



DAUGAVPILS UNIVERSITY
Institute of Life Sciences and Technologies, Department of Ecology
LATVIA, EUROPEAN UNION



2nd International Aquaculture Conference
RECIRCULATING AQUACULTURE SYSTEMS (RAS): LIFE SCIENCE AND TECHNOLOGIES
2017.05.04. Daugavpils University, Latvia

**RECIRCULATING AQUACULTURE SYSTEMS (RAS) IN SMALL
ZOO EXHIBITION: APPROACH OF NATURE-FRIENDLY
LATGALES ZOO, DAUGAVPILS, LATVIA**
(Aquaculture: Joint Goals – Different Ways)

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Aquaculture (hereinafter referred to as AC) is a **target** cultivation of hydrobionts in a regulated environment (Plotnikov et al., 2017).

What is the target of Latgales Zoo's aquaculture?





1. Material-productive aquaculture. .

Purpose: to satisfy the human need for substances (food, raw materials for industry, etc.).

Product: biomass of hydrobionts.

Example: the most aquaculture farms.





2. Function-productive aquaculture.. Purpose: to satisfy the human need for the processes (removing of "weedy" fish in the pond, the desired functioning of ecosystems and populations, etc.). **Product:** functional service of hydrobionts. **Example:** aquaculture for the restoration of populations in the nature conservation projects.





3. Information-productive aquaculture.

Purpose: to satisfy the human need for knowledge (genetics of hydrobionts, their behaviour, physiology, etc.).

Product: information on hydrobionts.

Example: laboratory aquaculture of *Danio rerio*.





4. Emotion-productive aquaculture.

Purpose: to satisfy a person's need for emotions (love, aggression, joy, fear, pleasure, etc.).

Product: emotions caused by hydrobionts.

Example: aquaculture of a home aquarium.





According to the **purpose**, requirements and **product**, all ACs can be divided into the following 4 types:

Product

Material
(Substance) **Functional**
(Behavior)

Latgales Zoo
Informational (Knowledge) Emotional (Happiness)

