Flanders
State of the Art

Diet spectrum and preference of the invasive round goby (*Neogobius melanostomus*) in Flanders (North Belgium)

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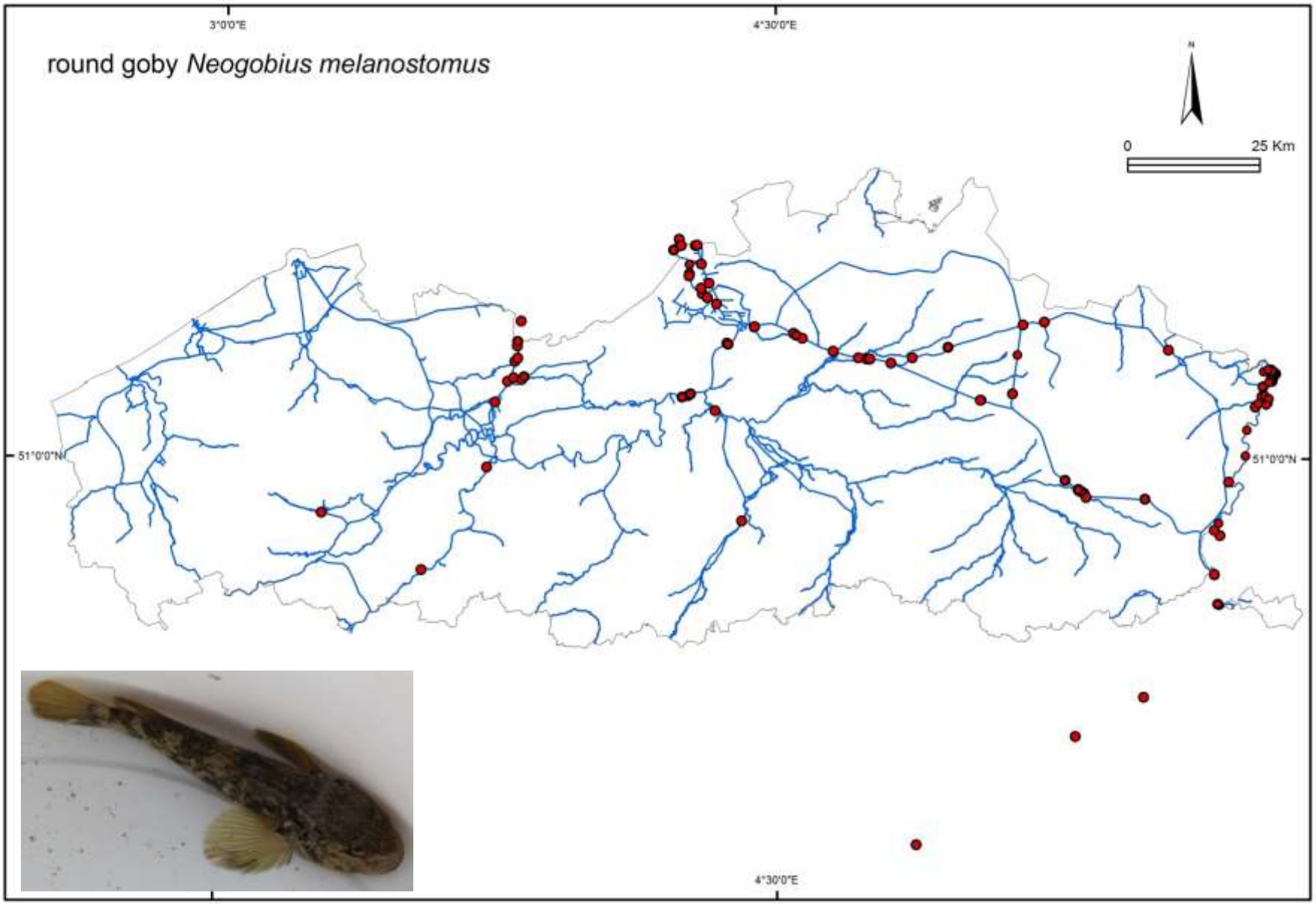


Round goby: current distribution

Material & Methods

- 4 sampling sites
  - Large tidal river ‘Scheldt’
  - Gravel pit ‘Kessenich’
  - Two shipping canals ‘Albertcanal’ and ‘Moervaart
- Fish sampling with electrofishing gear, fyke nets and angling (INBO)
- Invertebrates sampling with dipnet and artificial substrates (VMM)
- Stomach content analysis and food preference

M&M: stomach analysis

- Stomach and gut dissected
- Stomach content weighed (0.0001 g)
- Different food types identified to family or genus level
- Method described by Hyslop (1980)
  → Relative biomass (%Bi), relative number (%Ni) & frequency of occurrence (%F) was determined for each food item.

