No significant negative impact on native fish species during first years of colonization by Ponto-Caspian gobies

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- Results
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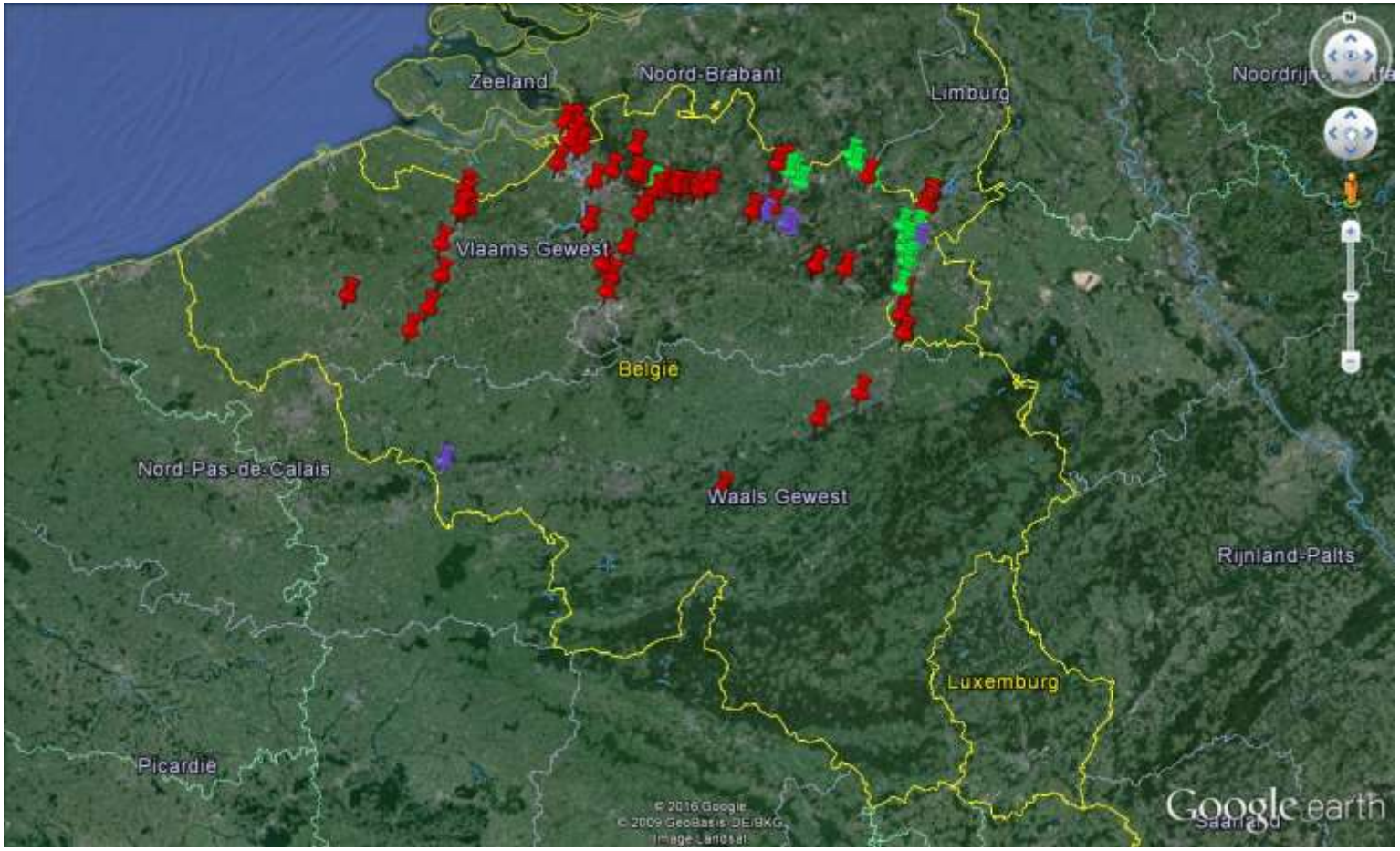
  - → Trends in fish community
  - → Impact of PC gobies?
- Conclusions

