Humane Fish Slaughter: A Comparison of Farmed Fish Welfare Standards in the United States and the United Kingdom

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Is this humane?
Do Fish Feel Pain?

- Pain vs. nociception

- **Argument**: fish cannot feel pain because they lack a neocortex

- **Counterargument**: neocortex is unique to mammals. Pain perception is a complex process that is not dependent on a sole anatomical structure
  - 1) Fish have nociceptors (A and C fibres)
  - 2) Pain-like responses in fish can be reduced with analgesic drugs
  - 3) Fish can develop appropriate avoidance behavior associated with an aversive stimuli

Sneddon et al. 2003

Figure 1. Position of polymodal mechanoreceptors or nociceptors, mechanothermal receptors and mechanoochemical receptors on the head and face of the rainbow trout, *Oncorhynchus mykiss* (triangles, polymodal nociceptor; diamonds, mechanothermal nociceptor; hexagons, mechanochemical receptor).
Aquaculture is the fastest growing sector of livestock production

World capture fisheries and aquaculture production

Million tonnes

Year

FAO 2014
Human consumption is a major stimulus for aquaculture

- 66 million tons of finfish produced in 2012 (132 billion lbs)
- 37 to 120 billion individual fish produced for human consumption
- More fish are slaughtered than all other farmed vertebrate species combined!
Increasing concerns for fish welfare

- **Early 1990s**
  - Fish health/diseases
  - Effects of transportation

- **Late 1990s and early 2000s**
  - Stocking density

- **Most recently**
  - Welfare indicators
  - Welfare of fishes at slaughter
  - Development of husbandry/slaughter systems that promote humane slaughter

Keywords “welfare” and “aquaculture” in Web of Science

Huntingford and Kadri 2009
There is a lack of legislation that protects the welfare of farmed fish.

- The United States
  - Humane Methods of Slaughter Act 1958
    - Does not include poultry or fish
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- **The European Union**
  - Regulation 1099
    - Includes poultry but not fish
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“Recommendations on **farm fish are not included** in this Regulation because there is a need for further scientific opinion and economic evaluation in this field.”
Major U.S. guidelines for welfare of fishes

1) “Guide to Drug, Vaccine, and Pesticide Use in Aquaculture”

2) “Use of Fishes in Research Committee’s Guidelines for the Use of Fishes in Research”

3) “American Veterinary Medical Association’s Guide to the 2000 report of the AVMA Panel on Euthanasia”

4) “American Association of Zoo Veterinarians Guidelines for Euthanasia of Nondomestic Animals.”
The U.K. is a world leader in the campaign for enhanced farmed fish welfare

- Several U.K. entities have developed guidelines for humane slaughter of farmed fish

- U.K. aquaculture industries and some grocery retailers have adopted these guidelines.
The U.K. is a leader in the campaign for enhanced farmed fish welfare.

As of this week, RSPCA Freedom Food approved Salmon will be available nationwide in Morrisons stores. As the only retailer to stock over 50 species, which are all fully sustainable, the retailer is especially proud of its fresh fish. Great care is taken in sourcing the best quality, which is why all fresh and smoked Scottish Salmon sold from the fresh fish counter will now be Freedom Food accredited.

Bearing the Freedom Food label, customers can be assured that the Salmon they are buying has passed through the high standards of the only UK farm assurance scheme dedicated to improving farm animal welfare.

John Akehurst, Freedom Food, comments: “It’s encouraging to see a large retailer such as Morrisons continue to support the Freedom Food scheme. Customers get great tasting produce, safe in the knowledge that extra care has been taken into the welfare of the animal.”
U.K. farmed fish slaughter standards

- Guidelines aim to reduce fish stress, suffering, and pain
  - Fish should not be out of water for longer than 15 seconds
  - Stunning must occur in < 1 sec
  - If fish are to be slaughtered using a two-phase method, unconsciousness must be long enough to ensure fish are dead before potential recovery
Slaughter/Stun methods that are **not** ethical

- Live chilling
- Asphyxiation in any manner (e.g., air, CO\(_2\), N\(_2\))

Problems
- Prolonged stress
- Immobilized but not insensible
- Strong aversive reaction
Slaughter/Stun methods that are not ethical

- Live chilling

- Asphyxiation in any manner (e.g., air, CO₂, N₂)

- Bleeding or decapitation of conscious fish

Problems
- Prolonged stress
- Immobilized but not insensible
- Strong aversive reaction
Promising methods for humane slaughter/stunning

| Iki jime       | Percussive stunning | Electrical stunning |
Promising methods for humane slaughter/stunning

- Pithing or spike method
  - Insertion of a spike into brain to render immediate brain damage
  - Can cause immediate insensibility
Promising methods for humane slaughter/stunning

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- **Pithing or spike method**
  - Insertion of a spike into brain to render immediate brain damage
  - Can cause immediate insensibility

- **Limitations**
  - Skill and training
  - Not feasible for large operations
  - Fish handling → stress
  - Reserved for larger-sized fish (e.g., salmon, tuna)
### Promising methods for humane slaughter/stunning

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- **Blunt force trauma**
  - Blow to the head to render fish unconscious
  - If done correctly, instantaneous insensibility
  - Manual, semi-automatic, or automatic
Promising methods for humane slaughter/stunning

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- **Limitations**
  - Manual: inaccurate after prolong activity
  - Requires training
  - For semi-automatic or automatic systems, requires fish to be sorted beforehand
  - Does not work for all species (skull morphology)
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How not to do it...
### Promising alternatives for slaughter/stunning

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- **Application of electric current through water**
  - Dry vs. wet stunning—can also be used for direct slaughter
  - If correct parameters are used, instantaneous insensibility
  - Batch or individual stunning
Promising alternatives for slaughter/stunning

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  - Dry vs. wet stunning—can also be used for direct slaughter
  - If correct parameters are used, instantaneous insensibility
  - Batch or individual stunning

- **Limitations**
  - Dry stunning not allowed in RSPCA guidelines
  - Inadequate settings can allow fish to recover quickly
  - Hemorrhaging and injuries
  - Constrained by water conductivity
Many farms are adopting electrical stunning systems for rested harvest or direct slaughter.
Summary

- There is a progressive movement to enhance animal welfare, including farmed fish.

- The U.K. has adopted strict guidelines. Major retail markets have preference for “Freedom Food” stamp of approval → May be passed as legislation.

- The aquaculture/retail industry in the U.S. has been slow to respond to similar guidelines.

- U.S. fish farmers and processing facilities need to be aware of potential changes in legislation in upcoming years.
Questions?

eat more fish
International animal welfare recommendations

- World Organization for Animal Health (OIE)
- European Food and Safety Authority (EFSA)
- Both serve as a general guideline, but not legally enforced.
Promising alternatives for slaughter/stunning

- **Iki jime**
  - Field: Evaluation of visual evoked responses (VERs)
    - Opercular pumping/coordinated movements
    - Eye roll
  - Lack of these indicators suggest fish are unconscious

- **Percussive stunning**

- **Electrical stunning**

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**FIG 1**: Diagram illustrating vestibulo-ocular reflex (‘Eye roll’) (a) in a live cod and (b) its absence in a dead cod. Note the plane of the ocular axis in each image.

Kestin et al. 2002