



How should we conduct fish research in the light of our current knowledge on pain perception?

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Acknowledgements:

Felicity Huntingford

Colin Adams, Sunil Kadri, Tom Pottinger & Jimmy Turnbull

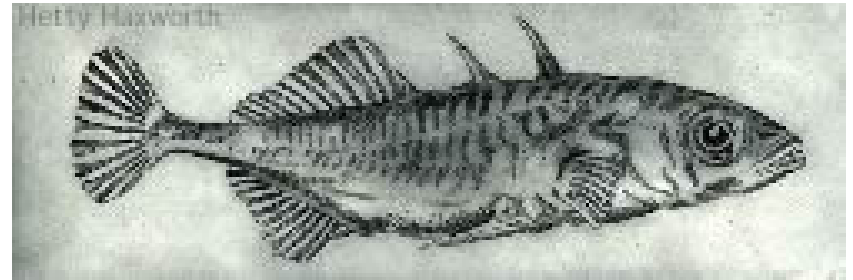
Mike Gentle & Lynne Sneddon

BBSRC, NERC, The Leverhulme Trust

We are increasing our interactions with fish...



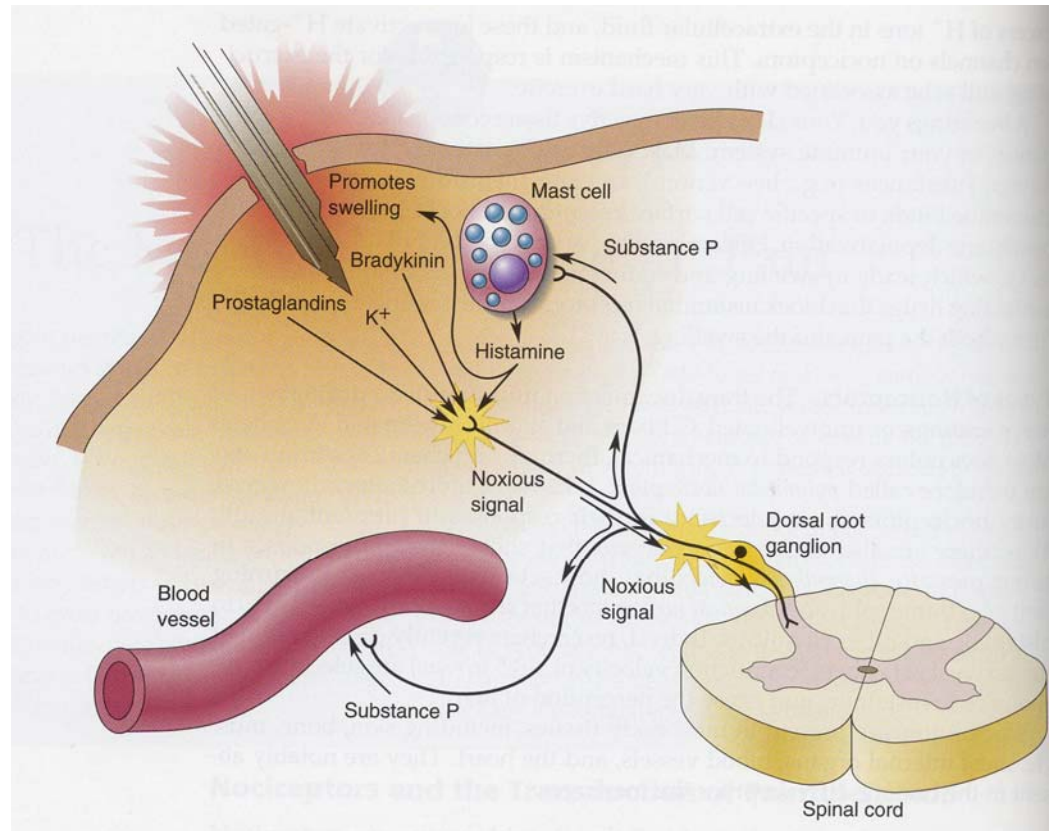
QuickTime™ and a
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are needed to see this picture.



- What do we know?
- What are the implications for current practices?
- What do we need to find out?