INTRODUCTION – Invasion of Ponto-Caspian gobies in Flanders



- Round goby
- Tubenose goby
- Bighead goby

Flanders
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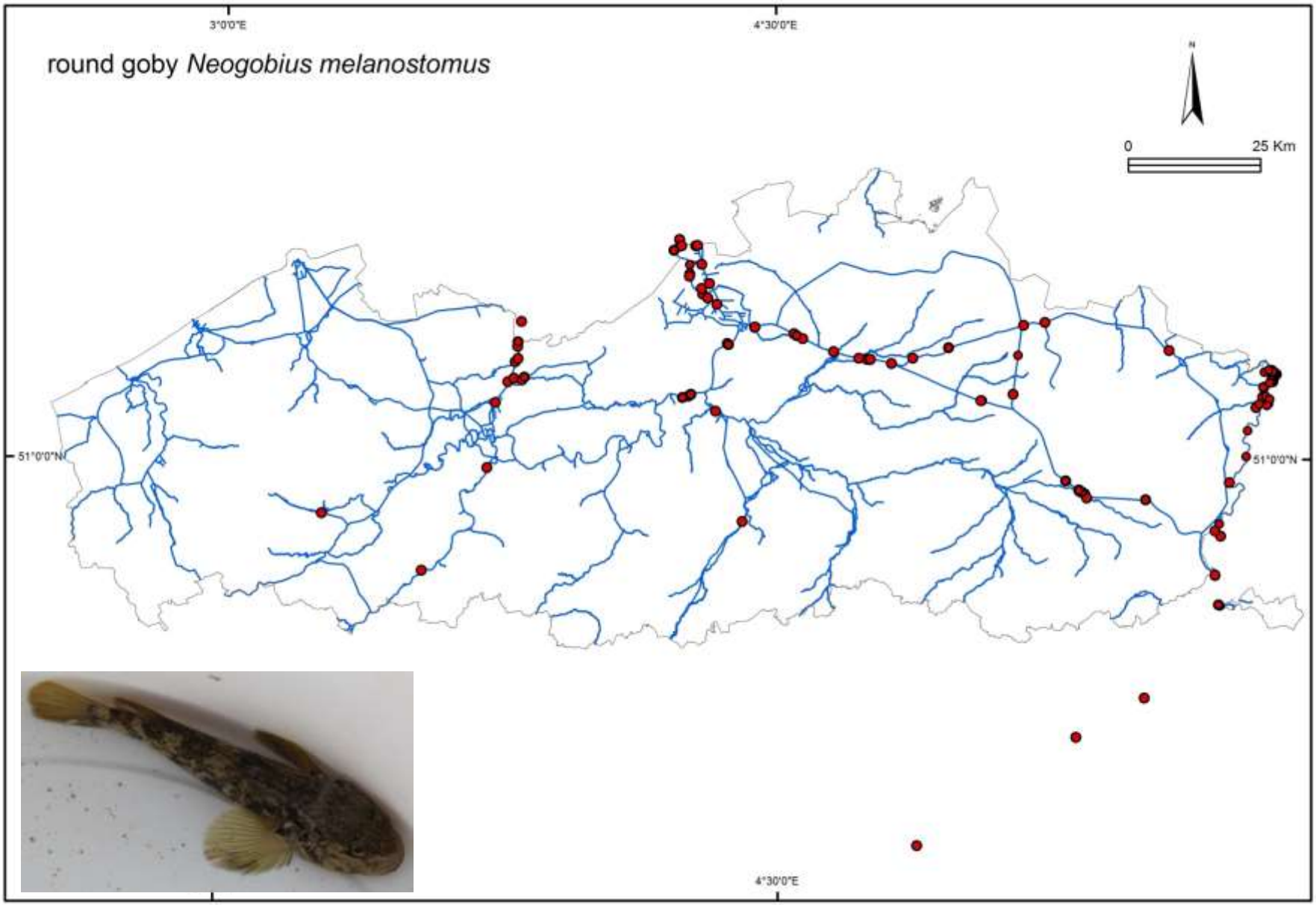
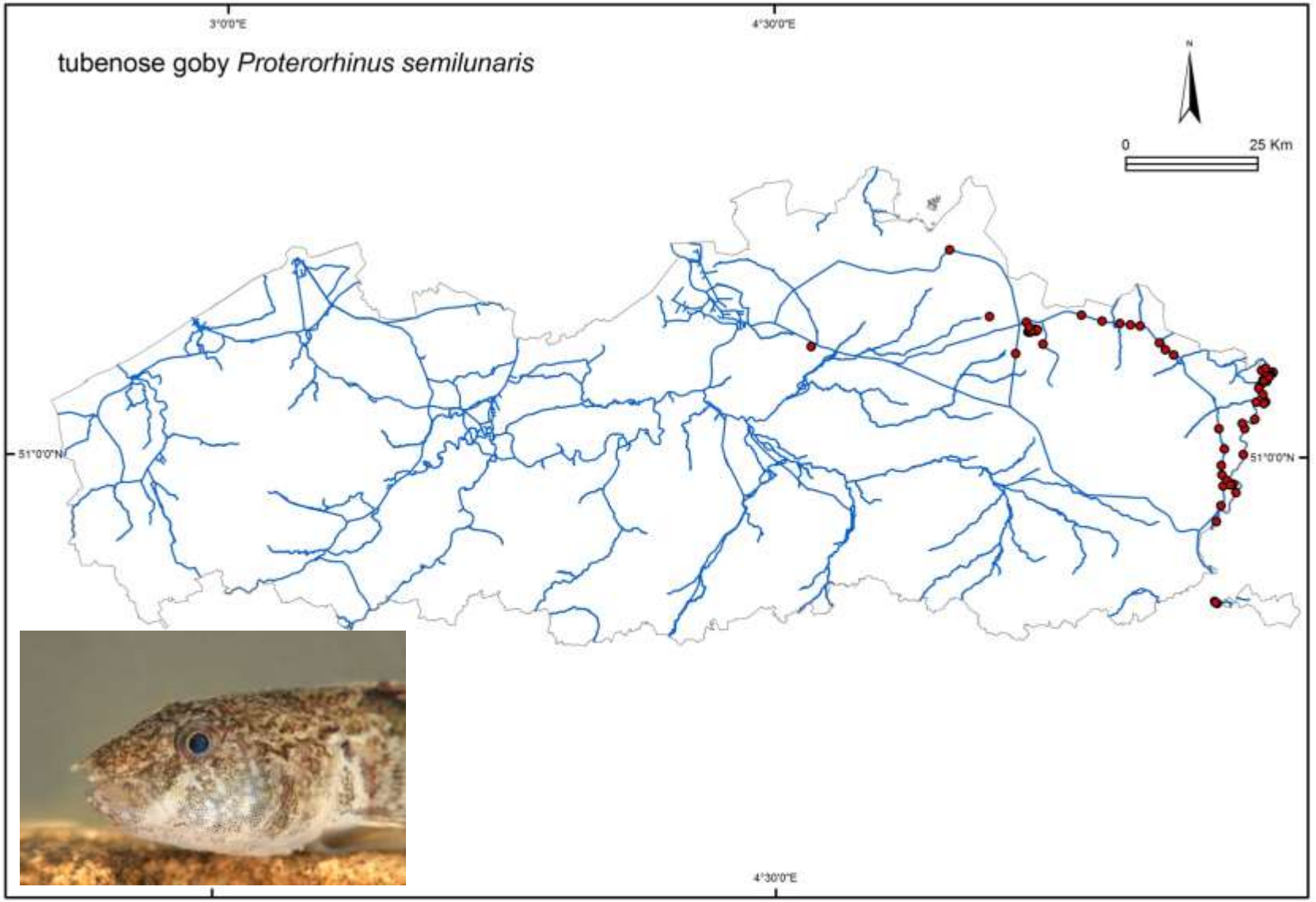
INTRODUCTION – Invasion of Ponto-Caspian gobies in Flanders

- In Flanders (North-Belgium)
  - → Round goby *Neogobius melanostomus* (2010)
  - → Tubenose goby *Proterorhinus semilunaris* (2010)
  - → Bighead goby *Ponticola kessleri* (2012)

