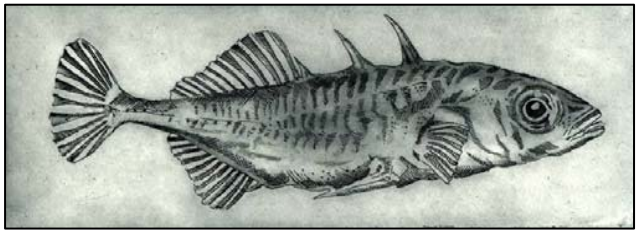
Cognition and Decision Making in Non-Primate Animals

Victoria Braithwaite



Decisions, decisions….

Which mate?

Where to forage? What to eat? How do I avoid being eaten?

Decisions can be simple - stimulus response
e.g. escape responses

Or, they can be more complex
- integrate different types of information / compare with remembered events / decide on most appropriate response

☐Food storing birds

What, where, when - episodic memory

Clark's nutcracker

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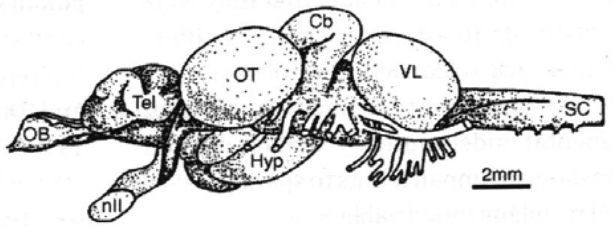
Mexican jay

Fish are an excellent model organism for cognition studies:

General vertebrate plan
but simplified



Despite the simplicity…

- They still generate mental representations such as maps

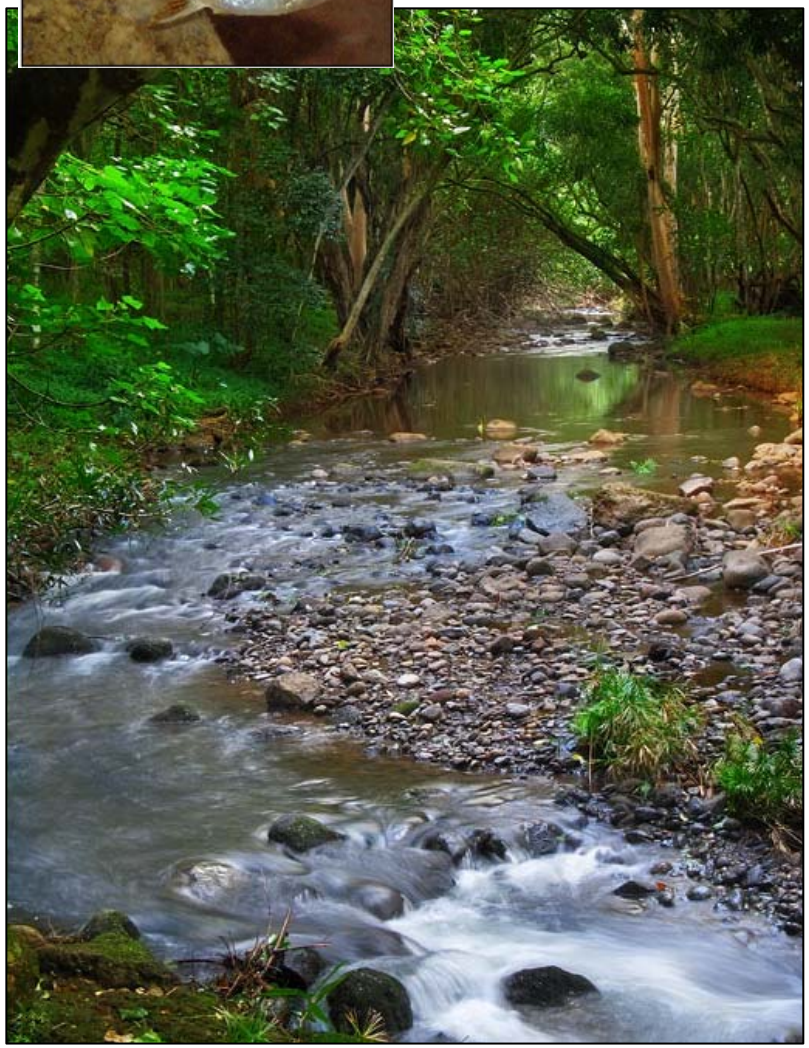
- They integrate different modes of information
  e.g. time and place information

