The Scottish Wrasse Projects

4th Sea lice multination

November 2013, Trondheim

Meritxell Diez-Padrisa, Vet at Marine Harvest

Project consortium

Early work started in 2010

A TSB co-founded project started in January 2012

Technology Strategy Board
Driving Innovation

The UK innovation agency

Project leader
Dave Cockerill
& the health team

Academic partner
Herve Migaud
& the Reproduction group

Industrial partner
Chris Hempleman
& the health team

Commercial Hatcheries
Machrihanish Marine Farms
Paul Featherston & the team

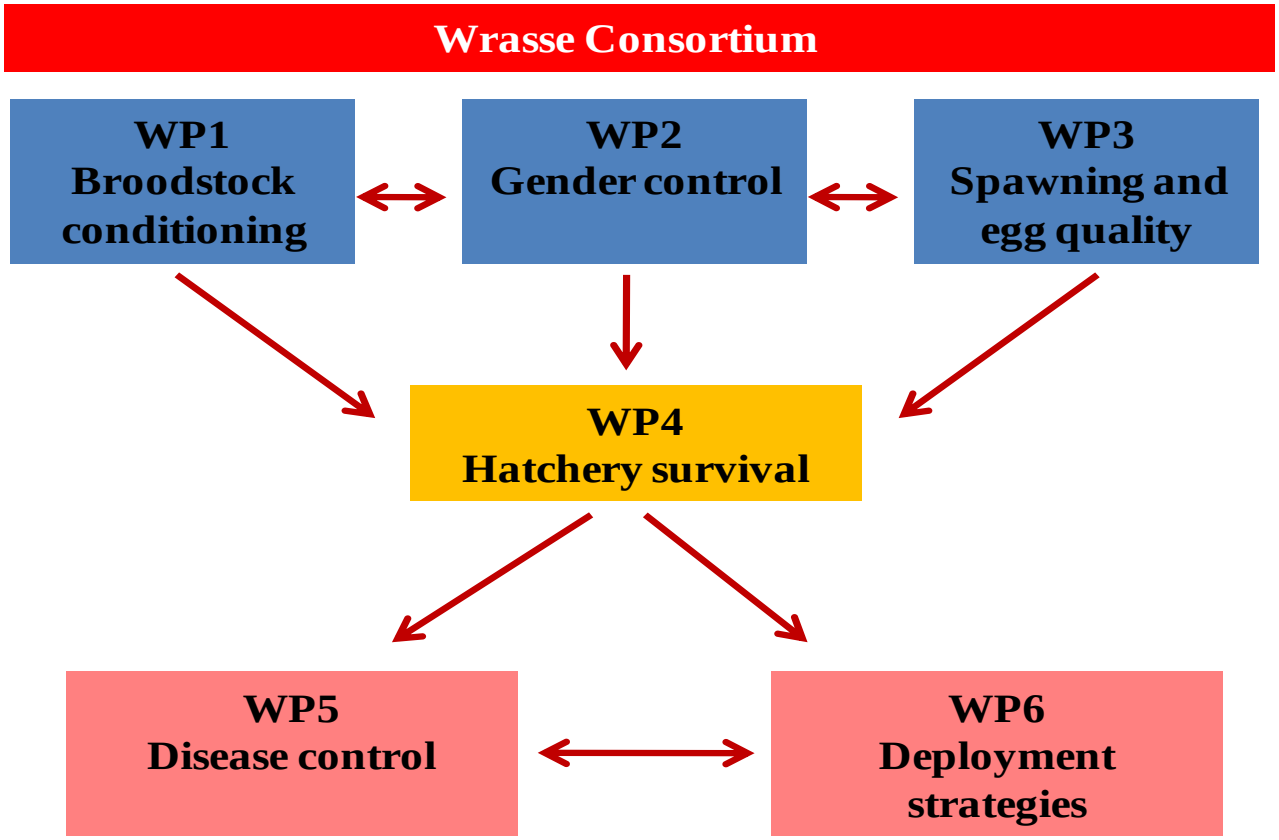
Otter Ferry Seafish Ltd.
Alistair Barge & the team

Marine laboratory
Marine Environmental Research Lab
(Institute of Aquaculture)
William Roy & the team

Sub-contractor

Project aim

"Production and implementation of farmed wrasse in the Scottish Salmon industry"