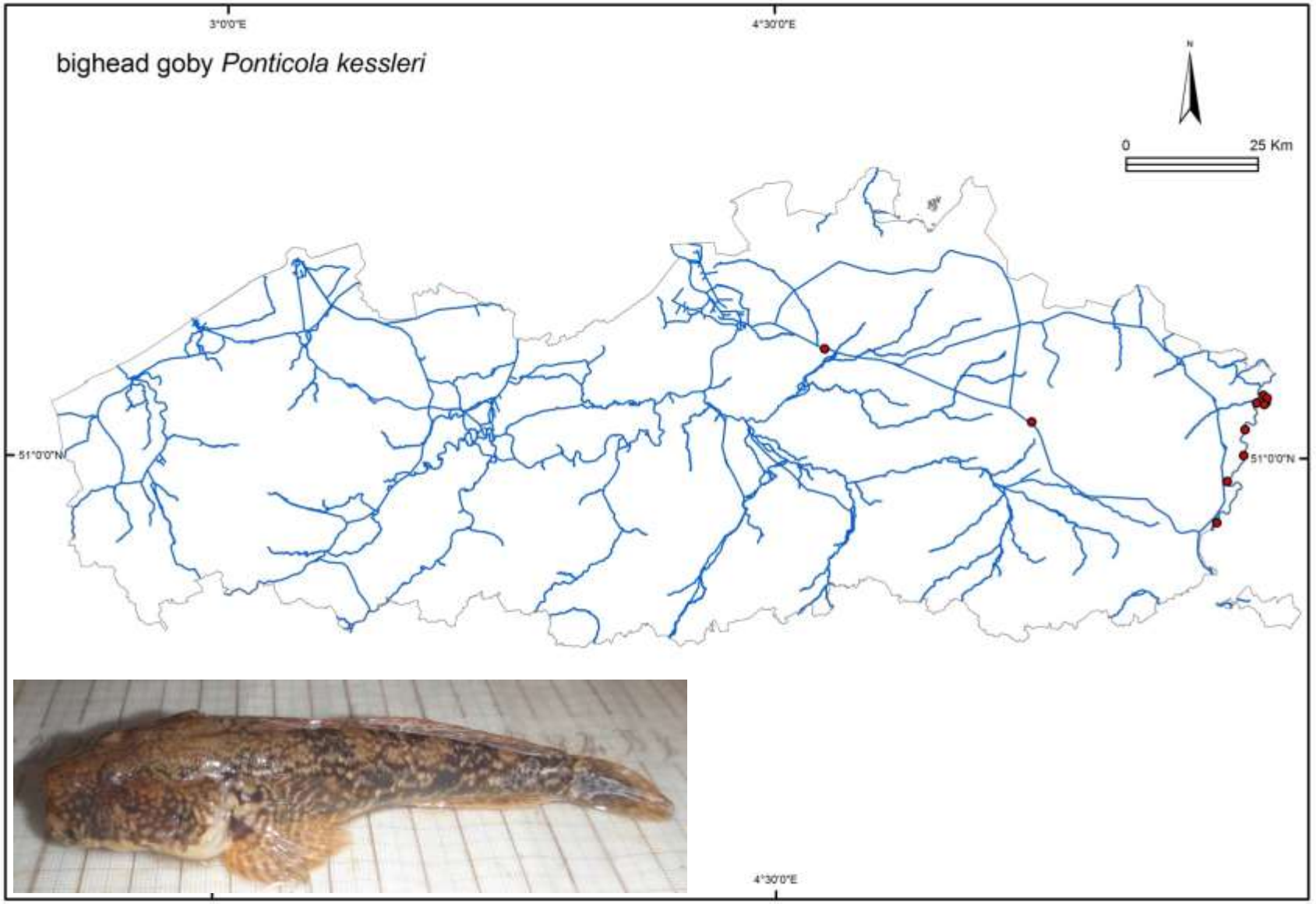
- Current distribution



Round goby



Tubenose goby



Bighead goby

Did native fish community in Border Meuse change as a result of the emergence of Ponto-Caspian gobies?

INTRODUCTION - River Meuse

- R. Meuse (935 km) originates in France, runs northwards through Wallonia and Flanders and ends in the Netherlands (Hollands Diep)
- Border Meuse constitutes the border between Belgium (Flanders) and the Netherlands over a length of 44 km.
- Border Meuse has a natural course, and is not navigable

INTRODUCTION - Border Meuse

- Width 70 – 100 m, depth 0.10 – 1.25 m
- Substrate: sand, gravel, small and large boulders, riprap
- Banks: often strengthened with riprap
- Discharge: average year discharge (2015) 205 m^3/sec (between 26 – 967 m^3/sec)
- During dry periods discharge may be very low (e.g. May – Aug 2015 = 62.2 m^3/sec)
- Water velocity in the River Meuse is very variable in time and sites

M&M - Fish monitoring in Meuse

- Data obtained from fish stock assessments through electric fishing (wading or from boat) along the Border Meuse
- Complete dataset includes data collected between 1998 and 2015 (not sampled all years) and 21 fishing locations
- Not each location is sampled every occasion (max = 8)

M&M - Complete dataset

Town	Site number	1998	2002	2005	2008	2012	2013	2014	2015	Total fish/site
Dilsen-Stokkem	92019225	96								96
	92019250	182	96	196	97	73	53	382	271	1350
	92019275	74								74
	92019300	192	25	65	81	181				544
Kinrooi	92219050	173	108	94	15	41	159	262	251	1103
	92219075	167								167
Lanaken	92019050	41	66	51	15	151	22	212	283	841
	92019075	525								525
Maaseik	92019325	136								136
	92019350	500	318	115	56	229	547	155	670	2590
	92019375	493							298	791
	92019375B								70	70
	92019375C								111	111
	92019400	232	228	121	90	63	165	63	133	1095
	92219025	173					659			832
Maasmechelen	92019100	96	101	97	27	28				349
	92019125	138								138
	92019150	81	41	133	27	375				657
	92019175	148								148
	92019200	113	33	52	22	135	21	110	102	588
Voeren	92019025	12	24	17	25	41				119
Total fish/year		3572	1040	941	455	1317	1626	1184	2189	12324

M&M - Statistical analysis

- Exploratory analysis
  - → Complete dataset (21 sites)
- Mixed models analysis (site = random effect)
  - → Dataset I (12 sites, sites sampled only once were removed)
    - × Response
      - → Species richness
      - → Individual species
    - × Explanatory variable: year (piece-wise before and after PC goby invasion)
  - → Dataset II (6 sites, sampled all consecutive years since 2012)
    - × Response
      - → Density of a typical species of Border Meuse + PC goby
    - × Decline in typical species? (interaction species x year)

M&M - Dataset I

Town	Site number	1998	2002	2005	2008	2012	2013	2014	2015	Total fish/site
Dilsen-Stokkem	92019250	182	96	196	97	73	53	382	271	1350
	92019300	192	25	65	81	181				544
Kinrooi	92219050	173	108	94	15	41	159	262	251	1103
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	92019200	113	33	52	22	135	21	110	102	588
Voeren	92019025	12	24	17	25	41				119
Total fish/year		2288	1040	941	455	1317	1626	1184	2008	10859