Visitors - your future staff

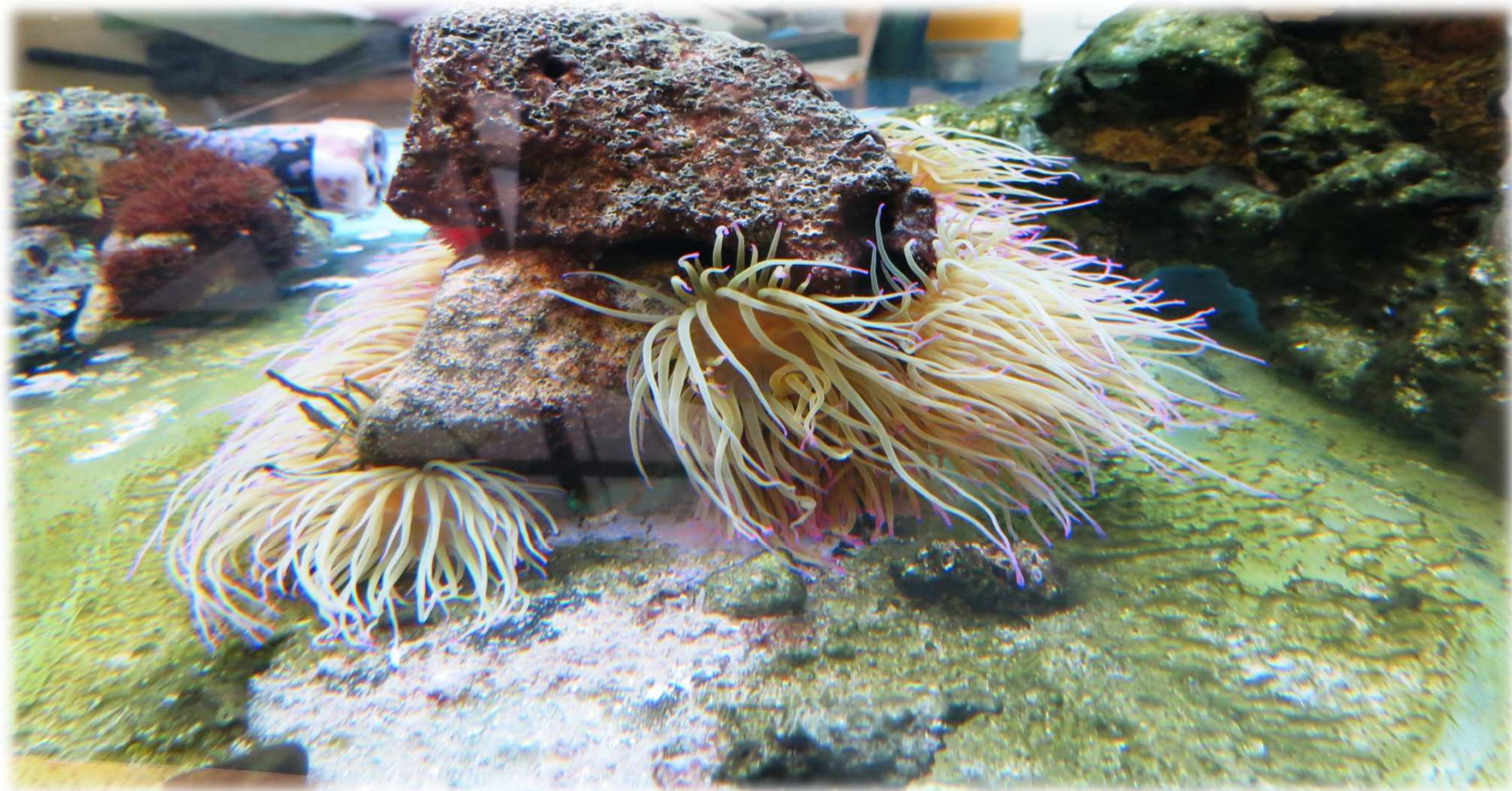




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What kind of hydrobionts species are kept in Latgales Zoo Aquaculture?





Aquaculture: species degrees of aquatic life

- 1. Full life cycle is in air environment. Water can be used for drinking, bathing.

Latgales Zoo aquacultures: excrements and living in water

- 2. Part of life cycle is in air environment and part – in water.
- 3. Full life cycle is in water environment. Air can be used for breathing.