- *What do we know?*

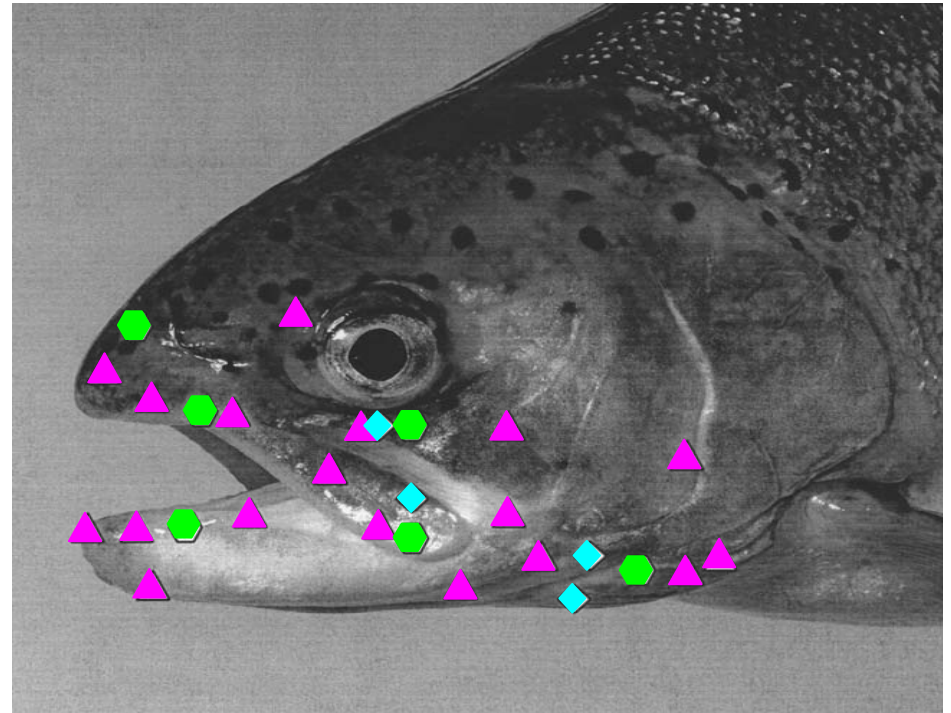
Broad similarities in the nociception processes are found in fish and other vertebrates



Teleost fish such as salmonids have specialised receptors around the head and mouth that detect noxious stimuli

Receptor types:

- ▲ Polymodal
- Mechanochemical
- ◆ Mechanothermal



Chemical
stimulation
(1% acetic acid)

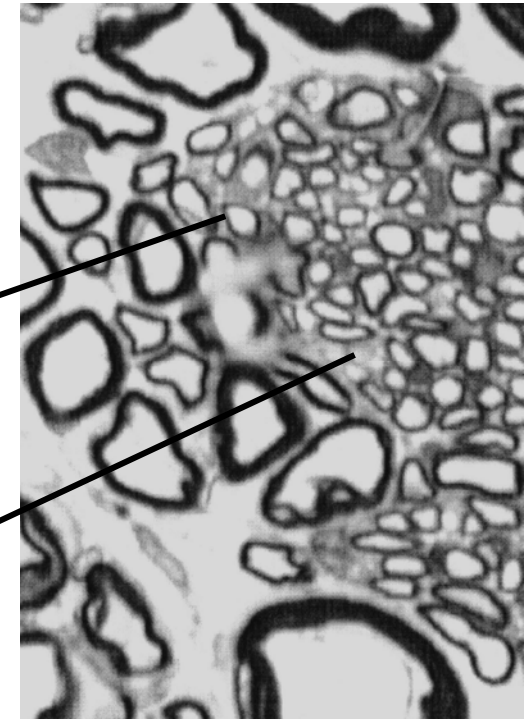
*Sneddon, Braithwaite
& Gentle 2003a*

Nociceptors in the trigeminal nerve

- A-delta fibres - small slow conducting
- C fibres - smaller and slower conducting

