ESR Ethical Seafood Research

WTS Welttierschutzstiftung

# INTRODUCTION TO FISH WELFARE

# IN THIS MODULE YOU WILL LEARN:

- Why fish welfare matters
- About sentience in fish
- About key welfare issues in captivity
- How you can contribute to better fish welfare

# CONTENTS



# // INTRODUCTION

# DEFINITIONS

**Aquatic animals:** Animals that live primarily in the water including molluscs, fish, mammals, crustaceans and reptiles.

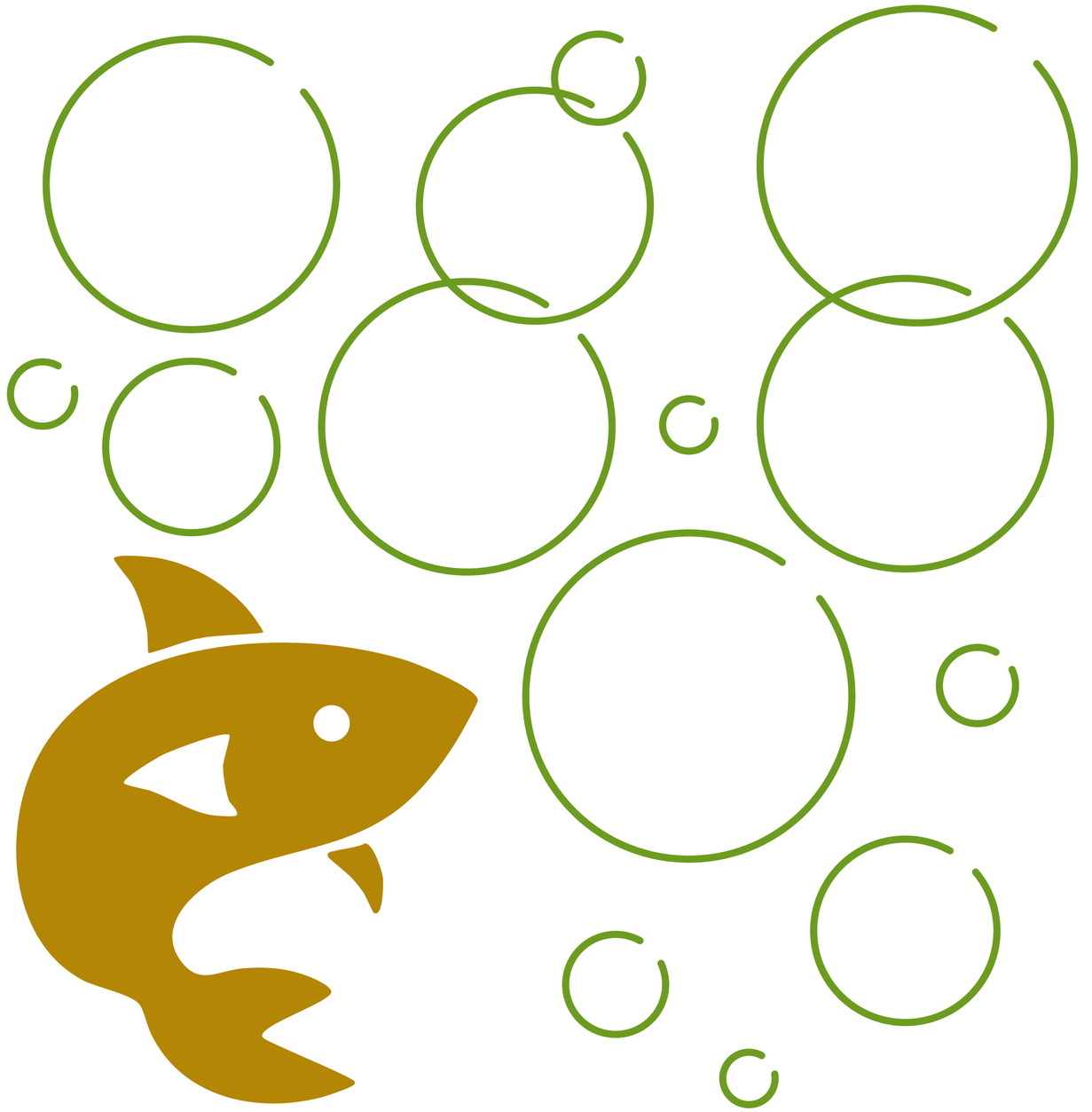
**Seafood:** Any wild-caught or farmed aquatic organism consumed by humans.

**Aquaculture:** The farming of aquatic animals or plants for food.

**Fishery:** An operation to harvest fish, either by capturing wild stocks or farming them through aquaculture.

# WHY DOES FISH WELFARE MATTER?

# WHY SHOULD WE CARE?



# WHY DOES FISH WELFARE MATTER?

# WHY SHOULD WE CARE?

# HOW DO WE PERCEIVE FISH?

- **Psychological distance** due to aquatic environment: “Out of sight, out of mind”
- **Intelligence misconception:** “3- second memory”
- **Language:** “harvesting fish”, “ornamental fish”, “seed” for juvenile fish (technically called ‘fry’) …
- **Low “cuddle factor”:** Perceived as cold, bonding more difficult

# HOW DO WE PERCEIVE FISH?

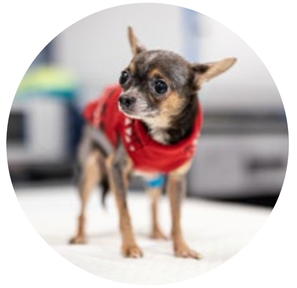
- No vocal communication
- Difficulty to read their facial or body expressions
- Limited recognition of their sentience

**Remember?**

**Sentience** means having the capacity to have feelings. Some scientists say that all vertebrates and most molluscs and crustaceans are sentient.

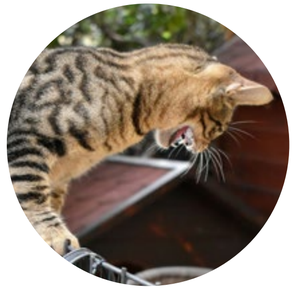
Happy dog

Angry dog



Scared dog

Happy cat



Angry cat

Scared cat

Happy?
Angry?
Scared?

# CONSEQUENCES OF HUMAN PERCEPTION

- **Weak lobby:** Animal protection organisations have traditionally neglected aquatic animals (except for dolphins, whales, etc.)
- **Frequent exclusion from welfare legislation:** Despite growing legal advocacy for other animals, fish remain neglected
- **Welfare vs. economy:** Prioritisation of economic aspects over welfare concerns is even stronger in fish than in other species
- **Low recognition of species-specific needs** because they are often perceived as one single species

# ARE ALL FISH THE SAME?

# ARE ALL FISH THE SAME?

**Atlantic Salmon:** Migrate hundreds of km before returning to its home river to spawn.

**Tilapia:** Makes nests in the mud, scents the surrounding water, and keep the young in their mouths to defend from predators.

