

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



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*Washington  
Department of*  
**FISH and  
WILDLIFE**

# 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

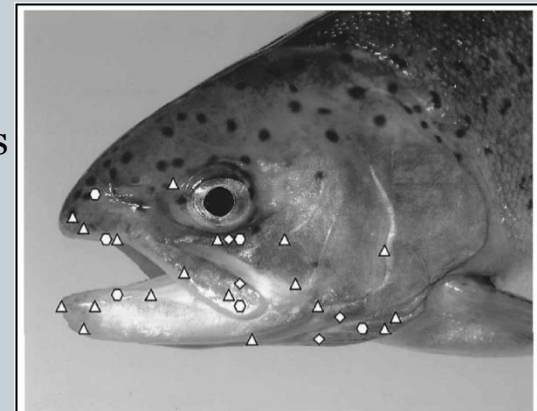


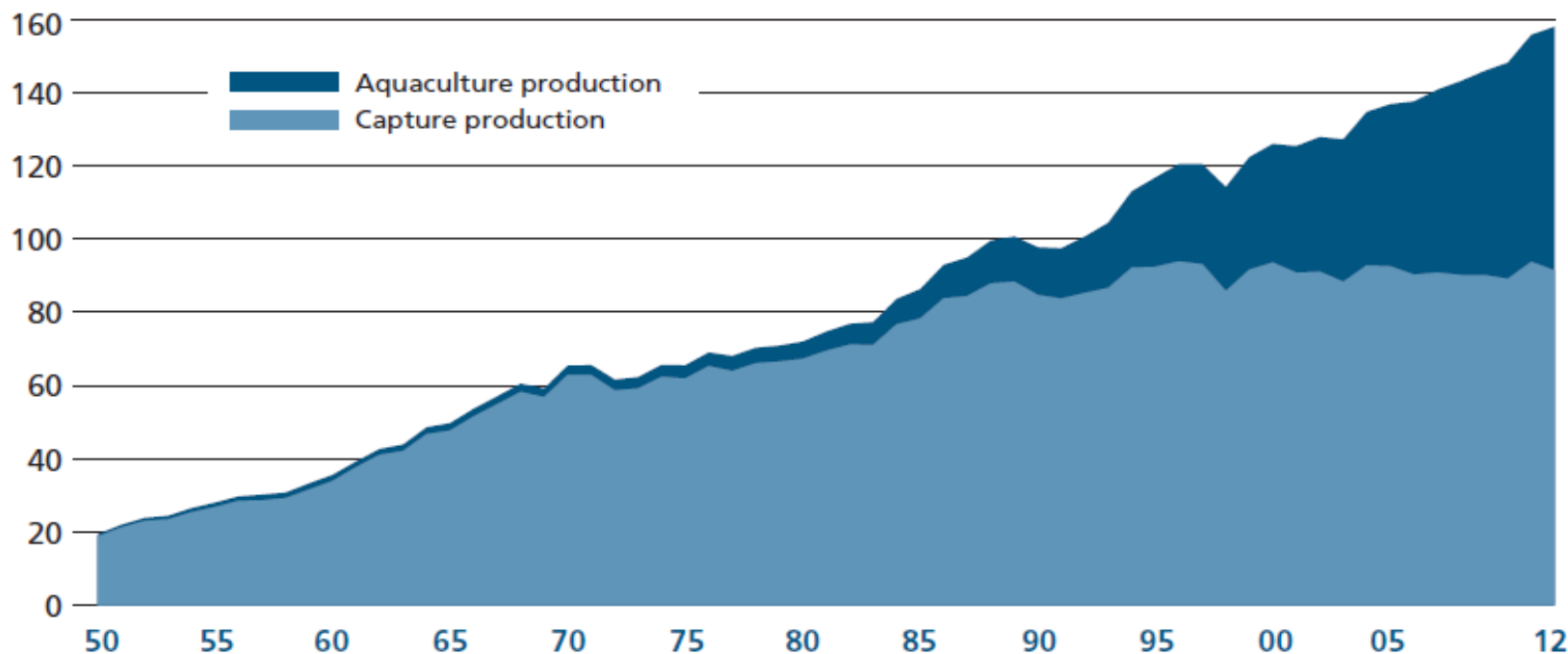
Figure 1. Position of polymodal mechanoreceptors or nociceptors, mechanothermal receptors and mechanochemical receptors on the head and face of the rainbow trout, *Oncorhynchus mykiss* (triangles, polymodal nociceptor; diamonds, mechanothermal nociceptor; hexagons, mechanochemical receptor).

