Module 23
Welfare of Wild-Caught and Farmed Fish (Fish Welfare Part 1)

Student Activities

Questions

1. **It is widely accepted that fish are sentient. Which four major criteria have been used to investigate whether fish feel pain?**

(4 marks)

- Nociception, i.e. the ability of fish to perceive adverse stimuli.
- Protective behavioural responses to aversive stimuli, e.g. seeking relief from pain.
- Avoidance learning, i.e. learning to avoid a specific and repeated threat.
- Making trade-offs between pain responses and other motivations such as hunger.

2. **Name three stressors that wild fish are exposed to**

(3 marks)

Any three of the following:

- Predation
- Starvation
- Competition for mates
- Disease
- Migration

3. **What is methaemoglobinaemia caused by?**

(1 mark)

A buildup of nitrite in the water due to overstocking.

4. Describe the main symptom of methaemoglobinaemia and the processes which cause it

Symptom: the blood has a brown tinge **(1 mark)**

Causes: **(4 marks)**

- In overstocked areas, there is excess fish waste in the water which leads to incomplete aerobic breakdown of ammonia.
- This results in excess ammonia which causes nitrite to accumulate in the water.
- Nitrite is absorbed through gills and oxidises the haem ion.
- The resulting methaemoglobin cannot carry oxygen, resulting in brown-tinged blood.

5. What are the two most humane ways to slaughter fish?

(1 mark)

- Electrical stunning
- Spiking

6. Does high stocking density mean that welfare is poor for fish in a confined space? Explain your answer.

(4 marks)

Any four of the following points:

- Stocking density is not a reliable indicator of the welfare of fish in a confined space such as a cage or tank.
- Recommended stocking density assumes uniform distribution of fish throughout the available space whereas in reality fish are not so evenly spread.
- Welfare depends in part on water quality and flow rates.
- Weight per unit flow of water (kg/litre/minute) may be more useful than weight of fish per volume of water (kg/litre).
- However, stocking densities are very important for welfare, as they can cause or prevent problems such as the spread of diseases and fighting.

7. It is thought that Atlantic salmon migrate to satisfy needs related to food, swimming and establishing themselves in new areas. Explain the potential welfare implications for Atlantic salmon in a farmed environment for each of the motivational scenarios above.

(4 marks)

- If their motivation for migration is to find food to eat then the ample and predictable provision of food will reduce any frustration felt by not being able to move.
- If the motivation is to seek food by migration (not just to eat food) this will be a source of frustration
- If salmon migrate in order to satisfy the need to swim, being able to swim in a circle should satisfy that motivation.
- If they migrate as a result of innate life cycle motivations that drive them to move to new areas, being confined could cause suffering.

In-class activity

Discussions

The discussion below explores the issues around fish sentience and should take approximately 30 minutes. You should start by taking a poll of the class to determine whether all students are convinced by the evidence that points to fish sentience. Choose either discussion (a) or discussion (b) depending on the outcome of the poll.

Discussion (a)

If a significant proportion of the students believe that fish are not sentient then discuss the evidence covered in the module.

Key prompts:

- Evaluate the key scientific findings proposed – which arguments are compelling and which arguments are perceived as weak.
- Examine the barriers to individuals accepting fish sentience.
- Allow students with opposing views to counter argue.

Discussion (b)

If most students accept fish sentience then discuss the following.

Scientific evidence points strongly to fish being sentient. In light of how fish are used / treated / viewed in your region, how would you raise people's awareness of sentience in fish? What audience would you focus on and why? What problems would you expect to come across?

Key prompts:

- The discussion will depend on fish use in your particular country / region, e.g. small-scale local fisherman with one boat vs. large-scale fish farms or commercial fisheries – in both cases, people earn their living from working with fish. The same may be true of deep-sea sport fishing / tourism.
- Consider also ornamental fish kept as pets or as decoration in restaurants, offices etc. The module does not cover all these uses, but the general question is how to persuade people that we need to rethink some of the ways in which fish are kept and killed in your region?
- Are people generally aware of suffering in mammals, especially farmed mammals, e.g. are there animal protection laws for these species? If people are not aware of suffering in mammals, why not? Are the reasons cultural? Religious? Socio-economic (poverty)? On the other hand, if people are aware of suffering in mammals – or fish – how is it that they are so aware?
- When trying to change attitudes, it is best to be constructive; offer positive alternatives rather than simply telling people that something is wrong.

