Incorporating welfare in your research – mental frameworks and focal points in welfare assessments

Institute of Aquaculture

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https://fishhealthforum.com/new-knowledge-sheds-light-on-bacterial-threats-to-asian-tilapia-aquaculture/

Hello everyone, thank you for all coming and taking the time to participate in this discussion on welfare today. My name is Timothy Wiese, and I am a postdoctoral researcher at the Institute of Aquaculture in Stirling. My research has revolved entirely around helping to improve farmed fish welfare, and today I'd like to dive into some concepts and principles that I believe are essential to better our understanding of animal welfare science.

Mental framework for welfare science

Overwhelming consensus ➔ Most animals have some level of sentience and can experience both poor & good welfare.

"What does welfare actually mean, and how is it any different from health?"

Welfare as seen from the animals themselves! Subjective nature of welfare presents significant challenges to us scientists…

Assessing welfare, inevitably, requires balancing different people's moral frameworks & outlooks on welfare…. How to do this objectively??

In the interest of time, I am starting with the assumption that most of us, at least on some level, agree on the growing evidence that there is for sentience in other animals, and the importance that therefore comes with protecting the well-being or welfare of those animals we are responsible for growing.

The questions that I would instead like to start off with are ones that often pop up in the back of people's minds when they first hear that word 'welfare' being used ➔ "Well, what does that actually mean, and how is welfare

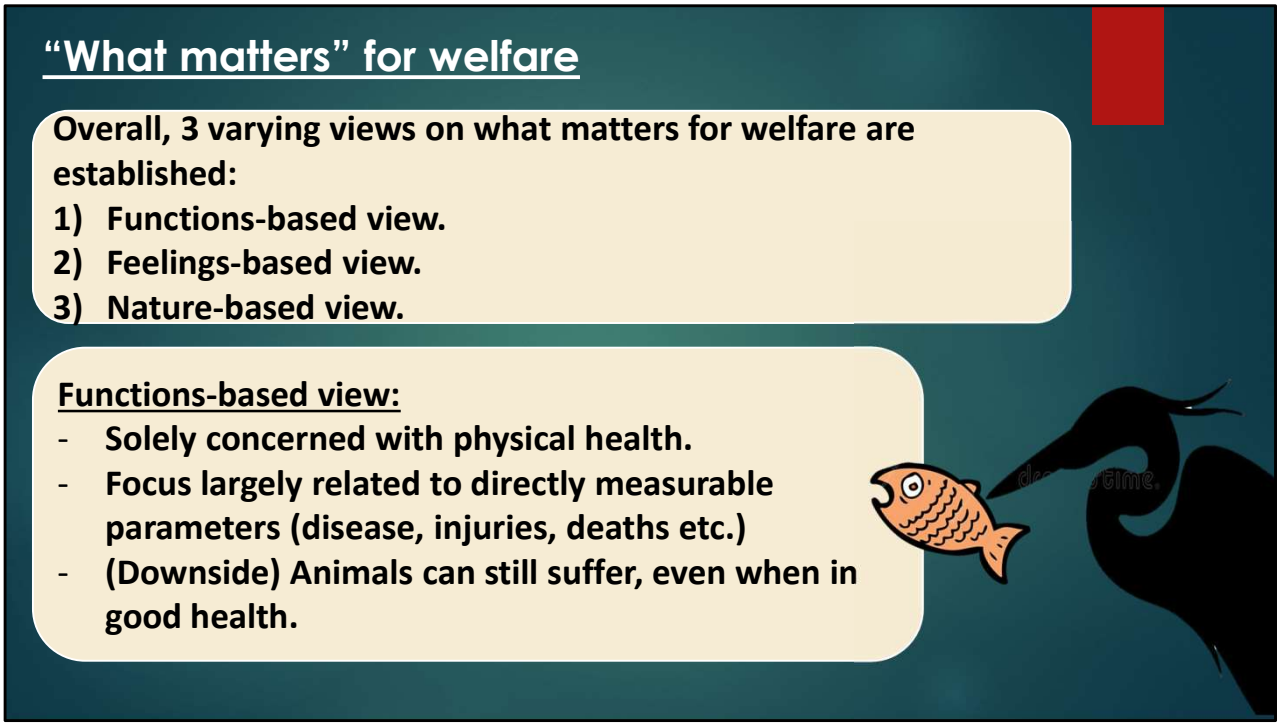
any different from health?”

