Kallaveden tilaan vaikuttavat tekijät / Factors affecting the condition of Lake Kallavesi

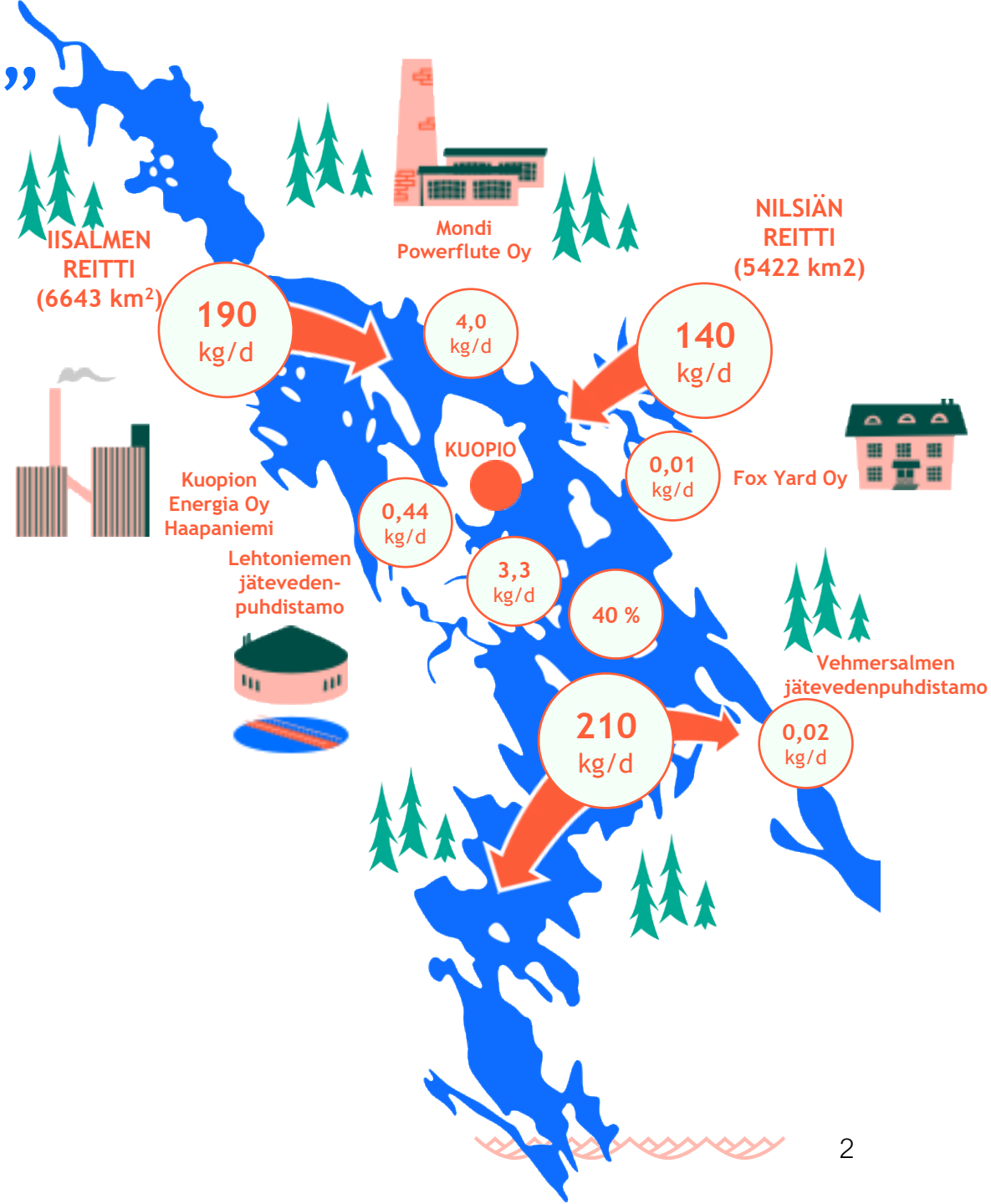
Kallavesimalli webinaari 30.9.2026

Jukka Koski-Vähälä, Tmj., Sc.D.

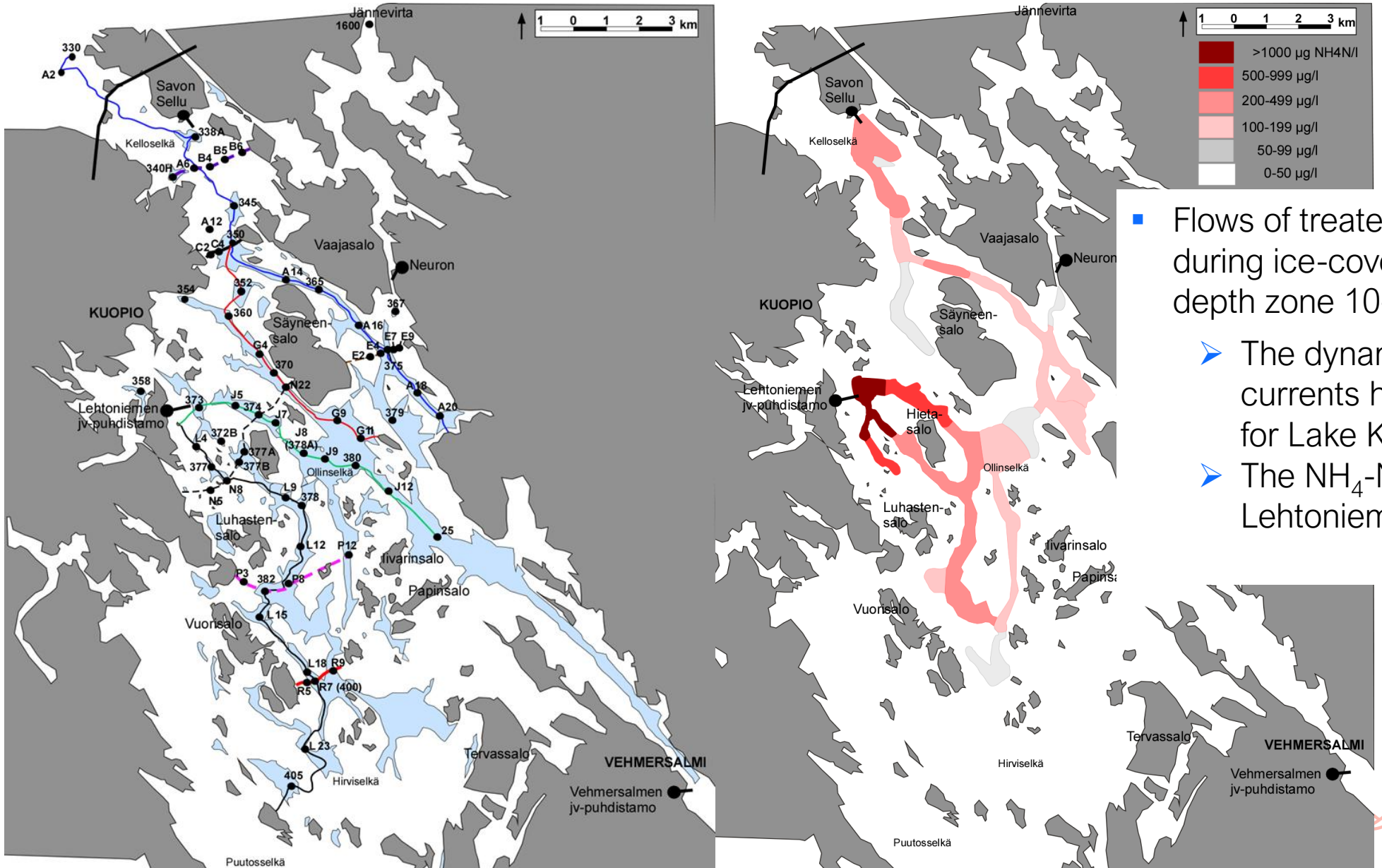
UNIVERSITY OF EASTERN FINLAND
SKVSY
Pohjois-Savon liitto
Euroopan unionin osarahoittama

”Large Picture of Kallavesi”

- A large humic lake; 317 km^2, colour value 50-70 mgPt/l
- The ecological status has been good, but is shifting towards moderate.
- 90 % of the mass flow of phosphorus (the limiting nutrient) originates from the upstream watercourses.
- The waters from the watercourses converge at Kelloselkä, with the main part of the flow directed north of Säyneensalo.
- 1/3 of the water from the Nilsiä watercourse flows through Kortesalmi.
- The share of diffuse load from the local catchment area is 8 %
- The share of point source loaders is approximately 2 %
  - Impacts are observable during the summer season near the discharge areas, and during the winter over a wider area.
  - Ammonium nitrogen concentration, electrical conductivity.
- Kallavesi retains approximately 35–40% of the phosphorus (retention time less than 1 year).
- The main part, approximately 85–90% of the mass flow, exits through Puutossalmi, and the remainder through Vehmersalmi into Suvasvesi and further into the Heinävesi watercourse.

