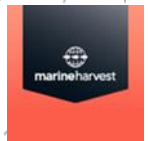


Status coordinated action LeppeProd

Ingrid Lein¹, Øystein Sæle², Katerina Kousoulaki¹, Stine Wiborg Dahle³, Åshild Krogdahl⁴, Synnøve Helland¹, Kai Kristoffer Lie², Anne-Berit Skiftesvik⁵, Elin Kjørsvik⁶, Olav Breck⁷, Espen Grøtan⁷, Kristin Hamre²



Background

Increasing use of Ballan wrasse for integrated sea lice management in the Norwegian salmon industry

Concerns about using wild caught wrasse:

- overfishing
- disease control, transfer of diseases
- restricted periods of wrasse catches
- welfare of wild caught wrasse

Why farmed Ballan wrasse?

Wild wrasse

- Not domesticated
- Long transports, import from Sweden
- Pathogen vector?
- High mortality
- Little reuse of wrasse in cages

| stress

Farmed wrasse – better control

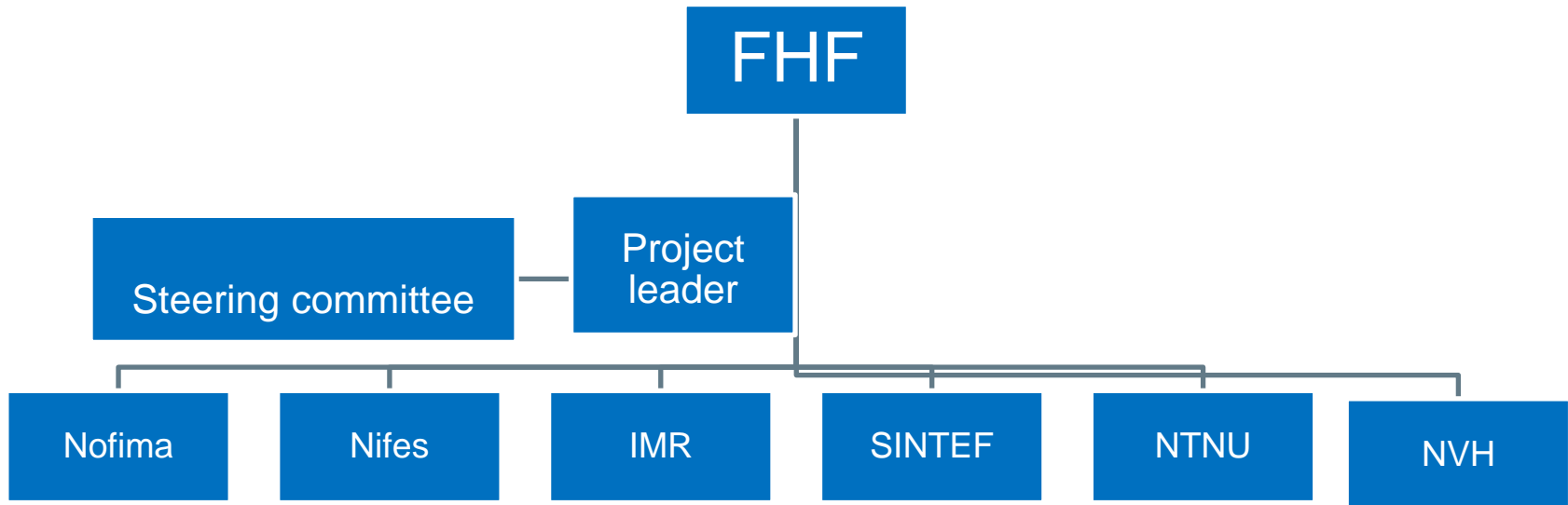
- Domestication – less stress
- Disease control – vaccines and hygiene
- Availability – year round
- Fish size – more control and flexibility

At start of the project in 2011:

4 commercial wrasse hatcheries were established. There was a need for knowledge about:

- reproduction
- first feeding
- weaning and on-growing
- disease control
- **ability to graze on salmon lice**

Organization



Funding by FHF: 33 mill NOK over 3 years

Project leader: Norwegian Seafood Center

Steering committee (industry):

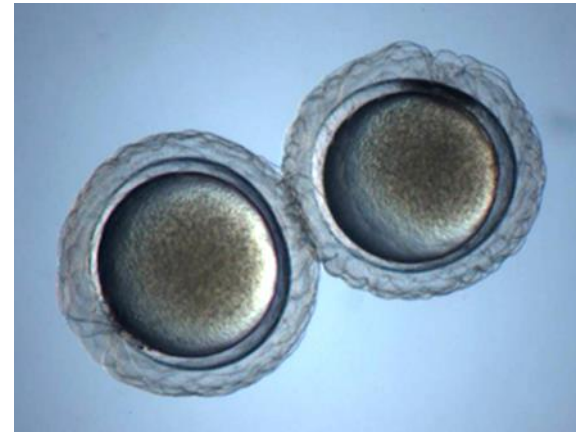
Marine Harvest Labrus, Nordland leppefisk, Lerøy, (Cleanfish, Profunda)