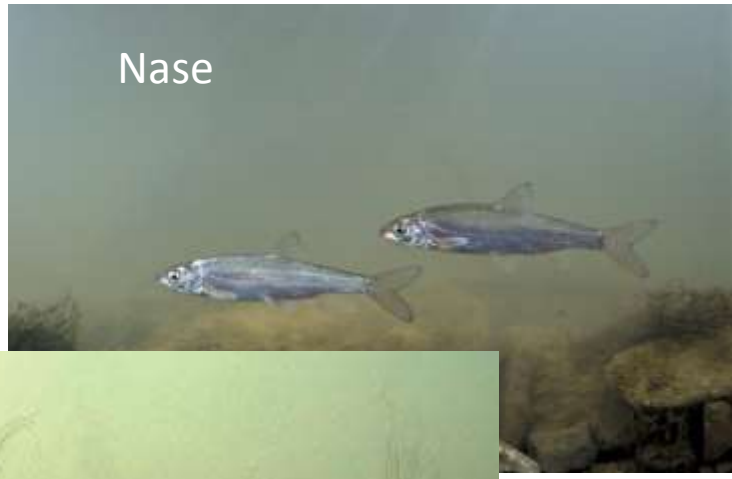
M&M - Dataset II

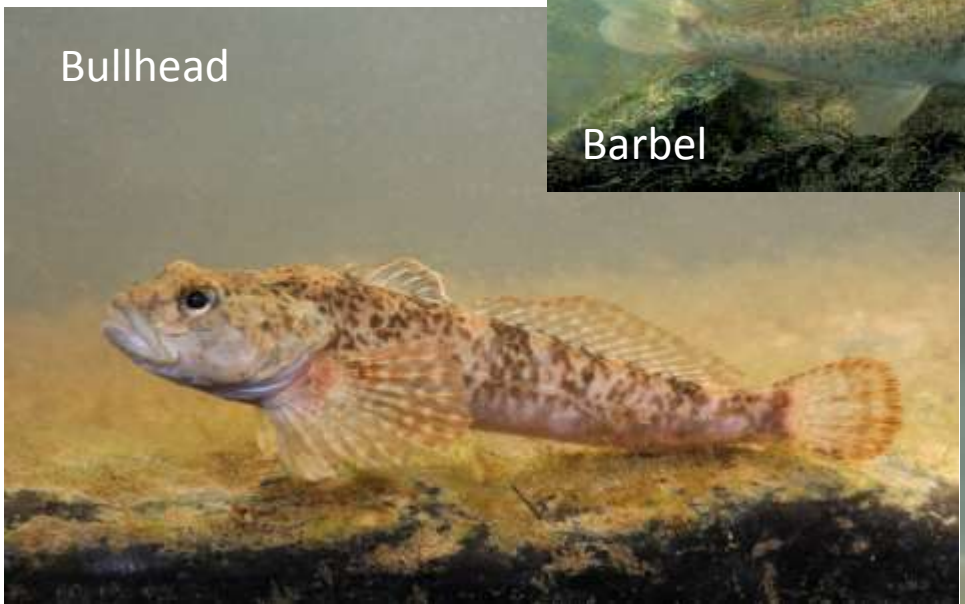
Town	Site number	2012	2013	2014	2015	Total fish/site
Dilsen-Stokkem	92019250	73	53	382	271	779
Kinrooi	92219050	41	159	262	251	713
Lanaken	92019050	151	22	212	283	668
Maaseik	92019350	229	547	155	670	1601
	92019400	63	165	63	133	424
Maasmechelen	92019200	135	21	110	102	368
Total fish/year		692	967	1184	1710	4553

RESULTS – Fish assessments

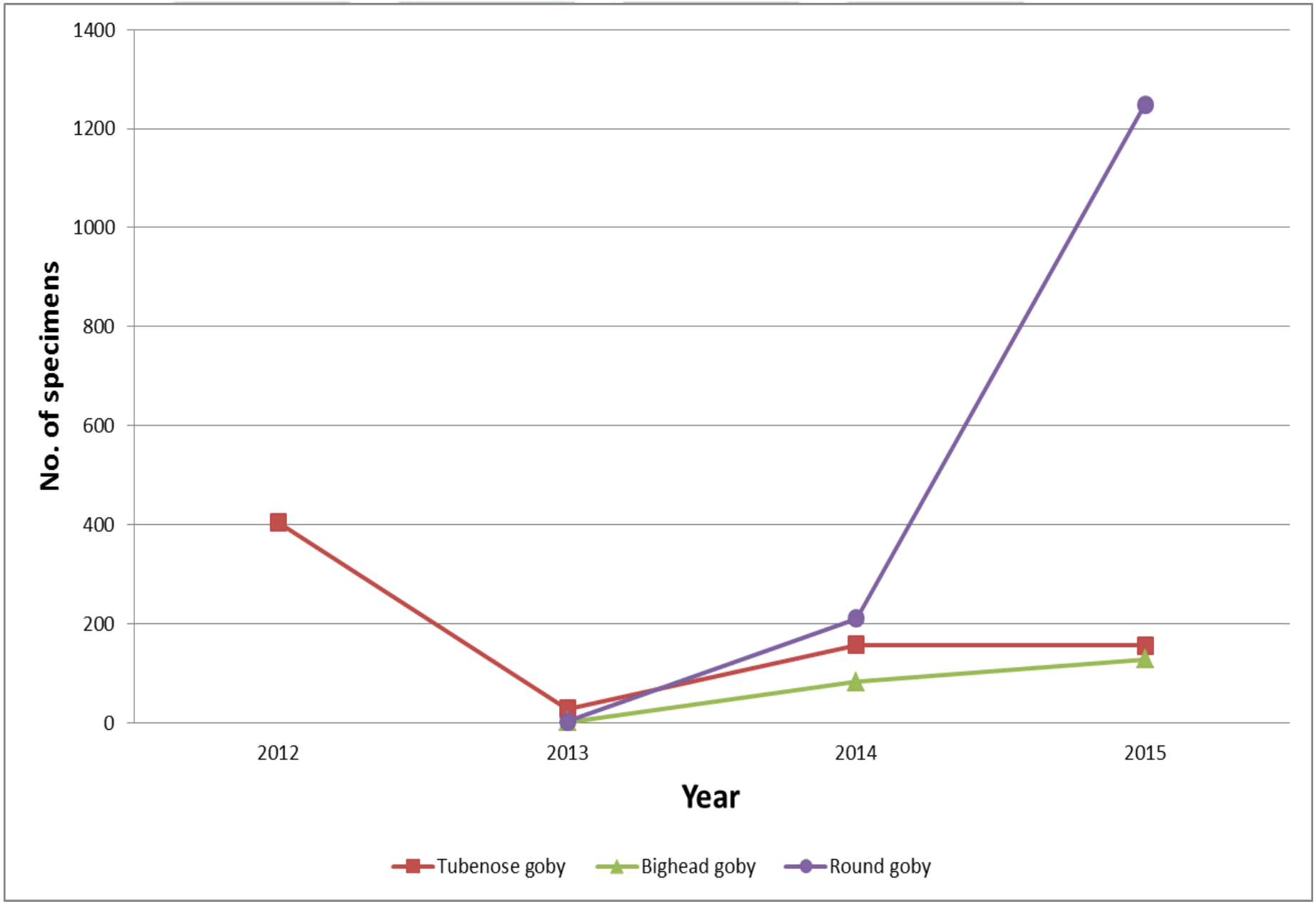
- 37 fish species (12.324 specimens) over 21 sites and 8 sampling years
- Most common: eel (2193), roach (2178), chub (1852), perch (1662), round goby (1460), tubenose goby (745), gudgeon (620)
- Rheophilic species: nase, barbel, chub, dace
- Benthic species: stone loach, bullhead, gudgeon
- Eurytopic species: roach, perch, eel, ruffe
- Non-native species: asp, Ponto-Caspian gobies
  - → Tubenose goby *Proterorhinus semilunaris* (since 2010?)
  - → Round goby *Neogobius melanostomus* (2013)
  - → Bighead goby *Ponticola kessleri* (2013)

