



**Joint management of Latvian – Lithuanian
transboundary river and lake water bodies
(TRANSWAT)**

**Ecological quality of five sparsely monitored
transboundary lakes**

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Lake Garais/Ilge

Lake Galiņu/Salna

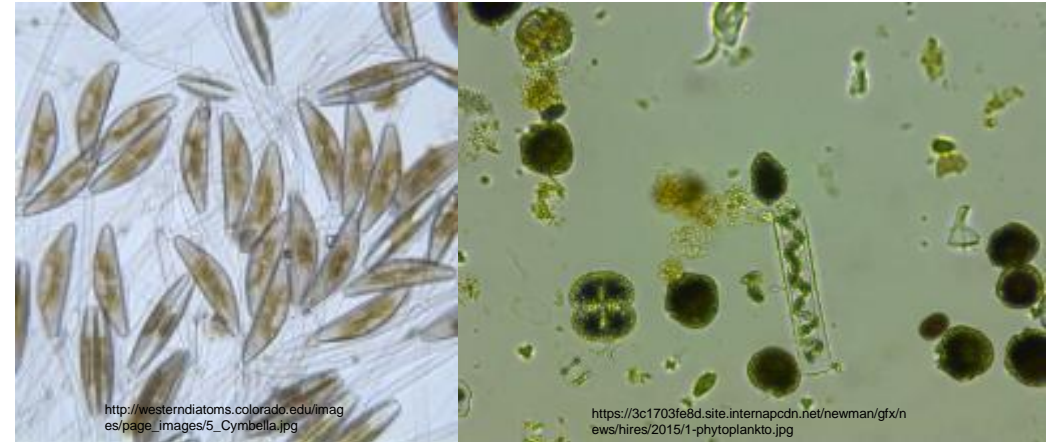
Lake Lielais Kumpinišku/Kampiniskiai

Lake Laucesas/Laukesas

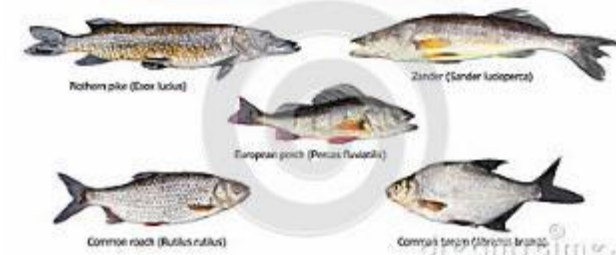
Lake Skirnas

Ecological quality

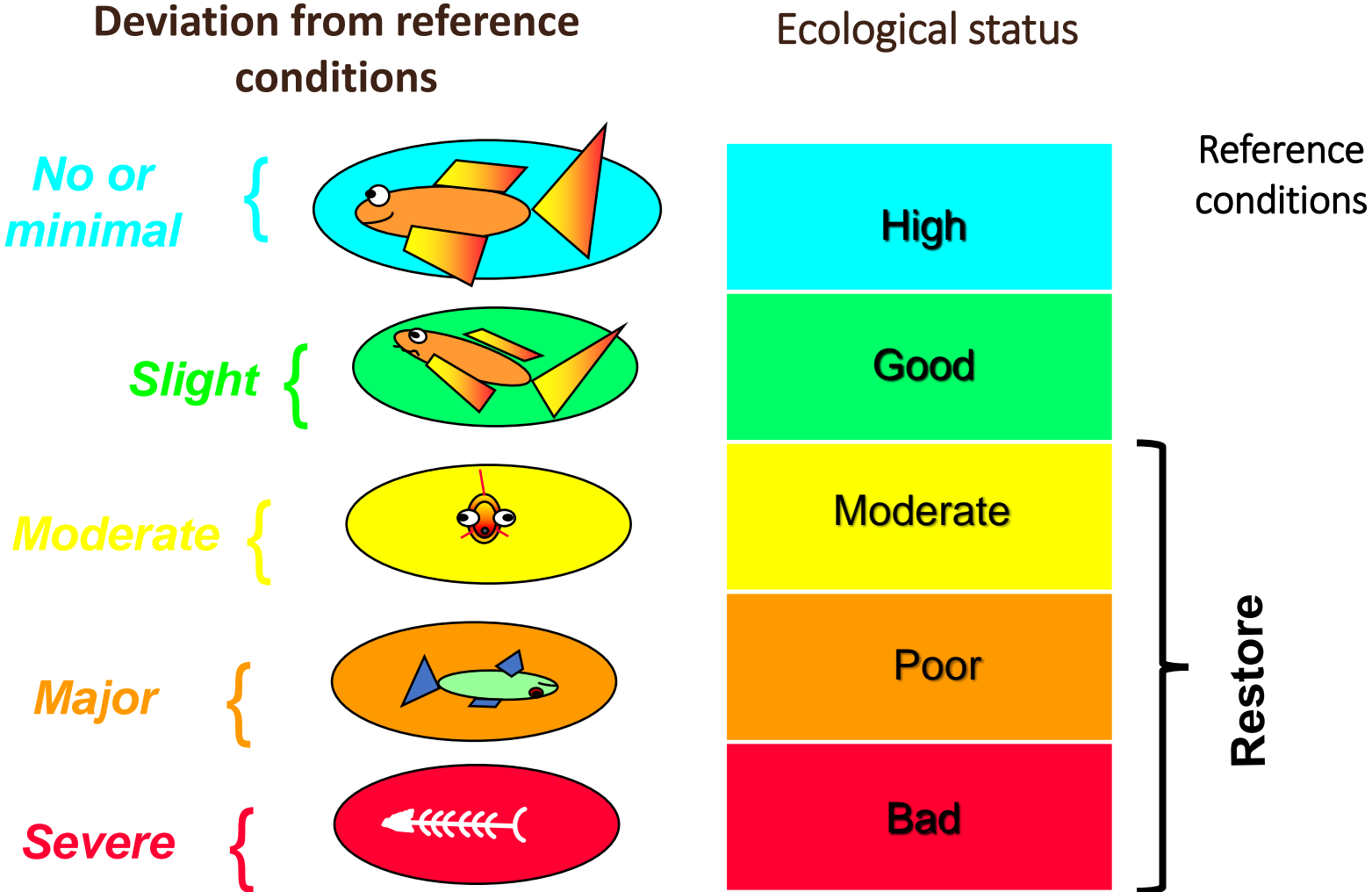
- **Legislations** – EU Water Framework Directive (2000/60/EK);
- **aim** – achieve good status according hydromorphological, physcal-chemical and biological parameters;
- **biological quality elements** – phytobenthos, phytoplankton, macrophytes, benthic macroinvertebrates and fish