This sounds like a very obvious, straightforward question, but it’s essential to ask, because how you define welfare will determine entirely how you assess it. It’s a question that many people fail to properly ask themselves, or they even avoid it entirely, and that’s for good reason.

Whether you use the phrase animal welfare, well-being, or quality of life, we are talking about something that goes beyond just the animal’s health. Instead, animal welfare is ultimately concerned with what the animal is experiencing, from their own perspective. This obviously brings with it some serious challenges in a scientific context. Even when we ask another human being how their day has been, or how happy they are, you’ll face the same issue; you might gain some valuable insights / information directly relevant that will point you in the right direction, but even if you are a world renowned psychiatrist, you cannot walk away from that conversation with a measured, objective score on that person’s well-being.

While we can appreciate that welfare is something that is absolutely real, these subjective experiences that we ultimately care about are not something that is so easily accessible, and they certainly cannot be measured in the same way that you can measure a person's height or blood pressure. The scientific community is therefore faced with the fascinating challenge of trying to remain as close to that subjective experience as possible, while never being able to directly capture it in the first place.

When we are dealing with something like animal welfare that cannot be directly measured, we inevitably are forced to tackle something that is, ultimately, a matter of human philosophical concepts. This means we have to somehow find a reliable, robust, and methodical way of assessing something that is unavoidably influenced by the variety of human ideas and moral frameworks that are out there. Unfortunately, we are well known for not always being in agreement with each other on what matters most.



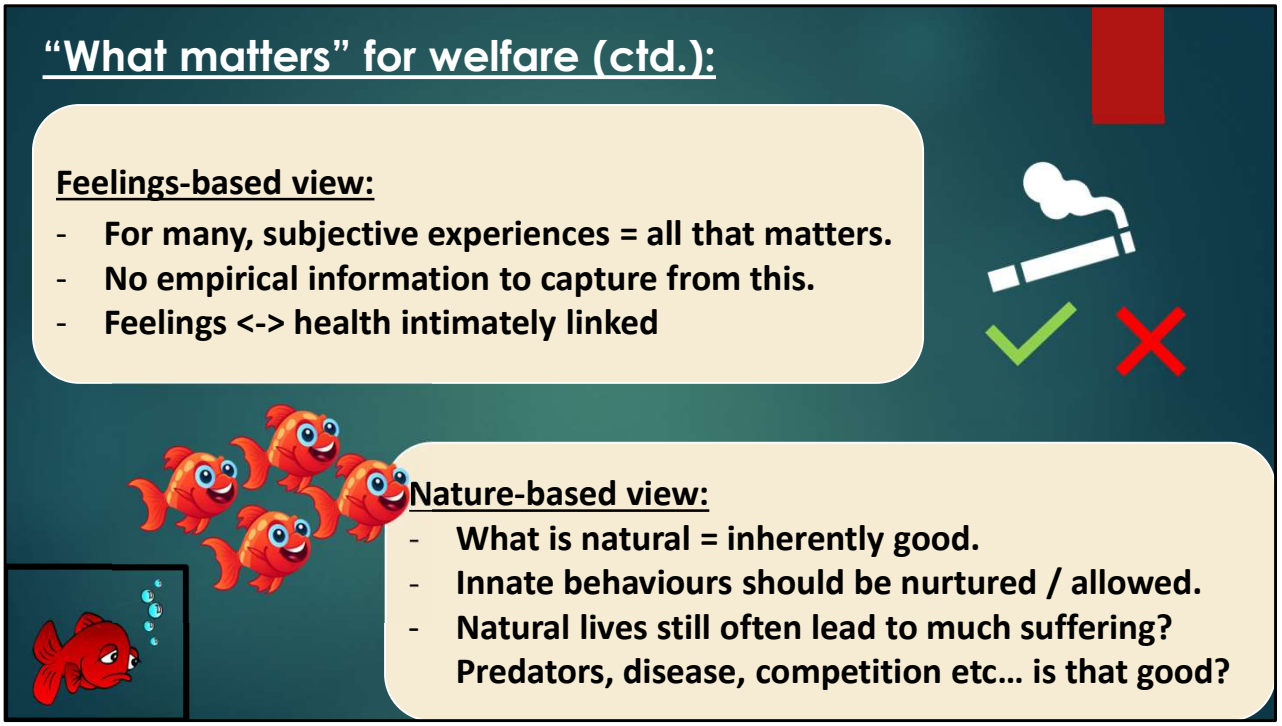
In understanding broadly what matters most for welfare, there are 3 different but overlapping views of welfare that have been established. These should all sound familiar so I'll quickly outline each, and provide examples for why these are not always in agreement with each other:

1) A functions-based view:

This view is solely concerned with the biological functioning of the animal, or its physical health, and this tends to form a large portion of how most people conceptualise animal welfare. This is understandable,

because the concerns for an animal's welfare are often closely related to its overall physical condition, including directly measurable variables such as disease, injuries, or deaths. The strict definition of this view encompasses concerns that, ultimately, have little to do with the animal suffering, and instead puts specific value solely on the functional state of the animal, regardless of how it may or may not be perceiving its own welfare.

