Royal Veterinary College
University of London

FOUNDATIONS of ANIMAL SENTIENCE

European Research Council
Established by the European Commission

LSE

Animal Consciousness

Evidence & Ethics

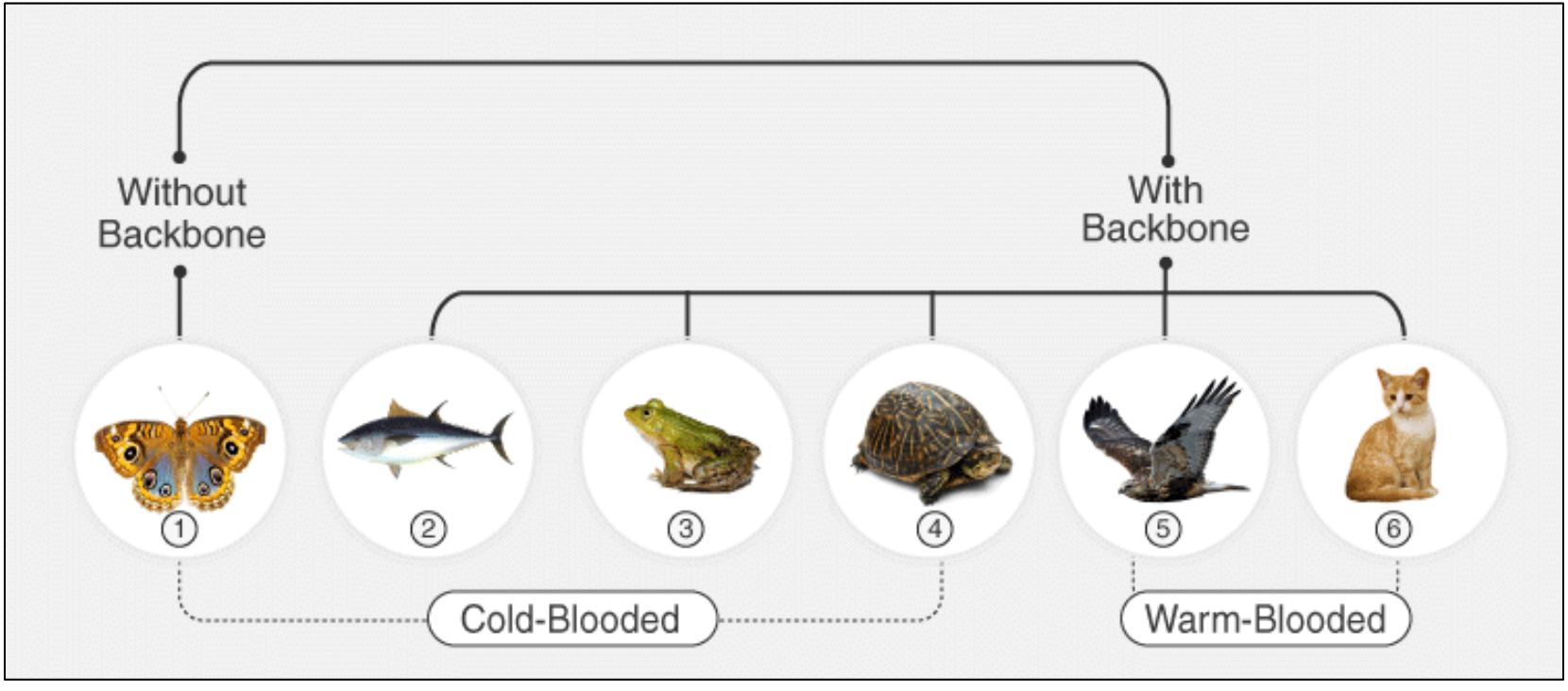
Dr. Andrew Crump
acrump@rvc.ac.uk

Danish 3Rs Symposium, Copenhagen, 6th November 2023

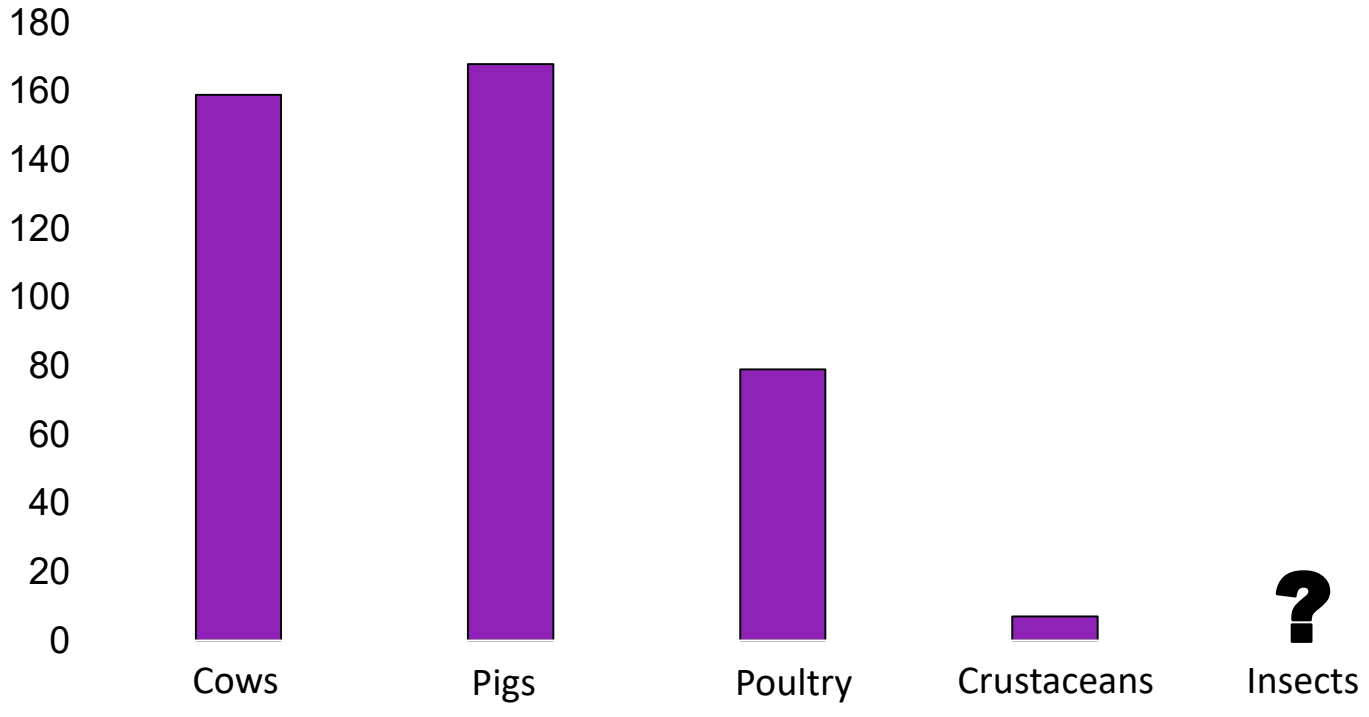
This Presentation's **BIG** Idea

Animal welfare science & policy is **fundamentally misguided**…

The Animal Kingdom?