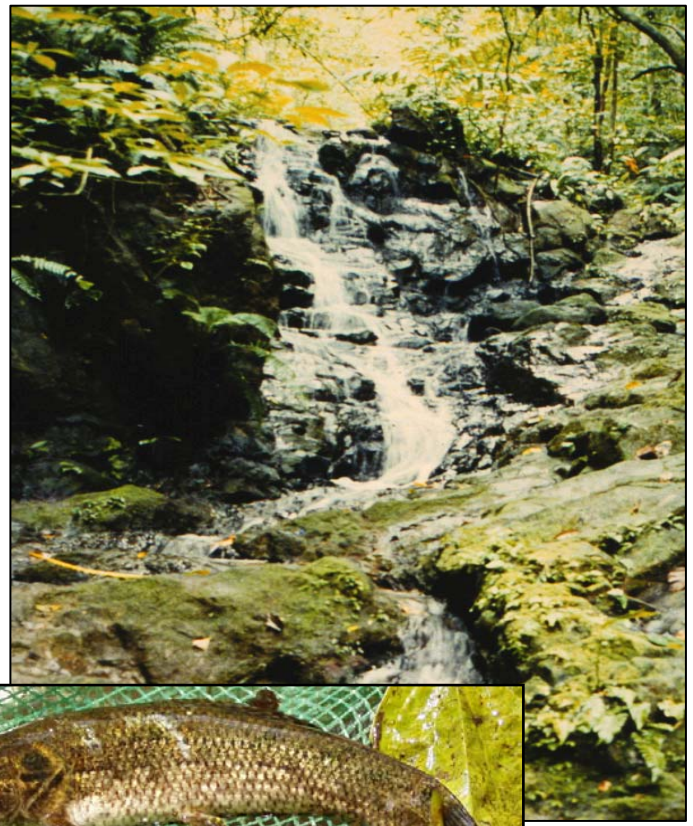
- They show hemisphere lateralization

- They exhibit different ‘personalities’ - risk prone / bold vs. risk averse / timid

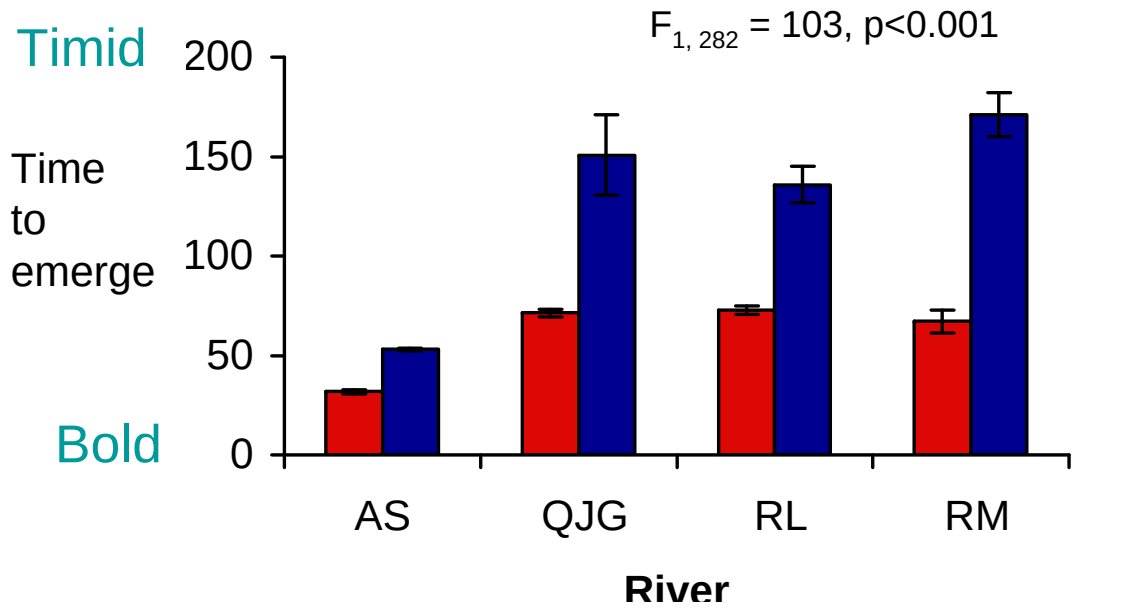
How does living in a dangerous environment affect how animals make decisions?

