MSc colloquium <Dec 14>

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Ecology conservation track

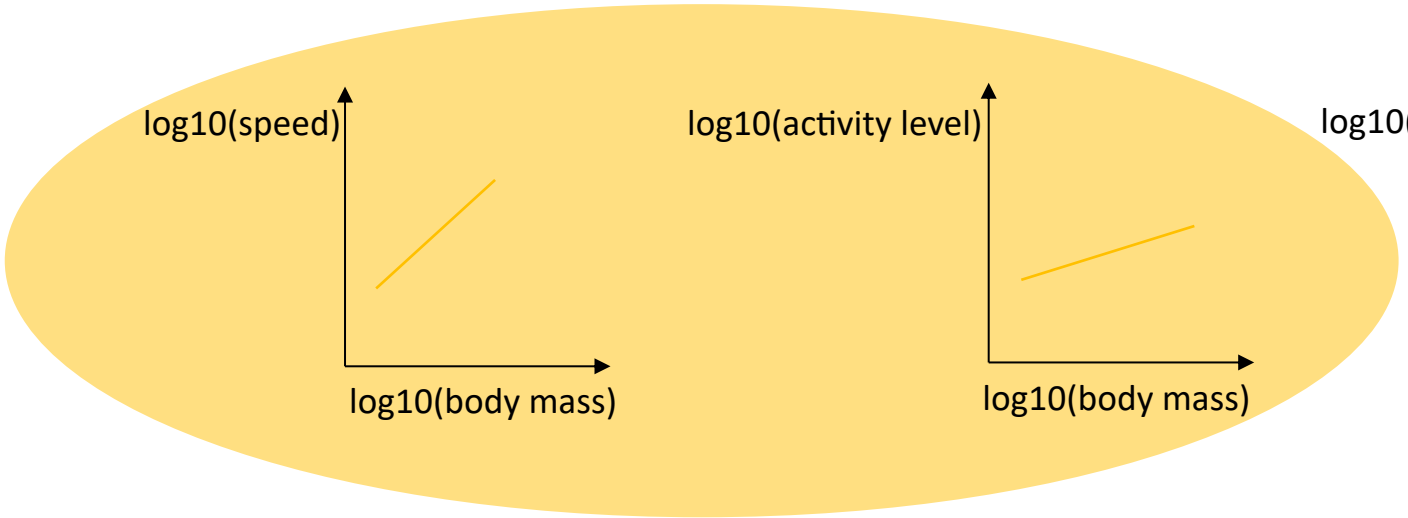
Supervisor: Marion Nicolaus

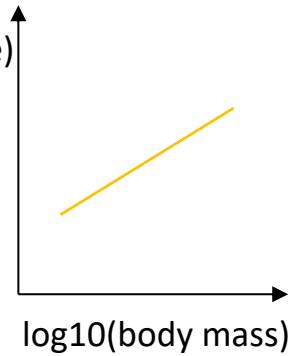
Does animal personality affect the passage success in fishway?

Inspiration from last project: correction model for camera trap rate

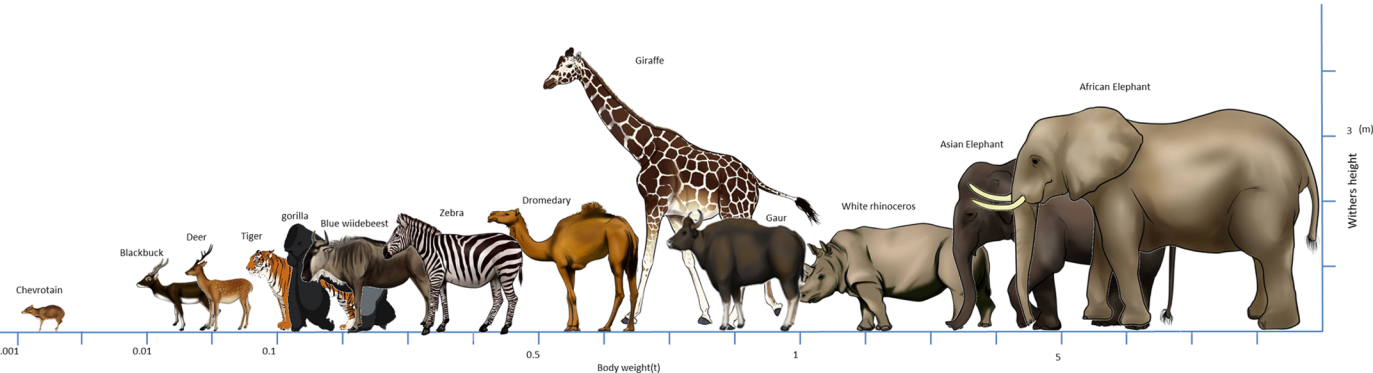
$$\lambda_{new} = \lambda_{ori} / C^* M^{s+a+d}$$

camera trap rate → (proportional to) animal density

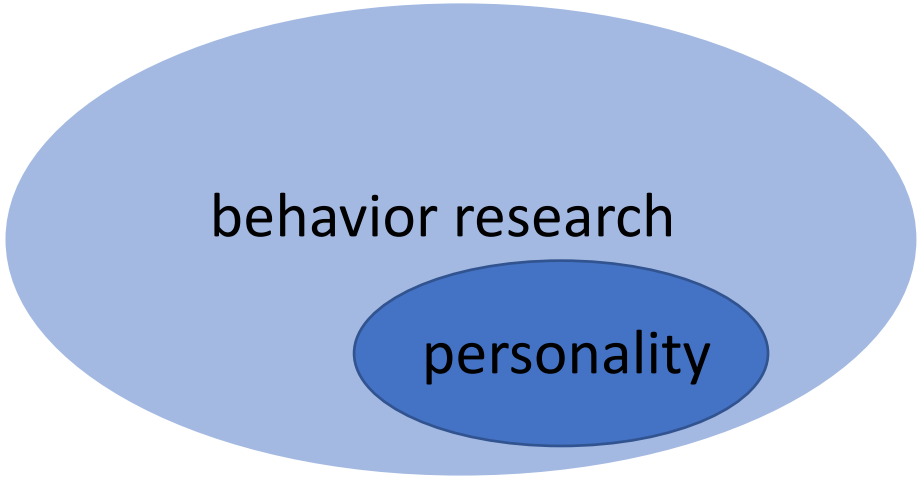




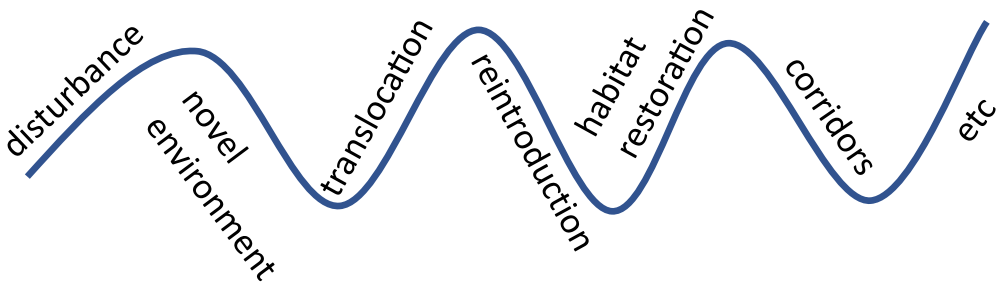
behavior → sampling rate

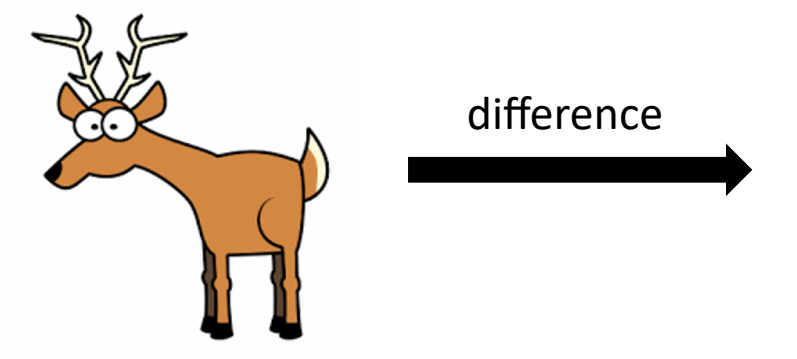


Personality & sampling bias



Personality:
Behavioural differences among individuals that are consistent through time and across contexts (Wolf et al., 2007).





Personality & sampling bias

Merrick et al., 2017

passive sampling

active sampling

?

?

