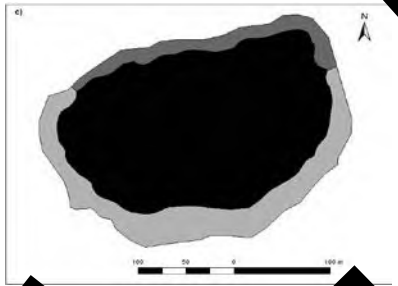# Predicting the effects of reintroducing a native predator (European eel, *Anguilla anguilla*) into a freshwater community dominated by alien species

Phillip J. Haubrock, Paride Balzani, Alberto Criado, Agustín P. Monteoliva & Elena Tricarico

Lake Arreo

Protected habitat

~ 136 ha

Max. depth: 24 m

Native species

Coleoptera

Gyrinus paykulli

Crayfish

Austropotamobius pallipes

Fish

Tinca tinca

Anguilla anguilla

Non-native species

Crayfish

Procambarus clarkii

Fish

Micropterus salmoides

Lepomis gibbosus

Cyprinus carpio

Vegetation

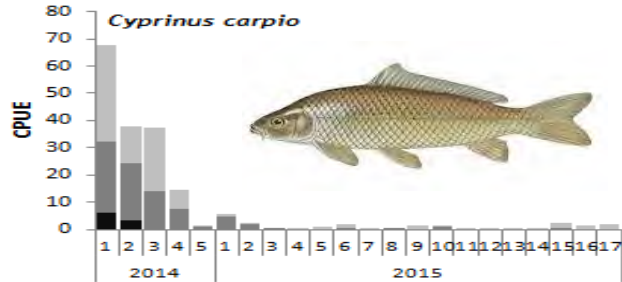*Phragmites australis*

Management

Cyprinus carpio

Lepomis gibbosus

Micropterus salmoides

Sector	Density (ind/dam³)		Biomass (g/m²)	
	2010	2015	2010	2015
Pelagic	0.25	0.51	1.60	0.02
Litoral	0.80	0.98	0.74	0.01
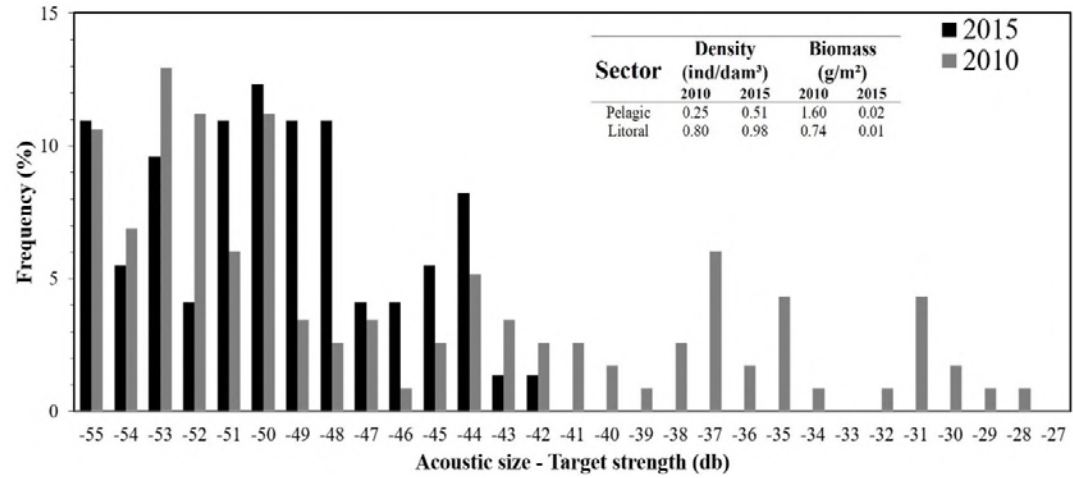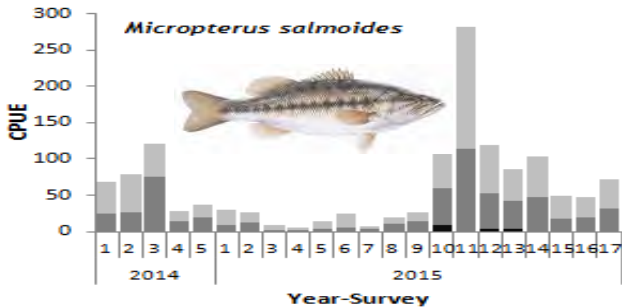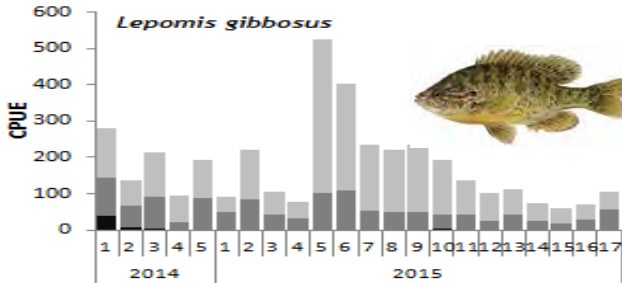
Anguilla anguilla

