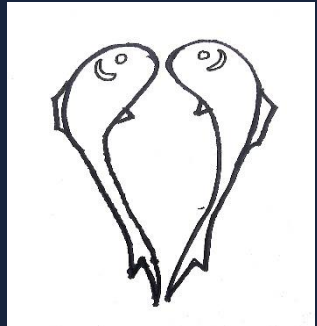




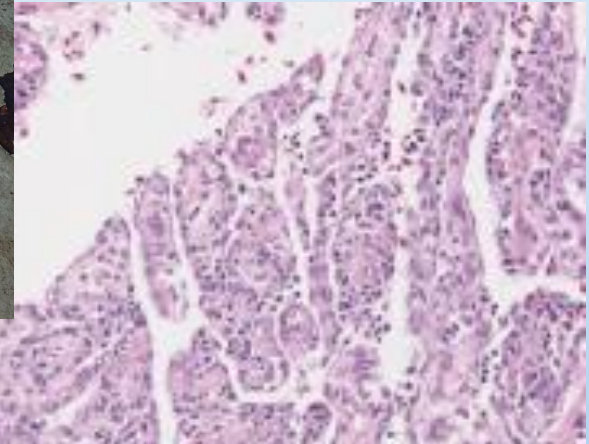
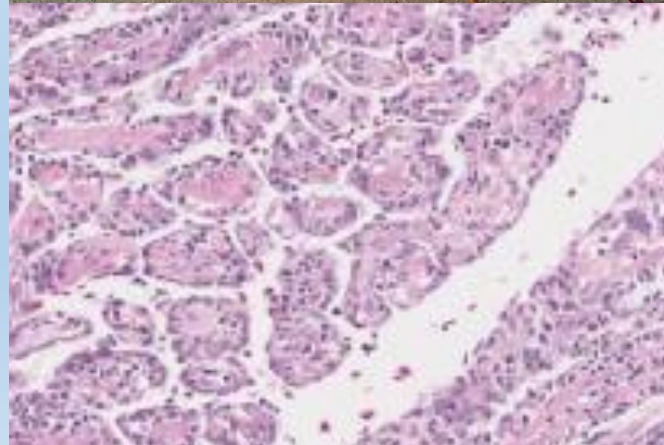
FishVet Group



 A Benchmark  
Company

  
**BIM** Ireland's  
Seafood  
Development  
Agency

# EPIDEMIOLOGY OF CMS IN IRELAND TRINATIONS 2019





# HISTORY OF CMS IN IRELAND

- 2012 was 1<sup>st</sup> clinical outbreak

Journal of Fish Diseases 2014, 37, 935–939

doi:10.1111/jfd.12186

Short communication

## **Clinical cardiomyopathy syndrome in Atlantic salmon, *Salmo salar* L.**

**H D Rodger<sup>1</sup>, S J McCleary<sup>2</sup> and N M Ruane<sup>2</sup>**

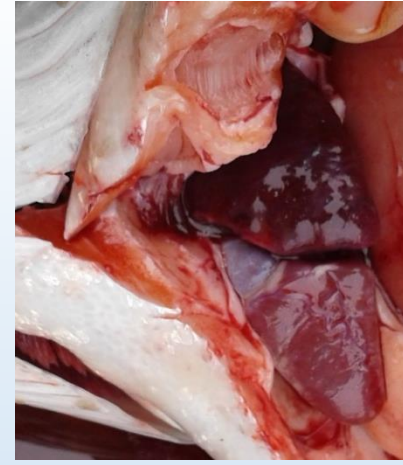
<sup>1</sup> Vet-Aqua International, Oranmore Business Park, Oranmore, Co. Galway, Ireland

