

Effects of climate change on pond fish farming



Béla URBÁNYI

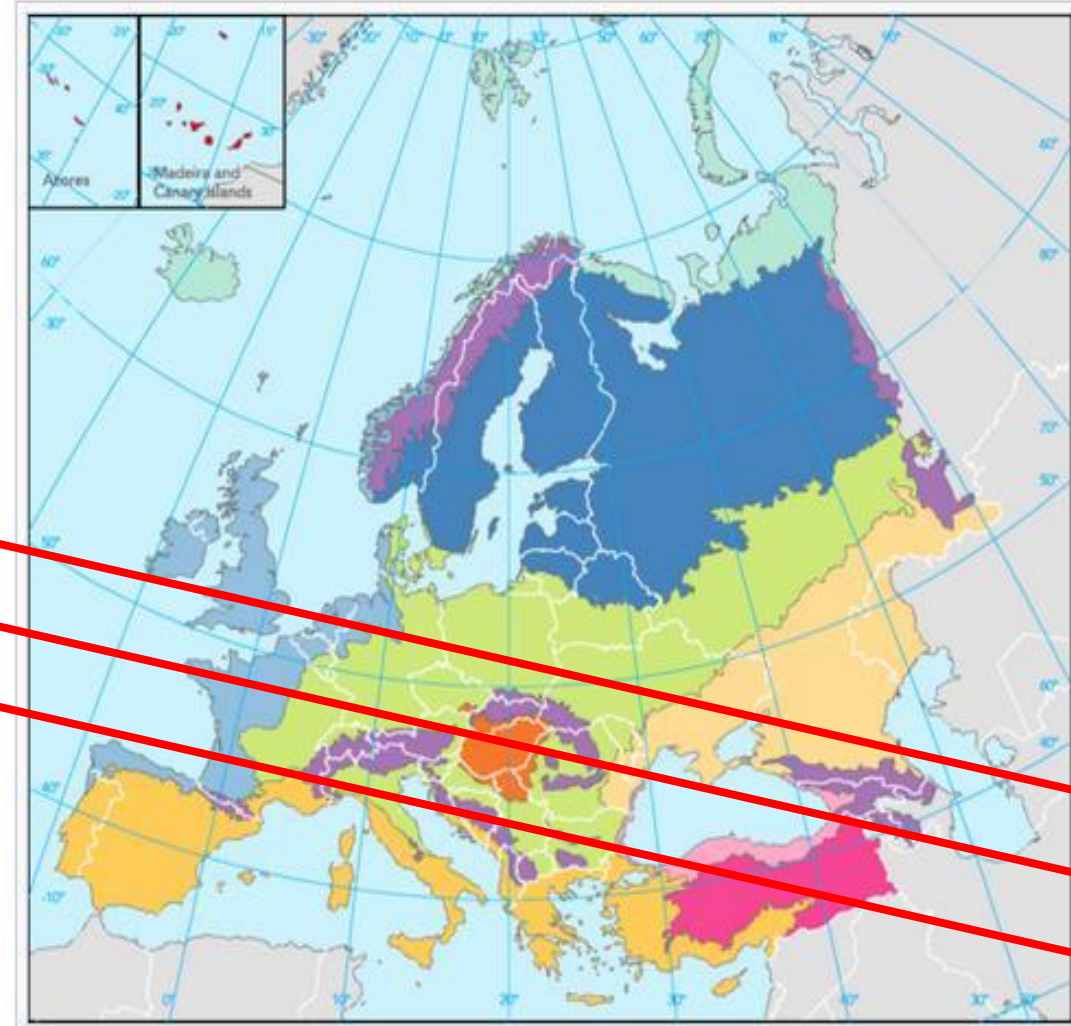
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Agenda

- **Main problems**
 - **Pond aquaculture in general**
 - **Challenges and solutions**
 - **Conclusions**
 - **Final messages**

Main problems: 1.

- Mediterranean climate heading north at ~400 km/20 years.
- Hungary currently = Croatia 20 years ago!!!
- In 2044, the climatic conditions in Poland will resemble the situation in Croatia.



