COMPARISON OF LARVAL PERCH FEEDING BETWEEN LITTORAL AND OPEN-WATER SITES OF THE LAKES

Katrit Karus, Matiss Žagars, Priit Zingel, Helen Agasild, Tõnu Feldmann, Arvo Tuvikene, Madara Medne-Peipere, Linda Puncule

SHALLOW LAKES 2021

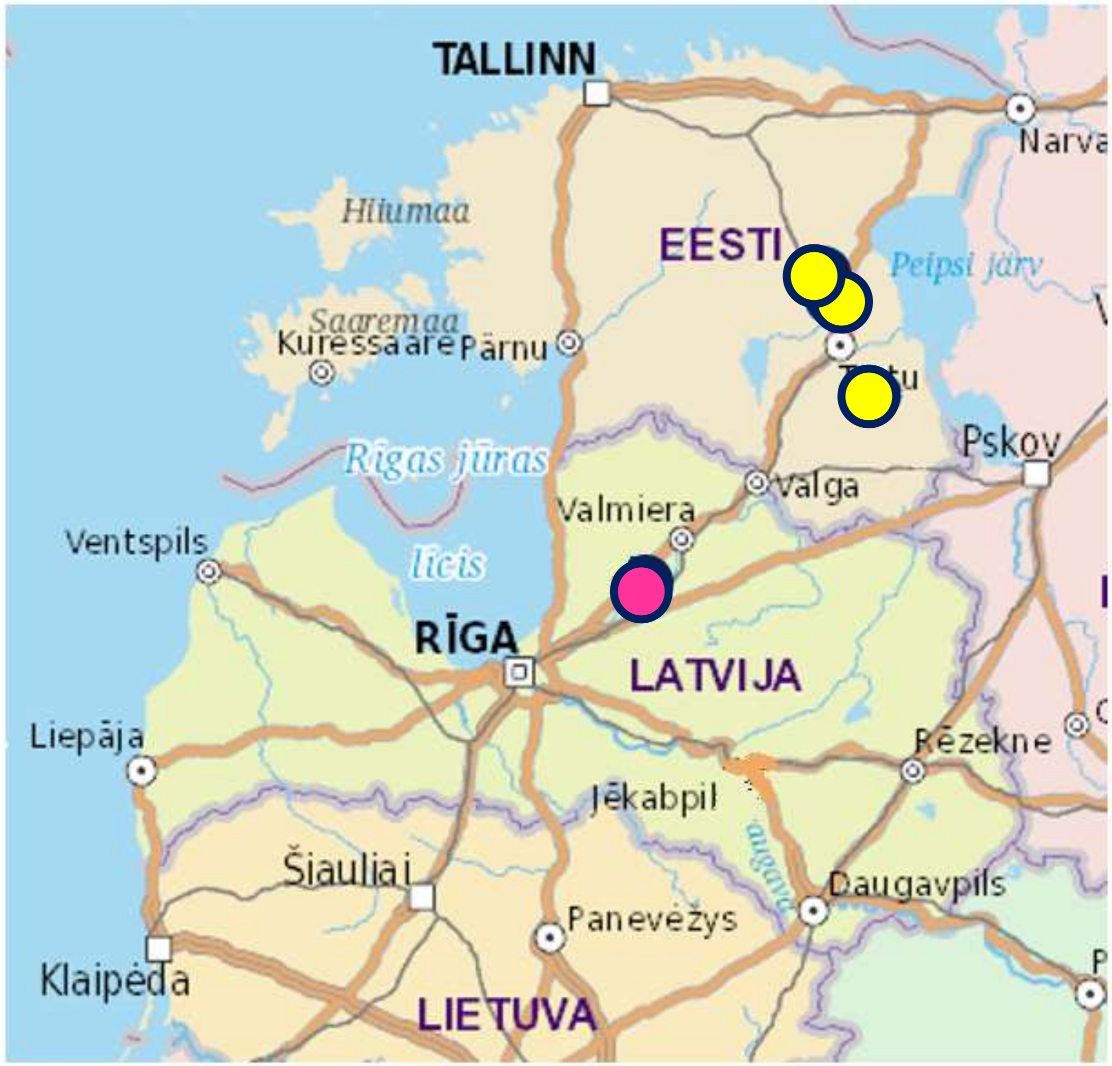
Purpose of the study

was to compare larval perch (0+) feeding in littoral and open-water sites of the lakes in spring 2019.