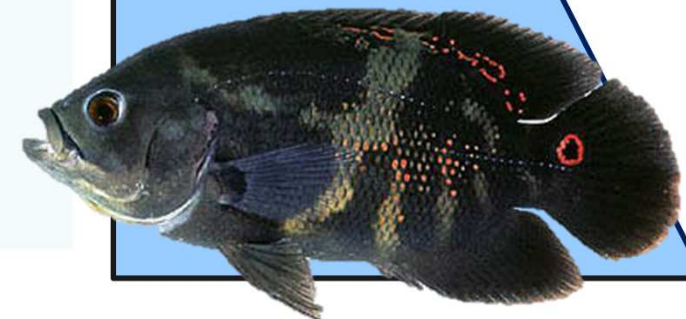
1. AEROBIONT



2. AMPHIBIONT



3. HYDROBIONT





Zoo aquaculture objects

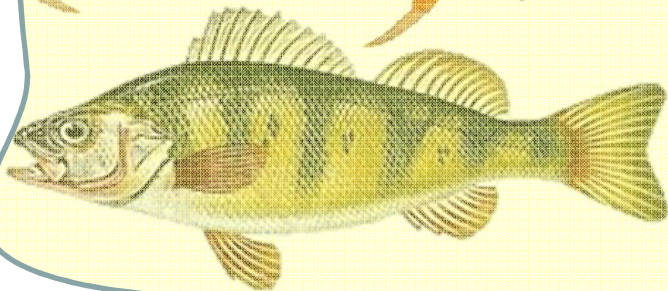


Plants

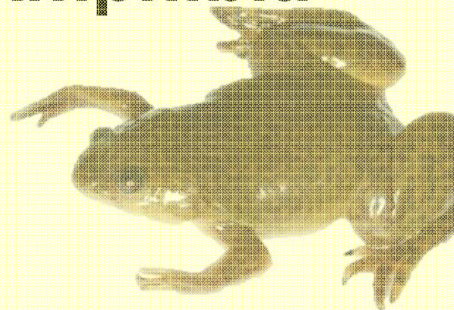
Invertebrata



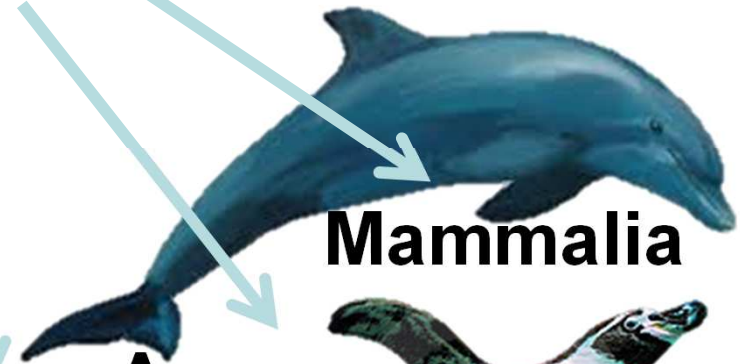
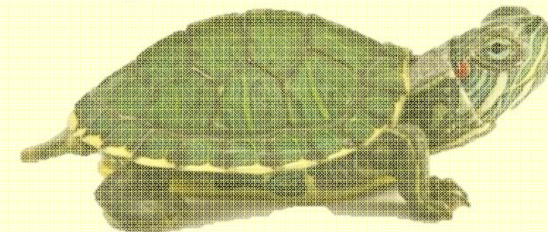
Fishes



Amphibia



Reptilia



Mammalia

Aves





Latgales Zoo is a very small Nature Friendly Zoo and has its own conceptual principles of organization, according to which its RAS solve non-standard tasks. These are:

- 1. Visitors and animals are in the same environment**
- 2. The design is Nature-friendly**
- 3. Nobody is prisoned: all animals are from zooculture**
- 4. Mixed species in one RAS; like-in-wild**





Problem 1. The keeping of several species of hydrobionts with different needs in one basin with one RAS

Decision. Joint keeping inside of tolerance range

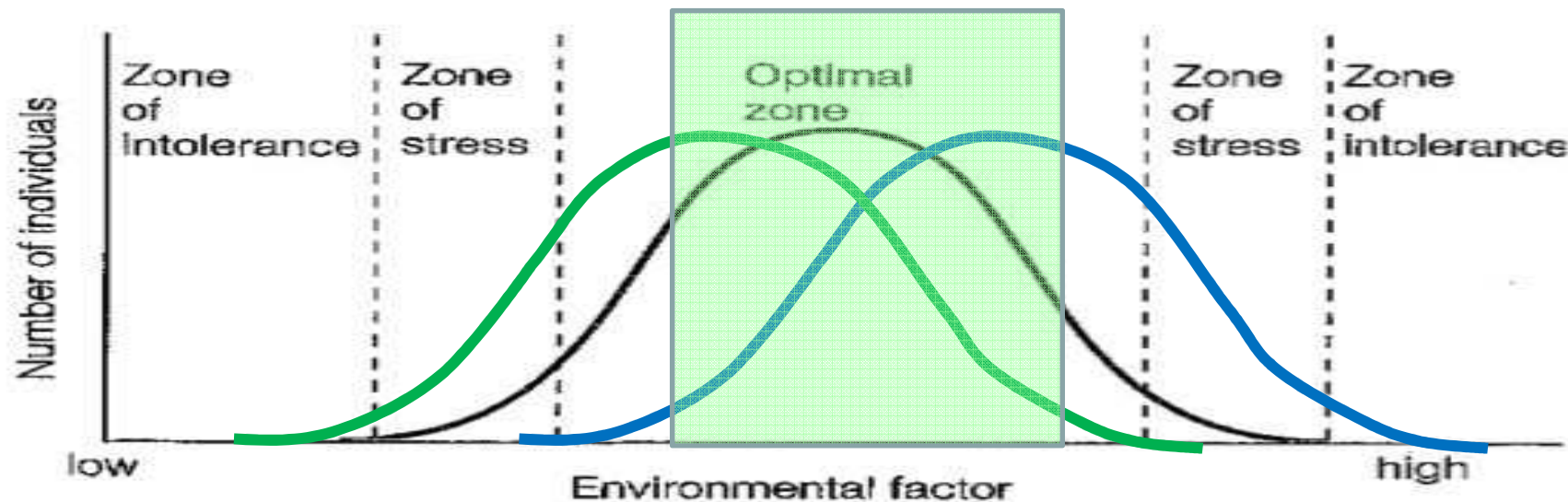


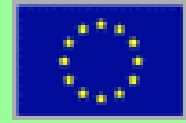
FIGURE 3.1 Shelford's law of tolerance. A plot of the number of individuals of a species as a function of some environmental factor (such as temperature) produces a bell-shaped curve that can be divided into various tolerance zones.