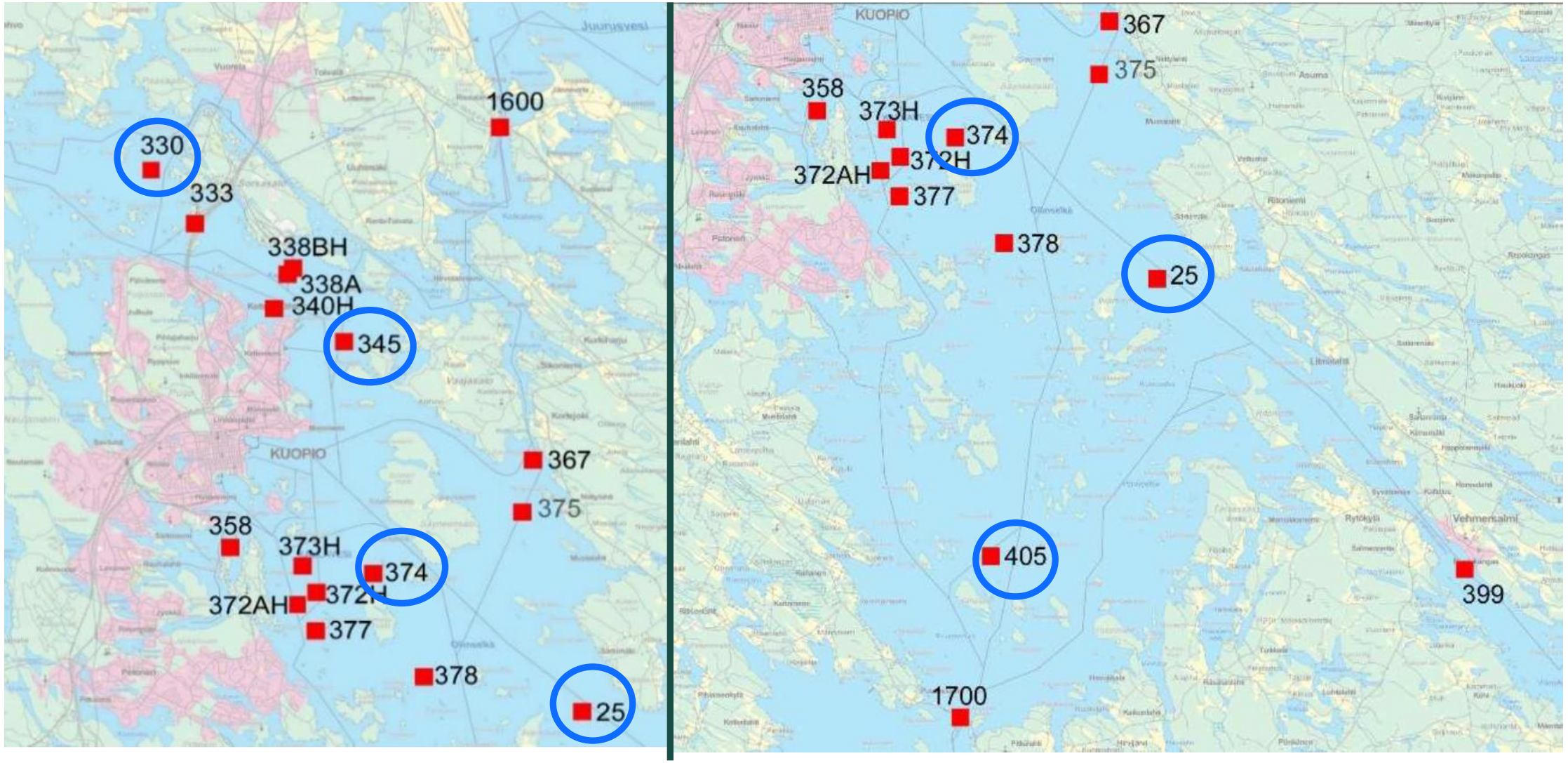


Flows of treated wastewater in winter / ice-cover period



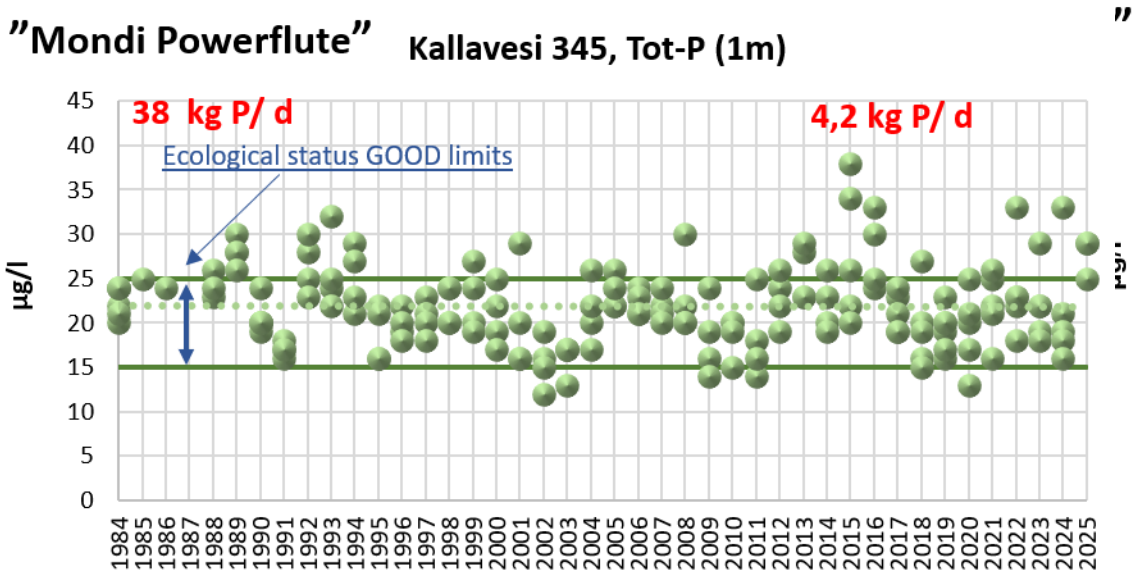
- Flows of treated wastewater (NH_4-N) during ice-cover period in Kallavesi in depth zone 10-30 m
  - The dynamics of intermediate currents have proven advantageous for Lake Kallavesi !
  - The NH_4-N- load has ”ceased” in the Lehtoniemi area

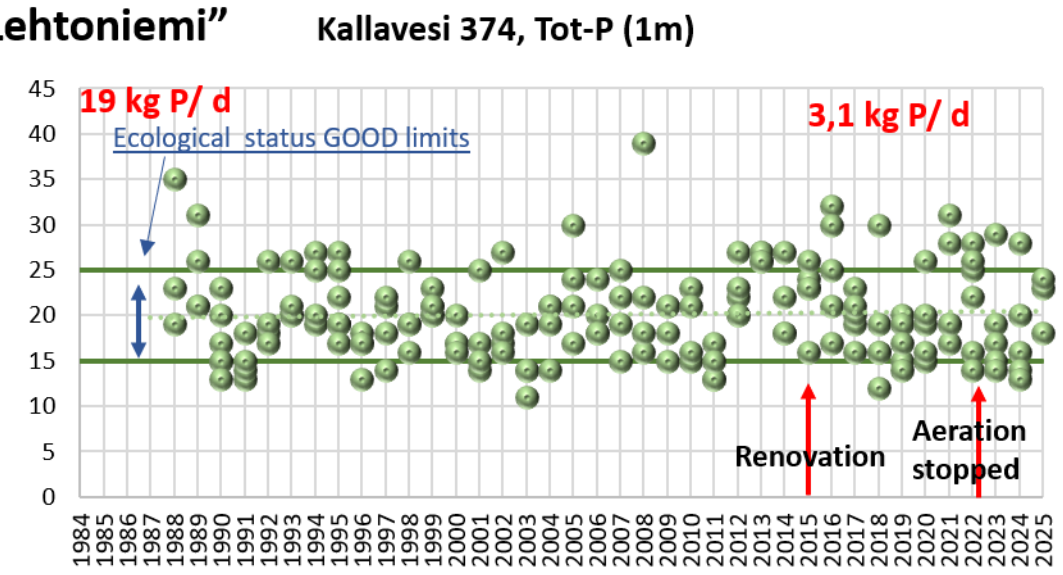
Sampling sites of Kallavesi joint monitoring programme



Lähde: Savo-Karjalan Ympäristötutkimus Oy 2025

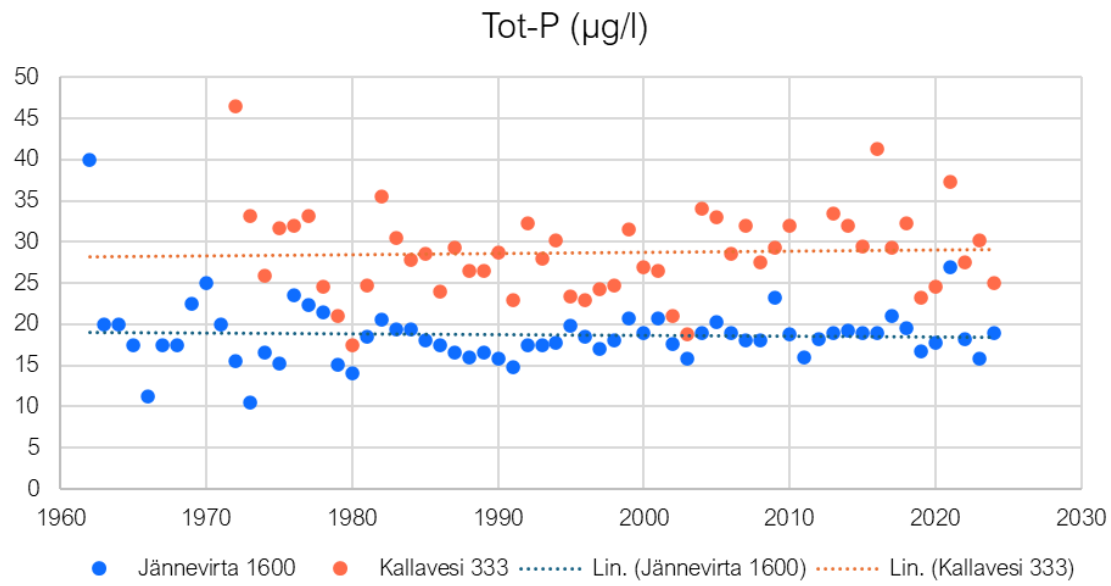
The trophic status of Kallavesi (summer results)