<sup>2</sup> Fish Health Unit, Marine Institute, Oranmore, Co. Galway, Ireland



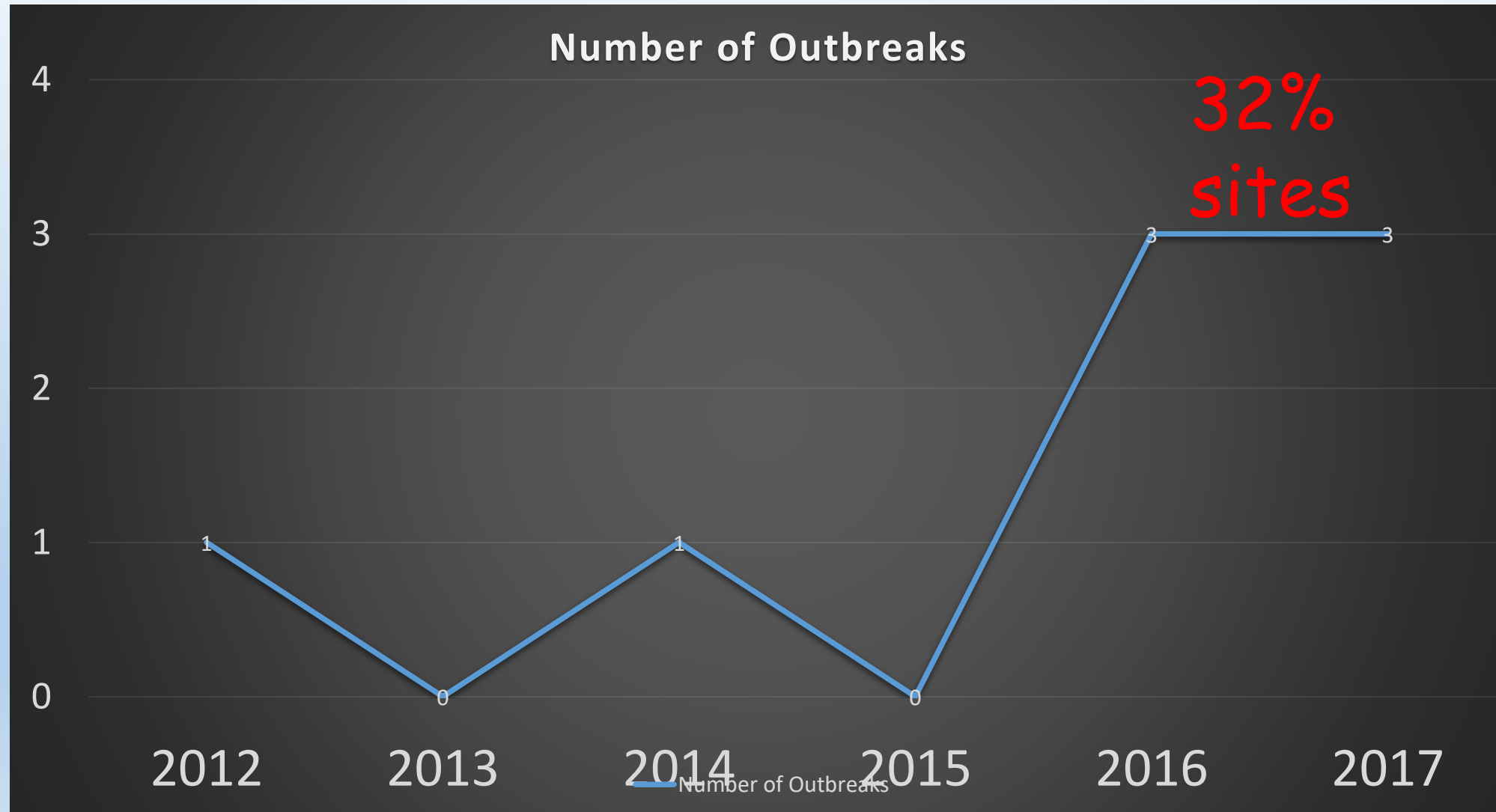
# CMS – 1<sup>ST</sup> CASE IN IRELAND

- Autumn 2012
- 3.5kg fish
- Low mortality but dramatic presentation
- Ventral pitting oedema, exophthalmia, ascites, fibrinous membrane on liver, haemopericardium etc.
- Classical CMS
- Accelerated harvest, low stress management





# CMS SINCE 2012



# EPIDEMIOLOGICAL SURVEY - 2016 & 2017

- Survey aims

1. Establish the significance of and describe the current epidemiology of CMS in Ireland
2. To investigate a range of factors for trends with clinical outbreaks
3. To identify risk factors and areas for further research in order to inform future mitigation and management strategies for CMS

# GENERAL SURVEY PARAMETERS

| General parameters measured on all sites in the survey |  |
|--|--|
| Number of fish on site                                 | Diet in seawater phase                         |
| Smolt type (S1 vs S0)                                  | Stocking density at sea and pen size           |
| Strain of fish   | Presence and use of cleaner fish               |
| Smolt source (lake vs tank origin)                     | Bay fallowing                                  |
| Smolt stocking density in freshwater                   | Proximity of site to a processing plant        |
| Level of oxygenation during freshwater phase           | Bath and oral treatments during seawater phase |
| Vaccination  | Presence of other diseases                     |

Table 1. Parameters investigated in CMS surveys on all sites in Ireland, 2016 and 2017 generations.

# SITES WITH A CMS OUTBREAK

| Additional parameters quantified on sites with an outbreak of CMS |   |
|---|---|
| Month of outbreak   | Number of pens affected on site           |
| Time to outbreak from seawater transfer                           | Mortality levels                          |
| Water temperature   | Clinical signs                            |
| Weight of fish  | Length of outbreak                        |
| Stocking density at outbreak                                      | Strategies employed to deal with outbreak |

Table 2. Additional parameters investigated in sites with a CMS outbreak in 2016 and 2017 generations.