Problem 2. Visitors don't like technical elements of RAS

Decision. Nature-like masking design of all technical elements of RAS from visitors





Problem 3. Ensuring the necessary water turnover with the undesirability of creating a perceptible current in the basin (for example, for water turtles).

Decision. Creating of current breaks from special elements of design





**Problem 4. Decreased efficiency of RAS
with small room dimensions**

**Decision. The RAS filters are
placed out-side of exhibition**

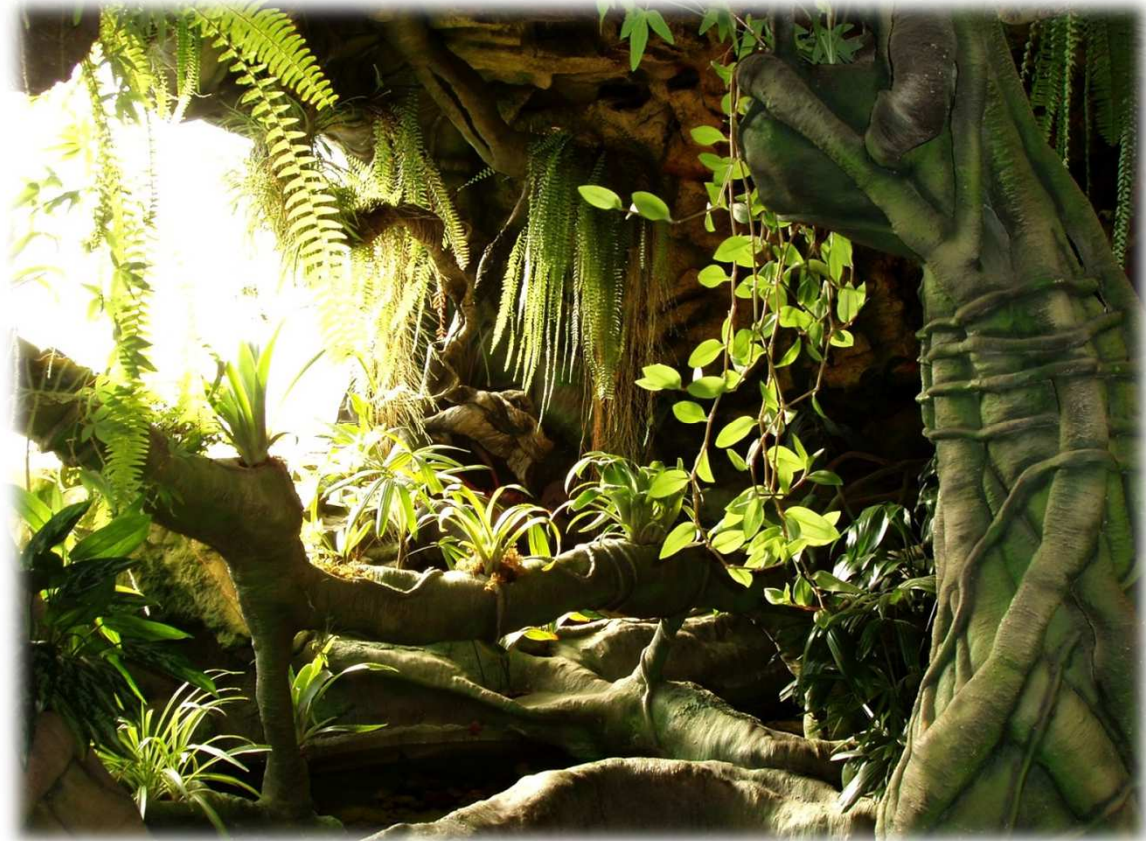