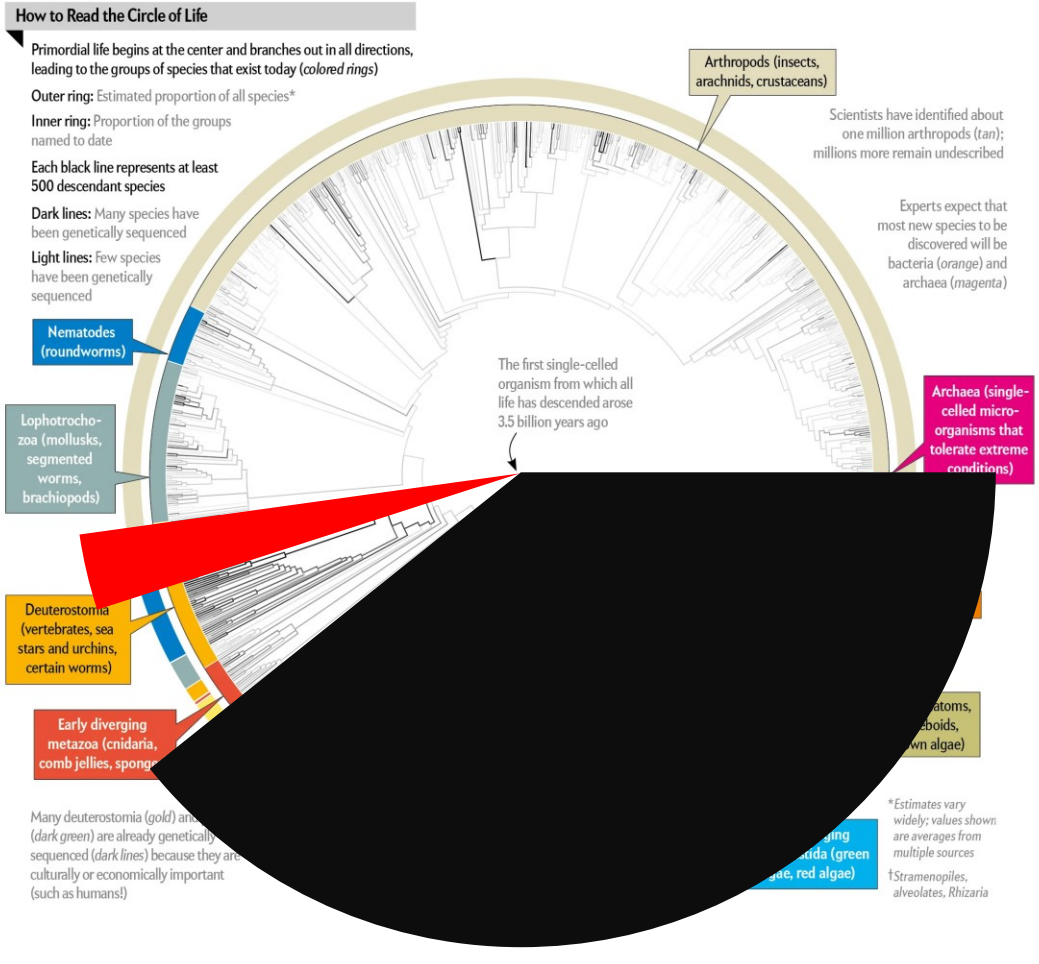


Mentions in Animal Welfare Journals



Walker *et al.* (2014) *Int J Comp Psychol*

The *Real* Animal Kingdom

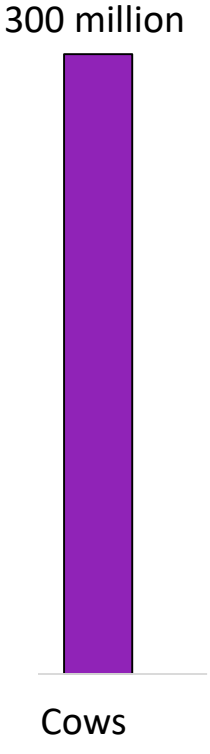


>1.5 million animals

Only ~60k vertebrates (mostly fish)

Hinchliff *et al.* (2015), *PNAS*

How Many are Slaughtered?



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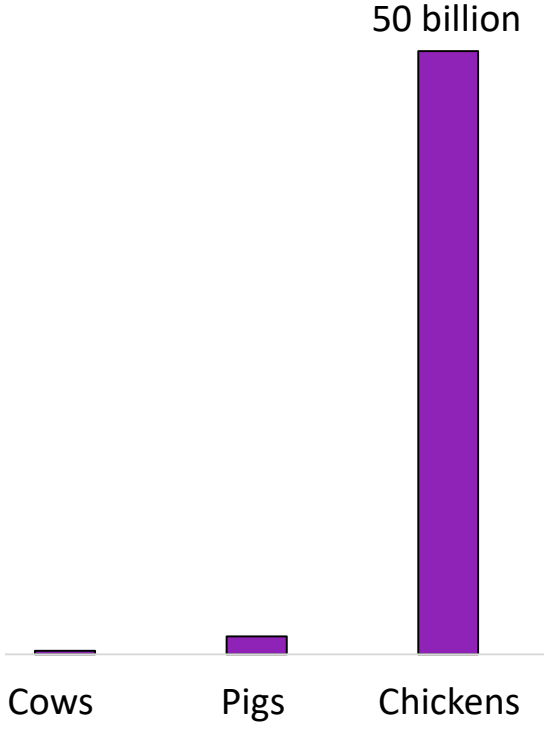
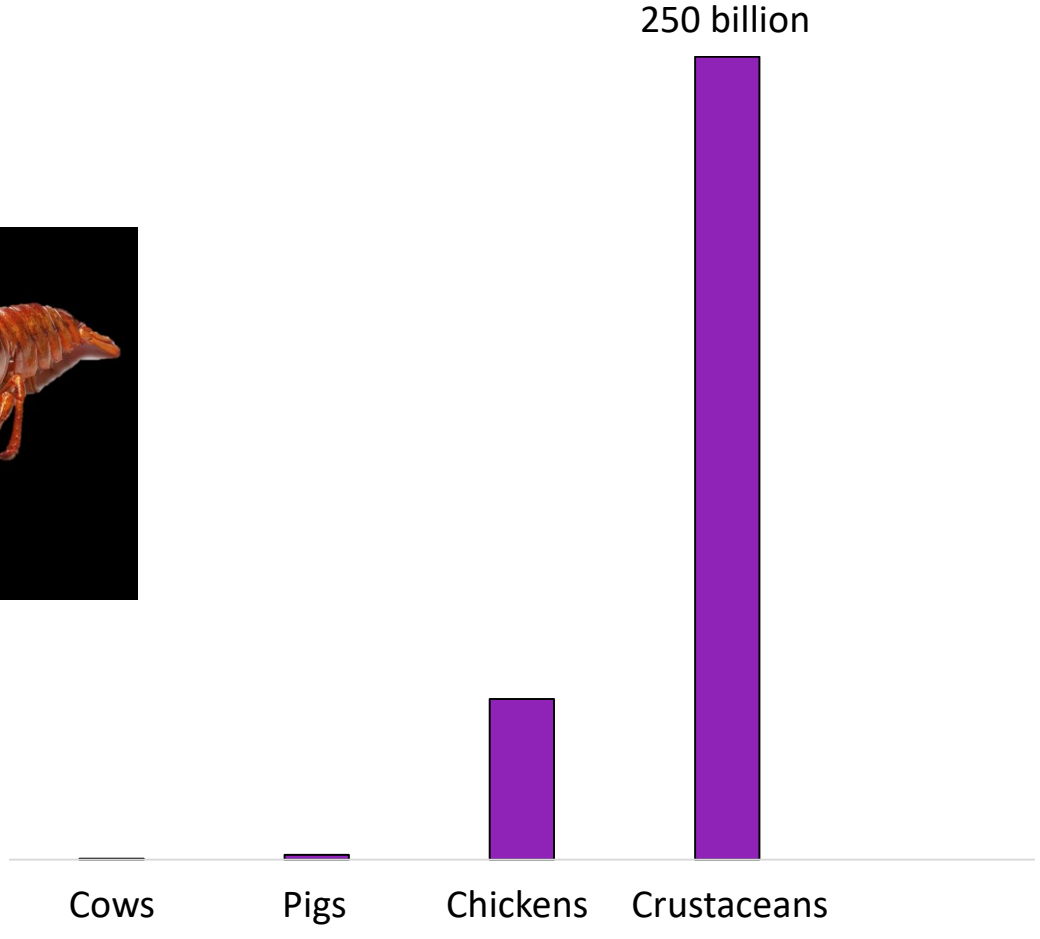


How Many are Slaughtered?



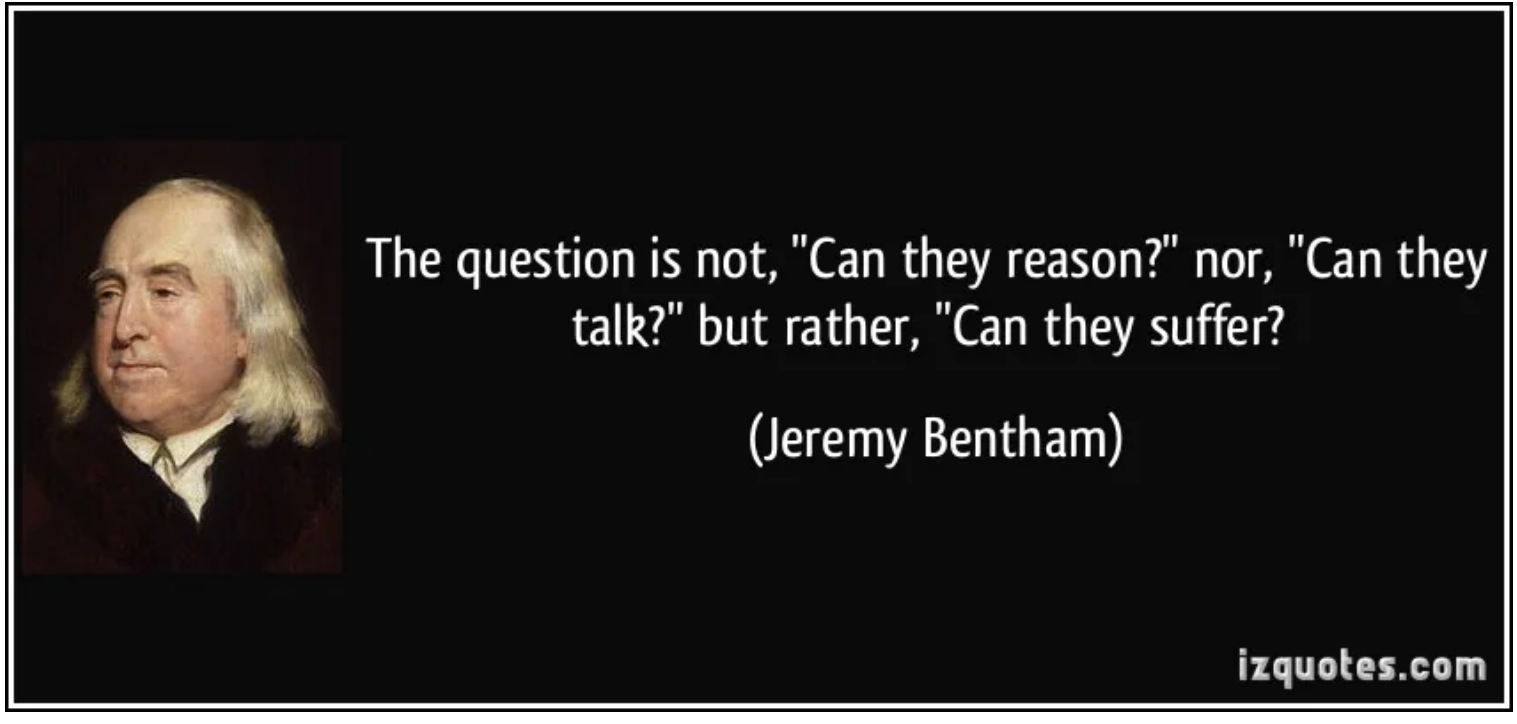
But Does their Welfare Matter?