2044

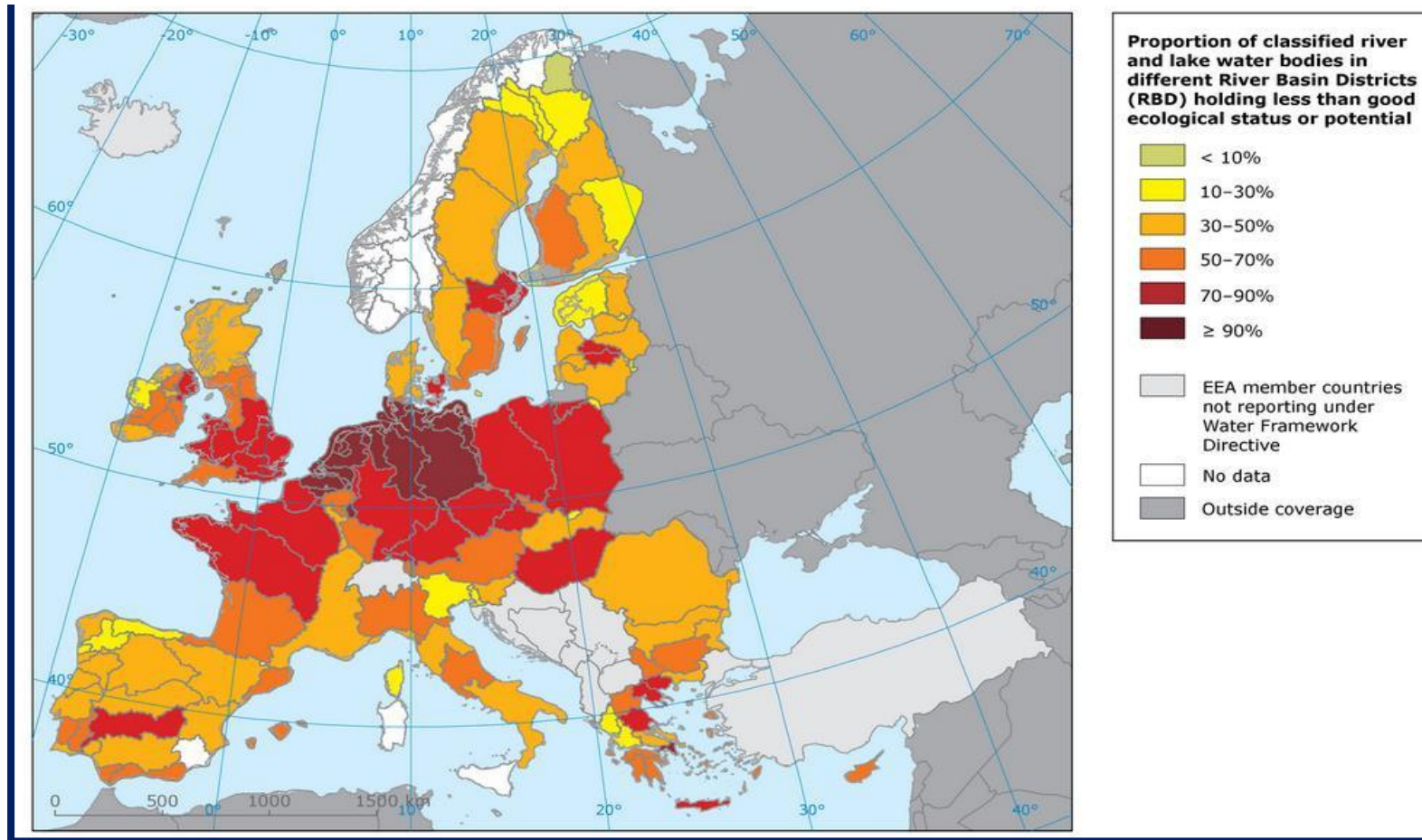
Today

2004

Source: Ditrich-The future is called life, 2021

Main problems: 2.

