

Functional feeding traits as predictors of competitiveness of alien freshwater fishes

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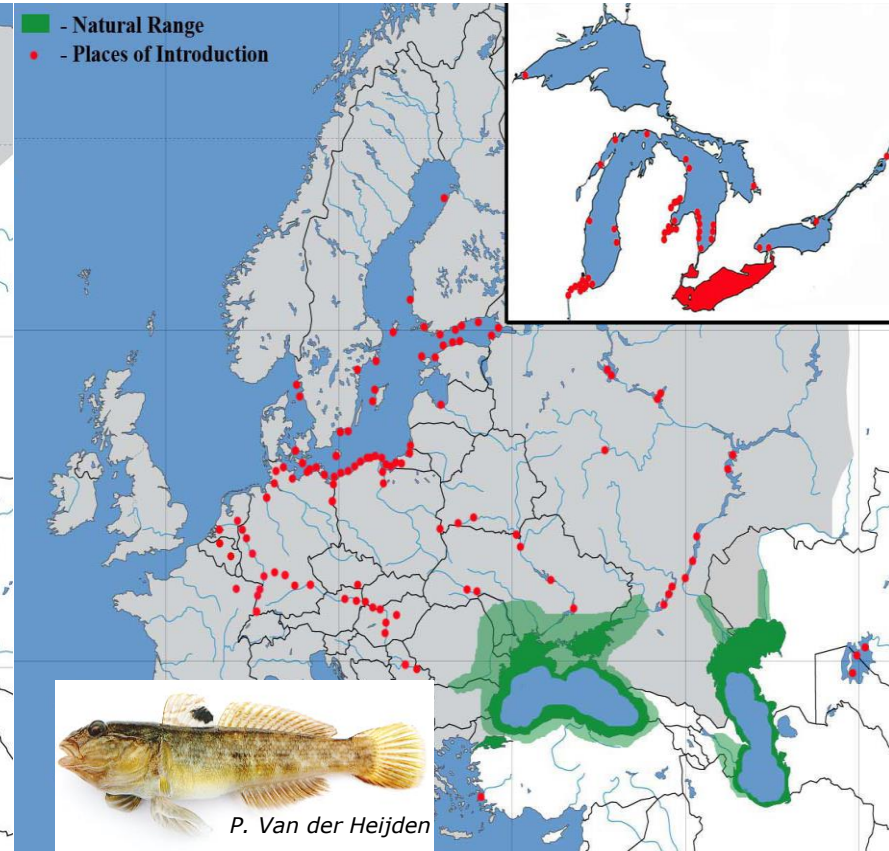


Explosive spread of Ponto-Caspian fish species

Bighead goby, *Ponticola kessleri*

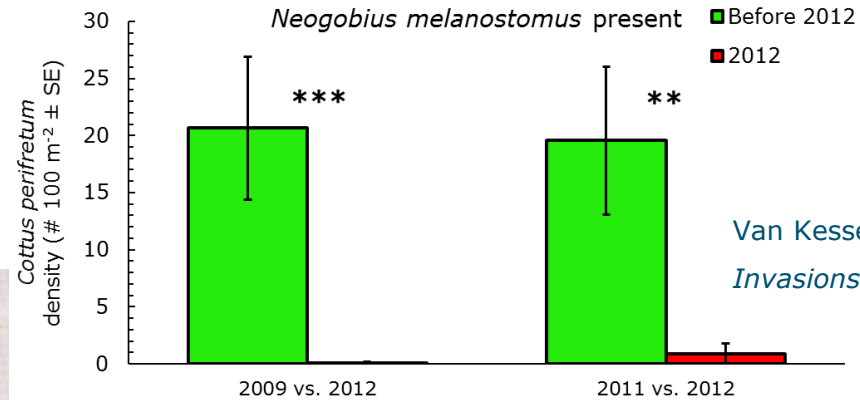
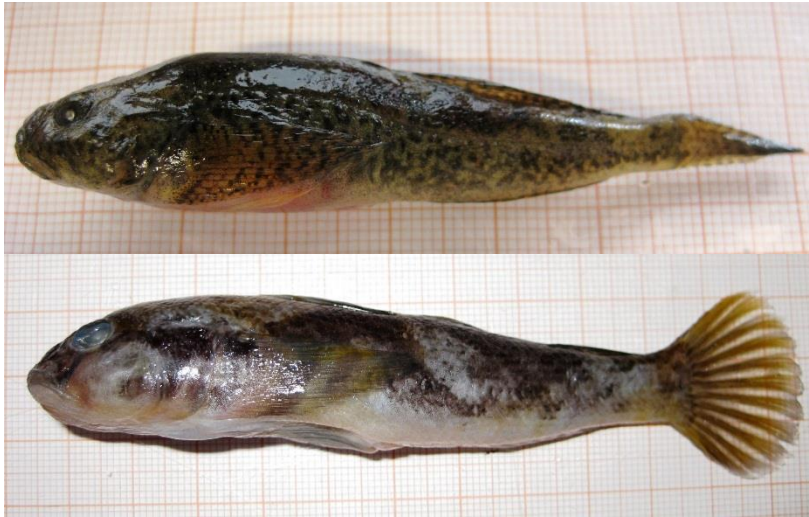