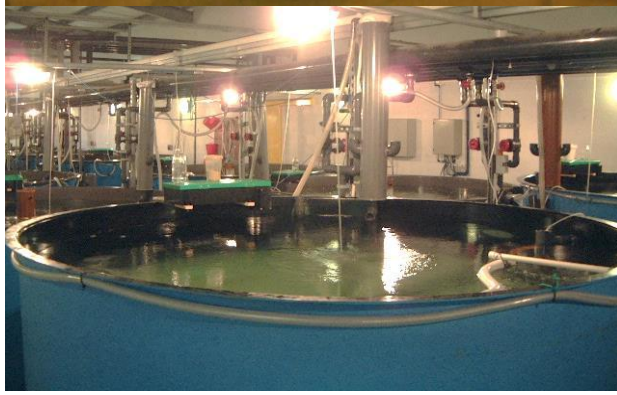


Machrihanish Marine Farms

Old cod hatchery at the Machrihanish Marine Environmental Research Lab

Machrihanish Marine Farms

- Broodstock spawning
- Egg incubation
- Larval rearing and live feed production
- Juvenile on-growing



- At all life-stages , continued effort to secure
  Water quality (filtration, sterilization)
  Temperature control through re-circulation
  Establish best photoperiod regime

- First few thousands ballan wrasse delivered in summer 2013

- On target to scale-up output

Broodstock conditioning

Early days: One man and his fyke nets summer of 2010

- **2011** : No spawning occurred
  Cold winter temperatures (~6 °C) suspected as having 'switched off' the spawning

- **2012 : Temperature control (~12°C)**
  First spawning (In-season; 2010 caught fish)
  ~15 females produced ~1M eggs

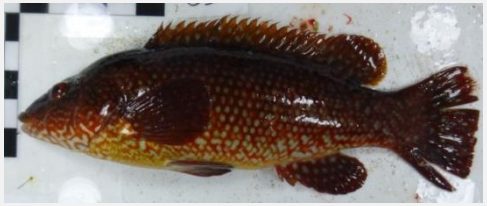
- **2013 : 3 photoperiod regimes** successfully established
  2 months advanced – Ambient - 2 months delayed
  > 1000 broodstock fish
  100`s millions of live-egg produced

Challenges:

- Even in water kept warm over winter (12 °C), our Ballan don't seem to spawn until 18m-2 years in captivity

Gender control

No sex specific morph



Low male prevalence

- **In-field sex prediction**

Gender can be predicted with ~ 90% accuracy using simple weight and length data

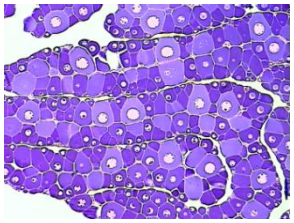
► Used to help stocking at the targeted sex-ratio

- **Induction of sex-change (female into male)**

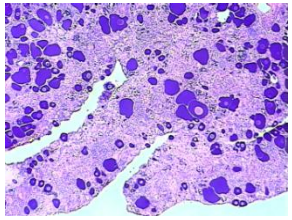
- Hormonal injection (synthetic testo) successfully sex-reversed female broodstock.
- Male functionality will be confirmed in 2014

► Could be used to secure the presence of male

Control



Injected

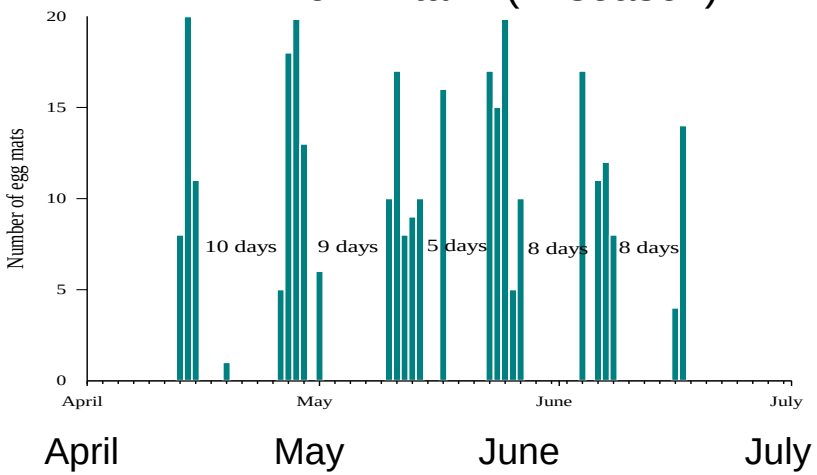


Numerous spermatogenic cells

Spawning and egg quality

- **Spawning dynamic**

From 1 tank (in-season)