Sampling 2018

Species	Isotope Sample Size	Stomach Sample Size
Micropterus salmoides	15	50
*Lepomis gibbosus**	15	50
Cyprinus carpio	11	11
Procambarus clarkia	15	50
Phragmites australus	5	

Laboratory procedure
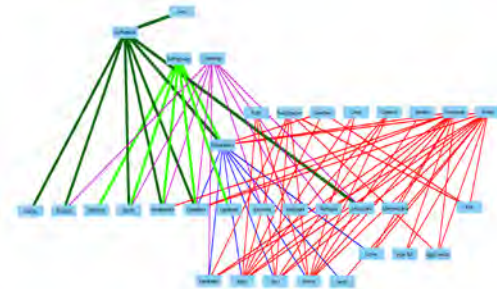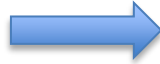
Diet analysis

| Prey	L. gibbosus	M. salmoides	C. carpio
P. clarkii	5.2	78.7	0.0
L. gibbosus	0.0	5.6	0.0
Odonata	0.0	4.0	0.0
Mollusks	1.5	0.0	0.0
Hymenoptera	10.3	0.5	0.0
Heteroptera	4.5	0.0	0.0
Snails	0.0	0.0	0.0
Araneae	0.5	9.7	0.0
Diptera	1.3	0.0	0.0
Odonata	2.1	0.0	0.0
Orthoptera	5.2	0.0	0.0
Coleoptera	49.7	0.0	0.0
Formicidae	0.5	0.0	0.0
unid. Insects	44.1	0.0	0.0
detritus	32.6	0.5	45.5
fisheggs	3.7	0.0	0.0
plant material	1.6	0.0	0.0
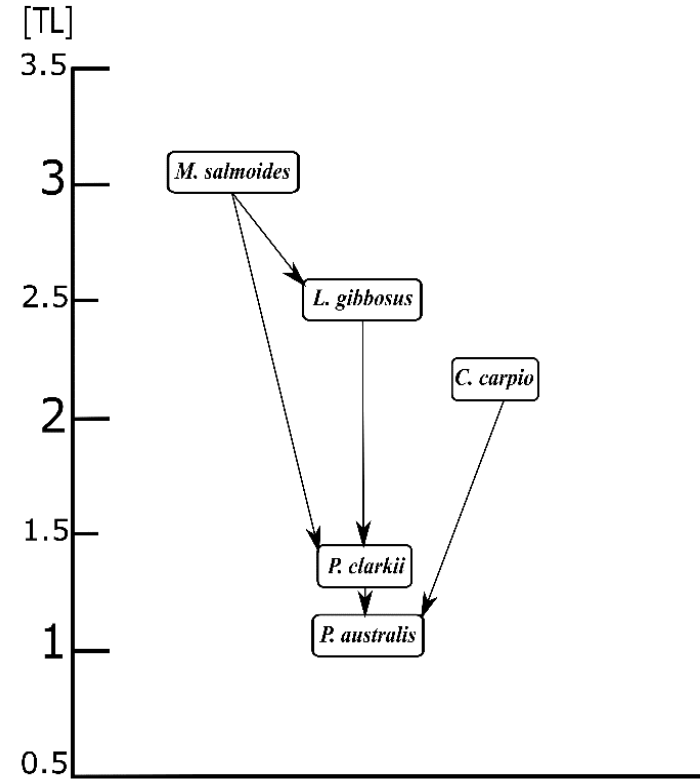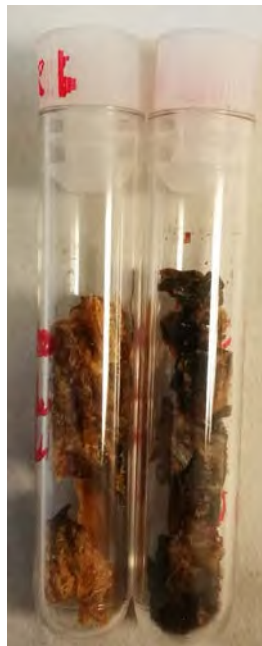
Laboratory procedure