NORTH-EUROPEAN FRESHWATER FISHES



Ecological quality



Ecological quality of studied lakes according benthic macroinvertebrates

- Benthic macroinvertebrates – aquatic invertebrates that are > 1 mm and live on the bottom of water bodies. They might be borrowed in soft substrates or live on the aquatic vegetation, snags, pebbles, rocks and other substrates.
- Samples were collected in May and October, 2021 in lakes Ilzas, Lielais Kumpinišķu, Galiņu, Skirnas and Laucesas;
- The ecological quality was assessed using Latvian Lake Macroinvertebrate Multimetric Index (LLMMI) and Lithuanian Lake Macroinvertebrate Index (LLMI)

2.1. METHODS AND REQUIRED BQE PARAMETERS

For the calculation of LLMMI, five metrics were used (Table 1), which cover all four indicative parameters required by WFD: taxonomic composition, abundance, sensitive / tolerant taxa and diversity metrics. It could be concluded that the LLMMI is compliant to the WFD.

The LLMMI was developed based on the Estonian freshwater assessment method using benthic invertebrates (Birk et al. 2010). All metrics were calculated using the Asterics 4.04 software (Anonymous 2004).

Table 1. Overview of the metrics included in the Latvian Lake Macroinvertebrate Multimetric Index (LLMMI)

MS	Taxonomic composition	Abundance	Sensitive / tolerant taxa	Diversity
LV	Number of taxa Number of EPTCBO taxa	Relative abundance (Shannon – Wiener diversity index)	ASPT index (Armitage et al. 1983). Acidity index (Hendrikson, Medin 1986)	Number of taxa Number of EPTCBO taxa Shannon – Wiener diversity index

(Skuja and Ozoliņš, 2017)



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Macroinvertebrate metrics and their integration for assessing the ecological status and biocontamination of Lithuanian lakes

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Macroinvertebrate sampling and sample processing

- Samples were collected with a hand- net in the shallow littoral (< 0,8 m);
- at every sampling location 5 replicates were collected, combined in a joint-sample, washed through a sieve and preserved in ethanol;
- in laboratory, samples were washed, invertebrates were sorted out and the taxa were identified using different identification keys



Ecological quality according macroinvertebrates – Lake Ilzas/Garais

Latvia		Lithuania	
Ecological quality	LLMMI	Ecological quality	LLMI
Good	0.67	Good	0.58

- Samples collected at 3 localities in May and October;
- in littoral, the dominant taxa are larvae of non-biting midges Chironomidae, watermites Hydrachnidia and mayfly nymphs *Caenis horaria*;
- in spring, 55 taxa were identified (14 Trichoptera species) while in autumn - 47 (12 Trichoptera taxa).