April May June July

- **Egg quality**

> 90 % fertilization rate

75 % of egg batches with hatch rate > 50 %

Fatty acid profile similar in captive and wild

No significant seasonality in egg quality (egg diameter, Fatty acid profile, hatch rate)

- 2 months spawning season
- 4 to 6 spawning events / season
- Each spawning event last 2 to 4 days with 8 to 10 days interval

► **Egg quantity and quality is now satisfactory**

Challenges:

- The number of female contributing is suspected to be relatively low
- Spawn spread means that larval tanks are stocked over a few days which increase larval size dispersion

Egg disinfection and degumming

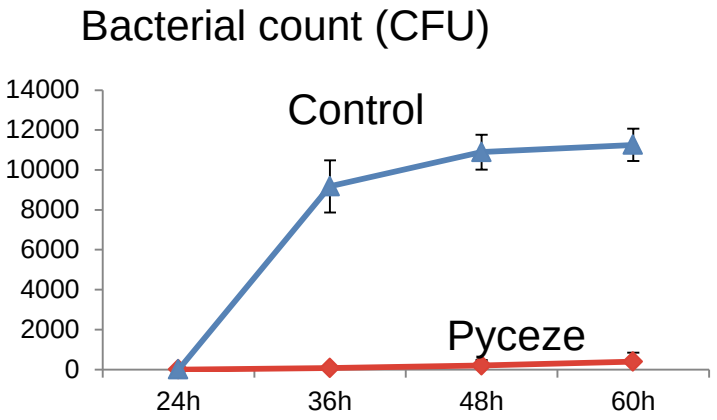
- **Egg disinfection**

Pyceze at [500 ppm; 30 min] (but not 100 ppm)

► Effective in-vitro ; no impact on hatching rate

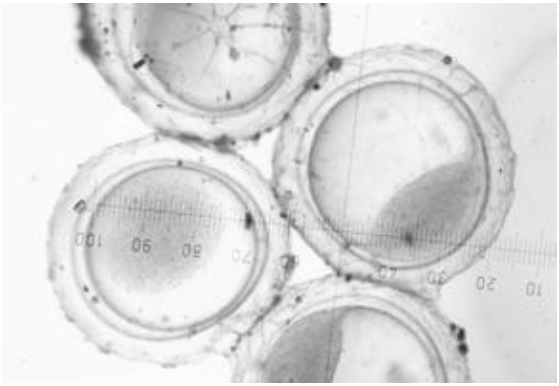
Used as static bath on spawning substrates prior to incubation

Challenge: Substrates + egg stickiness prevent full disinfection



- **Egg degumming (petri-dish study)**

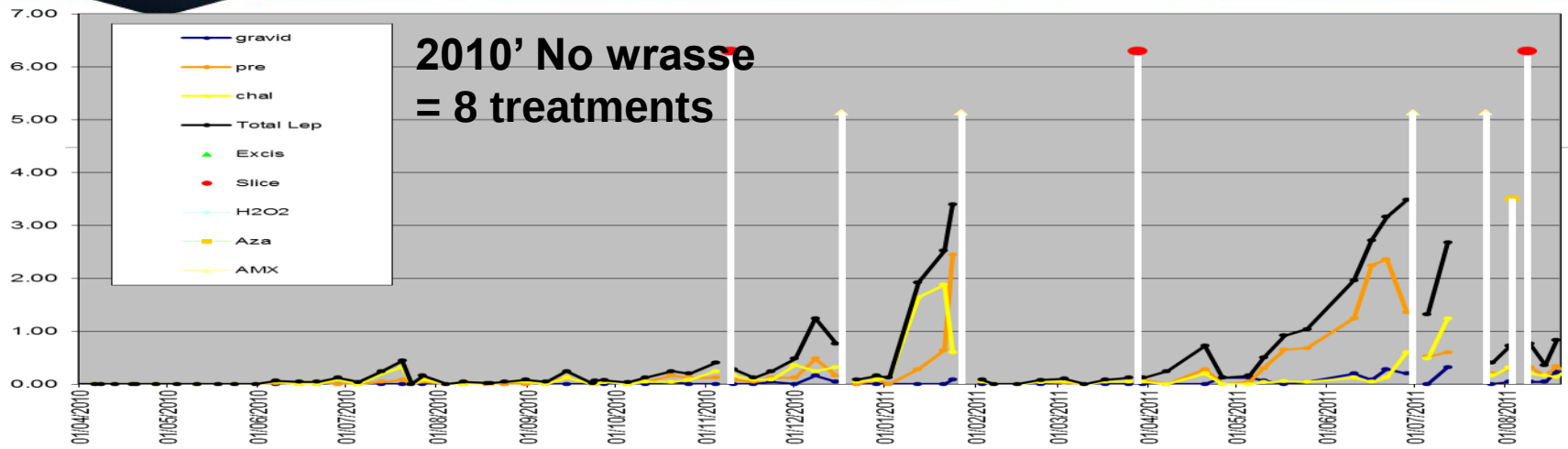
Exposure to the enzyme Alcalase [0.5 %; 15 min] :
- 100% of eggs degummed
- No negative impact on hatching rate