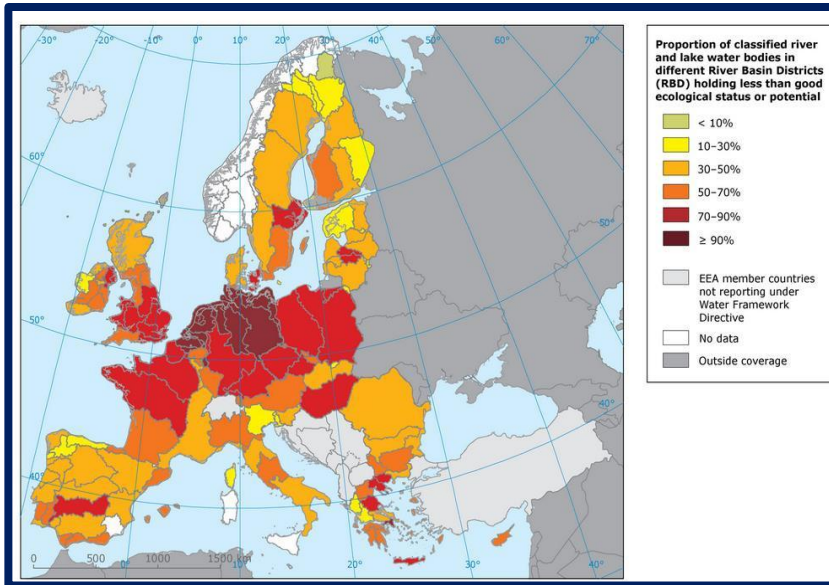
Ratio of good to poor lake water quality in 2015



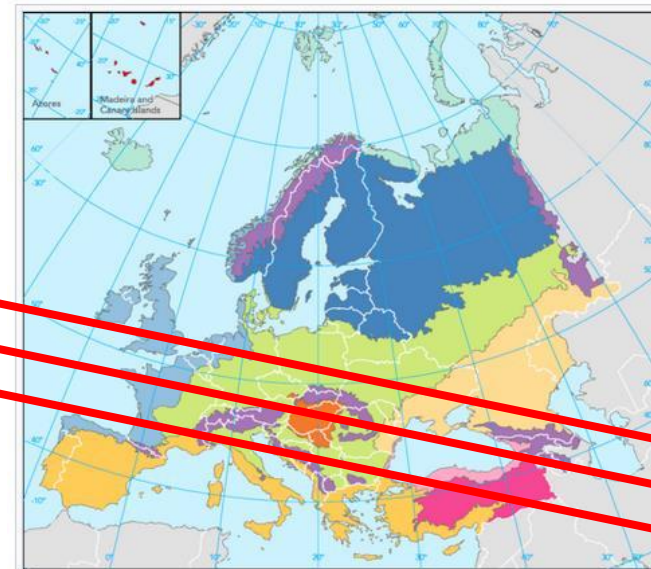
Source: <https://www.eea.europa.eu/soer/2015/europe/freshwater>

Main problems: 3.