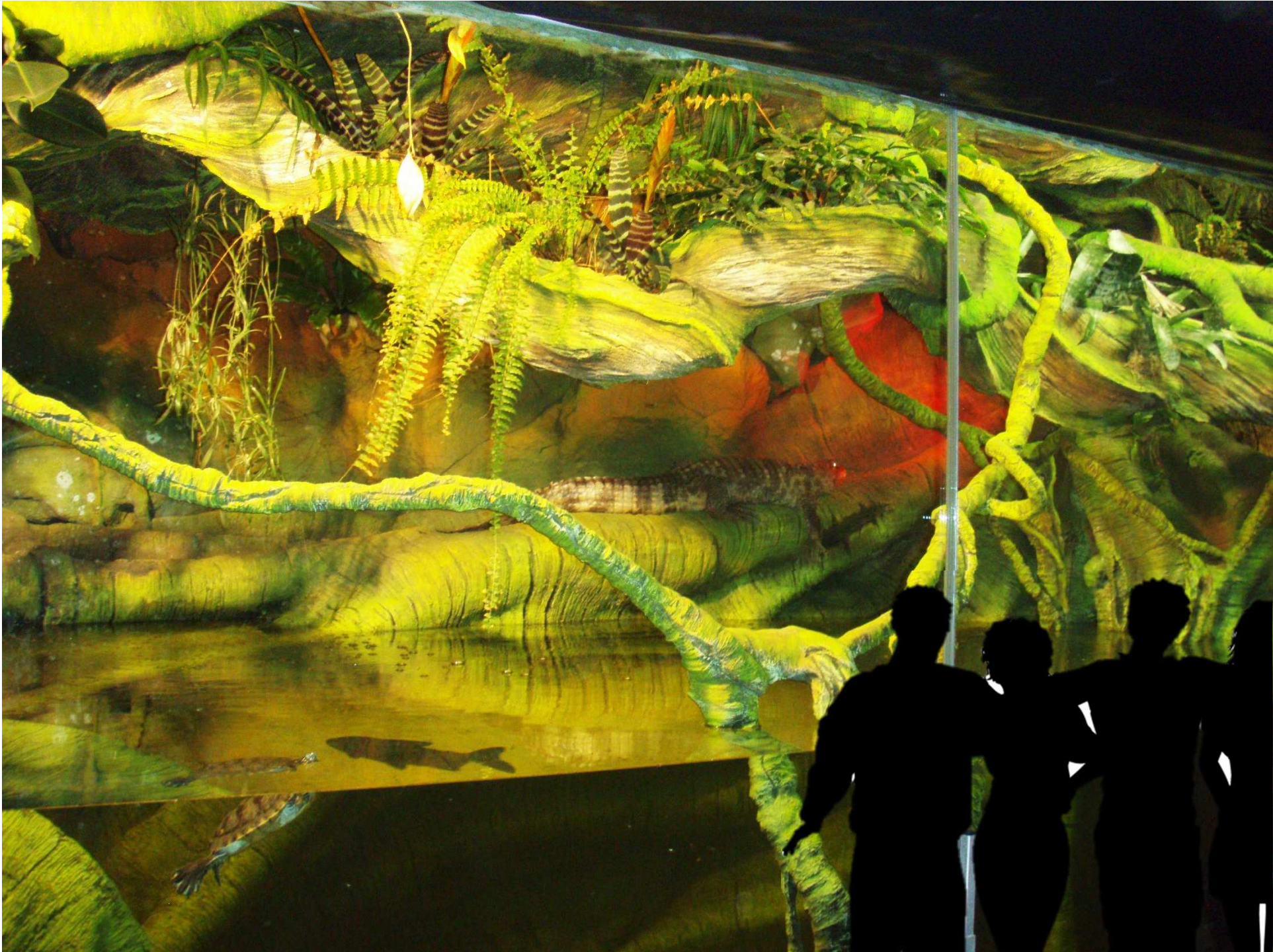


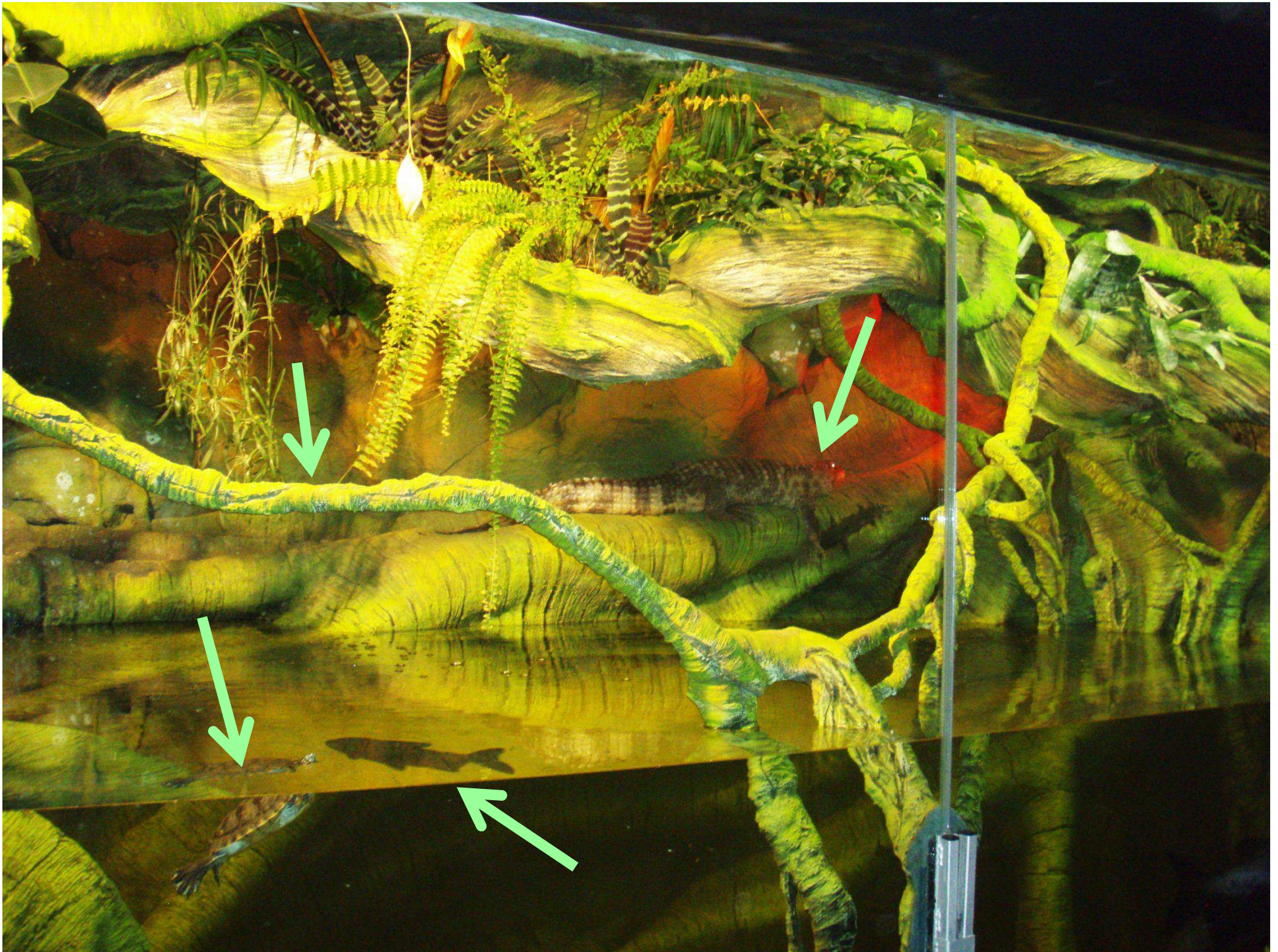
**Problem 5. Different hydrobionts
need for different conditions of the
biotope**



**Decision. Creation of individual
zones for each species**











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Results: The successful solution of these tasks allowed creating a system RAS in Nature-Friendly Latgales Zoo and successful keeping of hydrobionts for **25 years (110 species and more than 500 individuals in 2017)**, that attracts up to 45 000 visitors per year (50% from the city population).

Perspectives: The technology will be used in 2018 creating RAS for hydrobionts of 100 species 16 exhibition basins in Latgales Zoo according the Latvian Environmental Protection Fund co-financed Project “LV100-Eo-LV200”.

Effectiveness:

Project “LV100-Eo-LV200”.= 50 000 Euro = 10

Emys orbicularis

1 *Emys orbicularis* = 5 000 Euro





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**Thank you for
your attention!**



**We thank Dr.biol. V.Vahrusevs for his great
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for cooperation and consultations.**