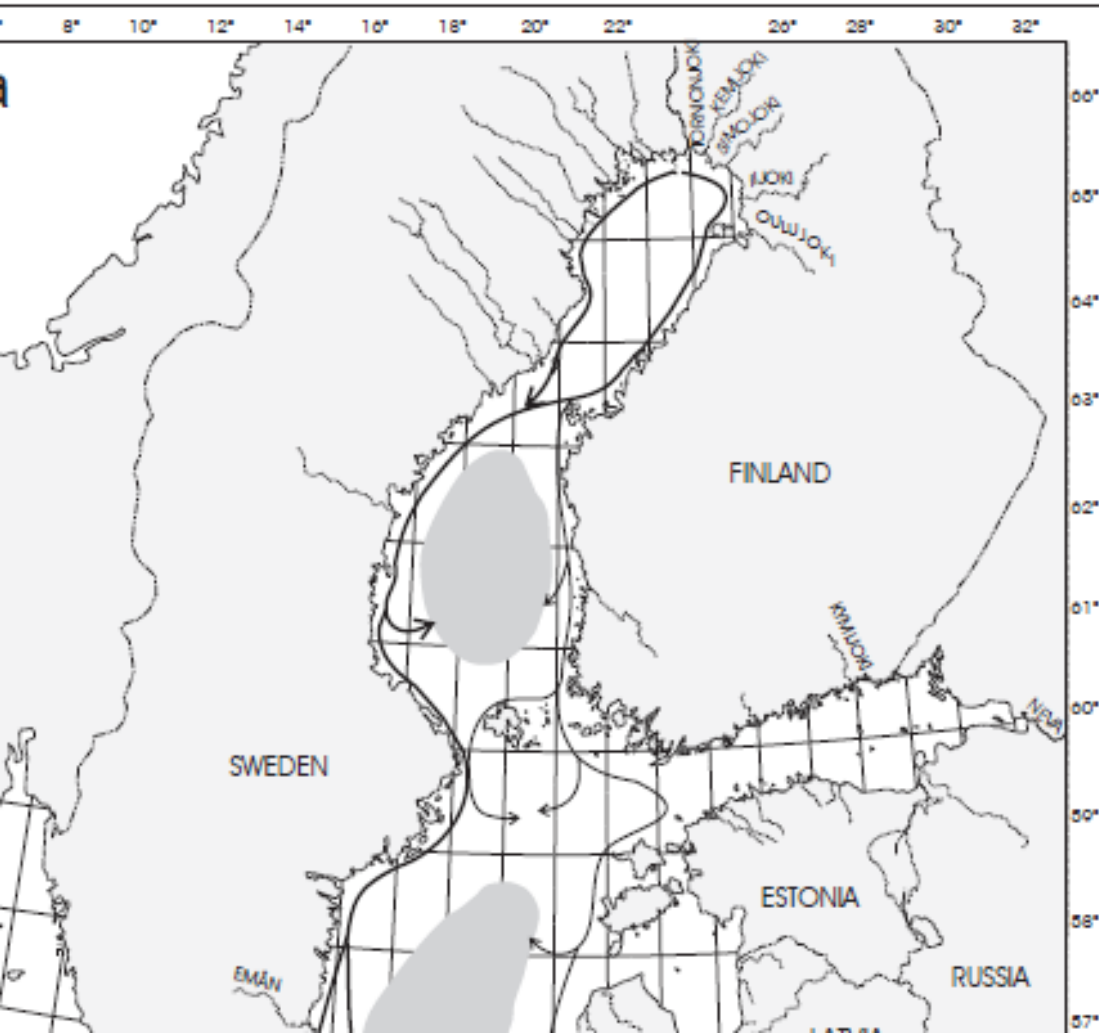
Figure 6. Distances (black lines, km) and migration times of salmon between sub regions in the Bothnian Bay. Time between release and recapture of tagged fish from one sub region to another (A-E) is pre-