# ARE ALL FISH THE SAME?

**Herring:** Maintain exactly the right spacing to catch escaping prey when shoaling.

**White-spotted pufferfish:** Make elaborate patterns in the sand to attract mates.

# DO FISH HAVE EMOTIONS?

# FISH HAVE COMPLEX SKILLS

- **Self-awareness:** some fish can recognise themselves in a mirror
- **Problem-solving:** some fish can collaborate and communicate using body movements
- **Emotions:** fish have a dopamine system and an area in their brain that regulates their emotional behaviour

# FISH FEEL PAIN

| Criteria | Mammals | Birds | Reptils/ Amphibians | Fish | Cephalo-pods | Decapods | Insects |
|---|---|---|---|---|---|---|---|
| Nociceptors, CNS pathways and processors | ● | ● | ● | ● | ● | ● | ● |
| Analgesic receptors | ● | ● | ● | ● | ● | ● | |
| Physiological responses | ● | ● | ● | ● | ● | ● | |
| Learned avoidance | ● | ● | ● | ● | ● | ● | ● |
| Change in behavior | ● | ● | ● | ● | ● | ● | ● |
| Drugs reduce response | ● | ● | ● | ● | ● | ● | ● |
| Self-administration of drugs | ● | ● | | ● | | | |
| Pain takes priority | ● | | | ● | ● | ● | |
| Change in behavorial preferences/choices | ● | ● | | ● | ● | ● | ● |
| Pay cost to avoid pain | ● | ● | | ● | | ● | |
| Trade off pain with other requirements | ● | ● | | ● | | ● | |

Table adapted from: Sneddon, L. U., Elwood, R. W., Adamo, S. A., and Leach, M. C. (2014). Defining and assessing animal pain. Animal Behaviour 97, 201-212

# POSITIVE TRENDS IN RECENT YEARS

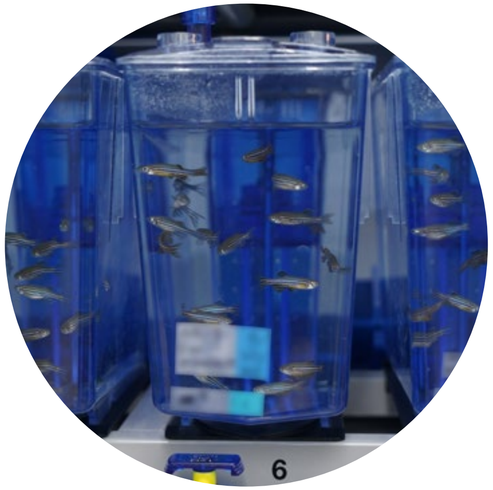
- **Increased scientific research** leading to higher moral consideration
- **Advocacy:** More **NGOs** are working in fish welfare
- **Recognition of fish as sentient beings:** e.g. The *Animal Welfare Act* (2022, UK) acknowledges fish as sentient beings under UK law
- **Development of international guidelines:**
  - WOAH Aquatic Animal Health Strategy, including fish welfare (2021)
  - Food and Agriculture Organization (FAO) technical papers addressing welfare in aquaculture
- **Industry engagement & certifications:** Many certification bodies now include aquatic animal welfare-focused components in their schemes

# // THE USE OF FISH

# HOW DO WE USE FISH?

# HOW DO WE USE FISH?

**Food and other products**



**Experimental animals**

**Pets/ornamental fish**

**Recreational fishing**

# FISH AS FOOD

- Over 90% of all annually slaughtered vertebrate animals are fish
- Wild fish make up the highest number
- Farmed fish and poultry are slaughtered in higher numbers than any other farmed animal

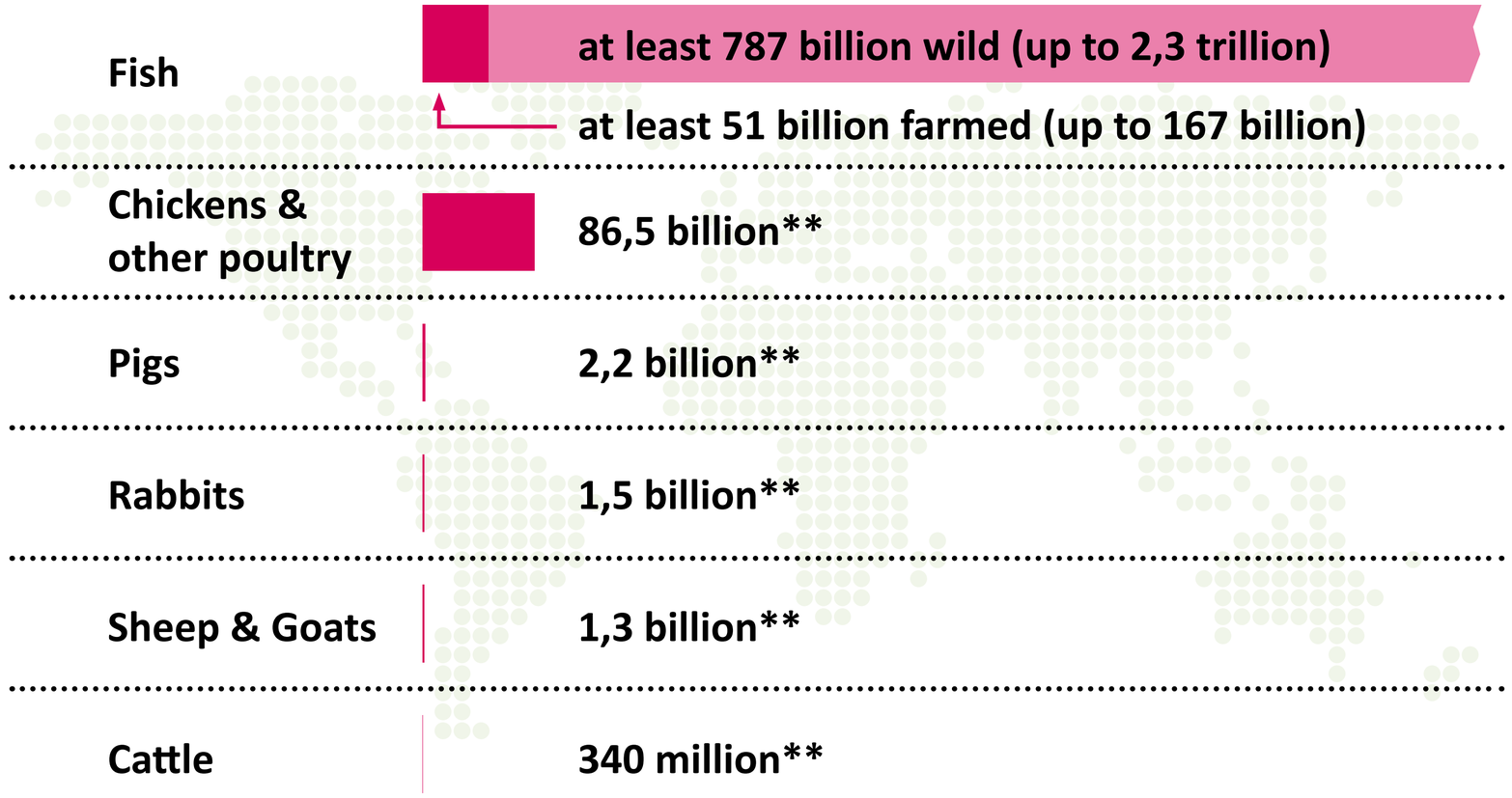



Table adapted from: Number of Land vs Aquatic animals slaughtered every year. Adapted fromFish Count/ Mood A, Brooke P. Estimating global numbers of fishes caught from the wild annually from 2000 to 2019. Animal Welfare. 2024;33:e6. doi:10.1017/awf.2024.7