Location of the study lakes

Estonian lakes

Latvian lakes



Lake Kaiavere/Estonia
Shallow lakes with medium water hardness (Type II)

Lake Prossa/Estonia
Shallow lakes with medium water hardness (Type II)

Lake Akste/Estonia
Softwater brown coloured lake (Type IV)

Lake Auciema/Latvia
Very shallow brown-water lake with high water hardness (Type II)

Study methods

- Larval fish samples were collected by a scoopnet in littoral sites and a bongonet in open-water sites of the lakes drawning the net horizontally through the water column.
- Larval fish diet was estimated by a gut segmentaion methodology using epifluorescence microscopy.

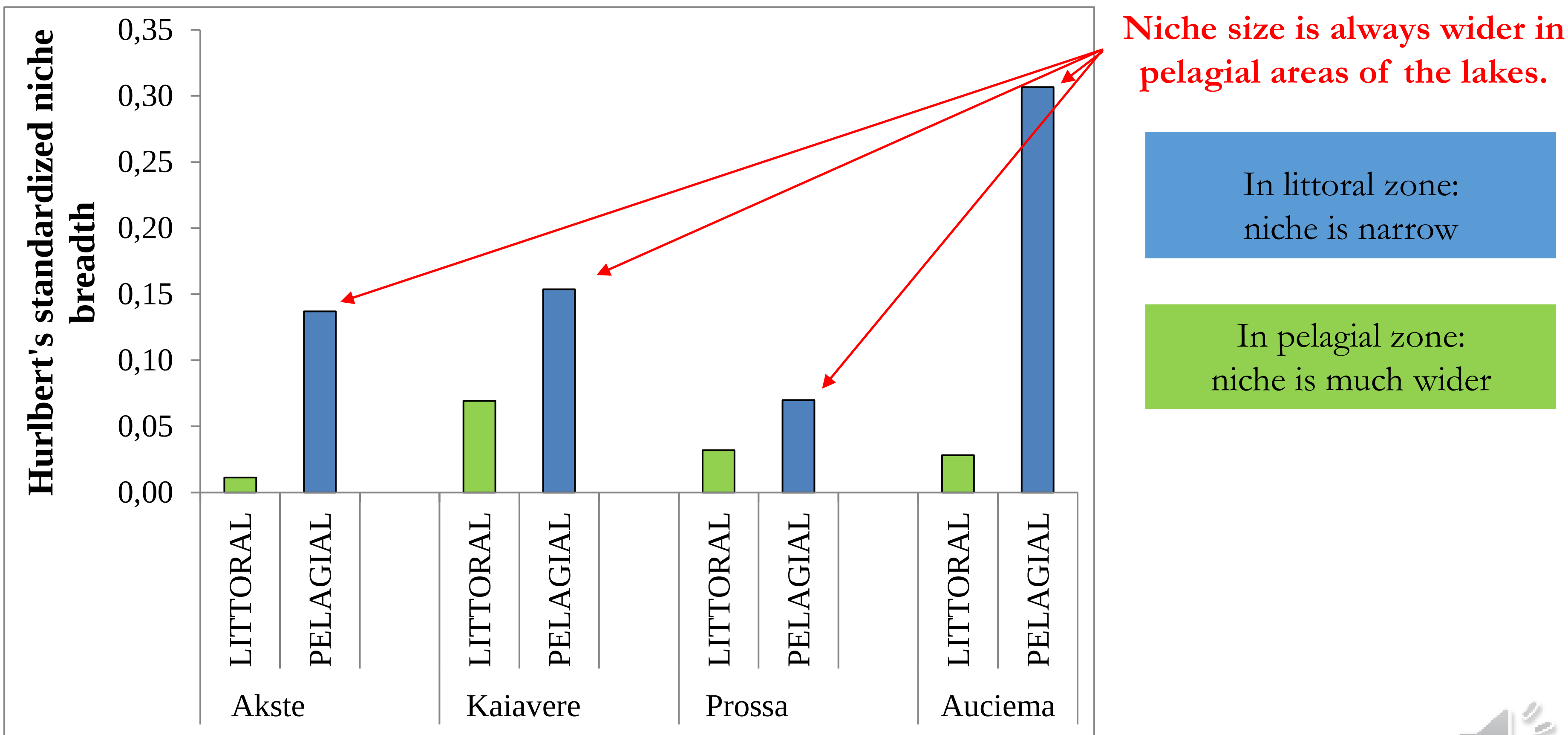
Study methods: Indices of dietary importance:

- Hurlbert's standardized niche breadth index (Ba);
- Fulthon’s condition index;
- Ivlev`s selectivity index (E);
- percent index of food items relative importance (%IRI);
- Zooplankton biomass and zooplankton biomass (mg) consumed by fish larvae (mg);
- Share of ciliates from total zooplankton biomass (%) and the share of ciliates from larval fish diet.

