



# Ecological impact of Ponto-Caspian invertebrates and fish in a shipping canal ecosystem

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# Introduction

- Shipping canals in Belgium are invaded by different Ponto-Caspian species
- The Albert canal is the largest canal connecting the river Scheldt and Meuse
- The five most abundant invertebrate species in the canal Albert are Ponto-Caspian
- Round goby is present in high densities
- In Europe, impact has been investigated in rivers and streams



# Where are we?





# Network of canals





# Albert Canal





# Albert Canal





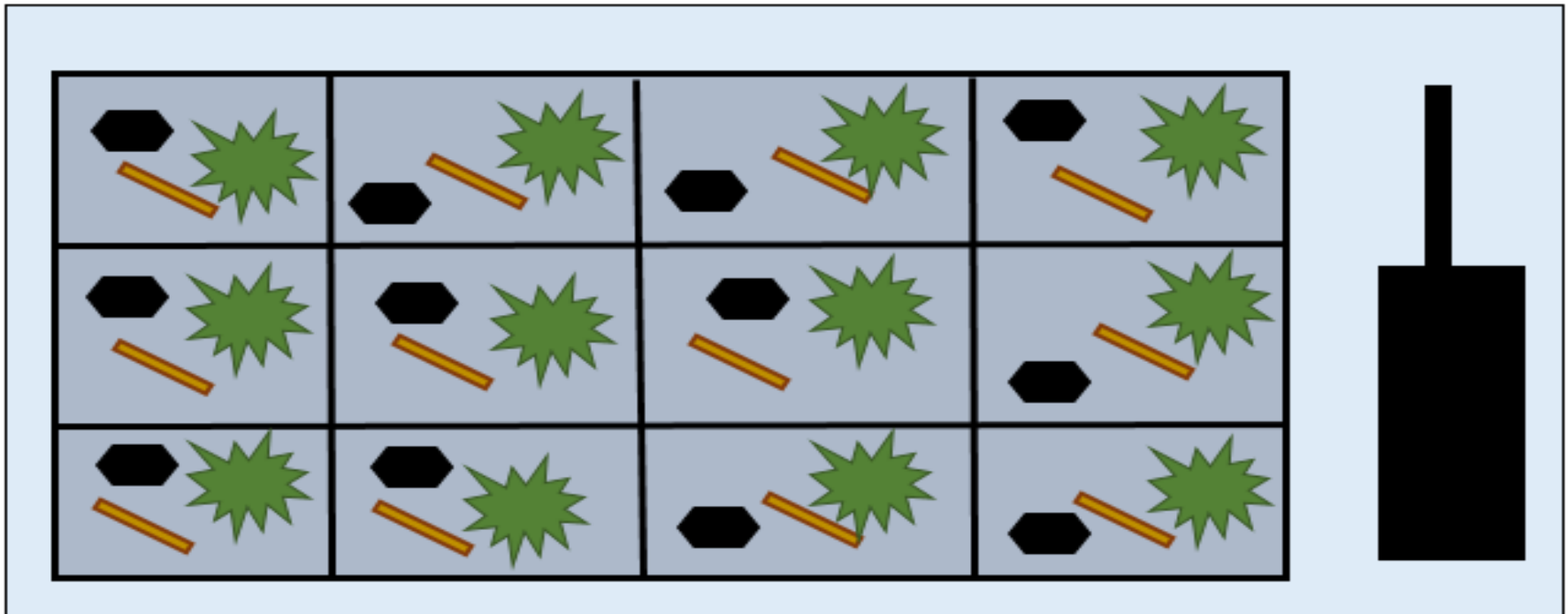
# Goals

1. Investigate interactions between invasive killer skrimp (*Dikerogammarus villosus*) and the native common freshwater skrimp (*Gammarus pulex*) in the lab.
2. Preliminary tests to investigate food preference of round goby (*Neogobius melanostomus*)
3. Preliminary tests to investigate competition for food between round goby and native roach (*Rutilus rutilus*)