One of the challenges with adopting solely a functions-based view is that animals can be in good health but may indeed still suffer when, for example, they spend their entire life being prevented from performing certain behaviours (even when that limitation causes little to no risk to their own health). This is especially the case if an animal, over length periods of time, perceives itself to be in great danger when it cannot perform certain behaviours; an animal will, for example, likely suffer greatly when restrained and prevented from performing evasive or escaping behaviours, even if it is not in danger from predators.



2) A feelings-based approach:

The subjective experience of an animal is what many argue is the ultimate concern in animal welfare. Many symptoms of poor welfare that fall under this category, including pain and fear, are suggested to have evolved in many animals through natural selection as defense mechanisms against threats to survival or mechanisms of motivation.

Adopting a solely feelings-based approach to welfare also presents many issues. As mentioned before, there is the issue of there being no empirical information

available that we can capture on the subjective experience of an animal.

We also have to recognise how closely linked biological functioning, or health, is to one's emotional state. A good analogy here is the example of a habitual smoker, where smoking cigarettes causes pleasure and relieves distress, lung damage causes little immediate suffering, and there are no grounds to determine whether the future suffering from smoking outweighs the pleasure. A strictly feelings-based view can conclude that, in some cases, cigarettes have a net improvement on welfare, even though they drastically impair health. Another question to ask ➔ If a fish or any animal undergoes a serious surgery, but is under anaesthetics the entire time and never experiences any pain or discomfort, then according to this view strictly, its welfare has not been seriously impaired?

3) A nature-based approach:

This view brings forward the argument that "what is natural is inherently good for animal welfare", and an animal's welfare can be compromised even in perfect health. There is significant overlap here with the feelings-based view in certain cases.

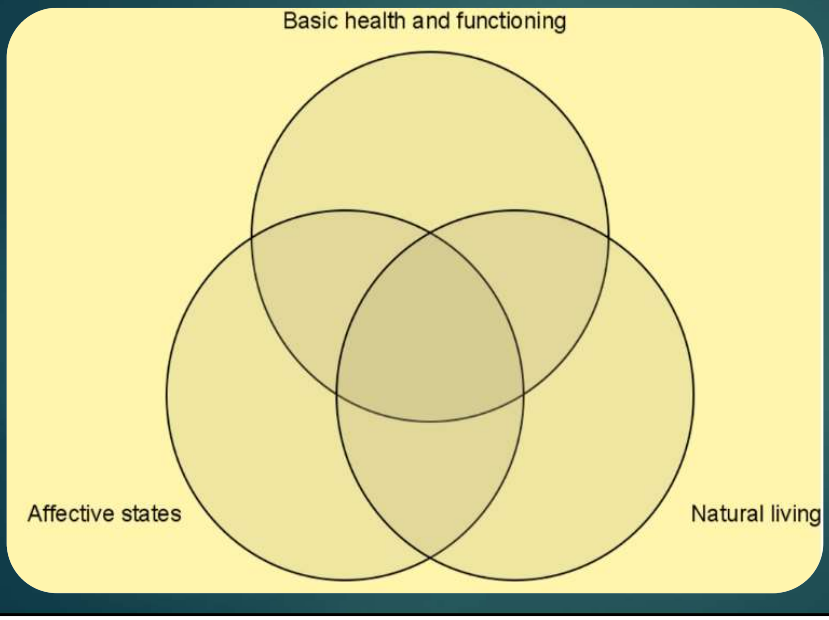
A common concern here would be the prevention of a

certain innate behaviour that, while having little consequence to the animal's health may, still have a cost to the animal's welfare;

For example, you can imagine a bird or any other animal that normally migrates that is then kept in a cage; even if it is well fed and looked after, and even if its chances of survival are far higher than its wild counterparts that are able to migrate, the animal is still unable to fulfil its strong motivations to fly, swim, or move to wherever it desires. Since the animal has not evolved to meet its new artificial conditions (i.e., a comfy, food-filled cage), this may mean that the animal's welfare is still compromised regardless of its great physical health.