Results: Hurlbert’s standardized niche breadth

Hulbert’s niche index shows degree of similarity between resources used by population members and resources available to them in their living environment.

(Scale 0-1; 1 – population uses all resources in equal proportions, >0 – population uses one resource/few resources exclusively)



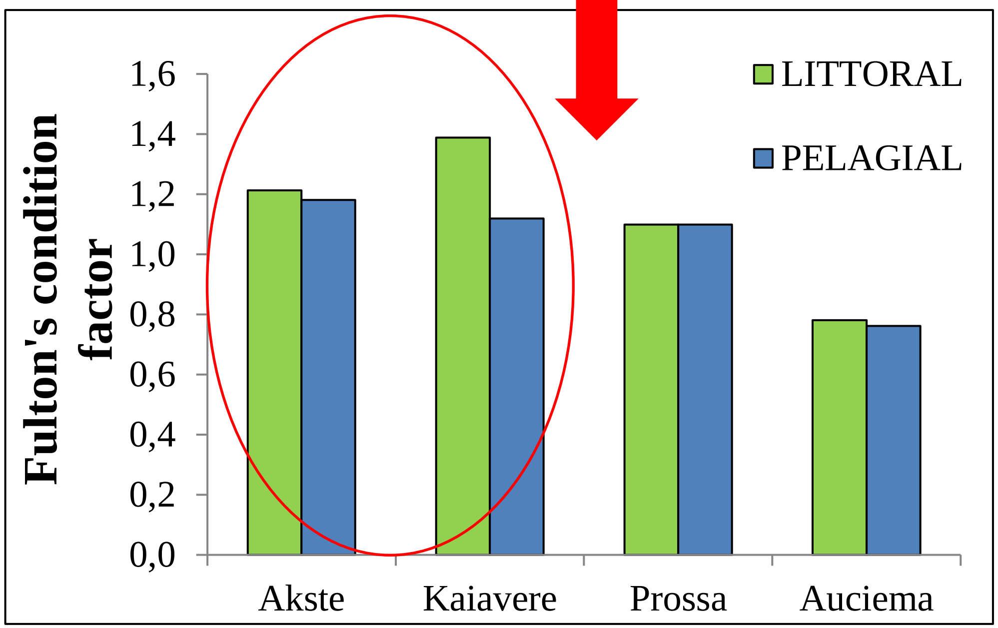
In littoral zone:
niche is narrow

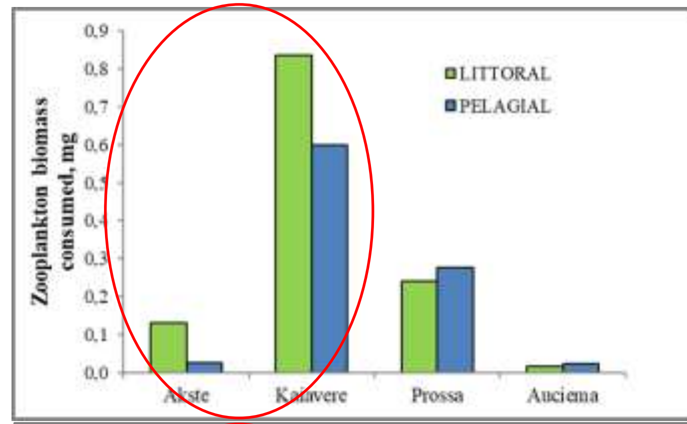