# 1. Competition test between *D. villosus* and *G. pulex*

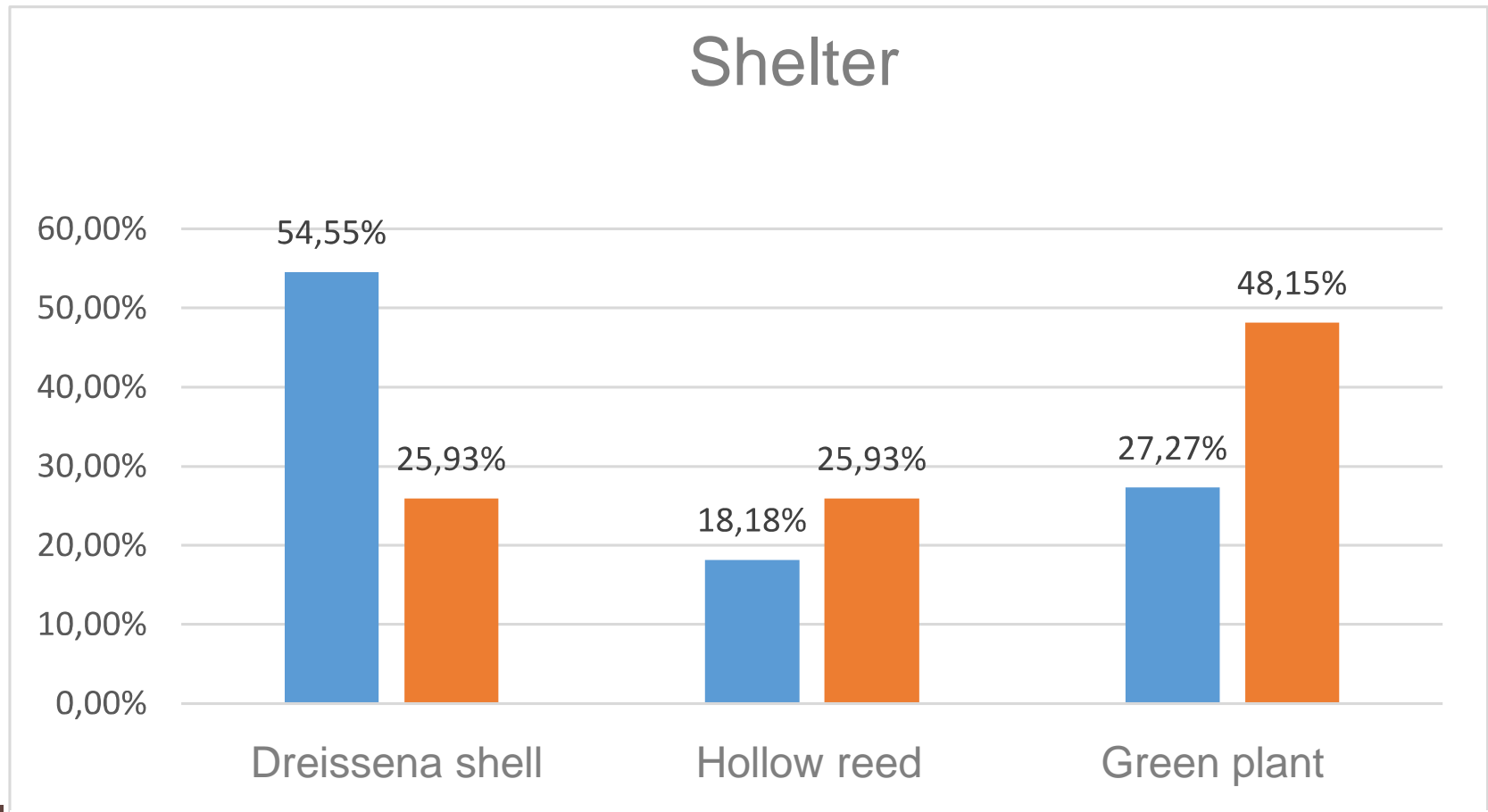
- 12 compartments in a 40X30 cm tray
- Placed in a aerated, container 76X60X10
- 3 shelters (Dreissena shell, hollow stem of reed (3-5 cm) and green aquarium plant)