# Aquaculture is the fastest growing sector of livestock production



## World capture fisheries and aquaculture production

Million tonnes



Year

# Human consumption is a major stimulus for aquaculture

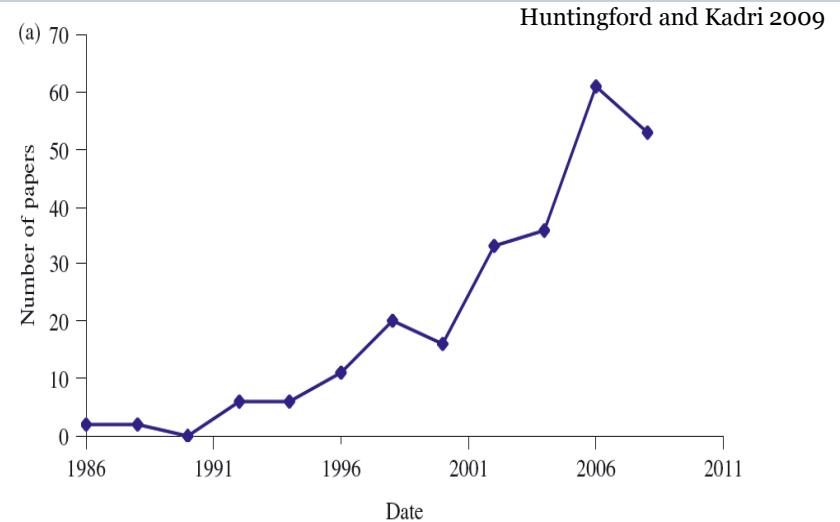


- 66 million tons of finfish produced in 2012 (132 billion lbs)
- 37 to 120 billion individual fish produced for human consumption
- More fish are slaughtered than all other farmed vertebrate species combined!



# 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

# 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 United States
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    - ✦ Does not include poultry or fish
- 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.”

## **Fish Slaughter, Killing, and Euthanasia: A Review of Major Published U.S. Guidance Documents and General Considerations of Methods<sup>1</sup>**

Roy P.E. Yanong, Kathleen H. Hartman, Craig A. Watson, Jeffrey E. Hill, B. Denise Petty, and Ruth Francis-Floyd<sup>2</sup>

# 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



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## Freedom Food Fish now available in store

**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."

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# 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<sub>2</sub>, N<sub>2</sub>)

## 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, CO<sub>2</sub>, N<sub>2</sub>)
- 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