In pelagial zone:
niche is much wider

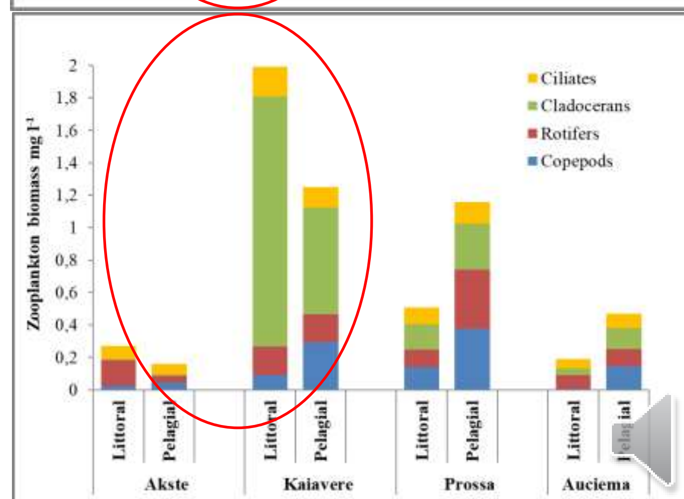
Results: Fulton's condition index

Fulton's condition index shows the overall health (fatness, vigour) of a fish by comparing its weight with the average weight of other fish of the same length and kind.

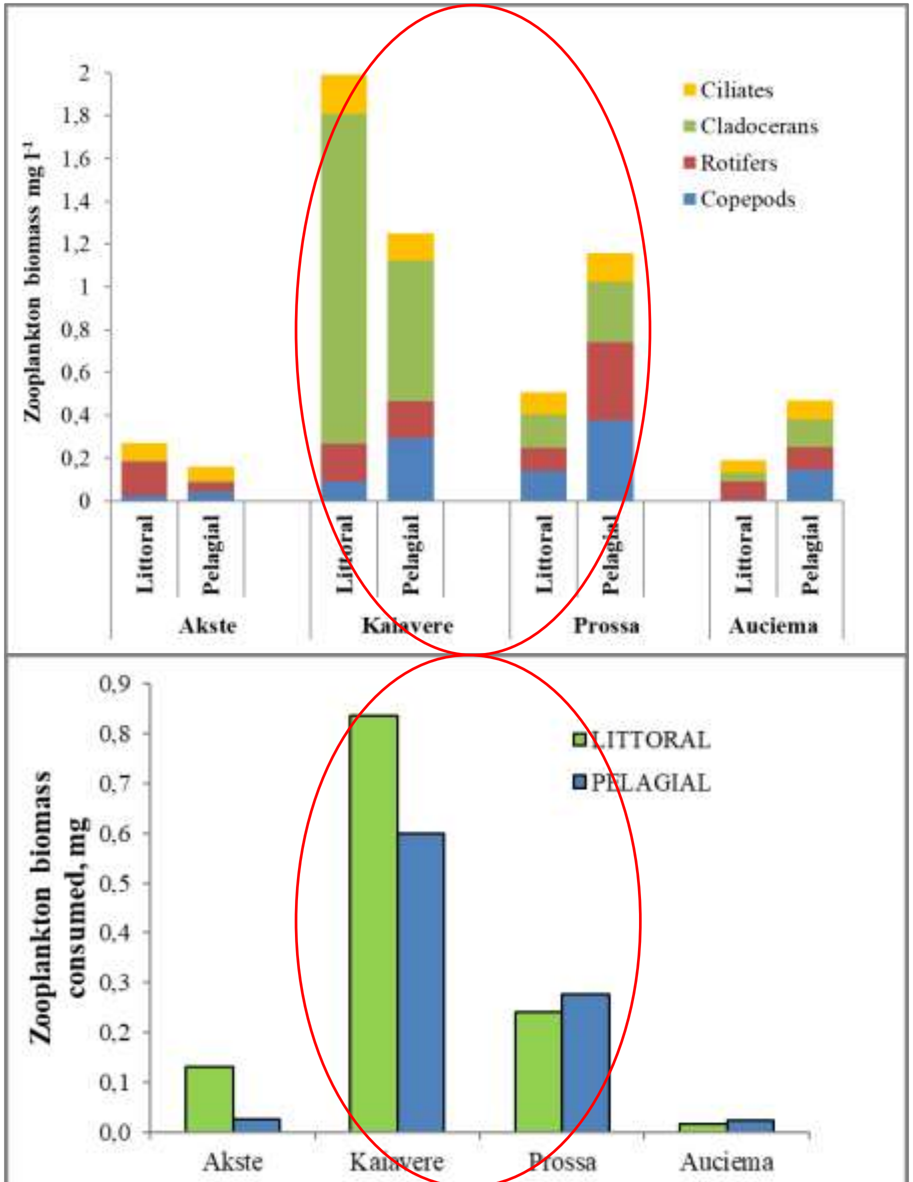
In open-water sites of the lakes the larvae are a bit thinner obviously because the consumption of energy is higher in open-water sites.