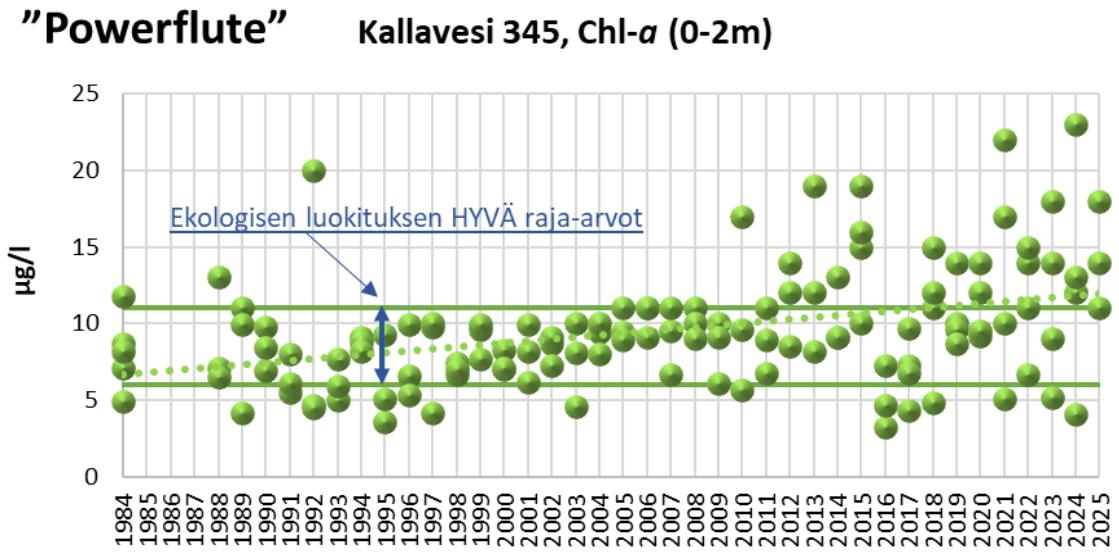


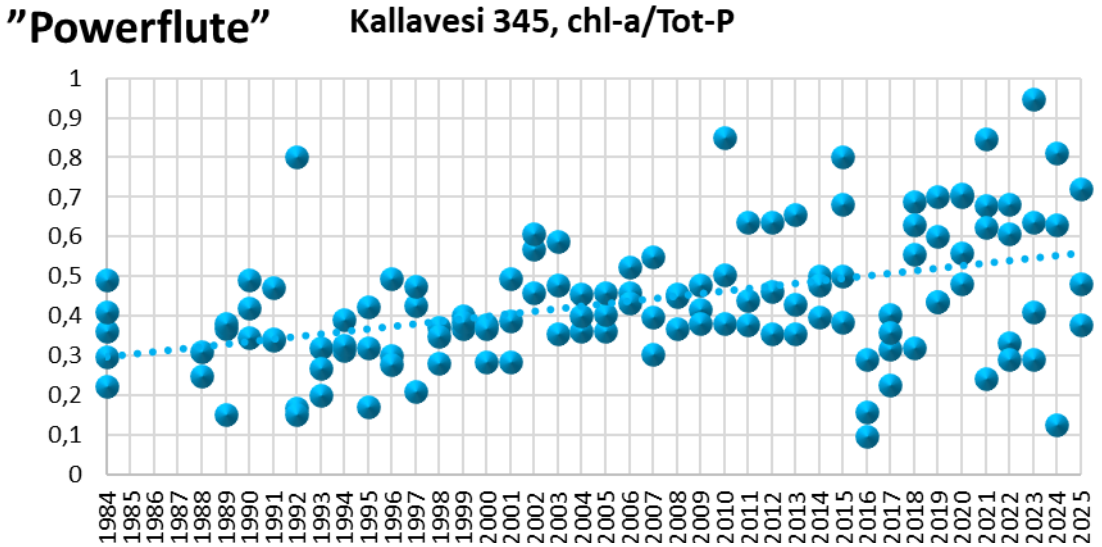
IISALMEN REITTI (6643 km²)

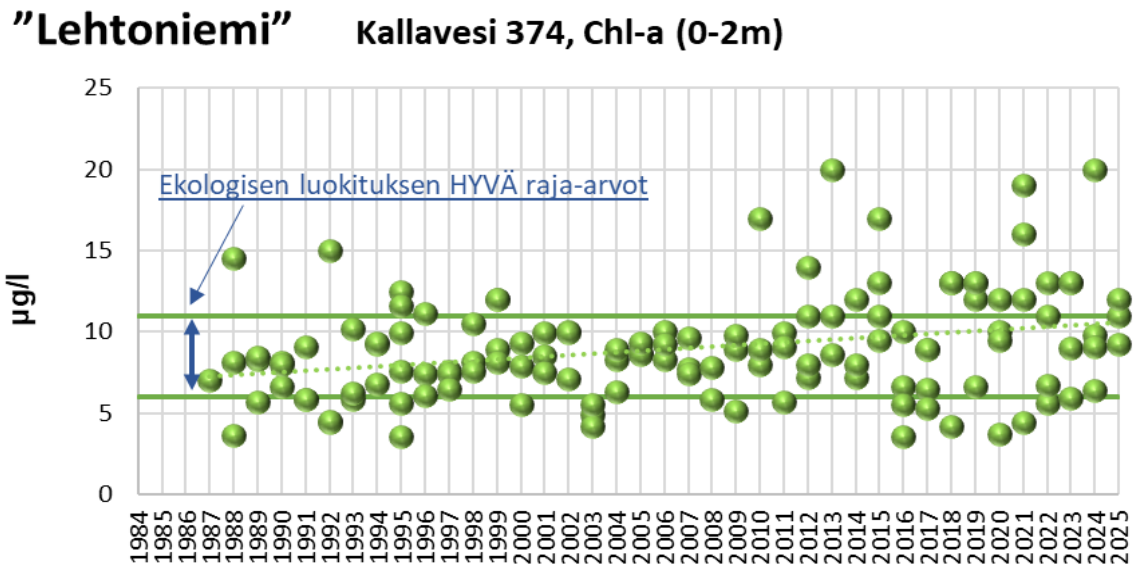
NILSIÄN REITTI (5422 km²)

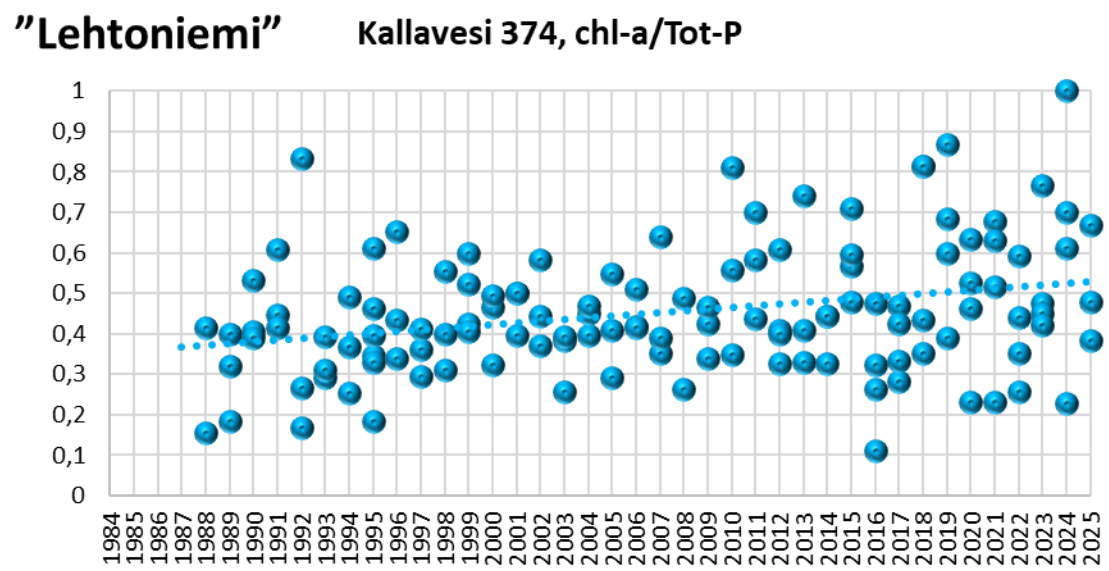


The trophic status - eutrophication of Kallavesi



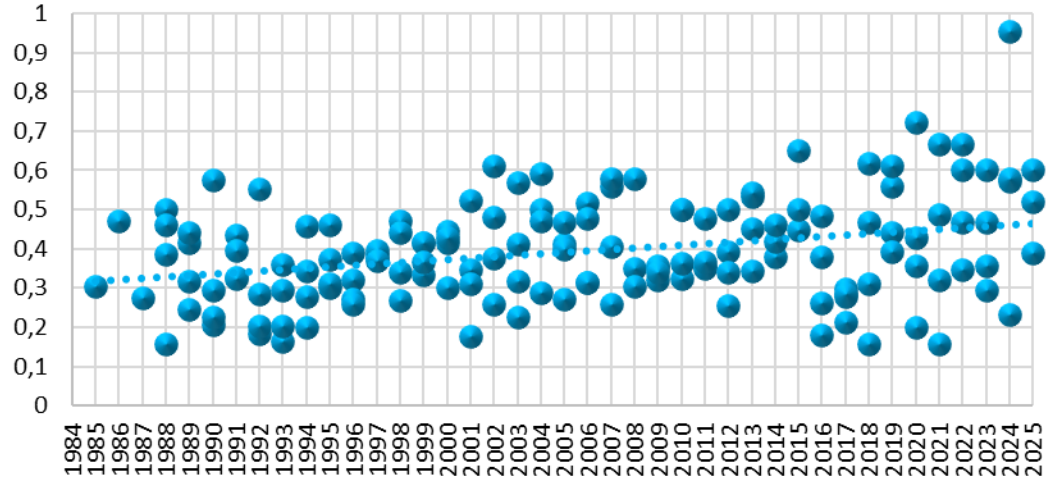




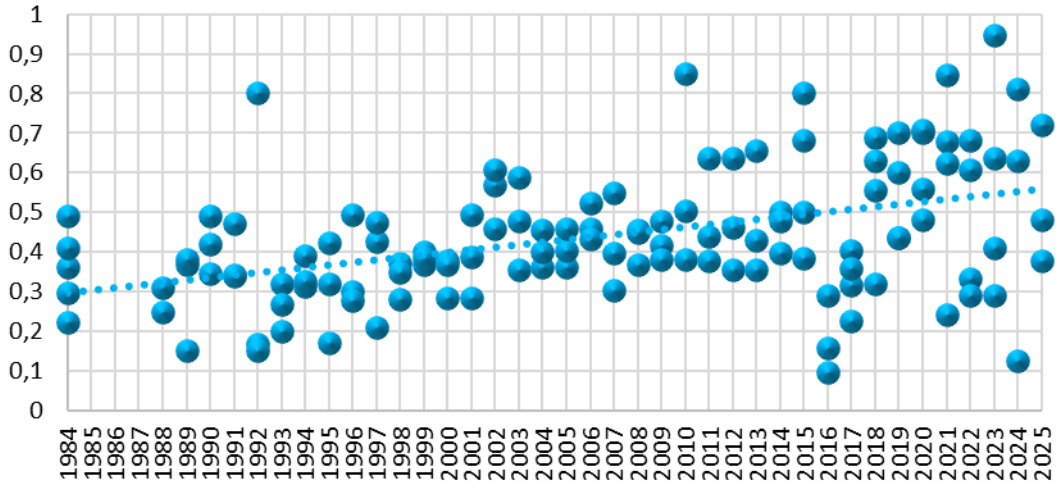


Eutrophication of Kallavesi

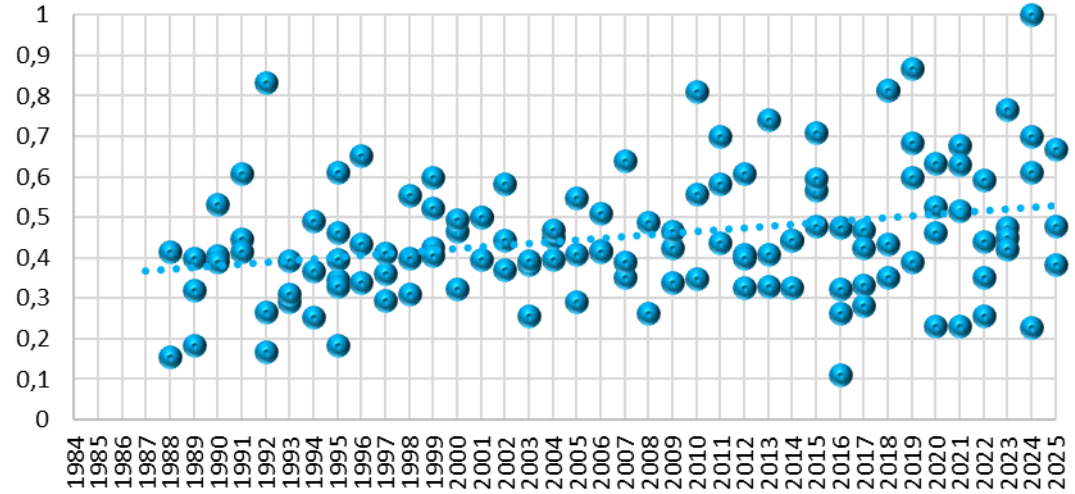
"Vertailualue" Pohjois-Kallavesi 330, Chl-a/Tot-P