# RESULTS

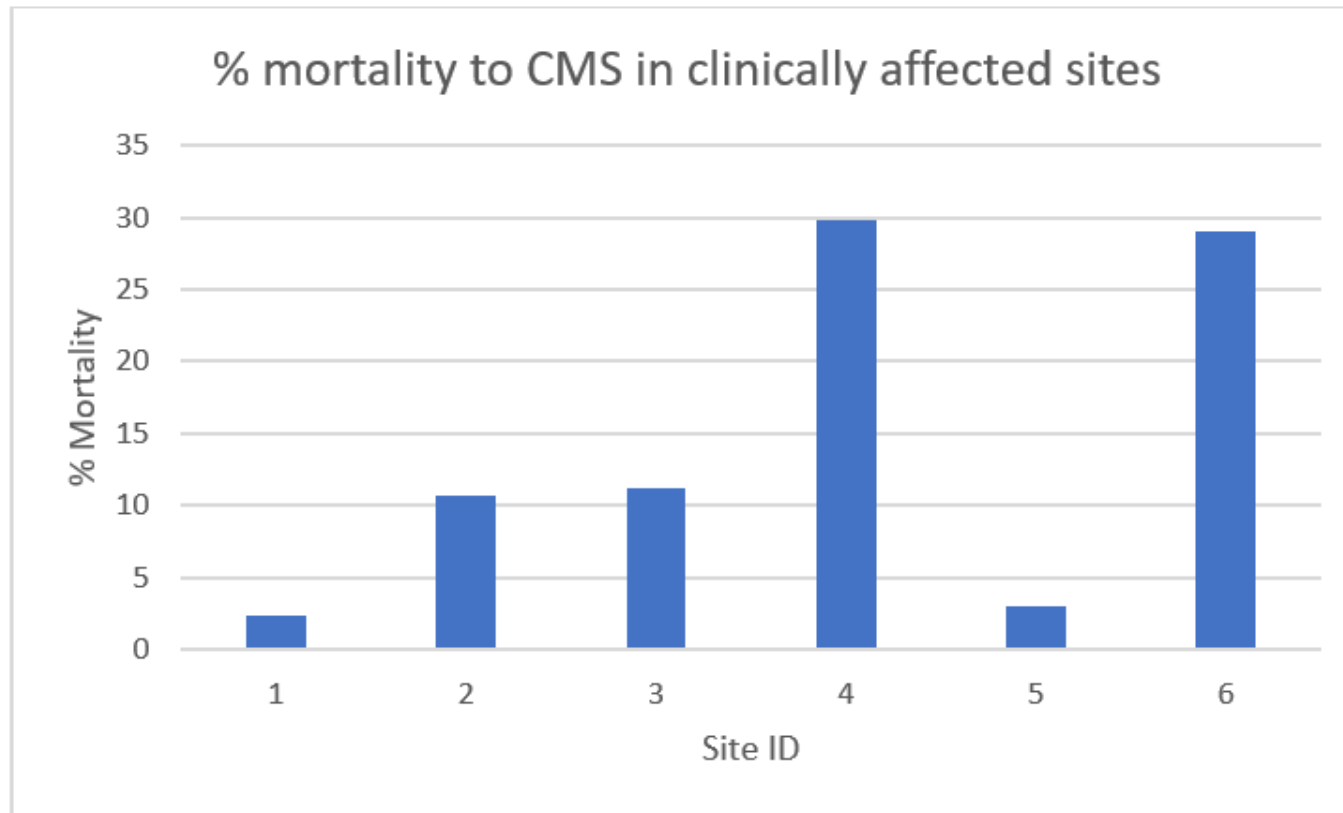


Figure 1. Percentage mortality attributed to CMS in the 6 affected sites.

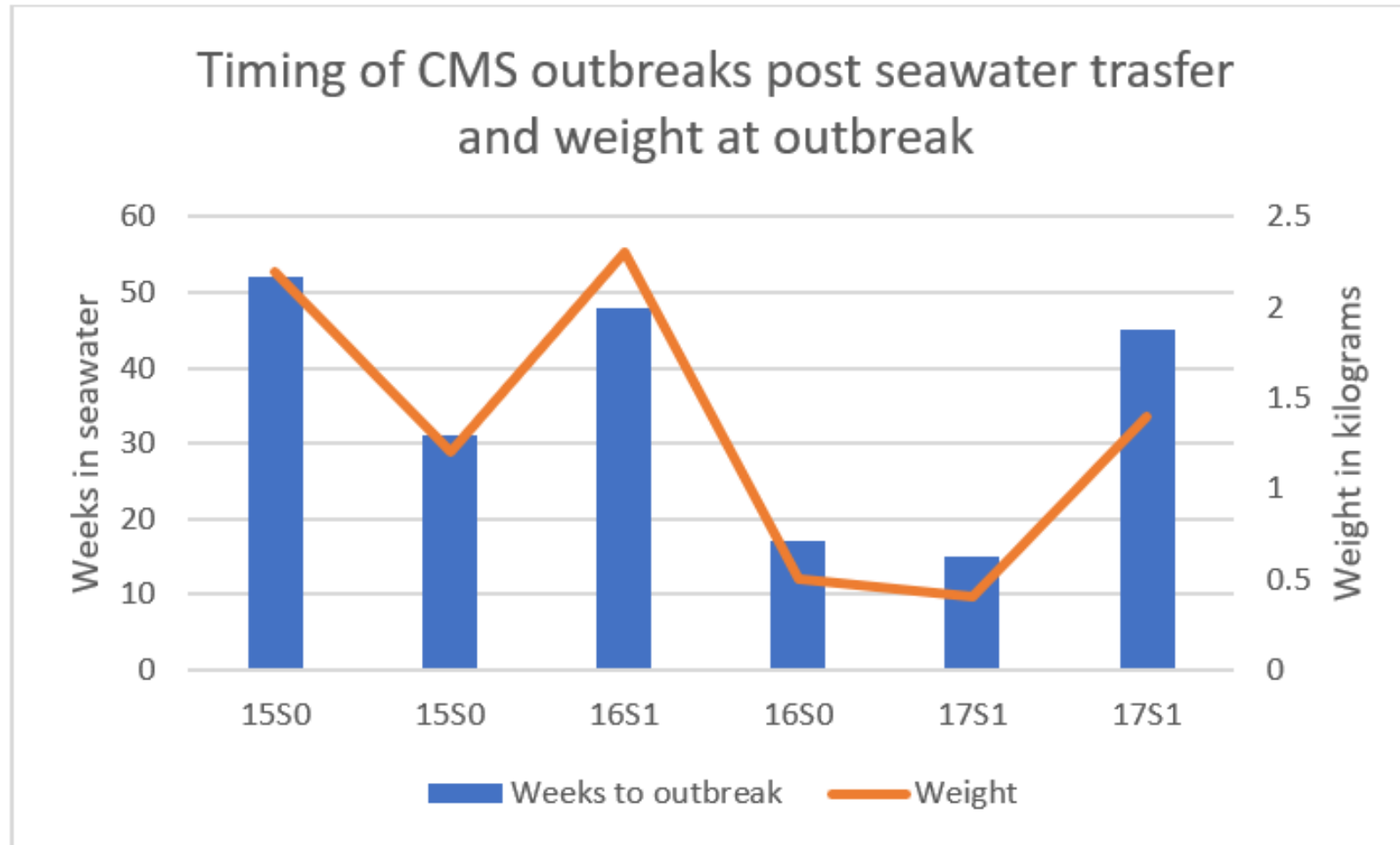
Average  
mortality  
14.3%  
Range 3-30%



