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Outcomes used to measure the welfare of cultured salmonids: a scoping review protocol

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Outcomes used to measure the welfare of cultured salmonids: a scoping review

Registration

This protocol was submitted online to SYREAF (https://syreaf.org/protocols/) and eScholarship, University of California Davis on May 26th, 2023.

Author Details

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Authors contributions

ZD will serve as review leader and will be responsible for conducting the search, training reviewers, and conducting all levels of screening, extraction, and charting of data. ZD will be primarily responsible for development of the final manuscript. BH will serve as methodological expert and will assist with developing methods and contribute to preparation of the manuscript. CM and JM will serve as content experts and will advise during development of the protocol and the manuscript and will participate in final manuscript development. Two to three additional reviewers will participate in screening, extracting, and charting the data.

Amendments

In the event of any protocol amendments, each amendment will be accompanied by the rationale and date.

Sponsor
Role of Sponsor

Introduction

Rationale:

Salmonids are a popular species in aquaculture, hatchery and research settings, and there is increased public interest in the welfare of fish species in our food system and research programs[1]. In the salmonid aquaculture literature, the term 'welfare' is used loosely, with a focus on physical health, physiological functioning, and cognitive abilities, and minimal assessment on fish affective state. Although many metrics have been used to assess welfare in the salmonid literature, few of these have been validated as indicators of salmonid welfare[2-5]. It is important to use validated measures to assess salmonid welfare, given that not doing so results in biased and inaccurate results that cannot be used to improve the welfare of cultured salmonids. To our knowledge, there is no scientific review of the scope of this literature, or assessment of the outcome measures used to evaluate salmonid welfare.

Thus, the goals of this review are to: 1) perform a descriptive analysis of the literature pertaining to animal welfare outcomes in cultured (aquaculture, hatchery, research) salmonid populations, 2) describe the global scope of this research, and 3) highlight outcome measures used to evaluate salmonid welfare and evaluate their validity.

Objectives

What are the outcome measurements that have been used to assess the welfare of cultured salmonid populations?

Definitions:
Salmonids: All salmoniforms, including atlantic and pacific salmon, trout, char, freshwater whitefish, graylings, taimens and lenoks.
Cultured: Fish grown in controlled conditions, for example in research settings aquaculture (all types) or hatcheries.

Methods

Eligibility criteria:

Inclusion Criteria: Eligible studies will be reported in English and published between 1981 and 2022. Eligible publication types include journal articles, and theses. Both experimental and analytical observational research studies (i.e., cross-sectional, case-control, cohort) will be included. The publication must include either the term welfare or wellbeing, and one of these terms must be associated with the outcome measures of the experiment. All salmonidae will be included, including pacific and atlantic salmon, trout, char, freshwater whitefish, graylings,

taimens and lenoks, while other finfish species will be excluded. Experiments conducted in an intensive or extensive managed production system will be included, such as aquaculture, hatchery or research settings will be included.

Exclusion Criteria: Publications not reported in English or published prior to 1981 will be excluded. Review articles and conference proceedings will be excluded. Publications focusing on angling or fishery welfare, including those associated with harvest techniques, bycatch and conservation of wild populations were excluded.

Eligible populations of interest: All salmonidae were included, including pacific and atlantic salmon, trout, char, freshwater whitefish, graylings, taimens and lenoks. These populations need to be maintained in human-managed care during or prior to the study, in research, aquaculture, zoo/aquaria, or hatchery settings. The populations cannot be exclusively wild, unless an intervention was performed during hatchery rearing, or hatchery released salmon are being compared to wild counterparts.

Eligible interventions of interest: Any intervention included in a study where the authors link an outcome measure to salmonid welfare or wellbeing will be included. This can include but are not limited to interventions such as environmental enrichment, handling methods, housing density, housing type, and nutrition.

Eligible outcomes of interest: Any outcome or test that is used to measure salmonid welfare or wellbeing will be included. These may include health metrics, behavioral metrics, physiological metrics, cognitive capacity, growth rate, or survival.

Information Sources
An initial search was performed in March 2023 by ZD, to determine appropriate search terms. The comprehensive search will be performed with the following databases: BIOSIS, ASFA and Web of Science Core Collection.

Search Strategy
The search will be limited to English language publications and will include variations of the term "salmon" and "welfare". Searches will be limited to the title, abstract and key words for all search terms and all databases. Of the 50 most recently published articles, reference list checking will be performed following level 2 screening.

Search term 1: Welfare OR Wellbeing OR Well-being
AND

Search term 2: Salmon* OR trout OR char OR freshwater whitefish OR graylings OR taimens OR lenoks

Data management:

The search results will be imported into the review software Covidence where they will undergo deduplication. Final information on total number of search results and duplicates will be reported according to the PRISMA-ScR© flowchart template.

Study selection:

Two independent reviewers (ZD and undergraduate research assistant) will screen all articles in parallel, and disagreements on exclusion will be decided upon a third reviewer (undergraduate research assistant). Both reviewers will undergo training with ZD.

Level 1: Title/Abstract screening will be performed with the following questions, with outcomes being either "yes", "no" or "unclear". Reviewers will undergo a pretest of 100 articles. Articles will be excluded if both reviewers agree that at least one question elicits a "no".

1. Is it available in English
2. Does the study population include one of the following species: Atlantic salmon, pacific salmon, trout (except seatrout or speckled trout), char, freshwater whitefish, graylings, taimens and lenoks.
3. Does the study include salmonids living in an aquaculture, hatchery, aquaria or research setting?

Level 2: Full text screening will be performed with the following questions, with outcomes being either "yes" or "no". Reviewers will undergo a pretest of 15 articles. Articles will be excluded if both reviewers agree that at least one question elicits a "no".

1. Is the study outcome associated with welfare or wellbeing of the fish?
2. Is this an experimental or analytical observational study?

Data extractions strategy

Full text sources will be acquired through the available University of California library resources and uploaded into a review management software program (Covidence). Data extraction will be performed by two reviewers (ZD and research assistant) working independently, and will consist of the following categories:

- General study characteristics
- Study population
- Intervention investigated
- Outcomes investigated stated as being related to animal welfare/well-being

Data Items

A descriptive summary of the characteristics assembled during data extraction will be generated.
- General study characteristics
  - Year
  - Country where experiment took place
  - Experimental vs analytical observational studies
- Study population
  - Species
  - Age group
  - Housing type
  - Purpose of culture (conservation, production etc)
- Intervention investigated
- Outcomes investigated stated as being related to animal welfare/well-being

Outcomes and Prioritization
Risk of bias individual studies

Data synthesis

The results may include both figures and tables summarizing the results and detailing the process of collection and exclusion or inclusion of each publication.

Meta biases
Confidence in cumulative estimate

Discussion

This scoping review will summarize the global scope of the literature, and outcomes used to measure the welfare of cultured salmon. The results of this review will be used to identify areas where more work is needed. Some validated measures of welfare exist for certain salmonid

species, and where possible we will refer to these. Overall, this review aims to encourage and increase the use of validated outcomes to measure cultured salmonid welfare in research.

Competing interests
The authors have no competing interests to declare

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4. Noble, Chris, et al. "Welfare Indicators for farmed Atlantic salmon: tools for assessing fish welfare." (2018).
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