The Emergence of Skin Diseases in Trout

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Background

Skin diseases have emerged in salmonid aquaculture in recent years. Red mark syndrome (RMS) was first identified in farmed rainbow trout, *Oncorhynchus mykiss* (Walbaum) in Scotland in 2003 (Verner-Jeffreys et al. 2008) and shares similarities with another condition affecting rainbow trout: strawberry disease (SD). Both diseases probably have an infectious aetiology, but no agent has been definitively identified.

In 2002 a new skin condition in farmed rainbow trout in England was recognised: puffy skin disease (PSD). Rate of spread to new sites was low until 2006 when cases increased substantially.

Objectives

- Establish the farm level prevalence and geographic distribution of PSD in trout farms in England and Wales.
- Investigate the association of PSD with live fish movements and with other skin conditions.

Puffy Skin Disease

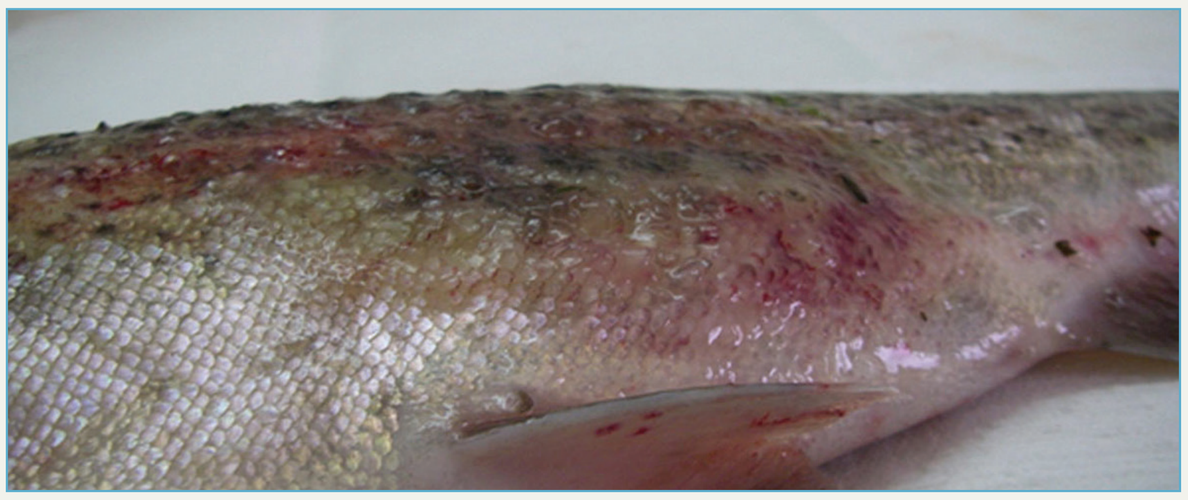

Figure 1. Severe puffy skin disease showing raised scales.

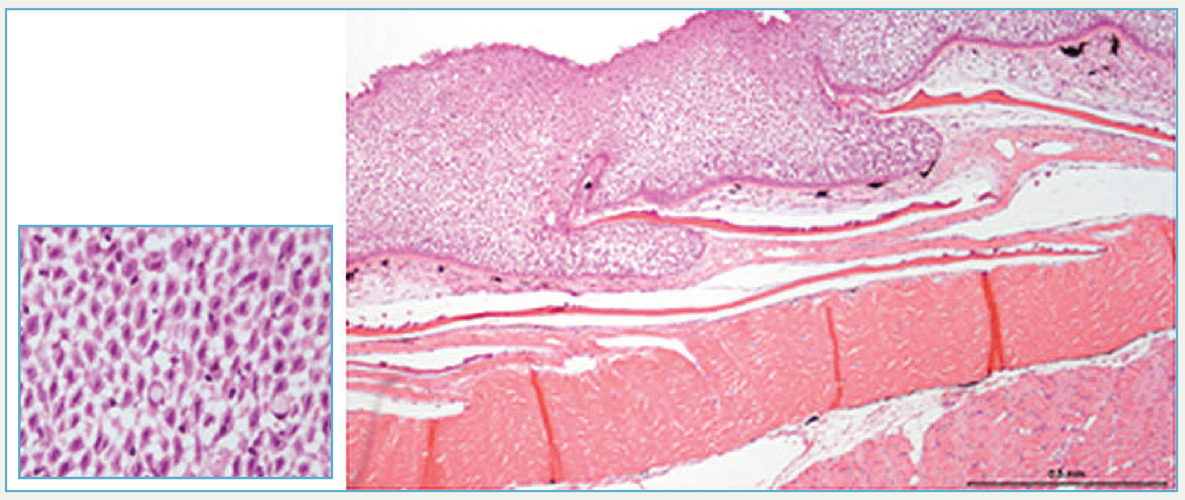

Figure 2. Section through a region of PSD affected skin of rainbow trout: hyperplastic epithelium with spongioform appearance. Some areas show evidence of erosion. Dermis and underlying musculature appear normal (H&E. Bar = 0.5mm).