Index of relative importance (IRI): $IRI = (\%Ni + \%Bi) \times \%F$

M&M: food preference experiment

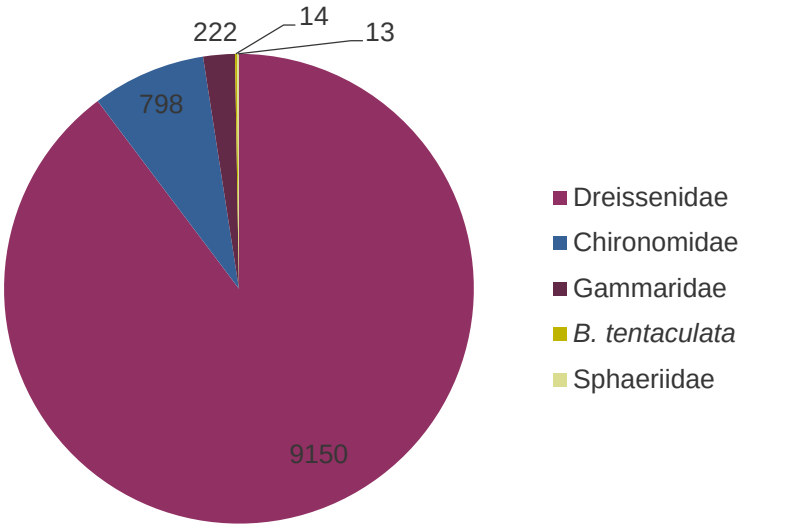
- Acclimation one week in aquarium (food = dried Chironomid larvae)
- (hard shelled) Dreissenidae *versus* (soft) Gammaridae
- 15 specimens of each, offered simultaneously
- Experiment = 1 hour

Results:
stomach content *vs.* prey availability

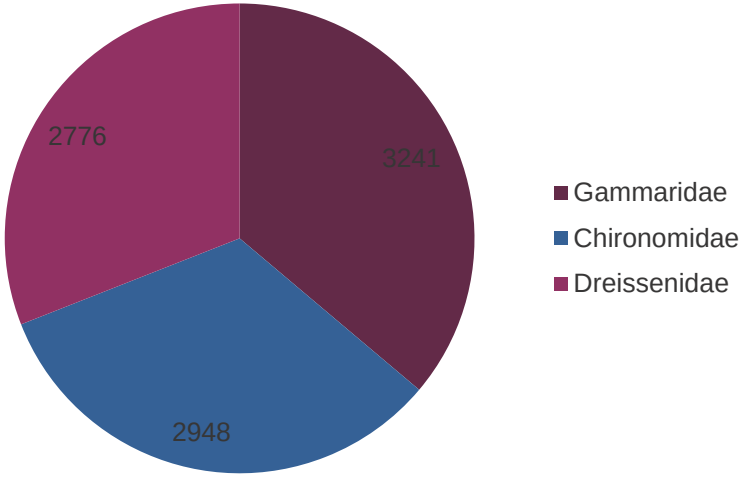
- 249 male and 143 females (77 stomachs empty)

Water	Season	Total length (cm)			♂ (n)	♀ (n)	n	Empty stomach
		Range	Mean	SD				
Albertcanal	Spring	4.7-16.2	8.7	2.8	84	37	121	11
	Summer	7.2-16.2	11.1	2.5	19	20	39	9
	Autumn	5.5-9.8	7.2	1.2	24	6	30	30
				Total:	127	63	190	50
Sea Scheldt	Spring	4.8-17.7	9.3	2.6	37	20	57	4
	Summer	4.8-15.8	8.9	2.4	44	34	78	17
				Total:	81	54	135	21
Kessenich Gravel Pit	Summer	5.2-9.3	7.4	1.4	9	3	12	5
Moervaart canal	Autumn	4.7-13.7	8.9	1.8	32	23	55	1