Panamanian bishop
Brachyrhaphis episcopi



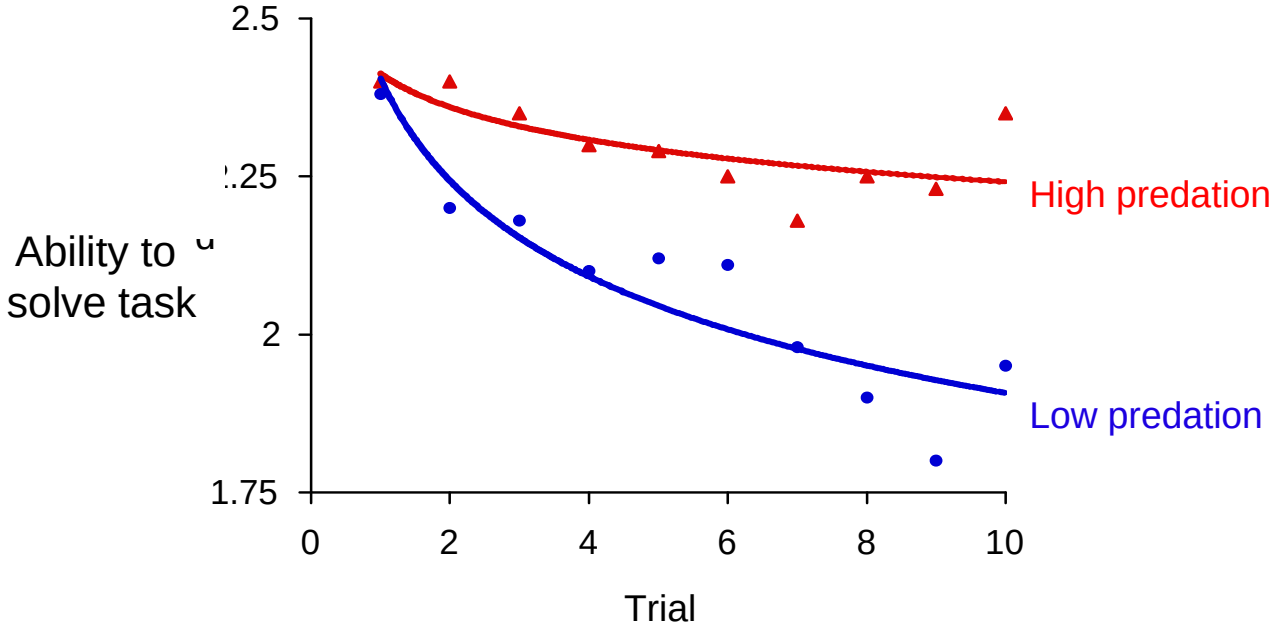


Risk perception



high predation / high risk
low predation / low risk

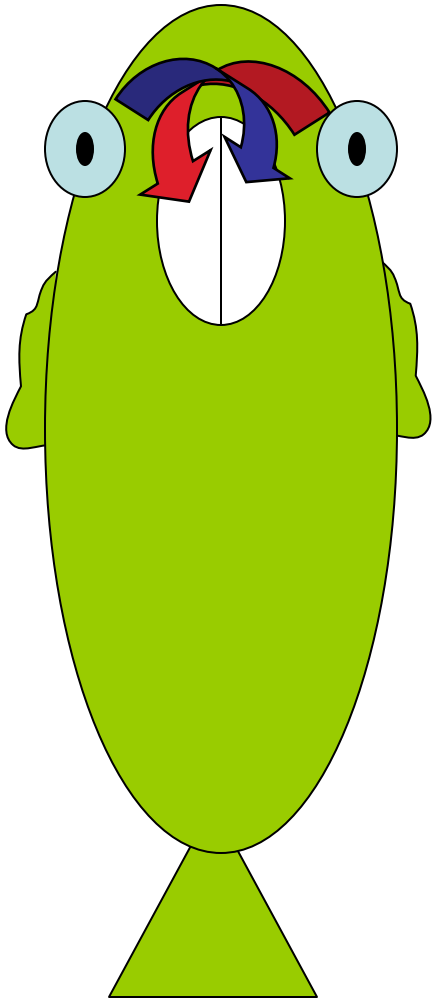
Brown & Braithwaite, 2004

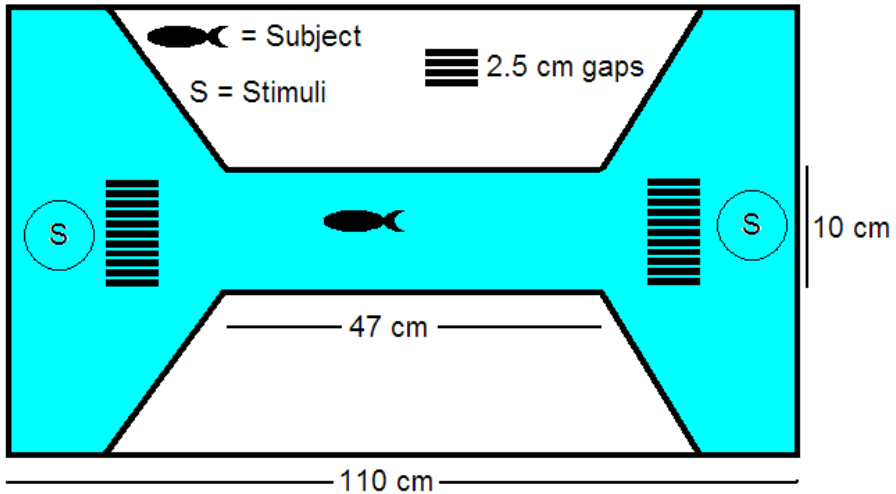


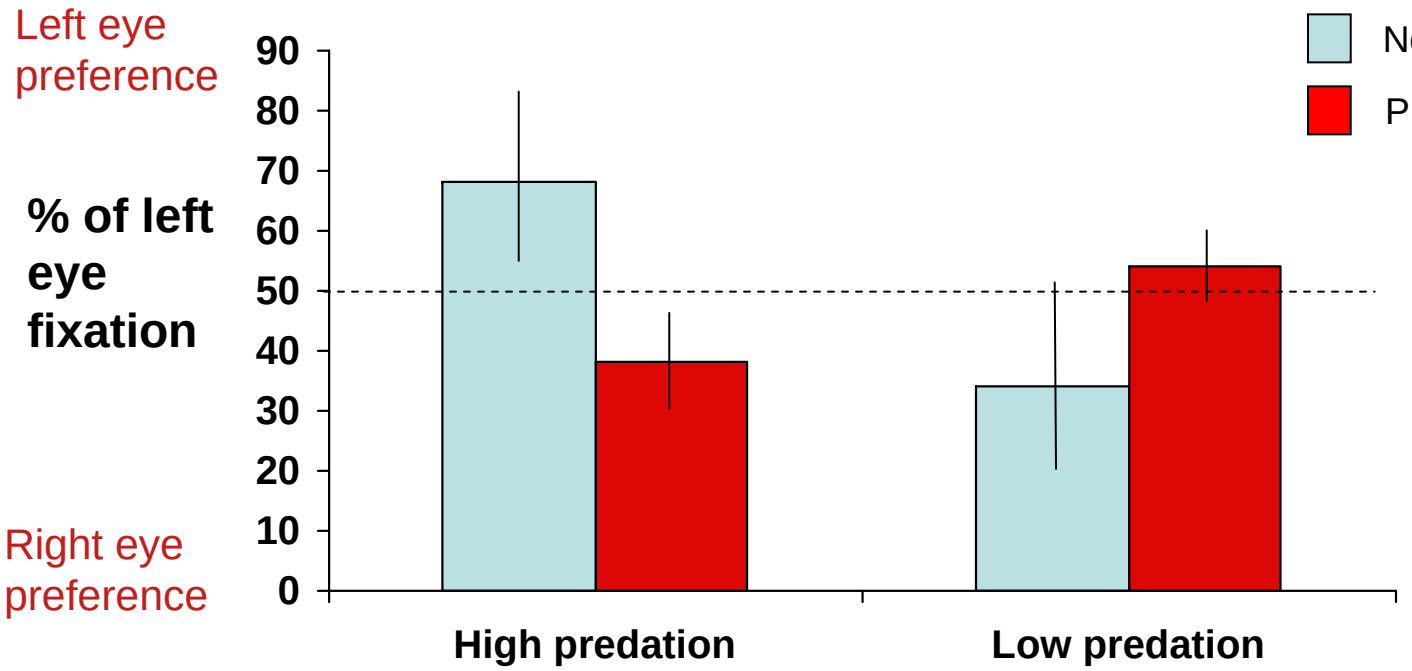
Learning a spatial task

Brown & Braithwaite, 2005

Lateralized visual responses - different use of left and right eyes







Brown, Gardner & Braithwaite 2004

Finding your way…

Finding reliable food sources…
Locating shelter when threatened…
Navigating a safe route home…

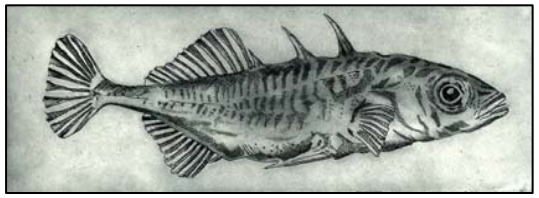
How do animals living in stable or unstable environments solve spatial problems?

