

The Scottish Aquaculture Industry – Surveillance and disease control measures applied by Marine Scotland Science

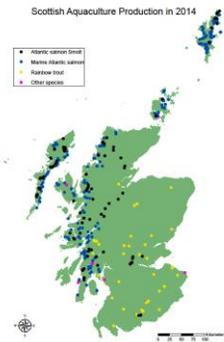


Eann Munro and Neil Purvis



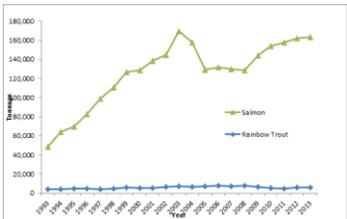
Industry overview – finfish sites

Active sites:-
 Atlantic salmon 359
 Rainbow trout 46
 Other species 26





Industry overview – finfish production



Other species	Tonnage (2013)
Halibut	56
Brown / sea trout	44
Wrasse	0.1

Atlantic salmon industry: 163 234 tonnes - farmgate value of approximately £677 million (2013)

Aspirations: Sustainable increase in A. salmon production by 50% by 2020



Annual fish and shellfish production surveys

- <http://www.gov.scot/Topics/marine/Fish-Shellfish/FHI/surveys>




Surveillance in accordance with 2006/88/EC

Site type	Year 1	Year 2	Year 3	Year 4
High Risk Fish (54)	Inspection	Inspection	Inspection	Inspection
Medium Risk Fish (210)	Inspection		Inspection	
Low Risk Fish (155)	Inspection			Inspection

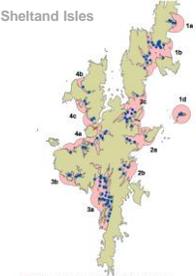
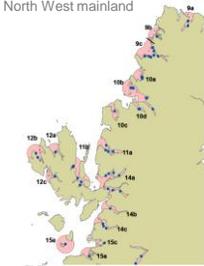
- Site risk assessment - contracting and spreading disease
- Checks on authorisation conditions and BMP
- Unannounced inspections
- Diagnostic investigation



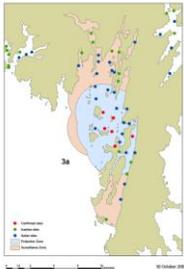


Disease control management areas

Strategic management at local and national scales


Disease control measures – real life example



- ISA disease outbreak 2008
- Powers within 2009 Regulations; listed and emerging disease
- Movement controls in designated areas; animals, equipment, personnel
- Epidemiological investigation
- Statutory sampling
- Depopulation of infected sites
- Repopulation to gain disease freedom?



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Disease control measures - Biosecurity and waste disposal

Enforce strict biosecurity measures in the event of outbreaks of serious disease

- BMP in peace time
- Supervision of harvests / culls, ensuring containment site harvest to processing, including effluent treatment & discharge
- Approval of methods of waste disposal (consultation of APHA)
- Movement restrictions controlling fallowing, C&D for equipment, staff and facilities prior to restocking testing and eradication



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The provision of advice to industry includes:

- General biosecurity, site separation, waste disposal
- Containment of fish & their products
- C&D procedures, disinfectants, dose rates & contact time for application
- RA in relation to movements of live or dead fish
- Quarantine of facilities, in the presence of high risk of transmission of listed or emerging diseases
- Codes of practice and disinfection guides

Reporting of increased mortality

Threshold limits:-
 Fish <750 g, mortality over 1.5% per week or 6% over a 5 week rolling period
 Fish >750 g, mortality over 1% per week or 4% over a 5 week rolling period



- Triggers further investigation –
 - FHI to contact site manager
 - Possible site inspection?
 - Diagnostic samples?

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Potential approaches to disease alerting

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- Cumulative sum control charts
- Moving average control charts
- Generalized Linear Models (GLM) identifying trends and anomalous observations

We are exploring the potential utility of a GLM approach with our diagnostic data

Investigating retrospective outcomes focussing on Amoebic gill disease



Cultured *N. perurans* (x10X with relief contrast)



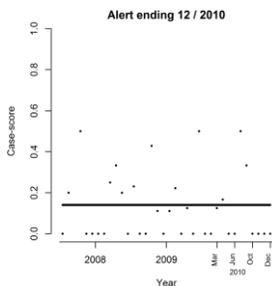
Amoebic gill disease



mortality

Analysis output: no AGD

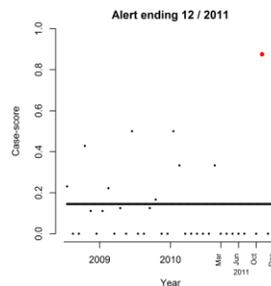
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Validation
 No AGD observed by commercial veterinary practices

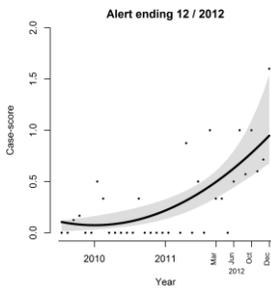
Analysis output: AGD emergence 2011

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Validation
 AGD from September 2011 involving multiple sites as observed by commercial veterinary practices

Analysis output: AGD continuation 2012


**Validation**

Geographical range of AGD increases as observed by commercial veterinary practices

Summary



Year	Algorithm Alert	AGD present	Summary	Comment
2010	No	No	Correct	
2011	Yes	Yes	Correct	
2012	Yes	Yes	Correct	
2013	No	Yes	Wrong	False-negatives
2014	No	Yes	Wrong	
2015				Awaiting results

The diagnostic data held by the institute appears to have potential to aid the detection of aquatic emerging diseases

or

Is it all a coincidence?

Try PD?

- **Summary**

- Essential that the Scottish aquaculture industry continues to grow in a sustainable manner
- Applying appropriate disease control measures assists with this strategy
- MSS attempting to implement an alert system for detecting emerging diseases
- Industry adhere to the 'Code of good practice'
- <http://thecodeofgoodpractice.co.uk>