Stable Isotope Analysis

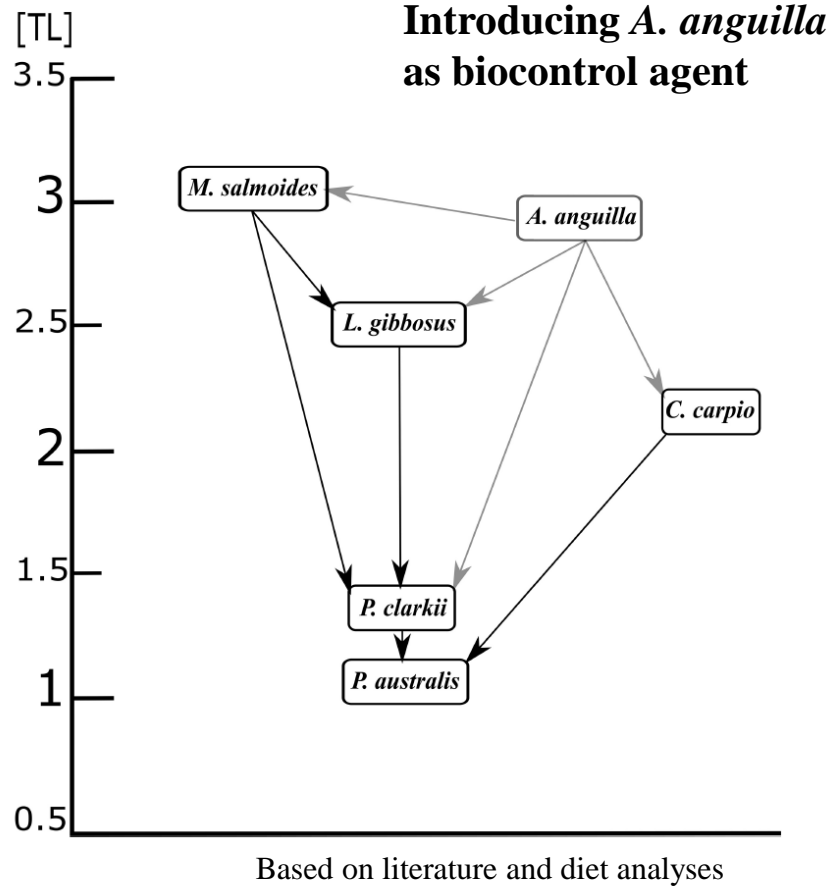| Group	Layman metrics and Stable Isotope Analysis results								
	Mean δ^{15}N	Mean δ^{13}C	NR	CR	TA	CD	MNND	SDNND	SEAc
Cyprinus carpio	12.2	−33.9	2.8	3.8	5.4	1.0	0.6	0.5	2.5
Lepomis gibbosus	13.5	−32.2	3.8	3.4	4.9	1.2	0.5	0.4	2.2
Micropterus salmoides	15.2	−30.8	2.2	2.3	2.6	0.9	0.3	0.2	2.3
Procambarus clarkii	9.4	−28.2	4.8	9.6	16.3	3.2	0.8	0.7	10.2
Phragmites australis	8.4	−28.6	1.0	1.4	0.1	0.6	0.3	0.2	0.1
Community	na	na	8.6	12.3	53.4	3.0	0.4	0.4	17.1
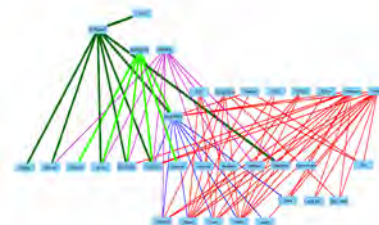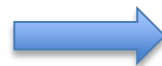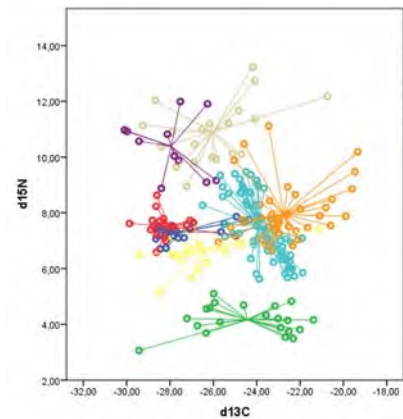
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Stable Isotope Analysis Mixing Models