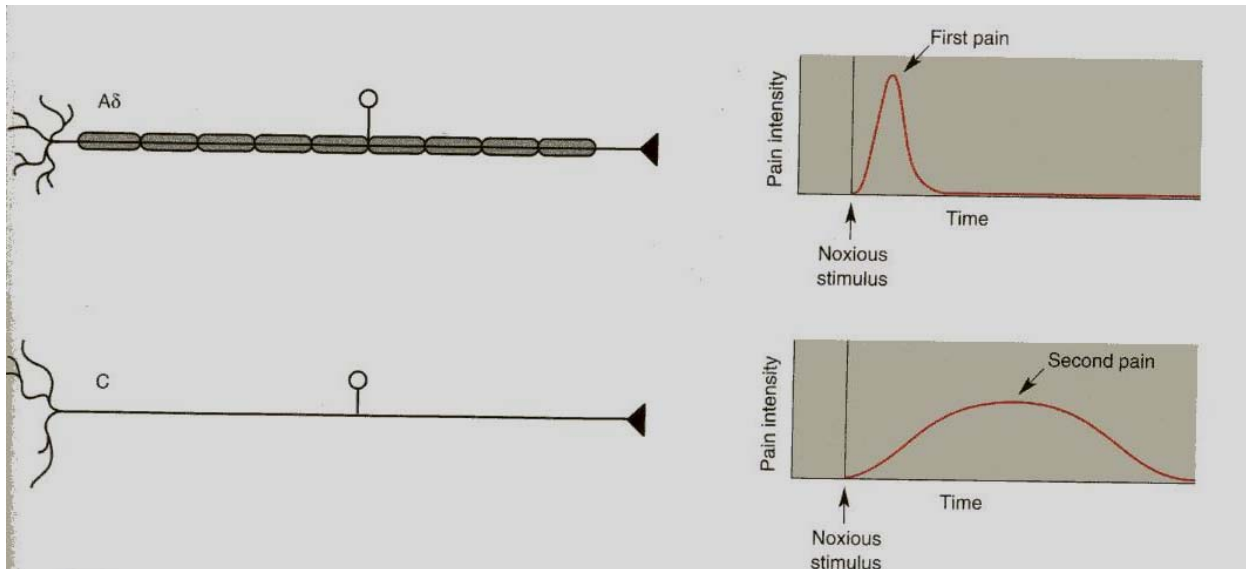
A-delta fibres

C fibres




2 μ m

Bear, Connors & Paradiso - Neuroscience



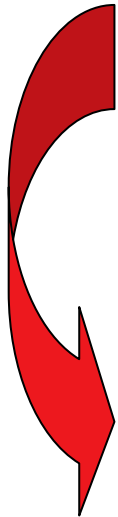
Stress physiology in fish is directly comparable to that of higher vertebrates

Primary responses:

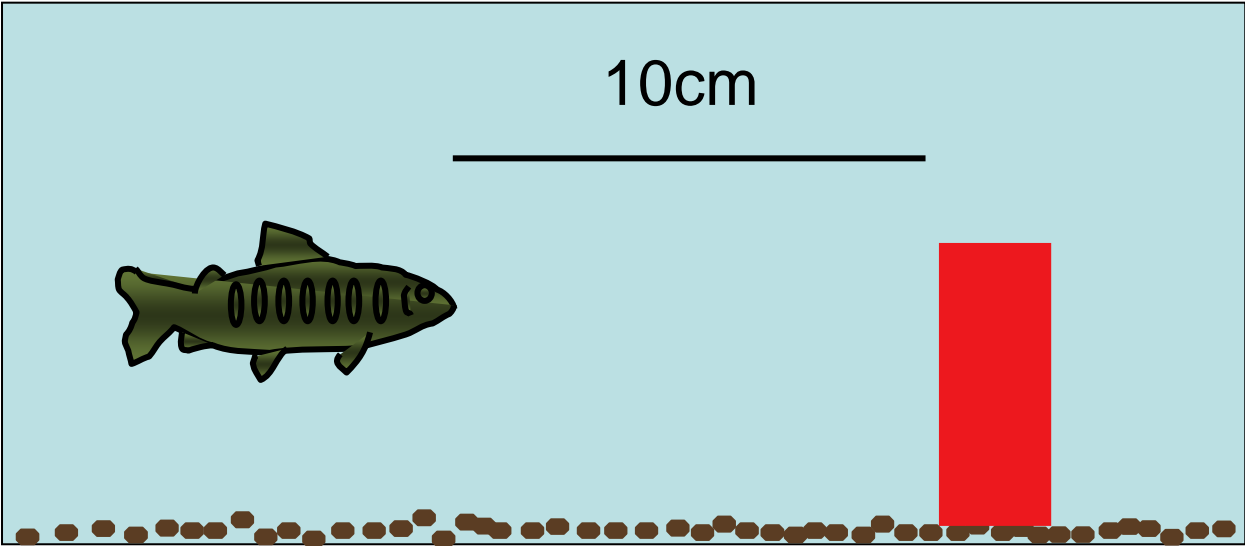
- Adrenaline and Noradrenaline
- Corticotropin-releasing hormone (CRH)  hypothalamic-pituitary-interrenal axis (HPI axis)
- Cortisol

Secondary responses:

- Altered hormone levels
- Altered turnover of dopamine and serotonin
- Improved respiration, heart rate, blood flow to gills
(but disrupted salt and water balance)
- Oxidation of muscle protein for energy