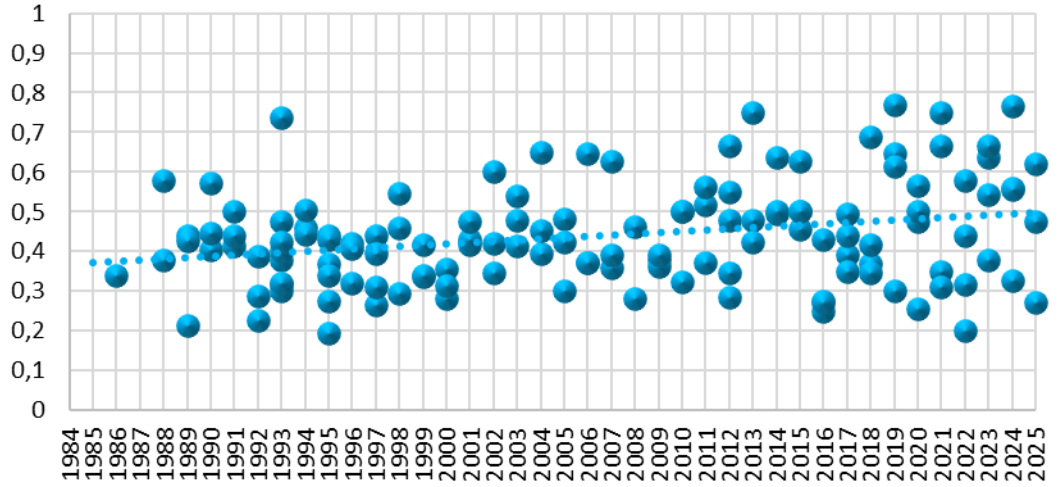
”Powerflute” Kallavesi 345, chl-a/Tot-P



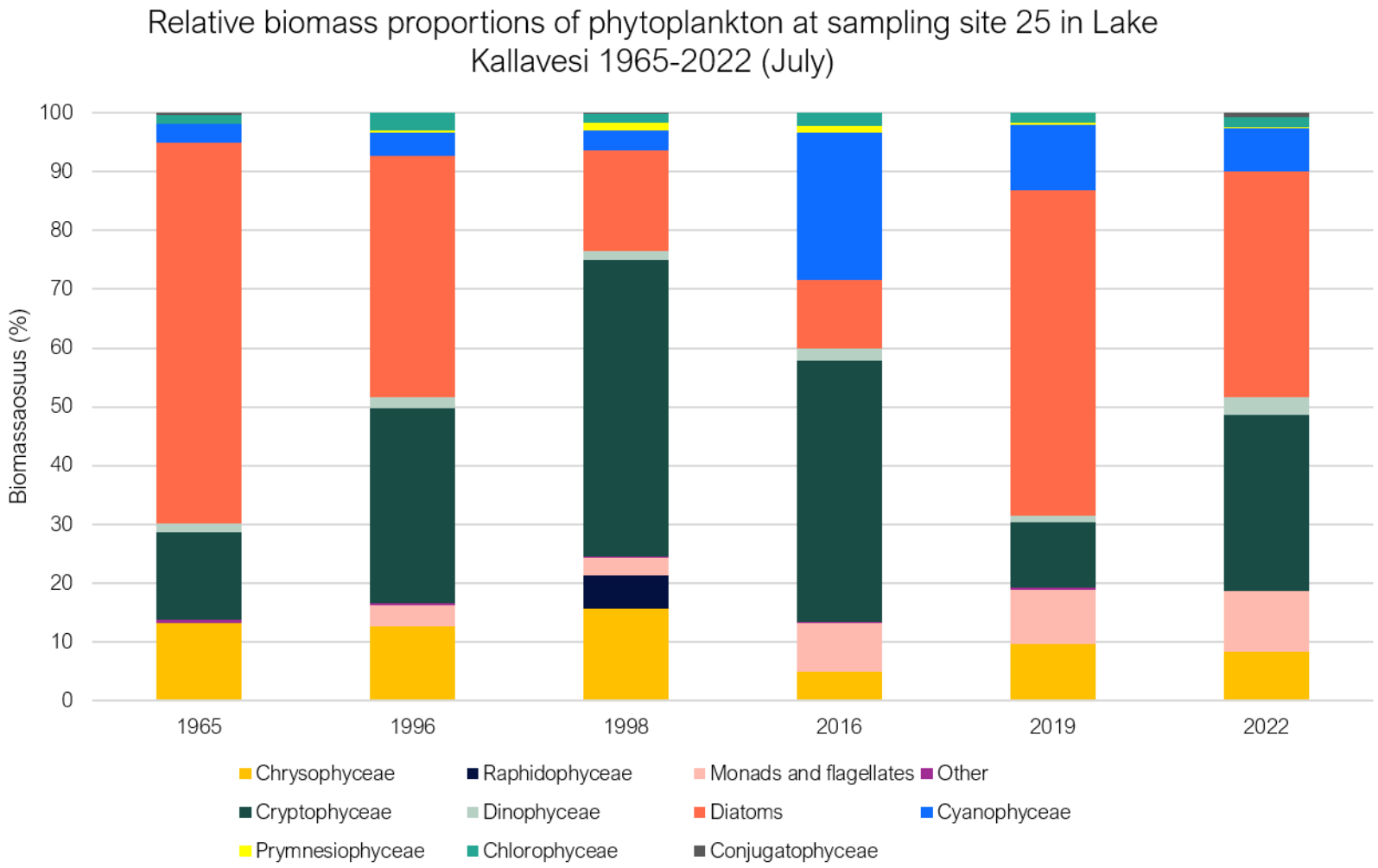
”Lehtoniemi” Kallavesi 374, chl-a/Tot-P



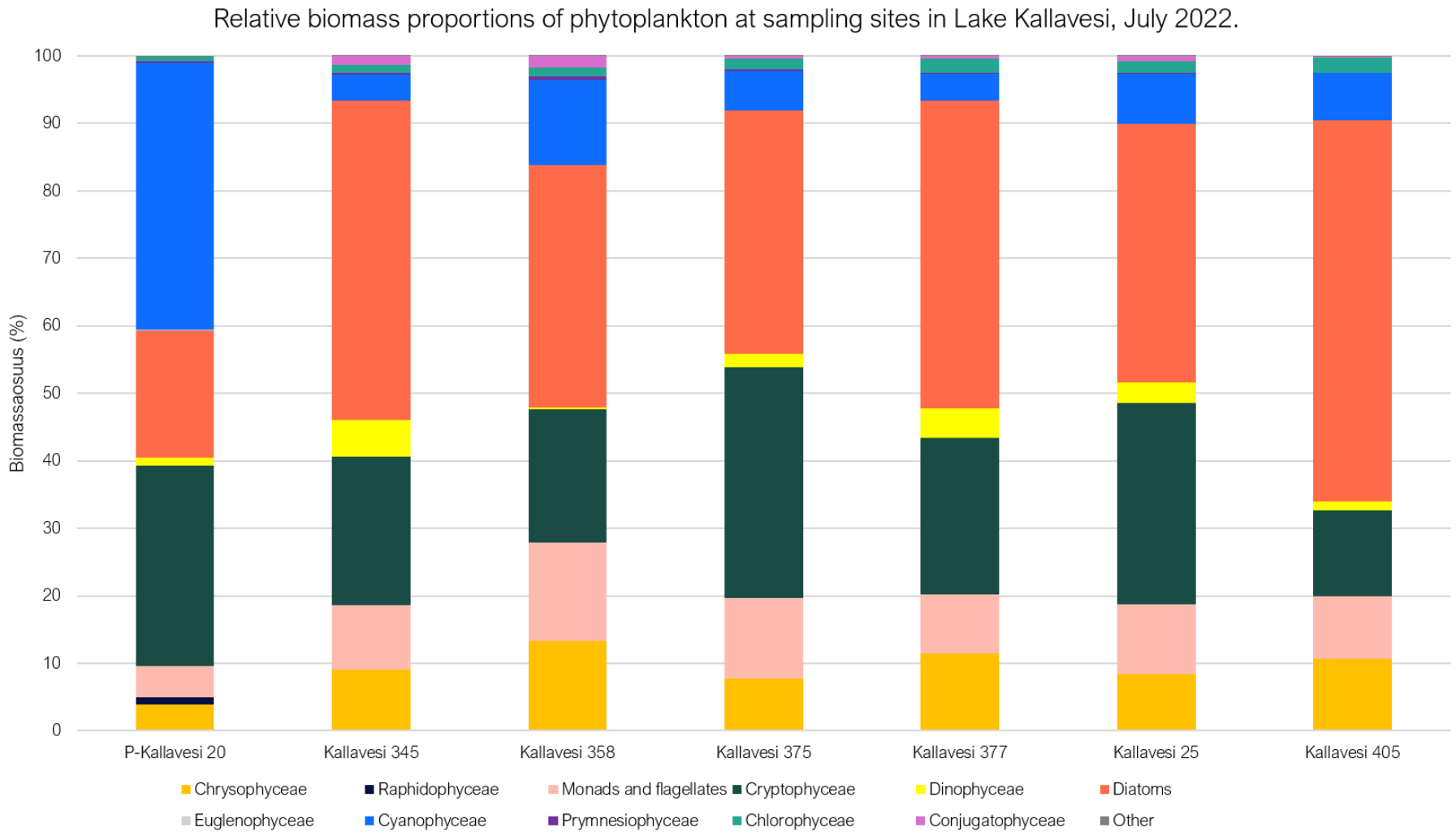
"Vertailualue" Kallavesi 405, chl-a/Tot-P



