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## Fifteen years of research in the western part of Romania, aimed for development of the pikeperch (*Sander lucioperca*) farming in recirculating aquaculture systems

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**Abstract:** The pikeperch (*Sander lucioperca*) is one of the most valuable species reared in fish farms in Romania, highly appreciated by consumers due to the excellent quality and taste of the meat. However, the pikeperch production in farms is low, this species being produced especially in polyculture in carp farms, and it cannot cover the market demand. Thus, the concerns related to the development of some technologies for farming pikeperch in intensive system were ever greater, and the University of Life Sciences from Timișoara (ULST) became the main pole in the western area of Romania that approached and deepened this subject. The first attempts to intensively rear this species in recirculating aquaculture systems (RAS) began in ULST in the year 2008. Since then, several generations of pikeperch have been produced, which have gradually adapted better and better to the conditions from RAS, and the rearing technology has consistently evolved based on research carried out in university. The present paper presents the most important achievements of the researchers from ULST that led to the development of the technology of raising the pikeperch in RAS in the western area of Romania, of the biotechnologies applicable to this species and the possibilities of their application in practice.

### 1. Introduction

The rearing of the pikeperch is an activity that has a low significance in the Romanian aquaculture, this fact is mainly due to the limited knowledge of the technology for rearing this species, especially in intensive systems within closed spaces. This technology has been extensively explored in countries with well-developed aquaculture practices. Currently, it is well-known that the main pikeperch production comes from farms that primarily focus on growing carp or other cyprinids, where pikeperch is raised in polyculture systems. In order to meet the market demand for pikeperch meat, it has become crucial to establish and develop intensive pikeperch farms capable of producing a sufficient quantity. In this context, several initiatives could be observed in Romanian aquaculture aimed at the intensive breeding of pikeperch, one of them being in the western part of the country, at the "King Mihai I" University of Life Sciences in Timișoara (ULST).

### 2. Pikeperch farming in recirculating aquaculture systems (RAS)

- The first attempts to rear pikeperch in a recirculating aquaculture system in the western region of the country began in 2007 with funding from the National Authority for Scientific Research (ANCS) for the project "Creation and optimization of an intensive rearing technology for pikeperch in recirculating aquaculture systems" (SANDERTEH), under Program 4, Partnerships in Priority Areas ([www.sander.ro](http://www.sander.ro)). The project, coordinated by ULST, facilitated the establishment of the first recirculating aquaculture system exclusively dedicated to pikeperch rearing in closed spaces at this institution. The recirculating system, with a volume of approximately 5 m<sup>3</sup>, was equipped with nursery compartments (4-6 per tank) to facilitate experiments aimed at optimizing the rearing technology for pikeperch fry during the early days of their life.



- In 2013, a second project funded under the HuRo Cross-Border Cooperation Program 2007-2013 (HUROFISH) was completed, which significantly contributed to the creation of optimal conditions for experimentation and highly-intensive rearing of pikeperch in recirculating aquaculture systems. Through the implementation of the mentioned project, a modern facility with 5 recirculating systems (about 180 m<sup>3</sup>) for pikeperch rearing and other economically valuable fish species was established. Currently, this facility houses pikeperch from the fifth generation exclusively produced and raised in a recirculating aquaculture system (RAS).

- The most important results:
- the team from ULST was able to design and demonstrate the functionality and the applicability of the intensive breeding technology of the pikeperch in the recirculating aquaculture systems;
  - some technological parameters for pikeperch farming in RAS were optimized (density, lighting, water movement etc.);
  - the technology for pikeperch farming that could assure an increased production of pikeperch meat in a sustainable management of the aquatic resources was developed.

### 5. Conclusions

The research conducted at ULST regarding pikeperch rearing in recirculating aquaculture systems (RAS) has laid the foundation for knowledge in this field and has facilitated the implementation of this activity in fish farming practice.

The findings and expertise gained through these studies have contributed to the advancement of pikeperch aquaculture techniques in Romania, enabling practical application and improved production methods in the industry.

### 3. Increasing economical efficiency and sustainability of pikeperch farming in RAS

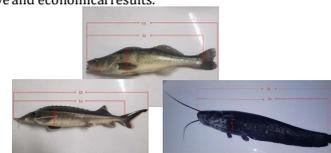
- through the use of aquaponics

- The team from ULST demonstrated that placing aquaponic lettuce culture (*Lactuca sativa*) as vegetal biofilter for the water in which the pikeperch grows favourable influences water quality parameters, reduce water consumption for pikeperch farming, improve income by providing and selling high-quality and safe aquaponic lettuce to consumers;



- through the use of polyculture

- It has been demonstrated that rearing pikeperch in a polyculture system with European catfish (*Silurus glanis*) in a recirculating aquaculture system is more advantageous compared to polyculture with sterlet (*Acipenser ruthenus*). However, polyculture of pikeperch with sterlet is superior to monoculture, allowing for better bioproductive and economical results.



- integrating indoor with indoor systems

- Pikeperch fry reared in RAS and fed with dry food can be successfully transferred to ponds, where they readily adapt to natural food and environmental conditions, with a beneficial effect on economical results for the farm.

### 4. Implementation of some biotechnologies for pikeperch reproduction, in order to increase the productive potential of this species

- Pikeperch fingerling and juveniles is season-linked and depends on the pikeperch's spawning in the natural waters or in ponds kept in the period of gonadal maturation. To raise the profit of the farms, some biotechnological techniques can be applied to the pikeperch, such as out-of-season reproduction and obtaining all-female populations, successfully applied until now to some other species (trout, carp). In the project SANDERBIOT coordinated by ULST conducted simultaneously with SANDERTEH and funded by the same entity (ANCS), a technology for intensive female pikeperch juveniles production, by using some biotechnological techniques such as the out-of-season spawning was developed.



- The most important results:
- for the first time in Romania was realized out-of-season reproduction, in 2010. From that time, our team obtained another generations of pikeperch, out-of-season;
  - there were made important steps towards gynogenesis in pikeperch. There were obtained haploid larvae in these species.
  - artificial reproduction techniques in this species were developed, which allow us to obtain an increased number of larvae per female.