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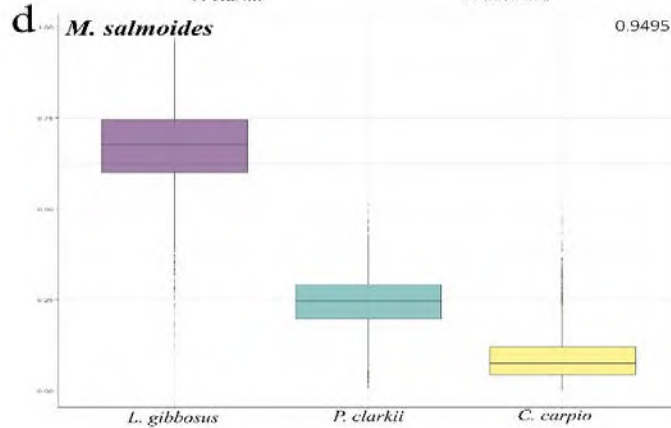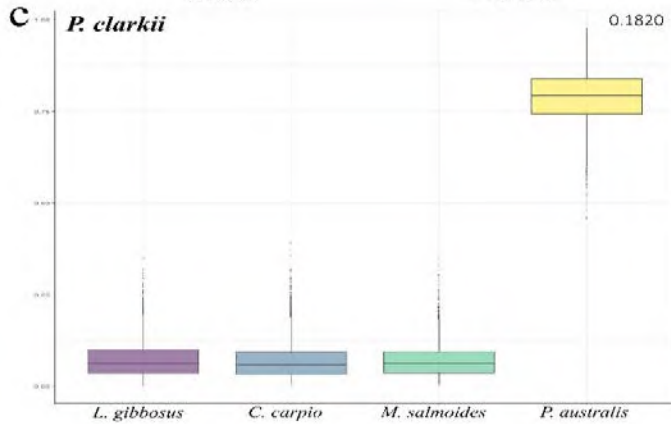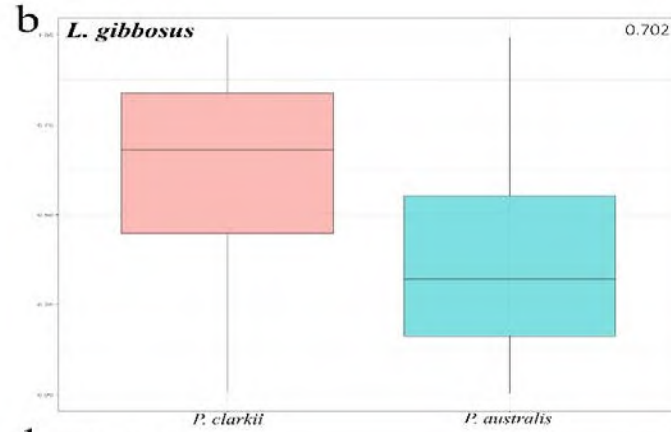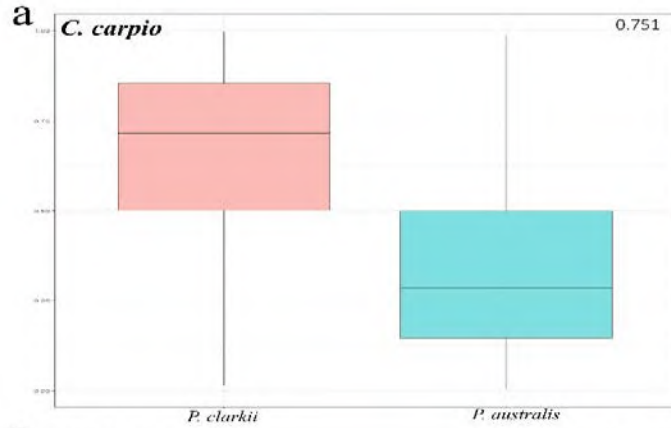
Idea: introduce 1.000 – 2.000 grown individuals

Anguilla anguilla

Introducing *A. anguilla* as biocontrol agent

Based on literature and diet analyses

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Introducing *A. anguilla* as biocontrol agent

1. Identifying suitable isotope data

Limited availability of data

Dörner et al., (2009) *Journal of Fish Biology* 74

Similar community:
- *Perca fluviatilus*
- *Rutilus rutilus*
- *Tinca tinca*
- *Orconectes limosus*
- *Phragmites australis*