Round goby, *Neogobius melanostomus*

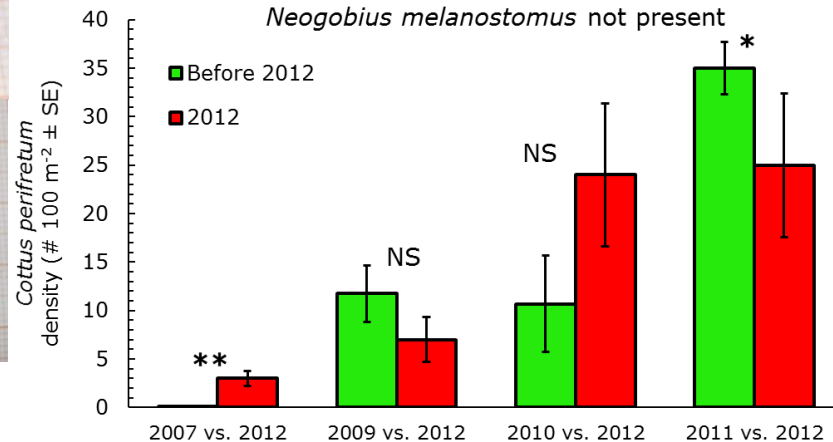


Interactions with native species

- Strong **decrease** of native River bullhead, *Cottus perifretum*
- **Competition** for prey?



Van Kessel et al. *Aquatic Invasions* (2016) **11**



Are functional traits a clue?

- Most theory and analysis from **plant science**
- Invasive species generally display traits associated with **high resource acquisition** or **broad** physiological **niches**

- **Functional Ecology**



- *Functional Ecology* 2010, **24**, 1353–1361

doi: 10.1111/j.1365-2435.2010.01739.x

individuals are most

- **Functional differences between native and alien species: a global-scale comparison**

Alejandro Ordonez^{*,1}, Ian J. Wright² and Han Olff¹

Ecology, 97(1), 2016, pp. 75–83
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is)