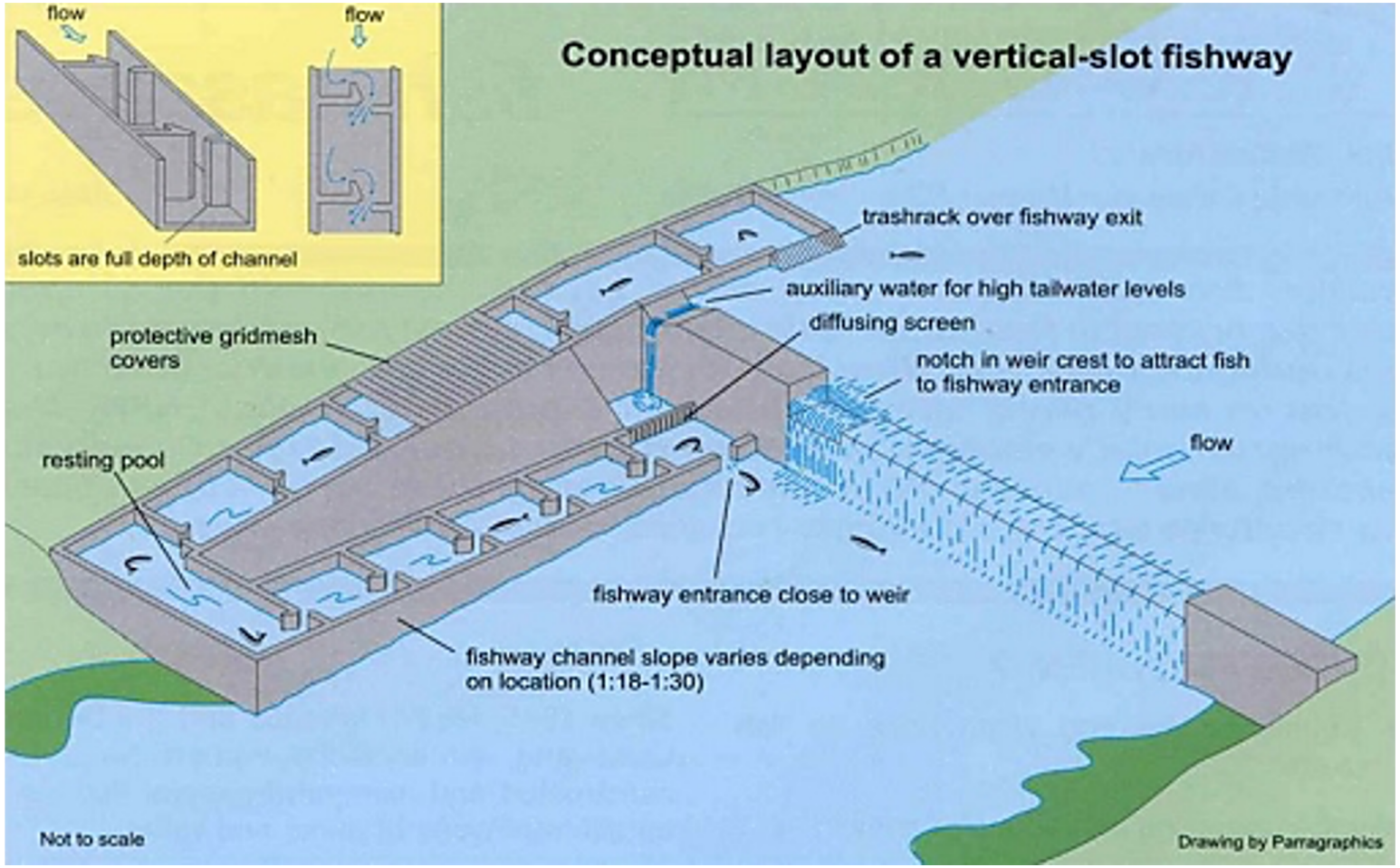
rock agama (*Agama planiceps*)

red squirre (*Tamiasciurus hudsonicus*)

pumpkinseed sunfish (*Lepomis gibbosus)*

Application on wildlife conservation

Personality difference → Sampling bias → real-life application → fishway



https://www.dpi.nsw.gov.au/fishing/habitat/rehabilitating/fishways

Fishways are hydraulic structures placed on or around man-made barriers to assist the natural migration of diadromous fish (*Alvarez-Vázquez et al., 2011).*

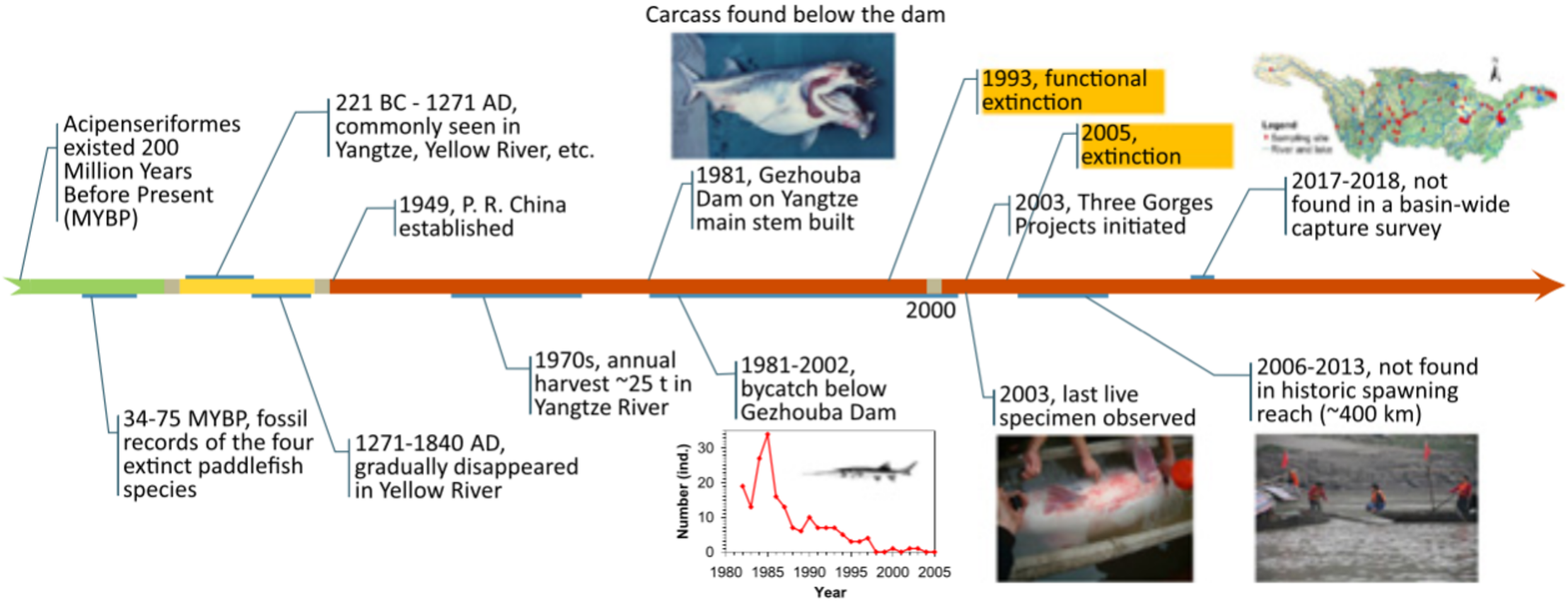
What do dams and weirs do?