Skretting

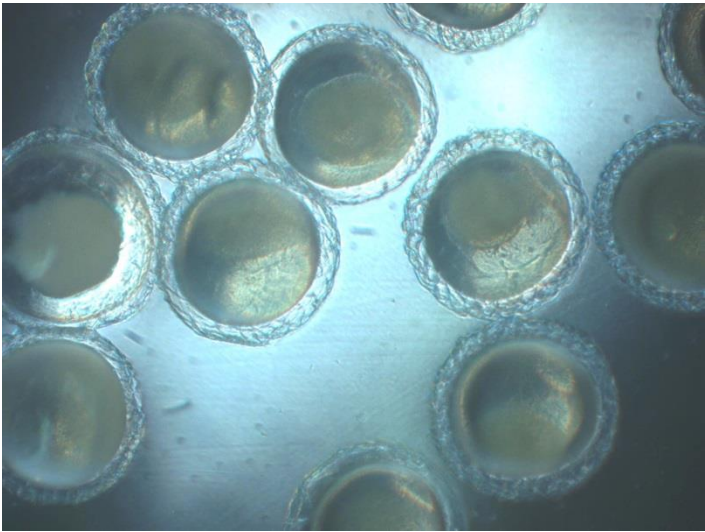


First attempts of stripping eggs and milt in 2012

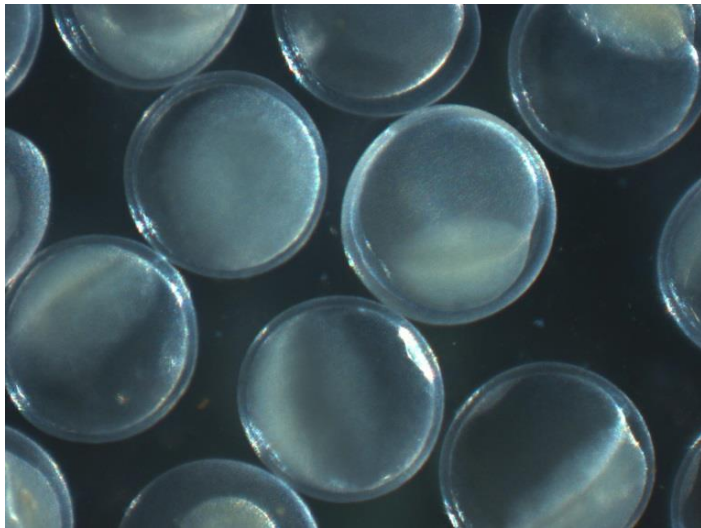
- Relatively simple to strip eggs and milt
- No regular spawning intervals observed – due to stress in wild caught fish?
- Small amounts of milt in most males



High fertilization rates:
Up to 99 %



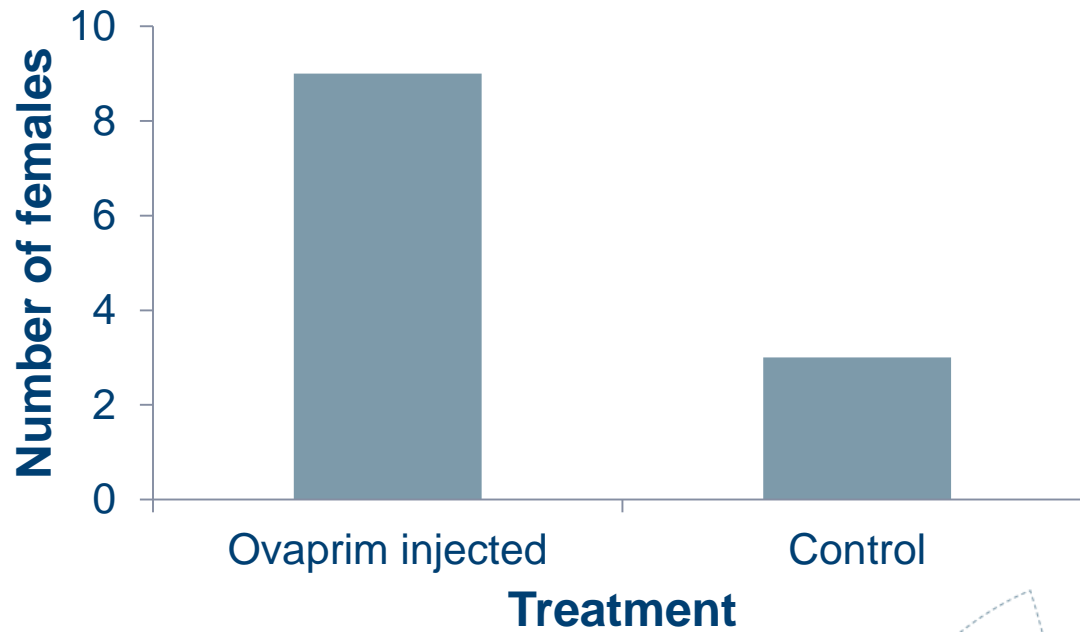
Control (eggs in egg fluid)



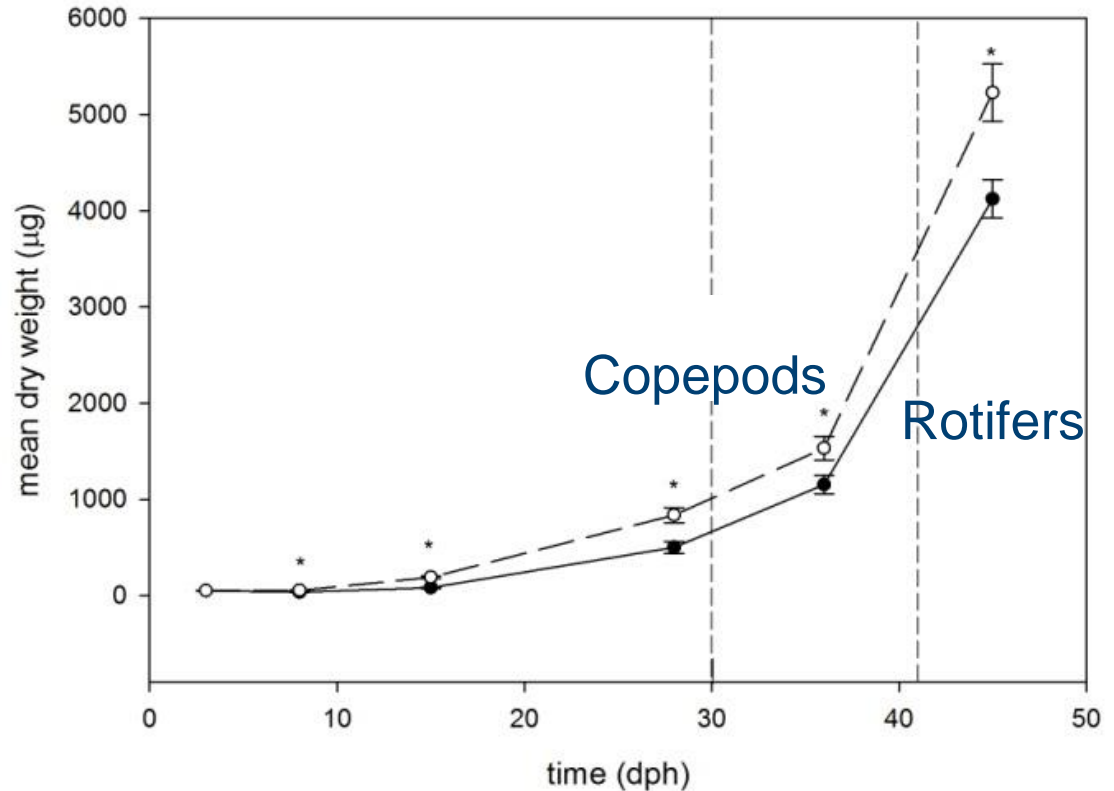
Replacement of egg fluid + enzyme treatment for 5 min