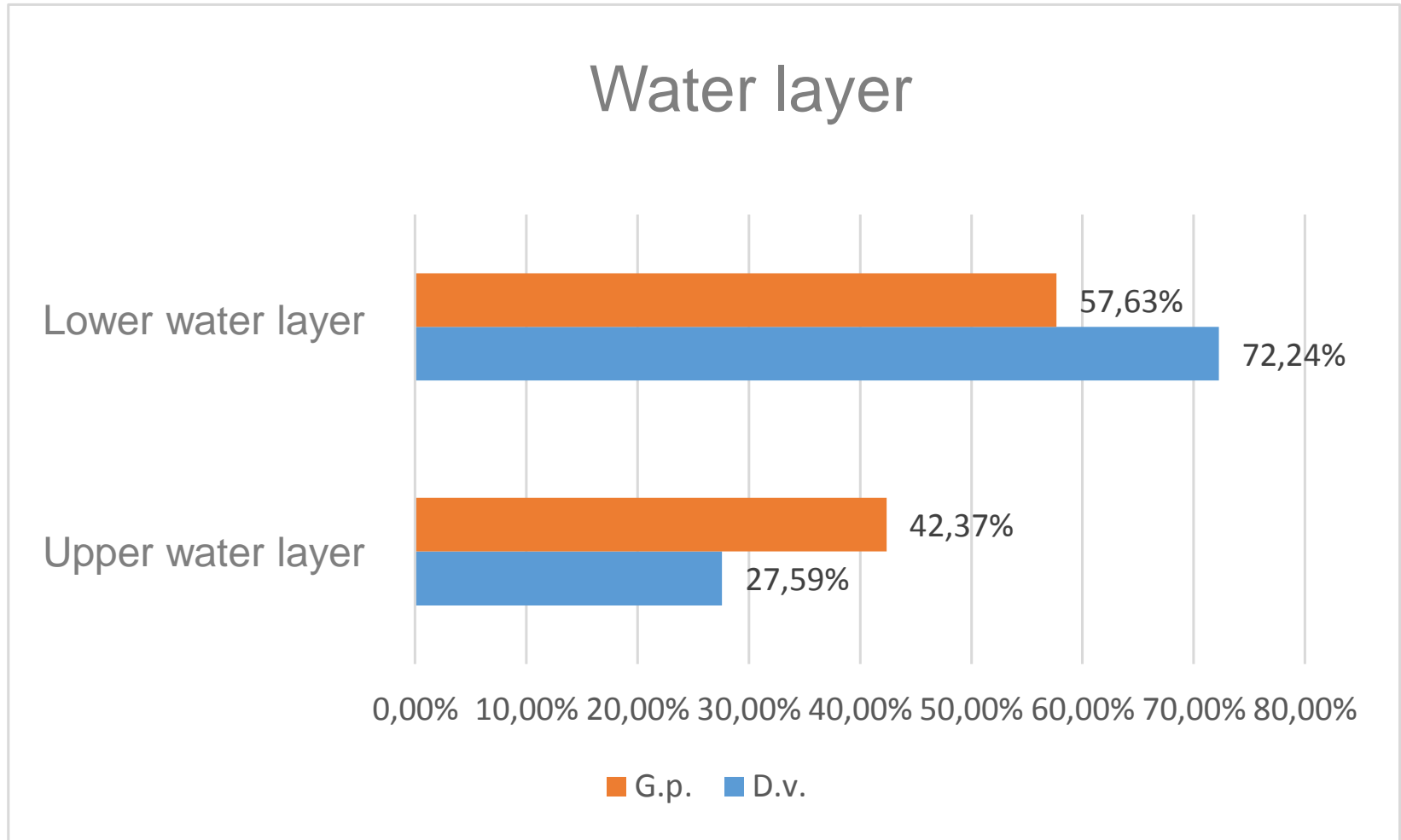


# Habitat use *D. villosus* and *G. pulex*



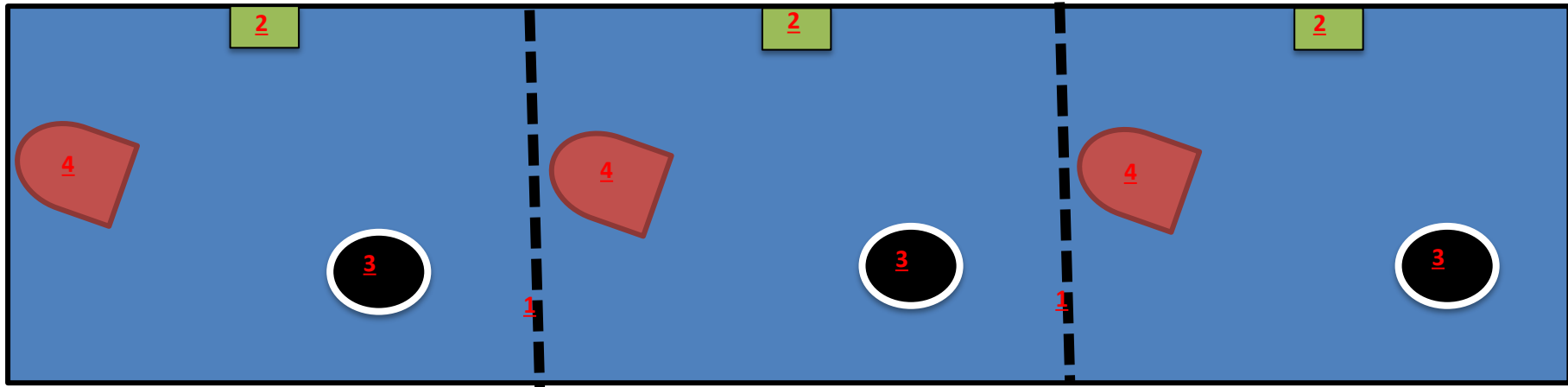


# Habitat use *D. villosus* and *G. pulex*





## 2. Food preference test round goby



3 compartments, 40 l each

1: Separated by filter mats

2: Small internal filter

3: Stone with *D. polymorpha* (12 mm)