©Shutterstock/Gary Saxe

- Alter flows
- Disrupting connectivity
- Changing ecological communities

A negative impact from barriers to wildlife

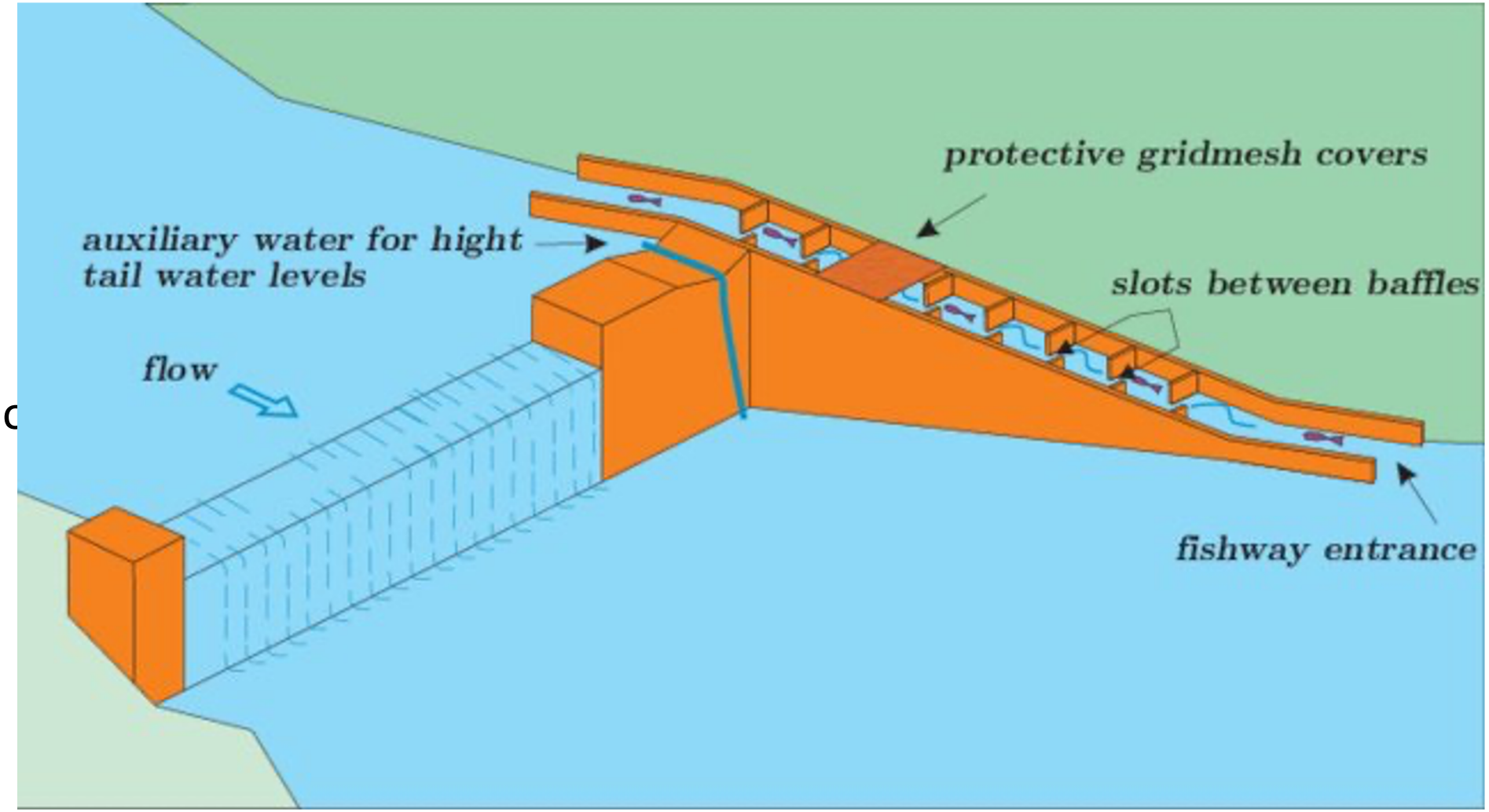
Chinese paddlefish
psephurus gladius



Zhang et al., 2020

How do fishways work?

- Pool-type
  - Denil
  - Lock
  - Trap and Transpo
  - Rock Ramp
  - Bypass
  - Eel



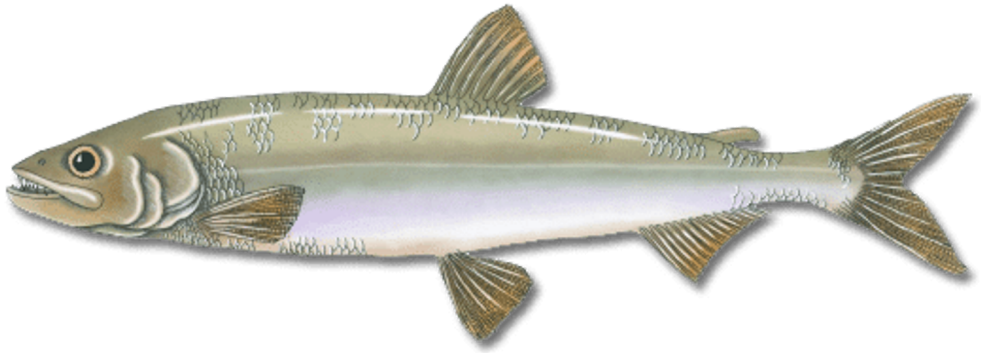
Alvarez-Vázquez et al., 2011

Research question

If and how does animal personality affect the passage success in fishway?

©mindscanner

Method



Website:

- Google scholar
- Web of science
- Google

Key words:

Personality; sampling; fishway; fish passage; dam passage; fish ladder; fish pass

4 studies (2017-2021)

Study 1

American eel (*Anguilla rostrata*)

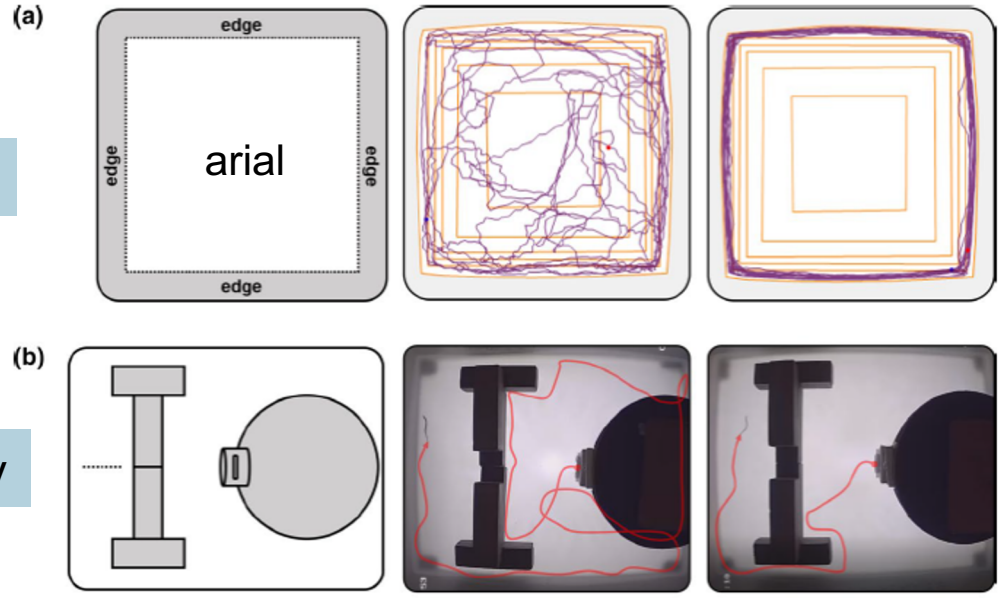
Mensinger et al., 2021

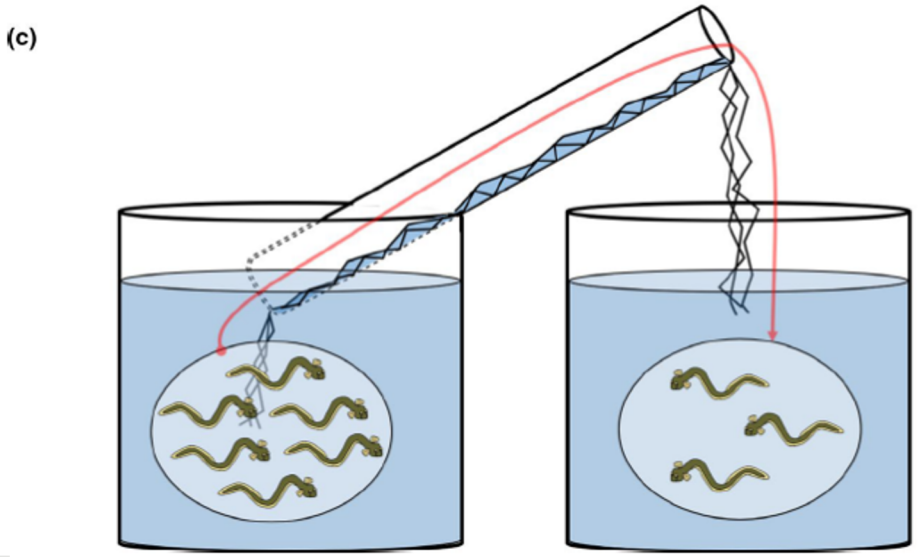
© Duane Raver

Open field assay

Emergence assay

- boldness
- exploratory activity





Assessment	Observations per fish 3	2	1	Total fish[a]
Open field	59	2	0	61
Emergence	60	1	0	61
Climb binary	59	0	0	59
Climbing time	2	6	11	19