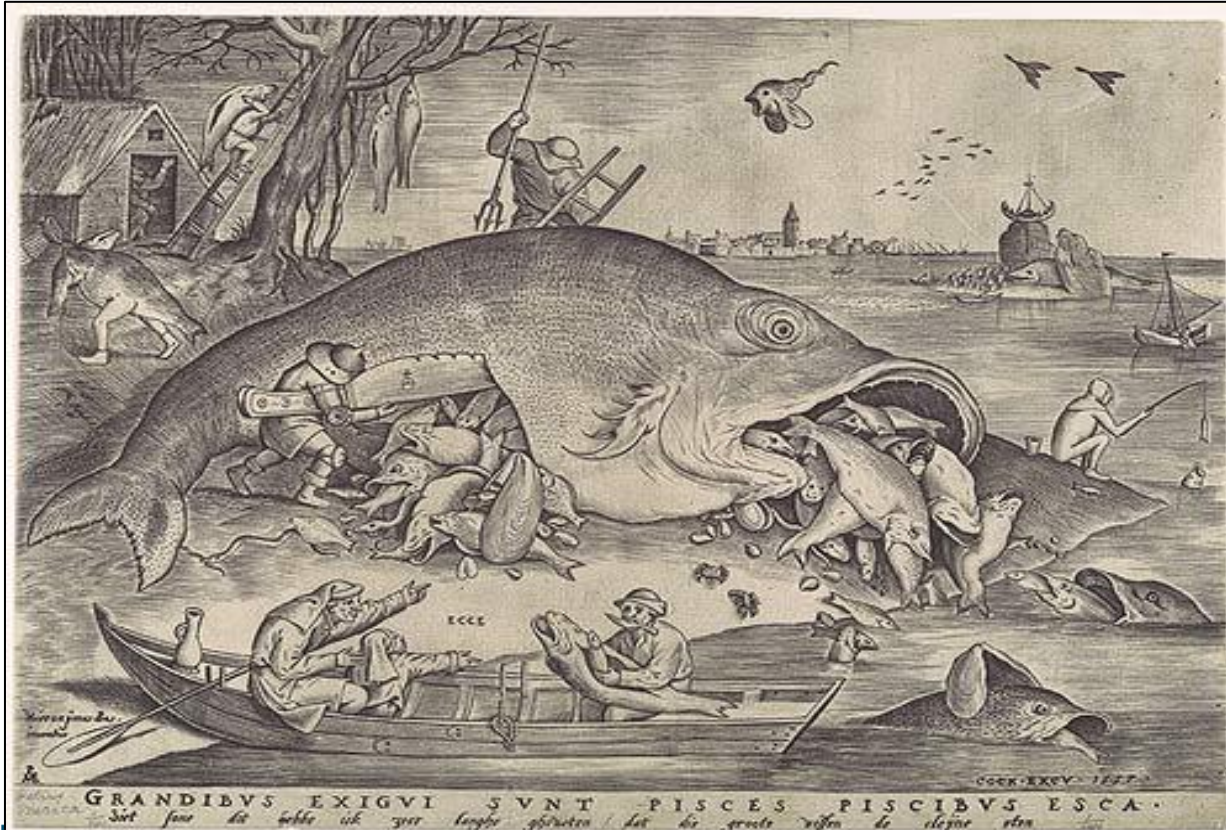
Plant functional traits of dominant native and invasive species in
mediterranean-climate ecosystems

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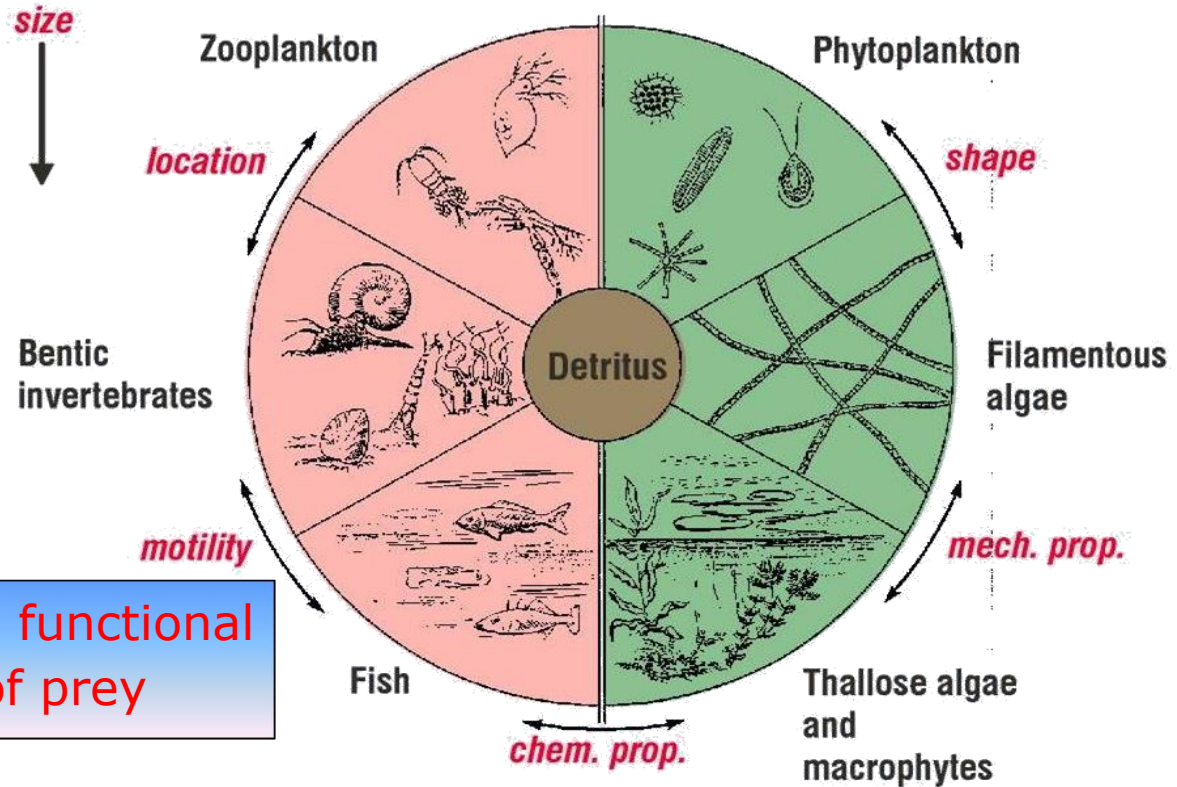
Size is an important functional trait