4: half of a terracotta flower pot as shelter

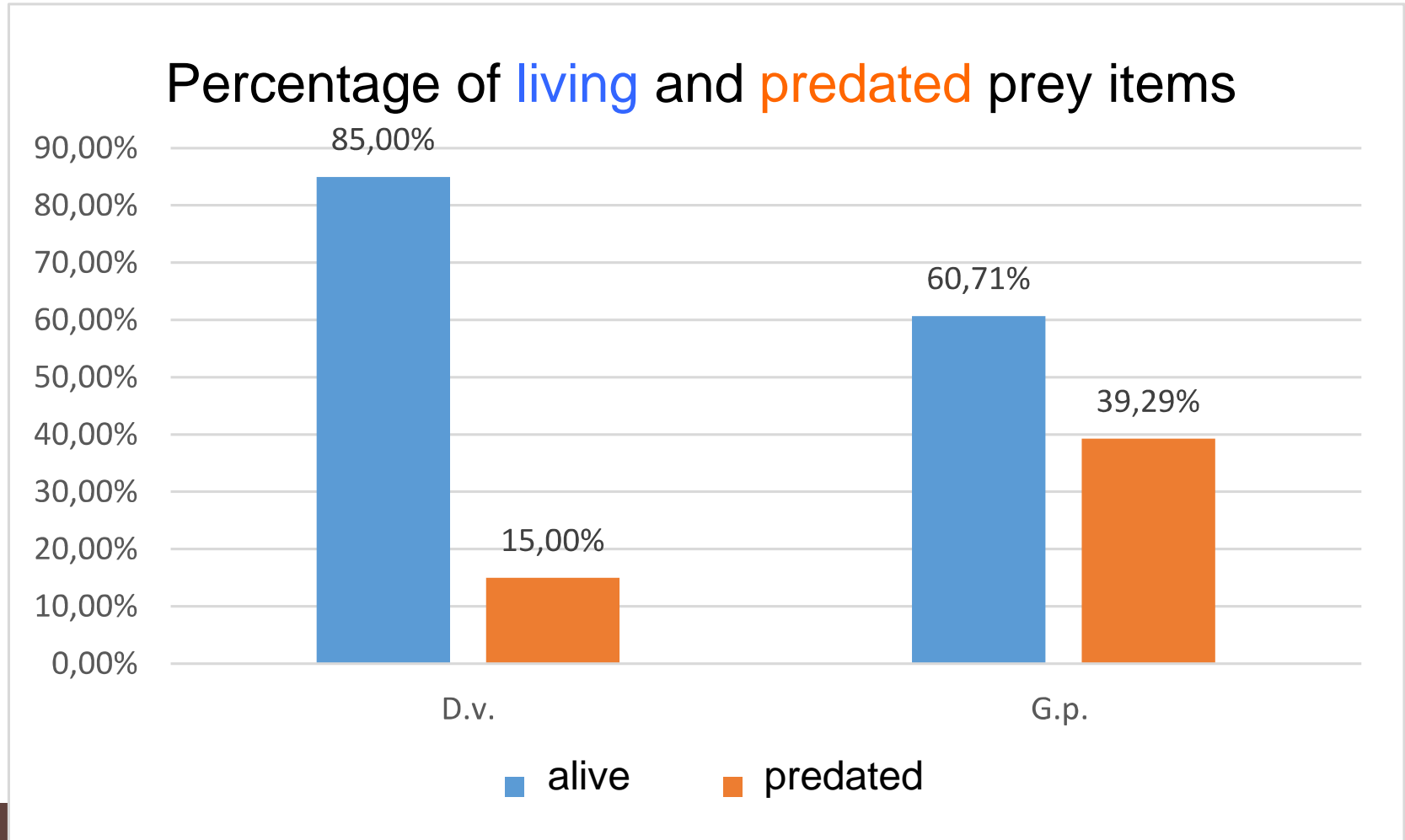


## 2. Food preference test round goby

- 10 *D. villosus* and 10 *G. pulex*
- 4 length classes (5-10;10-15;15-20;20-25 mm)
- 10 min acclimatisation of prey
- Introduction of round goby (5-12 cm)
- 1day starvation
- 20 min observation
- Final count of surviving gammarids