Hormone treatment (GnRH) and stripping - 2013



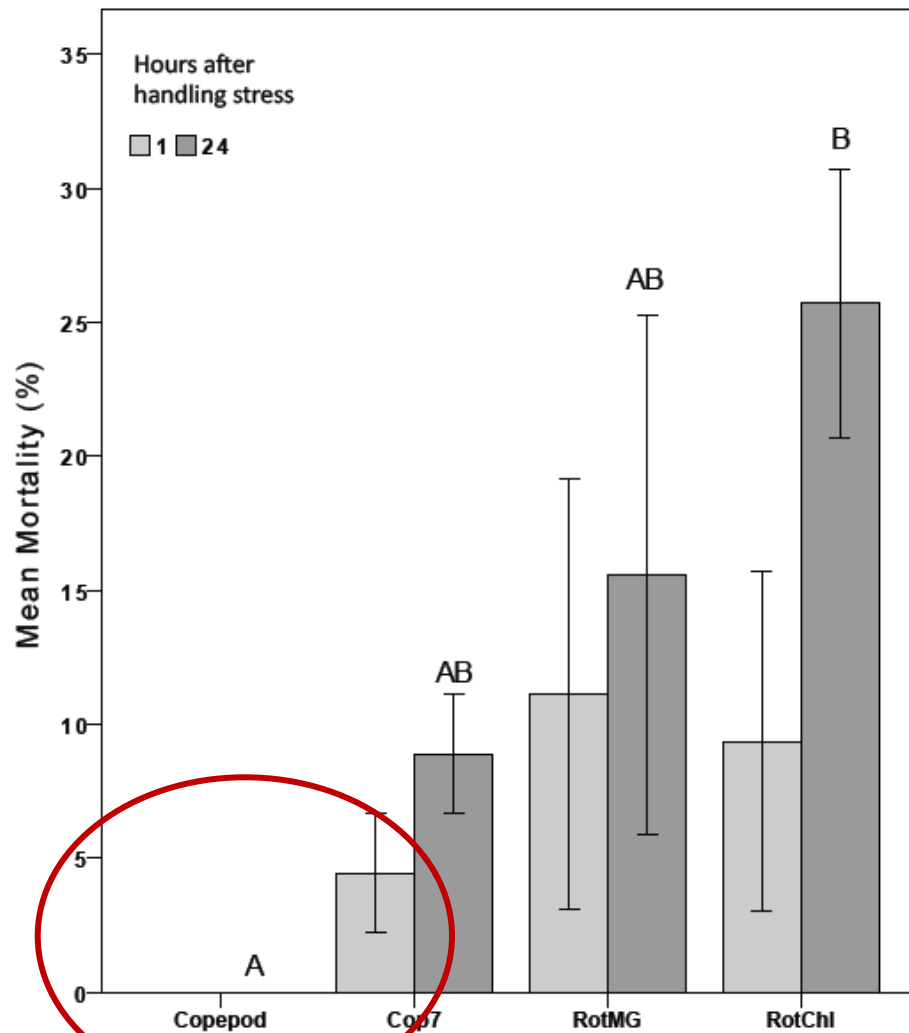
First feeding: relatively easy with enriched rotifers



Cultivated copepods improves growth until 45 days post hatch

Stavrakaki 2013 (MSc-thesis, NTNU)

Tolerance to handling stress (29 dph)



- 45 seconds netting/air exposure

Stavrakaki 2013 (MSc-thesis, NTNU)

Picky feeders!

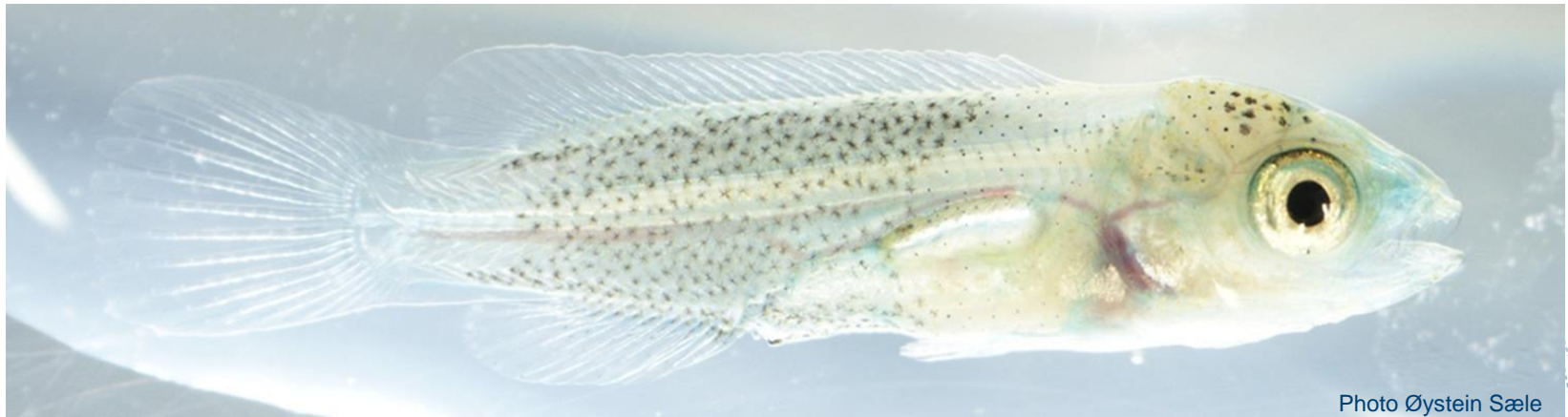


Photo Øystein Sæle

Protocols for weaning to dry feed and transfer on-growing feeds

Diet	Ingredients	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
1	Cod filet + shrimps	[Blue shaded cells]																																										
2	Cod filet, shrimps, sticky water	[Green shaded cells]																																										
3	Diet 2	[Green shaded cells]										[White cells]																																
	Otohime	[White cells]										[Orange shaded cells]																																
4	Diet 1	[Blue shaded cells]										[White cells]																																
	Otohime	[White cells]										[Orange shaded cells]																																