# FISH AS FOOD

## wildfish vs. aquaculture

- Decline in wild population and increase in demand has led to increase in aquaculture
- Since 1950s, the volume of global aquaculture production has increased by 7-9% annually

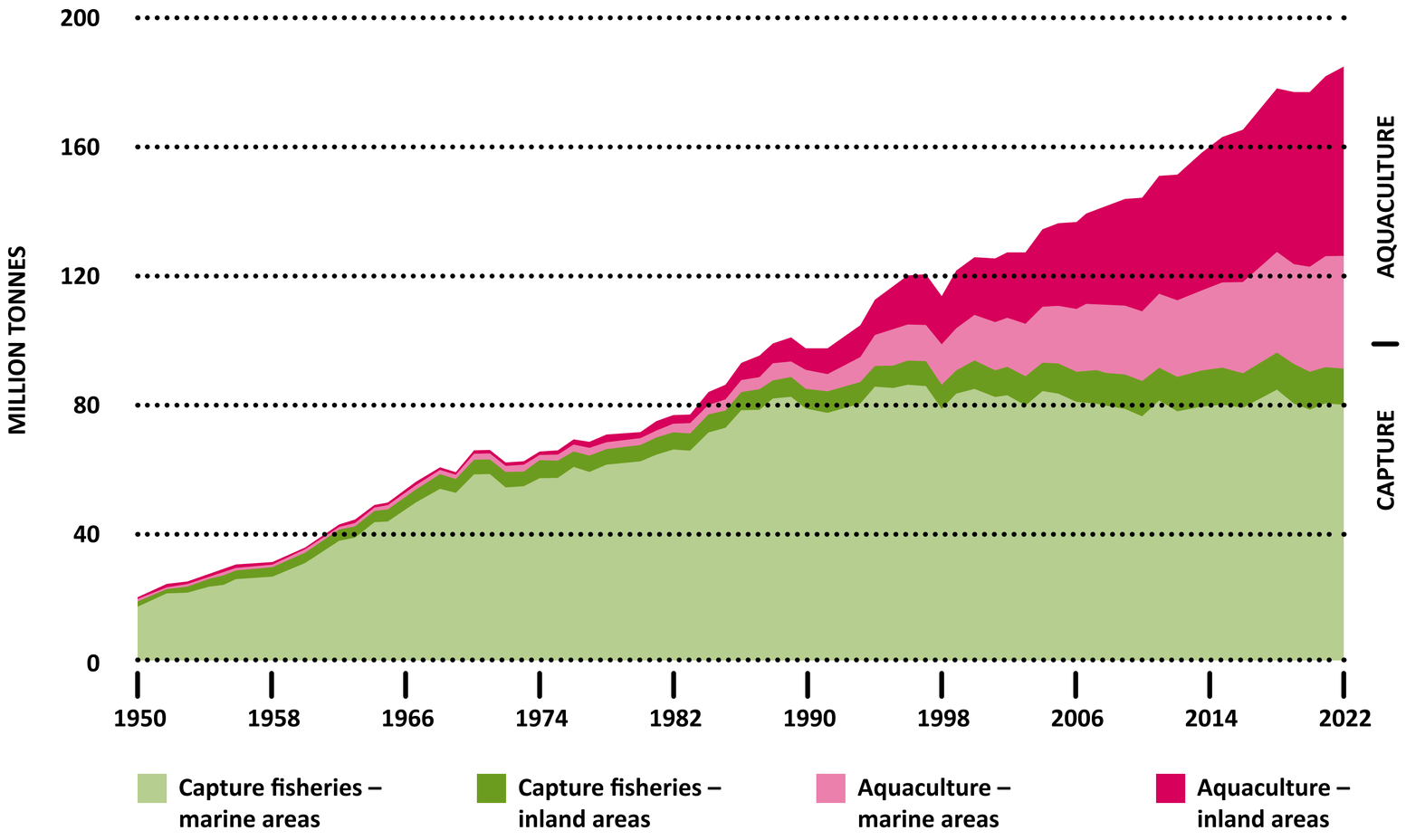
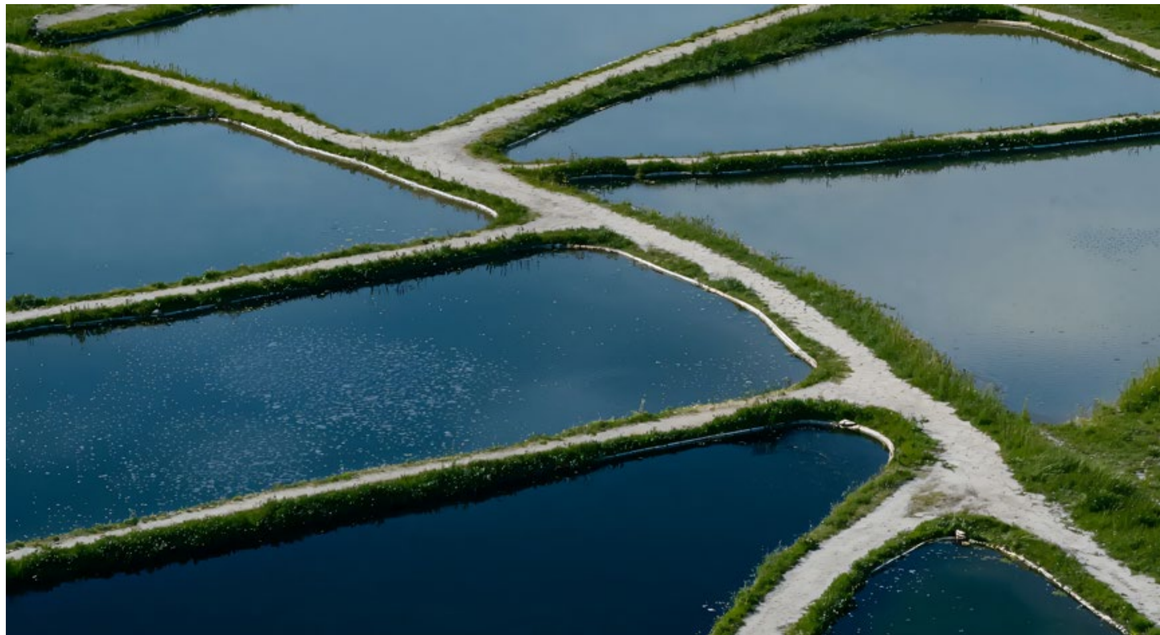