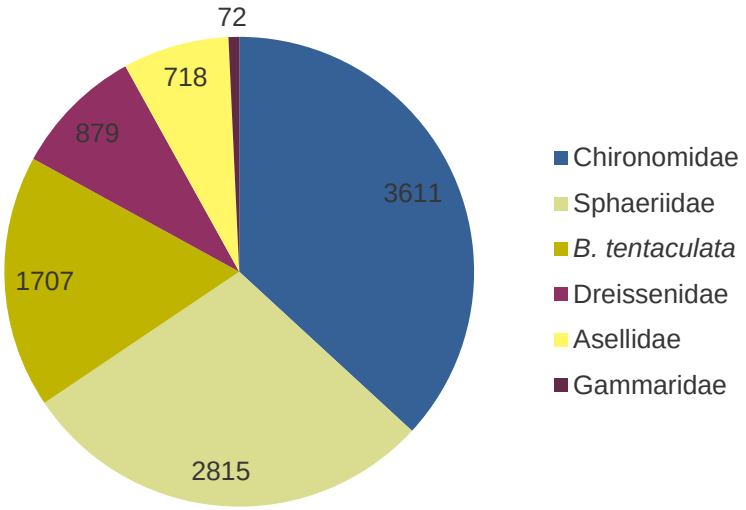
Results: IRI Albertcanal



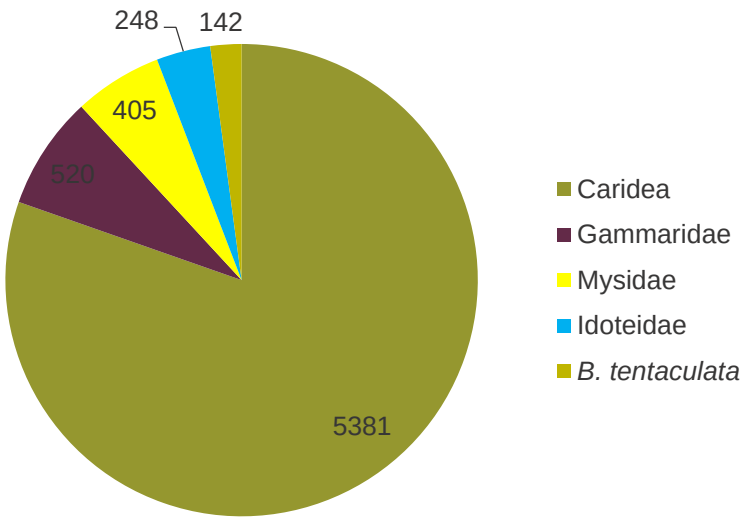
Results: IRI Kessnich gravel pit



Results: IRI Moervaart

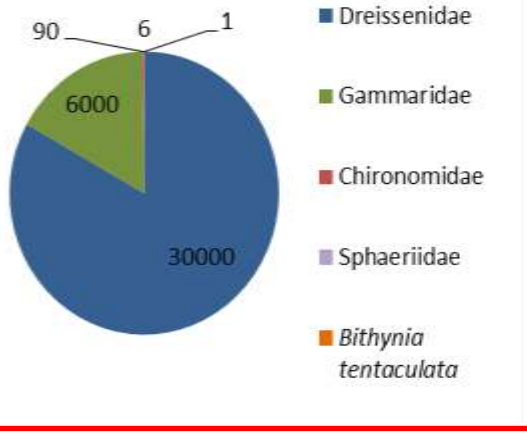