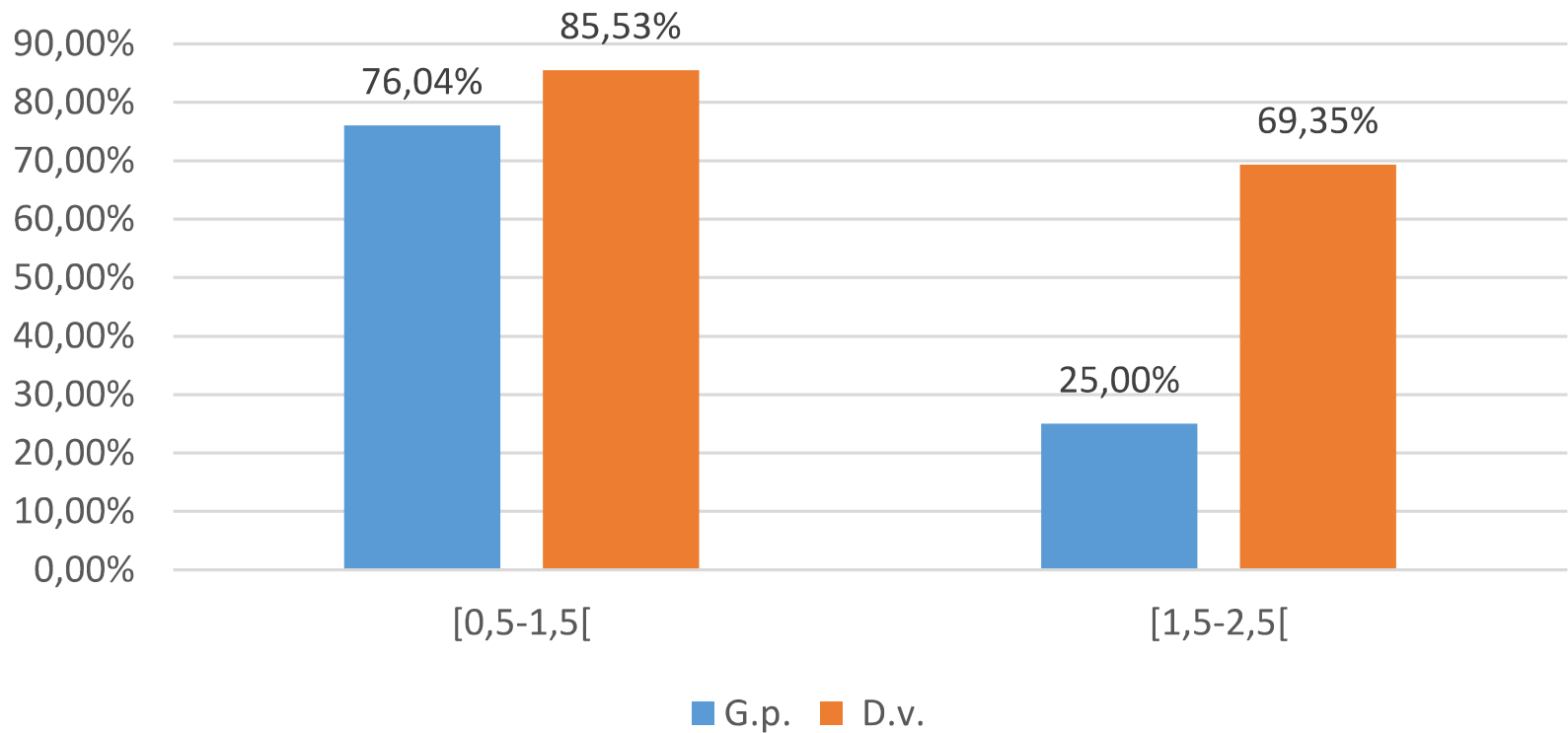
# Prey preference





# Impact of prey length

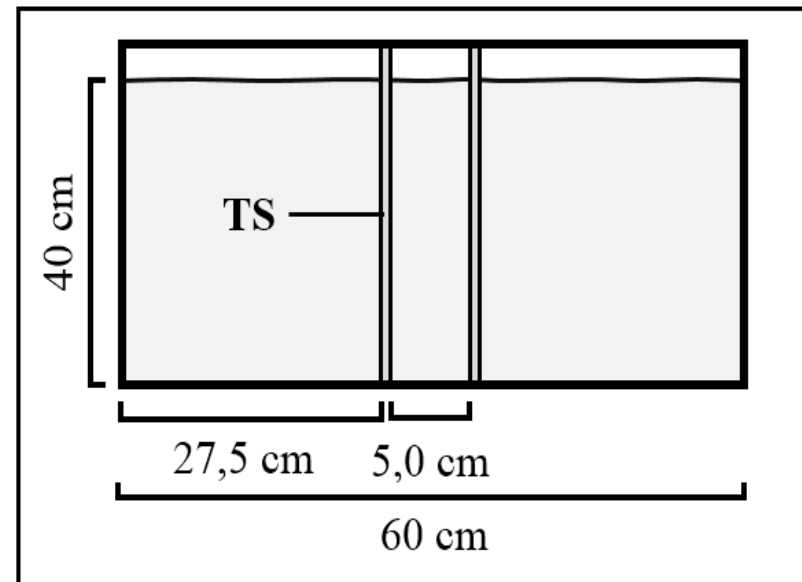
Percentage left over *D. villosus* and *G. pulex* per length class





### 3. Single species and competition experiments round goby and roach

- Roach 15-18 cm and round goby 9.2–12.3 cm
- Acclimatisation > 7 d at 18-20 °C
- Stress control
- Fish in outer compartment
- Starvation for 20 h
- 60 min. acclimatisation
- Middle compartment :  
prey  
10 *D. polymorpha* (4-12 mm),  
10 *G. pulex* 9-21 mm)





### 3. Single species and competition experiments round goby and roach

- Prey items consumed 10 min/1 h
- Failed prey attacks 10 min/1 h
- Observations behaviour, interactions recorded