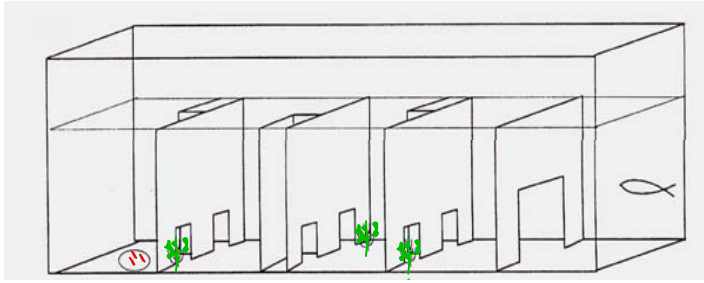
Ponds spatially stable

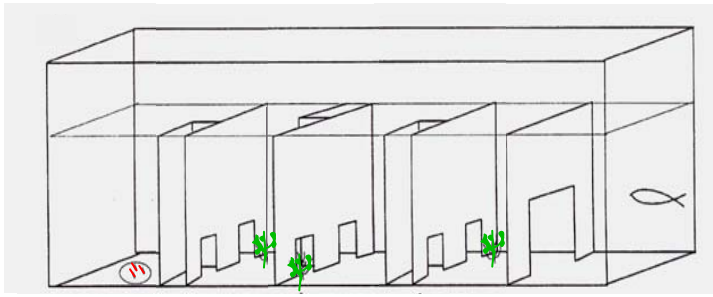
Landmarks

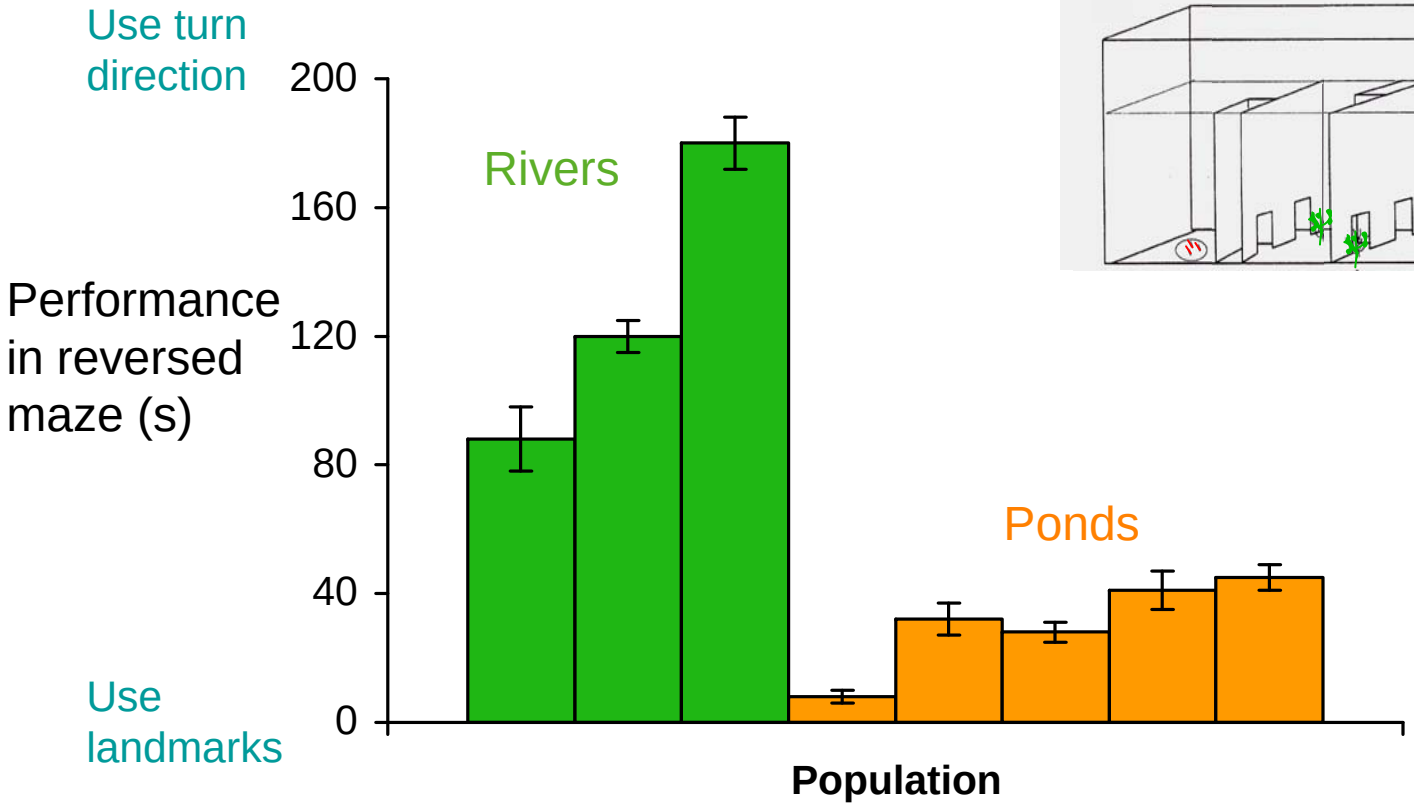
River spatially unstable

Do fish from ponds & rivers solve mazes the same way?