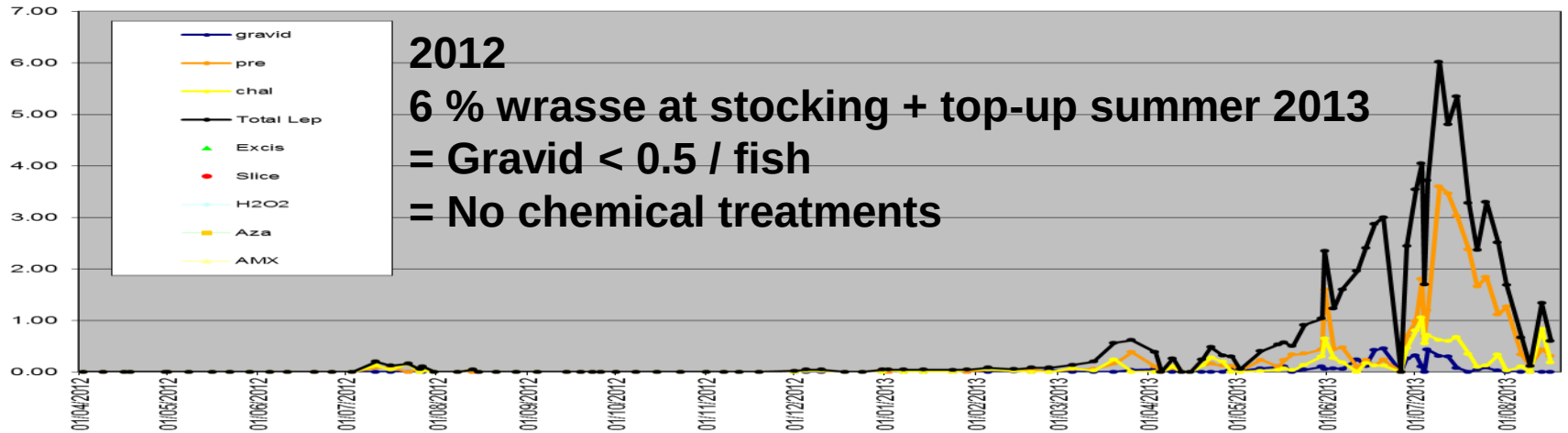


Eggs with gum layer and organic matter

Eggs degumming post-spawning is a potential avenue to secure disinfection, incubate eggs in suspension and facilitate stocking

Delousing efficiency: On-farm





Needs: High net hygiene; hides and false kelp; dedicated staff; care at net change
Supplementary feeding

Direct benefits:

7p per kg saving in medicine cost, ~£200K over 2,800t of production (vs wrasse cost of £120K)

Delousing efficiency: Tank-based

- **3 Comparative trials to date**

Using infected post-smolt of ~ 150 g at 5% wrasse

Same delousing pattern with:

1. 20g, 40g or 75g ballan
2. with or without access to fresh mussels
3. Only extreme jaw deformity reduced efficiency