# 2. Extract species of interest and potential baseline organism

Anguilla anguilla & Phragmites australis

3. Standardize species of interest and community by the common baseline organism

Assumption:
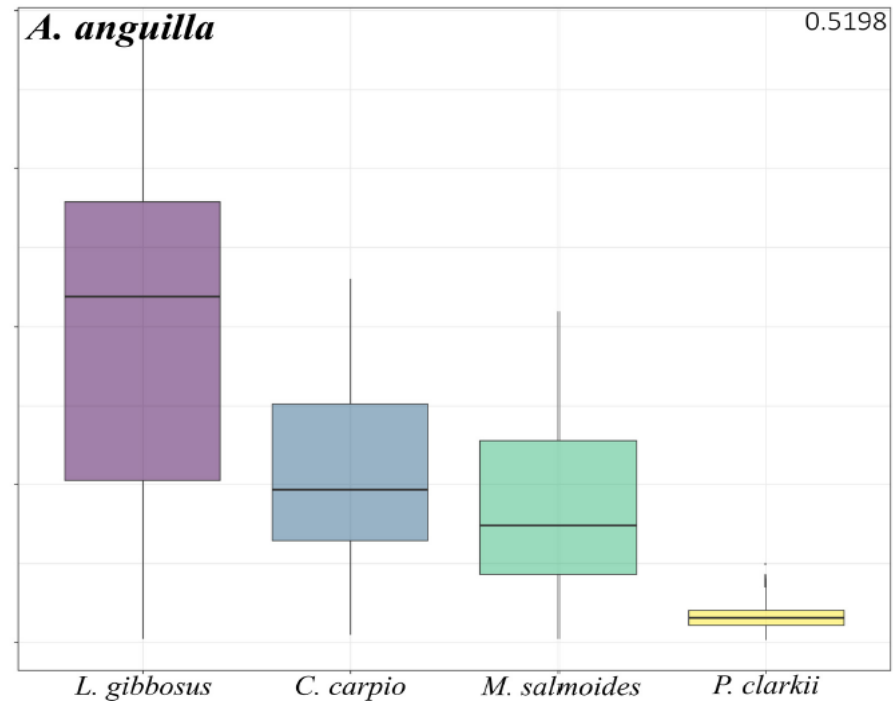   1. potential prey abundances reflecting abundances from last monitoring
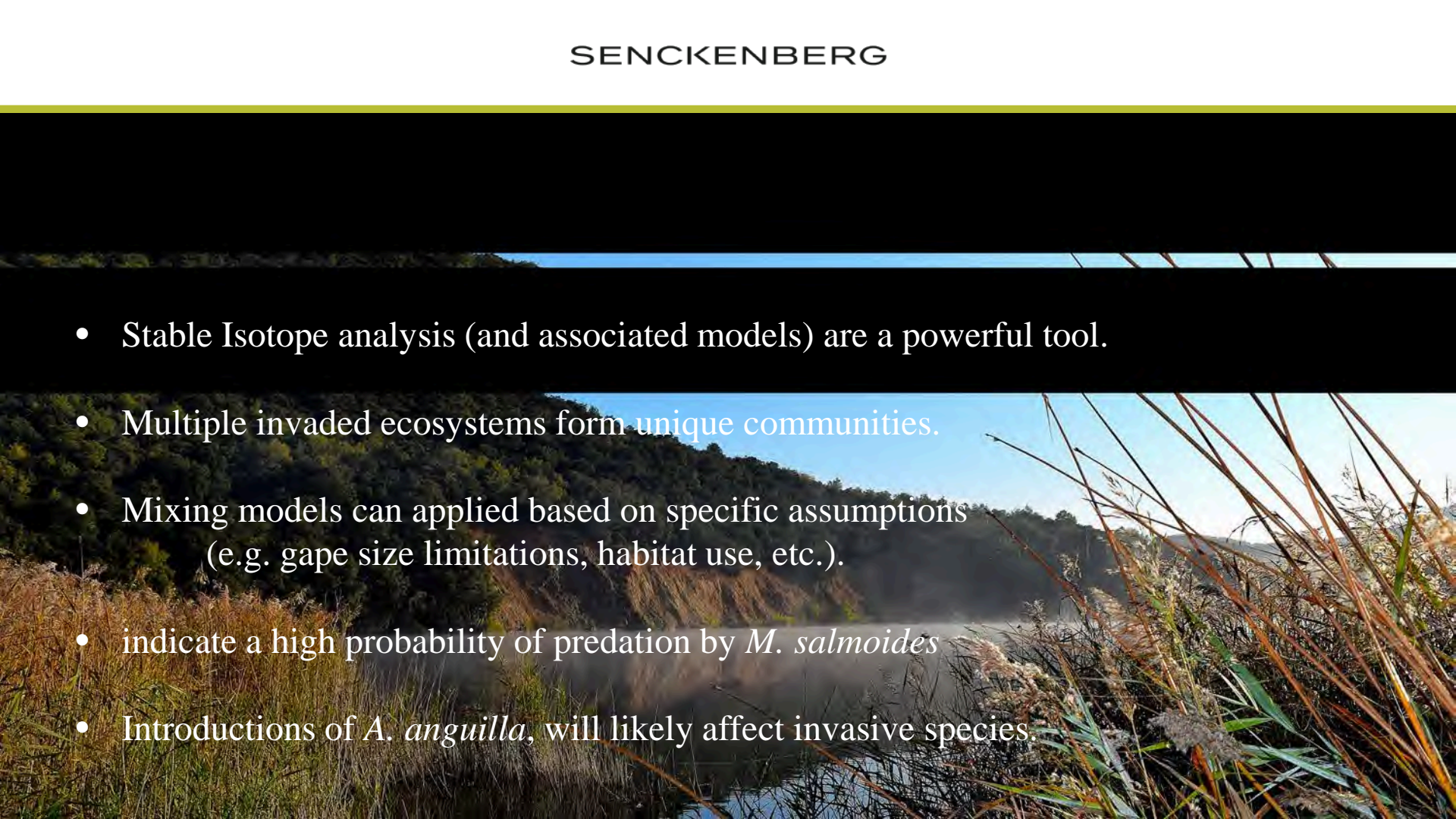   2. introduction of 1000 individuals of *A. anguilla*