Table adapted from: FAO (2024) The state of World Fisheries and Aquaculture 2024 – Blue Transformation in action. Rome

# FISH AS FOOD
## Farming methods

### Floating Cages

- Closed nets in open water
- Often used in coastal areas or in large inland lakes
- Common species: salmon, trout, sea bream, sea bass



### Ponds

- Earthen or lined, usually semi-intensive inland systems
- Common species: carp, tilapia, shrimps

## Raceways

- Rows of rectangular concrete basins with an in- and outlet of water
- Used for inland aquaculture
- Typical species: rainbow trout, Atlantic salmon, Nile tilapia, channel catfish, carp


## Recirculating Aquaculture Systems (RAS)

- Artificial basins, water is 90% recirculated and repeatedly treated
- Intensive system, depends on high maintenance and external power source
- Typical species: Atlantic salmon, rainbow trout, European seabass, barramundi, sturgeon

# FISH AS EXPERIMENTAL ANIMALS

- Fish are one of the most used animals in laboratories only second to mice
- Globally most common species: Zebrafish
- Preferred because of
  - short reproduction cycle
  - transparent embryo development
  - small adult size
  - robustness in husbandry
- Number of Zebrafish used in the EU + Norway (2022): 362.449 animals; numbers are increasing

# FISH AS PETS OR "ORNAMENTS"

- 90% of freshwater species are bred in captivity
- 90% of marine fish are caught in the wild
- Thousands of species from distinct environments are kept in aquariums → diverse health and welfare requirements

# // BASICS OF FISH WELFARE

# FISH ARE DIVERSE

- There are more than 30.000 fish species (compared to about 6.640 mammals)
- Each species has specific physiological, environmental and behavioural needs

→ Welfare recommendations must always be **species-specific**

1

## NUTRITION

RIGHT AMOUNT, TYPE, AND VARIETY OF FOOD

2

## ENVIRONMENT

WATER QUALITY, THERMAL BALANCE, SUBSTRATE, SPACE, LIGHT, NOISE

3

## HEALTH

DISEASE, INJURY, PAIN, HYGIENE, SAFETY AND PROTECTION

4

## BEHAVIOUR

SOCIAL INTERACTIONS, MOVEMENT, SEXUAL ACTIVITY, PLAY, SLEEP, REST

**POSITIVE AND NEGATIVE EFFECTS**

5

## MENTAL STATUS

## WELFARE STATUS

# WELFARE PRINCIPLES

Each domain translates into a welfare principle,
which is used in many animal welfare assessment protocols:

| | | |
|---|---|---|
| Domain Nutrition | → | Good feeding |
| Domain Environment | → | Good housing/Good environment |
| Domain Health | → | Good health |
| Domain Behaviour | → | Appropriate behaviour |
| *Domain Mental state* | → | *No separate principle, difficult to assess directly* |

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# GOOD FEEDING

includes:

**Feed quality**

- Balanced diet appropriate for species, age and growth state
- Right size and palatability

**Feed quantity**

- Adequate for number of animals to avoid overfeeding/underfeeding

**Feed delivery**

- Uniform feed distribution
- Consider natural feeding behaviour of species

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# GOOD ENVIRONMENT

includes:

- **Water quality**
- **Environmental structures** and **installations**
- **Environmental enrichment**
- **Stocking density**

# GOOD ENVIRONMENT

## Water quality

Water quality is one of the most crucial parameter for fish welfare. It must always be monitored.

Important indicators:

- Oxygen saturation
- Temperature
- pH
- Turbidity
- Non-ionised ammonia
- Nitrite
- Alkalinity
- Salinity (depending on species)

# GOOD ENVIRONMENT

## Environmental structures and installations

The physical environment must be carefully adapted to the species‘ needs.
Key considerations include:

- **Material:** non-toxic, no sharp edges, easy to clean
- **Substrate and structural elements:**
  - Provide hiding spaces to reduce stress
  - Encourages natural behaviors (e.g., foraging and burrowing)
- **Protection from predators:** Especially outdoors enclosures must be protected from predators to avoid injury, suffering and chronic stress

# GOOD ENVIRONMENT

## Environmental structures and installations

Other important environment factors:

- **Noise exposure:** Loud and ongoing noise can cause chronic stress and hearing damage
- **Vibrations:** from filters, pumps, and other equipment, also outside the water, should be minimised
- **Light exposure:** artificial light can flicker, too much sun can cause burns, temperature changes etc. Light exposure must be considered in relation to turbidity, water depth, and species requirements
- **Group composition:** Careful selection of compatible species is necessary in shared habitats

# GOOD ENVIRONMENT

## Environmental enrichment

Allows to satisfy species specific behavioural needs, which are not met by the environment.
EE must be an integral part of animal care and should not be seen as an “add on”.
It must always be closely monitored, evaluated and adjusted.

Types of enrichment:

- **Physical** (e.g. shelter, plants, floor material like gravel, tank cover)
- **Sensory** (e.g. coloured walls, bubbles)
- **Dietary** (e.g. flavoured feed, different sized feed)
- **Occupational** (e.g. changes in water flow)
- **Social** (e.g. rearing with other compatible species)

# GOOD ENVIRONMENT
## Stocking density

- Ideal stocking density depends on species, life stage and management parameters

- Inappropriate stocking densities can affect behaviour, social dynamics and water quality

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# GOOD HEALTH

includes:

- **Preventative health care**
- **Detection of diseases**
- **Veterinary treatment**
- **Correct handling to avoid injuries and stress**

Health care includes preventative and curative measures and should always be guided by a specialised animal health professional.