Normal

Mild

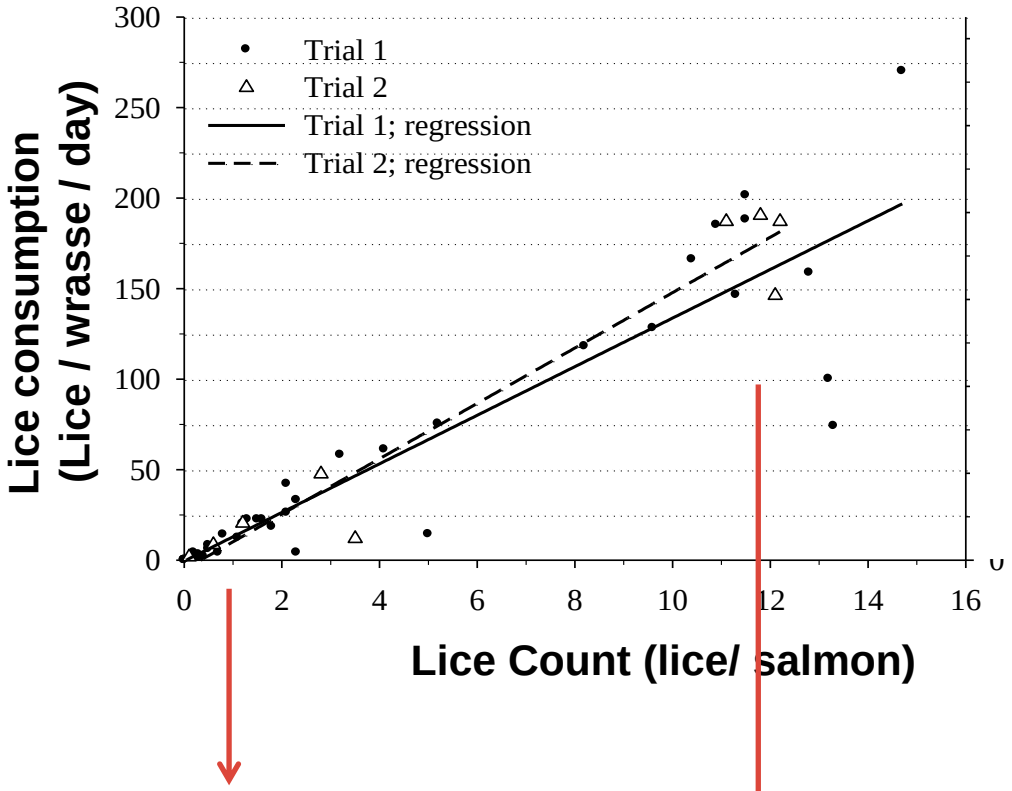
Extreme

- ► No benefit of higher ballan body-mass
- ► Supplementary feeding to be encouraged
- ► Jaw deformed Ballan should not to be deployed

Delousing efficiency

- **Comparative study (continue)**

Lice consumption is proportional to lice density



Each ballan cleaned the equivalent of ~ 14 salmon / day

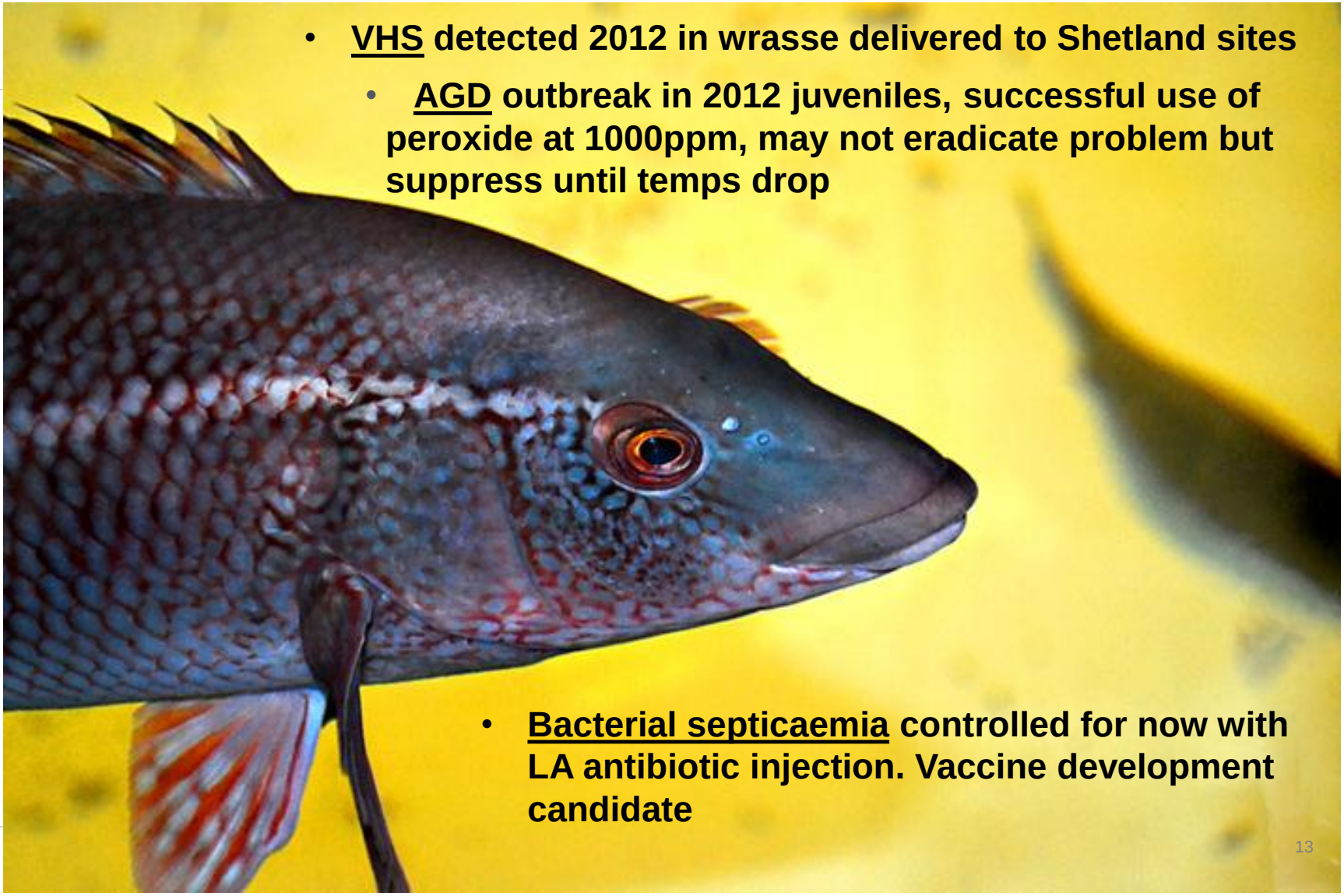
Each 20g ballan ingested up to ~ 200 lice / day (at 12 lice / salmon) even if offered fresh mussels