2015



2024



2044

Today

2004

20xx



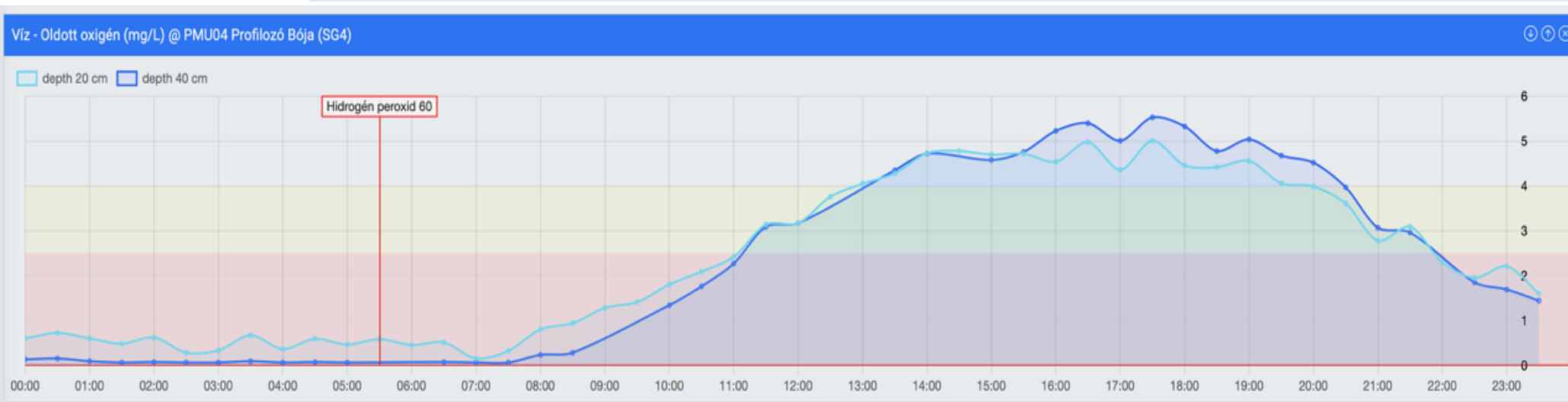
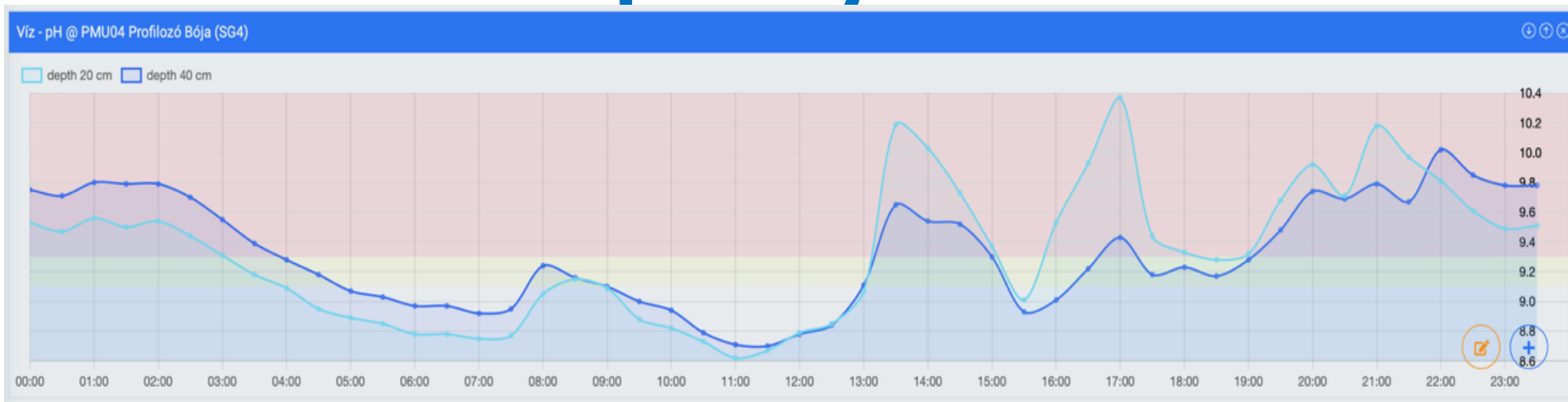
Pond culture in general

- Growing period: 3 years,
- Technology: pond culture (earthen pond, different size),
- Carp oriented production,
- Polyculture,
- Market size fish weight: 1,5-2,0 (>3,0) kg,
- Artificial reproduction: 100% in hatchery condition,
- Main feed: cereals and artificial (pellets and special feed),
- Natural feed: plankton and algae,
- Manure fertilisation,
- Harvesting period: autumn,
- Carp consumption: 1,02 kg/capita/year (Hungary, 2024),
- Market price: carp-3,5 euro/kg, pike-perch 22,0 euro/kg (live fish, Hungary, 2024).