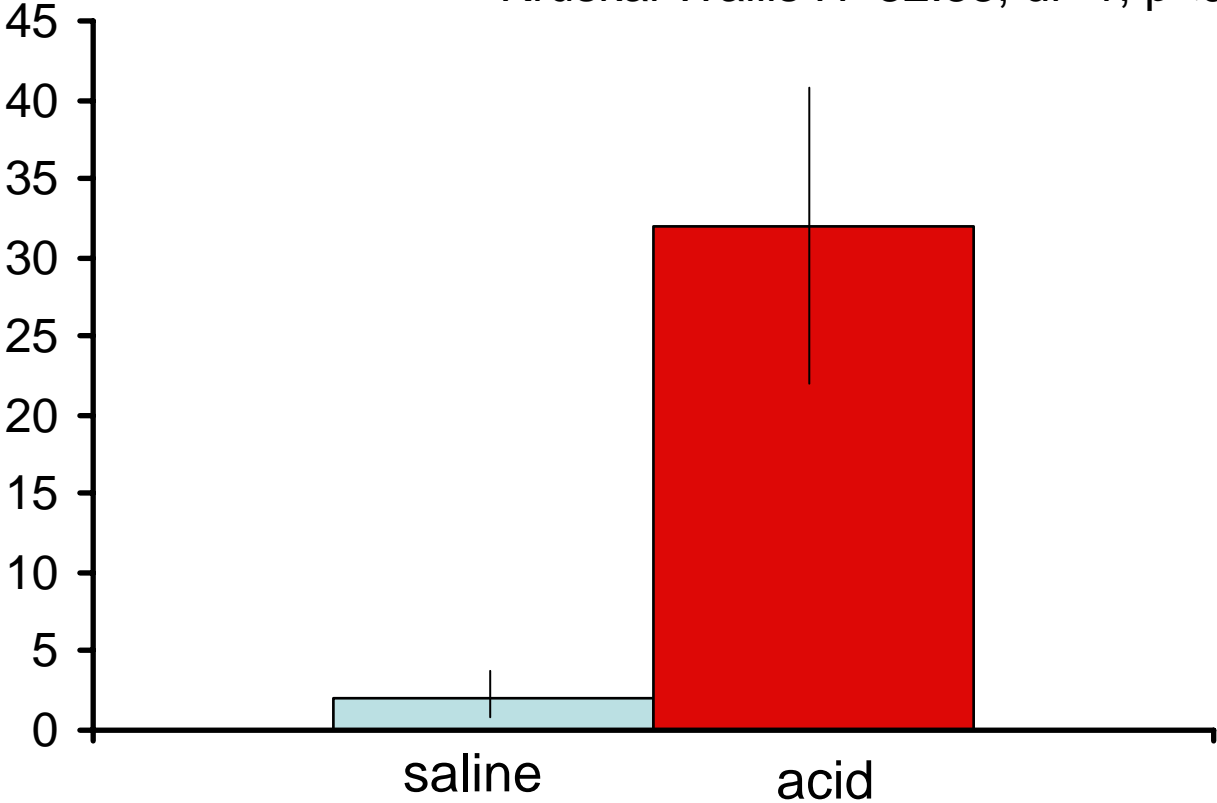


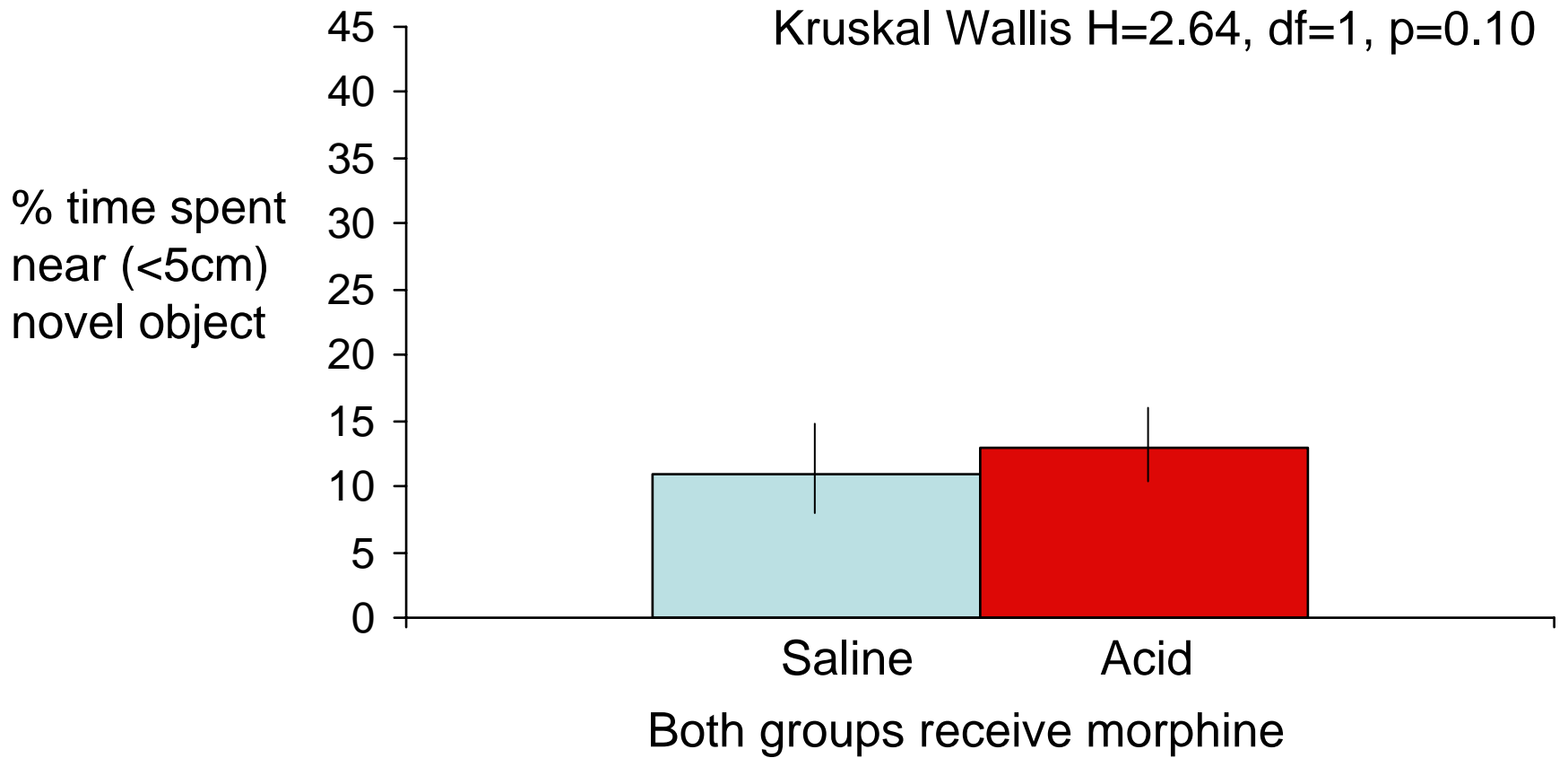
Cognitive processes are affected by noxious stimulation