Sentience (& Consciousness)

Sentience: The capacity to have consciously experienced positive or negative mental states (feelings), e.g.

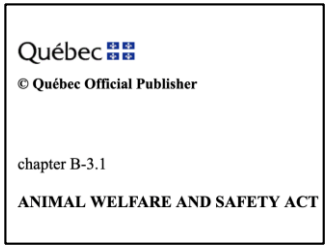
- Pain
- Pleasure
- Hunger
- Thirst
- Warmth
- Depression
- Excitement

So Sentience Matters Ethically…



…And Sentience Matters Legally

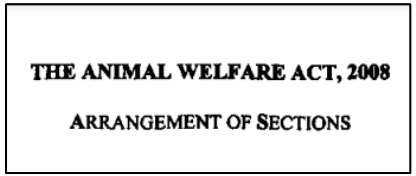
When drafting animal welfare law, **where should we draw the line?**


Québec
© Québec Official Publisher

chapter B-3.1

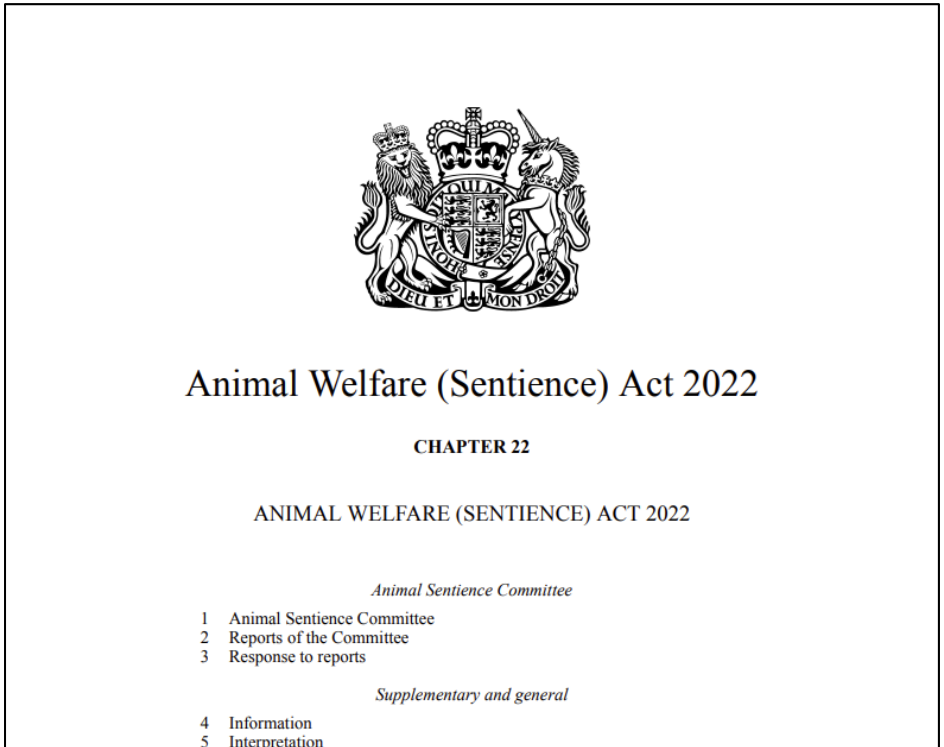
ANIMAL WELFARE AND SAFETY ACT

Canada
(Québec)


THE ANIMAL WELFARE ACT, 2008

ARRANGEMENT OF SECTIONS

Tanzania


Animal Welfare (Sentience) Act 2022

CHAPTER 22

ANIMAL WELFARE (SENTIENCE) ACT 2022

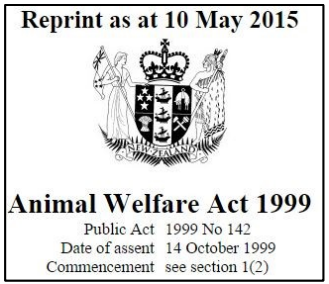
Animal Sentience Committee

1 Animal Sentience Committee
2 Reports of the Committee
3 Response to reports

Supplementary and general

4 Information
5 Interpretation

European Union

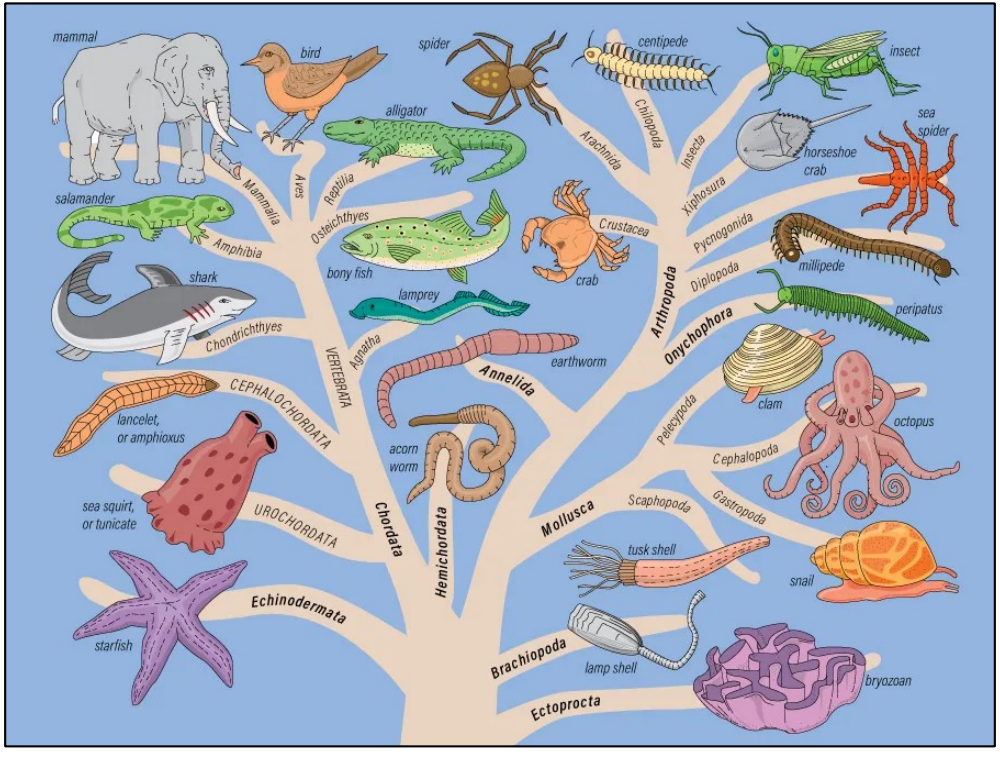

Reprint as at 10 May 2015

Animal Welfare Act 1999

Public Act 1999 No 142
Date of assent 14 October 1999
Commencement see section 1(2)

New Zealand

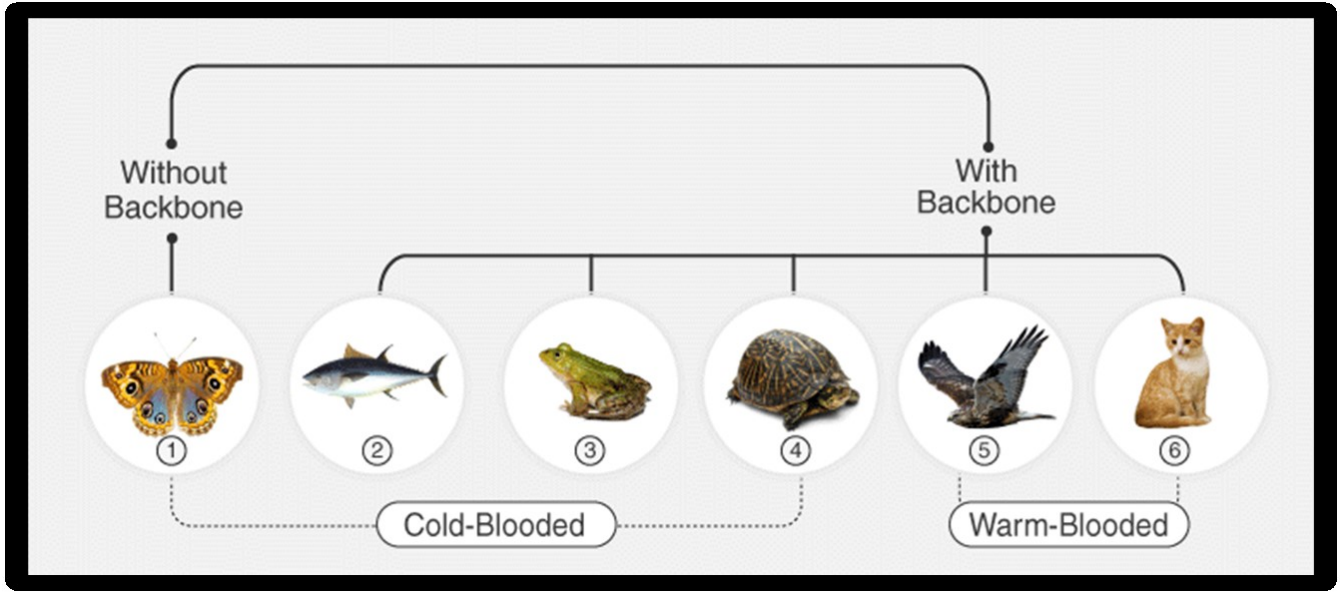
Which Animals Are Sentient?