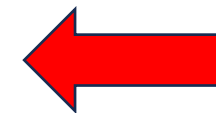


Challenges 1.: Water volume and quality

pH



Oxygen

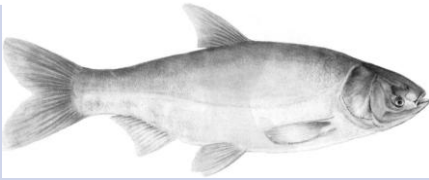


Challenges 1.: Water volume and quality

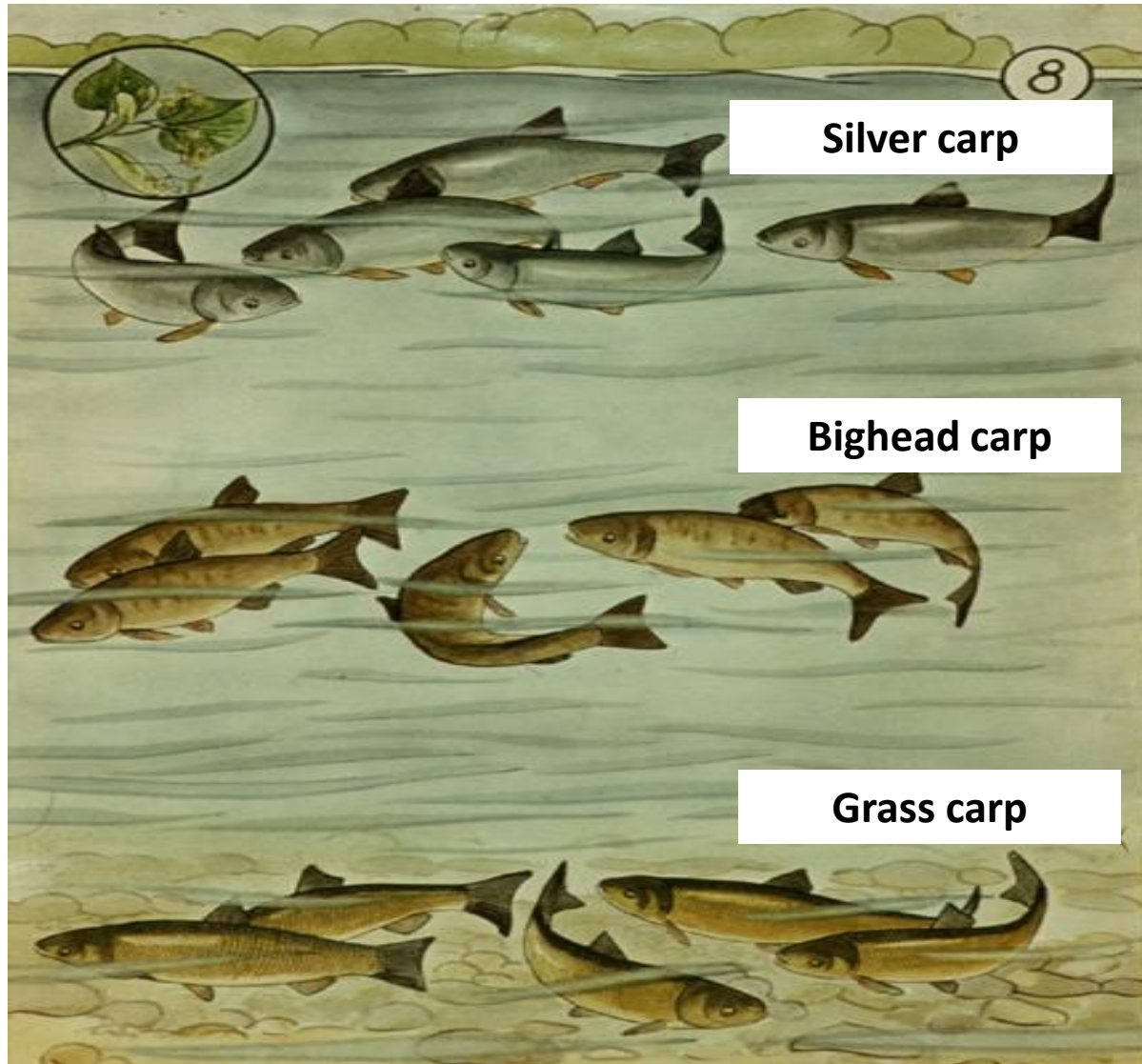
- Development of useful equipment.
- Use of digital and smart technologies.
- The device performs real-time measurement and data recording continuously.
- Need to collect many important parameters.
- At a critical level, it sends an alert and initiates an intervention.