# Results of 1 h tests

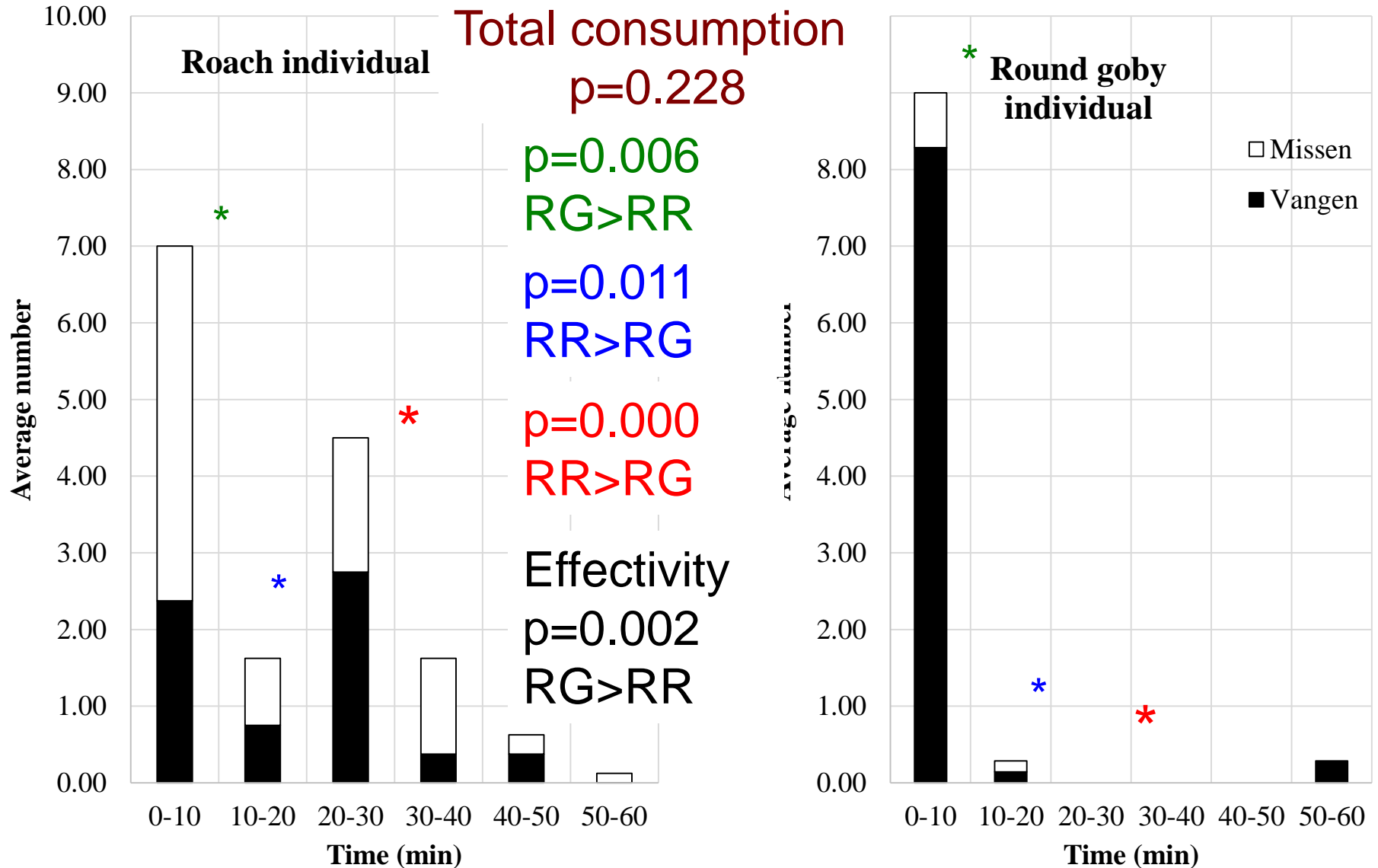
- Mainly *G. pulex* consumed, mainly within 10 min.
- *G. pulex* consumed (average  $\pm$  SE)

|            | Individual       |                    | Competition      |                    |
|------------|------------------|--------------------|------------------|--------------------|
|            | Consumption<br># | Effectivity<br>(%) | Consumption<br># | Effectivity<br>(%) |
| Roach      | 6.14 $\pm$ 1.70  | 41.0 $\pm$ 8.3     | 1.14 $\pm$ 0.70  | 25.8 $\pm$ 10.3    |
| Round goby | 8.71 $\pm$ 0.99  | 91.0 $\pm$ 4.6     | 7.71 $\pm$ 0.99  | 75.0 $\pm$ 7.0     |