# GOOD HEALTH

## Preventative health care

- **Breeding:**
  - selecting for robust physiology
  - avoid breeding animals with feature that cause health and welfare problems
- **Hygiene**
- **Vaccinations**
- **Prevention of disease** between farmed and wild fish
- **Preventing injuries** from inadequate handling, tools or tank structures

# GOOD HEALTH
## Detection of diseases

Visible indicators of fish health:

- **Skin and eye colour changes**
- **Morphological changes/injuries**
- **Reluctance to move** or altered **body posture**
- **Excess mucus production**
- **Opercular beat frequency**
- **Body condition scoring**
- **Immediate treatment** of diseases by a veterinary professional

# GOOD HEALTH

## Detection of diseases


Normal eye, healthy mouth, intact tail finn

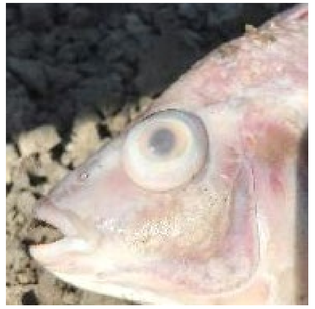
Healthy operculum

Healthy gills

**PHYSICAL HEALTH INDICATORS: EXAMPLES**

Deformed body

Deformed spine



Swollen eye

Skin ulceration

Missing rays in tail finn

# GOOD HEALTH
## Veterinary treatment

Responsibilities of different people involved:

**Keepers and caretakers …**

- must be trained to recognise abnormalities and conduct ongoing monitoring
- consult animal health professional for treatment
- provide follow-up care according to veterinary instructions

**Animal health professionals …**

- diagnose and treat conditions as soon as possible
- decide in the patient´s best interest
- involve animal keeper and make sure they understand instructions

# GOOD HEALTH

## Correct handling to avoid injuries and stress

Routine farming operations – including tank cleaning, equipment maintenance, fish transport, and size grading – impact welfare.

Common issues:

- Fish are handled in a rough manner
- Fish are often exposed to air where they cannot breathe

→ Injuries, stress, suffering and increased susceptibility to diseases

Always ask:
Is handling necessary?
If **YES**,
how can suffering be reduced?

# GOOD HEALTH
## Handling

Health problems caused by air exposure:

- **Hypoxia:** gill collapse → prevents oxygen exchange
- **Gill damage:** prolonged exposure can cause irreversible damage
- **Skin damage:** increased risk of infections
- **Damage to internal organs** through gravity
- **Increased cortisol levels:** air exposure triggers the HPI-axis
- **Heart problems**
- **Energy depletion** because of struggling behaviour
- **Thermal stress** because of temperature difference

# HANDLING DO'S AND DON'TS

## Do's

- Only handle when unavoidable
- All procedures must be carried out by trained staff
- Handle in water if possible
- Handle gently and with adequate tools and techniques (e.g. gloves or wet hands)
- Support the entire body of the fish
- Use nets of soft material and adequate size
- Use anaesthesia/analgesia for painful procedures
- Regularly revise and optimise procedures

## Don'ts

- Don´t take fish out of water unnecessarily
- Don´t use dry tools and surfaces
- Don´t lift the fish by single body parts, e.g. the gills
- Don´t damage the skin, gills, fins
- Don´t put live fish on ice
- Don´t expose fish to abrupt temperature changes when transferring from one system to another

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## MENTAL STATUS

## WELFARE STATUS

# APPROPRIATE BEHAVIOUR

Fish should have the possibility to express important behavioural needs like:

- **Feeding and foraging behaviours**
- **Exploration and habitat use**
- **Shoaling or schooling**
- **Resting or reduced activity**

The needs depend on individual factors like species, age and sex.

Lack of opportunity to express these behaviours can result in aggression and stress.

# APPROPRIATE BEHAVIOUR

## Detection of abnormal behaviour

Behaviour can be observed on individual and group level. Examples of behaviours that may indicate welfare issues:

- **Excited swimming**
- **Surface gasping**
- **Lethargy or hovering**
- **Flashing** (rubbing against objects)
- **Position preferences** in the enclosure
- **Change in foraging behaviour**
- **Aggression and dominance**

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## MENTAL STATUS

## WELFARE STATUS

# MENTAL STATE

## All domains influence the mental state

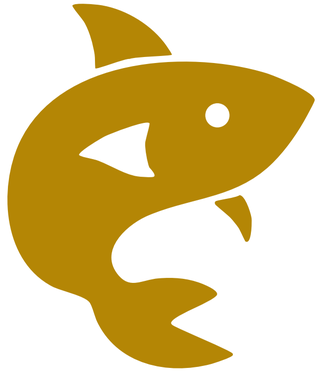
**FACTORS AFFECTING WELFARE**

**Nutritional factors**
e.g. insufficient food, competition for food

**Environmental factors**
e.g. poor water quality, presence of predators, noirse, vibrations

**Health factors**
Diseases, injury from inadequate handling

**Behavioural factors**
e.g. lack of opportunoity to express natural behaviours



**STRESS RESPONSE**

**Primary stress response**
e.g. increase in stress hormone (cortisol)

**Secondary stress response**
e.g. metabolic changes (increase in glucose/ lactat, immune sytem)

**Tertiary stress response**
e.g. changes in health, growth and behaviour (reduced food intake, aggression)

# // FISH WELFARE ASSESSMENT

# WHAT IS ANIMAL WELFARE ASSESSMENT?

Evaluation of an animal´s welfare status by observing  and measuring different signs and parameters, called **indicators**.

We can look at indicators on the animal, in its environment and in its management.

# WHY IS IT IMPORTANT?

**Advocacy is more convincing when you have data to back you up**

→ **Advising stakeholders** (law makers, politicians):

- Providing a scientific basis for advocating to improve laws and legal frameworks for animal welfare

→ **Advising farmers and animal keepers:**

- Make recommendations from an informed basis
- Explain the link between animal welfare, health and productivity
- Support them to comply with legal requirements and trade standards
- Follow-up assessment: compare situations before and after intervention

# ASSESSING FISH WELFARE

- Animal welfare is complex and multidimensional
- This complexity should be reflected in assessments

  → combine different indicators to get the whole picture

- Results are the basis for analysis, for discussion, and for improvements

The combined indicators from these three areas provide information about the overall animal welfare status. It varies between good and poor.