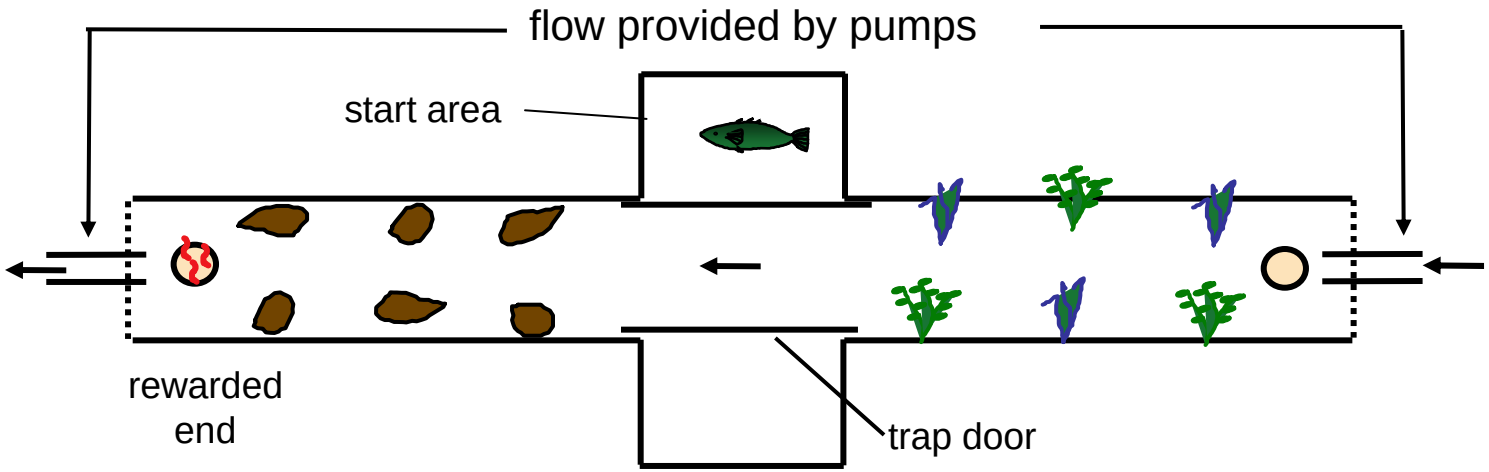


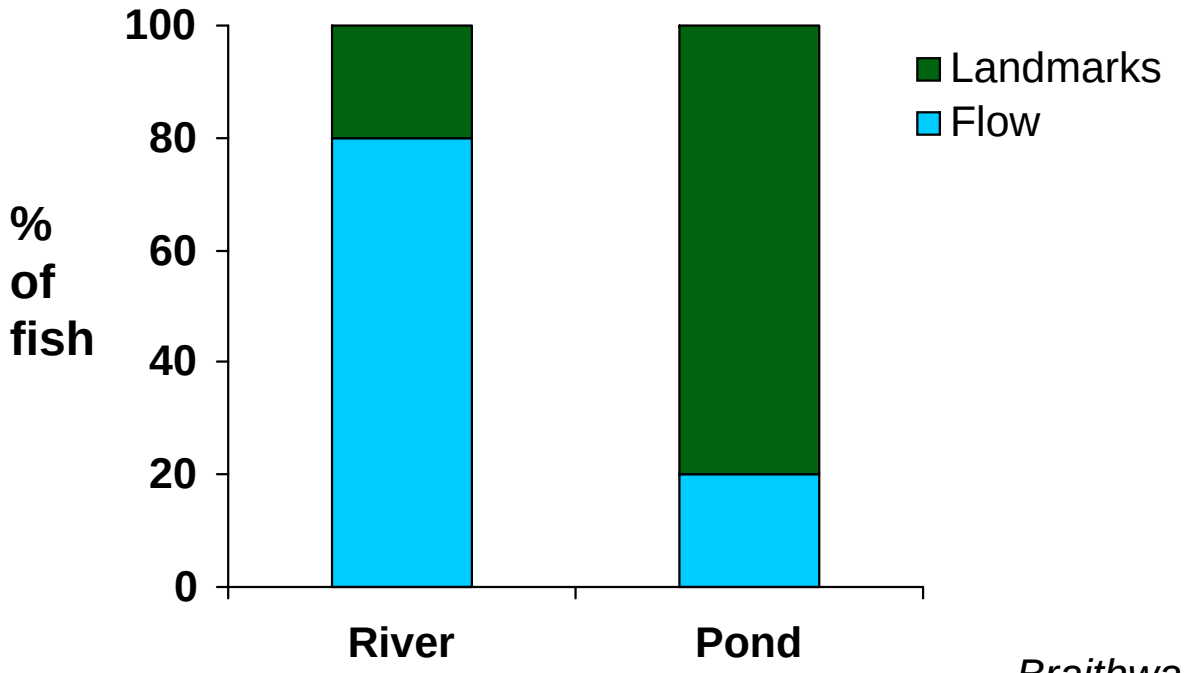


Girvan & Braithwaite 1998

(Girvan & Braithwaite 2001; Odling-Smee & Braithwaite 2003)

2 possible spatial cues: (i) water flow direction or (ii) landmarks

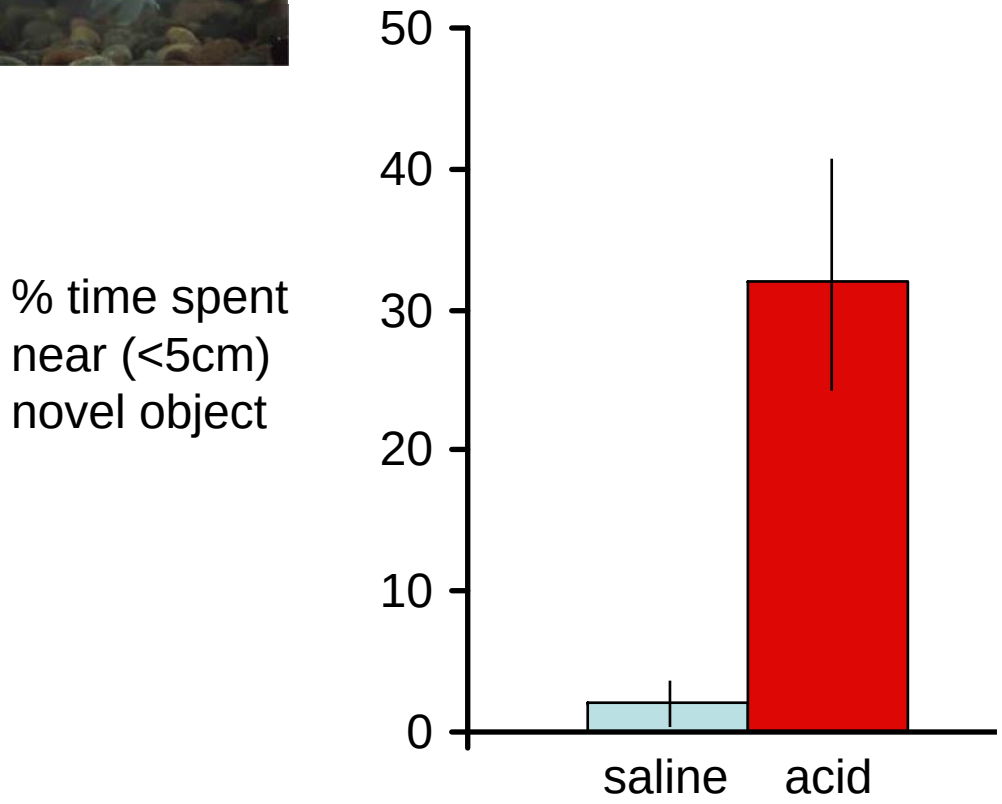




Braithwaite & Girvan 2003

How does coping with a distraction affect decision making?

