fishes

MDPI

Review

Salmon Louse (*Lepeophtheirus salmonis* (Krøyer)) Control Methods and Efficacy in Atlantic Salmon (*Salmo salar* (Linnaeus)) Aquaculture: A Literature Review

Table S1. Search strategy for systematic literature review.

Treatment Type	Keywords for Search
Chemical treatment	chemical treatment, medical treatment, drugs, chitin synthesis inhibitor, organophosphorus compound, hydrogen peroxide, avermectin, and pyrethroid
Cleaner fish	biological method, cleaner fish, lumpfish, *Cyclopterus lumpus*, wrasse, *Ctenolabrus rupestris*, and *Labrus bergylta*
Mechanical treatment	warm water treatment, fresh water treatment, thermolicer, optilicer, lazer, stingray, hydrolicer, water jet, and brushing
Preventive measures	skirt, plankton net, selective breeding, vaccine, functional feed, submersive cage, deep water feeding, snorkel cage, and light regime

Databases: Scopus and Web of Science (document title, abstract and keywords fields); search limits: date range (01/01/1991–01/09/2019); language (English); Boolean operators "OR" and "AND" were used. Keywords concerning salmon lice (salmon lice, *Lepeophtheirus salmonis*, and *L. salmonis*) were combined with the above search components.

Table S2. Checklist for measuring document quality.

Reporting

1. Is the hypothesis/aim/objective of the study clearly described?

yes 1 no 0

2. Are the main outcomes to be measured clearly described in the Introduction or Methods section?

If the main outcomes are first mentioned in the Results section, the question should be answered no.

yes 1 no 0

3. Are the characteristics of the population included in the study clearly described?

In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.

yes 1 no 0

4. Are the interventions of interest clearly described?

yes 1 no 0

5. Are the distributions of principal confounders in each group of subjects to be compared clearly described?

A list of principal confounders is provided.

yes 2 partially 1 no 0

6. Are the main findings of the study clearly described?

Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. This question does not cover statistical tests, which are considered below.

yes 1 no 0

7. Does the study provide estimates of the random variability in the data for the main outcomes?

In non-normally distributed data, the interquartile range of results should be reported. In normally distributed data, the standard error, standard deviation, or confidence intervals should be reported. If the

distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.
yes 1 no 0
8. Have all important adverse events that may be a consequence of the intervention been reported?
This should be answered yes if the study demonstrates that there was a comprehensive attempt to measure adverse events. A list of possible adverse events is provided.
yes 1 no 0
9. Have the characteristics of population lost to follow-up been described?
This should be answered yes where there were no losses to follow-up or where losses to follow-up were so small that findings would be unaffected by their inclusion. This should be answered no where a study does not report the number lost to follow-up.
yes 1 no 0
10. Have actual probability values been reported (e.g., 0.035 rather than <0.05) for the main outcomes, except where the probability value is less than 0.001?
yes 1 no 0

External validity
All the following criteria attempt to address the representativeness of the findings of the study and whether they may be generalised to the population from which the study subjects were derived.

11. Were the subjects in the study representative of the entire population from which they were recruited?
The study must identify the source population and describe how the samples were selected. Samples would be representative if they comprised the entire source population, an unselected sample, or a random sample. Random sampling is only feasible where a list of all of the members of the relevant population exists.
yes 1 no 0 unable to determine 0
12. Were those subjects representative of the entire population from which they were recruited?
Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population.
yes 1 no 0 unable to determine 0
13. Were the staff, places, and facilities where the sample were treated representative of the treatment the majority of the population receive?
For the question to be answered yes, the study should demonstrate that the intervention was representative of that in use in the source population.
yes 1 no 0 unable to determine 0

Internal validity: bias
14. If any of the results of the study were based on "data dredging", was this made clear?
Any analyses that had not been planned at the outset of the study should be clearly indicated. If no retrospective unplanned subgroup analyses were reported, then answer yes.
yes 1 no 0 unable to determine 0
15. In trials and cohort studies, do the analyses adjust for different lengths of follow-up of samples, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls?
yes 1 no 0 unable to determine 0
16. Were the statistical tests used to assess the main outcomes appropriate?
The statistical techniques used must be appropriate to the data. For example, non-parametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.
yes 1 no 0 unable to determine 0
17. Were the main outcome measures used accurate (valid and reliable)?

For studies where the outcome measures are clearly described, the question should be answered yes. For studies that refer to other work or that demonstrates the outcome measures are accurate, the question should be answered yes.
yes 1 no 0 unable to determine 0

Internal validity: confounding (selection bias)
18. Were the samples in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?
yes 1 no 0 unable to determine 0
19. Were the study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?
yes 1 no 0 unable to determine 0
20. Were the study subjects randomised to intervention groups?
yes 1 no 0 unable to determine 0
21. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?
In non-randomised studies, if the effect of the main confounders was not investigated or confounding was demonstrated but no adjustment was made in the final analyses, the question should be answered no.
yes 1 no 0 unable to determine 0
22. Were losses to follow-up taken into account?
yes 1 no 0 unable to determine 0
23. Did the study have sufficient power to detect a clinically important effect where the probability value for a difference due to chance is less than 5%?
Insufficient power 0 Medium power 3 Sufficient power 5
Total:

Table S3. Data extraction form.

Data to be extracted	Notes to reviewer	Data
Document title		
Author(s)		
Year of publication		
Place		
Study of *Lepeophtheirus salmonis* treatments in Atlantic salmon aquaculture (yes/no)	If "no", exclude	
Intervention method used (chemical, biological, mechanical, or preventive)	If "no", exclude	
Methodologies used for measurements		
Period of trial		
Data source		
Sample size		
Age of individuals in the sample		
Size of individuals in the sample		
Other relevant sample details	If they have some bearing on the results of this study	
Number of lice before treatment	If mentioned	
Reported effect on the number of lice	Include details of significance testing, if reported	
Specific information regarding the treatment effect	Other useful information (e.g., time from intervention to effect)	
Control group (yes/no)		

Results compared to control group	If "yes" to the question above
Health impacts on Atlantic salmon (diseases and mortality)	Others than *L. salmonis* (if specified)
Health impacts in cleaner fish (diseases and mortality)	In case of cleaner fish trial
Resistance to chemical treatment detected (yes/no/not mentioned)	In the case of a chemical treatment trial
Effect of environment changes on Atlantic salmon detected (yes/no/no information)	In the case of other non-chemical treatment trials
Other impacts associated with the treatment