# FISH WELFARE INDICATORS

## Indicators provide information about the welfare status of the fish

### Inputs

**Management-based indicators**

**Resource-based indicators**

### Outputs

**Animal-based indicators**

# FISH WELFARE INDICATORS

## Indicators provide information about the welfare status of the fish

### Inputs

**Management-based indicators**

- Handling
- Feeding

**Resource-based indicators**

### Outputs

**Animal-based indicators**

# FISH WELFARE INDICATORS

## Indicators provide information about the welfare status of the fish

### Inputs

**Management-based indicators**

- Handling
- Feeding

**Resource-based indicators**

- Water quality
- Environmental structures
- Stocking density

### Outputs

**Animal-based indicators**

# FISH WELFARE INDICATORS

## Indicators provide information about the welfare status of the fish

### Inputs

**Management-based indicators**

- Handling
- Feeding

**Resource-based indicators**

- Water quality
- Environmental structures
- Stocking density

### Outputs

**Animal-based indicators**

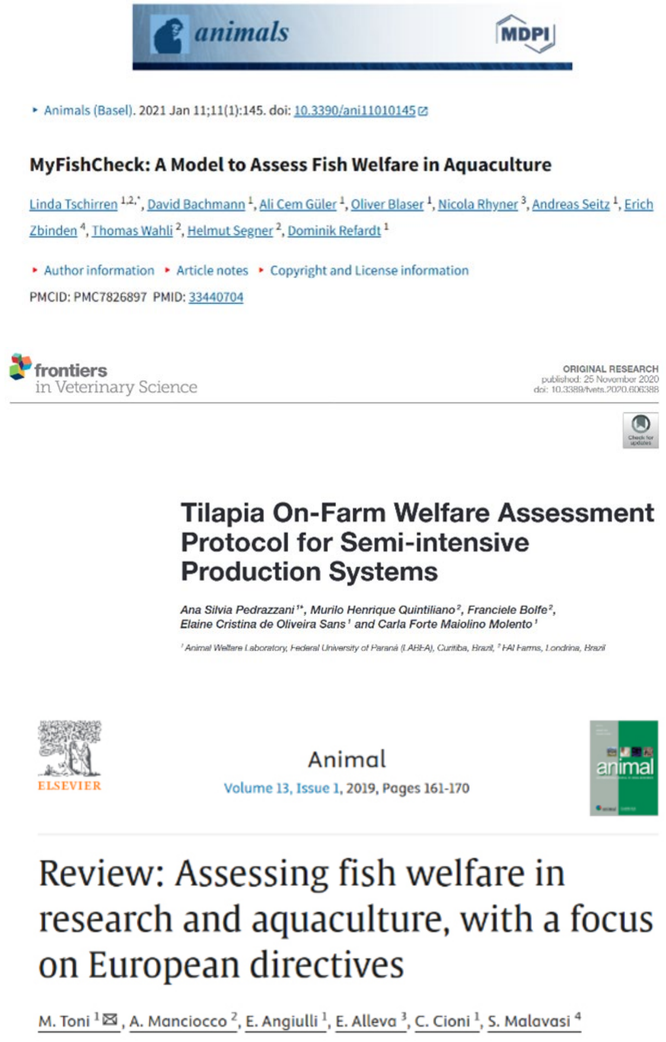
- Physical state
- Behaviour
- Physiological (laboratory) parameters

# ASSESSING FISH WELFARE

A variety of fish welfare assessment schemes are available.

Choose a protocol which is suitable for:

- Species
- Husbandry system
- Purpose of the assessment
- The resources available (time, staff, money)

# // WELFARE DURING TRANSPORT AND SLAUGHTER

# WELFARE ISSUES DURING TRANSPORT

Fish are moved between enclosures or locations for different farming stages, or when they are sold. This includes the stages:

- Crowding and catching
- Transport
- Release at the new location

**Common issues**

- Stress through crowding, catching, temperature, vibration etc.
- ↑ injury and mortality
- Poor water quality: ↓ oxygen, ↑ nitrogen, change in temperature and pH

# TRANSPORT DO'S AND DON'TS

## Do's

- Ensure adequate oxygen levels
- Maintain appropriate water temperature
- Ensure handling is calm, brief and safely
- Provide adequate space in transport tanks
- Make sure everyone involved incl. drivers is trained and sensitised for potential animal welfare issues and how to manage them

## Don'ts

- Don´t expose fish to sudden environmental changes
- Don´t use poor-quality or contaminated water
- Don´t subject fish to excessive noise or vibrations
- Don´t prolong transport unnecessarily

# WELFARE ISSUES AT SLAUGHTER

Fish are slaughtered for human consumption;
they therefore deserve humane handling to minimize suffering.

Humane slaughter includes:

- Pre-slaughter handling (crowding, fasting, transport)
- Stunning (electrical or percussive)
- Bleeding and processing

Just like mammals and birds,
**fish MUST be stunned before bleeding** !

# WELFARE ISSUES AT SLAUGHTER

**Common issues:**

- **Stress** from handling, crowding, and inadequate stunning
- **Ineffective stunning** leading to prolonged suffering

Acceptable stunning methods:

- **Percussive stunning:** Hitting the head of the fish with a blunt object.
- **Electrical stunning:** Through electric voltage

# WELFARE ISSUES AT SLAUGHTER

## Verifying unconsciousness after stunning (before killing)

Unconsciousness should be assessed **immediately after stunning** and **before killing**, using the **absence of reflexes and responses**. Common indicators include:

- **Opercular Rate (Opercular movements; OR):** Check for the absence of regular gill movements
- **Vestibulo-ocular reflex (VER):** No eye movement when the fish is rolled side to side
- **Equilibrium (EQ):** Fish does not right itself or swim when placed in water
- **Tail-grab reflex (TGR):** No escape response when the tail is firmly grasped

**More than one reflex should be tested to confirm unconsciousness.**

# SLAUGHTER DO'S AND DON'TS

## Do's

- Use effective stunning methods (electric or percussive)
- Confirm unconsciousness before killing
- Killing must be done by immediate bleeding
- Regularly monitor stunning efficiency
- Maintain equipment properly
- Train staff in humane slaughter techniques

## Don'ts

- Don`t bleed fish without stunning
- Never use stunning methods like CO2, suffocation or putting on ice, as they cause severe distress
- Don`t delay the period between stunning and bleeding, as fish may regain consciousness

# // ROLE OF ANIMAL HEALTH PROFESSIONALS

# WHAT ROLE CAN YOU PLAY IN FISH WELFARE?

# ROLE OF ANIMAL HEALTH PROFESSIONALS

## On site

- Assess the welfare of fish on a scientific basis
- Advise on the specific physiological, environmental and behavioural needs of fish
- Consult about welfare measures to prevent disease, suffering and economic loss
- Accompany fish keepers in the constant improvement of their husbandry systems
- Treat sick animals (veterinarians)
- Perform euthansia for unrecoverable sick and injured fish

# ROLE OF ANIMAL HEALTH PROFESSIONALS

## In society

- Raise awareness for fish welfare issues and fish sentience
- Promote good welfare practices
- Advocate for fish welfare research and refinement of fish welfare legislation and policies
- Support the development of animal welfare certification systems for fish

# // SUMMARY

# SUMMARY

- Fish are one of the most exploited animal groups.
- Aquatic animal welfare is closely linked to human and environmental welfare.
- Fish are complex beings, and it is ethical to consider their welfare.
- Fish are an extremely diverse group and have very different welfare needs.
- Knowledge about the specific needs is the foundation for welfare assessment and improvements.
- Fish farming is on the rise – animal health professionals must be prepared to safeguard fish welfare in a science-based way.