Behaviour

mean speed

time along edge

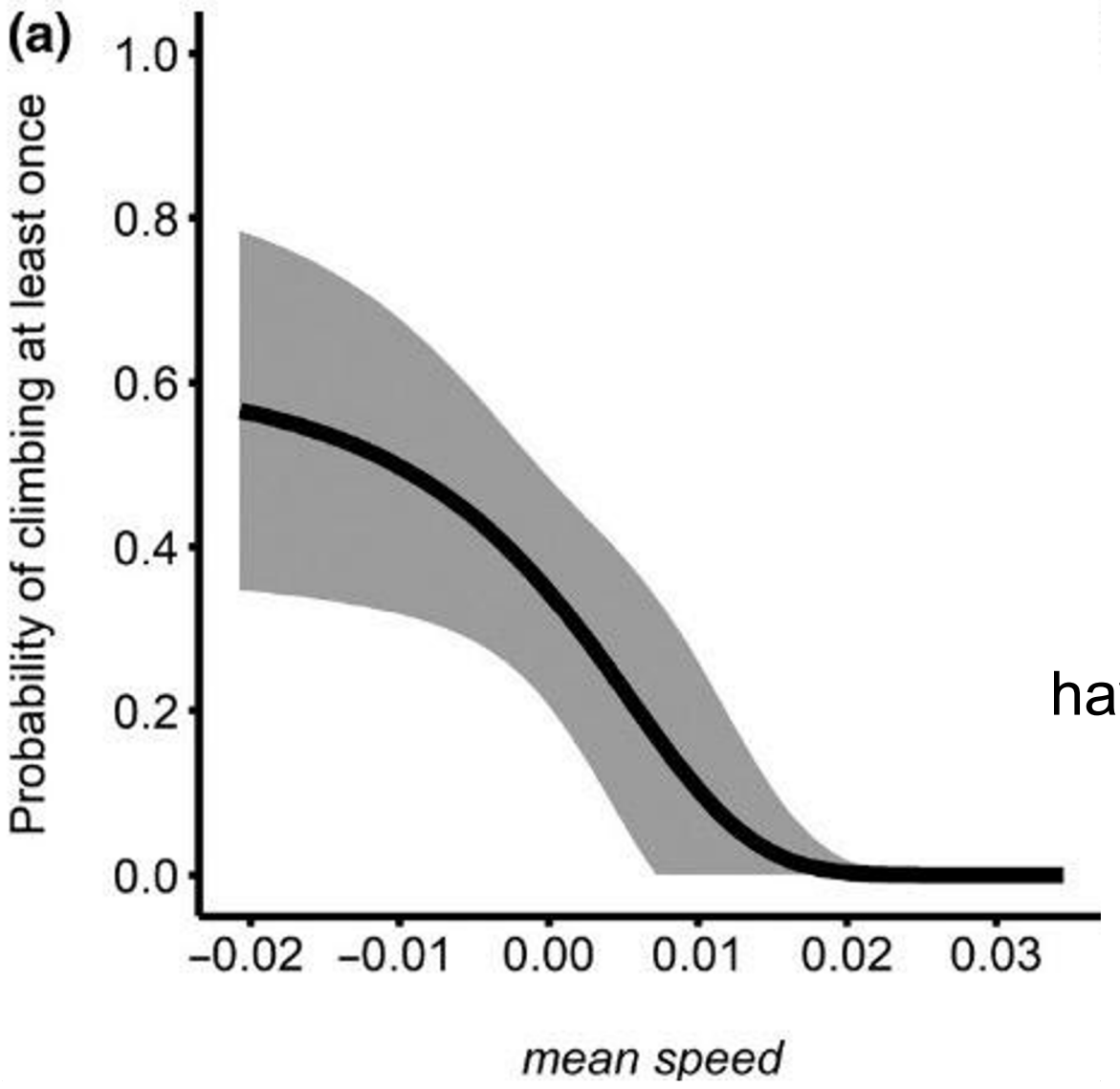
escape attempts

binary emergence

emergence time

exploration time

Study 1



More exploratory (slow swimmers)

have a higher propensity to use the fishway

Study 2

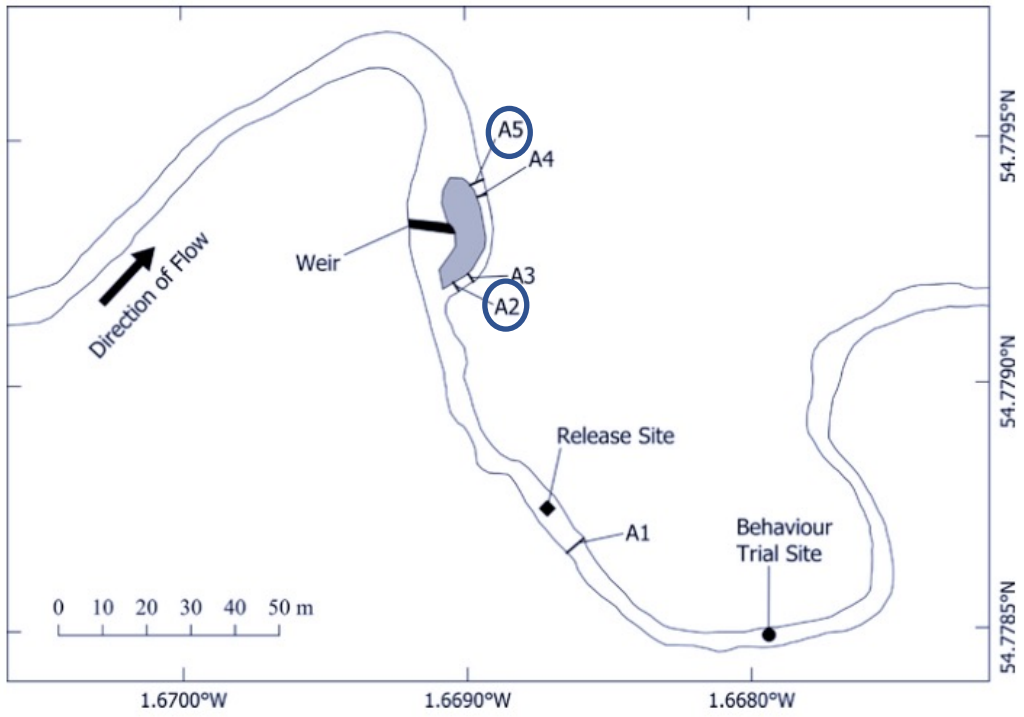
Brown trout (*Salmo trutta; n1=78 individuals; n2=12 individuals)*

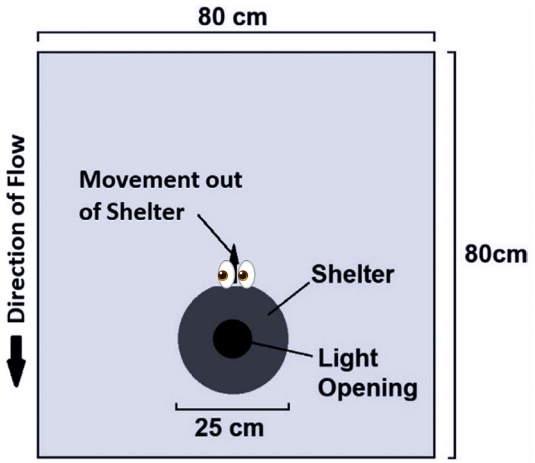
Lothian et al., 2021

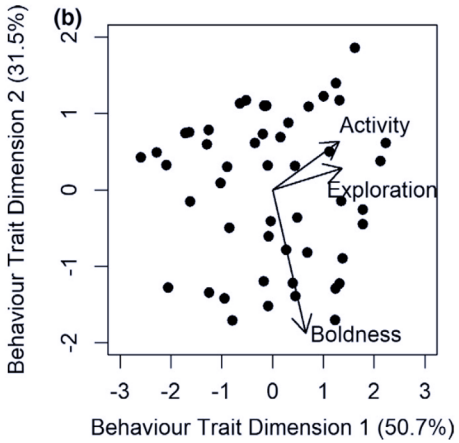
Bypass fishway

© Aller Aqua Group

- Boldness trial—shelter departure latency
- Exploration trial—area of enclosure explored
- Activity trial—time spent active