Head deformities and survival

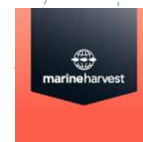
Deformed



Normal

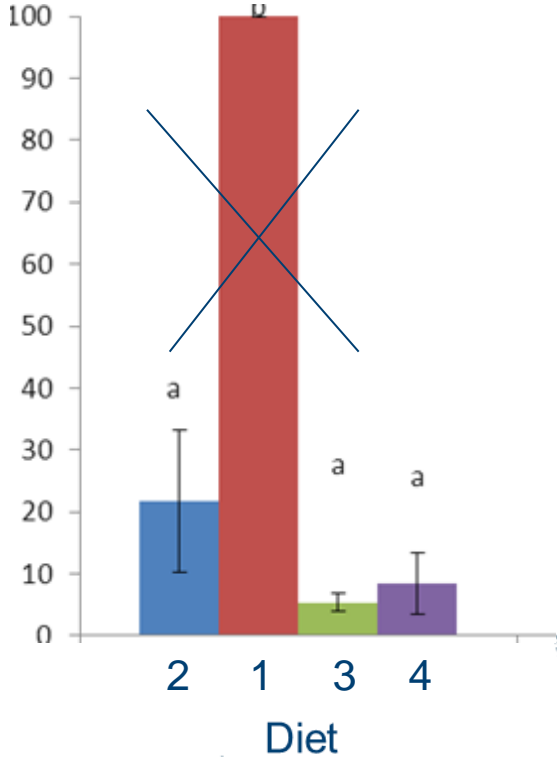
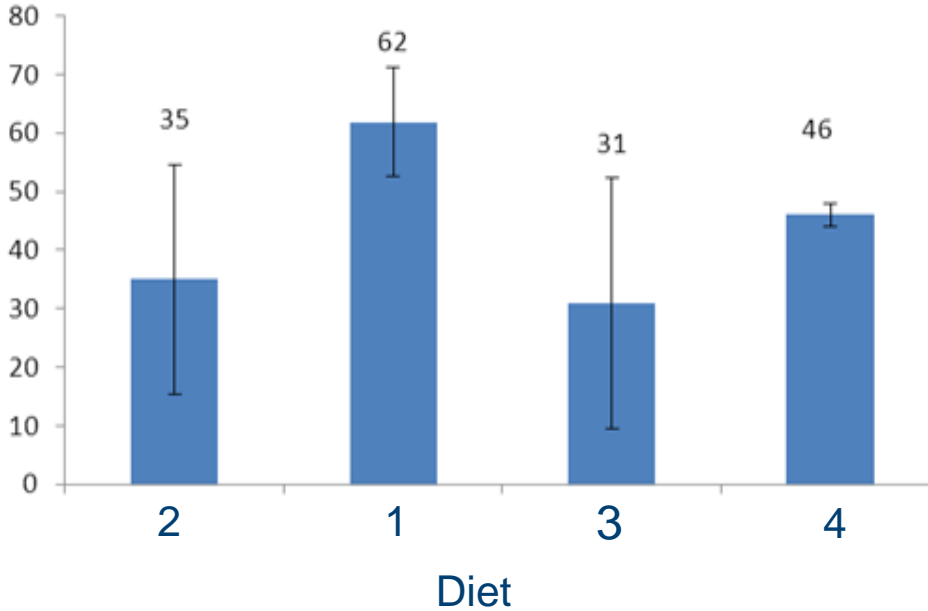


Katerina Kousoulaki et al. (unpublished)



Head deformities (%)

Survival (%)

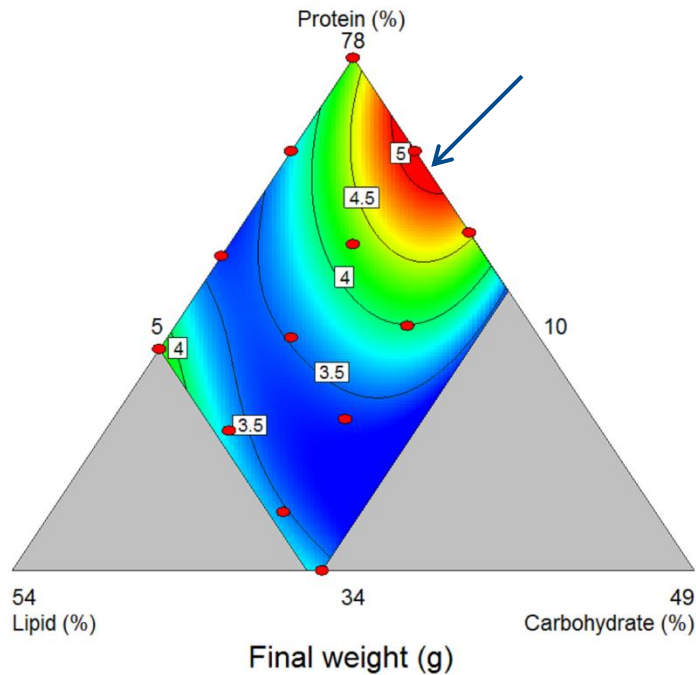


Further development:
Fish meal and krill or fish meal and shrimps

Katerina Kousoulaki et al. (unpublished)



Dietary macronutrient composition



Maximum growth at:

- 65% protein
- 12% lipids
- 16% carbohydrate

Hamre et al, 2013. A holistic approach to development of diets for ballan wrasse (*Labrus berggylta*) – a new species in aquaculture. Peer J. 1:e00, DOI10.7717/peerj.99



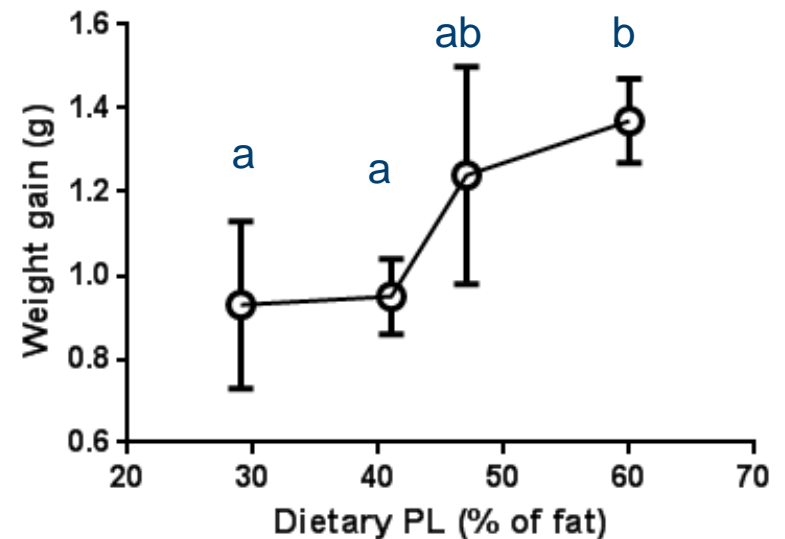
Effect of dietary phospholipids (PL) on juvenile growth