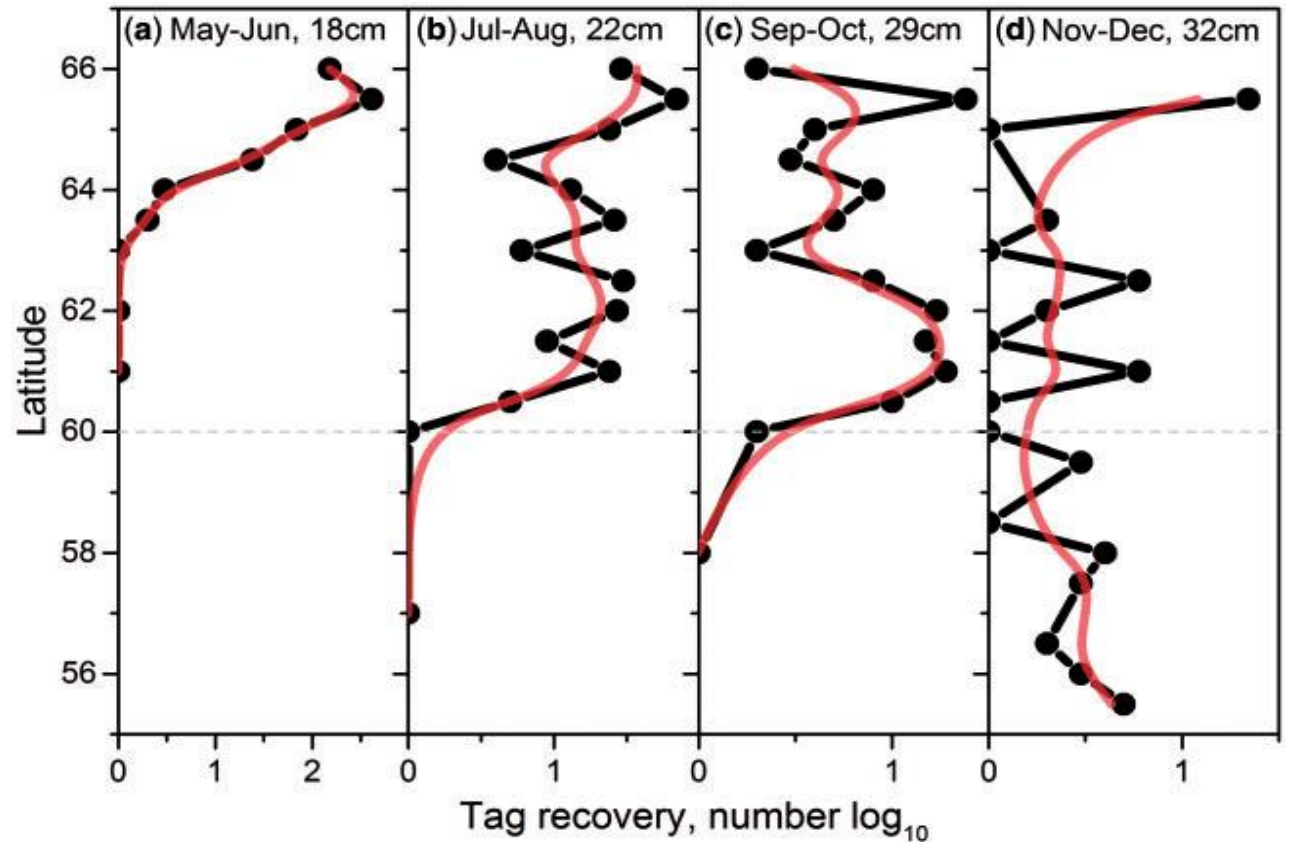
Figure 2. Trajectories of 12 salmon migrating in 1997, as reconstructed from SST and travelling time. For each salmon there are one eastern and one western alternative.

What about migration routes of salmon post-smolts?

Reconstruction of BoB post-smolt migration routes, based on tag recaptures (Ikonen 2006)



Speed of southward movement, based on tag recaptures (Friedland et al. 2017)



Between 1959-2014, post-smolts reached South of Bothnian Sea in September and Baltic proper in November