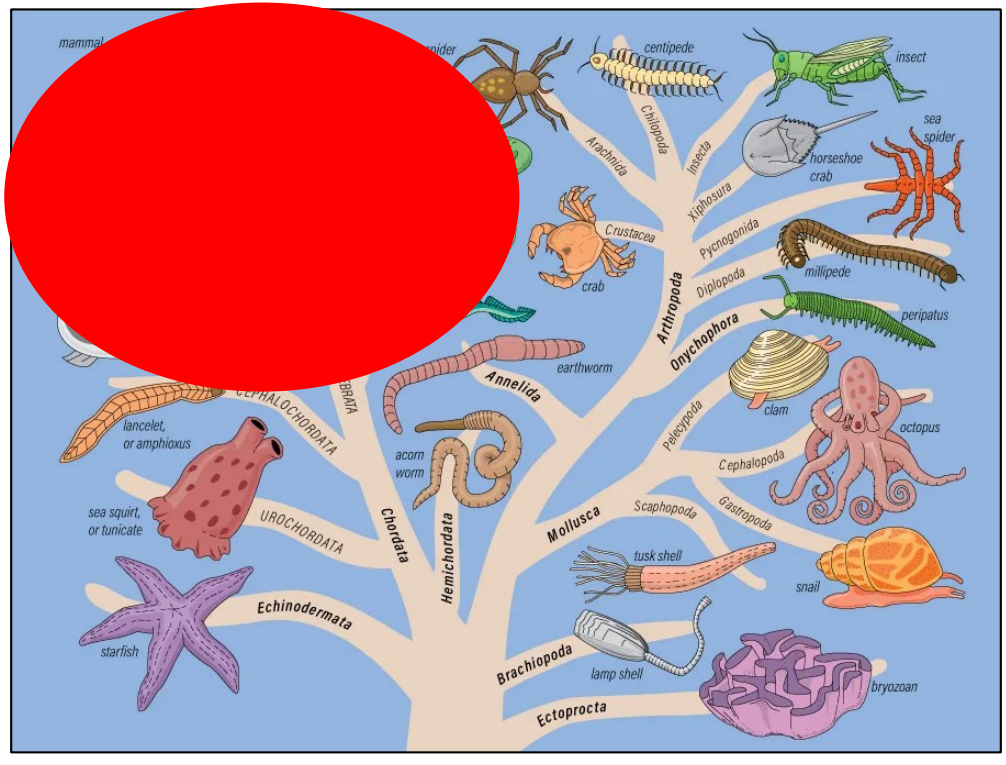
Little Controversy about Vertebrates

Mammals and birds have very similar brains to humans, and behaviour/cognition that makes **sentience highly likely**

All vertebrates have the same basic brain structure



Which Animals Are Sentient?



The Challenge of Studying Sentience

Sentience

- Private
- Subjective

Science

- Observable
- Objective

We humans describe our feelings using language

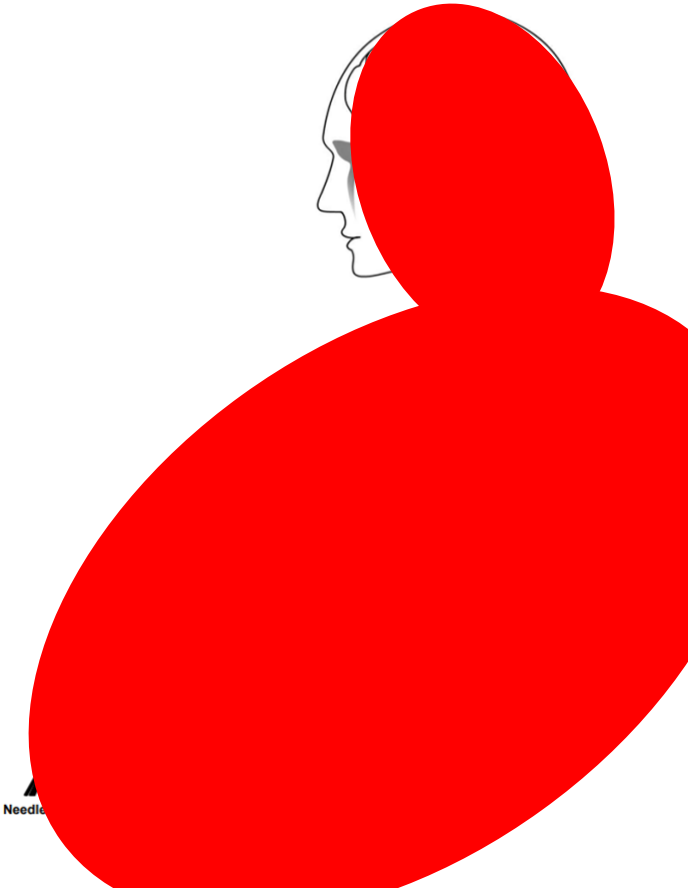
This is obviously impossible for other animals

E.g., Nociception vs. Pain

Nociception
Processing of noxious stimuli

Pain
Unpleasant feeling associated with nociception

Nociceptive reflexes don’t require pain



Forget Certainty!

But how do we address the ethical importance of sentience, whilst acknowledging scientific uncertainty?

Precautionary Principle: In the face of serious welfare risks, we should treat animals as if they are sentient, even in the absence of certainty.

But precautionary reasoning doesn't mean anything goes – we still need **some evidence** that the animal is plausibly sentient.

Birch (2017) *Animal Sentience*

Are Invertebrates Plausibly Sentient?

Report:
https://bit.ly/sentiencereport

Journal Paper:
https://bit.ly/crumpetal

Magazine Article:
https://bit.ly/schnelletal

LSE THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

RVC Royal Veterinary College University of London

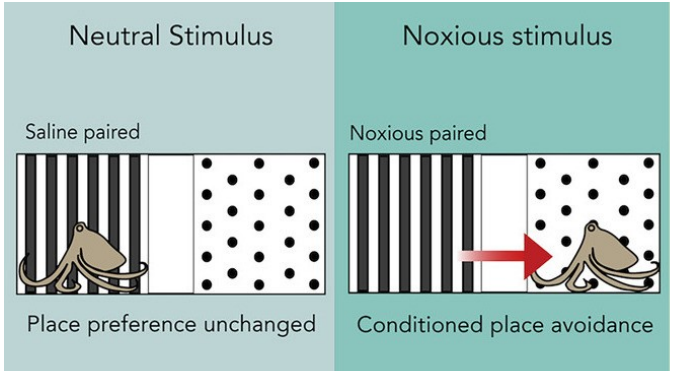
UNIVERSITY OF CAMBRIDGE

Eight Criteria for Sentience

1. Nociceptors
2. Integrative brain regions
3. Connections from nociceptors to integrative brain regions
4. Responses affected by potential anaesthetics / analgesics
5. Motivational trade-offs
6. Flexible self-protective behaviours
7. Associative learning
8. Valuing anaesthetics / analgesics when injured

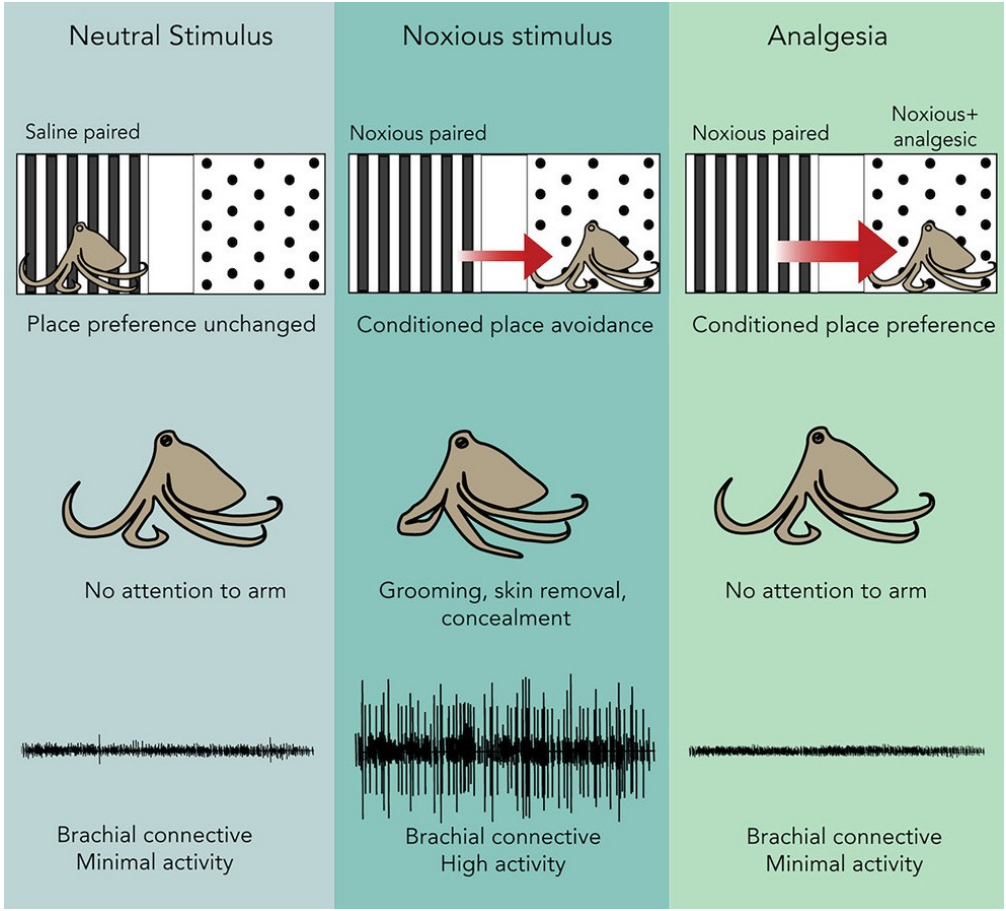
Birch *et al.* (2021) Defra

Cephalopod Sentience



Crook (2021) *iScience*

Cephalopod Sentience



1. Nociceptors
2. Integrative brain regions
3. **Neural connections**
4. **Anaesthetic / analgesic responses**
5. Motivational trade-offs
6. **Flexible self-protection**
7. **Associative learning**
8. **Valuing anaesthetics / analgesics**

