



Jihočeská univerzita  
v Českých Budějovicích  
University of South Bohemia  
in České Budějovice

Fakulta rybnářství  
a ochrany vod  
Faculty of Fisheries  
and Protection  
of Waters

# Ph.D. study

## Specialist in biological and biologically-related fields

Topic: *Molecular background of the developmental switch from planktivory to piscivory in pikeperch brain*

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### Annotation

The switch from planktivorous foraging to piscivory is one of the most crucial phases in the pikeperch ontogeny since it determines its chances on surviving the first winter. It is a dynamic phase involving already well-known eco-morphologies like shifting pikeperch niche and acceleration of its growth and of the overall development. While ecological aspects of this switch have been investigated for decades the molecular backgrounds remain almost unknown.

There are several possibilities how to utilize already available transcriptomic (RNA-seq) data of two pikeperch generations from the water reservoir Lipno (Czechia). Although the first two RNA-seq batches were performed with the standard poly-A enrichment approach selecting particularly mRNA transcripts, several potentially important non-coding RNA (ncRNA) species have been identified. Hence, further RNA-seq foreseen will be performed via ribodepletion to catch more ncRNAs and active transposable elements beside mRNA transcripts. Moreover, a special attention will be paid to other ncRNA species, including microRNAs, by further modifications of the currently used protocol.

#### The main hypothesis

- Is the switch of planktivores towards piscivory driven by brain transcription of orexigenic neuropeptides?
- Are non-coding RNA species and transposable elements involved in the regulation of the switch towards piscivory?
- Is there any genetic background of the accelerated switch towards piscivory?
- Are the early piscivores of the same age as the late ones?

#### Aim(s) of the Ph.D. thesis

- Characterization of molecular traits accompanying and following the switch to piscivory
- Reconstruction of regulatory networks of epigenetic mechanisms governing the gene transcription (i.e. interplay between gene transcription, alternative splicing, and activity of ncRNAs and transposons)
- Genetic and ecological exploration the co-existing distinct size classes in the young-of-the-year pikeperch
- Establishing machine learning approach in search for patterns in alternative splicing data (optional)

#### Possible approaches to reach the aims / to verify the hypotheses





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- Field work on the Lipno reservoir – sampling pikeperch brains for RNA isolation and RNA-FISH
- Eco-morphological study further exploring the developmental plasticity of young pikeperch
- Laboratory work – RNA isolation, ribodepletion, sequencing library preparation
- Brain histology and RNA-FISH to brain tissue
- Bioinformatics – transcriptomic data processing, gene annotation, functional annotation of gene networks, differential gene transcription analysis, alternative splicing analysis, assessment of transcriptional activity of transposable elements, identification of molecular sex marker for juvenile pikeperch utilizing BioProject PRJNA561467 data (de los Ríos-Pérez et al., 2020), integration of all results.

#### References

- de los Ríos-Pérez, L., Nguinkal, J.A., Verleih, M. et al. 2020. An ultra-high density SNP-based linkage map for enhancing the pikeperch (*Sander lucioperca*) genome assembly to chromosome-scale. *Sci Rep* 10, 22335 doi: 10.1038/s41598-020-79358-z
- Jůza T, Blabolil P, Čech M, Draštík V, Hejzlar J, Kočvara L, Muška M, Peterka J, Sajdlová Z, Tušer M, Vašek M, Kubečka J. 2023. Distribution patterns, annual density changes, growth and mortality of pikeperch [*Sander lucioperca* (L. 1758)] fry following oligotrophication of a reservoir. *Ecology of Freshwater Fish*, 32(4), 742-734 Doi: 10.1111/eff.12718
- Nguinkal JA, Brunner RM, Verleih M. et al. 2019. The First Highly Contiguous Genome Assembly of Pikeperch (*Sander lucioperca*), an Emerging Aquaculture Species in Europe. *Genes (Basel)*. 2019 Sep 13;10(9):708. doi: 10.3390/genes10090708
- Symonová et al. submitted. Transition to piscivory seen through brain transcriptomics in a juvenile percid fish: Complex interplay of differential gene transcription, alternative splicing, and ncRNA activity.

#### Funding

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## Activities

- Daily Ph.D. study in the discipline of Fishery or Protection of Aquatic Ecosystems
- Working on student's own Ph.D. thesis topic (the list of available Ph.D. thesis topics and the contact details of the supervisors are available below)
- Publishing manuscripts in Q1-Q3 journals
- Presenting results at international conferences and faculty seminars, completing research internships abroad
- Teaching or assisting with courses, consulting or supervising bachelor's or master's students
- Supervising summer school projects
- Other activities within the given research unit

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## Requirements on applicants:

- Successfully completed master's degree study in environmental chemistry, toxicology, ecology, biology, protection of environment, fishery, biology, agriculture, veterinary medicine or related fields
- Admission into the Fishery Ph.D. study program or the Protection of Aquatic Ecosystems Ph.D. study program at USB FFPW, full-time form of study
- General knowledge of biology, aquatic ecology and chemistry
- English language knowledge at the B1 level or higher
- User-level computer skills, particularly the MS Office suite (Word, Excel, PowerPoint, Outlook)
- Communicativeness, responsibility, conscientiousness, organizational ability, willingness to learn new things, stress resistance

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## We offer:

- Nice working environment in new faculty facilities
- Study and work in an international team
- Opportunities for personal and professional development
- Other benefits (5 weeks of paid leave, 4 days of sick leave, MS Office for private use)

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**Starting date:** February 2025

**Working hours:** equivalent to a full-time workload (40 hours per week)

**Duration of the position:** 4 years (standard duration of the Ph.D. study program)

**Net monthly income:** from CZK 25,000 (depending on the study results)

**Place of work:** depending on the supervisor's location  
(Vodňany, České Budějovice, Nové Hradky)

Get in contact with the supervisor listed under the selected topic. **If you reach a mutual agreement, complete the e-application to study.** Applicants should submit e-application to the Ph.D. study program at USB FFPW via e-mail at [svesela@frov.jcu.cz](mailto:svesela@frov.jcu.cz) by **December 1, 2025.**

More information at:

<https://www.frov.jcu.cz/en/admissions/admission-procedures>

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