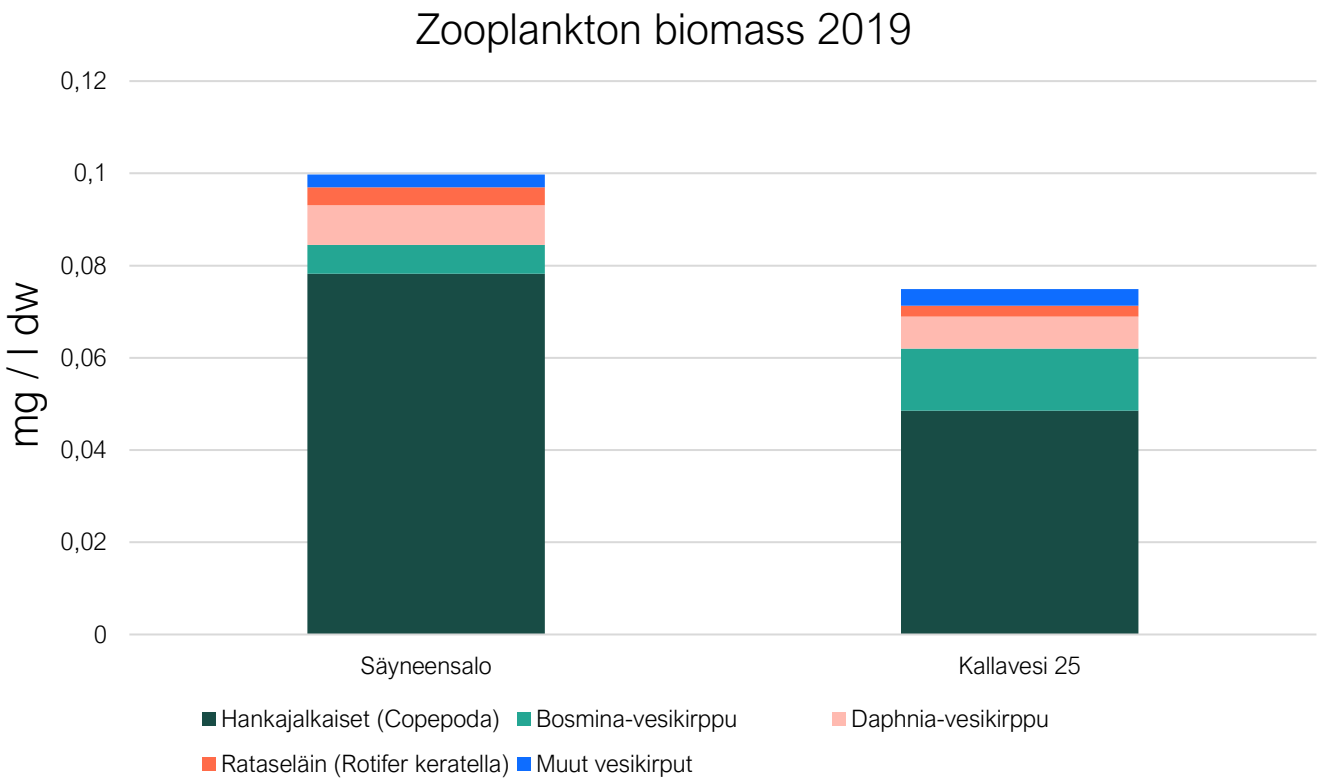
Phytoplankton biomass proportions 1965-2022



Phytoplankton biomass proportions July 2022

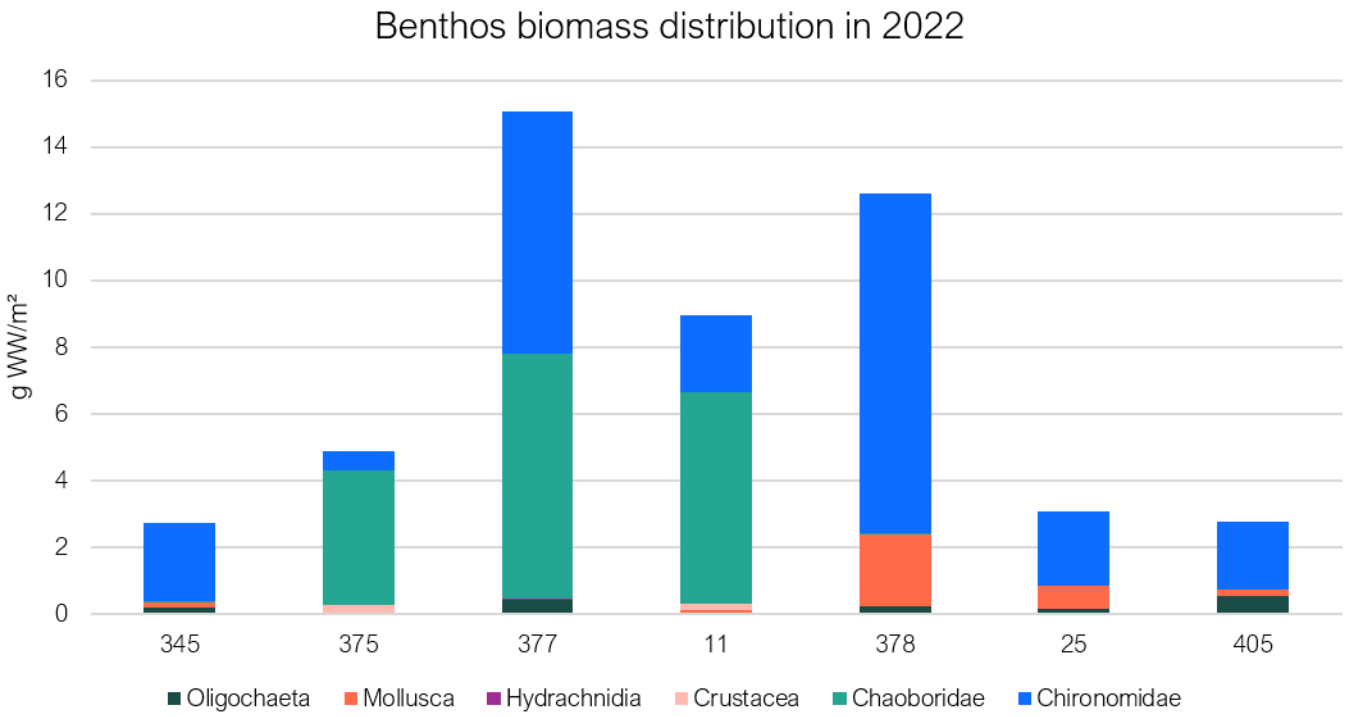


Zooplankton

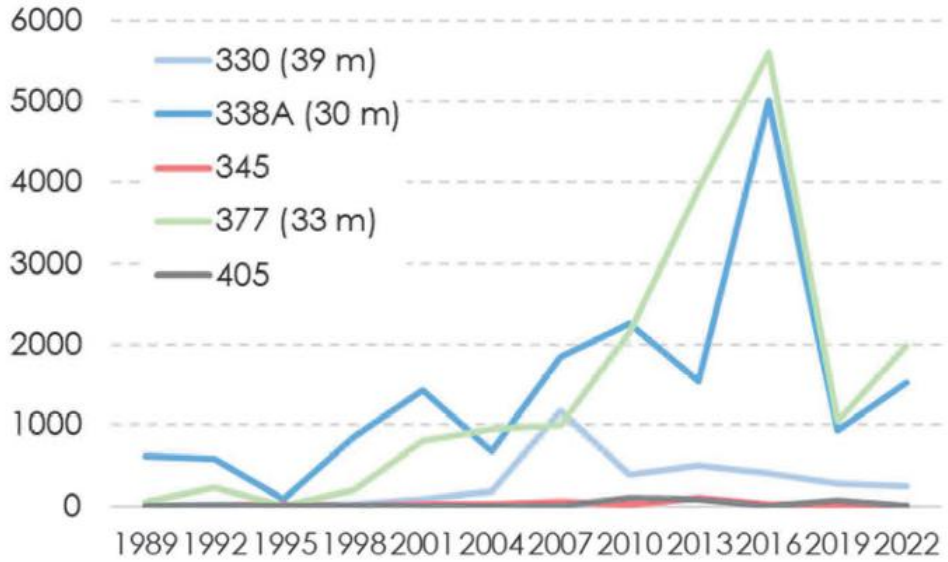


- For the modelling, results were available only from 2019
- Based on the thesis (Enroth 2022), the size of zooplankton has decreased; **these changes will be assessed in more detail**

