Using literature analysis to compare the relative significance of diseases of farmed salmon

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Salmon aquaculture and salmon diseases

Scottish salmon production is 171,722 tonnes annually and worth £550M; this makes it the largest single food export and an important part of the economy, particularly in remote areas.

Infectious diseases are major problem in aquaculture, accounting for ≈30% of total losses to production. They cause major epidemics and serious economic costs. Different diseases need to be prioritised for prevention and control. However it is difficult to compare diseases. For example sea lice usually cause limited mortality but control is expensive and lice can infect wild fish, exacerbating problems. Consistent economic assessments are not available and data may be inadequate.

Scientific literature is used as a measure of effort invested in understanding diseases, hence gauging relative concern. Literature analysis has been used for ranking terrestrial domestic animal and human diseases and pathogens. Here we use it to assess salmon diseases.

Method

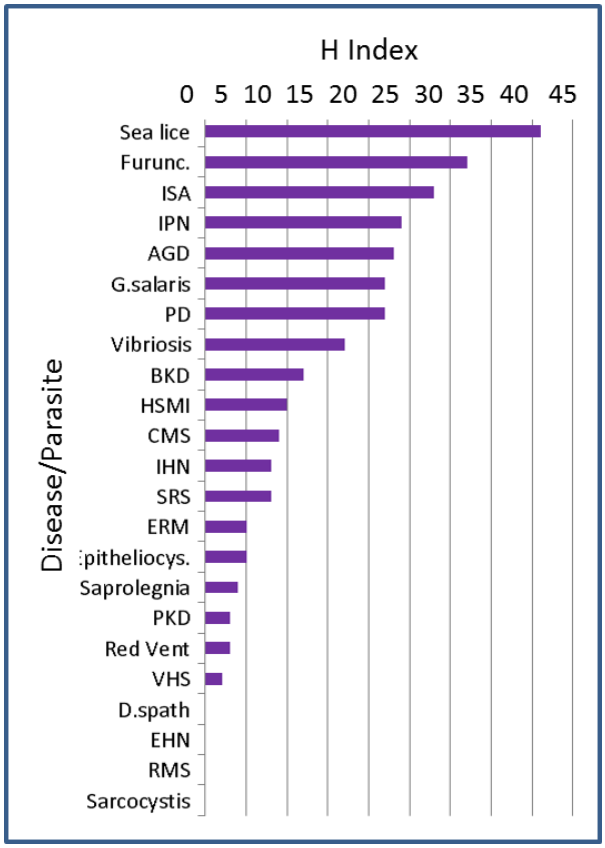
Literature between 1990-2014 was searched via the Web of Science using a query of the form:

TI = (host) AND (pathogen OR disease)

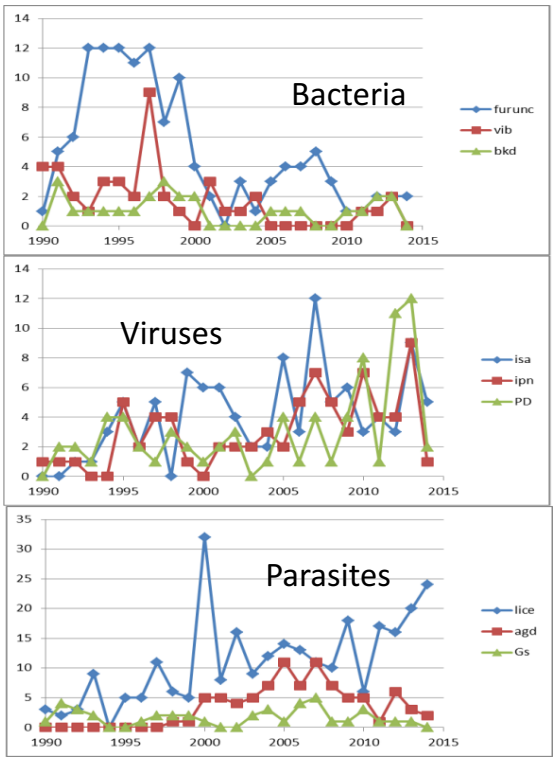
A paper title containing selected synonyms for both salmon and the disease or pathogen of concern was included in the list of papers for that pathogen. This list of papers was then used to calculate H-Index (where number of citations = rank of the paper sorted by citation). Title searches are more specific than searches using the papers' entire texts, although less sensitive.

Numbers of publications per year were also derived to assess trends in disease publications. Further, searches were conducted by country.

Ranking of salmon diseases



Trends in publication



Results

H-index scores ranged from 0 to 41. Sea lice (H-index=41), Furunculosis (32) and Infectious Salmon Anaemia (28) were the highest ranking. For searches using publication only for 2000-2014, Amoebic Gill Disease (AGD) replaced Furnculosis at number 2 rank. The high H-index for sea lice corresponds with these being widely considered as the most important pathogen impacting sustainability of salmon.

Changes in the priority of pathogens are also reflected in publication rates. Publications on bacteria have declined at statistically significant rates, while those on viruses have increased significantly. Among parasites, sea lice increased, while AGD and *G. salaris* publications both peaked. Publications by country (not shown) tended to reflect salmon production (e.g. Norway > USA) and rankings reflected national disease issues (e.g. AGD #1 for Australia).

The use of literature has some issues; it is conservative, over-emphasises old problems and takes time to catch-up with emerging diseases. There are also biases in research e.g. Salmon Rickettsial Syndrome is very important in Chile, but ranks low because Chile lacks the resources to undertake much research – this is changing.

Conclusions

Publication histories and the H-index scores of salmon pathogens largely correspond to "expected" patterns. They provide a valuable objective measure to support opinion-based ranking to prioritize control effort, where other measures are not available.

Murray A.G., Wardeh M. & McIntyre K.M. (2016) Using the H-index to assess disease priorities for salmon aquaculture.. Prev Vet. Med. 126, 199-207