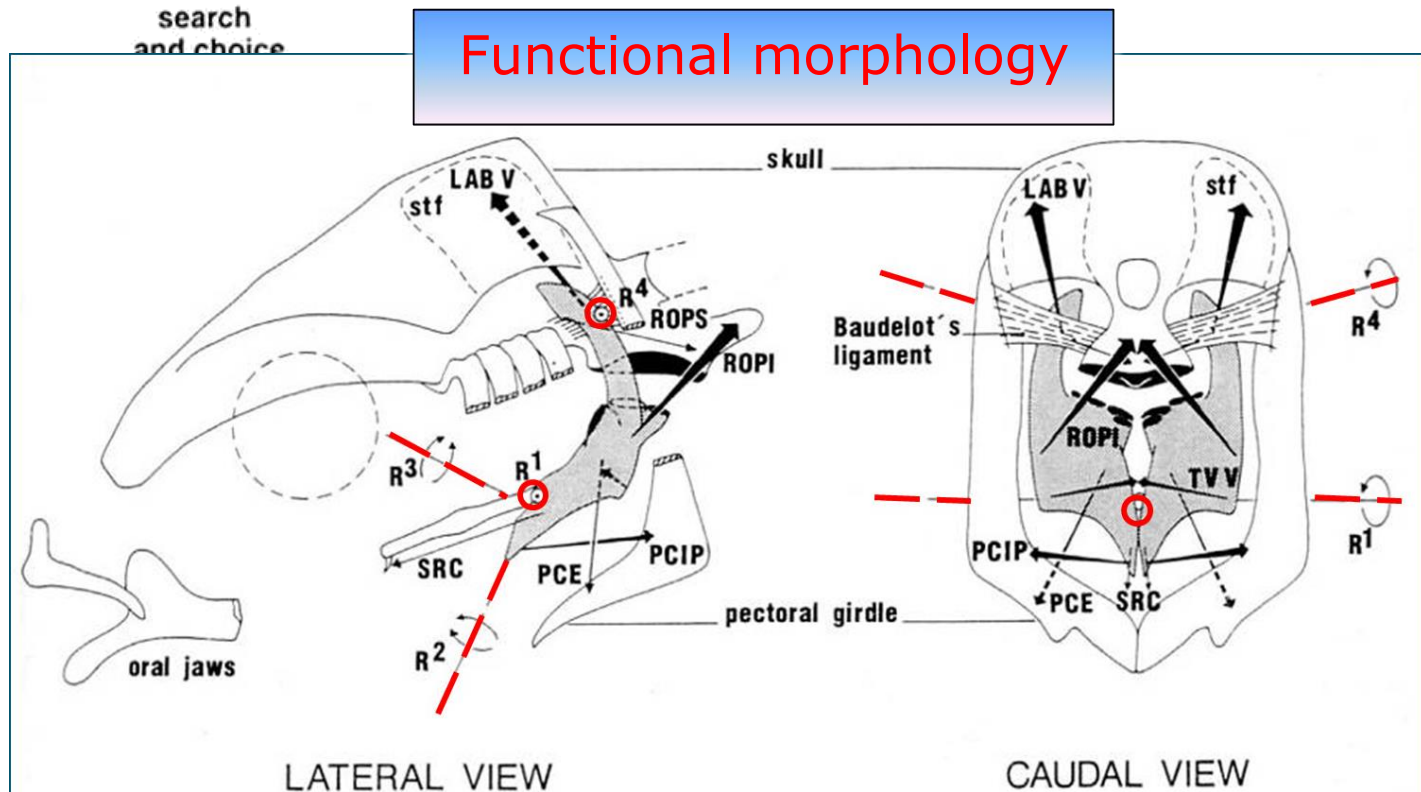
Functionality of fish traits depends on prey traits

- Size
- Habitat
- Motility
- Mechanical properties
- Digestibility
- Etc...