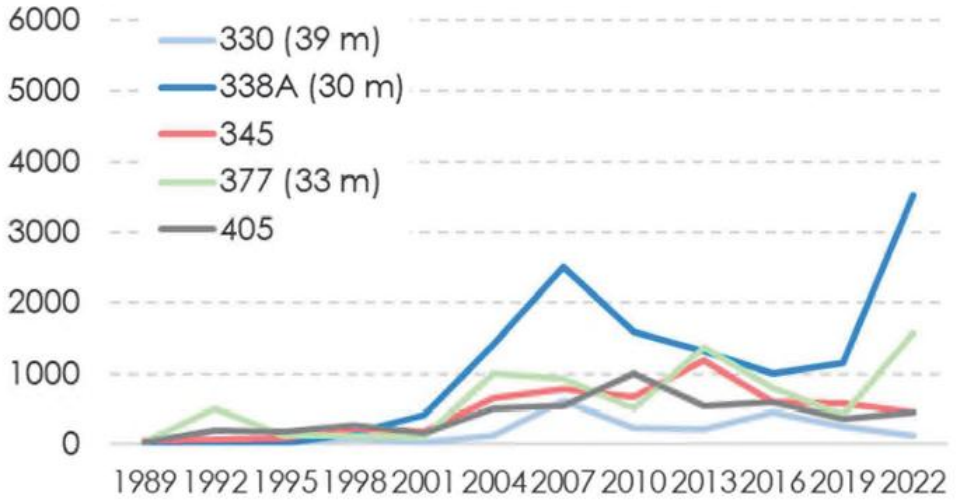
Benthic fauna



Chaoborus flavicans, ind/m2



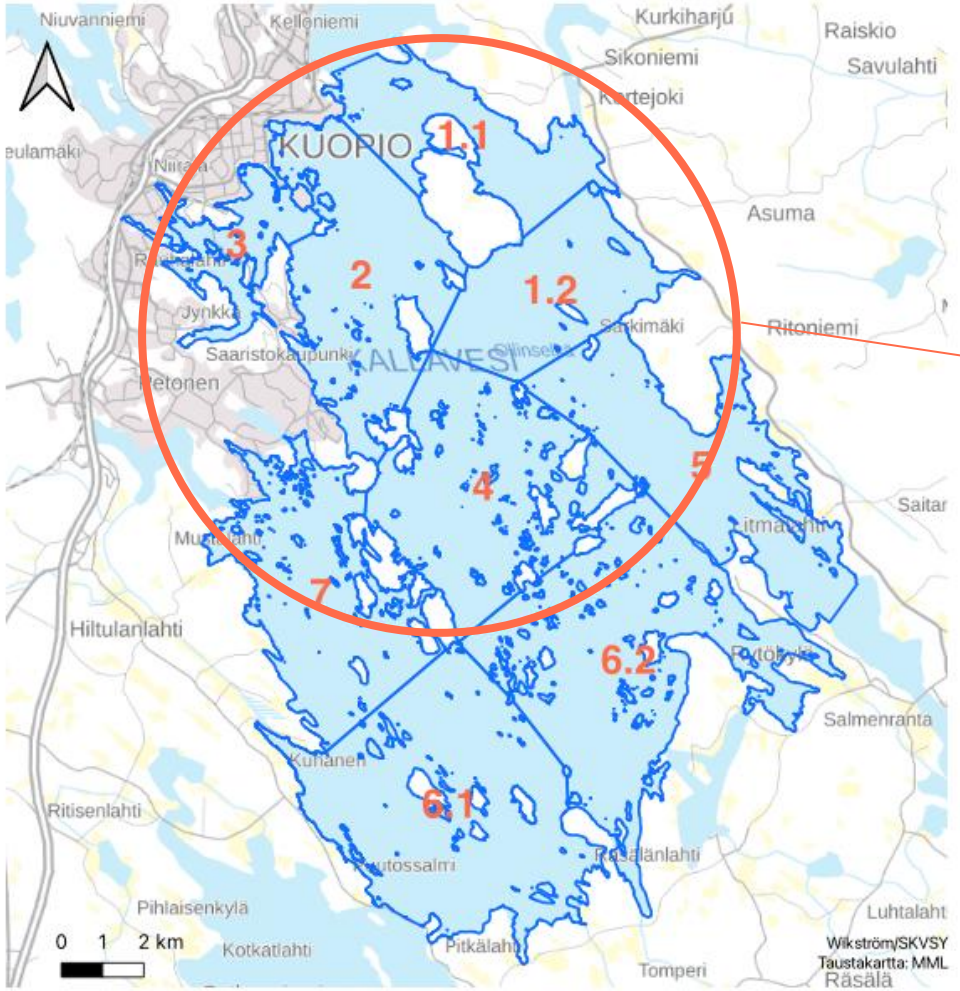
Zoobenthos excluded Chaoborus, ind/m2

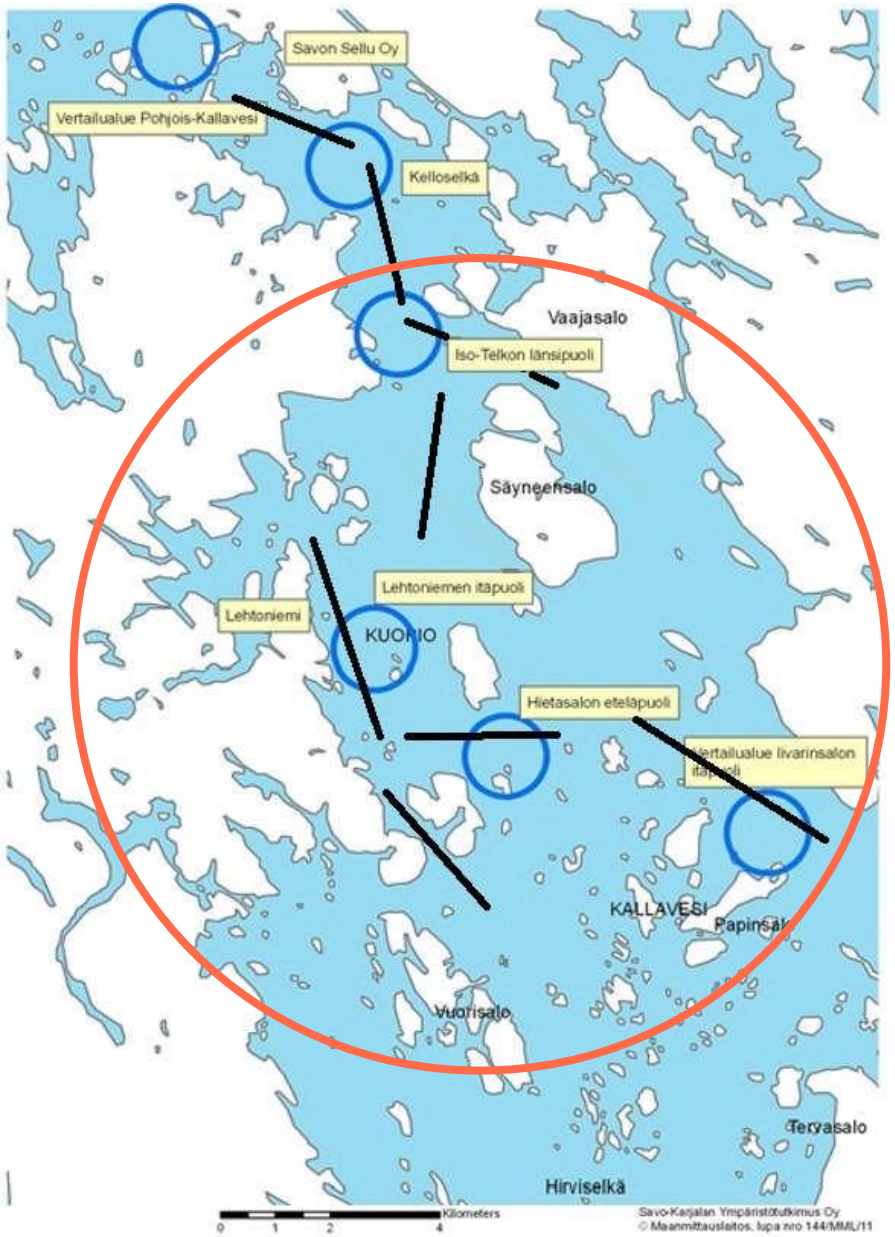


- Large differences between areas / sampling stations
- Benthic invertebrate biomass / abundance has increased
- Chaoborus has increased, especially in the 2010s
- The significance will be assessed in more detail

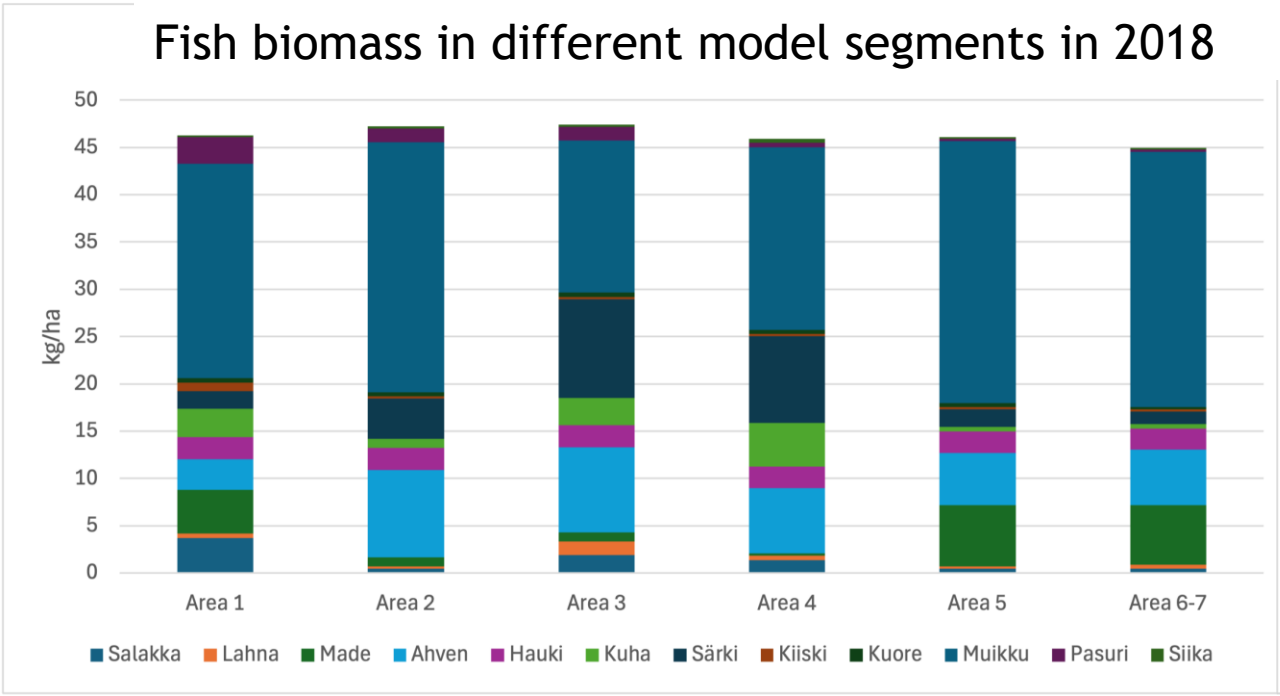
Lähde: KVVY Tutkimus Oy 2023

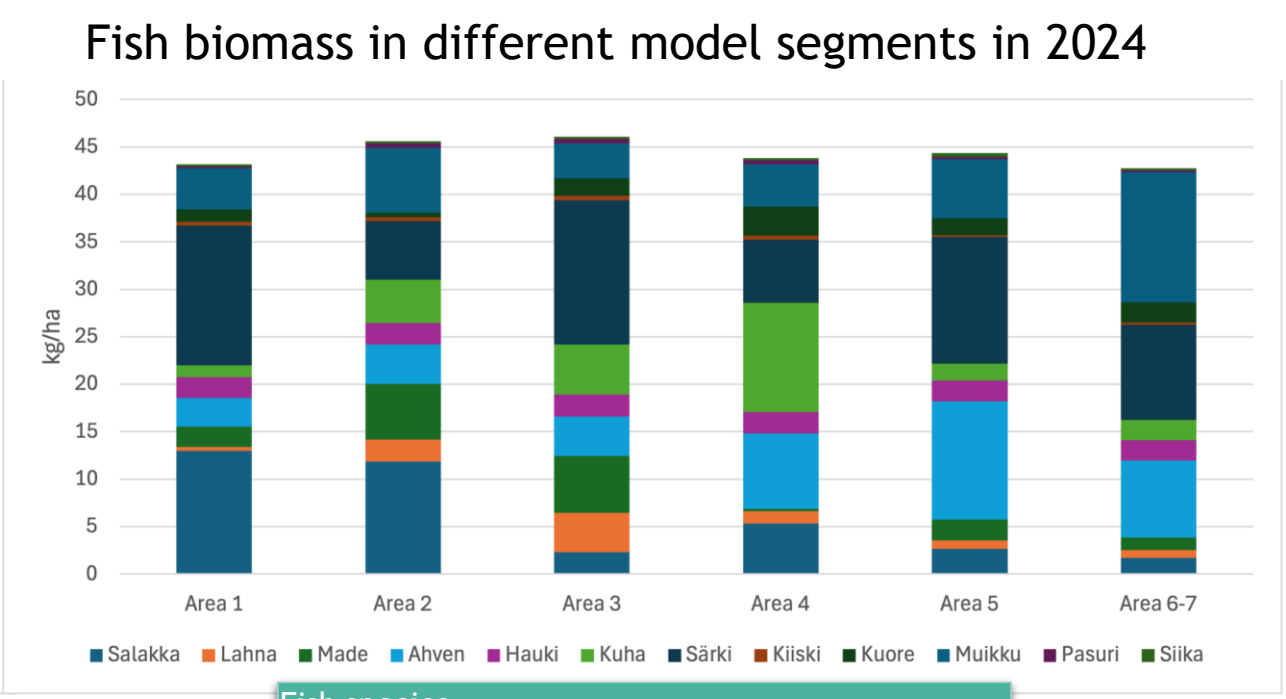
Nordic-gillnet and survey trawling results