# OTHER OBSERVATIONS

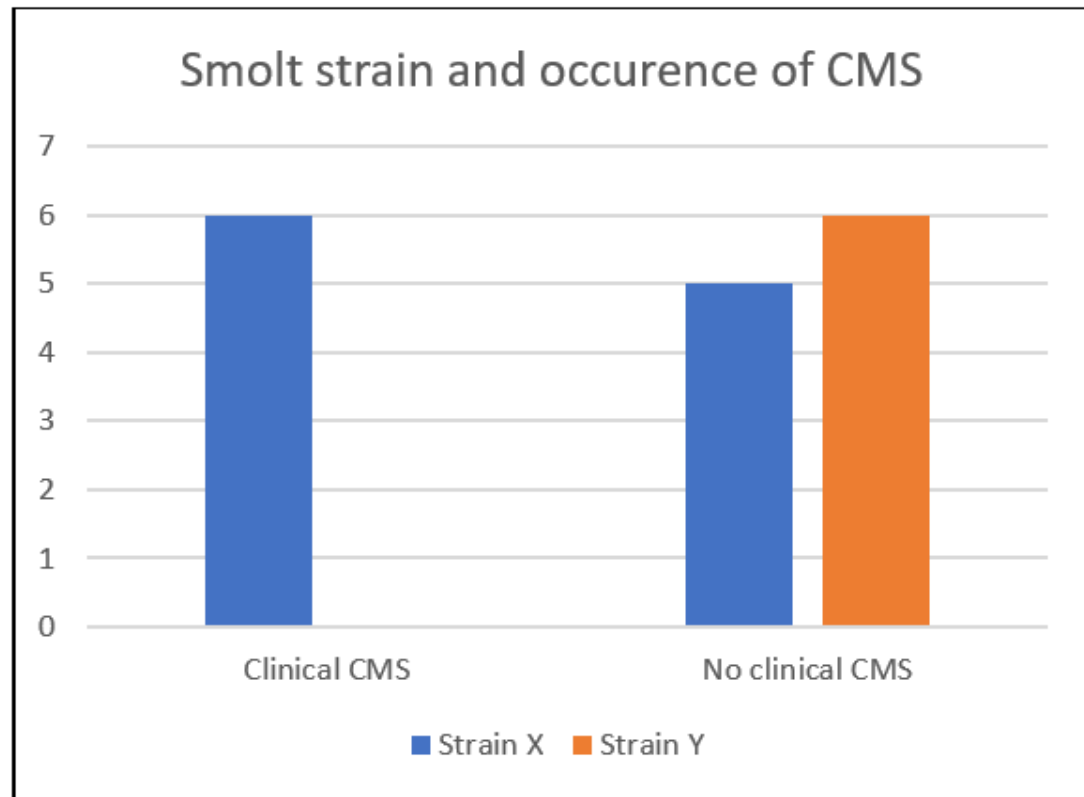
- In 2/3 of affected sites clinical CMS only occurred in a proportion of pens (2-5)
- Other pens were PMCV positive but no clinical disease
- Mortality very variable between affected pens
- Outbreaks lasted 8 months – harvest
- Mortality spiked during stressful events

# TIME POST TRANSFER TO OUTBREAK



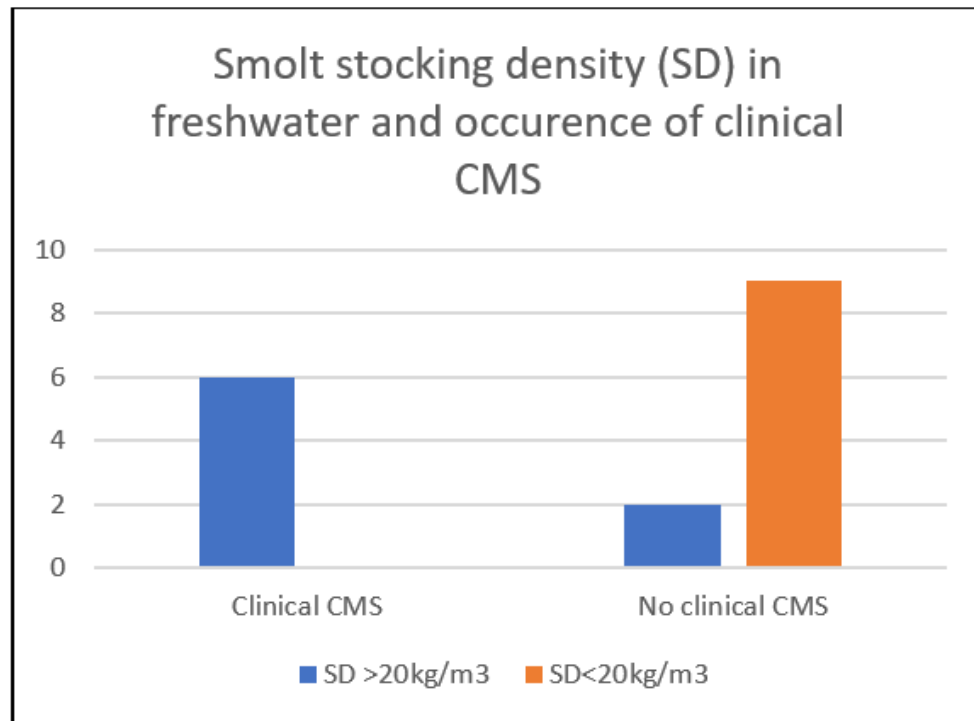
Average weight  
1.3kg  
Range 0.4-2.3kg