New fishery-independent data on migrations at sea: acoustic telemetry

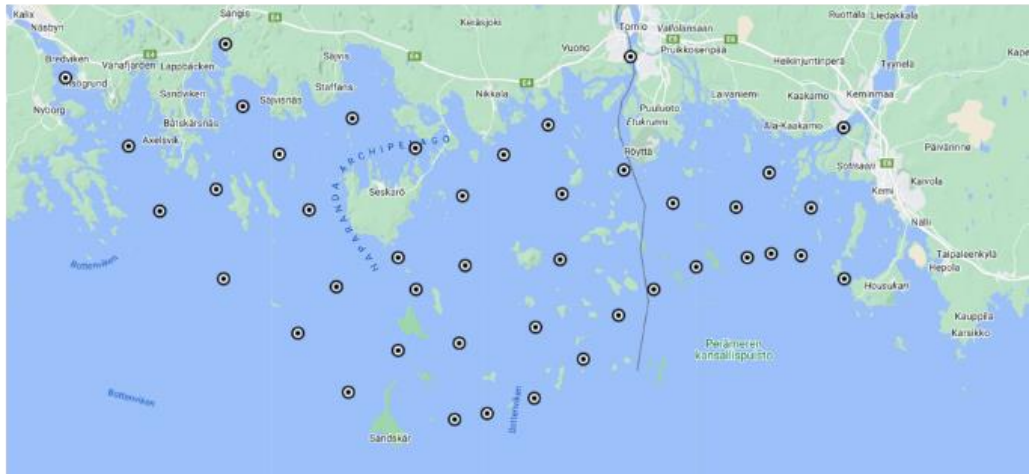
Project "Coastal behavior and survival of Tornionjoki sea trout", 2023-2027

- Swedish university of agricultural sciences (SLU): Gustav Hellström, Jörgen Wiklund
- Natural Resources Institute Finland (Luke): Atso Romakkaniemi, Riina Huusko, Jarno Jääskeläinen
- Co-financed from the fund of Tornionjoki fishing licence revenue
- Focus on sea migrations of Tornionjoki sea trout: early sea migration, feeding areas, overwintering areas, survival, returns back to river
- Some salmon (smolts) are used for comparison

New fishery-independent data on migrations at sea: acoustic telemetry

- Special **tags with acoustic transmitters** tagged to smolts and also sub-adult and adult sea trout
 - Smolts: smaller tags, battery life max. 1 year
 - Adult sea trout: largest tags, battery life almost 3 years
- **Network of acoustic receivers** is installed in the sea area of interest, battery life of receivers ~1 year → data download and battery exchange once a year
 - Detection radius of a receiver ~0.5-1 km
 - Collaboration with another project focusing on grayling in BoB: extra receivers were installed 2023-2024