Fish biomass and species

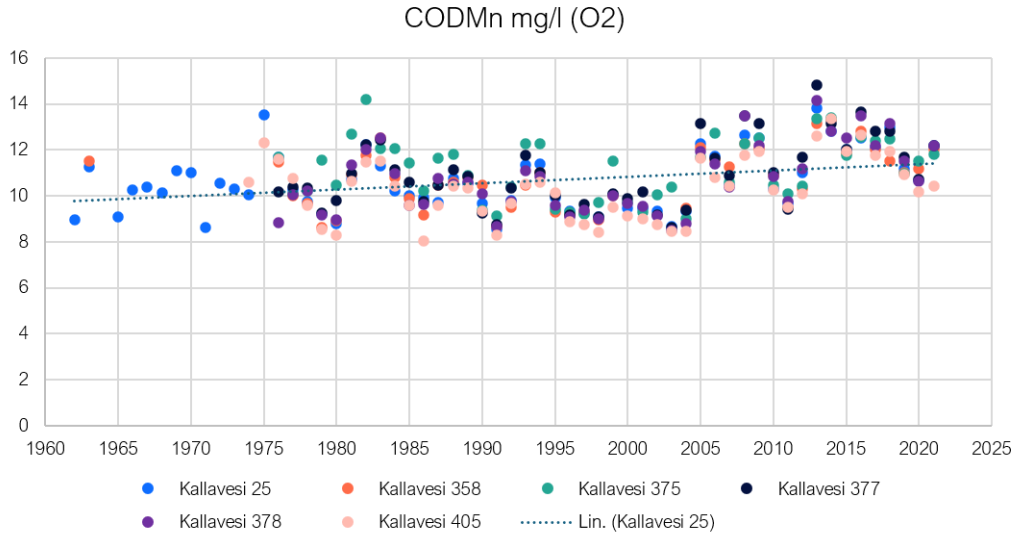


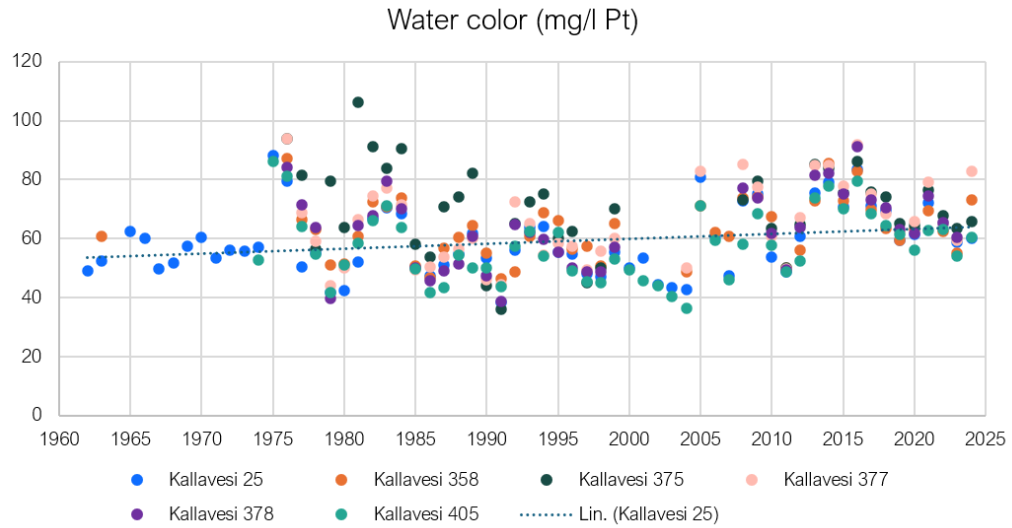


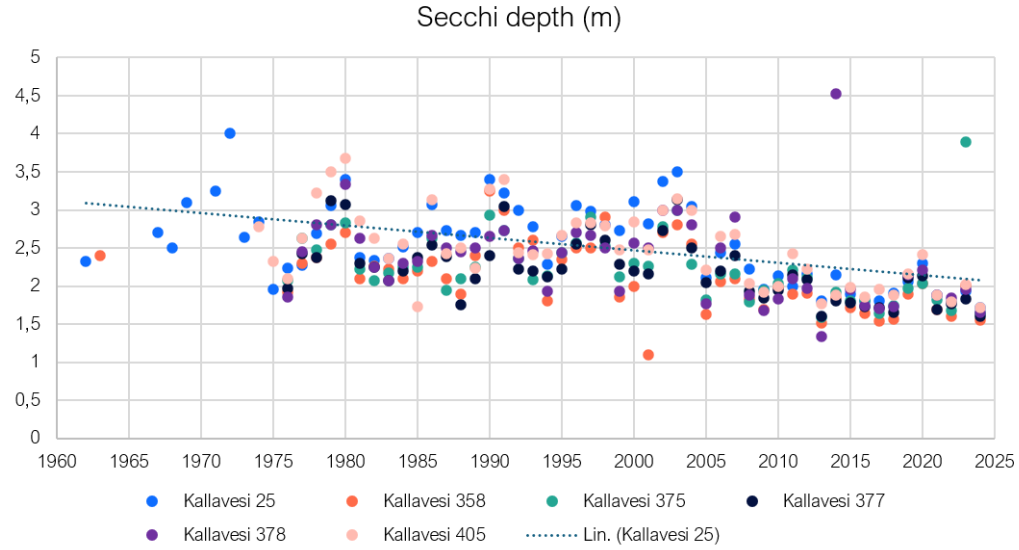
- Vendace is decreasing
- Roach, pikeperch, bleak and bream are increasing
- What about pike ?
- Food webs and ecological equilibrium in the future ?
- The results will be compared to commercial catc
- Is the fish population changed by drivers or is it a driver or both ?

Fish species	
Bleak (Alburnus alburnus)	Salakka
Bream (Abramis brama)	Lahna
Burbot (Lota lota)	Made
Perch (Perca fluviatilis)*	Ahven
Pike (Esox lucius)	Hauki
Pikeperch (Stizostedion lucioperca)	Kuha
Roach (Rutilus rutilus)	Särki
Ruffe (Gymnocephalus cernuus)	Kiiski
Smelt (Osmerus eperlanus)	Kuore
Vendace (Coregonus albula)	Muikku
White Bream (Blicca bjoerkna)	Pasuri
Whitefish (Coregonus lavaretus)	Siika

Drivers of the ecological change

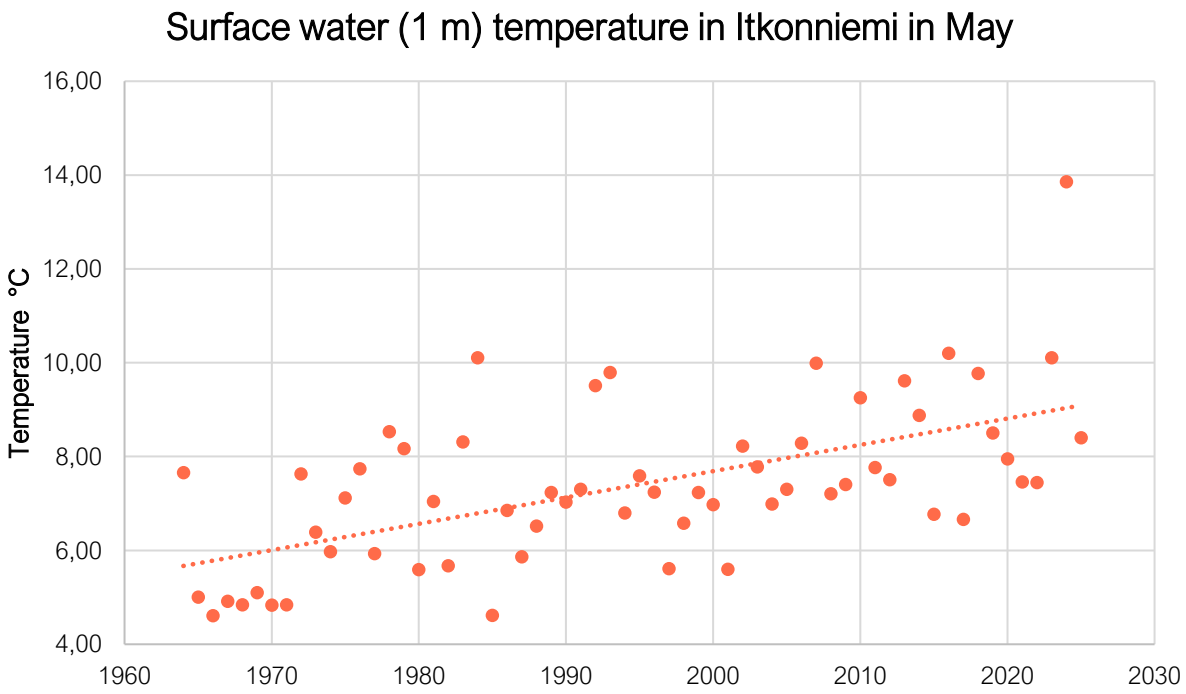


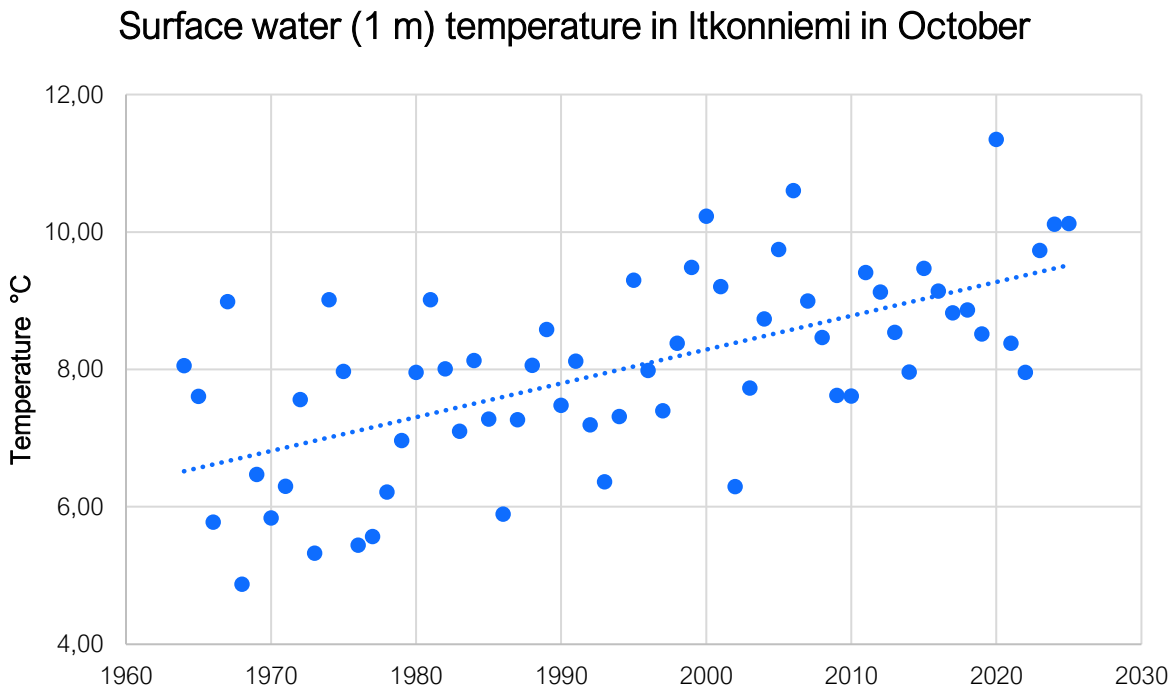




- Brownification / browning !!!