# FISH STRAIN AND OCCURRENCE OF CMS



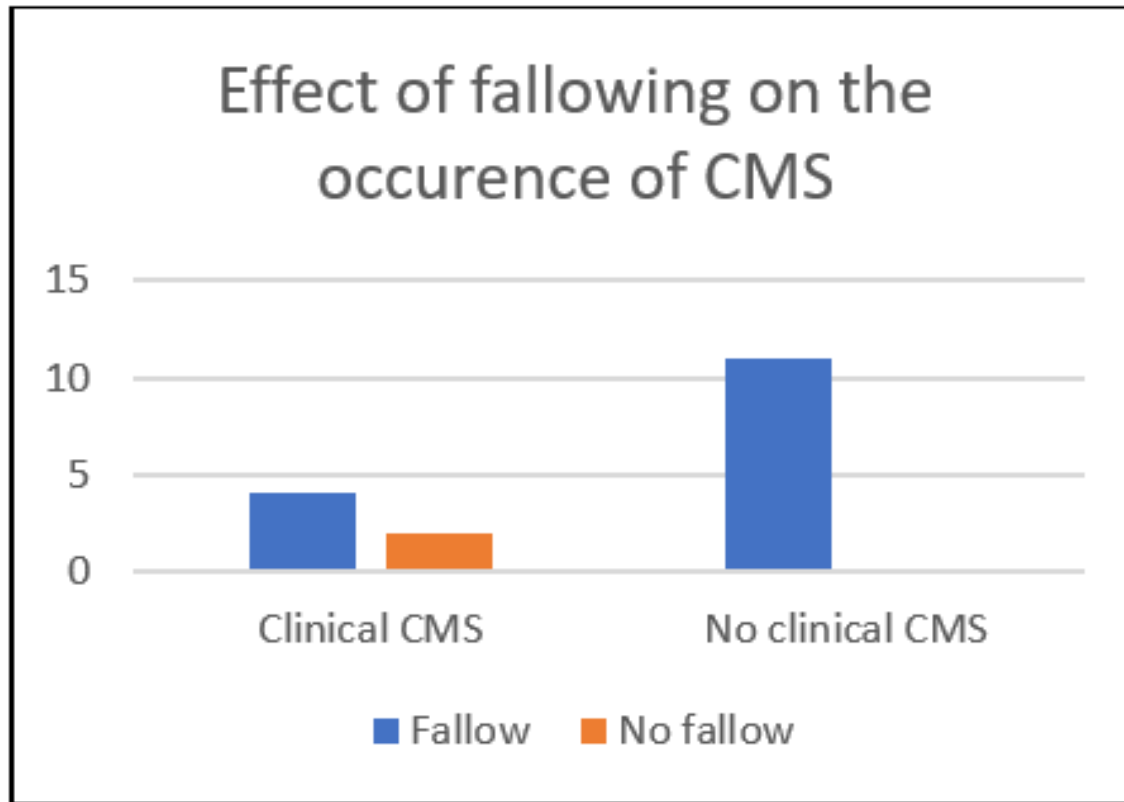
No difference  
in outbreaks  
between S1s  
and S0s

# FRESHWATER PARAMETERS AND EFFECTS



- Two hatchery scenarios – high and low SD
- Is this significant?
- Why might it be?
- Levels of oxygen use in freshwater?

