



LUND
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Department of Biology
Aquatic Ecology

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Thesis evaluation

Evaluation of PhD thesis "Ecology of top fish predators, European catfish and asp, with consequences to fish communities" by Marek Šmejkal

Marek delivers a very broad thesis, including the topics chemical cues in predator-prey interactions, method development, sexual selection and mating systems, as well as ontogenetic intraguild predation. Usually, a PhD thesis would deal with one of such topics. High topic diversity of a thesis could be viewed as a strength or a weakness. In my head it is a strength. Showing capacity of grasping a wide array of scientific topics and theories indicates scientific maturity and interest. I found only minor peculiarities, some dealing with statistical methods used, when going through the thesis, why I have no doubt that the thesis contents and its conclusions are valid and scientifically sound.

Although not up for evaluation for the thesis defence, Marek also has an impressive publication track record outside the thesis. Overall, I believe the thesis shows solid ground for a passed exam.

Paper I

The olfactory sense is very important in aquatic systems, and organisms can use chemical cues to detect food, mating opportunity, habitat and predation risk. Chemical cues from predators have been shown to elicit a variety of antipredatory behavioural responses in prey, and this first paper of the thesis focuses on laboratory evaluation of behavioural responses of fish prey (rudd, roach and perch) to chemical cues from predatory catfish fed the prey species. These experiments were evaluated in light of laboratory (catfish) and field (catfish and pike) evaluation of predator selectivity and predation rates between prey, in attempts to link behaviours with selective predation and community responses.

Paper II

Surveys of lake fish community species and size composition is central to biomonitoring for lake fisheries and ecosystem functions. The widely used standard multimesh gillnets for such purposes have fixed mesh sizes between 5 and 55mm (knot-to-knot). The mesh sizes of gill nets inevitably cause size-selective catches of fish, with consequences for the precision of particularly size but also species composition of lake fish communities. By evaluating

catches of also larger mesh sizes, this paper shows that fish larger than 30cm can be underestimated by over 20 times by use of only the standard gillnet mesh sizes. As fish of these larger sizes can have substantial impact on lakes by e.g. piscivory and benthivory, many lake fish surveys using standard survey gillnets may be erroneous.

Paper III

Most mating systems include sexual selection at some level, from e.g. explicit choice of individual characters in mating partners, to intrasexual competition and selection. Paper III deals with evolutionary and tradeoff aspects of sex-specific spawning behaviours in asp. Males compete for opportunity to encounter females during spawning, and females are available over short time periods. This leads to extended spawning behaviours in males that aim to arrive early to spawning grounds on a seasonal and daily basis. Staying on the spawning grounds however poses an energy cost to both males and females, why they perform diel migrations to and from less energy costly habitats. The differential temporal presence of females and males on the actual spawning grounds indicate adaptive behavioural reproduction efforts in males according to the presence of females.

Paper IV

Predation is indeed an important structuring force in aquatic ecosystems, that can alter fish community composition, consumer-resource dynamics, and can cause cascading trophic effects through the food web. Intriguingly, fish species are not only predators or prey throughout ontogeny, but can according to their indeterminate growth be prey as small and predators as large individuals. Such intraguild predation systems should behave differently from more strict predator and prey systems. Paper IV describes the interesting predator-prey reversal system between asp eggs predated by bleak adults, where bleak are targeted as prey by adult asp. Hereby, bleak affect the recruitment of asp, and asp the survival of bleak, which should introduce non-trivial consequences for consumer-resource dynamics to this system. The paper also shows that asp eggs floating in aggregations are exposed to lower density-dependent bleak predation, with potential effects on adaptive egg-laying behaviour.

Marek's thesis is legible for defence.



Anders Nilsson
Professor

The review of the dissertation thesis “Ecology of top fish predators, European catfish and asp, with consequences to fish communities”, Marek Šmejkal, MA

Formal assessment of the Thesis

Dissertation defense is based on the presentation of four papers; three of them have been already published in prestigious international journals with the IF. The preparation of papers was supported by six grant agencies and foundations. Martin Šmejkal is the first author of all presented papers. The dissertation contains brief description of the professional approach to selected topics, acknowledgement to colleagues including technical team, review of available literary resources resulting in formulation of presented hypotheses, results and discussion, conclusions and plans for further research activities. At the end of the thesis are enclosed copies of the published/presented papers. All formal requirements of the dissertation thesis are fulfilled.

Professional assessment of the Thesis

The dissertation is well written and arranged. In an excellent way is presented analysis of available literature resources resulting in formulation of presented hypotheses. The text describing the current state of knowledge suggests a complex understanding of the topic, and author's ability to clearly and comprehensibly deliver it to broader reader audience. Especially, chapters 'Results and Discussion' and 'Conclusions' can be highlighted in this respect; this part of the text is an example of high quality level of both, the author and supervisor approach.

The papers focus on attractive issues dealing with the ecology of fish communities in water reservoirs.

The paper describing predation of eggs of spawning asp by bleaks is highly interesting. The mechanism of the nutrients transport, and concurrently reverse impact of the prey on predator is inspiring and still not fully explored issue in fish ecology. Recently, predation of eggs of anadromous salmonids by juvenile salmon and trout has been observed (Näslund et al. 2015). Similarly, we have also observed migrations of Cyprinid fish induced by newly adopted feeding strategies motivated by large spawning migration of asp using the radio telemetry; after asp spawning, Cyprinid fish usually return to winter refuges in reservoirs being again detected in streams during their own later spawning and feeding upstream migrations.

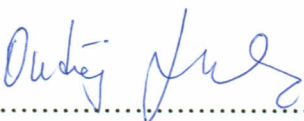
Different reproduction strategy between males and females of the asp is innovative and highly interesting topic. Below are two comments for discussion:

- 1) You tagged a certain number of asp individuals by PIT tags, and further registered their occurrence at spawning areas; missing is the evidence of the number of other, untagged spawning individuals. However, occurrence (temporal) of fish at spawning areas can be density dependent because spawning area is spatially restricted. Any limited resources are competitive, and time spend by specimen at a spawning area will also be proportional to individual resource holding potential (RHP; for example, Earley et al. 2000; Rudin & Briffa 2014), i.e. ability to defense/keep the resource. Would not be therefore useful to control a spawning area and stream towards it by camera system and/or sonar (in further research)?
- 2) Presented interpretation of reproductive strategy of asp males logically fully reflect data collected by authors, however, for further activities I would recommend considering environmental aspects of the study area - strongly affected inflow to reservoir. Upstream the spawning area is located a weir, i.e. the barrier for free upstream migration of asp conspecifics. This barrier artificially increases competitive pressure at the spawning area, and with high probability affects spatial and temporal distribution of spawning individuals.

Conclusion and recommendation

Submitted dissertation thesis is processed in an excellent way, hence I recommend it to defense without any reservations.

Prague, September 13, 2017



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