- 10% from the feed ingredients
- 6% added as a combination of soy oil and soy lecithine (PL)

Initial weight 1.0 g

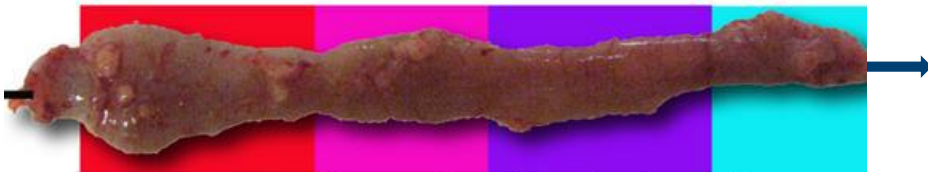
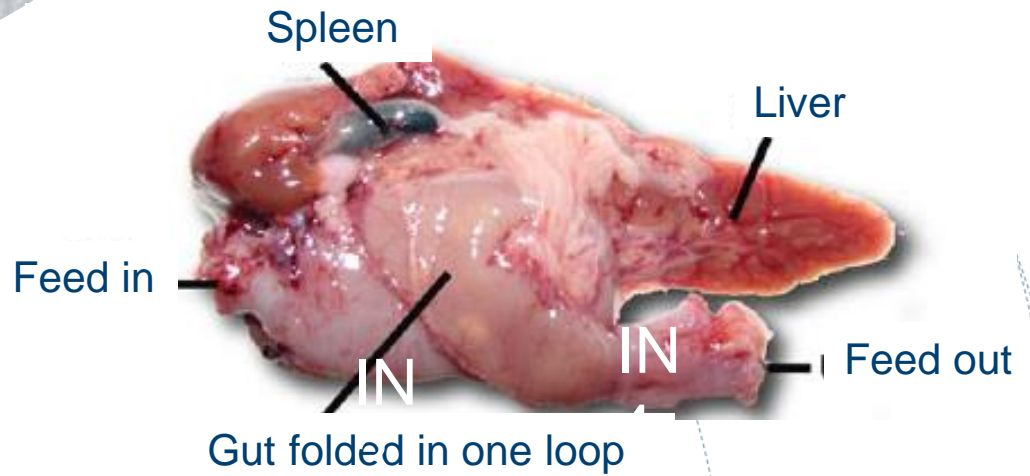
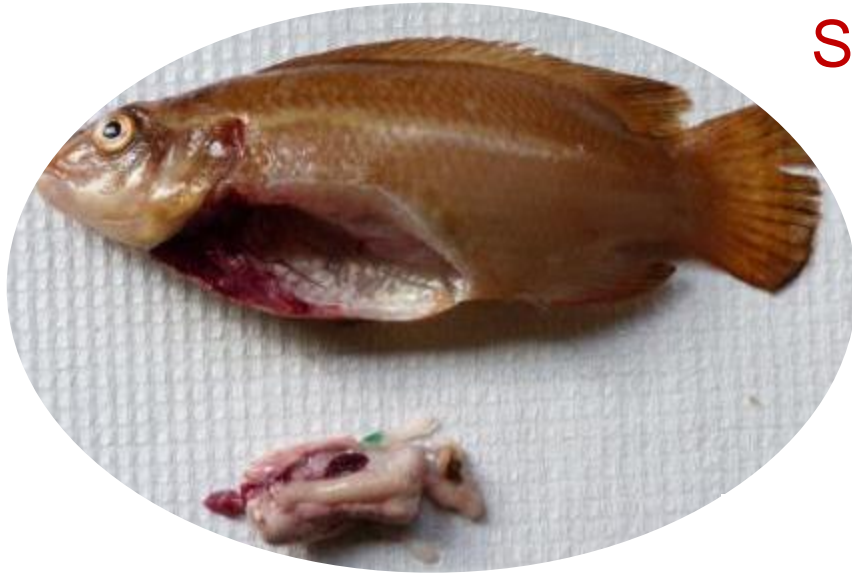
Duration: 2 months