From taxonomic to functional
classification of prey



Prey: challenges to predator



From morphology to functional traits:

Food-fish models: Sibbing & Nagelkerke (2001)

Identifying traits of predator and prey critical in feeding



Reviews in Fish Biology and Ecology
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Resource partitioning
morphometrics

Ferdinand A. S.

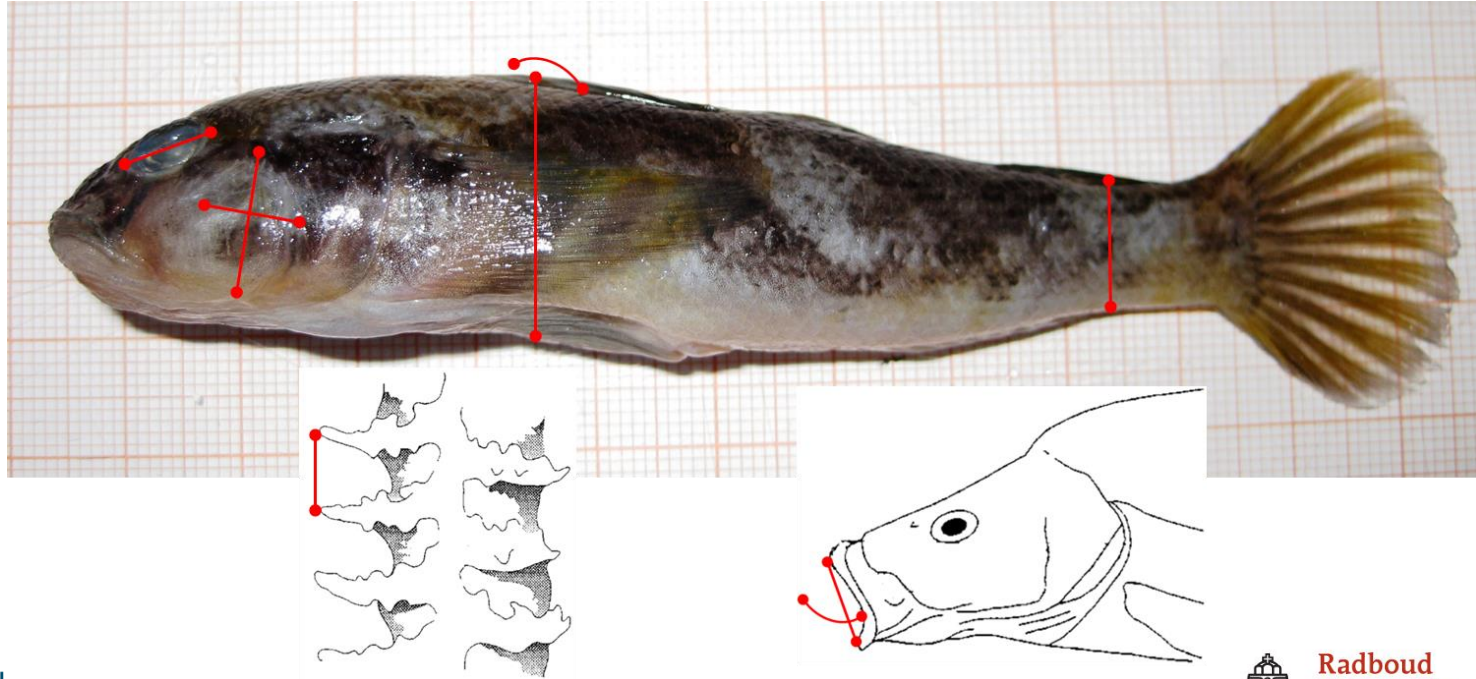
Consumer	Resource
Fork length	Maximum diameter
Anterior barbel length	Escape velocity
Eye diameter	Shape (elongation)
Body depth	Habitat (pelagic)
Body depth / width ratio	Chemical composition (protein content)
Oral gape / body area ratio	Strength
Caudal peduncle depth	Compliance
Anal fin area	Fibrousness
Oral gape axis	Toughness
Protrusion length	Requiring macro reduction
Lower pharyngeal teeth	
Pharyngeal teeth	
Head length	
Posterior gill arch resistance	
Oral gape diameter	
Gill raker length	
Gill raker profile	
Gut length	