RESULTS - Typical species



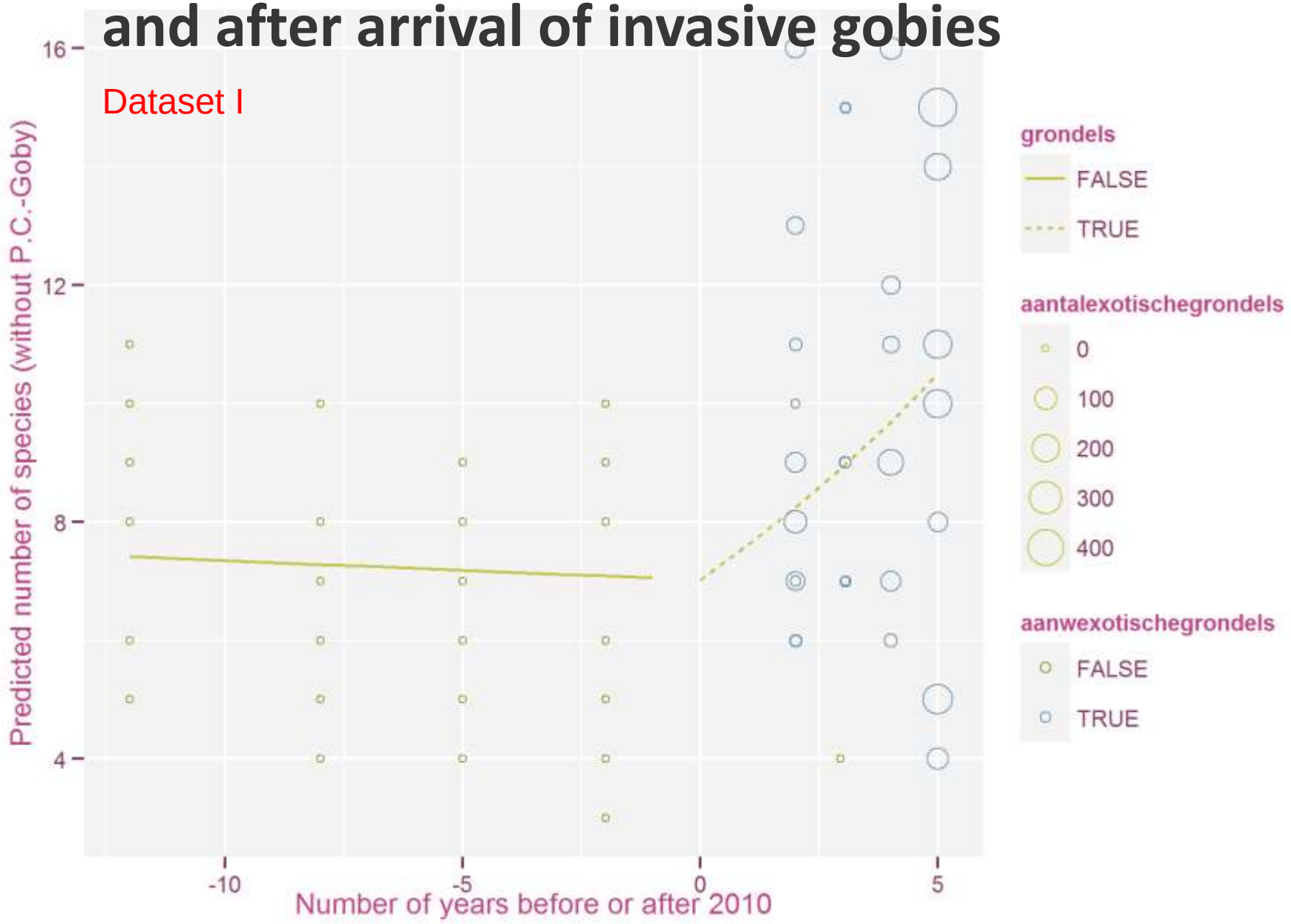


RESULTS – Fish numbers per site and year



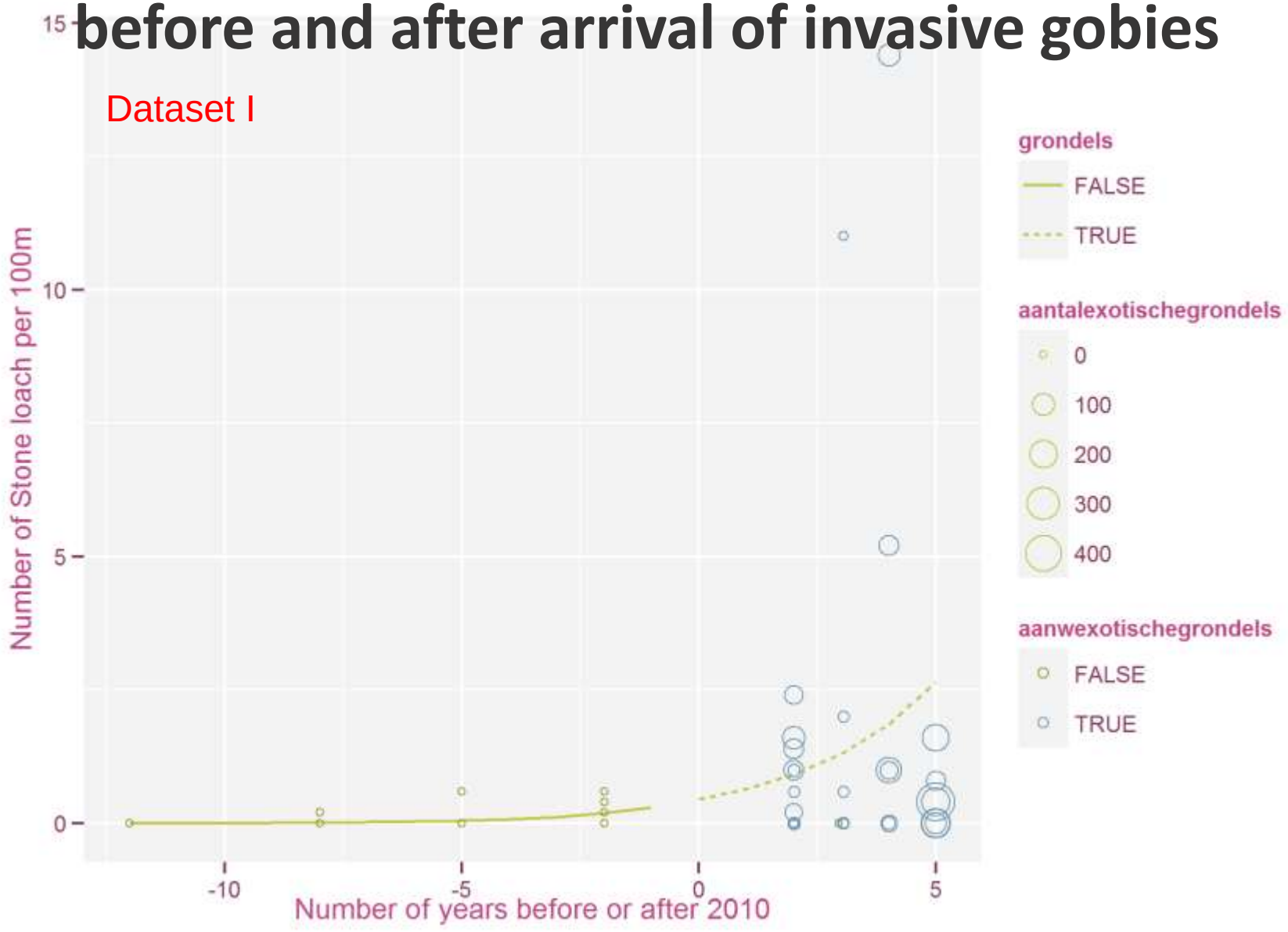
RESULTS - Trend in species richness