Plan view of behavior trial enclosure

- exploration-activity
- boldness

Study 2

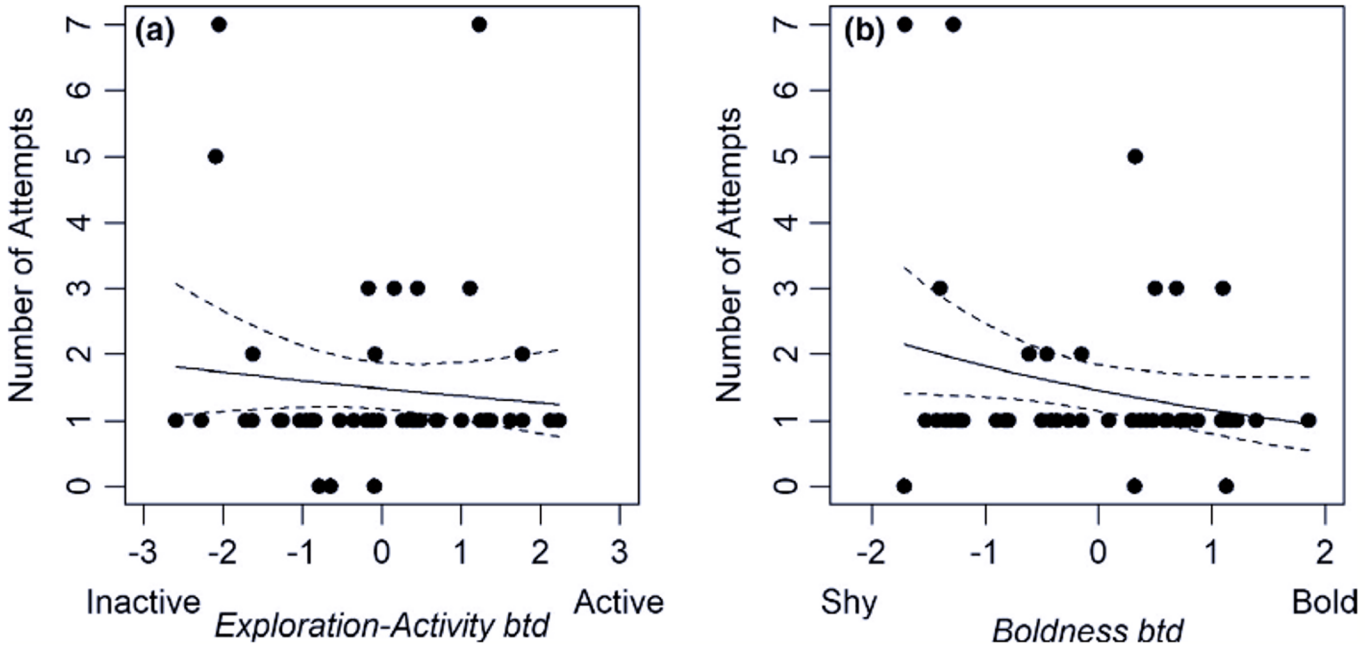
bolder & active individuals

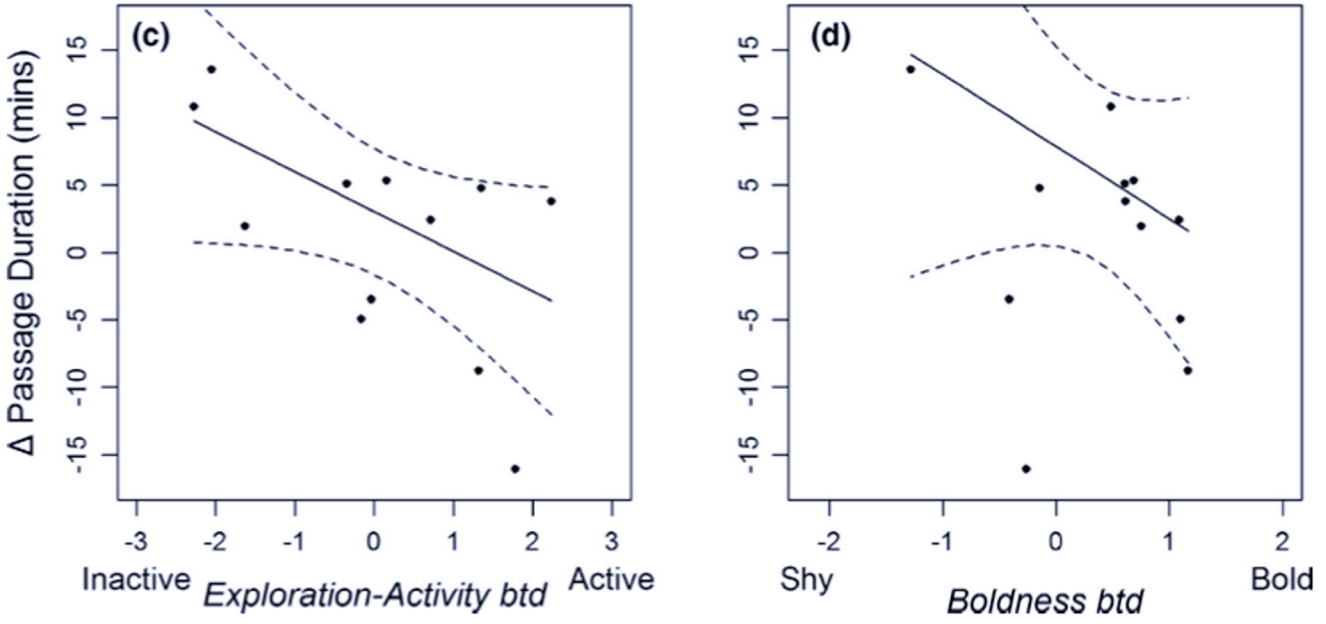
fewer attempts

increased probability of succeeding in passage

exploratory & active individuals

pass quicker on the second passage

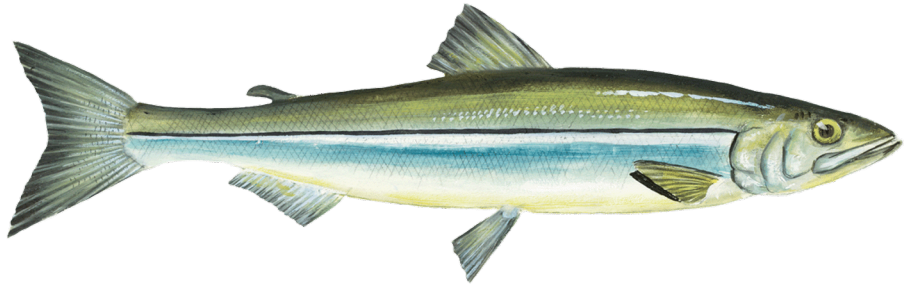




Study 3

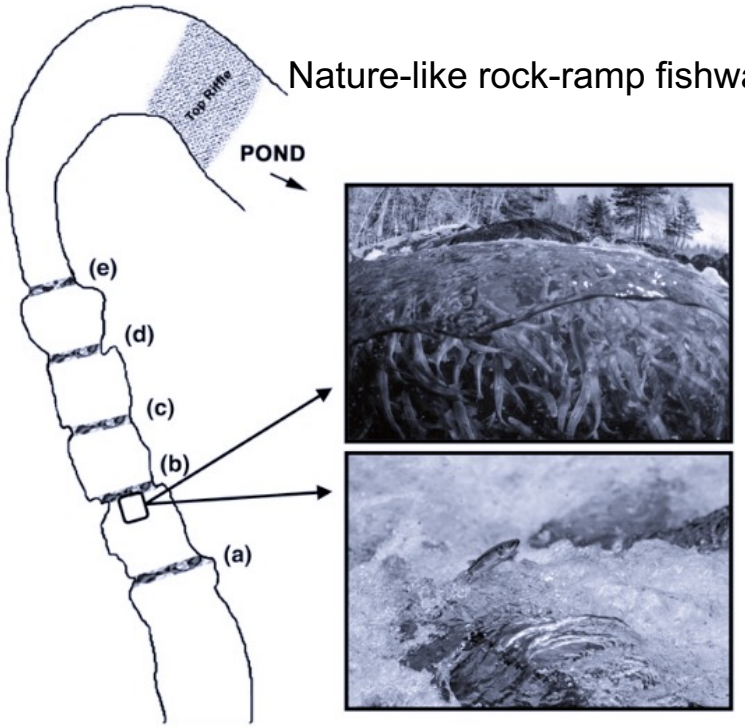
Rainbow smelt (*Osmerus mordax;* n1=276 individuals; n2=40 individuals)