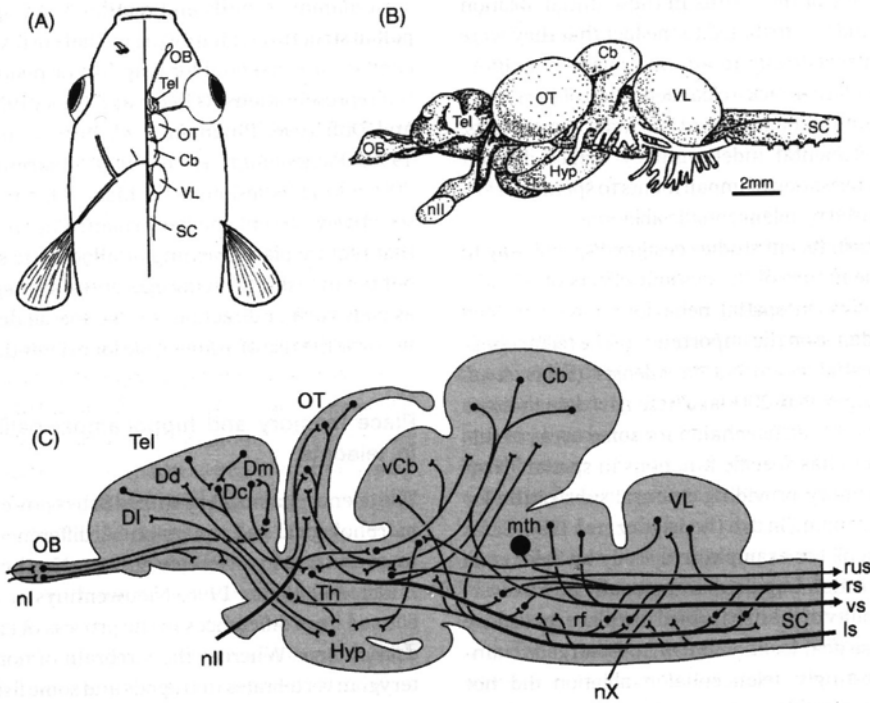
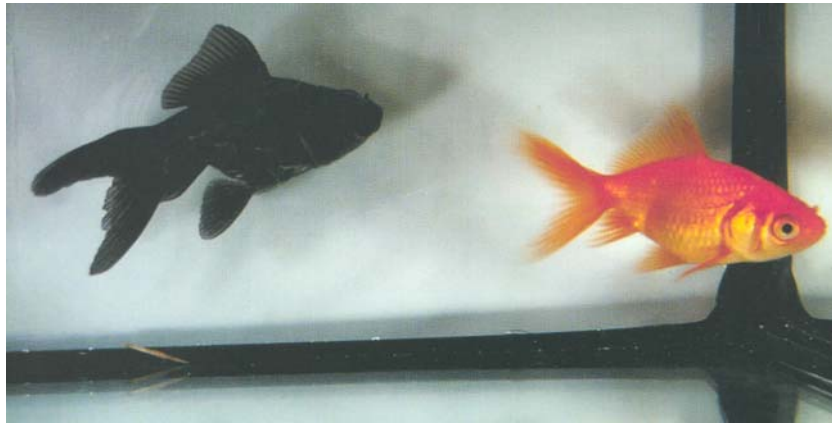