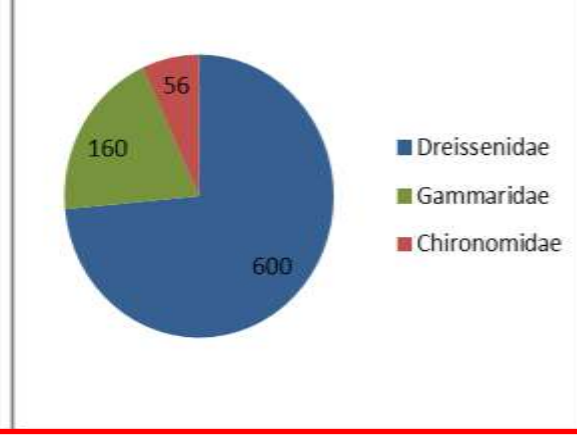
Results: IRI Sea Scheldt

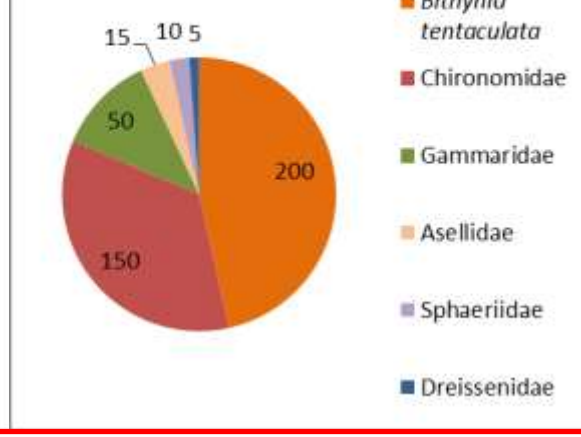


Prey availability *vs* stomach content

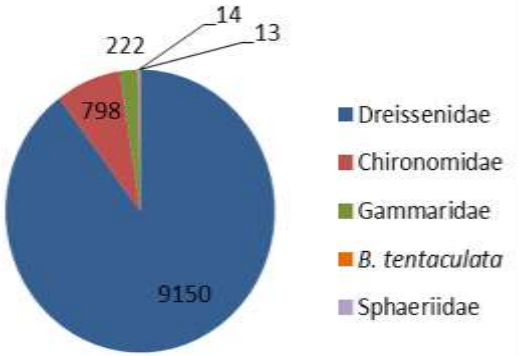
availability(BBI)