Challenges 2.: Chinese carps

Grass carp	Silver carp	Bighead carp
		
Feed: macrovegetation	Feed: phytoplankton	Feed: zooplankton
Status in aquaculture: cultured	Status in aquaculture: cultured	Status in aquaculture: cultured
Conservation classification: alien	Conservation classification: alien	Conservation classification: alien
Introduction to Hungary: 1964	Introduction to Hungary: 1963	Introduction to Hungary: 1963

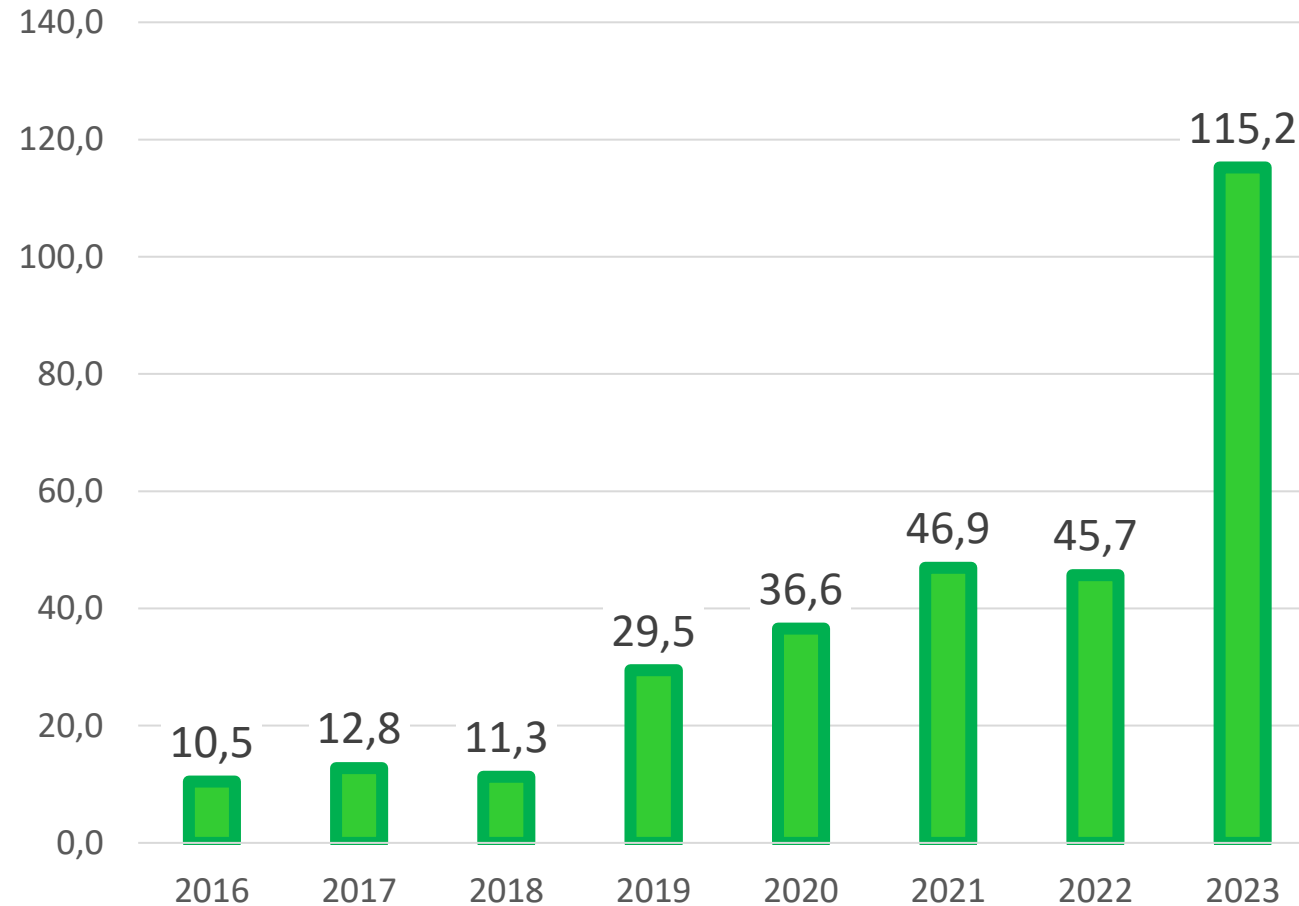
Challenges 2.: Chinese carps



Main factors:

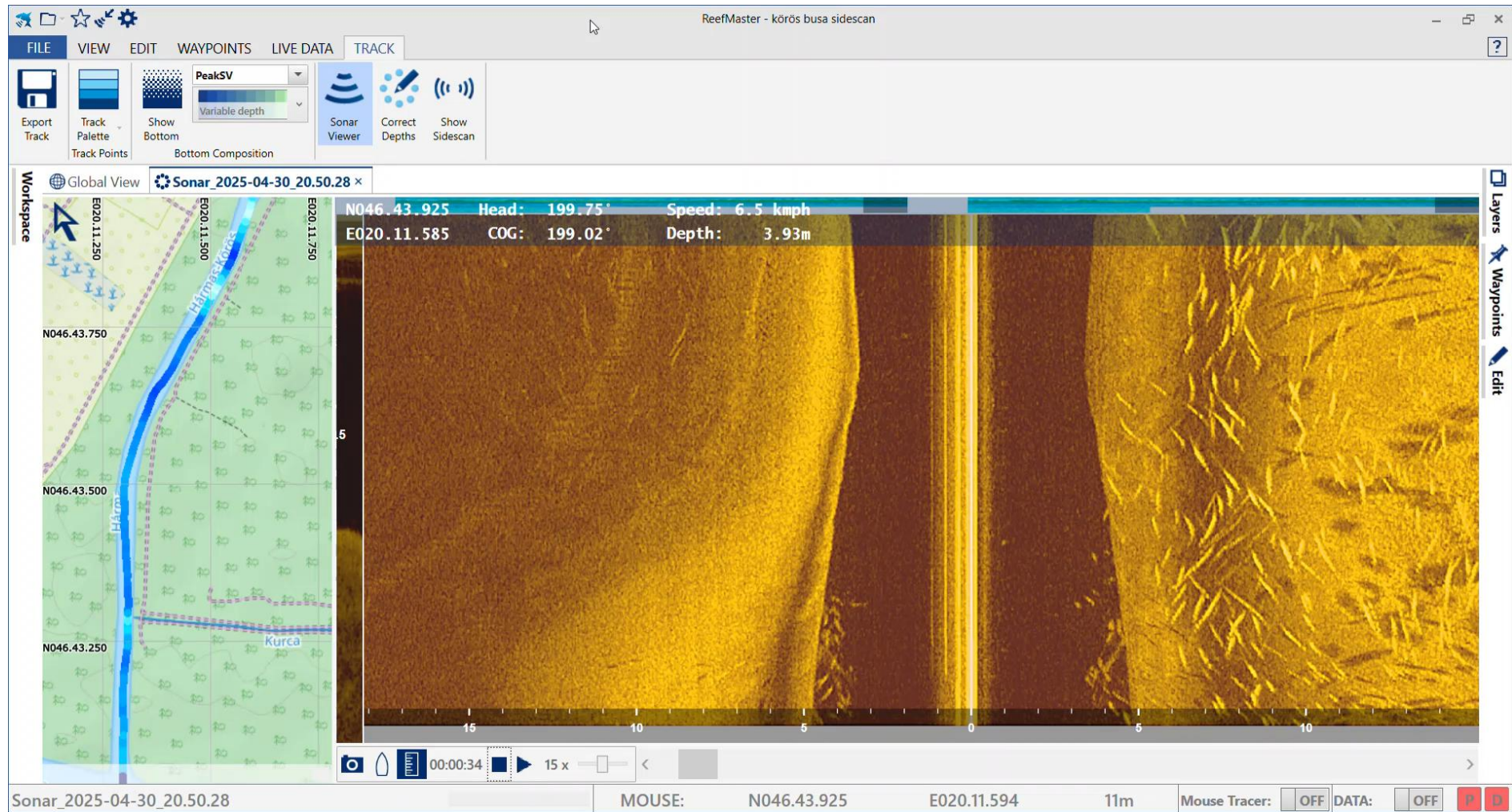
- Warm water (over 24 °C at minimum 7 days).
- Rapidly running river sections.
- In Hungary: June-July (linden tree flowering).
- **In the last 5 years, there have been 31 times in the spring period water levels (floods) that favour the reproduction of Chinese carps.**