When fish are experiencing pain their perception of threat changes



Fear of a novel object:

Sneddon, Braithwaite & Gentle 2003b

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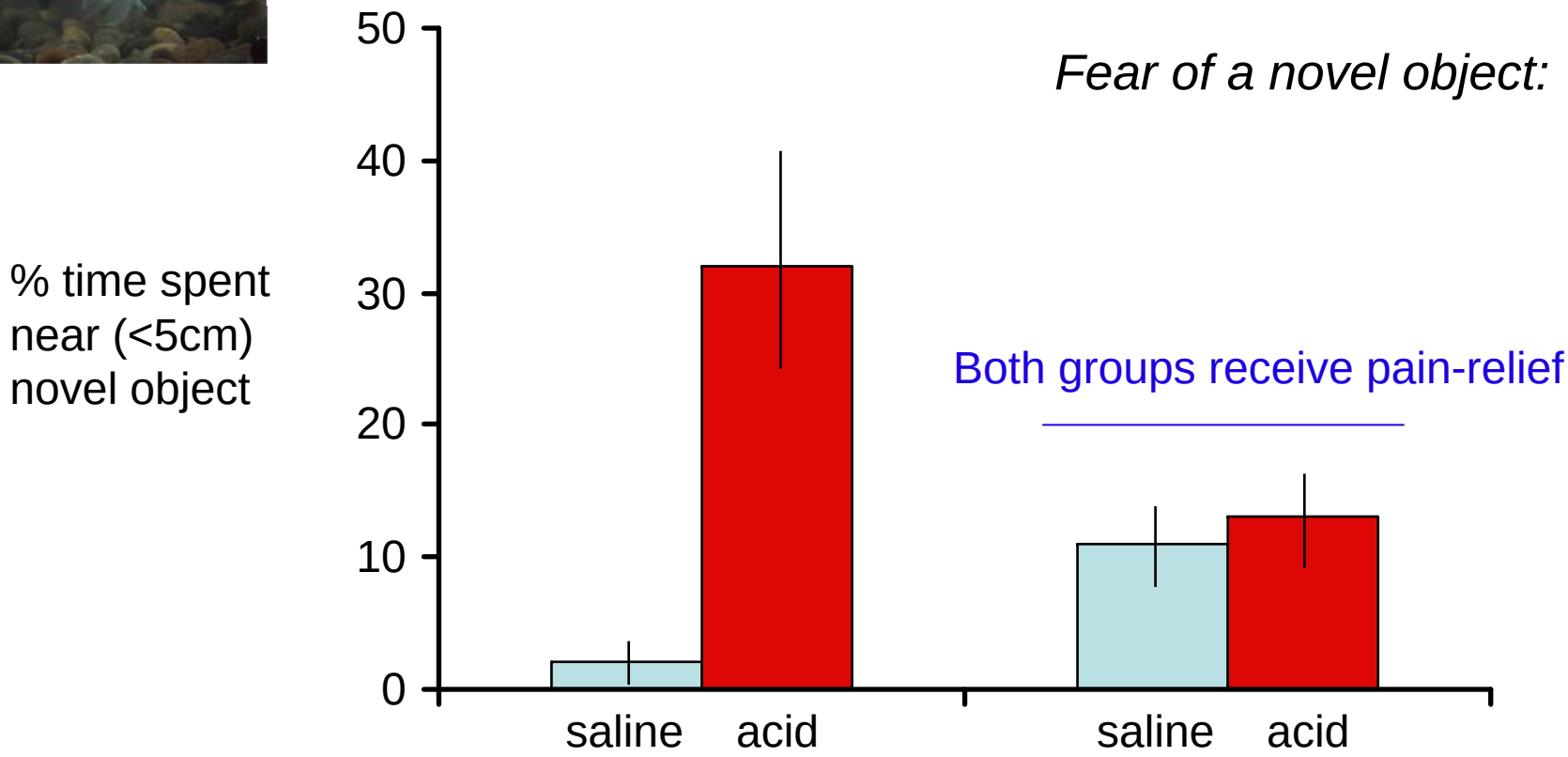


Sneddon, Braithwaite & Gentle 2003b

When do animals pay attention to personal information vs. social information / copy others?

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Risk averse / timid
- learns by
watching others

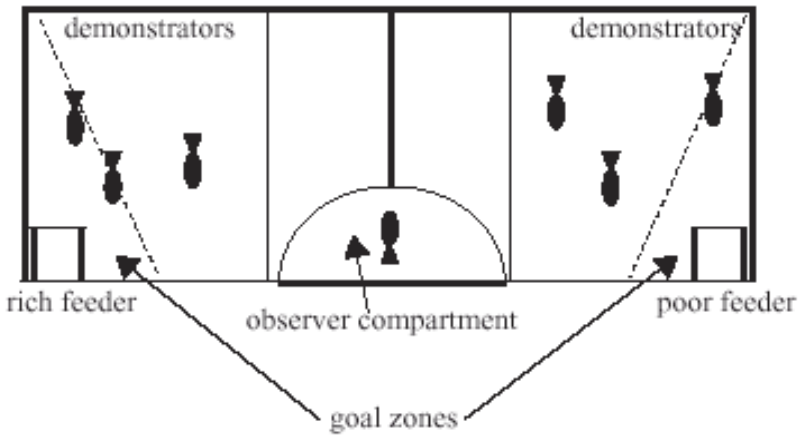


Figure 1. Diagram of the experimental apparatus for the public demonstration periods. Thick lines represent opaque partitions, thin lines represent transparent partitions and dashed lines represent goal-zone delimitations.