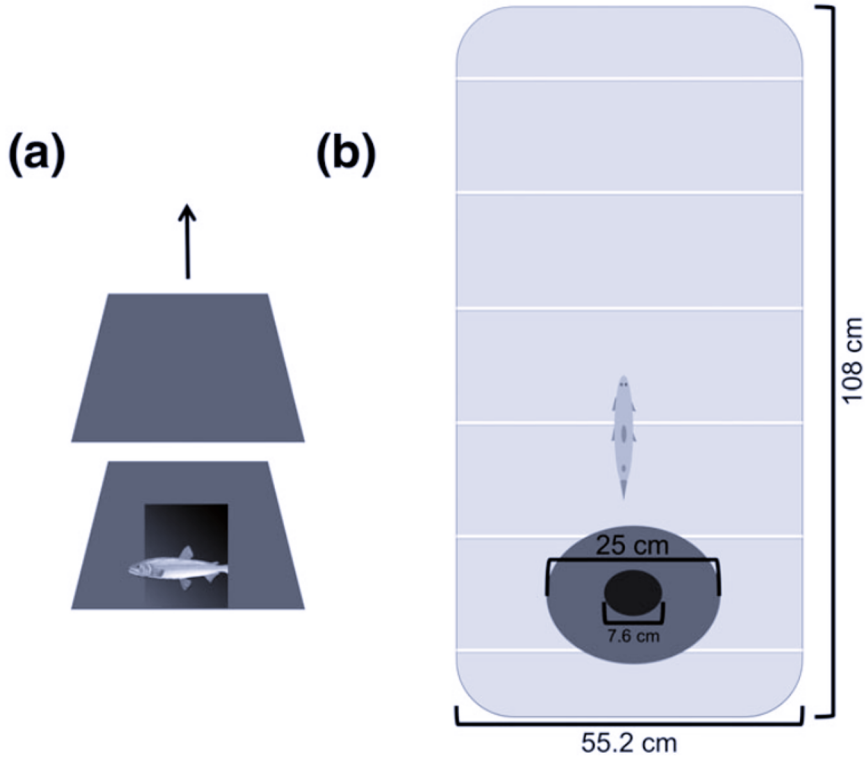
Landsman et al., 2017



https://www.seafoodwatch.org/recommendation/smelt/rainbow-smelt-1802

bold-shy
- Refuge departure latency
- activity
- predator avoidance



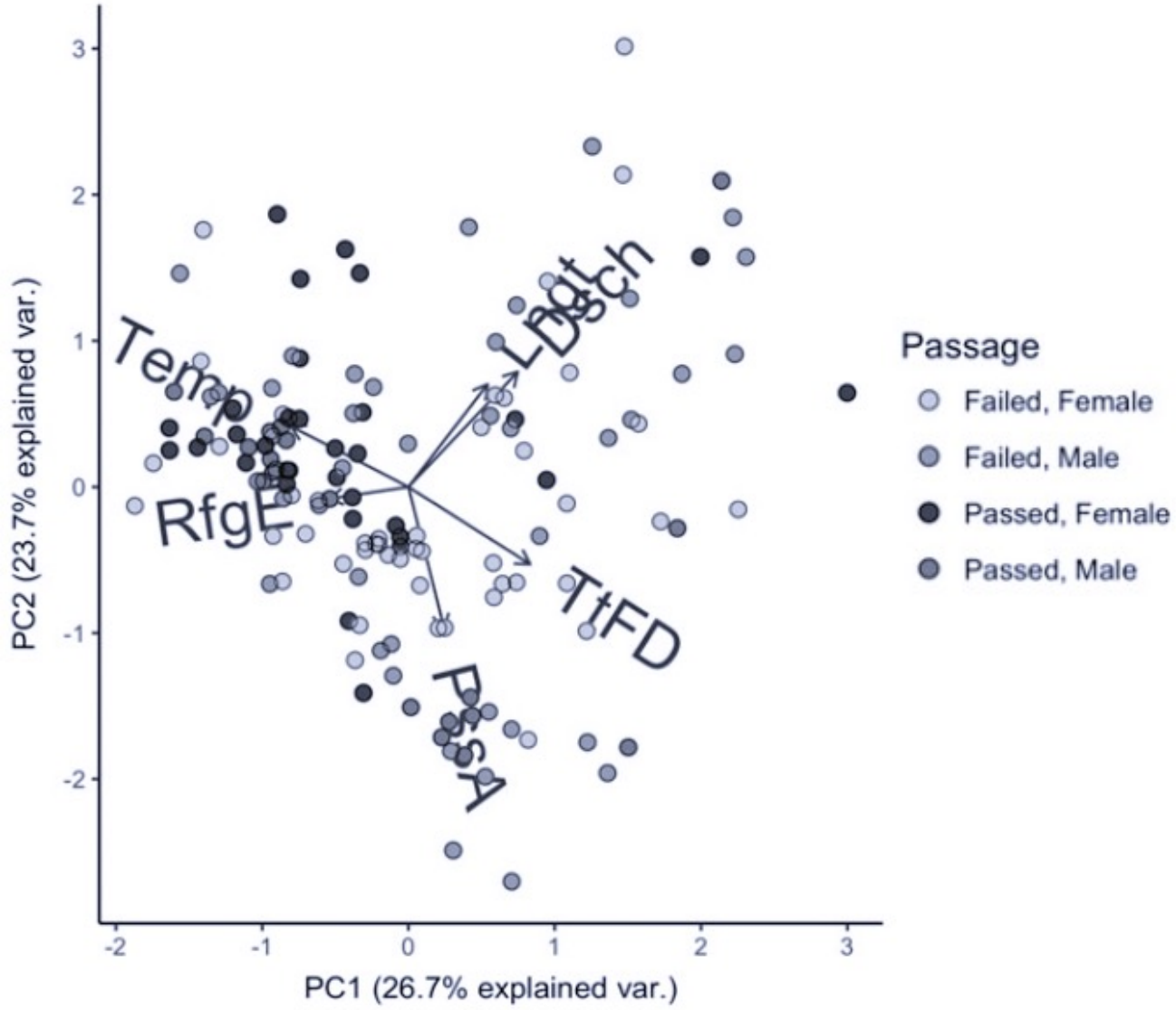


Study 3

boldness ☹️

increasing water temperature

decreasing river discharge



Study 4

Round goby (*Neogobius melanostomus; n=259 individuals)*

Nonmigratory species

https://wiki.fishingplanet.com/Round_Goby

Boldness

Asociability

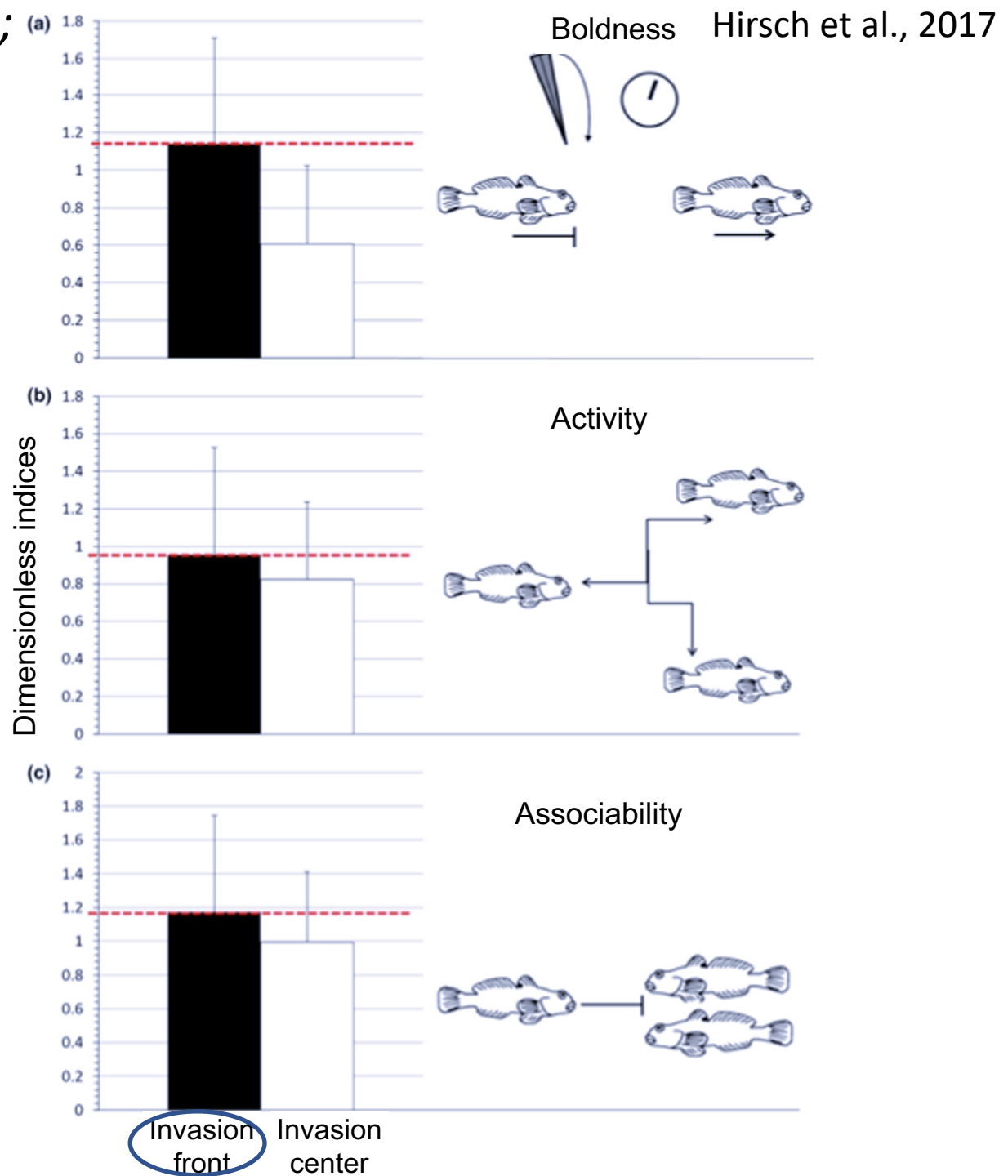
Activity

flow velocity

Prior thresholds

swim speed

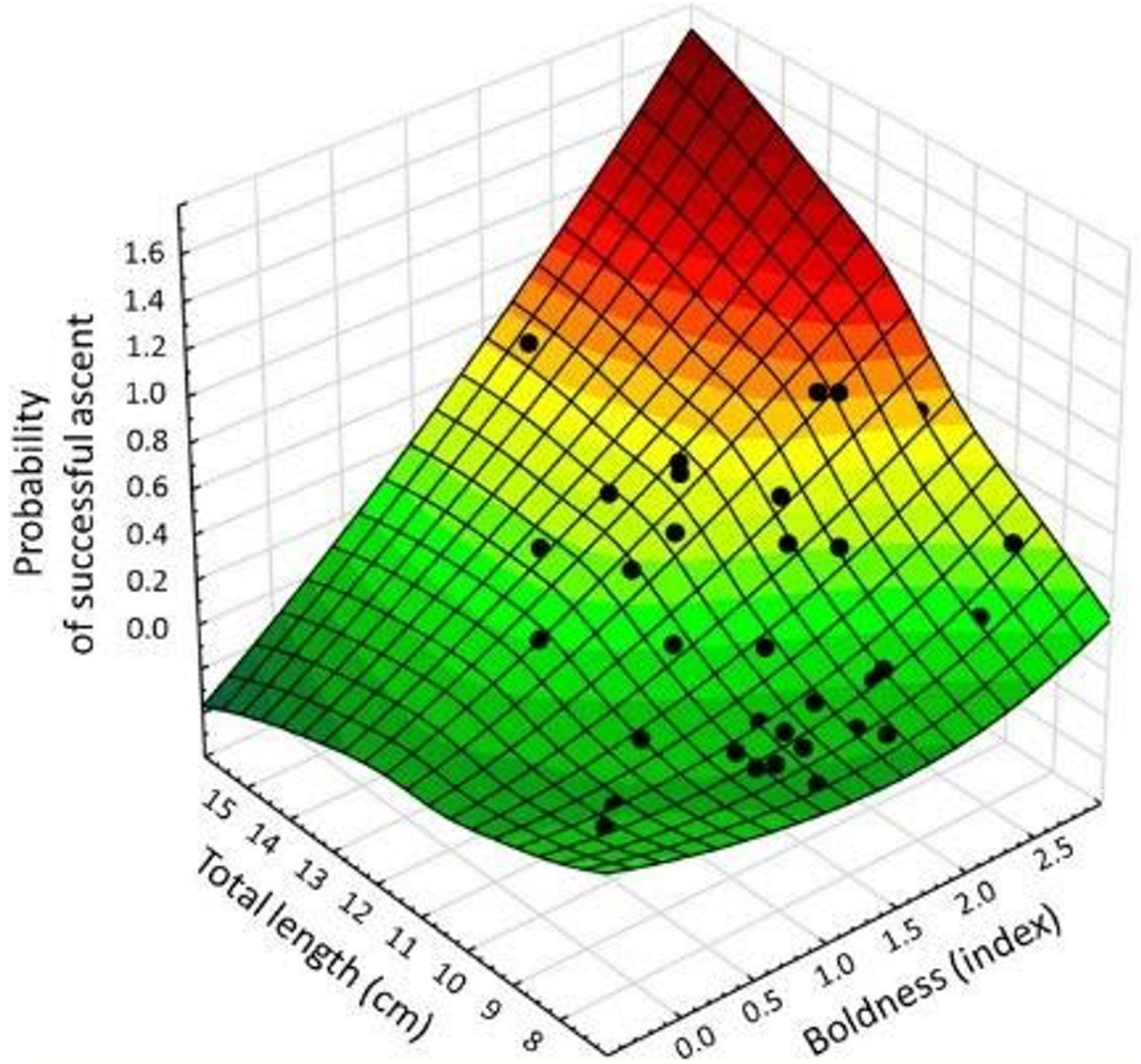
successful ascent



Study 4

larger and bolder individuals

higher success in ascending the bypass



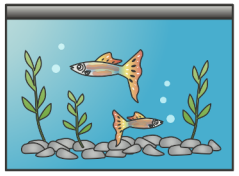
Discussion

- What we found from case studies.
- Implications from the results.
- What can we do?
- Broader implications from this colloquium.