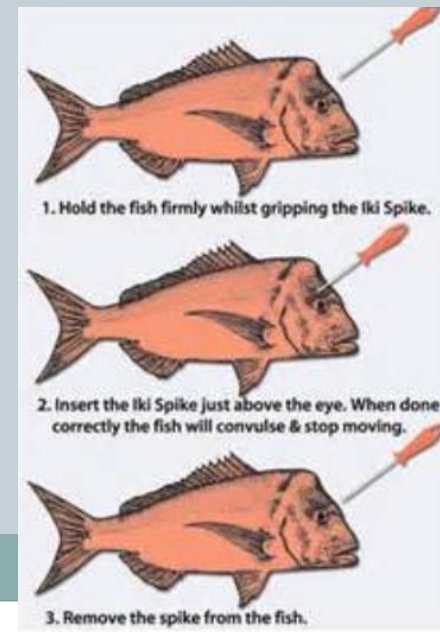


## Iki jime

## Percussive stunning

## Electrical 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

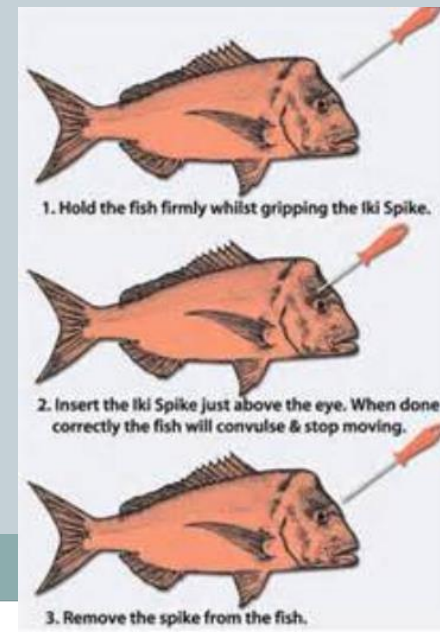
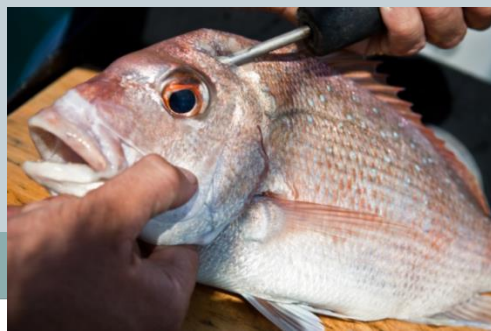


## Iki jime

## Percussive stunning

## Electrical stunning

- 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

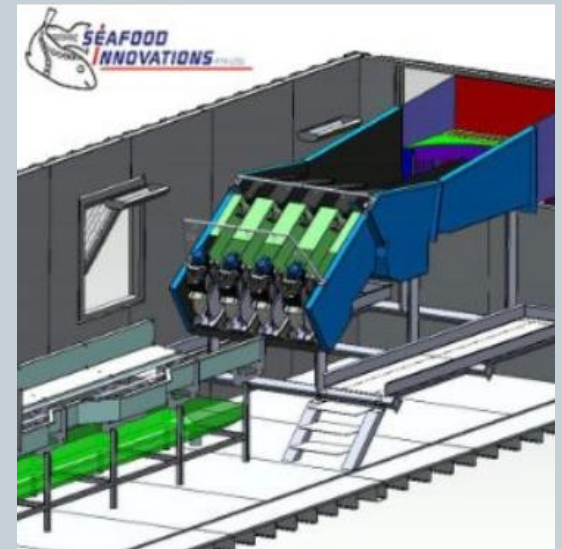


Iki jime

**Percussive stunning**

Electrical stunning

- **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



Iki jime

**Percussive stunning**

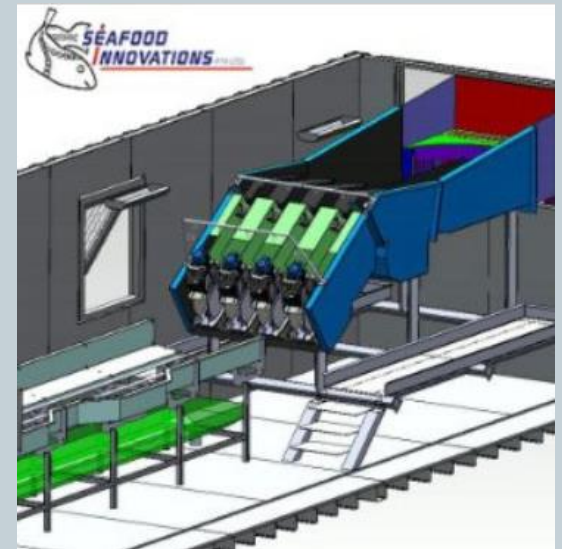
Electrical stunning

- **Blunt force trauma**

- Blow to the head to render fish unconscious
- If done correctly, instantaneous insensibility
- Manual, semi-automatic, or automatic

- **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)



# Promising methods for humane slaughter/stunning



Iki jime

**Percussive stunning**

Electrical stunning

How not to do it...