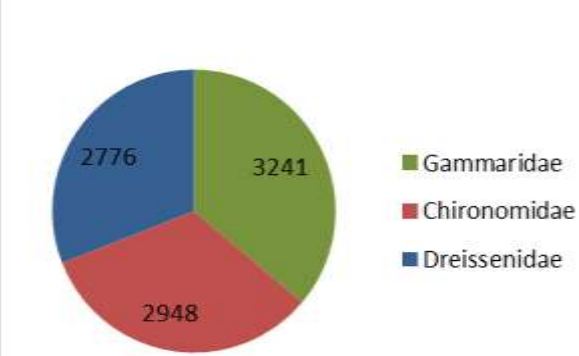


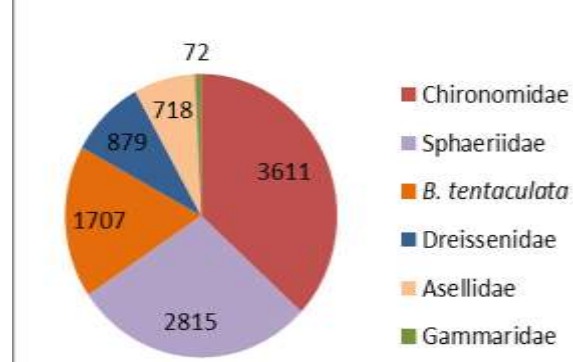




content







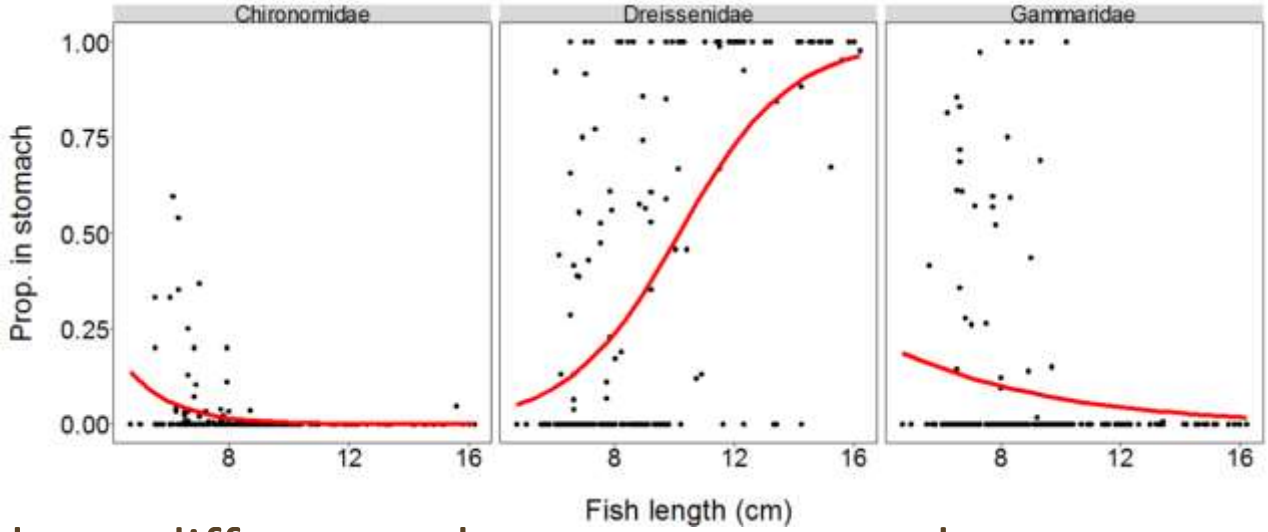
Summary results: availability *vs.* content

- Stomach content differs strongly among sites.
- Proportion of molluscs differs: higher when more mollusc are available, but not absolute => difference in catchability of other prey?

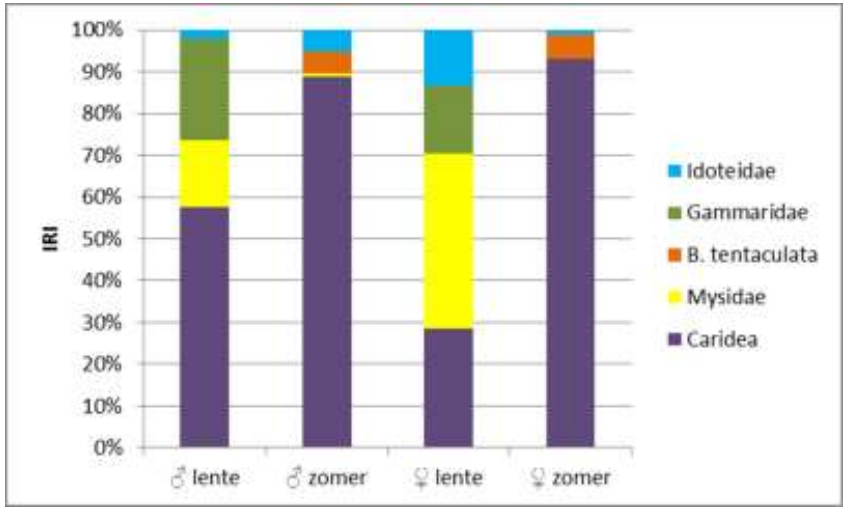
=> Round goby is food generalist which seems to adapt to the available local prey items and thus is very flexible in its diet.

Results: stomach content

- Larger (older) fish: significantly more Dreissenidae (less Gammaridae and Chironomidae)(Albertcanal) and Caridea (Sea Scheldt)