Kruskal Wallis $H=32.33$, $df=1$, $p<0.001$

% time spent
near (<5cm)
novel object







Broglio et al. 2003

- *What are the implications for current practices?*

Effects of handling...

Aquaculture has adopted many good practices

gloves

soft surfaces/ smooth netting

minimise handling events

keep events as brief as possible

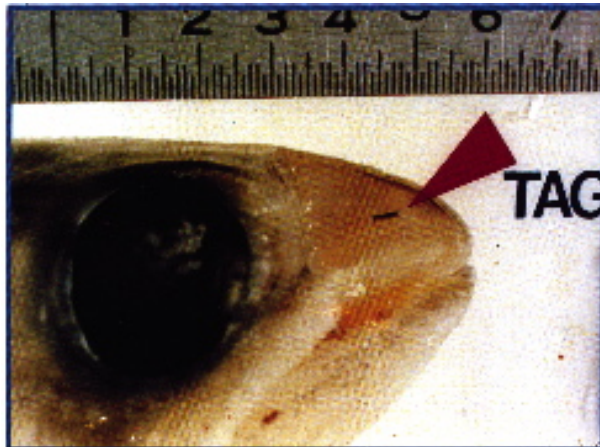


Research institutions...?

Netting and taking fish out of water



Marking or tagging...



Post operative analgesia?

Behavioural considerations - social interactions

QuickTime™ and a
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are needed to see this picture.

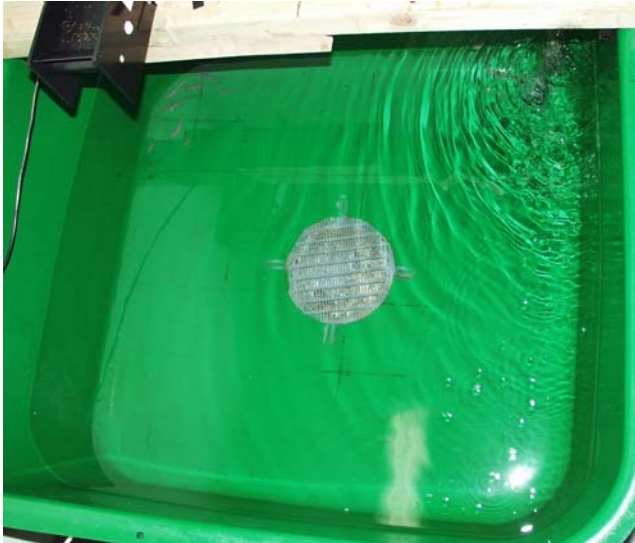
QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Should fish be kept in groups, if so what size?

Wild caught or lab reared....



Enrichment?



- *What do we need to find out?*

Better understanding of the sensory capacities of fish
- how are these affected?



Blind Mexican Cave fish

Anaesthesia

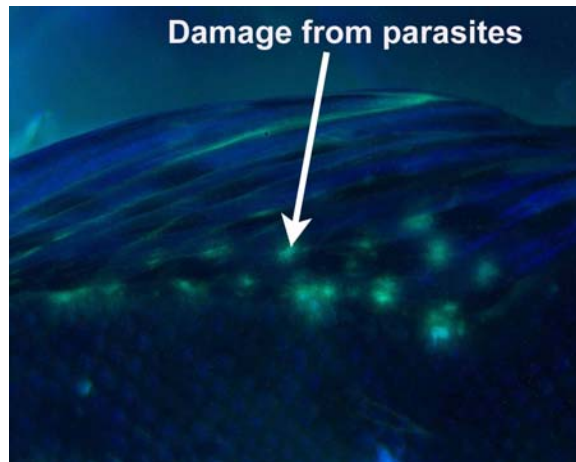


www.vetcare.gr

What other parts of the body are sensitive to noxious stimulation?