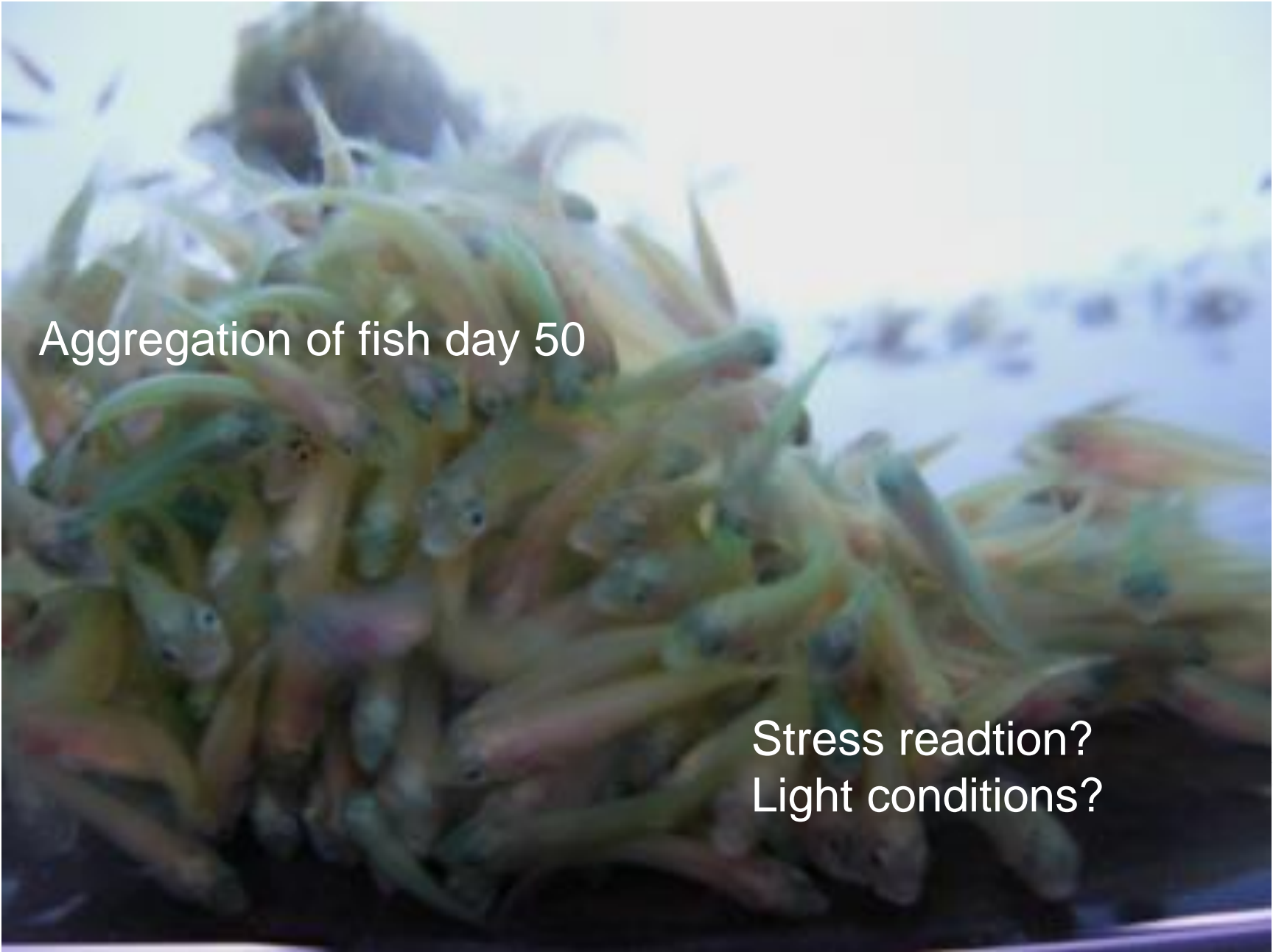
Diet	Added PL % of DM	Measured PL % of lipid
1	0	29
2	2	41
3	4	47
4	6	60



Hamre et al, 2013. A holistic approach to development of diets for ballan wrasse (*Labrus berggylta*) – a new species in aquaculture. Peer J. 1:e00, DOI10.7717/peerj.99

Stomachless fish





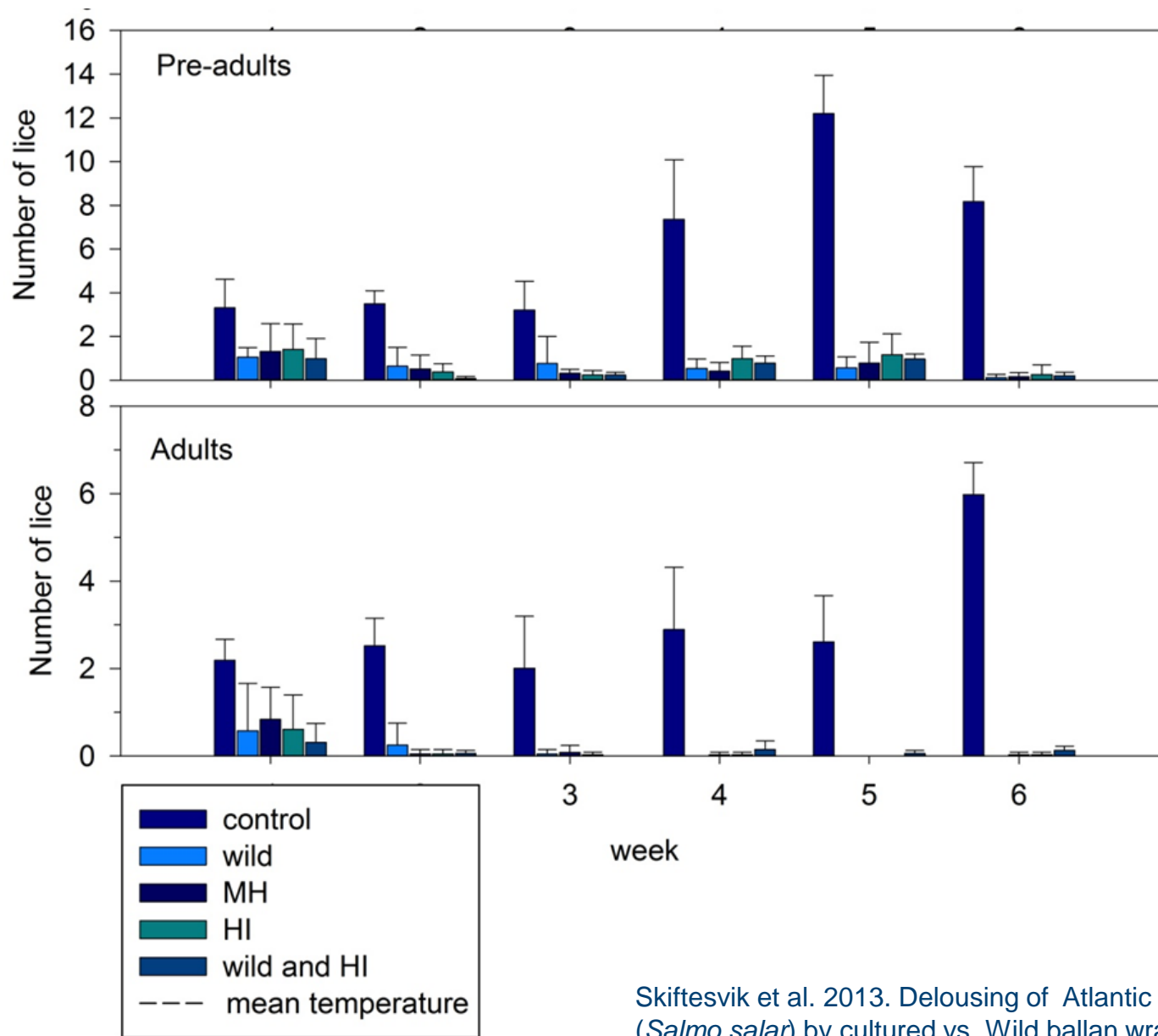
Aggregation of fish day 50

Stress reaction?
Light conditions?

Does farmed wrasse feed on salmon lice?