Risk prone
/ bold
- learns by
trial & error

Coolen et al. 2003

Animal decisions are affected by:

- The environment in which an animal is making decisions
- Mental state & perceived awareness of the animal
- Personality / temperament traits (bold vs timid)

Current Application:

Manipulating rearing environments of captive reared animals to generate appropriate behavioral flexibility prior to release

E.g.

Studies of animal cognition provide a number of opportunities...

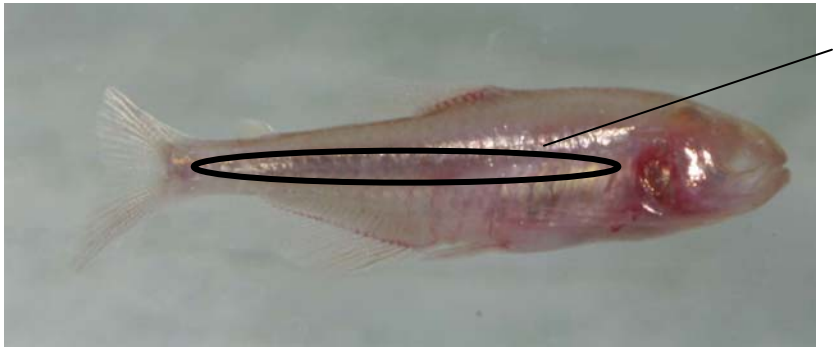
Animals are excellent models to understand risk (physical and cognitive)
….Simplicity of their brains and nervous system an advantage…

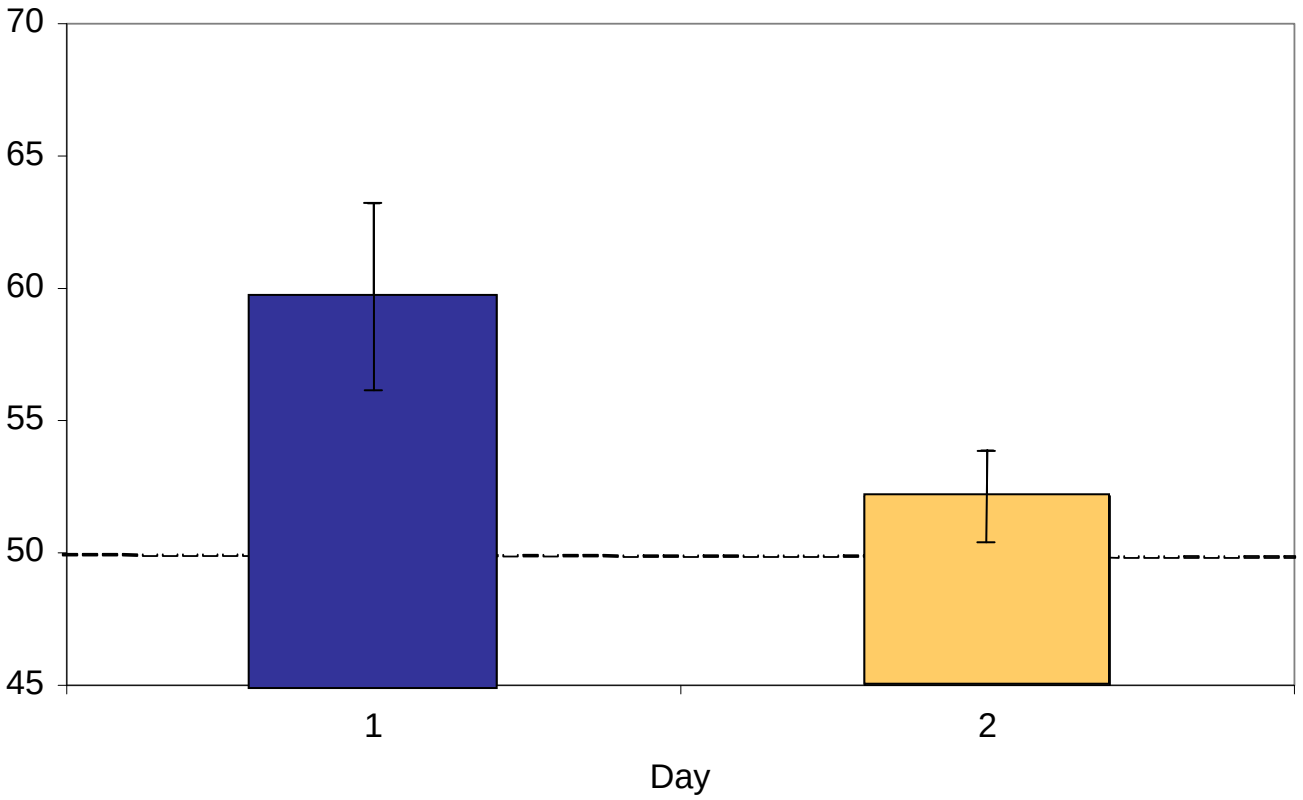
We could use them probe questions about ‘agility’ and ‘resilience’

Particularly we can make use of animals from natural environments
where real selection pressures shape behavior and create solutions

Do we see lateralized responses in other senses?

Blind Mexican cave fish





Burt de Perera & Braithwaite 2005