© angel fish

Conclusions from case studies

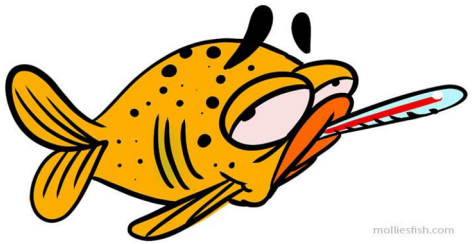
- Bolder/explorer behaviour → higher fishway passing rate
- Weak points from the case studies?
  - limited studies
  - lab/natural experiment
  - threshold assumption
  - migratory/nonmigratory species



vs

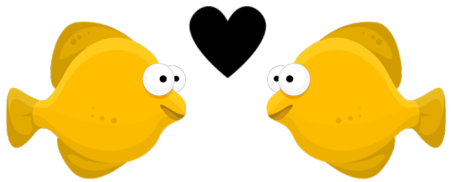
Implications from the results

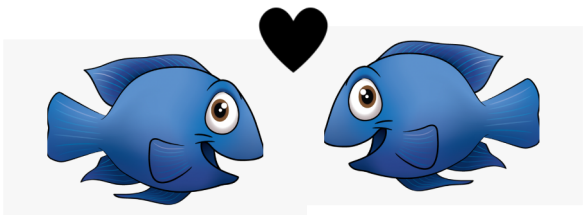
- Unfavorable habitats



- Decrease in population size

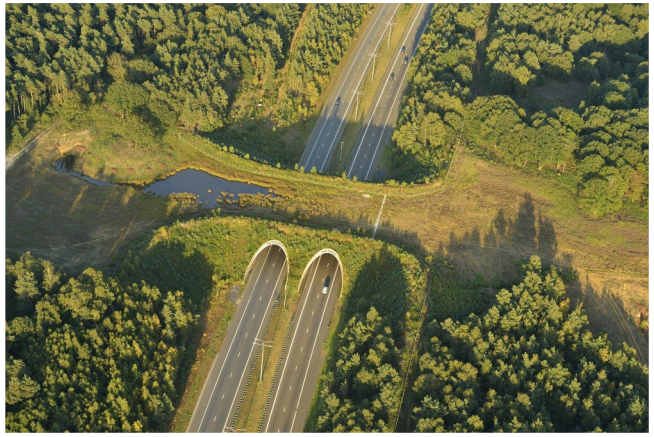
- Depletion of the genetic variation





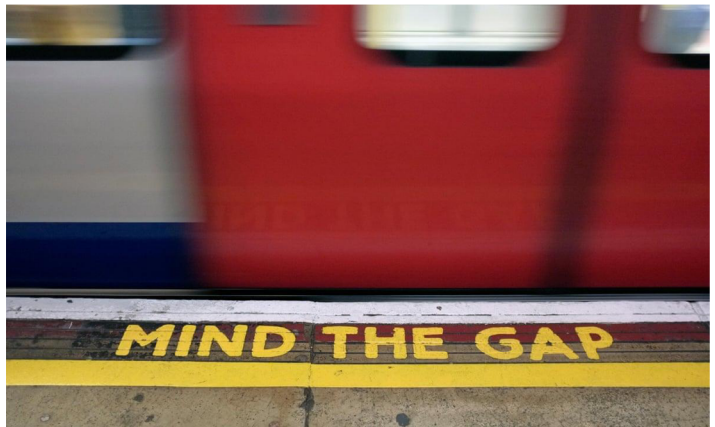
What can we do ?

- Raise the attraction of the fishway when designing



- Compare different types of fishway

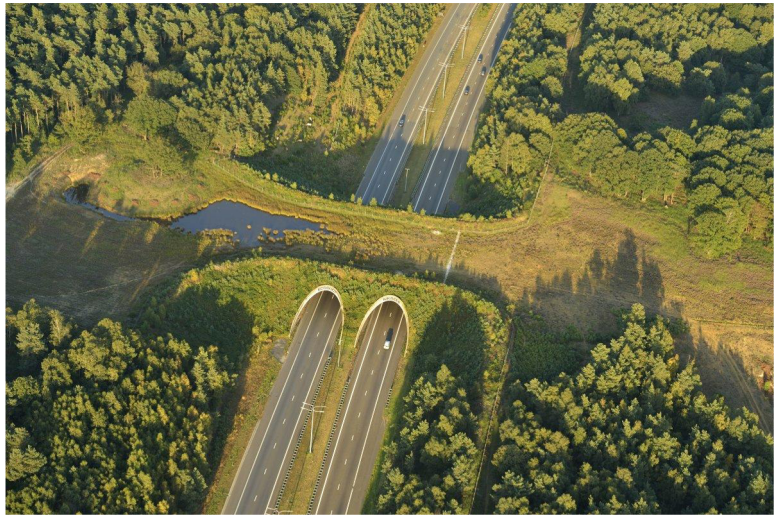
- Include personality into evaluation of anthropogenic barriers



Broader implications from this colloquium

- Not only commercial and endangered species invasive species.