IMR:
Farmed wrasse
Wild wrasse
Mix farmed and wild

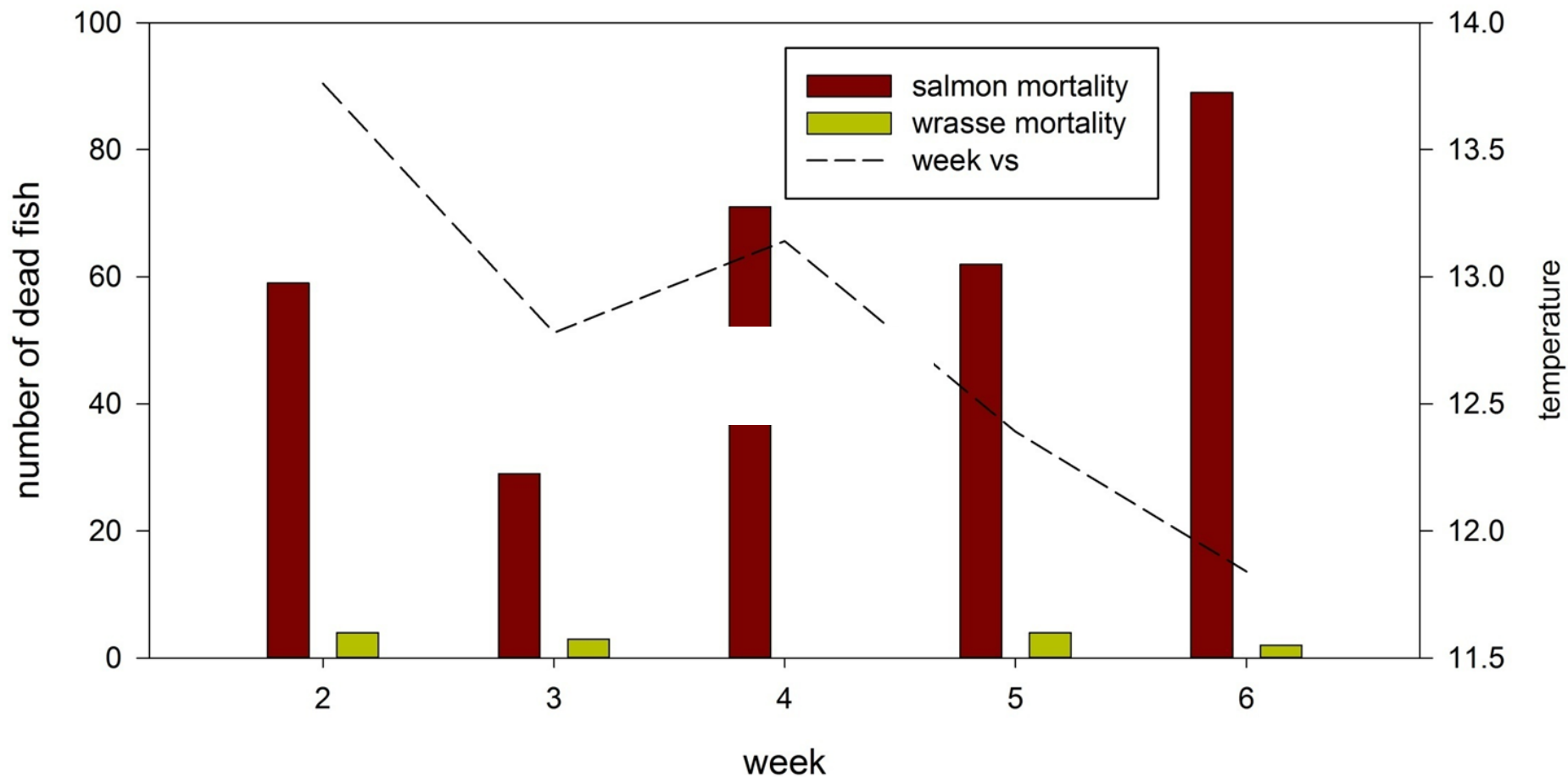




Skiftesvik et al. 2013. Delousing of Atlantic salmon (*Salmo salar*) by cultured vs. Wild ballan wrasse (*Labrus berggylta*). *Aquaculture* 402-403: 113-118.



Mortality



Skiftesvik et al. 2013. Delousing of Atlantic salmon (*Salmo salar*) by cultured vs. Wild ballan wrasse (*Labrus berggylta*). *Aquaculture* 402-403: 113-118.





Salmon lice

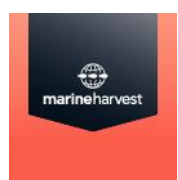
Ghost shrimp

Fish shell

Ballan wrasse are selective feeders

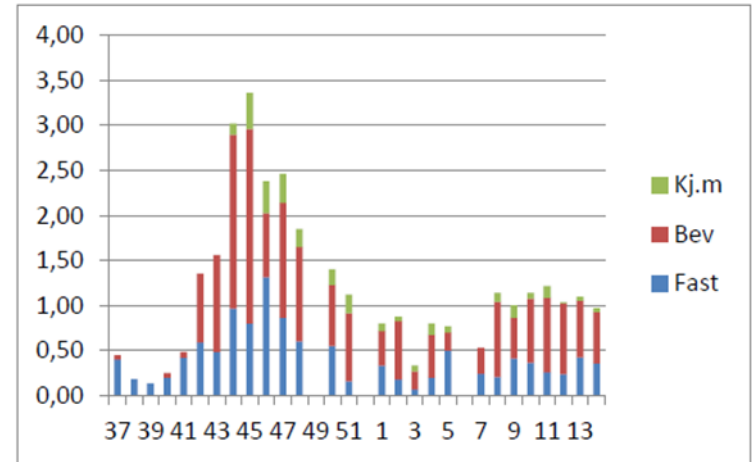


Commercial experiences (Marine Harvest Labrus)