While the inherent biological nature of an animal is an important consideration for their welfare, living a natural life by no means guarantees that the full range of ethical concerns of an animal's well-being have been satisfied. Animals that live entirely natural lives can still suffer greatly; aggressive competition and predation are unavoidable parts of a natural life, and those are seen as very negative in the other 2 views of welfare. There are also major problems of conceiving objectively what the definition of "natural" is for any given animal.

Approaching welfare with all 3 views:



- **Each view is important, but incomplete.**
- **All 3 views must be combined, BUT there is no consensus on how to do so.**
- **How can we possibly succeed in doing this objectively?**

Most people can agree that each view provides important factors to consider, but each view in isolation cannot provide sufficient guidelines for defining, assessing, and improving welfare. Instead, they all play an important role. Unfortunately, not all of us can always agree on how to value these views against each other. To some, physical health is without question the most important factor, whereas others would strongly argue that the subjective experiences of the animal (how much pleasure over suffering it experiences) is ultimately all that matters. In most cases, these views

tend to be aligned, but as you can see by some of the examples given, there are many situations where these views are in conflict with each other

So, how on earth do you even begin to work towards a robust, balanced way of assessing the quality of life of another animal, especially when you have these conflicting opinions on what matters most for welfare?

Guiding principles for assessing welfare:

Marian Dawkins (1998):

- **Assessing welfare = assessing the safety rating of a new building, NOT simply measuring its height.**
- **No single welfare indicator can "measure" welfare; need a variety of indicators to help you assess this "safety rating".**

- Variety is essential! Must ensure that your assessment covers all 3 previous views of welfare…

Well, as a starting point, one of the best mental frameworks that helps with approaching this challenge comes from Marian Dawkins (1998), and she equates welfare assessments to assessing the "safety" rating of a building, rather than say measuring the height of a building. In other words, instead of trying to simply score an animal's welfare with a single quantitative expression in isolation (e.g., growth, or mortality), there are a variety of different welfare "indicators" that you will need to use together to help come to a conclusion on your welfare assessment. If you are trying

to reach a conclusion on the animal's welfare as a whole at any given point, this should ideally include a combination of physiological, morphological, and behavioural data so that you can make as many validated judgements on the animal's subjective experiences as possible.

The challenge we are still faced with is coming to an agreement on how these different welfare indicators should be used together when we try to finally arrive at this "safety rating" of an animal's welfare. At the very least, we know that an integrated approach will always need to be used, one that attempts to consider and address all 3 different views previously discussed together.

Categories of welfare indicators:

Operational Welfare Indicators (OWIs) = Indicators practical enough to be used on-site.

Criteria for developing a welfare assessment (choosing OWIs):

- **Final list = exhaustive; must cover all important aspects.**
- **Must be "minimalist"; only necessary, independent OWIs.**
- **OWIs must be validated, practical, and robust.**

3 different categories of OWIs;

1) Animal-based (outcome-based) **2) Environmental-based**

3) Resource-based (risk-based)

Now that we have gone through some important principles to understanding and assessing welfare, let's start talking about some examples of these welfare indicators and how we might use them together.

Welfare indicators are unique assessments of an animal or its surroundings that provide either qualitative or quantitative information on specific aspects of a farmed animal's welfare. Operational welfare indicators, or OWIs, are indicators that are deemed practical enough to be routinely used in an on-farm context. As we mentioned before, the complex nature of welfare,

combined with the species-specific needs that each different farmed animal will have, means that there is no single OWI that can cover all of the important aspects that must be covered in a robust welfare assessment.

An accurate, reliable assessment of farmed animal welfare is therefore only possible with a collection of species-specific indicators. Sometimes, these indicators may even be system-specific, e.g., dependent on whether the animal is currently being transported, slaughtered, or treated.