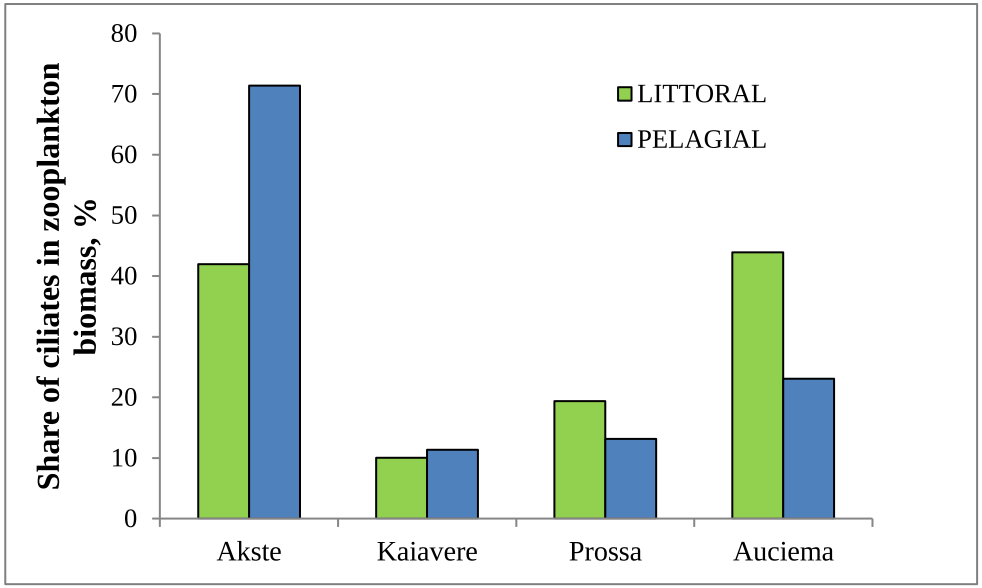
Zooplankton biomass consumed

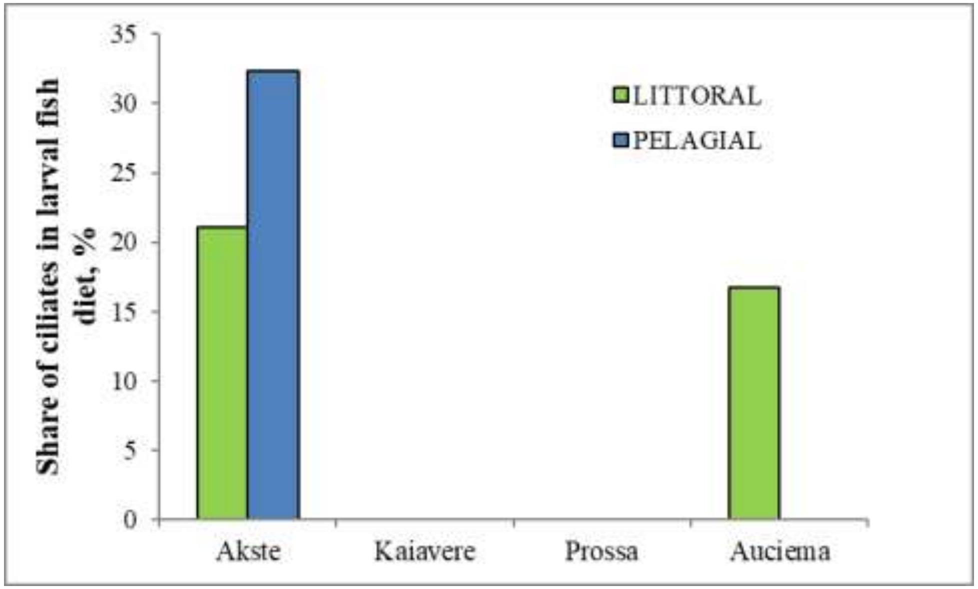


When zooplankton biomass is high (e.g. in Lake Kaiavere and Lake Prossa) in the lake, then they are abunantly eaten also by perch larvae

Total biomass of ZP is in a strong positive correlation with zooplankton biomass consumed by perch larvae.