# Promising alternatives for slaughter/stunning



Iki jime

Percussive stunning

**Electrical stunning**

- 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



Iki jime

Percussive stunning

**Electrical stunning**

- 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
- 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?



# 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.



## CHAPTER 7.3.

### WELFARE ASPECTS OF STUNNING AND KILLING OF FARMED FISH FOR HUMAN CONSUMPTION

#### Article 7.3.1.

##### Scope

These recommendations apply to the stunning and killing of farmed fish species for human consumption.

These recommendations address the need to ensure the welfare of farmed fish, intended for human consumption, during stunning and killing including transport and holding immediately prior to stunning.

This chapter describes general principles that should be applied to ensure the welfare of fish for stunning and killing for human consumption and also applies to farmed fish killed for disease control purposes. Other measures applicable to emergency killing for disease control purposes are addressed in Chapter 7.4.

As a general principle, farmed fish should be stunned before killing, and the stunning method should ensure immediate and irreversible loss of consciousness. If the stunning is not irreversible, fish should be killed before consciousness is recovered.



*The EFSA Journal* (2004), 45, 1-29, Welfare aspects of the main systems of stunning and killing the main commercial species of animals

Opinion of the Scientific Panel on Animal Health and Welfare on a request from the Commission related to welfare aspects of the main systems of stunning and killing the main commercial species of animals<sup>1</sup>

(Question N° EFSA-Q-2003-093)

Adopted on the 15<sup>th</sup> of June 2004

# Promising alternatives for slaughter/stunning



Iki jime

Percussive stunning

**Electrical stunning**

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

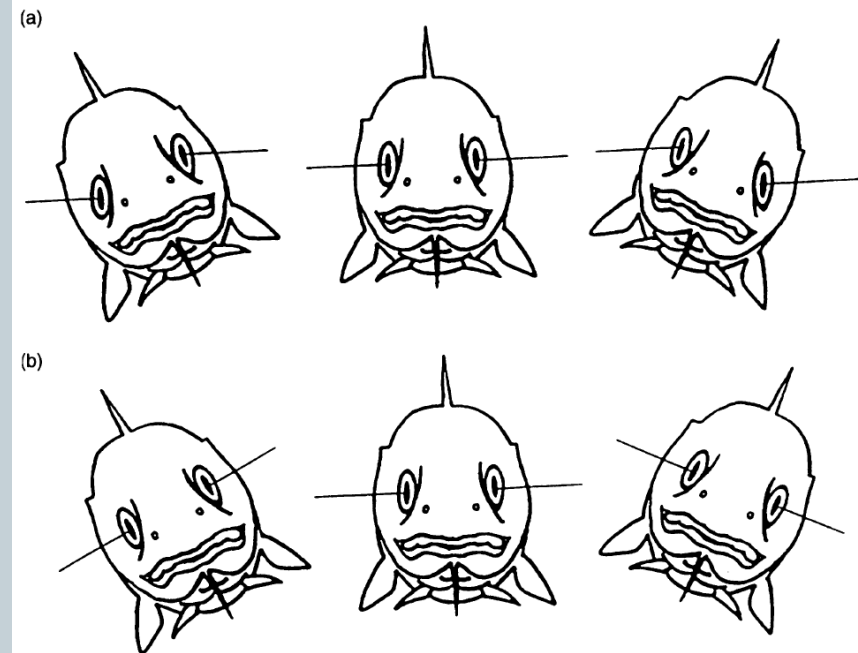


FIG 1: Diagram illustrating vestibulo-ocular reflex ('Eye roll') (a) in a live cod and (b) its absence in a dead cod. Note the plane of the ocular axis in each image