before and after arrival of invasive gobies

Dataset I



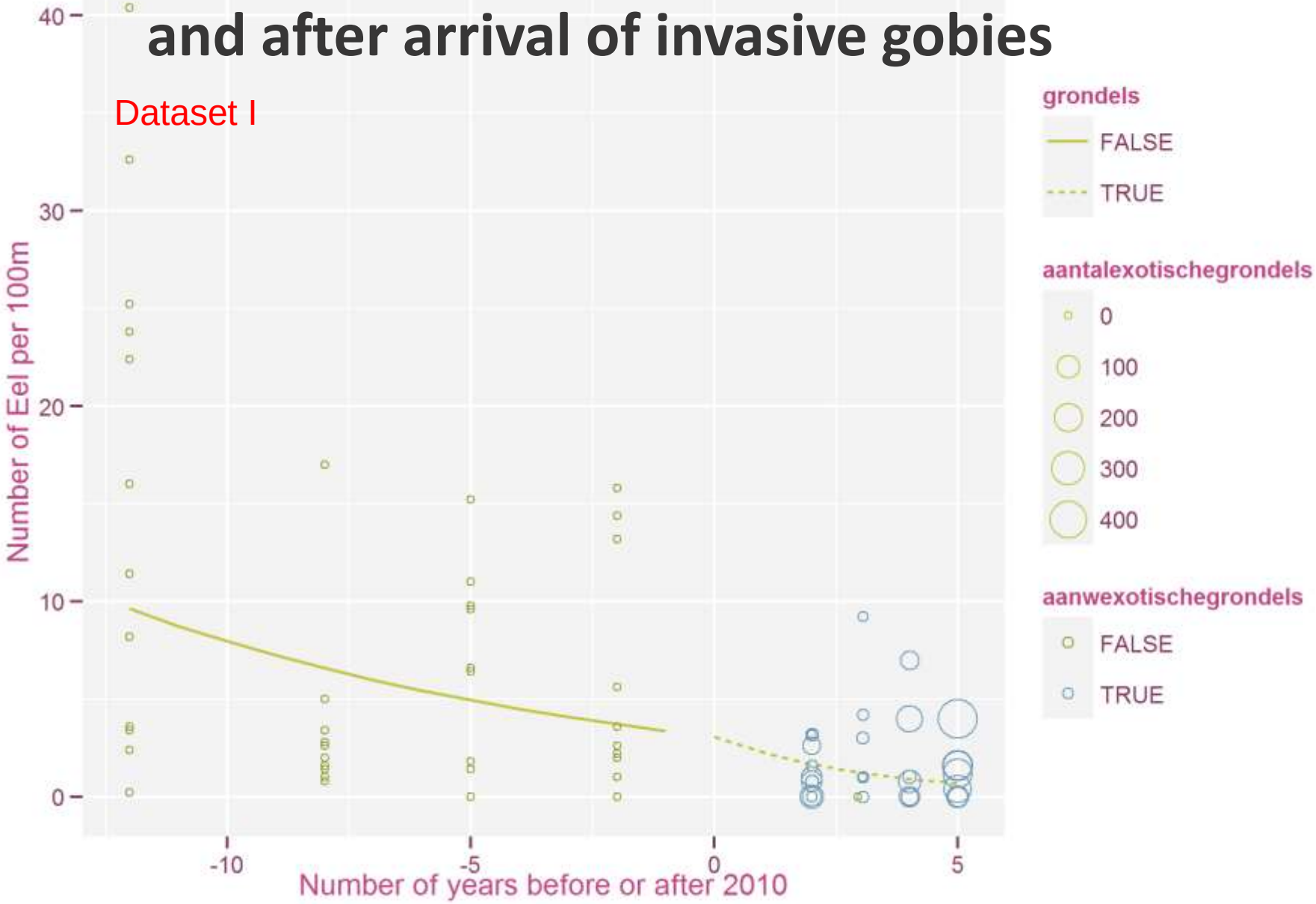
RESULTS - Trend in number of stone loach before and after arrival of invasive gobies