Share of ciliates in ZP biomass versus larval fish diet



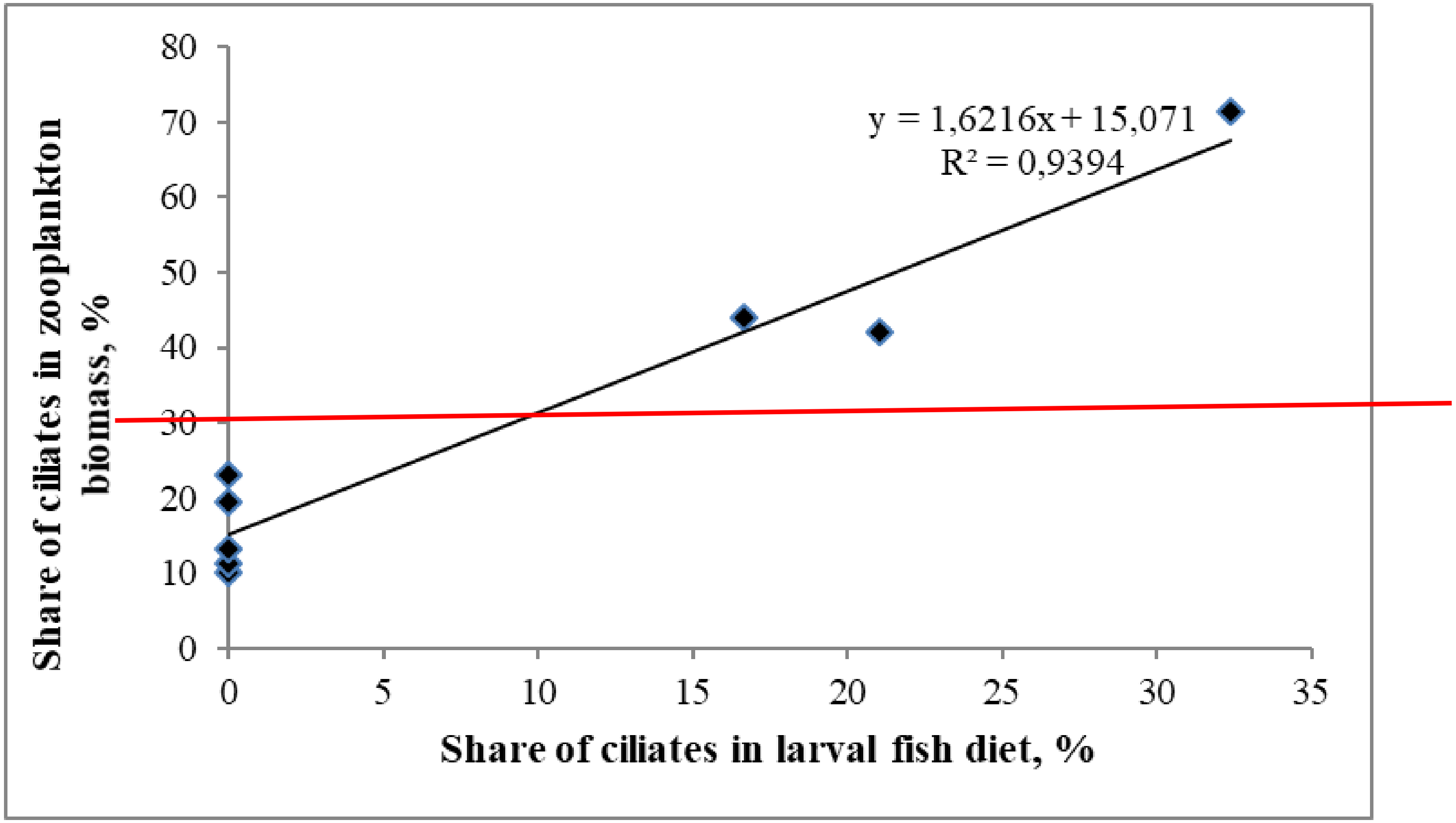


The share of ciliates from total ZP biomass was highest in Lake Akste and Lake Auciema.

Ciliates were eaten by perch larvae only in two lakes (Lake Akste and Lake Auciema) where their biomasses were higher.