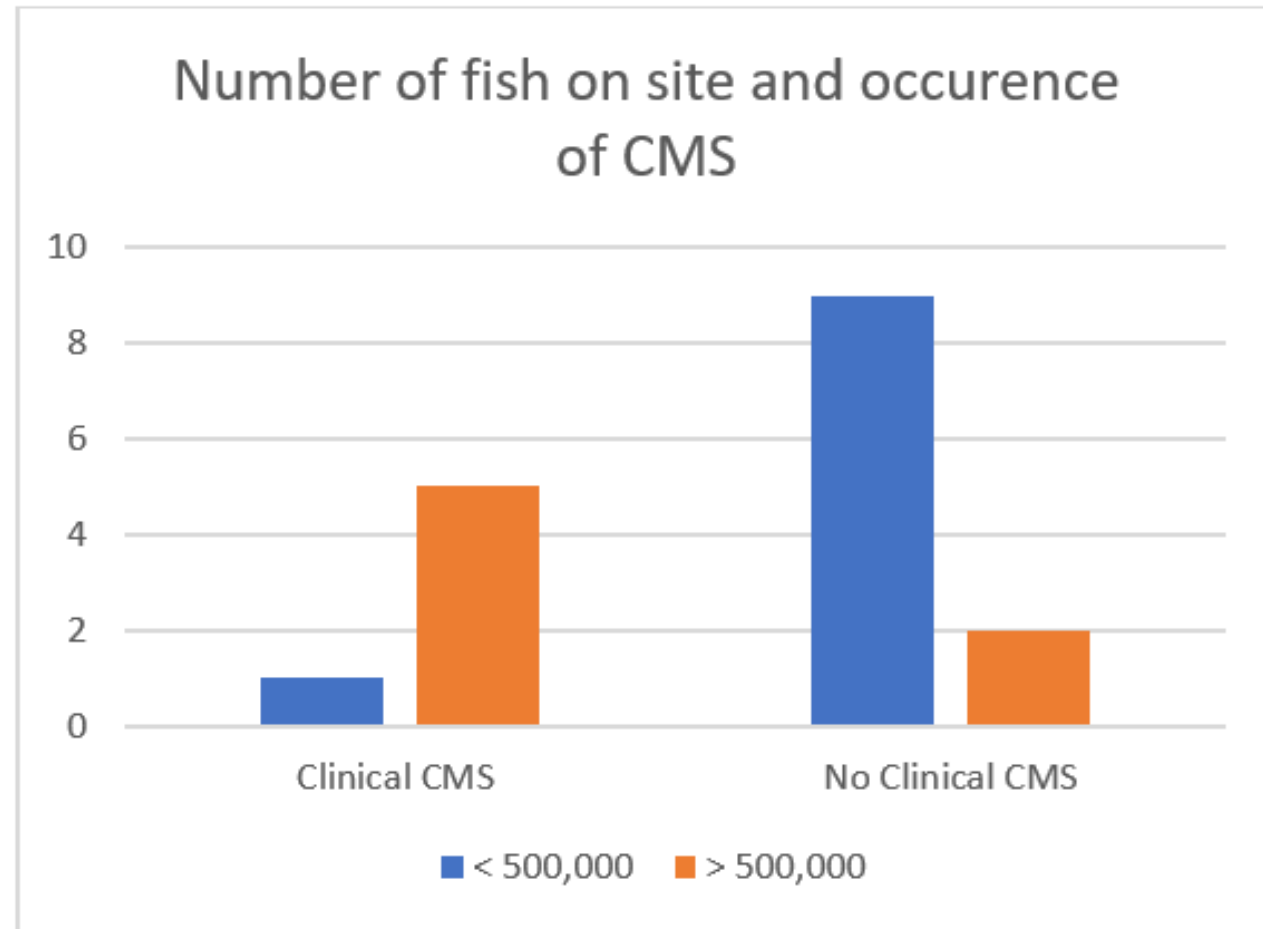
# SITE FOLLOWING



Not fallowing =  
significant  
increased risk  
of clinical CMS

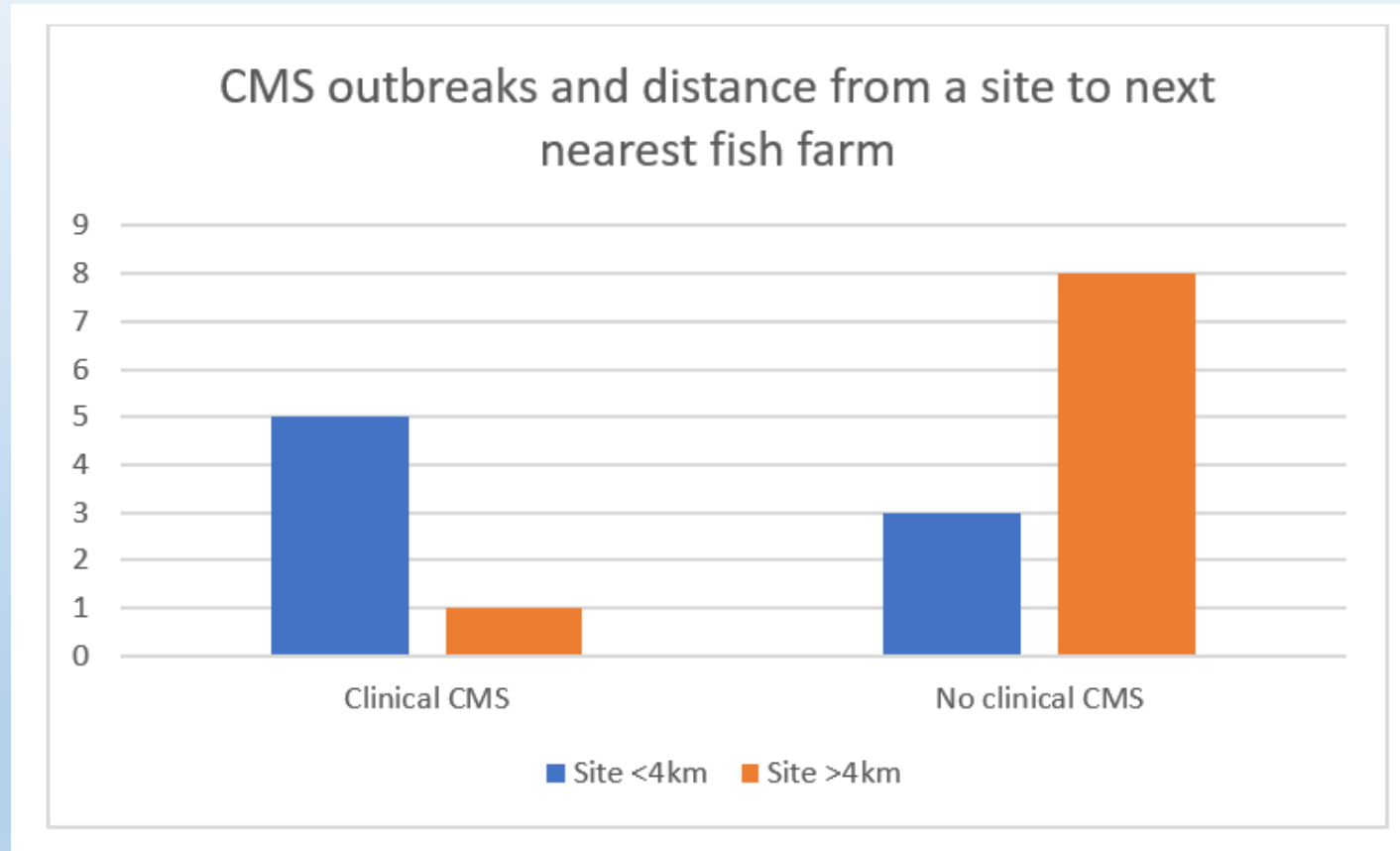
Length of  
fallowing did  
not appear to  
have an effect