Crook (2021) *iScience*

Cephalopod Sentience

Summary table (colours/letters represent confidence levels):

	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Criterion 8
Octopods (Octopoda)	VH	VH	H	H	M	VH	VH	H
Cuttlefish (Sepiida)	H	VH	H	L	M	M	VH	L
Other coleoids (squid, all orders)	H	VH	H	L	M	L	H	L
Nautiloids	H	L	L	L	L	L	M	VL

Decapod Sentience

Crayfish in a light maze

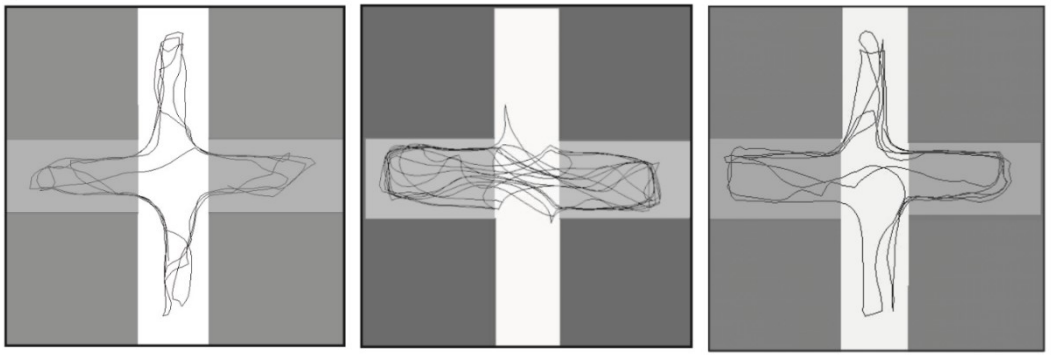
Fossat *et al.* (2014) *Science*

Decapod Sentience

Behaviour before stress

Behaviour after stress

After stress + anti-anxiety medication



Fossat *et al.* (2014) *Science*

Decapod Sentience

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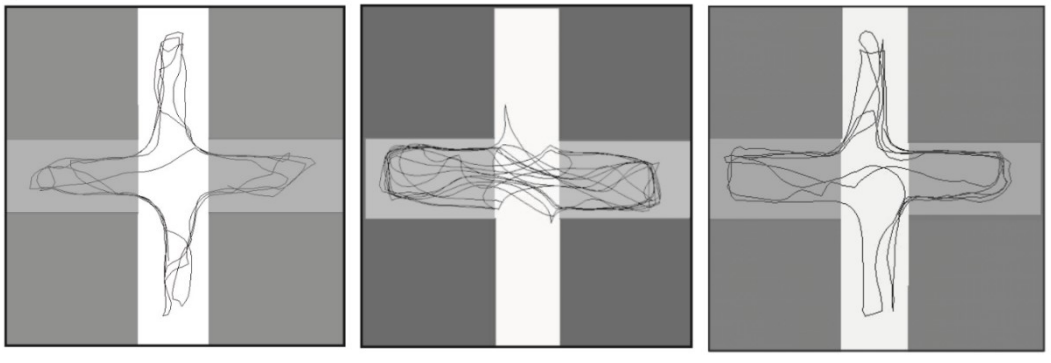
Behaviour after stress

After stress + anti-anxiety medication



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Fossat *et al.* (2014) *Science*

Decapod Sentience

Summary table (colours/letters represent confidence levels):

	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Criterion 8
True crabs (Brachyura)	H	VH	L	VH	L	VH	H	VL
Anomuran crabs (Anomura)	H	VH	L	L	M	H	L	VL
Astacid lobsters/crayfish (Astacidea)	H	VH	L	VH	L	L	M	VL
Spiny lobsters (Achelata)	H	VH	L	L	L	L	M	VL
Caridean shrimps (Caridea)	H	VH	L	M	L	M	L	VL
Penaeid shrimps (Penaeidae)	H	L	L	M	L	L	L	VL

How to Deal with Understudied Groups

Rather than having laws that protect only well-studied species, it's better to aim for **broad coverage in high-level legislation**…

And back this up with **enforceable best-practice guidance** specific to the needs of commercially/scientifically important species.




Report Recommendation

How should policymakers respond to this complicated evidential picture?

Our central recommendation

We recommend that **all cephalopod molluscs and decapod crustaceans** be regarded as sentient animals for the purposes of UK animal welfare law. They should be counted as “animals” for the purposes of the Animal Welfare Act 2006 and included in the scope of any future legislation relating to animal sentience.

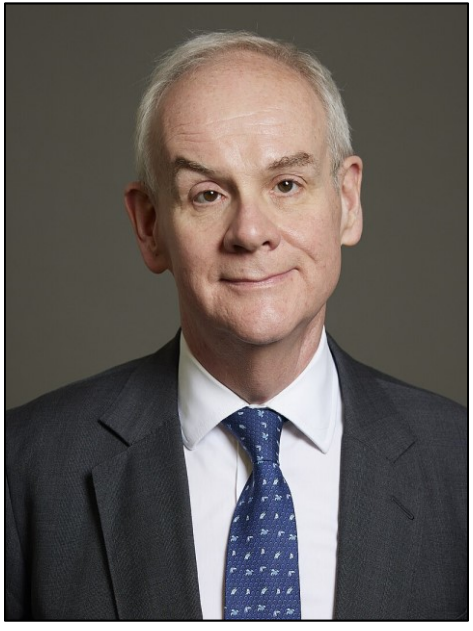
Some Resistance

"Who are the scientists in whom the Government are placing such faith for the scientific basis of animal sentience that they claim to exist?

Where do they gather?

Which respectable journals do they publish in?

Who is this cadre of leading animal sentience scientists?"



Lord Moylan

6 December 2021

Report Outcome

5 Interpretation

(1) In this Act "animal" means—

(a) any vertebrate other than *homo sapiens,*

(b) any cephalopod mollusc, and

(c) any decapod crustacean.

Media Coverage

ing of live lobsters could be banned
K under proposed legislation

ment-commissioned report finds crustaceans have feelings

-reviewed LSE report has concluded there is strong scientific evidence of sentience in
crustaceans and cephalopod molluscs. Photograph: Moonstone Images/Getty
tockphoto

News story

Lobsters, octopus and crabs recognised as sentient beings

Amendment to Animal Welfare (Sentience) Bill following LSE report on decapod and cephalopod sentience

From: Department for Environment, Food & Rural Affairs, The Rt Hon Lord Benyon, and The Rt Hon Lord Goldsmith

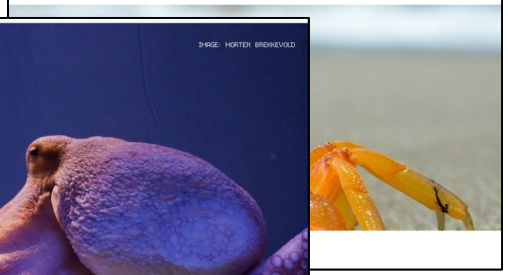
Published 19 November 2021

IFLScience
22 November at 13:19 ·
Outstanding news 👏

Unito, crostacei e polpi sono animali senzienti: la proposta per proteggerli

è stata lanciata una proposta per inserire crostacei, polpi e calamari nella nuova legge sul benessere animale: sono animali senzienti, bisogna proteggerli.

Home » Notizie » Regno Unito, crostacei e polpi sono animali senzienti: la proposta per proteggerli



A common bobtail squid (Sepietta ow

NATURE

The UK Will Finally Officially Recognize Octopuses And Crabs as Sentient Beings

TESSA KOUMOUNDOUROS 25 NOVEMBER 2021

THE TIMES | Today's sections | Past six days | Explore | Times Radio | Log in

Decapods have feelings too: ministers urged to ban sale of live lobsters and crabs

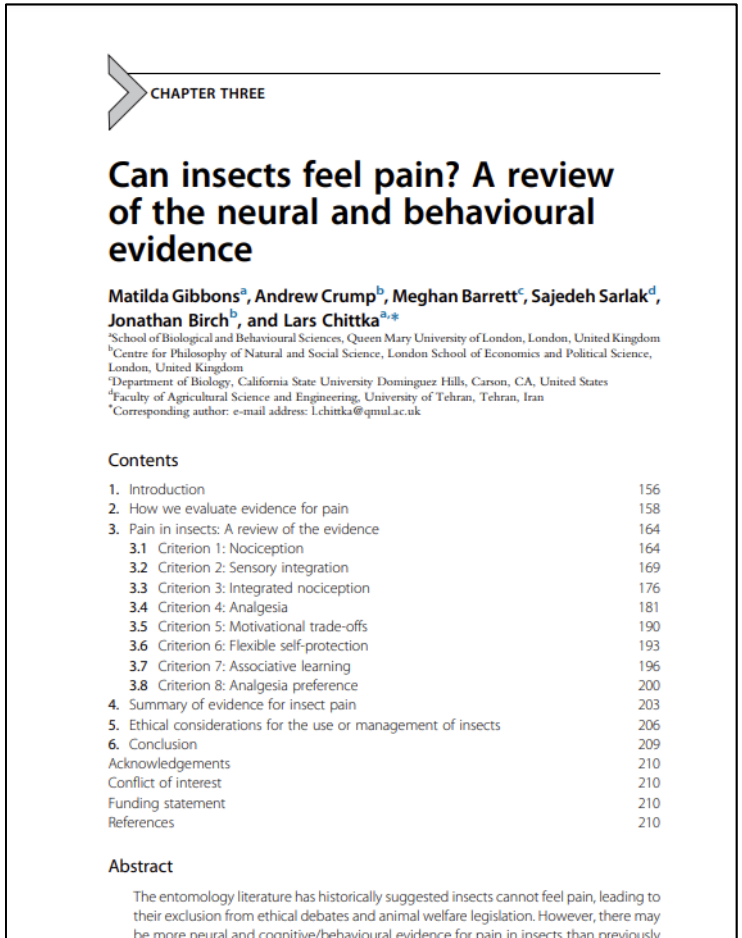
Eleni Courea, Political Reporter

Friday November 19 2021, 3.00pm, The Times

The government-commissioned review has concluded that lobsters and octopuses are sentient beings who feel pain

GETTY IMAGES

How About Insects?