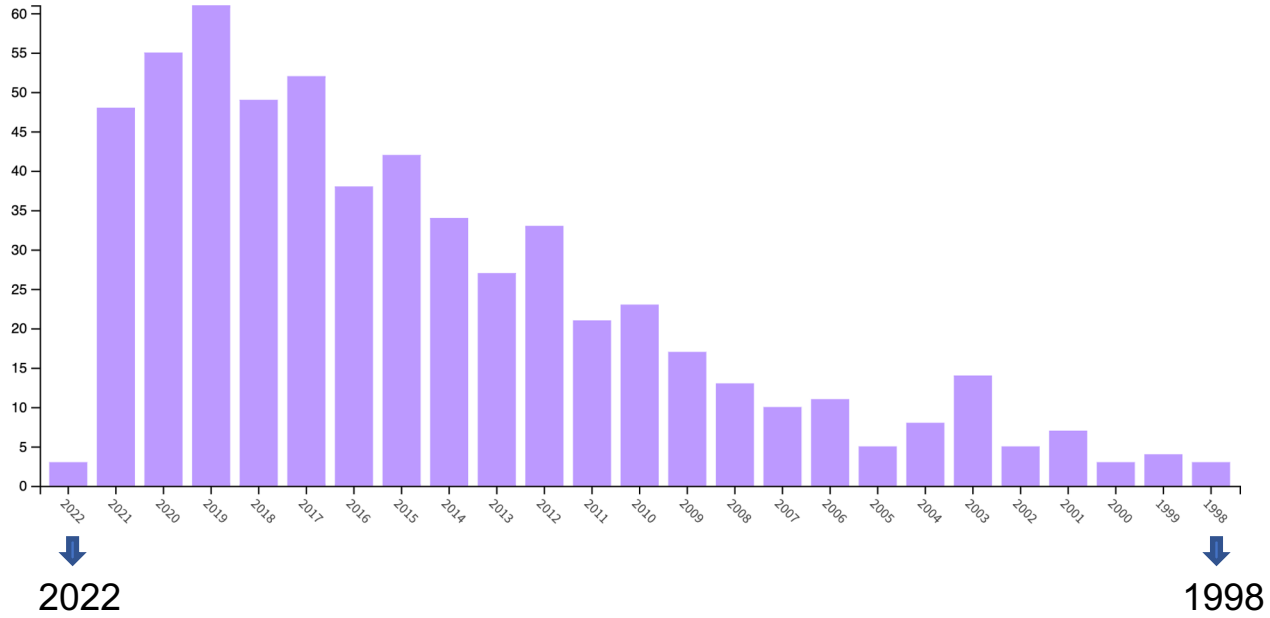
- Terrestrial passage like ecoduct.



- A better understanding between personality and passage bias can be acquired in the future.

Personality & sampling
1998-2022

publications

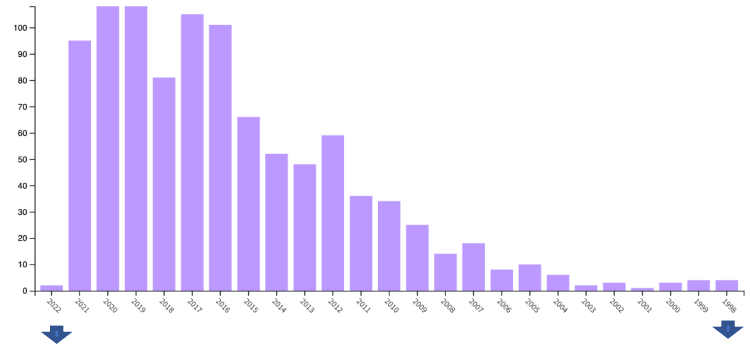


2022

1998

fish & personality
1998-2022

publications

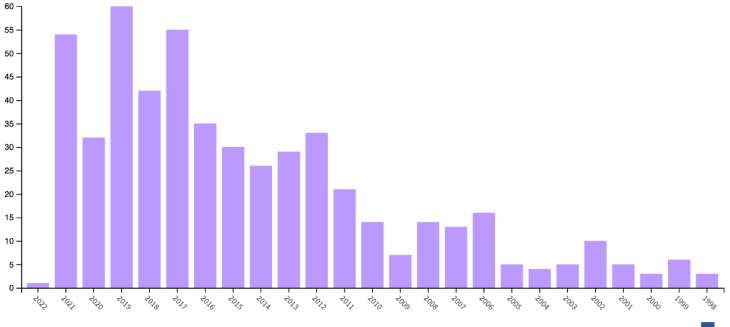


2022

1998

fishway
1998-2022

publications

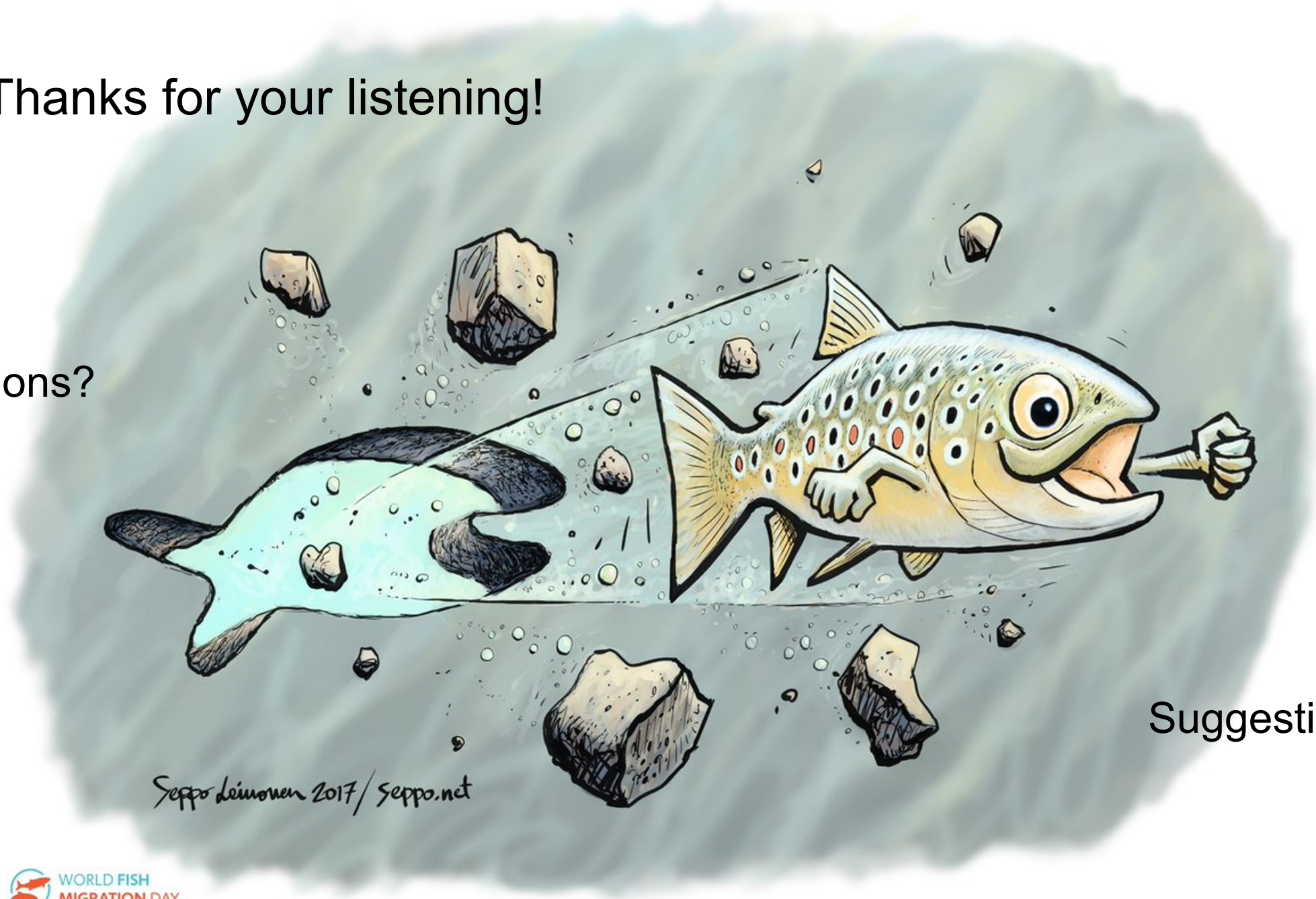


2022

1998

Thanks for your listening!

Questions?



Suggestions?

WORLD FISH MIGRATION DAY