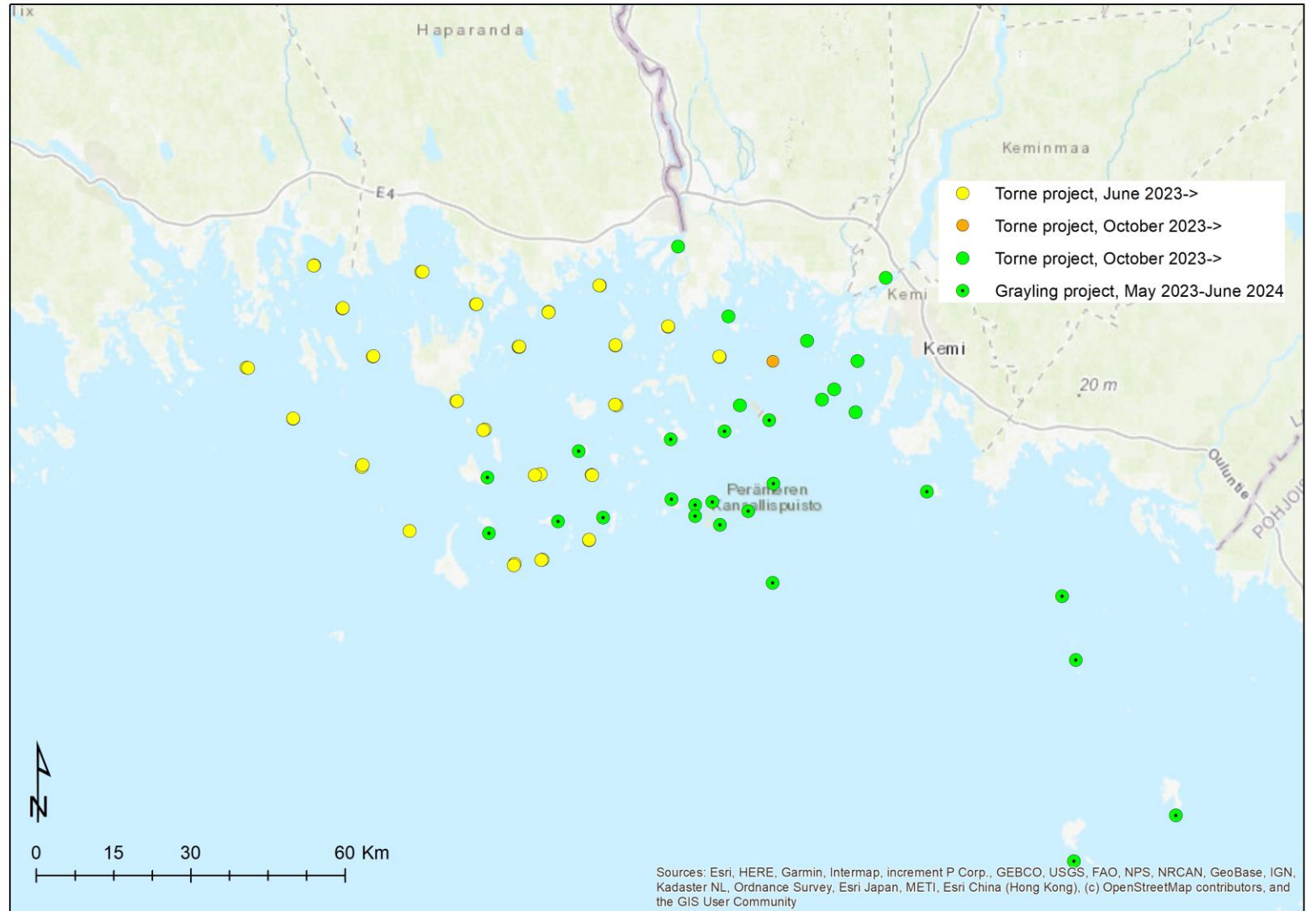




Realized network of receivers

- Time of deployment (installation) has varied
- So far, data received and processed only from the eastern part of the archipelago, plus from some of the southern receivers (green dots)
- Receivers of grayling project were removed last spring; most were replaced by new receivers

→ today's results do not give a full, balanced overview of migrations!



Tagging

Before this autumn, only smolts tagged, tagging at Tornionjoki smolt trap

- 2023 both salmon and trout were tagged, June 1-18
- 2024 only trout were tagged, May 28 – June 3

	2023		2024		TOTAL
	Amount inds.	Aver. length, mm	Amount inds.	Aver. length, mm	Amount inds.
Salmon	20	159	0	-	20
Trout	26	178	38	189	64
TOTAL	46		38		84

Autumn 2024: tagging of sub-adult & adult trout (>35 cm)

- Voluntary anglers catch fish on the lowermost river (below Kukkola)
- Fishing & tagging ongoing, so far 12 inds. tagged
- First tracking results obtained 2025



Tracking detections until June 2024

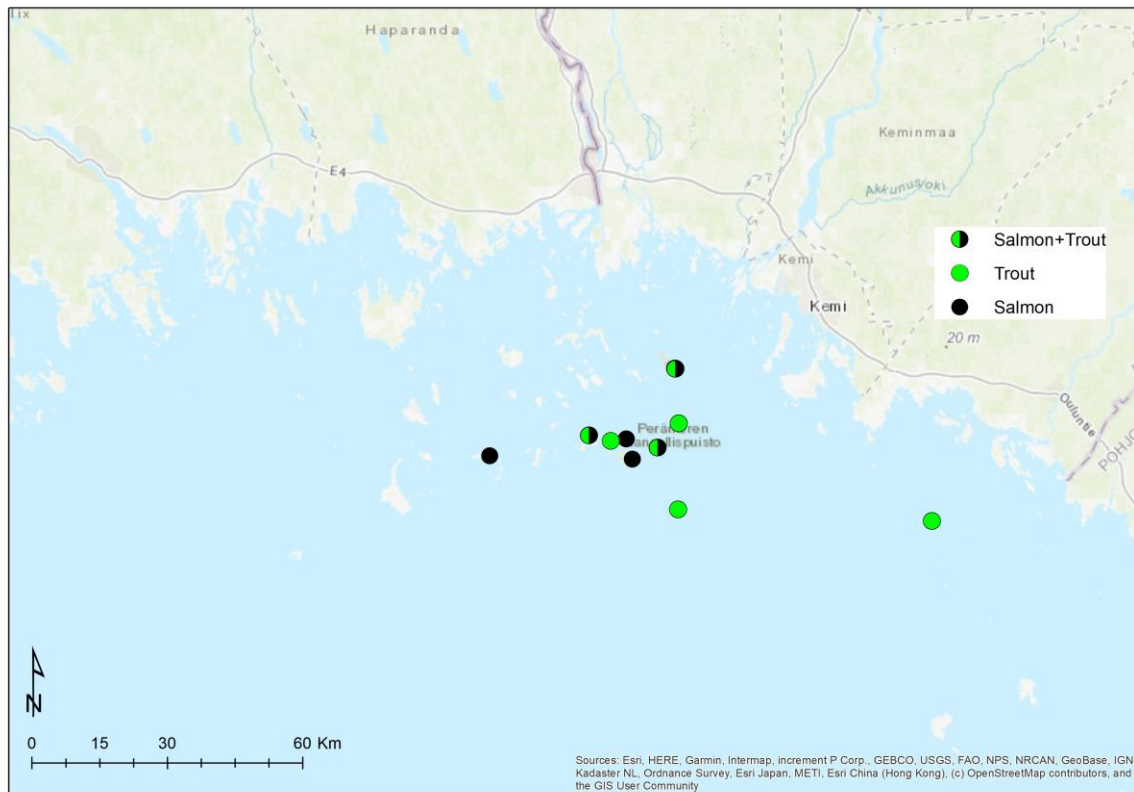
Remember:

- so far, detections only from tagged smolts
- Basically no data collected from receivers located to the west – southwest from the river mouth!

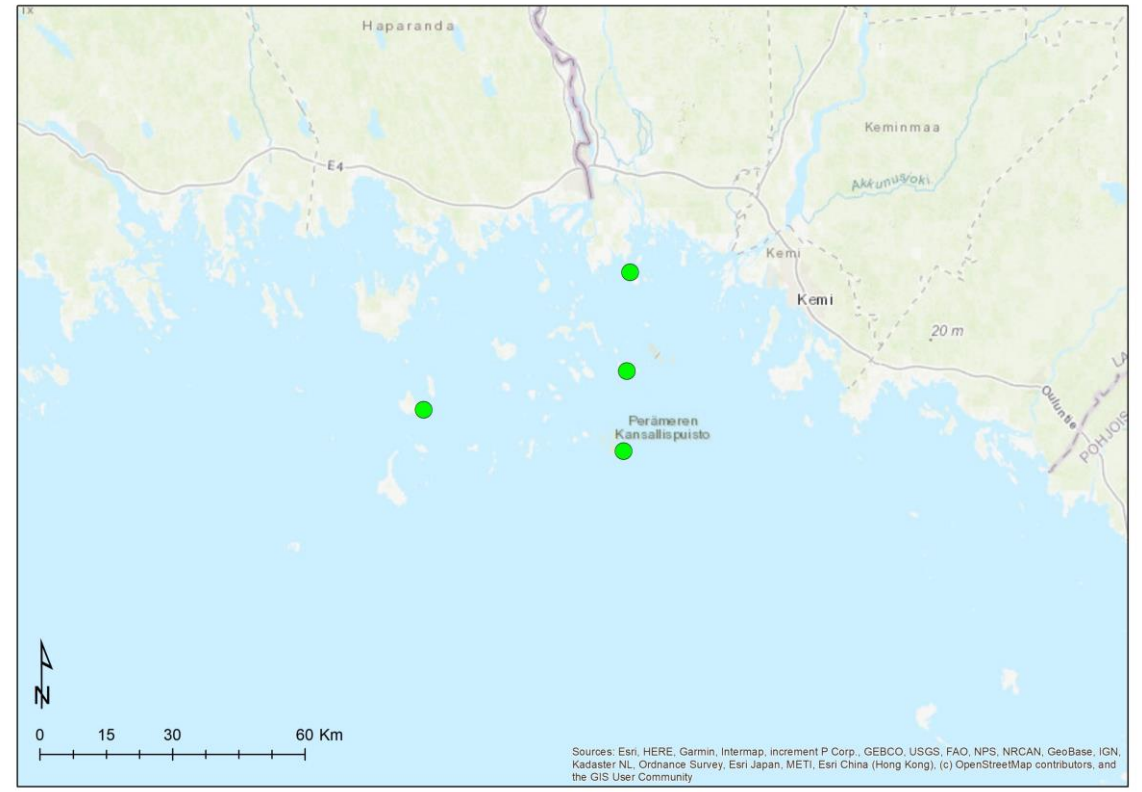
	2023			2024		
	Amount tagged	Amount detected	% detected	Amount tagged	Amount detected	% detected
Salmon	20	4	20 %	0	-	-
Trout	26	12 (8)	46% (30%)	38	5	13 %
TOTAL	46	16	35% (26%)	38	5	13 %