<http://www.aquatax.ca>



Timm, 2015



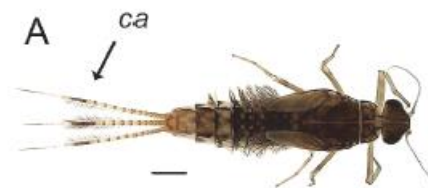
Ecological quality according macroinvertebrates – Lake Lielais Kumpinišku

Latvia		Lithuania	
Ecological quality	LLMMI	Ecological quality	LLMI
Good	0.71	Good	0.71

- 2 sampling points (shallow Northern part and deeper Southern part) in May and October;
- in littoral, the dominant macroinvertebrate taxa are Chironomidae, nymphs of *Caenis horaria* and *Cloeon dipterum*;
- in spring 41 taxa, in autumn – 47 taxa.



<http://www.aquatax.ca>



Timm, 2015



Ecological quality according macroinvertebrates – Lake Galiņu

Latvia		Lithuania	
Ecological quality	LLMMI	Ecological quality	LLMI
Good	0.67	Good	.53

- Samples collected at 2 sampling points in May and October;
- the dominant taxa in littoral – water louse *Asellus aquaticus*, mayfly nymphs *Caenis horaria* and Leptophlebiidae;
- lowest abundance and taxa richness from the studied lakes. In spring - 22 taxa, in autumn – 34;



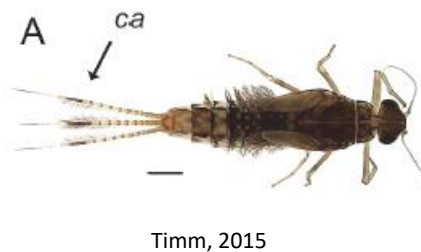
Timm, 2015



Ecological quality according macroinvertebrates – Skirnas ezers

Latvia		Lithuania	
Ecological quality	LLMMI	Ecological quality	LLMI
Good	0.89	Good	0.62

- Samples collected at 2 sampling points in May and October;
- in littoral, chironomids Chironomidae, nymphs of *Cloeon dipterum*, pea mussels *Pisidium* sp. and zebra mussels *Dreissena polymorpha*;
- in spring - 50 taxa, rudenī – 41.



Ecological quality according macroinvertebrates – Laucesas ezers

Latvia		Lithuania	
Ecological quality	LLMMI	Ecological quality	LLMI
Good	0.88	Good	0.59

- Samples collected at 2 sampling points in May and October;
- in littoral, chironomids Chironomidae, oligochaetes *Oligochaeta* and *Caenis horaria* nymphs;
- the highest macroinvertebrate abundance from all the studied lakes. In spring - 48 taxa, in autumn – 60;



<http://www.aquatax.ca>



Timm, 2015

Invasive species



Zebra-mussel (*Dreissena polymorpha*)

In lakes Lielais Kumpinišķu, Galiņu, Skirnas and Laucesas



Spiny-cheek crayfish (*Orconectes limosus*)

In lakes Lielais Kumpinišķu and Galiņu

Rare and protected species



The European Medical leech (*Hirudo medicinalis* L.)

**In the Lake Lielais Kumpinišķu;
species protected under Habitats directive (Annex V);
species protected under Regulation of the Cabinet of Ministers No 396;
micro-reserve species.**



Fire-bellied toad (*Bombina bombina* L.)