Dataset I

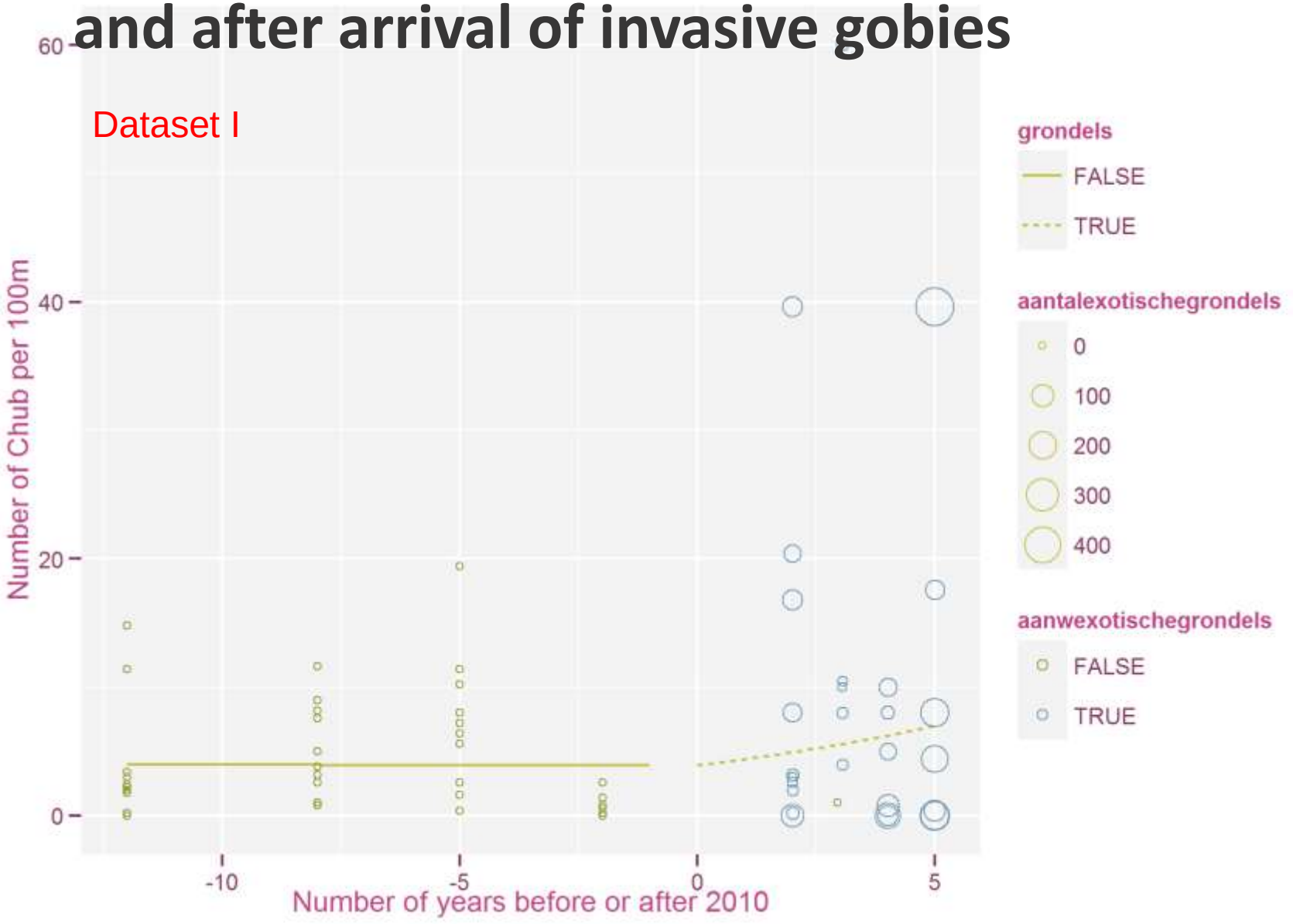


RESULTS - Trend in number of eel before and after arrival of invasive gobies

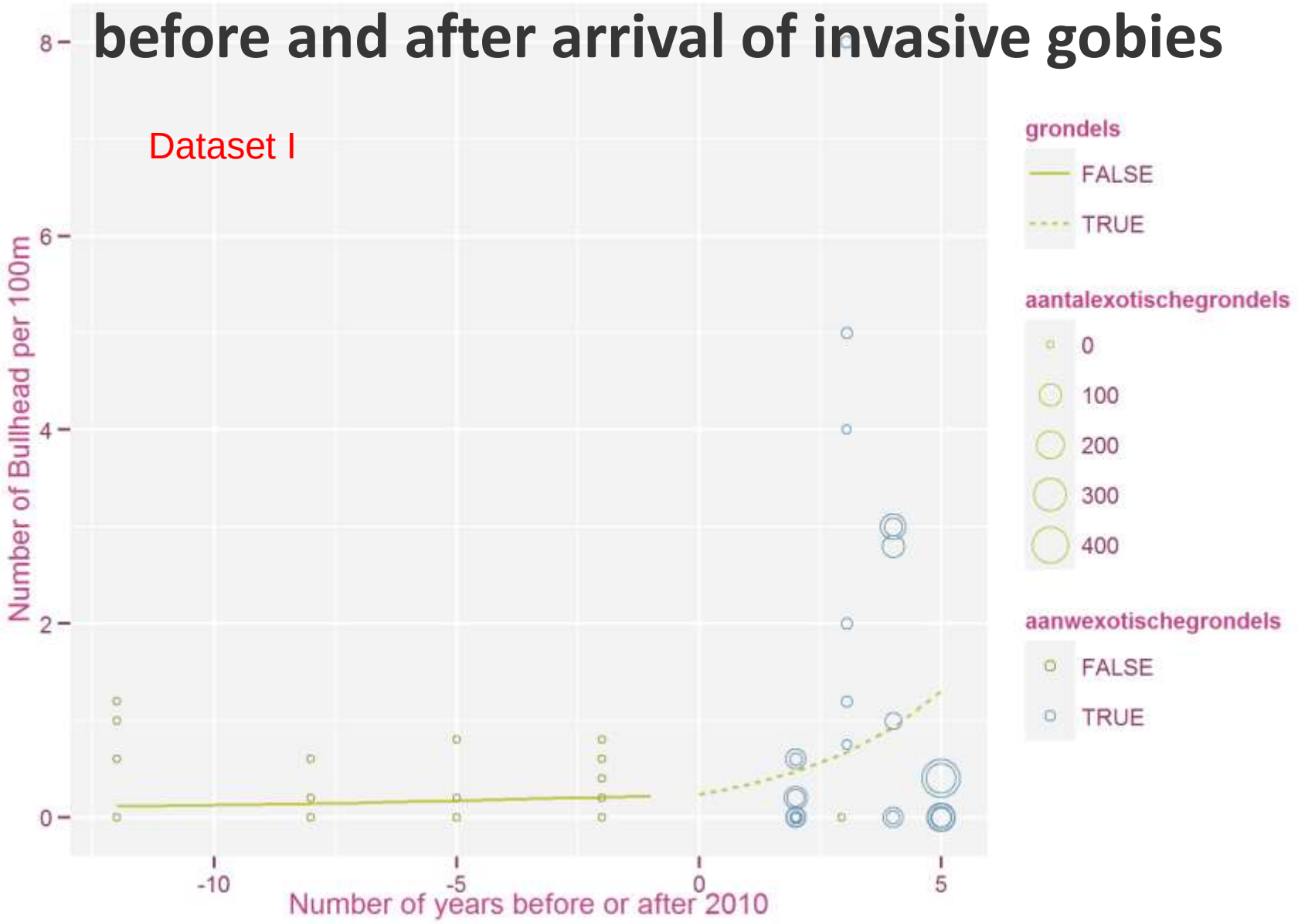
Dataset I



RESULTS - Trend in number of chub before and after arrival of invasive gobies

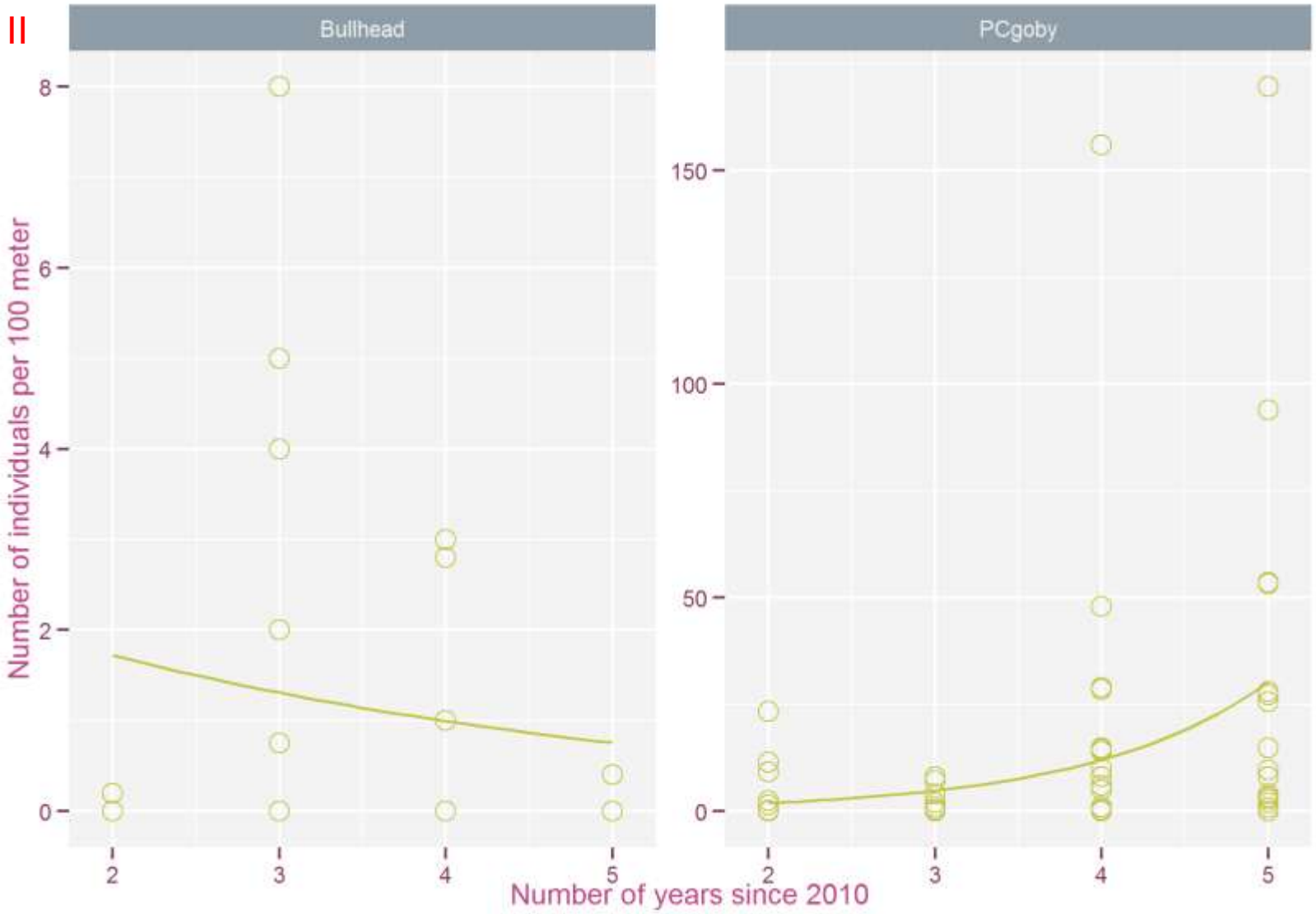


RESULTS - Trend in number of bullhead before and after arrival of invasive gobies



RESULTS - Trend in number of bullhead after arrival of invasive gobies

Dataset II



CONCLUSIONS

- Very fluctuating numbers of specimens over years, sites and species
- Ponto-Caspian gobies are increasing (especially round goby)
- Low numbers of specimens of most vulnerable benthic species e.g. bullhead
- We could not prove a significant impact of the Ponto-Caspian gobies on native fish species => explanation?
  - → Different sampling efforts? More attention to benthic species
  - → Different sampling conditions? Discharge, velocity, turbidity, …
  - → Low number of specimens of benthic species
  - → Invasion time of Ponto-Caspian gobies in the Border Meuse too short
- What will the future bring? Continue monitoring efforts to follow population trends

Thank you!

Questions?

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