# // FURTHER READING

# FURTHER READING
## Books

**Do Fish feel pain?**
Victoria Briathwaite

World Aquatic Veterinary Medical Association (WAVMA): Video resources to help become acquainted with different aquatic veterinary procedures and issues.
https://www.wavma.org/video-library

# FURTHER READING

## Articles online

RSCPA Welfare Standards: Farmed Atlantic Salmon
https://science.rspca.org.uk/documents/d/science/rspca_welfare_standards_for_farmed_atlantic_salmon

RSCPA Welfare Standards: Farmed Rainbow Trout
https://science.rspca.org.uk/documents/1494935/9042554/RSPCA+welfare+standards+for+farmed+Rainbow+trout+%28PDF+2.29MB%29.pdf/36aeab04-e2f1-8875-d8ae-f7c4ff724c4d?t=1557668422472

GUIDELINES ON WATER QUALITY AND HANDLING FOR THE WELFARE OF FARMED VERTEBRATE FISH EU Platform on Animal Welfare Own Initiative Group on Fish
https://food.ec.europa.eu/system/files/2022-07/aw_platform_plat-conc_guide_farmed-fish_en.pdf

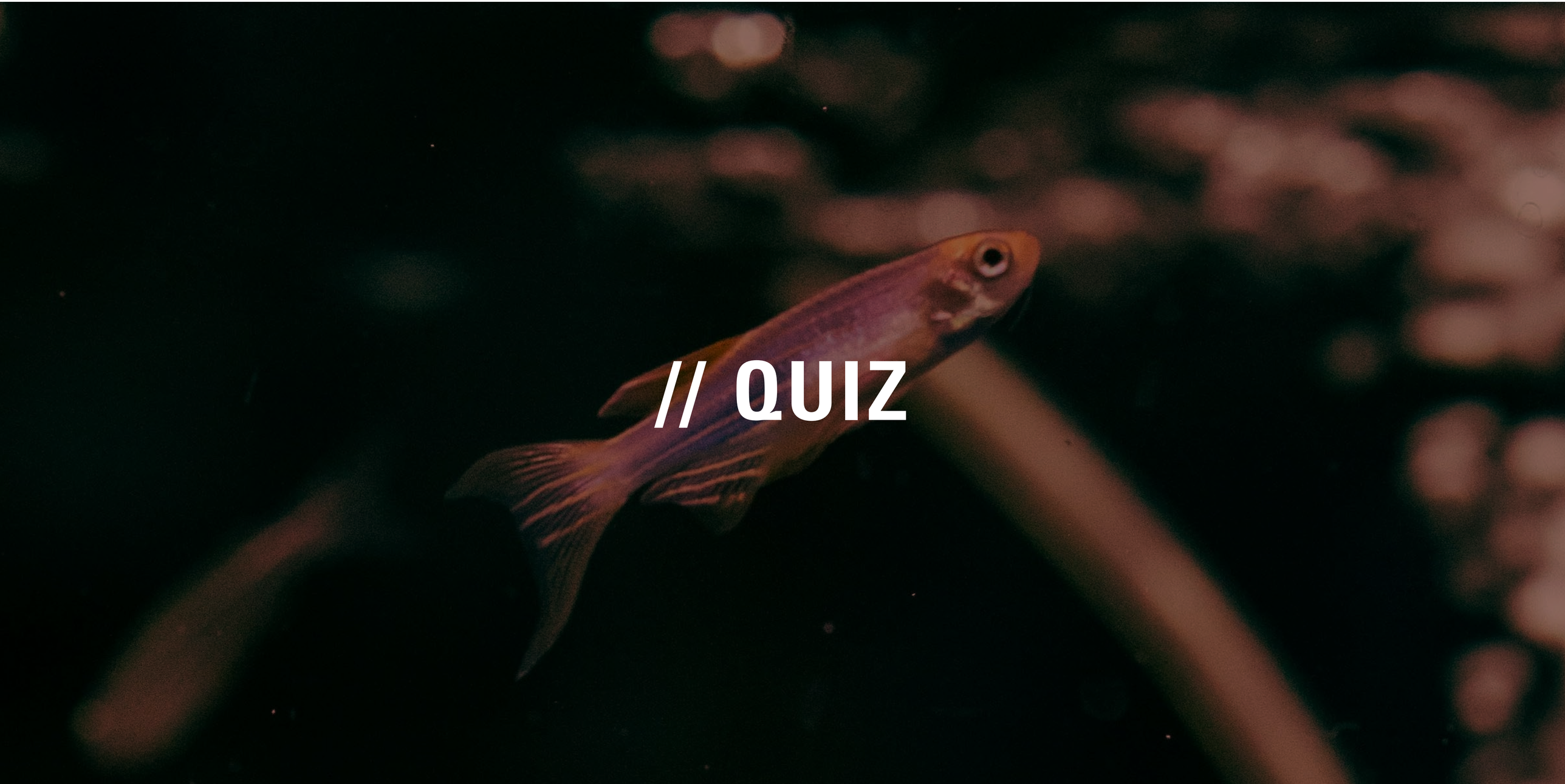
# FURTHER READING

Tackling Water Quality Challenges in Tilapia Aquaculture — Sara Barrento
https://www.linkedin.com/pulse/tackling-water-quality-challenges-tilapia-aquaculture-sara-barren-to-wrhnf

What do farmed fish and shrimp need to thrive? Start with the basics. — Sara Barrento
https://www.globalseafood.org/advocate/what-do-farmed-fish-and-shrimp-need-to-thrive-start-with-the-basics/

## Online learning

FAI Academy courses
https://enterprise.faifarms.com/catalog



# // QUIZ

# In what ways does human perception of fish affect their welfare? Give an example.

# What are the acceptable methods for stunning and slaughtering fish?

# What are the key environmental factors that influence fish welfare?

# What are the different types of welfare indicators? Can you give some examples?

# // CLASSROOM ACTIVITIES

# ARE FISH “ANIMALS”?

We often think about animal welfare laws in relation to pets or farm animals – but what about fish?

1. **Investigate the legal status of fish** in your country or region. Consider:
    1. Are fish explicitly recognised under animal welfare laws?
    2. Are there specific rules for fish in farming, fishing, or research?
2. **Summarize your findings**
3. **Present your insights** in class and compare findings with your peers.

This research will help us understand how societies value fish and their welfare within the broader scope of animal welfare laws.

# SPECIAL WELFARE ISSUES IN OTHER GROUPS OF FISH

So far, we've explored welfare issues in farmed fish—but what about fish in other settings?