Assumption:
    1. potential prey abundances reflecting abundances from last monitoring
    2. *A. anguilla* preying on only juv. fish
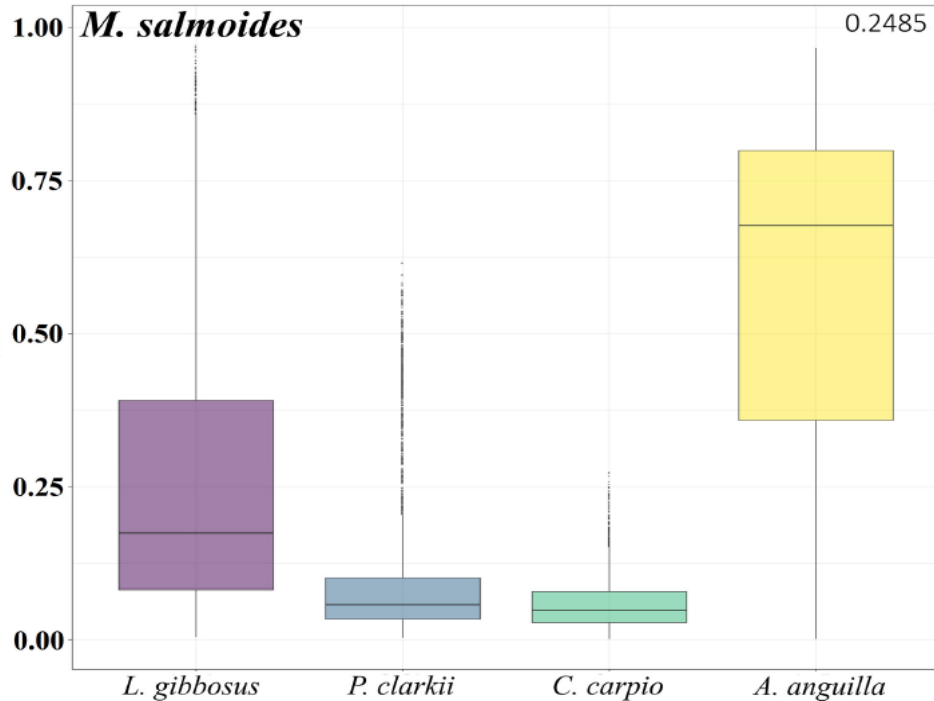
Limited effect due to predation by *M. salmoides*

Highly variable due to prey availability?

- Stable Isotope analysis (and associated models) are a powerful tool.

- Multiple invaded ecosystems form unique communities.

- Mixing models can applied based on specific assumptions (e.g. gape size limitations, habitat use, etc.).

- indicate a high probability of predation by *M. salmoides*

- Introductions of *A. anguilla,* will likely affect invasive species.

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Thank you for your Attention

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