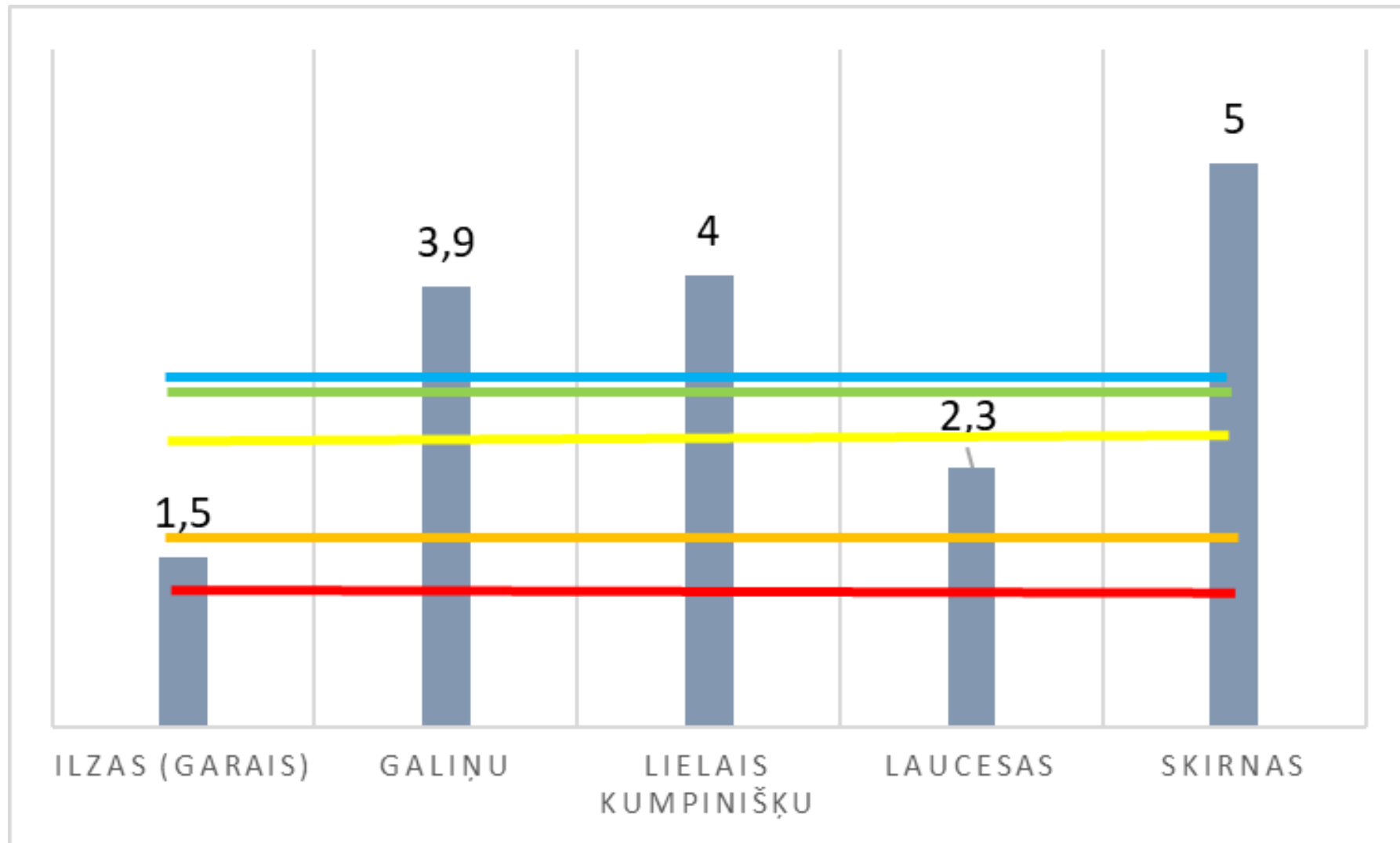
**At the shoreline of Lake Skirnas;
species protected under Habitats directive (Annexes II and IV);
species protected under Regulation of the Cabinet of Ministers No 396;
micro-reserve species.**

Ecological quality by using macrophytes

- Latvian macrophyte assessment method for lakes is based on dominating indicator taxa, adding two more parameters: species composition and depth limit of submerged plants.
- Different parameters are used according to classification of Latvian lakes.



Colonization depth of submerged macrophytes



Lake Ilzas (Garais)

Poor - moderate

Dominating species - *Phragmites australis*, *Nuphar lutea*, *Potamogeton natans*, *Ceratophyllum demersum*.

Species diversity is low - 18 species are found. Only 3 submerged species are found. Growth of macrophytes is limited by low water transparency caused by algae blooming.



Lake Laucesas

Moderate – Poor

Species composition is characteristic for eutrophic lakes (*Ceratophyllum demersum*, *Typha latifolia*).

Submerged species occur rare due to low water transparency, higher species diversity is found only in the bay where River Ilgas flows in the lake and water transparency is higher.



Lake Galiņu

Good

The colonization depth of macrophytes is high (3.9 m) and species diversity is high (30 species), but without charophyte species.

Overgrowing with macrophytes is characteristic for the bays where water exchange is lower, sediments deeper and macrophyte stands are dense.



Lake Lielais Kumpinišķu

Good

Macrophyte species diversity and abundance differ in the Northern and the Southern part of the Lake Kumpinišķu. The Northern part where water is shallow all area is overgrown with macrophytes.

The Southern part of the lake is deeper, the colonization depth of macrophytes is 4 m. Species diversity in is high - totaly 32 species are found.



Lake Skirnas

High - Good

Species diversity is high (34 species), including different charophyte species (*Chara filiformis*, *C. globularis*, *C. rudis*, *Nitellopsis obtusa*) and eight Potamogeton species.

The colonization depth of submerged macrophytes is high - 5 m.



Caldesia parnassifolia – new species for Latvia

In Europe, *Caldesia parnassifolia* is a relict, rare and protected species, reported as extinct in Austria, Bulgaria, Croatia, Serbia, Slovenia and Switzerland.

It was first recorded in Latvia in 2021 in Lake Lielais Kumpinišķu, reaching the northern border of its range.



Thank you!



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