Criteria for developing an assessment:

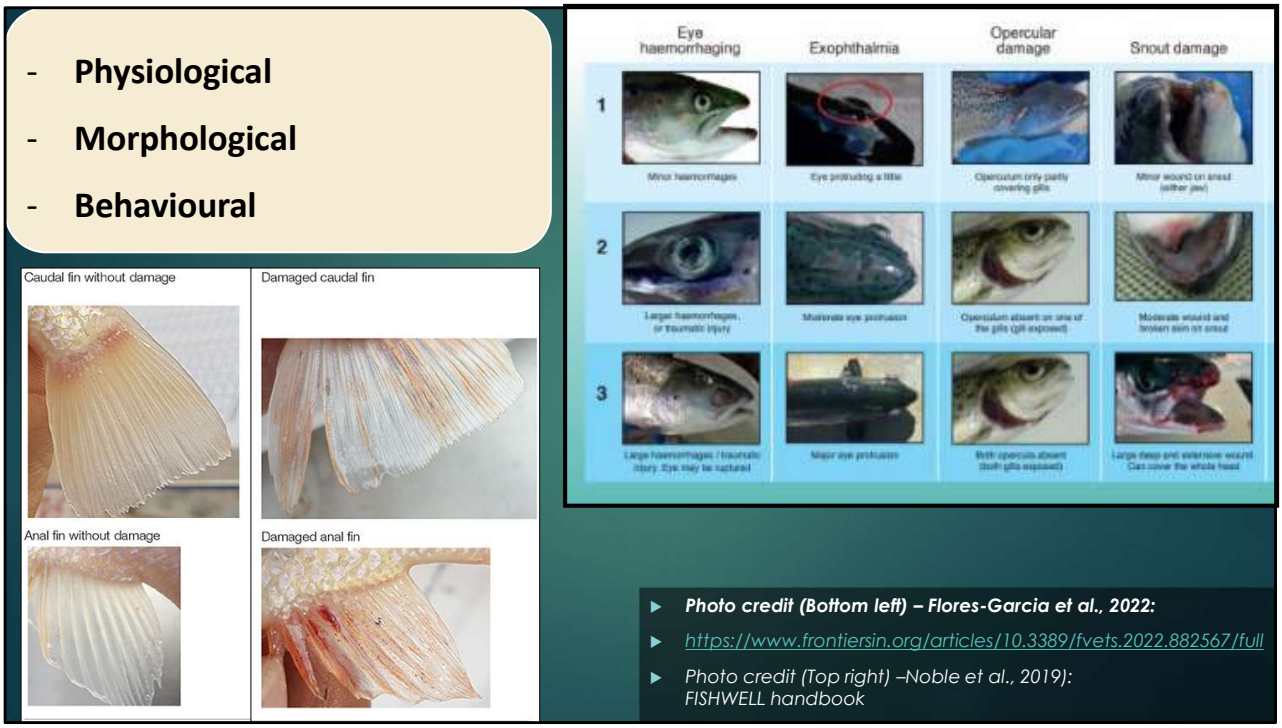
When determining what indicators to include for an assessment, they should at the very least fulfil the following theoretical and practical requirements:

- Final list of OWIs used should be **exhaustive**; together, they must cover all important aspects of the animal's welfare.
- This list must be "**minimalist**"; I.e., they contain only necessary, **mutually exclusive indicators**. No repetitive, redundant, or irrelevant indicators used.
- Indicators must be, at least to some degree, **independent from one another**. I.e., how you interpret one OWI CANNOT rely on the conclusions

from another.

- OWIS must be repeatable, validated, and practical for on-farm use.

As a whole, OWIs can be classified into 3 different groups, depending on how directly they measure an animal's welfare. These 3 groups are animal-based, environmental-based, or resource-based.



The most obvious group are **animal-based WIs**, or outcome-based WIs, which involve observations made on the physiological, morphological, or behavioural parameters of animals. For fish, this can include:

- Deformities of the gill cover, mouth, or vertebra.
- Conditions of the fin, skin, eye, snout, jaw, operculum.
- Scale loss or handling trauma.
- Condition index (comparing its weight against the typical weight of other fish of the same length).
- Parasite infestations, growth, mortality,

- Behaviour: Opercular beat rates, intra-species aggression, darting behaviours, burrowing, surface activity, appetite,

Fish Mortality Record Sheet

Date	Pond 1			Pond 2			Observation
	No of dead fish	Time of found	Estimated No of fish remaining	No of dead fish	Time of found	Estimated No of fish remaining	
10/03/2024				1	4:30pm	896	Cannibalized

Feed Quantity Consumed Within the Week

Bag opened date	Type of Feed	Finished Date	Quantity
15/03/2024	6.0mm		1
Total	6.0mm		1

Environmental-based WIs, or indirect WIs, are observations made on the surrounding environment of the animal that can have an influence on the animals' welfare.