Trophic profiles

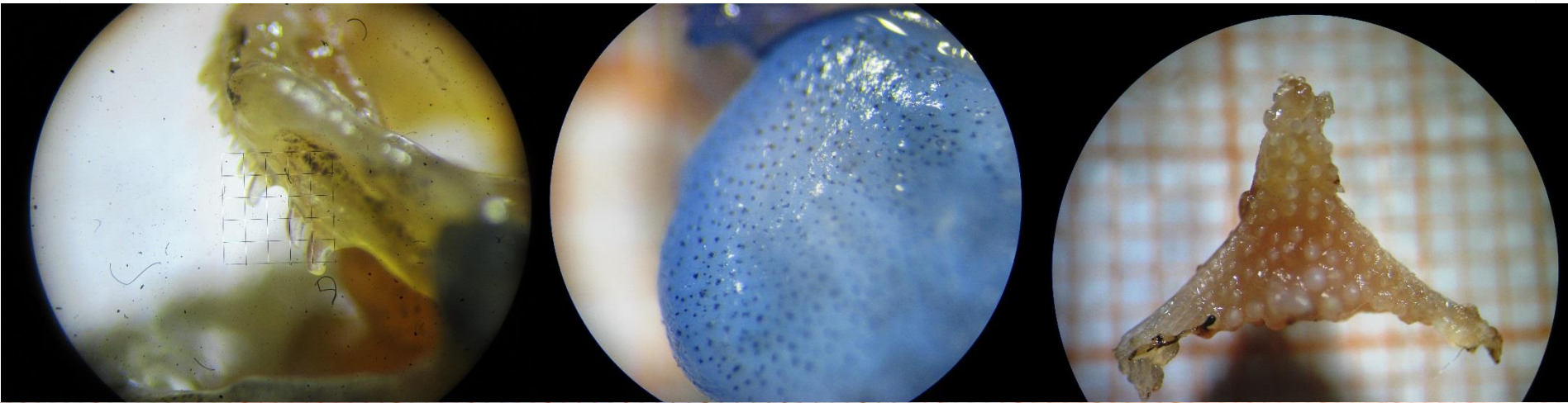
derived from fish

Materials & methods

- **Natives:** 2 bullheads (*Cottus*); 1 loach (*Barbatula*); 1 gudgeon (*Gobio*)
- **Aliens:** 4 gobies (*Neogobius*, *Proterorhinus*, *Ponticola*); 1 gudgeon (*Romanogobio*)
- 90 specimens
- 25 feeding-related traits

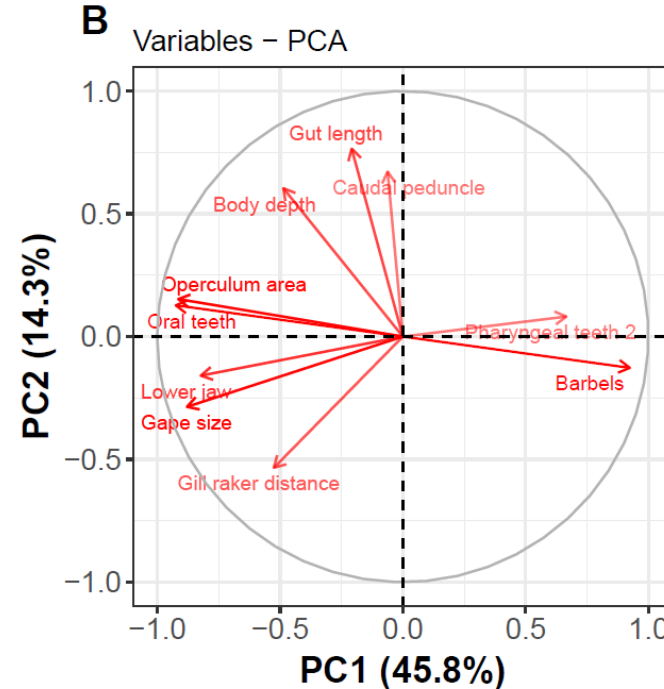
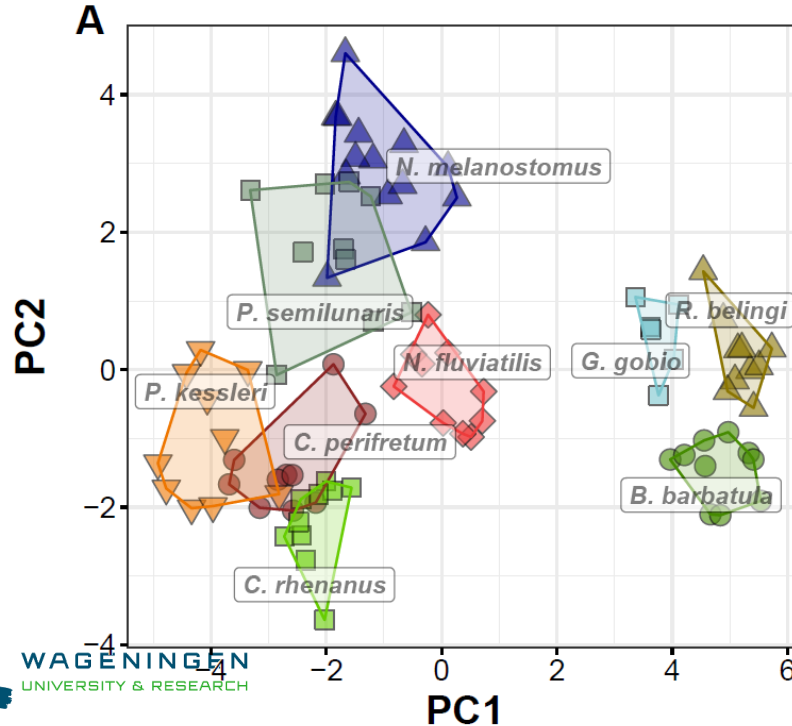