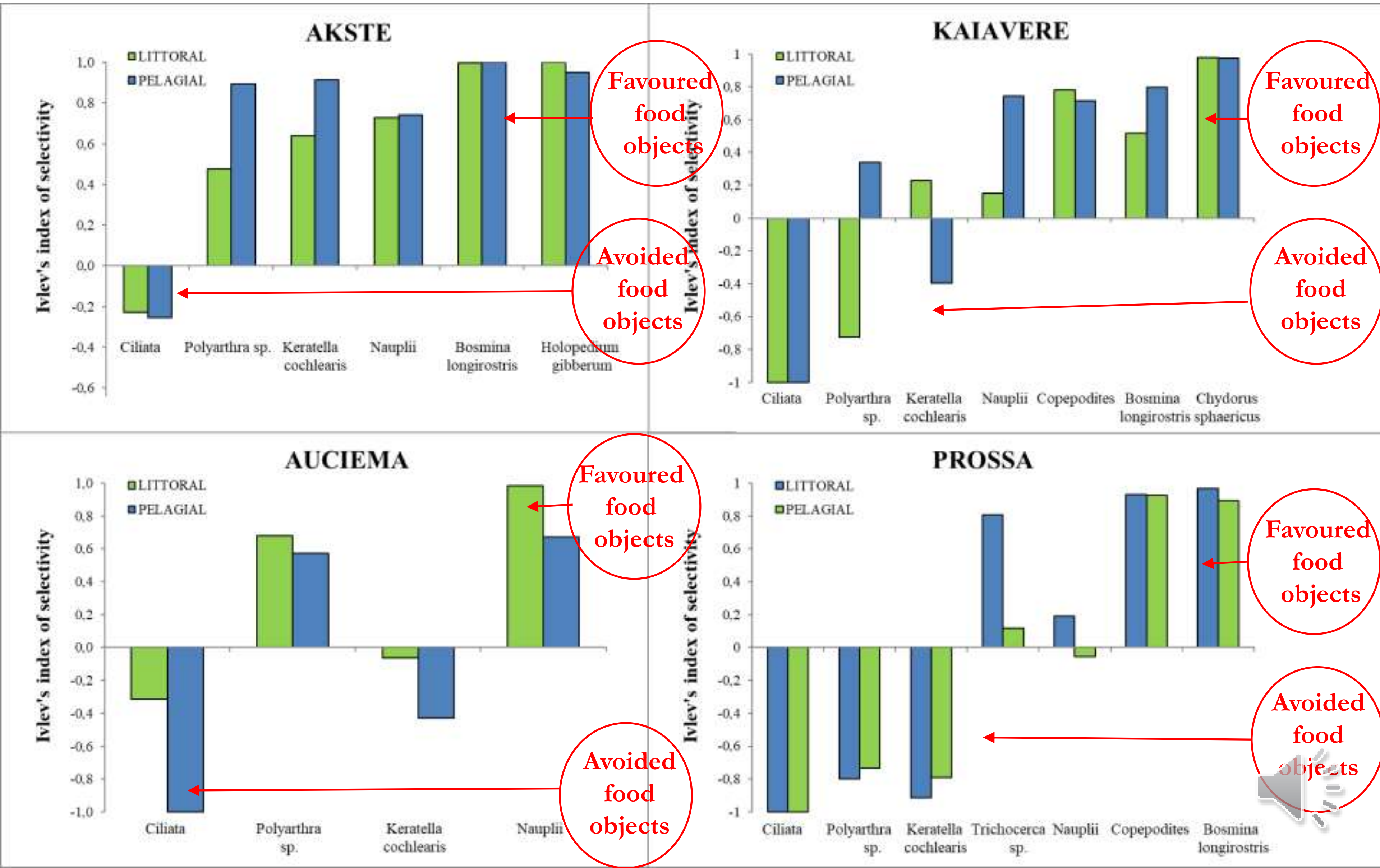
The share of ciliates in larval fish diet was high in Lake Akste and Lake Auciema forming significantly large part from larval perch diet.

Share of ciliates in ZP biomass versus larval fish diet



Perch larvae do not eat ciliates when the biomass of ciliates forms less than 30% of total zooplankton biomass.