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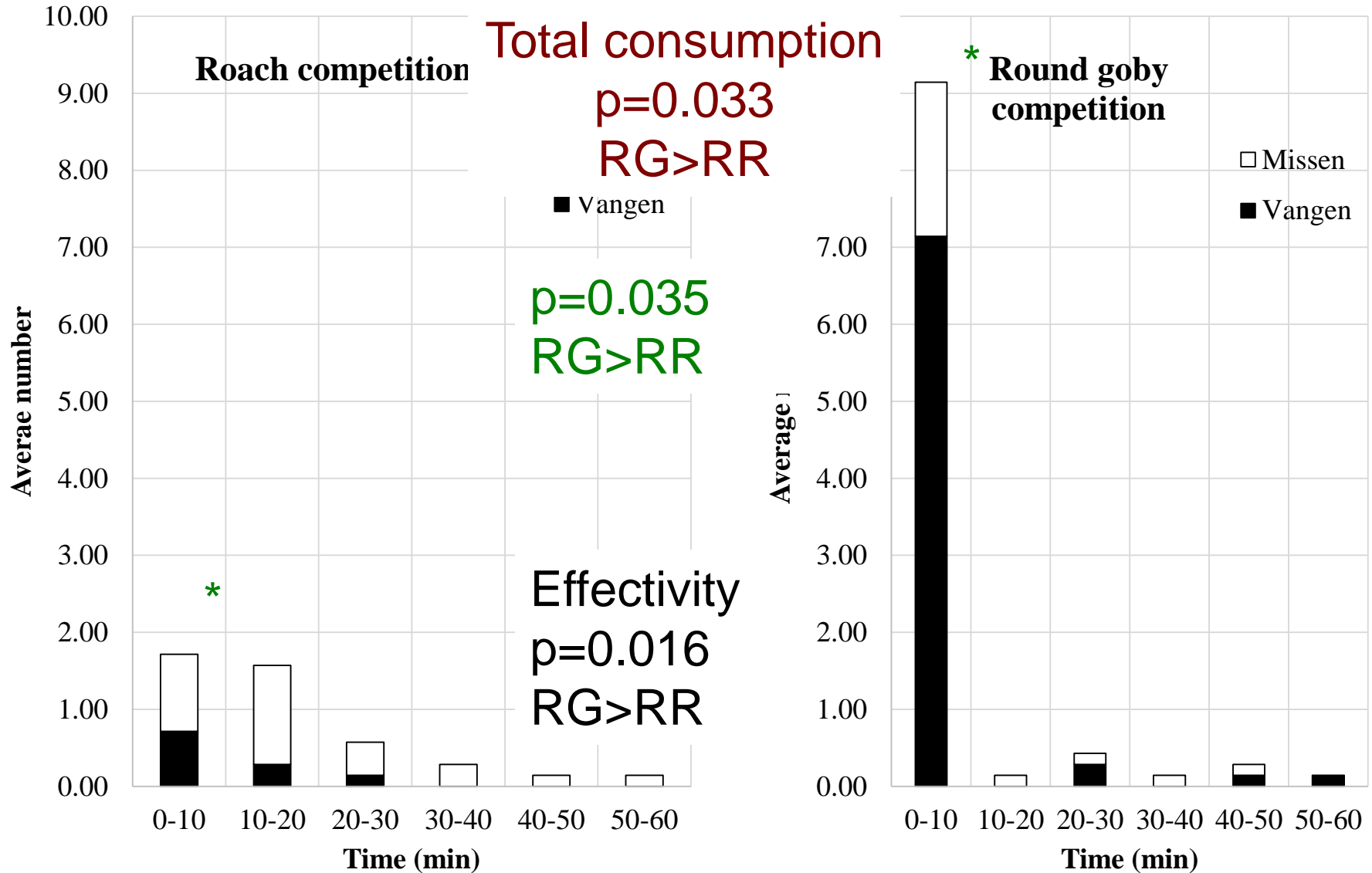