► **No apparent satiation**

► **Effective as preventive**

► **Effective as therapeutic**

Disease Risk and Control



- **VHS detected 2012 in wrasse delivered to Shetland sites**
  - **AGD outbreak in 2012 juveniles, successful use of peroxide at 1000ppm, may not eradicate problem but suppress until temps drop**
- **Bacterial septicaemia controlled for now with LA antibiotic injection. Vaccine development candidate**

Otter Ferry Seafish Ltd.

European 4-year project

Co-founded by the Scottish Salmon Company, Meridian Group and Crown Estate

HiE and Otter Ferry Seafish

Broodstock established: 2010

300 fish divided in 3 photoperiods

Production:

- 2011/2012: 15,000
- 2013: 30-50,000

Challenges:

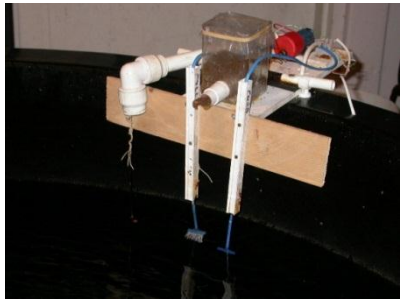
- Production of fertilised eggs
- Consistent weaning diets
- Vaccine development

Research

- Comparison of different spawning substrates: perspex tiles, Astroturf, carpet tiles
- Disinfection trials
- Egg de-sticking trials
- Testing different weaning and juvenile diets with demand feeders (with Biomar)
- Sex reversal trials with TSB project/SSPO
- SARF 068 project: Application of wrasse on farms: five successful farm trials with reduction in lice numbers and number of medicinal treatments, development of hide design, supplementary feeding of wrasse **www.sarf.org.uk**
- Guidelines for wrasse transport and use on farms
- Review wrasse diseases. J. Fish Dis. (2012). 35, 555-562. SSPO supported.

Continuing issues

- Egg supply
- Photoperiod production
- Egg survival and hatch rate
- Weaning diets
- Improvement of growth rates through diet development and warm water culture
- For more information: Jim Treasurer and Tim Atack



Demand feeder trials

Current challenges

- **HATCHERY**

  - Optimize egg production (female contribution)
  - Weaning and juvenile grower diet
  - Disease control, disease free, vaccination

- **UPON DEPLOYMENT**

  - Survival and welfare
  - Establish best stocking rate, feeding regime and handling protocols
  - No wrasse re-use to date

THANKS