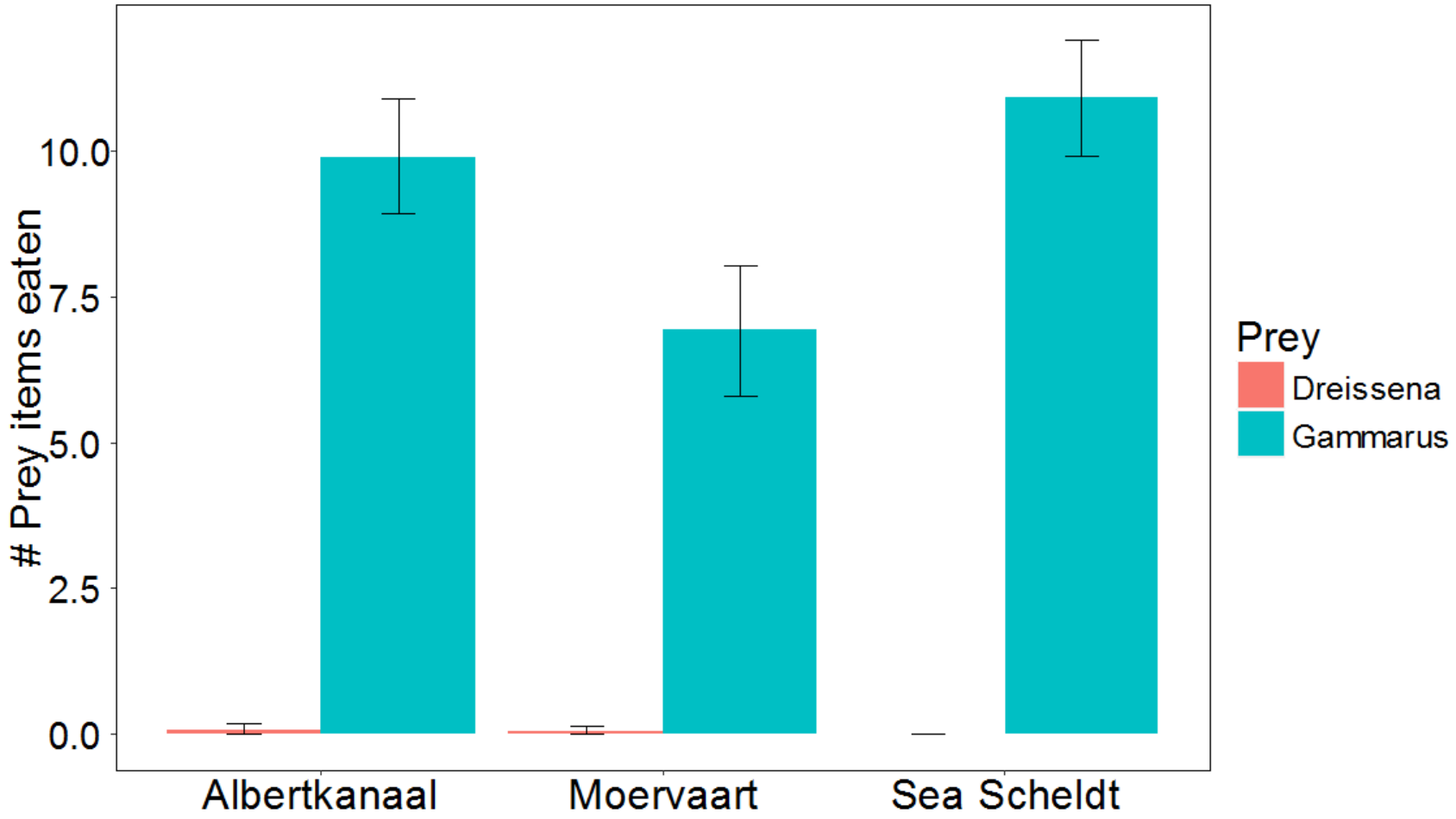


- Relatively large differences between sexes and seasons



Index of Relative Importance
Sea Scheldt - depending on sex and season

Results: food choice experiment



All fish significantly take more Gammarids (almost no Dreissenids)

Conclusions

- Round goby mainly feed on **benthic invertebrates**. It is a **food generalist** which can adapt to the available **local prey items**. Nevertheless, stomach content does **not fully reflects prey availability**.
- Diet content differs among **fish sizes** (age) and **season** within a site.
- When offered a **choice** between a “tough” prey (Dreissenidae are hard shelled and difficult to handle) and an **“easy” prey** (Gammaridae are soft bodied), all fish clearly prefer the latter.

Due to their flexible nutrition regimen and wide diet spectrum, round goby can easily adapt to new environments. Their feeding behaviour together with other adaptive "life-history traits" (multiple spawner, brood care, ...) make the round goby a good colonizer and invasive species .

Acknowledgements

- The Flemish Environmental Agency (VMM) for providing the data on invertebrate availability
- The Groenendaal fishing team (INBO) and several anglers for fieldwork support
- Paul Jacobs showed us the perfect site to collect Gammaridae and Dreissenidae for the aquarium experiment.

THANK YOU!