- Water quality parameters (Nitrite/nitrate, ammonia, temperature, oxygen, CO_2, turbidity etc.).
- Severity of algal blooms, total suspended solids, heavy metals etc.
- Lighting

Risk-based WIs, or resource-based WIs, are observations made on the risks either posed or minimised on farming

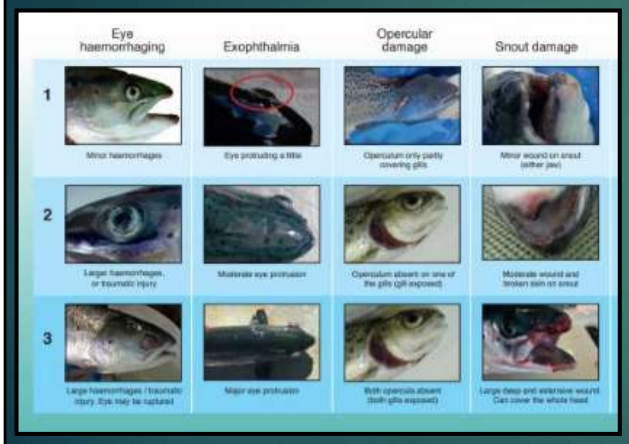
processes through ‘good practice’. These can be assessed in addition to the other OWIs, as they ultimately play a significant role in determining the state of farmed animal welfare.

- Staff training (feeding routines, fish handling, disease control / biosecurity, proper record keeping, steps taken to look after fish during transport / slaughter / treatments, quality of equipment essential to the animal’s health/survival etc…

Examples of environmental & risk-based WIs include:

- Stocking density.
- Enclosure maintenance – Predation prevention (e.g., use of nets to protect fish in ponds), sufficient aeration / belt feeders etc…

Welfare in the real world – comparing OWIs



VS.

Now that we have some examples of OWIs, we need to figure out how we are going to choose which ones we want to include in our assessment.

This will depend on the production system, the life stage of the animal, and the specific goals that you have of your welfare assessment (is it just routine monitoring? Are you assessing welfare during an intensive practice like a treatment, crowding, or slaughter event? Or is this an audit being carried out by certification schemes on a farm site?).

Each OWI used will have their own strengths and

weaknesses that must be acknowledged before using them, and we have to remember that each OWI will only address certain aspects of welfare, so a variety of them will be needed. Of course, the assessment still needs to be practical enough to be carried out alongside other farming practices, so the number of OWIs used must not be extensive.

For example, let's compare physical OWIs, such as conditions of the fins, eyes, skin, and operculum, against behavioural OWIs, such as darting behaviours, opercular beat rates, have a number of sampling and analytical considerations to take into account. External physical OWIs, like fin and skin condition, can often be routinely assessed using observations from above water, and sudden changes in the prevalence of fin or skin issues can act as an obvious indicator of compromised welfare. In addition to being easy to observe, increases in injury frequency and severity can act as quick, feasible, and robust OWIs of poor welfare that indicate an underlying issue that needs further interventions. However, these indicators can be time-consuming depending on how much robust information you want from your assessment, and if sampling is required this requires further disturbing the fish when you take them out of the water.

In contrast, behavioural indicators are incredibly insightful, non-invasive, and feasible avenue for many welfare assessments used in certain fish farms. Changes in behaviour may also provide early warning signs for researchers / farmers to act on and prevent a serious welfare issue before it arises. Their downside, however, is that they can be very limited by what visibility is available.. If you are working in pond aquaculture and 99% of the time your water makes your fish essentially invisible, your behavioural analysis is likely going to be focusing on surface activity and feeding behaviours (which can still provide significant insights).

CONCLUDING REMARKS….

A final point I would like to touch on is some important considerations if you are attempting to provide summary scores on an animal's welfare as a whole.

Various welfare assessment schemes, especially those that aim to act as a diagnostic tool or those that want to quantify the impact of various factors on an animal's welfare, will attempt to reach a single score on the animal's welfare.

As I've mentioned before, we are juggling a whole number of concepts, indicators, and concerns, so reaching a single score requires you to make a significant

amount of subjective decisions, weighing certain aspects of welfare over others, and taking the risk of making those judgements can often lead to disagreements on what conclusions you arrive at.

So just important to keep in mind that often its best to be cautious with reducing welfare to this single score, and to appreciate the complexity and have that be reflected in your assessments.

THANK YOU FOR LISTENING!