Preliminary assessment of the native benthic predators, burbot *(Lota lota)* and catfish *(Silurus glanis)* , as biological control agents for marbled crayfish.

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Flanders
State of the Art

Context

Invasive crayfish have become well-established in Flanders. Most of the species are widespread and eradication seems improbable. Yet, managers are looking for control measures to mitigate the density dependent impacts of invasive crayfish. This preliminary experiment explores predation of two benthic predatory fish burbot (*Lota* lota) and European catfish *(Silurus glanis*) on the marbled crayfish (*Procambarus virginalis)* and evaluates their potential for use as a future control measure.

CL: carapax length (mm)
CW: carapax width (mm)
TL: total length (mm)
W: weight (g)
MW: mouth width (mm)
MH: mouth height (mm)

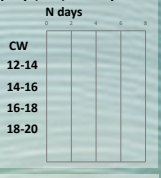
***Lota lota* – burbot**
- L: 221,5±3,1
- MW: 17,6 ±0,3
- MH: 15,3 ±4,5
- W: 53,2 ± 2,5

Sizes in prey choice

Large (CW: 8-10)
- TL: 47.15 ± 1.36
- CL: 22.93 ± 0.56
- CW: 7.38 ± 0.89

Small (CW: 4-6)
- TL: 29.05 ± 2.59
- CL: 14.82 ± 1.13
- CW: 5.70 ± 0.54

Max size consumed prey (CW) – 2 days



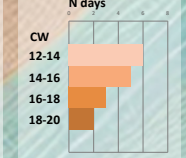
***Silurus glanis* – European catfish**
- L: 40.7 ± 0.4
- MW: 31.0 ± 0.8
- MH: 42.4 ± 0.6
- W: 278.5 ± 13.0

Sizes in prey choice

Large (CW: 14-16)
- TL: 71.86 ± 0.48
- CL: 34.88 ± 0.24
- CW: 15.07 ± 0.10

Small (CW: 10-12)
- TL: 55.35 ± 0.43
- CL: 26.83 ± 0.22
- CW: 10.96 ± 0.08

Max size consumed prey (CW) – 2 days



Research questions

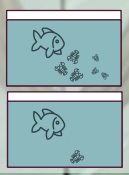
- Do commercial sized *L. lota* and *S. glanis* eat marbled crayfish?
- Do *L. lota* and *S. glanis* show clear size preference for prey?
- Is this preference constant over time?
- What is the maximum prey size consumed?

Experimental setup

24 fish per species
2d starvation prior to experiments
24h check + replenish

Prey choice
- 4 feeding days

Max size prey ingested
- 2 feeding days
- 4 size classes

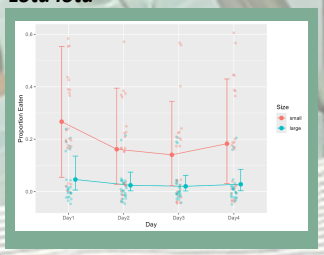


controlled 150L tanks
15°C burbot
17°C for catfish
PVC tube for shelter

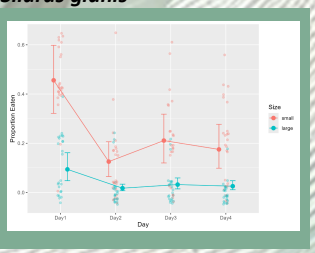
Data Analysis prey size

- Predation behaviour of *S. glanis* over four days was analysed, focusing on the preference for prey size (small vs. large) using generalized linear mixed models (GLMM). The response variable was the number of prey eaten, modelled with a binomial distribution. Fixed effects included prey size and day, with a random intercept for tanks. Initial models with random slopes for day showed singular fits, indicating potential overfitting.
- To address these issues, a Bayesian binomial regression was applied using default vague priors. Posterior estimates of the proportion of prey consumed were generated, and credible intervals (95%) were calculated. We visualized the results, comparing predicted proportions with observed data, to explore changes in prey preference over time.

Lota lota



Silurus glanis



Results

- Maximum CW of the crayfish ingested was 8-10 mm for burbot (mean length 22,2 cm) and 18-20 mm for European catfish (mean length 40,7 cm)
- Both burbot and European catfish show a preference for smaller prey. Larger prey was avoided, even though all fish would ingest the size class given no choice
- The proportion of prey ingested on the first day is significantly higher for European catfish, then on the following days where it remains more stable
- The proportion of prey ingested for burbot remains more stable, but with larger interindividual variance.

Conclusions & Future Prospects

- Both burbot and European catfish are effective predators of marbled crayfish, and show preference for smaller prey in this experiment
- Both fish predators of commercially available size show potential potential as biological control agents for invasive crayfish, warranting further investigation.
- Further experiments should explore prey choice among different prey types and functional response of these predators, both in experimental and mesocosm settings