- Skin on the flank shows excessive mucous and dermal hyperplasia, progressing to raised scales and skin.
- Affected fish may become inappetant and emaciated.
- Economic loss due to culling and downgrading of carcasses at slaughter.

Methods

- Questionnaire administered by Cefas fish health inspectors in face to face interviews with farmers from October 2012 to April 2013.
- All aquaculture production sites holding rainbow were included in the study.
- Additional site information was extracted from the Live Fish Movement Database
- The farmers were shown photographs of the condition and descriptions of all three skin conditions.

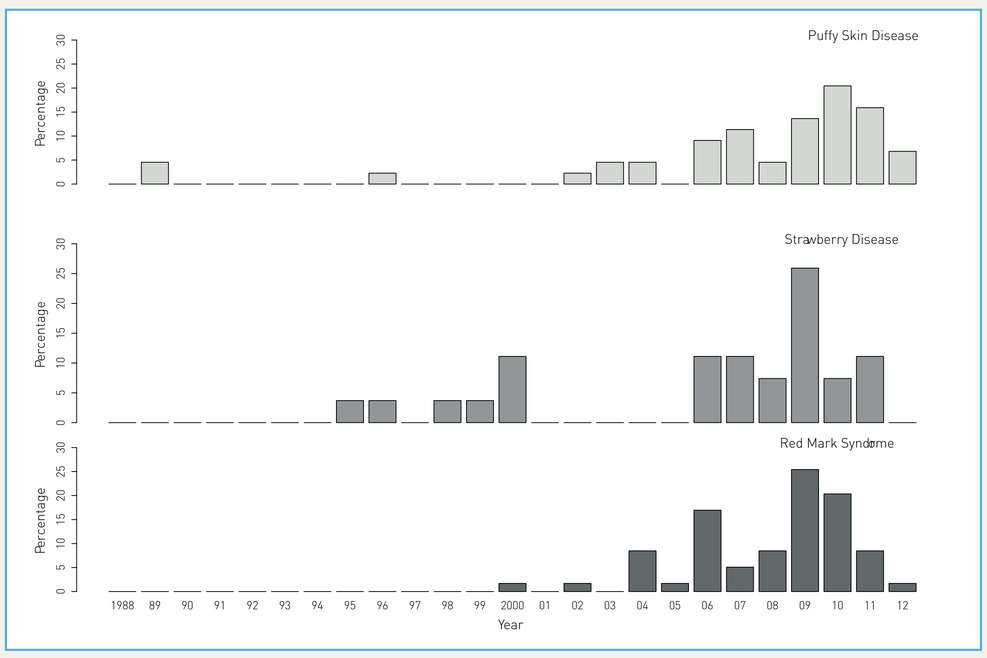

Figure 3. Number of new observations of puffy skin disease (n = 44), strawberry disease (n = 27) and red mark syndrome (n = 59) per year plotted as a percentage of all cases.

The pattern of mergence over time is similar for all three conditions

Results

- The questionnaire was completed on 131 farms, a response rate of 91%.
- 49 sites reported having seen the disease on their sites (37% of sites with rainbow trout). Affected farms were in 28, of 44 river catchments included in the study. No obvious geographic clustering of farms was apparent.
- RMS and SD had been observed on 61 (47%) and 29 (22%) farms, respectively.

Table 1. Associations between skins conditions and introduction of live rainbow trout onto site in the previous 12 months (n=131).

Outcome	Exposure	Chi Squared	P	Odds Ratio
PSD	Live RBT introduction	8.3	<0.01	5.3
RMS		12.2	<0.01	6.2
SD		4.6	0.03	4.6

Table 2. Associations between the occurrence of the three skins conditions (n=131).

Outcome	Exposure	Chi Squared	P	Odds Ratio
PSD	RMS	31.8	<0.001	9.7
PSD	SD	12.5	<0.001	4.6
RMS	SD	40.1	<0.001	36.1

RBT = rainbow trout, PSD = puffy skin disease, RMS = red mark syndrome, SD = strawberry disease.

All three conditions are strongly associated with live fish introductions

There are strong associations between the three conditions

Conclusion

- Live fish movements indicate an infectious aetiology for all 3 conditions.
- Strong association between SD and RMS and similar histopathology suggests the same infectious aetiology.
- The histopathology of PSD suggests involvement of a different agent.
- Association between conditions due to:
  - confounding
  - one condition predisposing to another
- Future On-farm longitudinal studies should:
  - consider all skin conditions and
  - investigate environmental (e.g. stocking density and water quality) and host factors (e.g. triploidy)

  to support improved disease control.

References

Verner-Jeffreys et al., 2008. Emergence of cold water strawberry disease of rainbow trout *Oncorynchus mykiss* in England and Wales: Outbreak investigations and transmission studies. Diseases of Aquatic Organisms 79, 207-218.

Acknowledgements

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