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

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Outline

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- Material and methods
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  - Stomach analysis
- Results
  - Index of Relative Importance
  - Gut content vs prey availability
  - Food preference experiment
- Conclusions
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 \textit{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)

<table>
<thead>
<tr>
<th>Water</th>
<th>Season</th>
<th>Total length (cm)</th>
<th>♂ (n)</th>
<th>♀ (n)</th>
<th>n</th>
<th>Empty stomach</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Range</td>
<td>Mean</td>
<td>SD</td>
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<tr>
<td>Albertcanal</td>
<td>Spring</td>
<td>4.7-16.2</td>
<td>8.7</td>
<td>2.8</td>
<td>84</td>
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<td></td>
<td>Summer</td>
<td>7.2-16.2</td>
<td>11.1</td>
<td>2.5</td>
<td>19</td>
<td>20</td>
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<td>Autumn</td>
<td>5.5-9.8</td>
<td>7.2</td>
<td>1.2</td>
<td>24</td>
<td>6</td>
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<td>Total:</td>
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<td>63</td>
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<tr>
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<td>9.3</td>
<td>2.6</td>
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<td>Total:</td>
<td>81</td>
<td>54</td>
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<td>7.4</td>
<td>1.4</td>
<td>9</td>
<td>3</td>
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<tr>
<td>Moervaart</td>
<td>Autumn</td>
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<td>1.8</td>
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</table>
Results: IRI Albertcanal

- **IRI**
  - Albertcanal

- **Dreissenidae**: 9150
- **Chironomidae**: 798
- **Gammaridae**: 222
- **B. tentaculata**: 14
- **Sphaeriidae**: 13
Results: IRI Kessnich gravel pit
Results: IRI Moervaart

- Chironomidae: 3611
- Sphaeriidae: 2815
- B. tentaculata: 1707
- Dreissenidae: 879
- Asellidae: 72
- Gammaridae: 718

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Results: IRI Sea Scheldt

- Caridea
- Gammaridae
- Mysidae
- Idoteidae
- B. tentaculata
Prey availability vs stomach content

**Albertkanaal**
- Dreissenidae
- Gammaridae
- Chironomidae
- Sphaeriidae
- Bithynia tentaculata

**Grindplas**
- Dreissenidae
- Gammaridae
- Chironomidae

**Moervaart**
- Bithynia tentaculata
- Chironomidae
- Gammaridae
- Sphaeriidae
- Asellidae
- Dreissenidae

**Content**

Albertkanaal
- Dreissenidae
- Chironomidae
- Gammaridae
- Sphaeriidae
- B. tentaculata

Grindplas
- 2776
- 3241
- Gammaridae
- Chironomidae
- Dreissenidae

Moervaart
- 3611
- 879
- 1707
- Gammaridae
- Sphaeriidae
- B. tentaculata
- Chironomidae
- Asellidae
- Dreissenidae
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 reflect 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

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• Paul Jacobs showed us the perfect site to collect Gammaridae and Dreissenidae for the aquarium experiment.

THANK YOU!