Class conference

In this activity, students create their own miniature scientific research conference. The topic of the conference is the welfare of farmed animals – both fish and mammals. The suggested timing for this activity is flexible and dependent on class size and time available. As a minimum, presentations should be approximately 10-15 minutes each, although this can be extended to reflect academic conferences that allow detailed presentations of research findings.

Divide the class into small groups. Give each group two scientific papers (or have the groups find two papers themselves), preferably in an area different from the other groups. One paper should be a study of an aspect of fish welfare, e.g. feeding and welfare, or cage environment and welfare, with some suggested titles presented here:

Conte, F. S. (2004). Stress and the welfare of cultured fish. *Applied Animal Behaviour Science*, *86*, 205-223

Huntingford, F. A. & Adams, C. (2005). Behavioural syndromes in farmed fish: Implications for production and welfare. *Behaviour*, *142*, 1207-1221.

Oppedal, F., Dempster, T., & Stien, L. H. (2011). Environmental drivers of Atlantic salmon behaviour in sea-cages: A review. *Aquaculture*, *311*, 1-18.

Yue, S., Moccia, R. D. & Duncan, I. J. H. (2004). Investigating fear in domestic rainbow trout Onchorynchus mykiss using an avoidance learning task. *Applied Animal Behaviour Science*, *87*, 343-354.

The second paper should be a study of welfare in a commonly farmed mammal. Some suggested titles:

Flower, F. C. & Weary, D. M. (2003). The effects of early separation on the dairy cow and calf. *Animal Welfare*, *12*, 339-348.

Hovinen, M. & Pyörälä, S. (2011). Udder health of dairy cows in automatic milking. *Journal of Dairy Science*, *94*, 547-562.

von Keyserlingk, M. A. G., Rushen, J., de Passillé, A. M., Weary, D. M. (2009). The welfare of dairy cattle – Key concepts and the role of science. *Journal of Dairy Science*, *92*, 4101-4111.

Oltenacu, P. A. & Algers, B. (2005). Selection for increased production and the welfare of dairy cows: are new breeding goals needed? *Ambio*, *34*, 311-315.

Each group should prepare a presentation that lasts for 10-15 minutes, comparing the methodology and the findings of both papers. The methods used to assess welfare, sample sizes, findings and the implications on farming practices should be compared and contrasted across both papers.

Lecturers are advised to use their discretion in the awarding of marks and in the feedback given to students regarding their presentation skills. A good presentation contains typical sections such as:

- Introduction (describing the purpose of the research or task)
- Main content (the outputs from the options listed below)
- Summary/conclusion (rounding up all the findings and making concluding statements, linking back to the purpose outlined in the introduction).

A good presenter speaks clearly and slowly, and doesn't engage in distracting habits such as clicking a pen while speaking, or jangling change in his or her pockets. They should remain relatively still and not move about too much which can also be distracting to the audience.

PowerPoint slides should also contain a minimum amount of text and the presenter should know the subject well enough (or read from additional notes) so that the slide works as a prompt rather than the presenter simply reading the entire slide to the audience and adding nothing extra.

Applied Learning Opportunity

Welfare assessment

In small groups create a checklist to assess welfare in fish using both animal-based and environmental measures of welfare. Then students should find a location where live fish are captive (e.g. goldfish in a pond; a fish farm; ornamental fish in a tank) and use their checklist to assess the fishes' welfare and report it.

Other modules (8, 7, 11 and 18) contain assessment protocol data sheets for terrestrial animals. This is repeated below and may provide a useful start point for students as they design their own checklist.

Welfare Principle	Welfare Criteria
Good feeding	Absence of prolonged hunger
	Absence of prolonged thirst
Good housing	Cleanliness
	Behaviours around resting
	Ease of movement
Good health	Absence of injuries
	Absence of disease
	Absence of pain induced by management procedures
Appropriate behaviour	Expression of social behaviour
	Expression of other behaviours
	Good human-animal relationship
	Positive emotional state

(from the Welfare Quality® Assessment Protocol for cattle, available free online as a PDF from the Welfare Quality® website: www.welfarequality.net/everyone/43148/9/0/22)

The report is likely to include quantitative measures such as water temperature, number of dead fish etc., although here there will inevitably be limitations as to how much the students can assess, e.g. water temperature may not always be feasible. Students should note these limitations and identify areas that need further assessment before welfare can be assessed fully.

This should also be handled with care as students are expected to behave appropriately and not pass judgment on the owner of the captive fish.