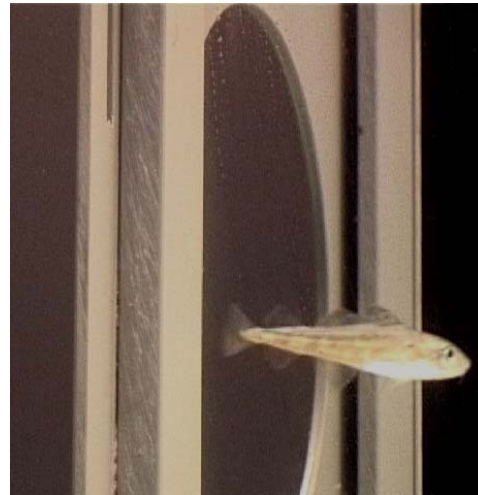
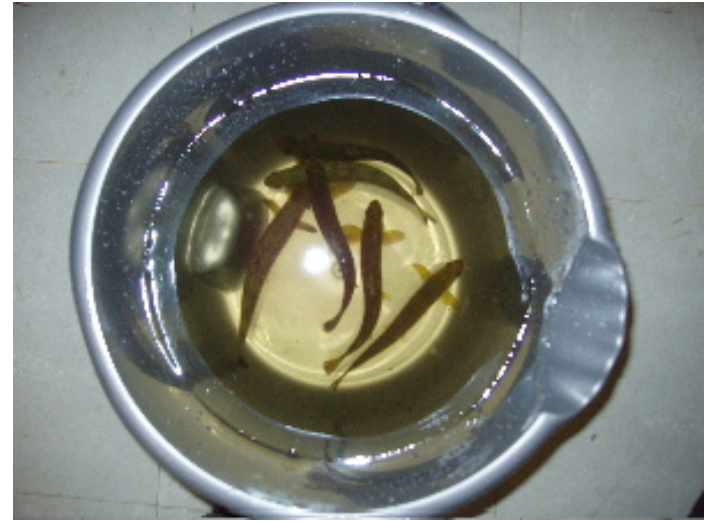
Fin erosion...



Jimmy Turnbull

Behavioural syndromes - personality traits

e.g. Huntingford 2004

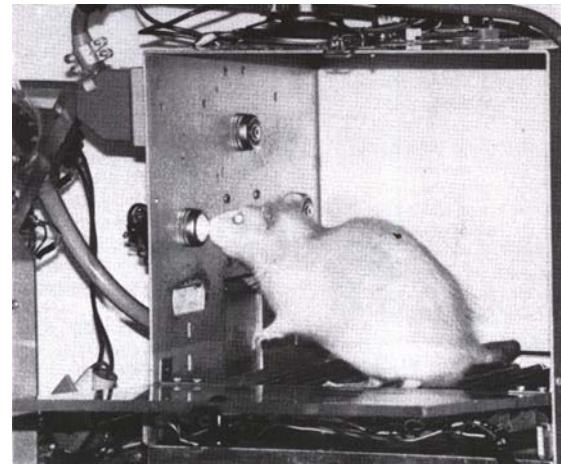


Quantify how aversive or how important different factors are...