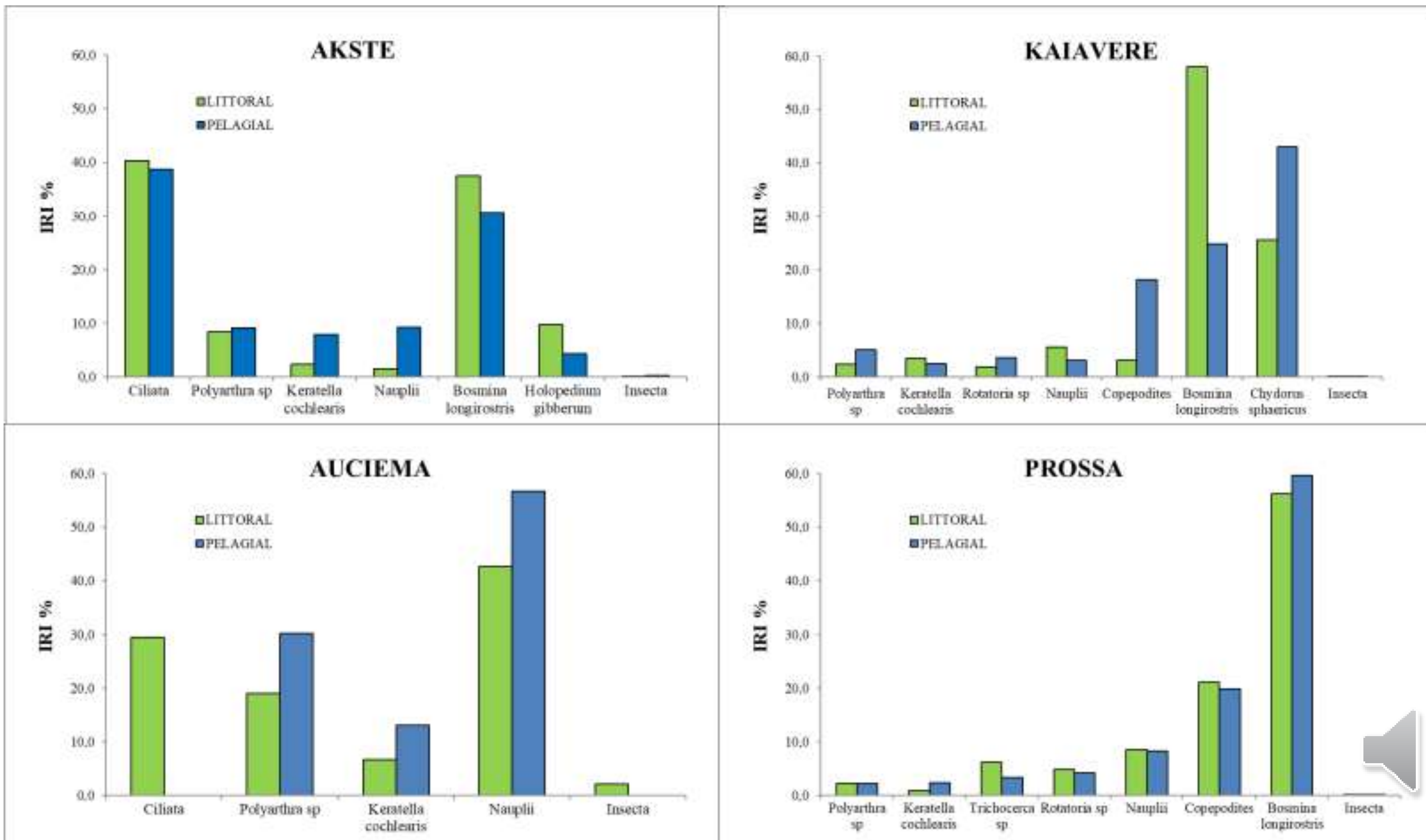
Ivlev' index of selectivity: shows which food objects are favoured and avoided by fish.



Percent index of food items relative importance (IRI)

Percent index of food items relative importance is calculated on the basis of three different indices – numbers, mass and frequency of occurence.

It shows which food objects are relatively the most important concerning all these three indices.



Conclusions

- Littoral and open-water sites are very different habitats, therefore we should treat them separately noticing very different worlds also in one water drop.
- When the biomass of some ZP species is high in the water, they were also successfully eaten by perch larvae.
- Large-sized MZP species and ZP species equipped with spines etc (e.g. *Daphnia cucullata Keratella quadrata*, *Kellicotttia longispina*, *Filinia longiseta*) were not eaten by perch larvae even when they were present in high abundances in the water.
- In the lakes where ciliates formed approximately 30% or more from total ZP biomass, they are very important food source in larval perch diet.
- In open-water sites perch larvae were thinner obviously because of higher energy consumption in this habitat.
- In open-water habitats consumed food items were more diverse (niche was wider) because of poorer feeding conditions (they have to put up with these prey species they encounter).
- Ivlev and IRI also showed that perch larvae mostly preyed upon these species which were more abundant in all lakes (e.g. *Polyarthra*, *Keratella,* and copepod nauplii in all the study lakes) and mostly fed on these species which were captured selectively and occurred in very low abundances or were already eaten by fish during spring (e.g. *Bosmina* and *Holopedium* in Lake Akste and *Chydorus* in lakes Kaiavere.

Thank you for your attention!

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 951963