Measurements



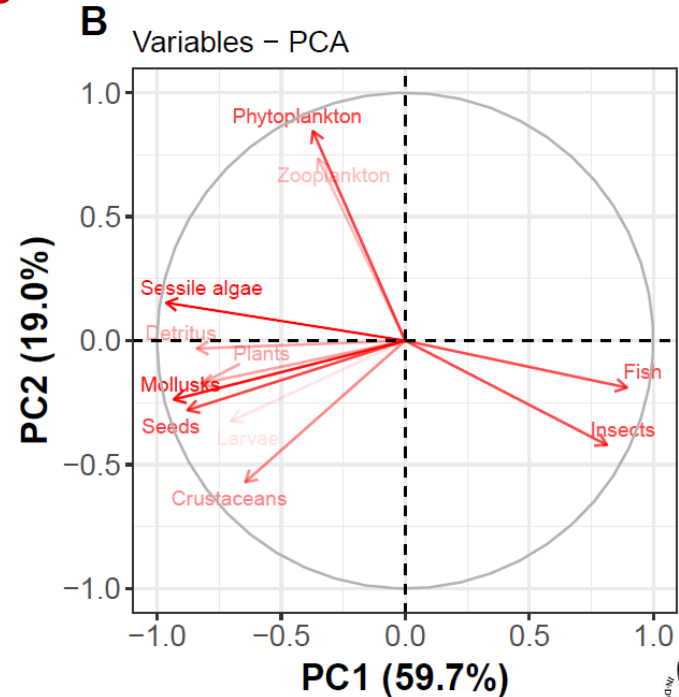
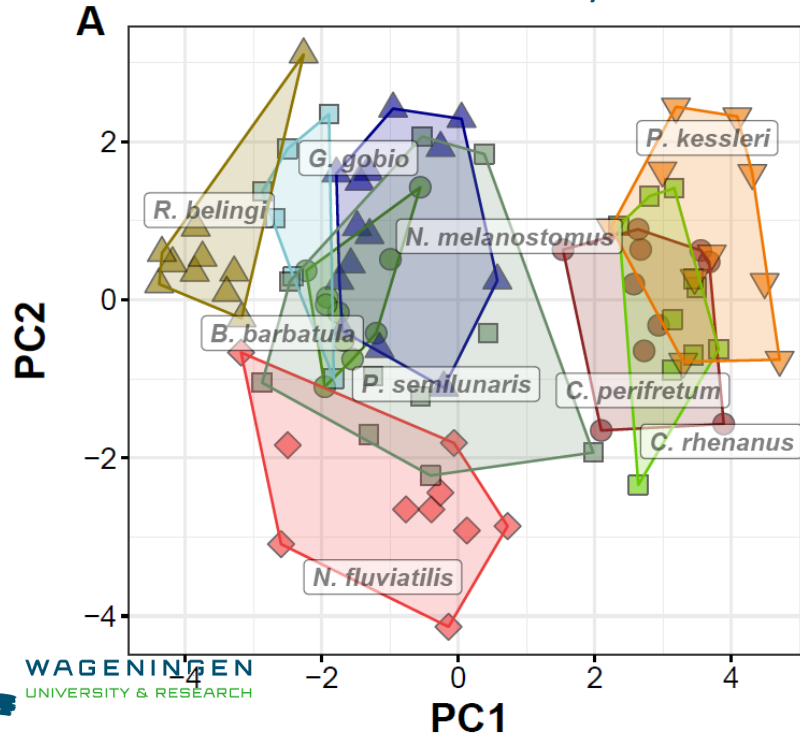
Morphological differentiation