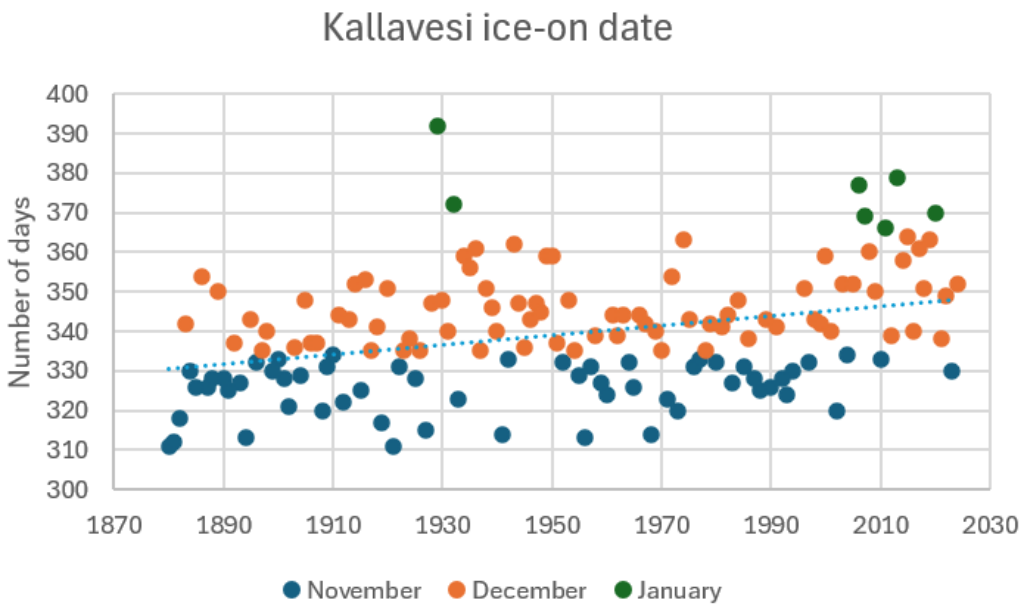
Drivers of the ecological change

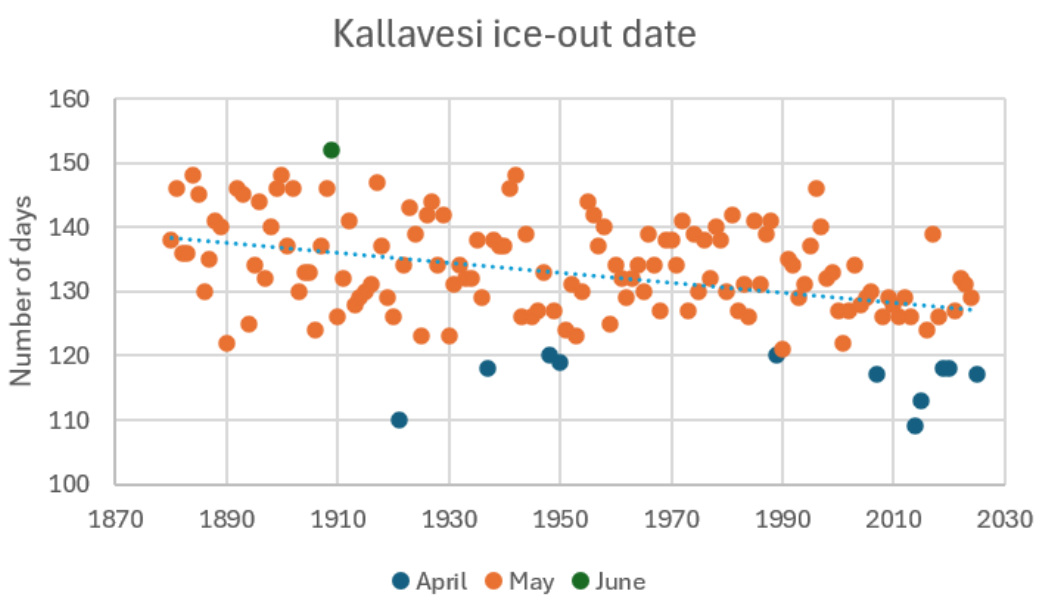


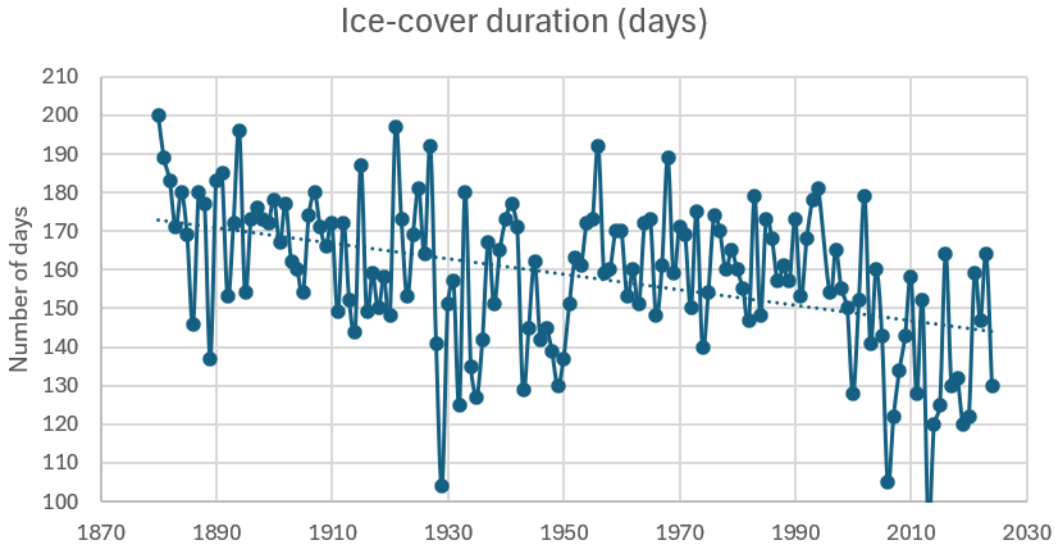


- Surface water temperature has increase both in spring and autumn

Drivers of the ecological change

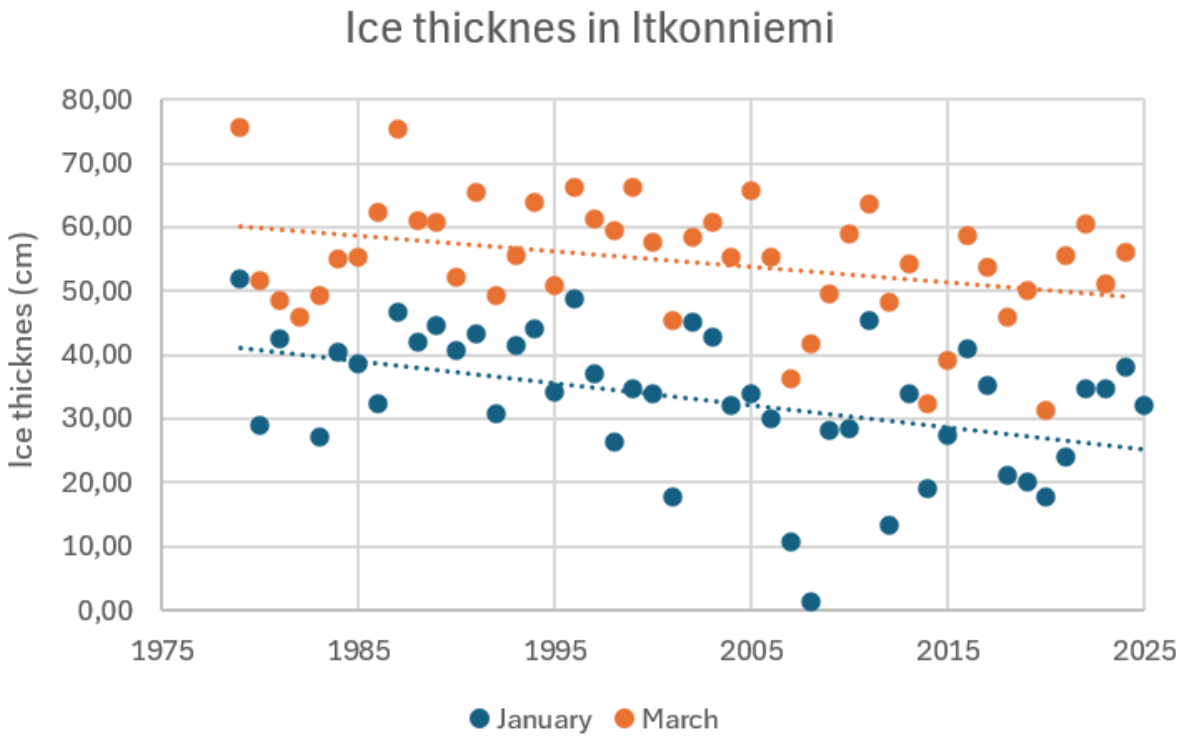






- Ice-cover duration has shortener about 1 month during 20 years period

Drivers of the ecological change



Conclusions

- Despite the reduction in point source load and the improved condition of the deep basins, the ecological status of the main basin of Kallavesi has gradually deteriorated, particularly based on phytoplankton.
- The nutrient-balancing effect of the upstream Northern Kallavesi has diminished, but diffuse load does not explain the changes in Kallavesi.
- **The biological and ecological changes are evident.**
  - Phytoplankton biomass and changes in species composition indicate eutrophication.
  - Chl-*a* / tot-P ratio has increased.
    - Chaoborus flavicans is increasing and a decrease in large-bodied zooplankton.
    - According to studies, the fish community structure is not skewed, but changes have occurred.
    - A shortened ice cover duration, rising water temperatures (spring and autumn), and water brownification are altering the previous ecological equilibrium.
- **There is a need to assess ecological changes and interactions in Kallavesi instead of focusing solely on nutrient load-concentration-production impacts !!!**



- SKVSY:n vesistösivut
  - https://skvsy.fi/jarvet-ja-joet/kallavesi/
- *Kallavesimalli - parempaa ja tehokkaampaa vesistöjen ympäristövaikutusten arviointia*
  - https://skvsy.fi/hanke/kallavesimalli/

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Kiitos!

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