

A logistic population model of the growth of production of salmon in Scotland 1979-2015

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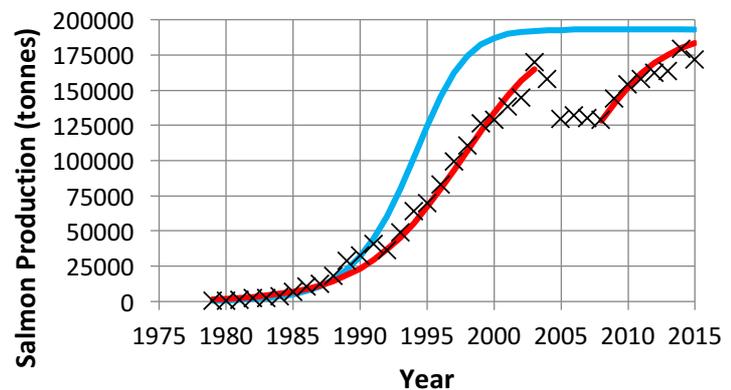


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Salmon aquaculture has, over the period 1979-2015 grown from 520 to 171,722 tonnes live weight, becoming a very important sector of Scottish food production and the largest single food export product. The data on salmon production has been collected since 1979 by Marine Scotland Science using an annual survey with returns obtained from 100% of the industry
A model has been fitted to understand the pressures that drove the growth in salmon production in order to understand how sustainable growth may be maintained.



Results

Different models fit data pre and post 1992

Pre 1992

- Number of farms increased rapidly
- Increase in production per farm was slow
- Losses of fish were relatively high

Post 1992

- Net number of farms did not increase
- Productivity per farm increase much faster
- Losses were much reduced
- Coincides with uptake of antibacterial vaccines

2004-8

- Model did not fit observations
- Associated with foreign competition and strong £

Post 2008

- post 1992 model resumes

The Logistic Population Model

$$S_{t+1} = S_t [1 + b(1 + K/S_t)]$$

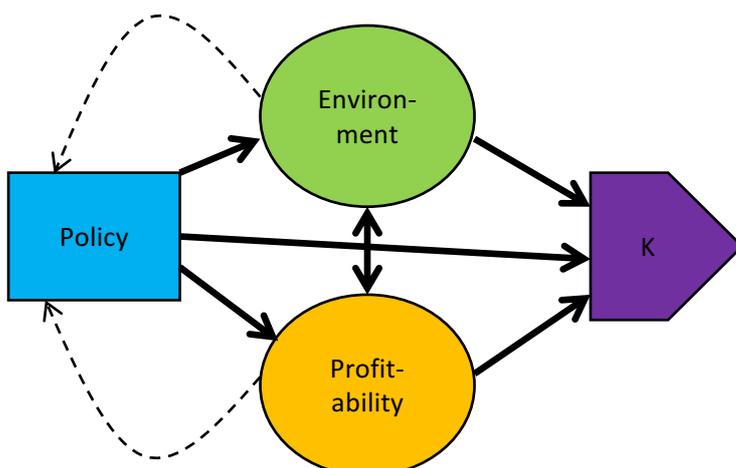
S_t = Production in year t

b = unlimited growth rate

K = carrying capacity

can be increased by good management

Parameters fitted to observations



K depends on environmental and social drivers

Conclusions

Simple models describe growth of salmon industry
Fundamentally different processes pre 1992
Little evidence of specific disease impacts
Economic competitiveness important

Limitation of carrying capacity being approached
HOWEVER carrying capacity K is not fixed and so can be increased
For example offshore production is an option

Munro LA & Wallace IS 2016. Scottish Fish Farm Production Survey 2015. Marine Scotland, Aberdeen