CHAPTER THREE

Can insects feel pain? A review of the neural and behavioural evidence

Matilda Gibbons[a], Andrew Crump[b], Meghan Barrett[c], Sajedeh Sarlak[d], Jonathan Birch[b], and Lars Chittka[a,*]

[a]School of Biological and Behavioural Sciences, Queen Mary University of London, London, United Kingdom
[b]Centre for Philosophy of Natural and Social Science, London School of Economics and Political Science, London, United Kingdom
[c]Department of Biology, California State University Dominguez Hills, Carson, CA, United States
[d]Faculty of Agricultural Science and Engineering, University of Tehran, Tehran, Iran
*Corresponding author: e-mail address: l.chittka@qmul.ac.uk

Contents

Abstract

The entomology literature has historically suggested insects cannot feel pain, leading to their exclusion from ethical debates and animal welfare legislation. However, there may be more neural and cognitive/behavioural evidence for pain in insects than previously

Review:
http://chittkalab.sbcs.qmul.ac.uk/2022/Gibbons%20et%20al%202022%20Advances%20Insect%20Physiol.pdf

Magazine Article:
https://theconversation.com/insects-may-feel-pain-says-growing-evidence-heres-what-this-means-for-animal-welfare-laws-195328

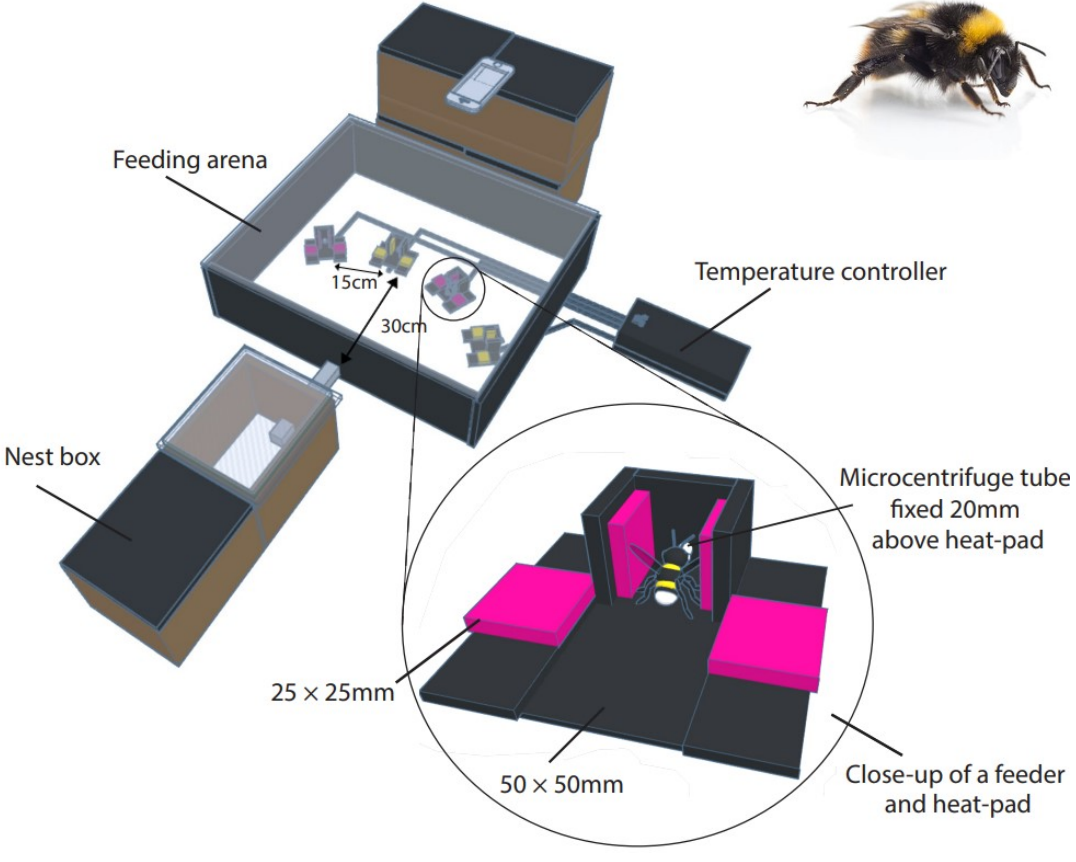
Motivational Trade-offs in Bumblebees

Motivation 1:
Avoid 50° heat

Motivation 2:
Consume high-conc sugar solution

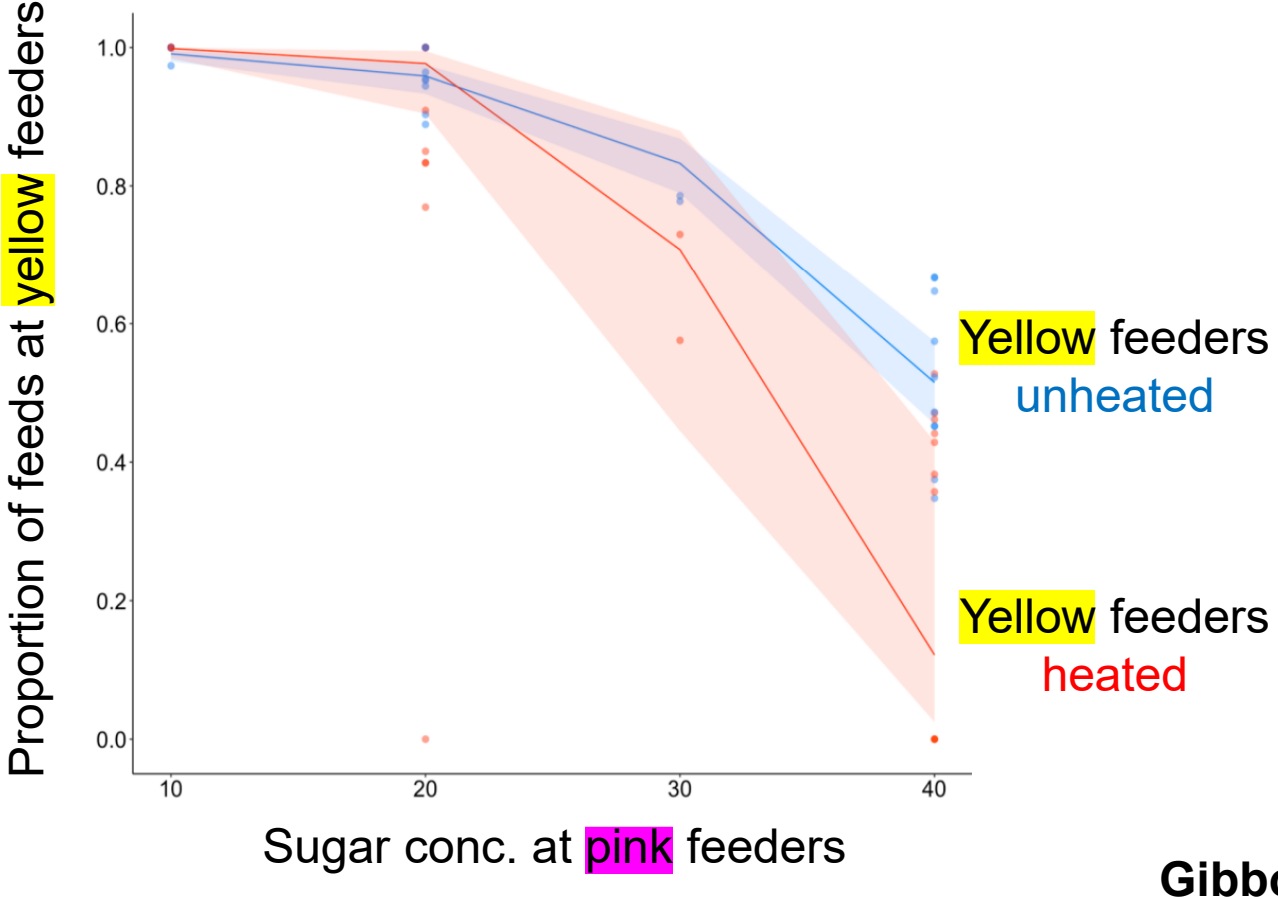
Yellow: 40% sugar and 50° heat

Pink: 10, 20, 30, or 40% sugar and no heat



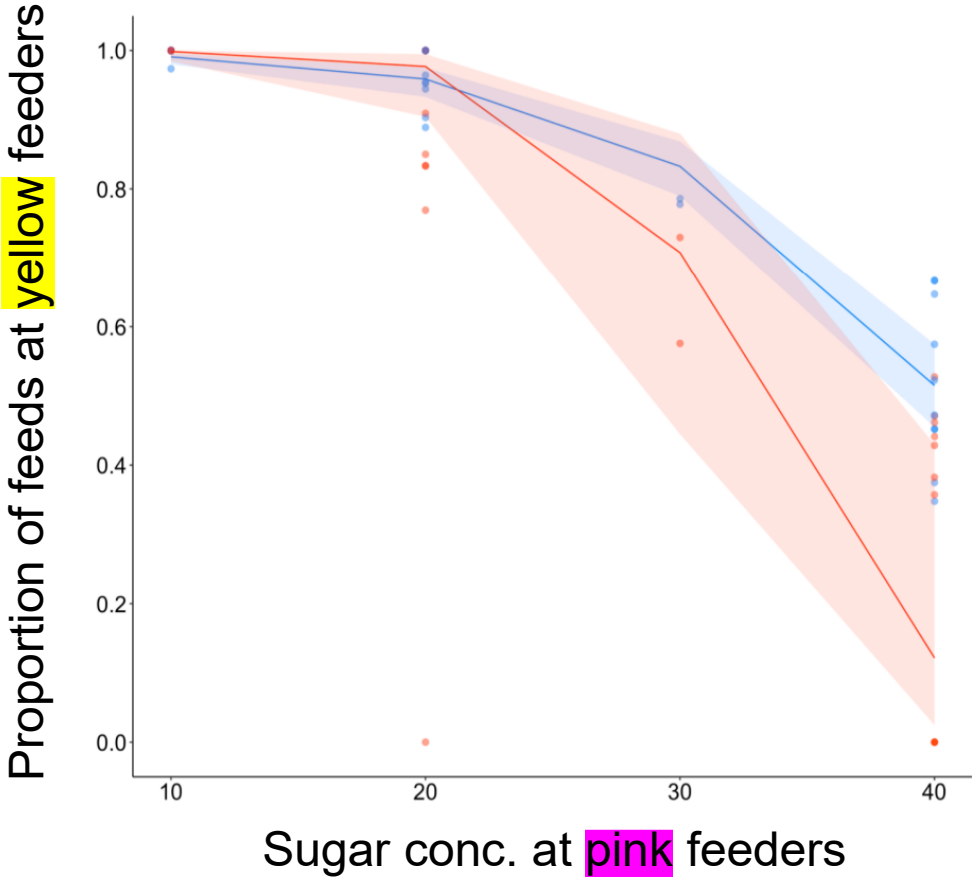
Gibbons *et al.* (2022) *PNAS*

Motivational Trade-offs in Bumblebees



Gibbons *et al.* (2022) *PNAS*

Motivational Trade-offs in Bumblebees



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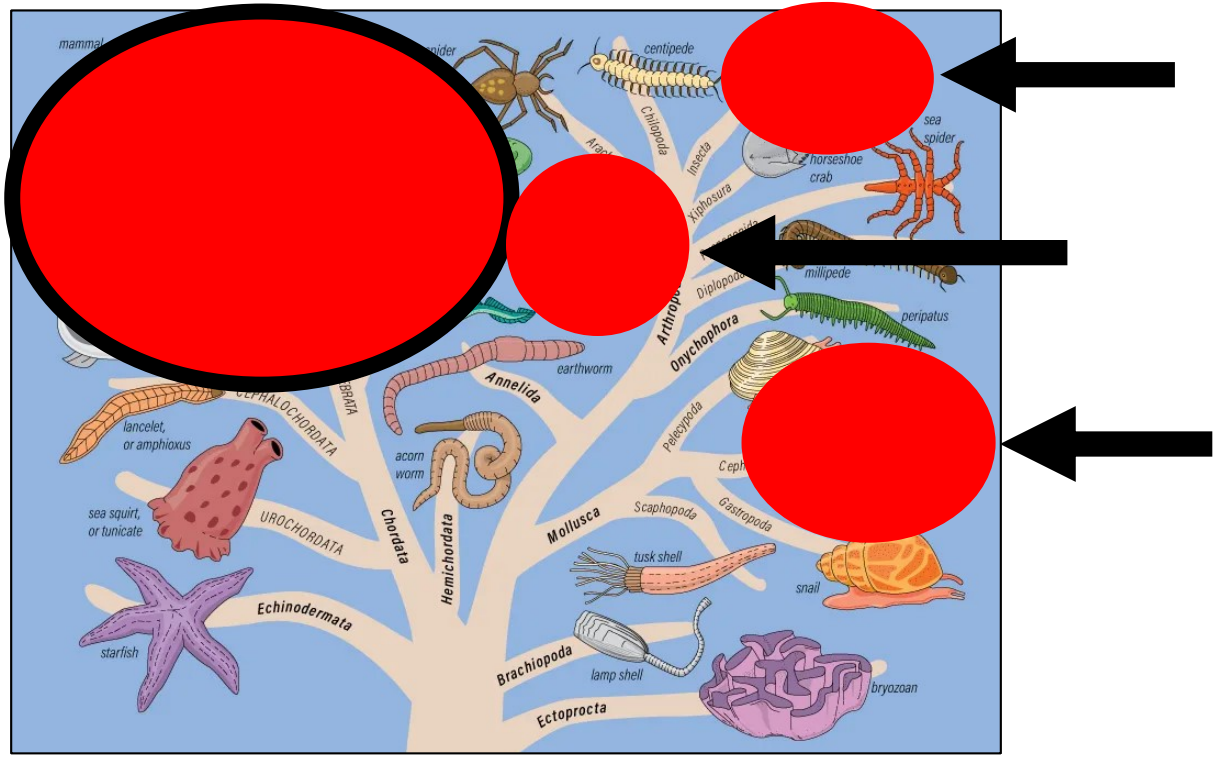
Gibbons *et al.* (2022) *PNAS*

Insect Sentience

Summary table (colours/letters represent confidence levels):

	Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	Criterion 6	Criterion 7	Criterion 8	
Flies	VH	VH	H	H	M	VL	VH	VL	
Bees, Wasps, & Ants	VH	VH	VL	M	VH	VL	VH	VL	
Butter-flies & Moths	VH	VH	VL	VL	VL	VL	VH	VL	

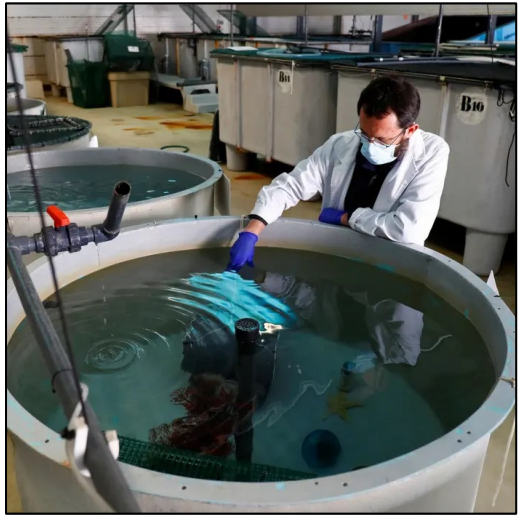
So… Which Animals Are Sentient?



Cephalopod Welfare Issues

Considerations in Research:

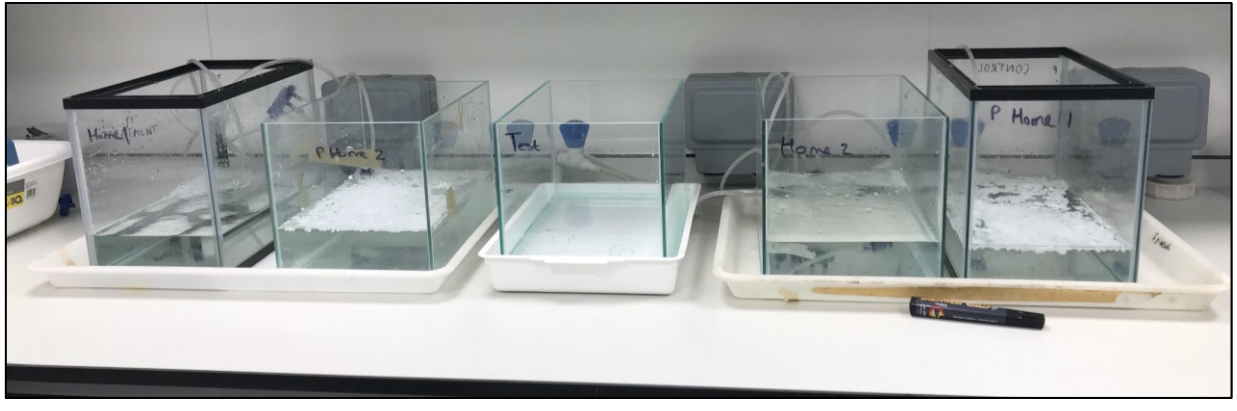
- Aggression and cannibalism
- Environmental requirements
- Boredom



Decapod Welfare Issues

Considerations in Research:

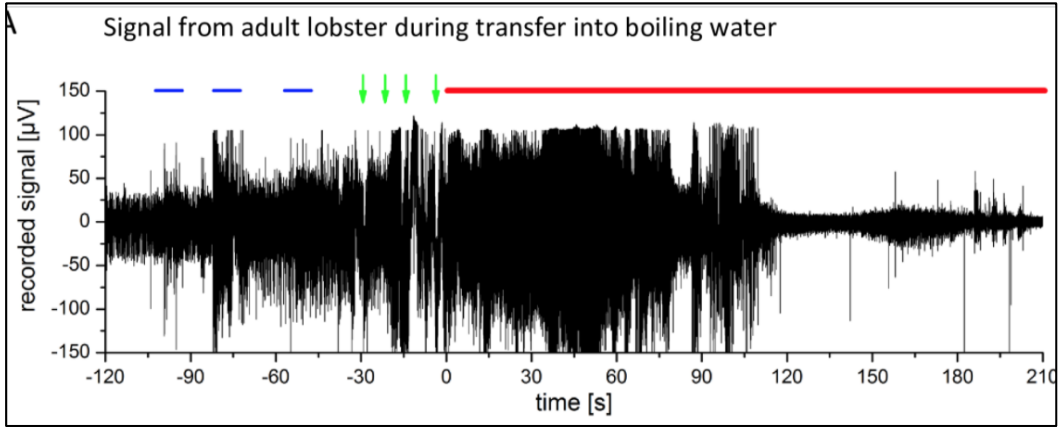
- Unlicenced research & untrained experimenters (e.g., undergrads)



Decapod Welfare Issues

Common Slaughter Methods:

- Dismemberment
- Freezing
- Boiling



Fregin & Bickmeyer (2016) *PLOS ONE*

Insect Welfare Issues

Considerations in Research:

- Invasive experiments
- Genetic mutations
- Inhumane killing

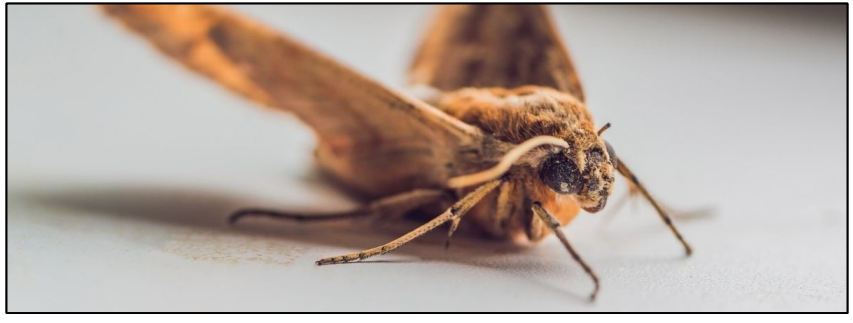
Insect Welfare Issues

Insect Farming Slaughter Methods:

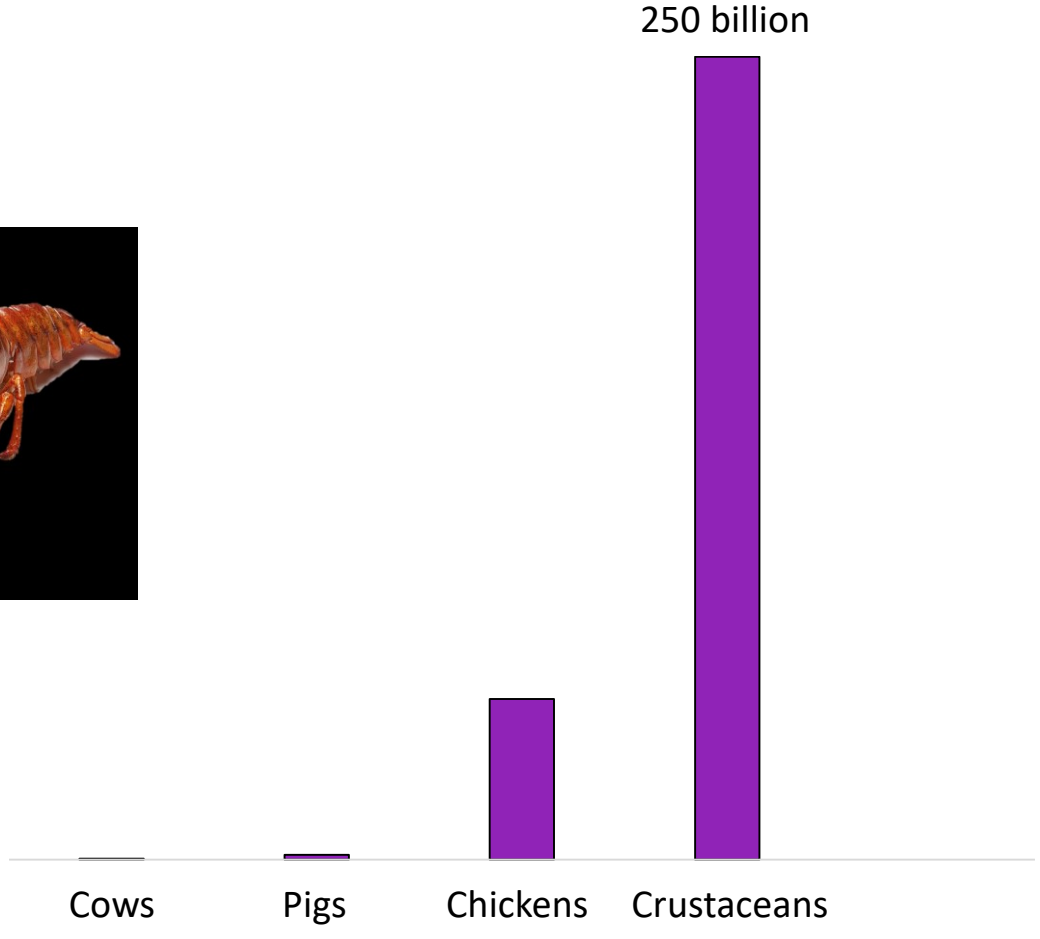
- Microwaving
- Boiling
- Freezing
- Crushing
- Starvation

Insect Welfare Issues

Pesticides



How many are Slaughtered?



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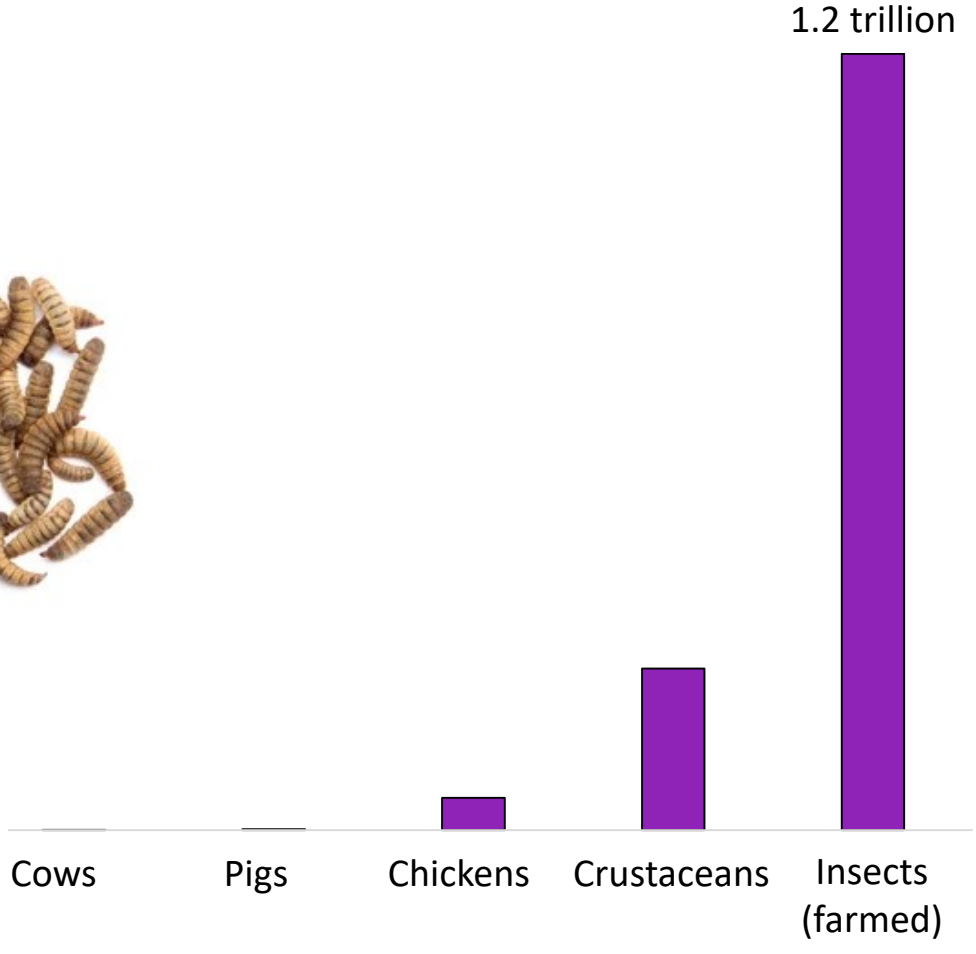
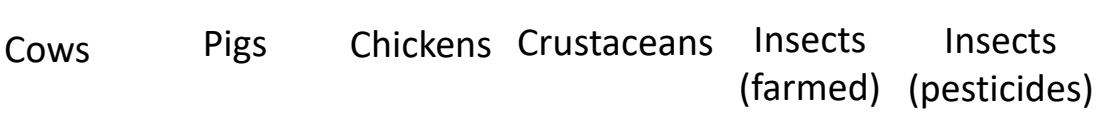


1 ***quadrillion***!?

How many are Slaughtered?



This Presentation's **BIG** Idea

Animal welfare science & policy is **fundamentally misguided**…

This Presentation's **BIG** Idea

Animal welfare science & policy is **fundamentally misguided**…

If our aim is to minimise animal suffering, we should all be focused on **invertebrates**

And, in particular, developing **more humane pesticides**

Royal Veterinary College
University of London

FOUNDATIONS of ANIMAL SENTIENCE

European Research Council
Established by the European Commission

LSE

Questions?

Dr. Andrew Crump
acrump@rvc.ac.uk

Danish 3Rs Symposium, Copenhagen, 6th November 2023