# Single species experiments



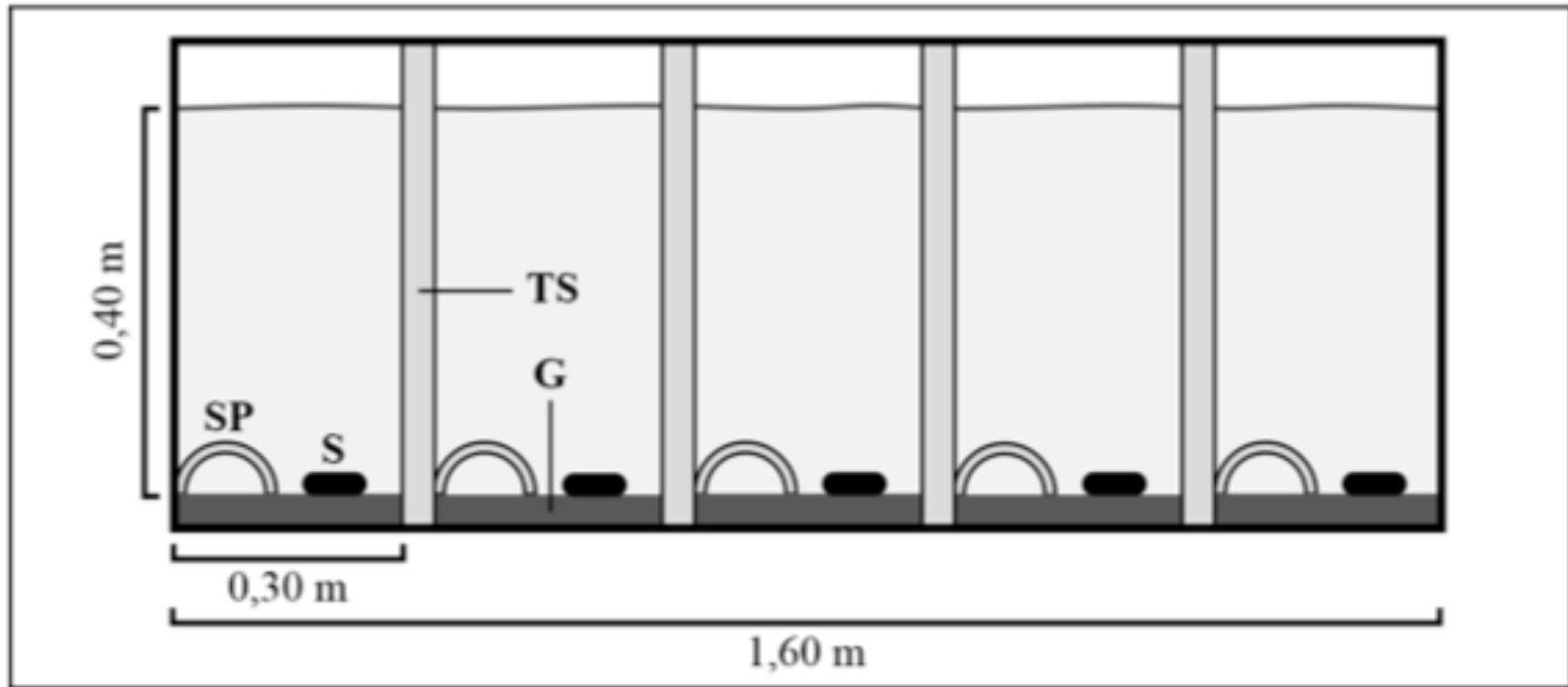


# Competition experiments





# 19 days competition experiment round goby and roach

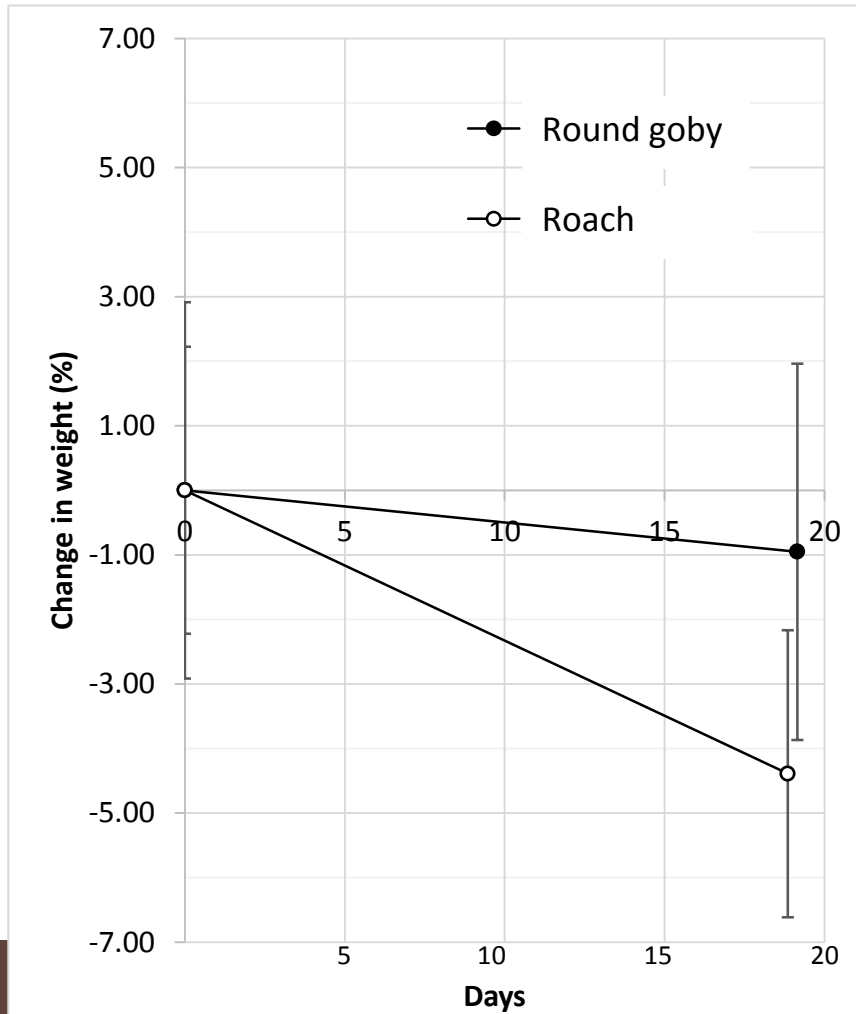


SP: hiding place, part of flower pot  
S: stone covered with *D. Polymorpha*  
TS: partitioning with solid filter mat  
G: gravel

Filtering, 15hL/9hD, T: 20 ° C  
Each compartment: 1 roach and 1  
round goby  
Fed: 6 Dreissenids and 6  
Gammarids/day



# Result 19 days competition test



- Both *Dreissena* and *Gammarus* are consumed
- Difference in change in body weight, but not sign. (W-SR-test  $p=0.25$ )



# Conclusions

- Preliminary results, test settings and timings need to be improved
- Our results suggest that different habitat use adds to a lower vulnerability of *D. villosus* to fish predation in comparison to native *D. pulex*
- Round goby had no preference for native or exotic prey species but predated the most conspicuous prey (*G. pulex*)



# Conclusions

- If 'easy' preys such as Gammarids are available *Dreissena's* are seldom preyed upon in these short experiments
- Round goby is a more effective predator on gammarids than roach
- In competition experiments round goby consumes more Gammarids than roach
- In a 19 days experiment negative impact on condition of roach is noticed

**Thank you for your attention**

Q&A



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