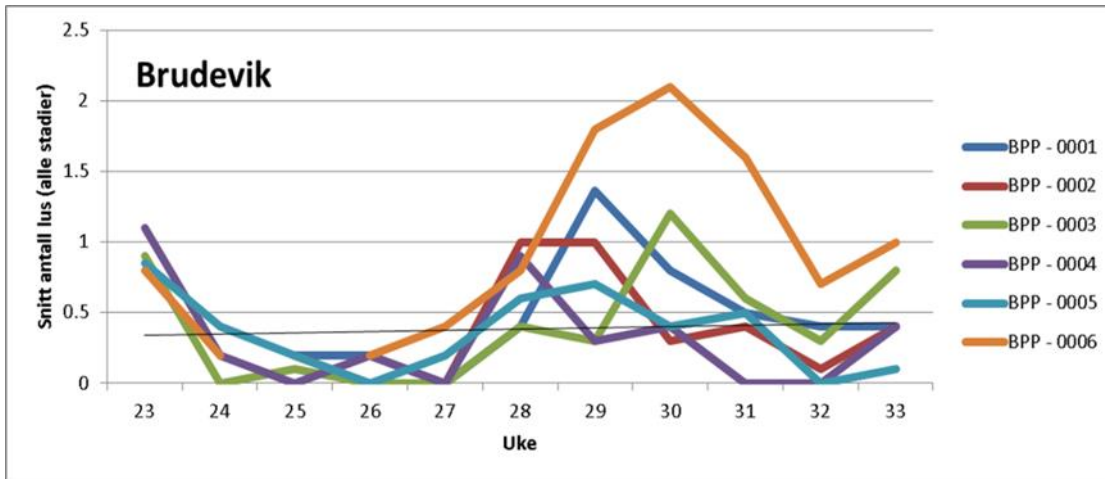


300 000 wrasse stocked with salmon in cages autumn 2012 (3 %)

Comparison wild and farmed wrasse



Ukentlige lusetellinger fra anlegget



Cage	Week delivered
1,3,6	30
2,4,5,	24

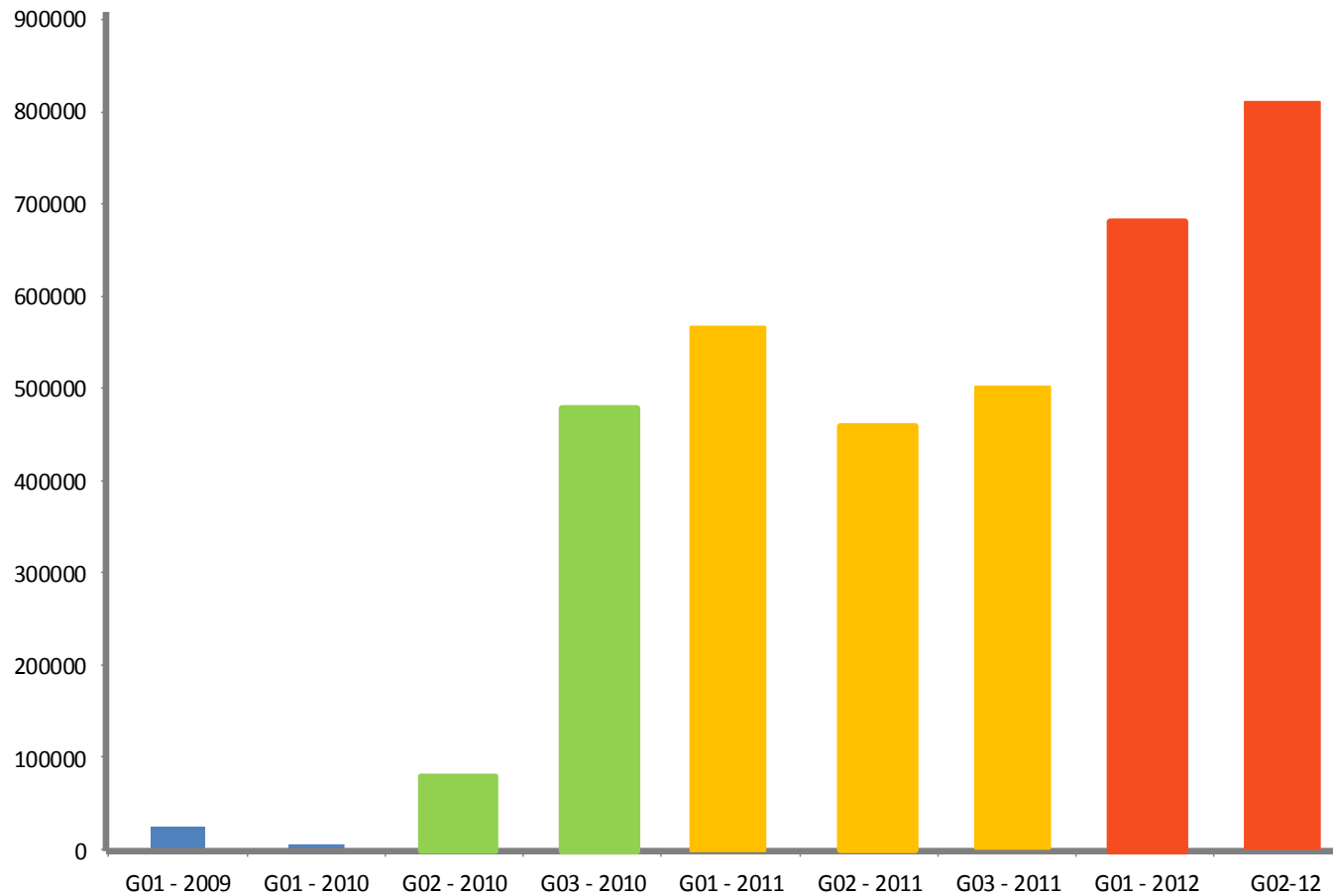
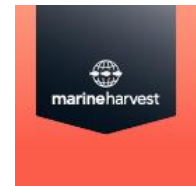
Olav Breck, Marine Harvest

The answer is:

- Yes, farmed wrasse do feed on salmon lice
- Farmed wrasse are as efficient as wild wrasse
- Early introduction of wrasse in salmon cages preferable
- Use of wrasse can replace several chemical treatments



Increase in juvenile production MH 2009-2012



Espen Grøtan, Marine Harvest

Needs for more knowledge/development:

- Protocols in general
- Egg and larval production including stripping of eggs/milt
- Optimization of feeds for all live stages
- Improvement of tank environment
 - light
 - water speed
 - water quality
 - Shelters
- Development of vaccines

Needs for more knowledge/development (continued):

- Causes of losses of wrasse in salmon cages
- Wrasse welfare in salmon cages (shelters, feeding)
- Disease control/wrasse as pathogen vector
- Development of vaccines
- Test lumpsucker in salmon cages – northern regions

Success factors in the Leppeprod project:


All involved partners (scientific and industrial) have long experience from production of marine fish

Very good multi-dicipline cooperation within the project

Development of production methods for a new species always needs time.....



Photo: Nofima



Thank you
for your
attention!