- Consistent **functional morphological** differences between species
- Aliens and natives are distinct



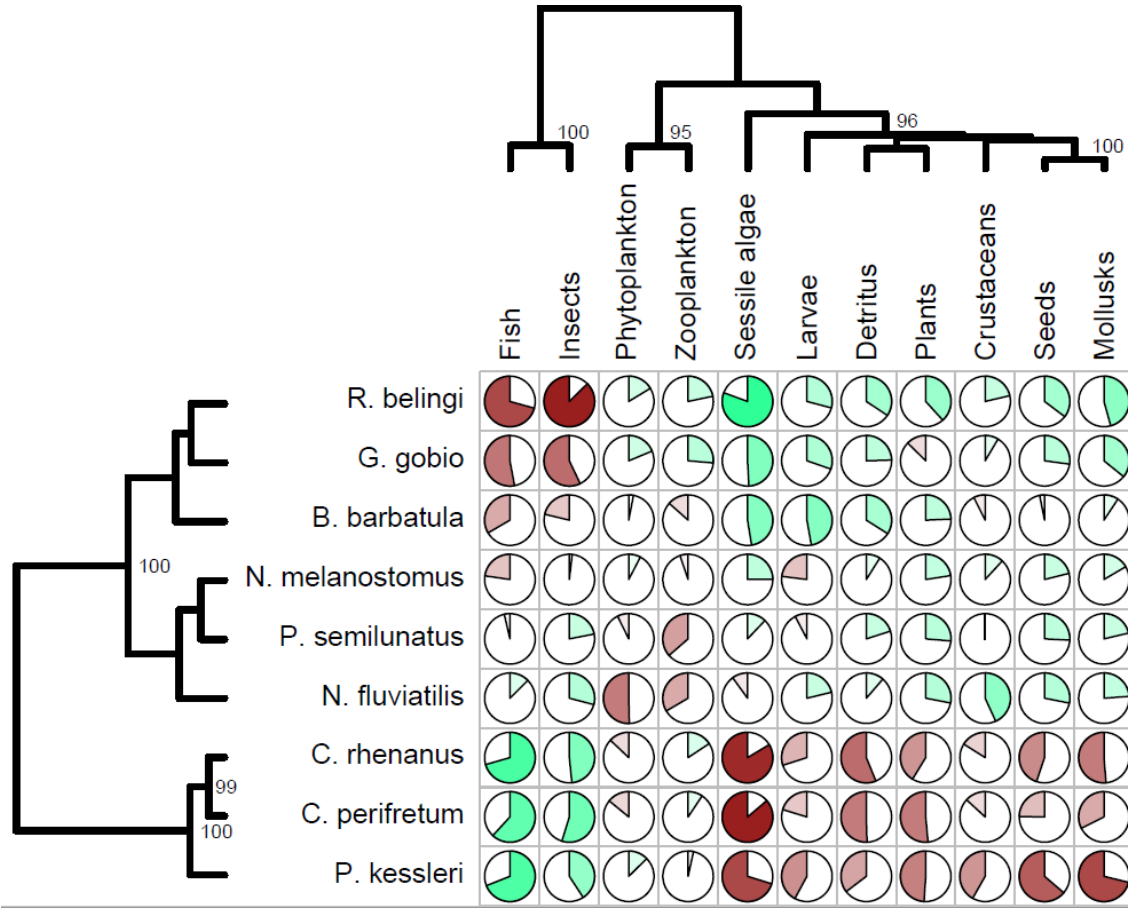
Trophic profiles

- Aliens partly **overlap** with natives
- Some aliens more **extreme**, others '**generalised**'



Trophic profiles

- Bullheads are very similar to Bighead goby
- Cyprinids and loach cluster together
- The ability to eat **macro-insects** and **fish** appears discriminatory



Conclusions

- Trophic morphology of native species does not necessarily **overlap** with aliens;
- Some aliens appear to be feeding **specialists**, others **generalists**;
- Both competition and filling of vacant niches?



Thank you for your attention!

Many thanks to:

Nils van Kessel, who provided
the fish

Eline van Onselen who
performed the measurements
and made the first analysis