# NUMBER OF FISH ON SITE AND CMS



Risk of contracting clinical CMS significantly higher in a site with over 500,000 fish

# DISTANCE TO NEAREST SITE – EFFECT?



Higher incidence  
of CMS in sites  
with an affected  
neighbour?



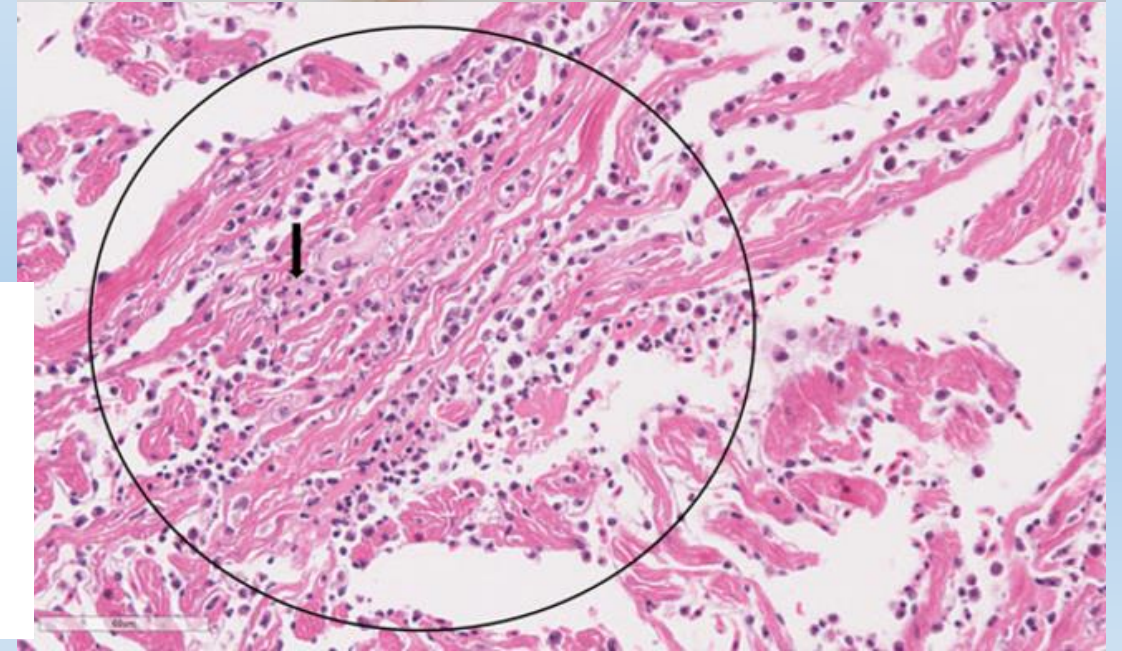


# CMS AND CLEANERFISH

PMCV detected in corkwing wrasse and ballan wrasse

Cleaner fish co-habiting with Atlantic salmon with clinical CMS



Virus present at low loads and non specific heart pathology observed



## SHORT COMMUNICATION

WILEY *Journal of Fish Diseases*

**Piscine myocarditis virus detected in corkwing wrasse (*Symphodus melops*) and ballan wrasse (*Labrus bergylta*)**

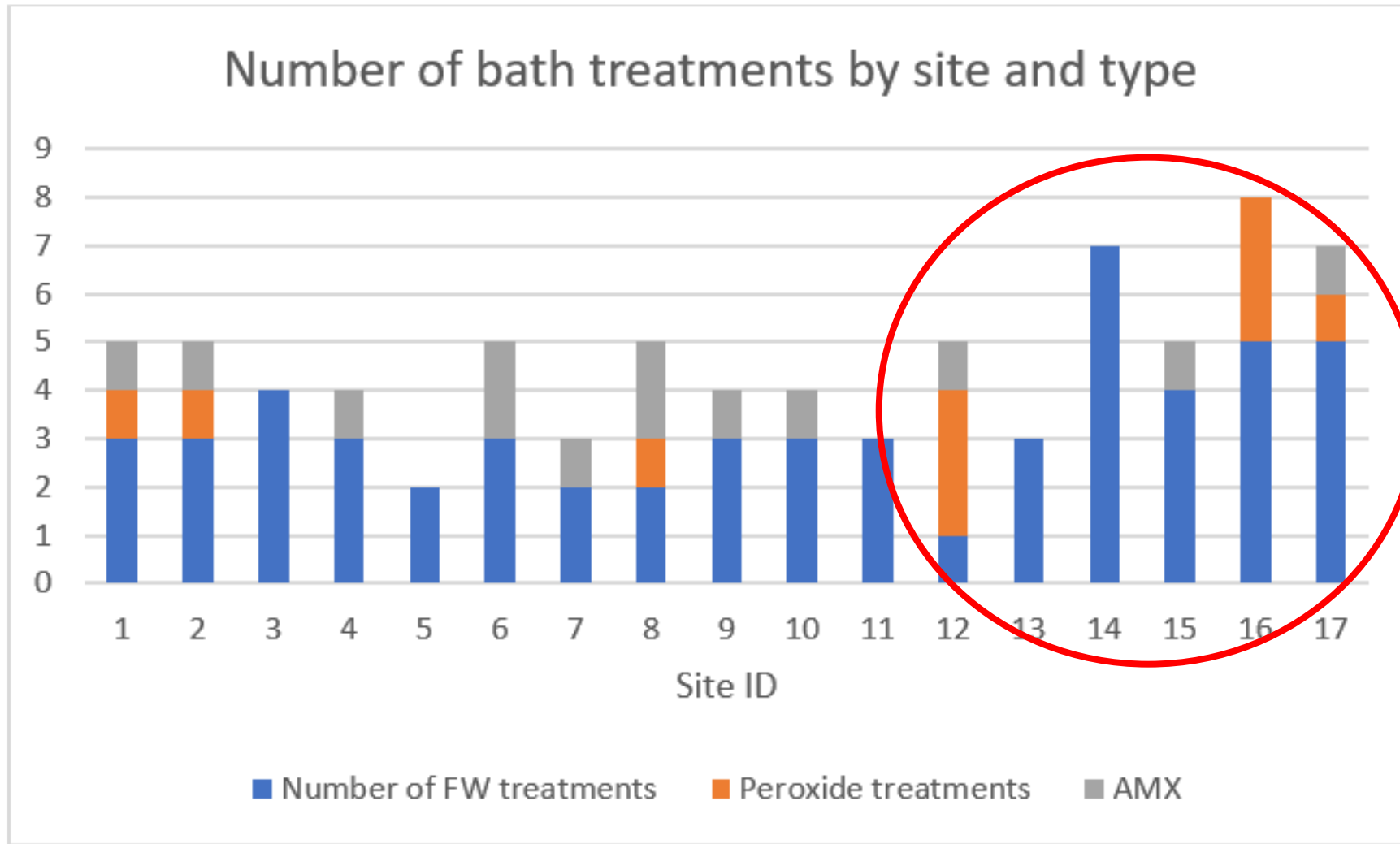
F Scholz<sup>1,2</sup>  | N M Ruane<sup>3</sup> | T Morrissey<sup>3</sup> | M Marcos-López<sup>1,2</sup>  | S Mitchell<sup>1</sup> | I O'Connor<sup>2</sup> | L Mirimin<sup>2</sup> | E MacCarthy<sup>2</sup> | H D Rodger<sup>1</sup>

# CMS AND CLEANERFISH

- Both sites with and without CMS had cleanerfish
- No associations with either species or movements etc.
- It is likely there is some risk!

|                                | Sites with clinical CMS  | No clinical CMS on site         |
|--------------------------------|--------------------------|---------------------------------|
| Cleanerfish stocked            | 6 (4 wrasse, 2 lumpfish) | 7 (5 wrasse, 2 lumpfish, 1 mix) |
| No cleanerfish stocked         | 0                        | 4                               |