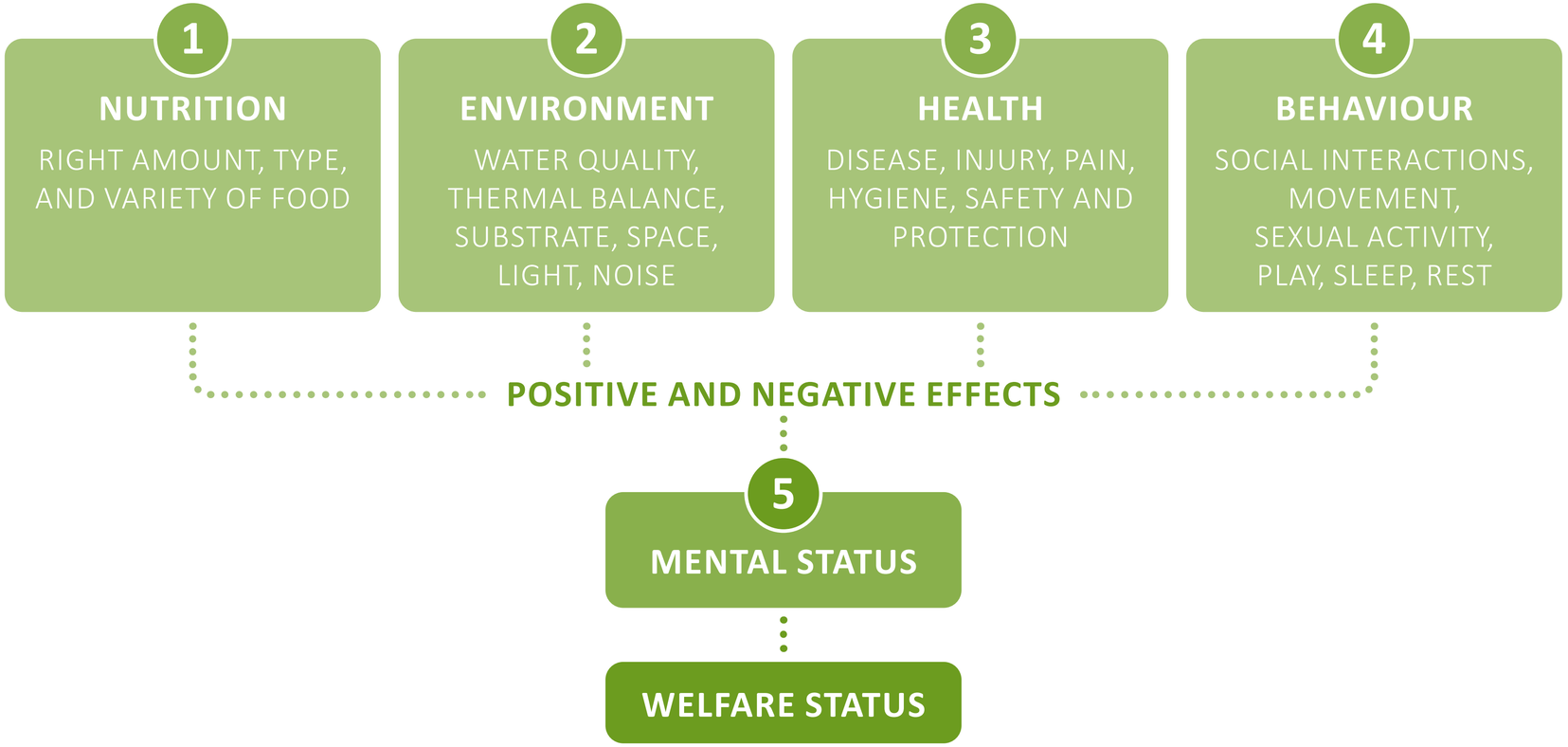
1. **Choose a category** of fish use. For example:
   - Fish in scientific research
   - Fish as pets or ornamental animals
   - Fish in zoos and public aquariums

2. **Investigate common welfare concerns:**
   - What are the main welfare risks in your chosen category?
   - How can these issues be prevented or minimised?
   - Are there guidelines or laws addressing these concerns?

3. **Present your research:** Share your insights with the class and compare welfare challenges across different fish-using industries.

# CASES

Discuss the pictures in the next slides. Keeping the 5 domains in mind, why are these situations problematic in regard to animal welfare?

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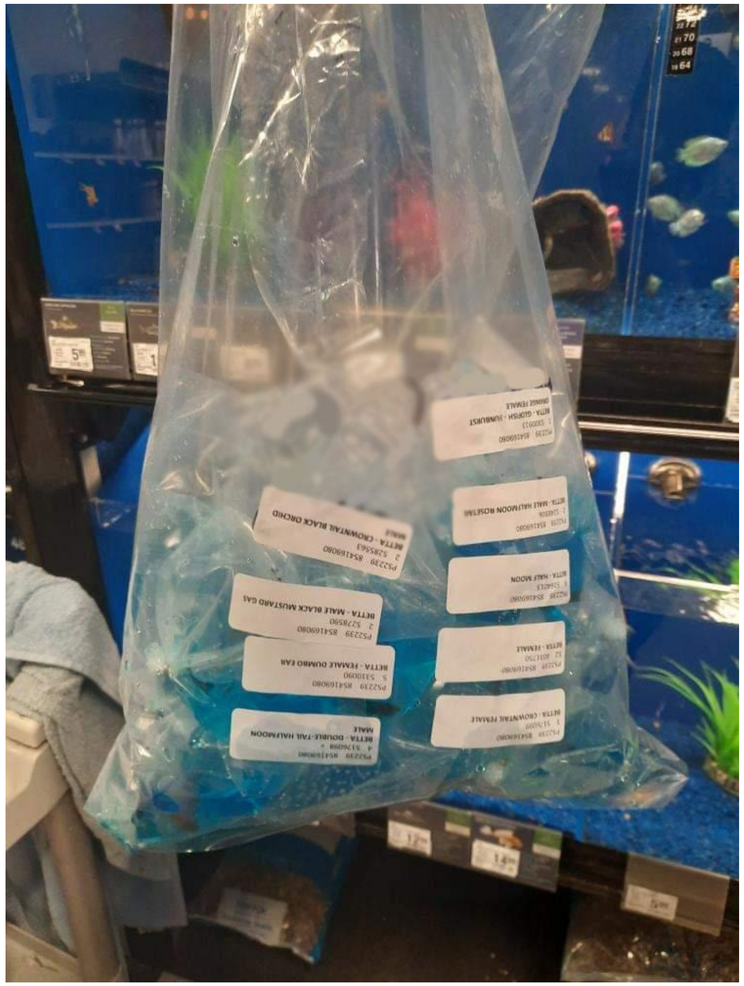

# ENRICHMENT

Fish, like other animals, have natural behaviors that are essential for their well-being. How can we design environments that support these behaviors?

**Your Task:**

1. **Choose a fish species** that is common in your region.
2. **Research its natural behavioral needs**, including:
   - Feeding behavior
   - Social behavior
   - Movement
   - Resting behavior
3. **Explore environmental enrichment options:** What changes to its habitat would allow it to express these behaviors naturally?

# // FIELD PRACTICALS

# LET'S TALK ABOUT FISH

What do people in your area think about fish?

1. **Design a short questionnaire** (3-5 questions) to explore people's attitudes toward fish welfare.

2. **Conduct a mini-survey:** Approach 10 randomly selected individuals and record their responses.

3. **Analyse and present your findings:** Summarise the key trends and insights from your survey and share them with the class.

# VISIT A FISH FARM

Plan a trip to a fish farm, This is a great opportunity to observe fish husbandry systems, management practices, and industry challenges firsthand.

- Pay attention to how fish are housed, fed, and handled.
- Ask about common welfare challenges in fish farming and how they are addressed.
- If possible, split into groups to focus on different aspects (e.g., water quality, feeding, health management, welfare standards).

Take notes, ask questions, and be ready to share your observations in class afterward.

# // REFERENCES

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