Tracking detections spring/early summer

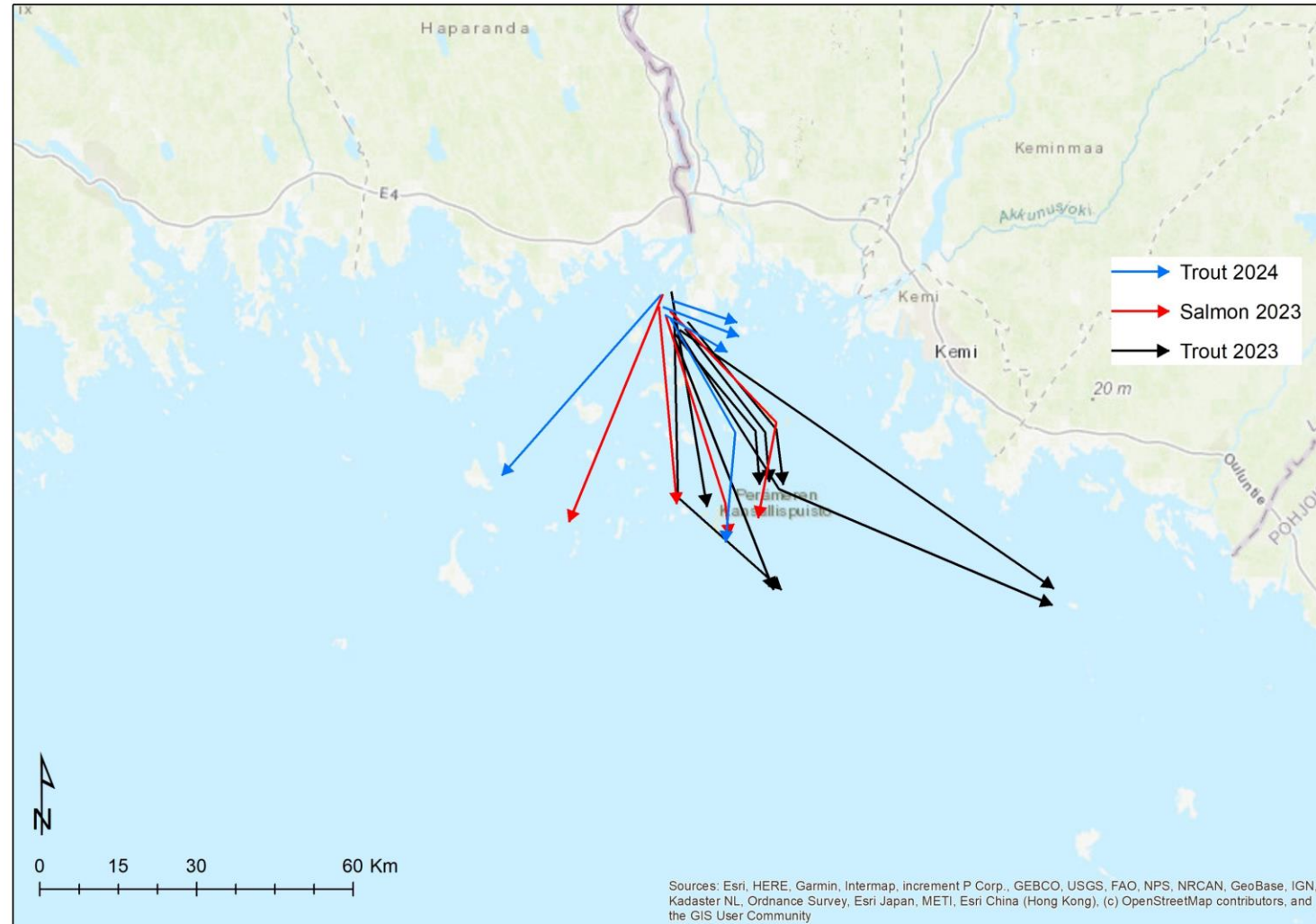
2023



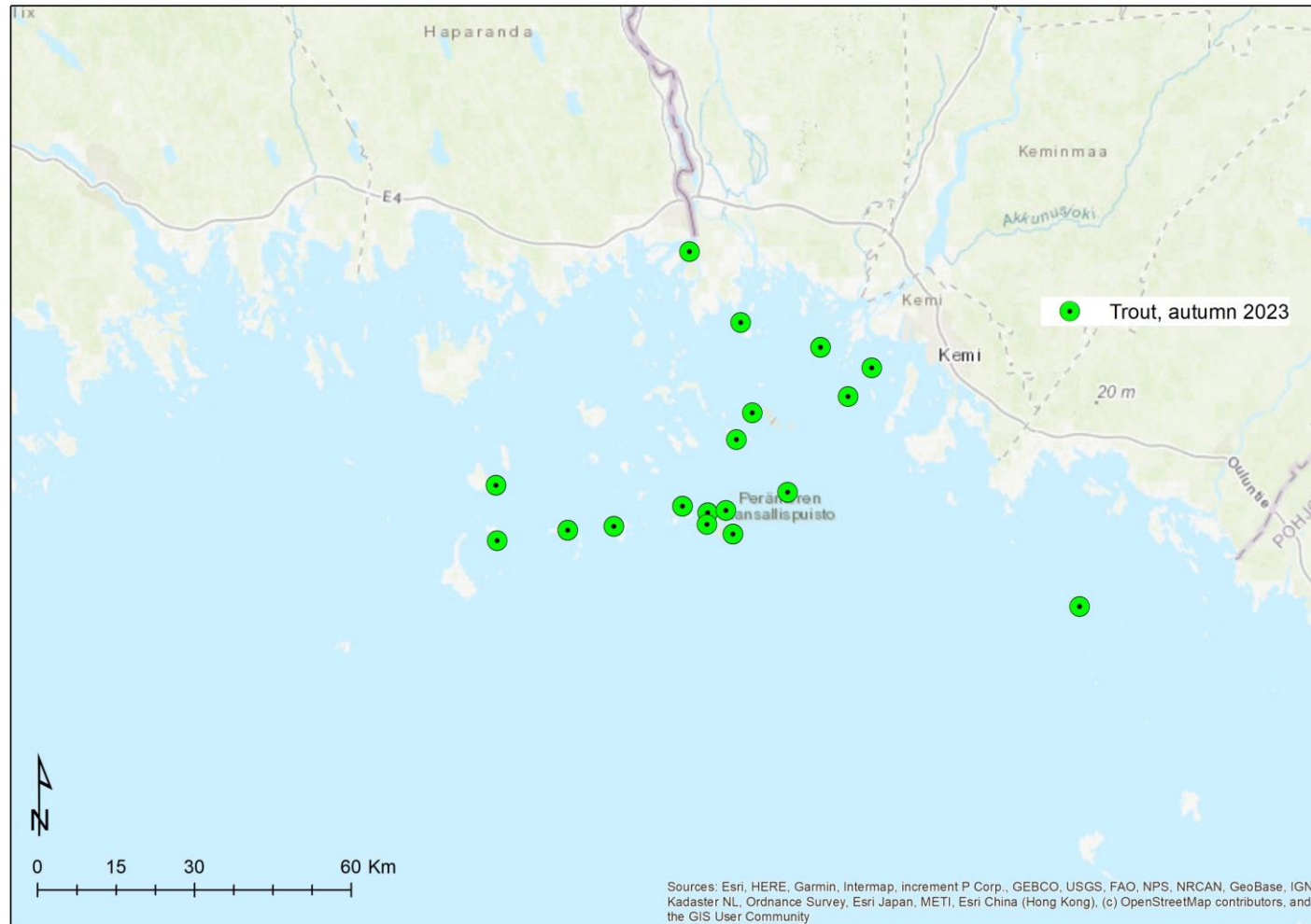
2024



Overview of migration directions in spring/early summer



Tracking detections, autumn



Summary

- Traditional information about migrations fishery-dependent: no fishing → no observations → potentially very biased information
- Returning salmon may also migrate through open sea, but more data needed
- Acoustic tracking project:
 - Migration of salmon smolts through estuary is very fast (oriented)
 - Some salmon smolts appear to migrate from river mouth towards open sea
 - Migration routes of trout smolts disperse, migration is slower and less oriented and fewer individuals show initial migration towards open sea
 - Data from receivers located west – southwest of R. Tornionjoki is essential to get a proper view about migrations of Tornionjoki salmon and sea trout
- Future steps:
 - Sub-adult & adult trout
 - Migratory whitefish, salmon?
 - Extending network of receivers further south?

Thank you!

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