| Cleanerfish moved between pens | 2                        | 2                               |

Table 3. Cleanerfish use and type on sites with and without clinical CMS.



Sites 1-11: No CMS

Sites 12-17: CMS

# SUMMARY

- Small number of sites in Ireland - difficult to carry out meaningful statistical tests
- However this type of study can help to elucidate the epidemiology of a disease and highlight areas that require further research
- Using relative risk analysis two factors appeared significant:
- The number of fish stocked in a site  $> 500,000$  fish increased the risk of an outbreak
- Not following a bay prior to stocking increased risk of a CMS outbreak in the study

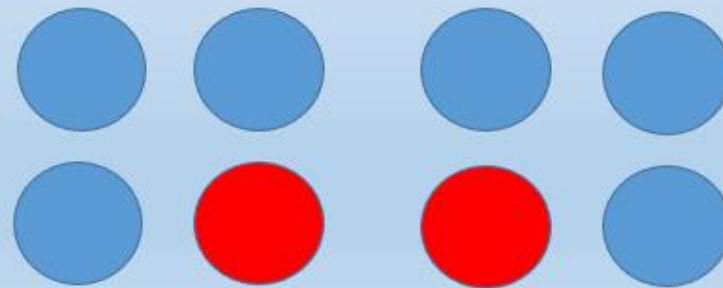


# AREAS FOR FURTHER INVESTIGATION

- FW parameters
- The number of
- Why does the virus spread in a random fashion? dynamics on in

Why does the virus only affect certain pens?

- Site with 11% mortality to CMS
- All pens were positive for PMCV
- 2 pens in middle of site developed clinical CMS but it never spread to other pens
- Clinical signs and mortality for 8 months



CMS pens -  
weight at  
outbreak 1.4kg

Average on site  
1.9kg

High CMS mortalities



# ACKNOWLEDGEMENTS

- Thanks to the following for sharing information:
- Colleagues at Fish Vet Group
- Marine Harvest Ireland
- Bradan Beo
- Mannin Bay Salmon Company
- Curraun Blue
- Ocean Farm Ltd.
- Glenarm Organic Salmon Ltd.