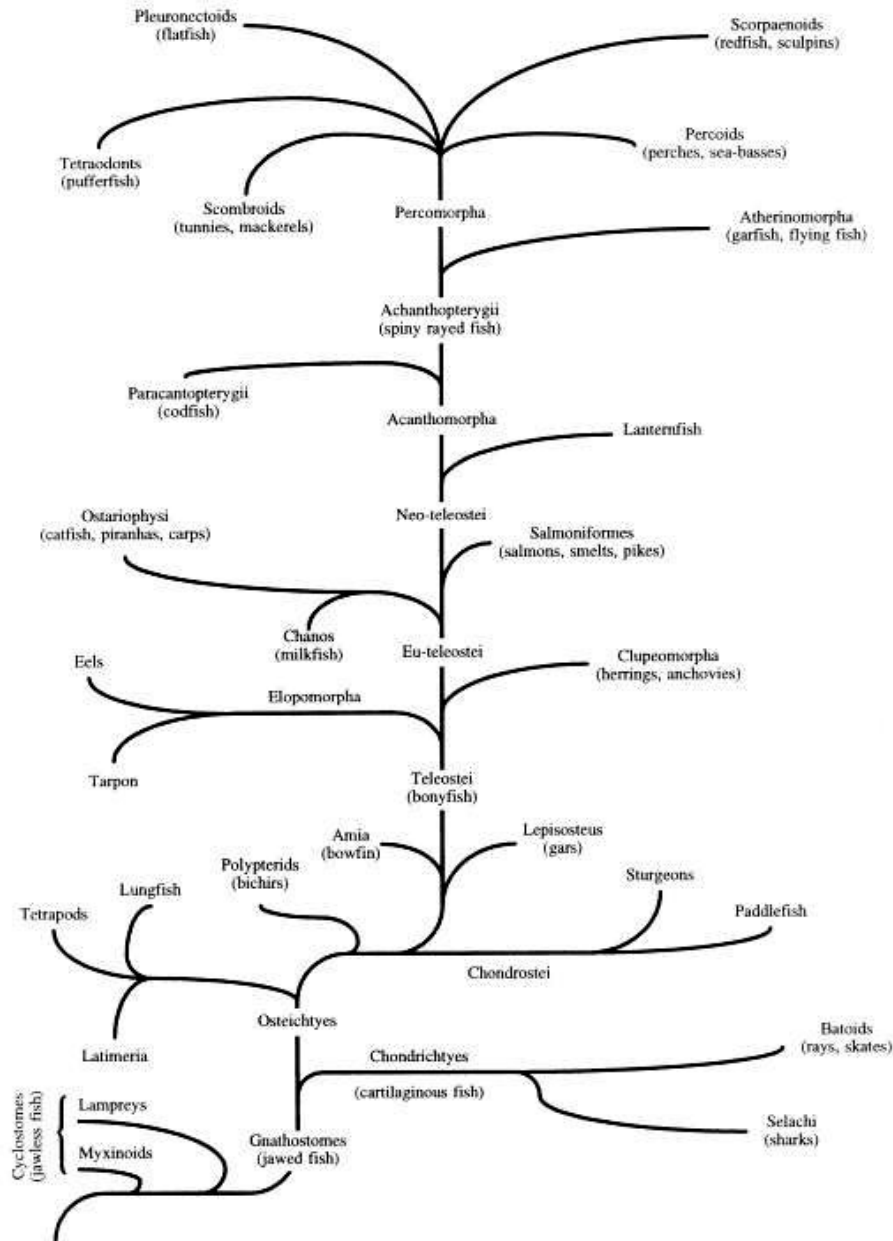
Demand studies - Marian Dawkins



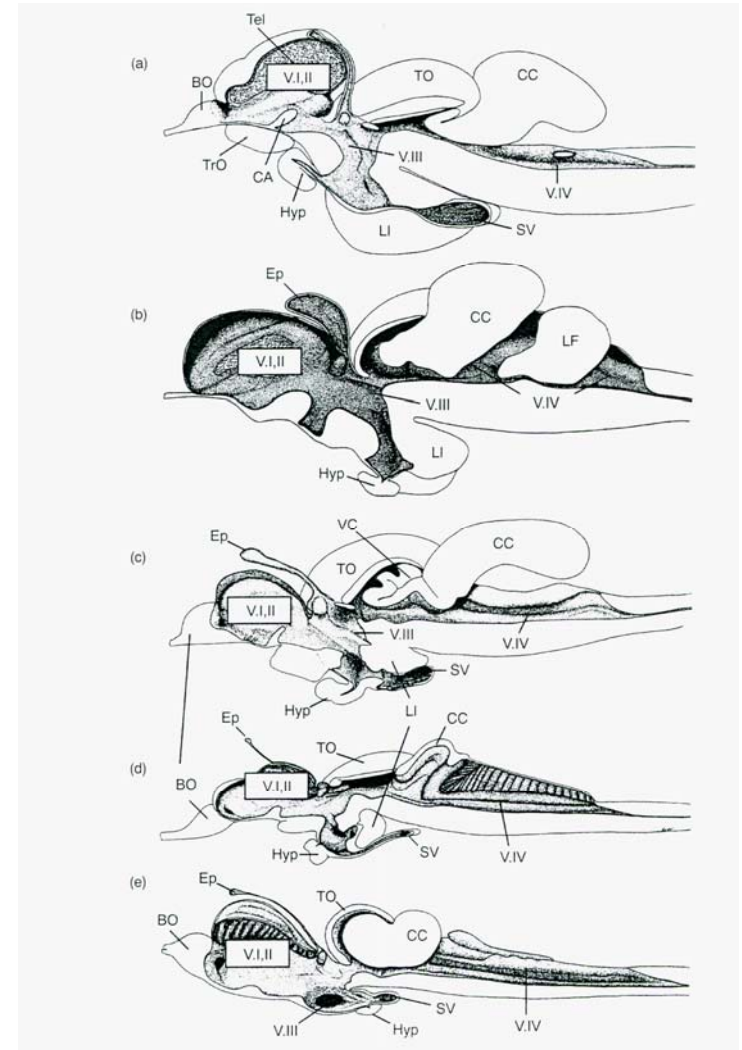
Devise ways to measure cognitive state



Fish represent an amazingly diverse taxonomic group



Kotrashal et al. 1998



Diverse sensory neuroanatomy



International Congress on the Biology of Fish

Newfoundland, Canada 18-22 July 2006

Fish welfare symposium

Conference website: www.mun.ca/biology/icbf7/index.html

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