Challenges 2.: Chinese carps



Source: Vitál Z. et al., 2025

Challenges 2.: Chinese carps



Source: Vitál Z., 2025

Challenges 3.: Climate smart nutrition

- In the past 5 years, there has been a frost longer than 5 days only once.
- There is no ice on the ponds, and the fish are not burrowing.
- Carp look for food and feed when the temperature is above 6°C.
- Development of special feeds that help fish digestion during the winter period and at the same time strengthen the immune system.



Challenges 4.: Health management

- 17 new pathogens registered in Hungary in the last 5 years.
- All of which were previously prevalent in Mediterranean and tropical areas.
- Temperate zone fish species have not yet encountered these pathogens.
- Fish health management (prevention and treatment) needs to be developed and improved communication!

Eustrongylides sp



Source: Puskás N., 2024

Challenges 5.: Cormorants

- The migration and wintering behaviour of great cormorants has been changing in recent years, probably due to climate change, with a significant decrease in the typical population size during the previous peak periods.
- The problem is that the damage caused to fish farmers by great cormorants, which cause significant financial losses, is difficult to assess using precise methods, and there is currently no aid available to compensate for the loss of income.



Source: Szendőfi B., 2023

The solution to this problem is not a national level, but an international level in close cooperation with the FEAP and EIFAAC organizations.

What is animal (fish) welfare?

Fish live (or are kept) in an environment that ensures their healthy condition, species-specific behaviour, and mental state throughout their entire lives.



healthy



active



eats naturally



shows natural
behaviour



lives in harmony
with its environment

Background



Source: Heisting, 2026

Regulation

- In the field of animal welfare (fish welfare), primordial chaos prevails in Europe (EU).
- Council Regulation 1/2005 EC on the protection of animals during transport and breeding.
- The principle of 'the fish should feel well during production life.' It is necessary to minimize injuries and diseases. Optimizing the conditions of breeding.
- Currently there is no regulation, only recommendations.
- Exact regulation of the issue is expected without having real input data...
- Using only non-invasive methods for detecting any stress.

Conlusions

- Dialogue.
- Collaboration in national and international level.
- Harmonisation of different interests.
- Communicating good practices.
- Education.
- Innovation.

Need for open dialogue for stronger and more sustainable European aquaculture sector by all stakeholders of the European aquaculture.

Past-present-future

„Polak, Węgier, dwa bratanki / I do
szabli, i do szklanki / Oba zuchy,
oba żwawi / Niech im Pan Bóg
błogosławi.”

„Lengyel, magyar két jó barát /
Együtt harcol s issza borát / Vitéz s
bátor mindkettője / Áldás szálljon
mindkettőre”



Invitation

- **1st International Catfish Conference (ICC)**
- **Organizers: Széchenyi István University and EUROFISH International organization**
- **Co-organizers: EAS and HUNATiP**
- **Date: 5-9., April, 2027**
- **Location: Győr (west part of Hungary)**

SAVE THE DATE!

Final messages

We need to get to know each other, and we need to work together because this way we will be stronger – COOPERATION!

**”Ibi semper est victoria ubi concordia est”
Where there is unity, there is always victory.
(after Publilius Syrius)**



Dzięki za uwagę!
Thank you for your attention!