

Sterling™



How to achieve predictable and stable juvenile production in
marine fish- an industrial approach **DIVERSIFY 2018**

Børre Erstad



- Egg access
 - Enough broodstock and egg/
milt production
- Optimum conditions for broodstock
 - Light regime
 - Feed
 - Enough water/top quality
- Stripping routines
 - «Personal» relation to the individuals
 - Stripping statistic on every individual through many years





- Biologically monitoring - crucial in a hatchery!
 - Livefeed production
 - Larvae production
- Monitoring = control in production!
 - Finding biological errors in the production
 - Correction (Action!)
 - Protocol improvement

Livefeed production– *Artemia*- clean, stuffed and cold



Bacterial decontamination of on-grown *Artemia*

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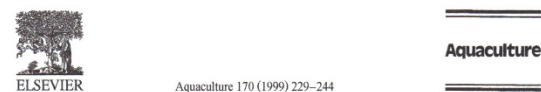
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- Cleaning of newly enriched *Artemia* is essential in relation to microflora
- Dirty *Artemia* gives trouble in startfeeding!
- Cleaning on the outside and the inside
 - flushing
 - Chemicals
 - (Pyceze, formalin, INVE products etc)
 - Fresh water
 - Boosting of *Artemia*
- Microscopy of crushed *Artemia*
- Plating if necessary
- Cold storage!



Partial decontamination of rotifers with ultraviolet radiation: the effect of changes in the bacterial load and flora of rotifers on mortalities in start-feeding larval turbot

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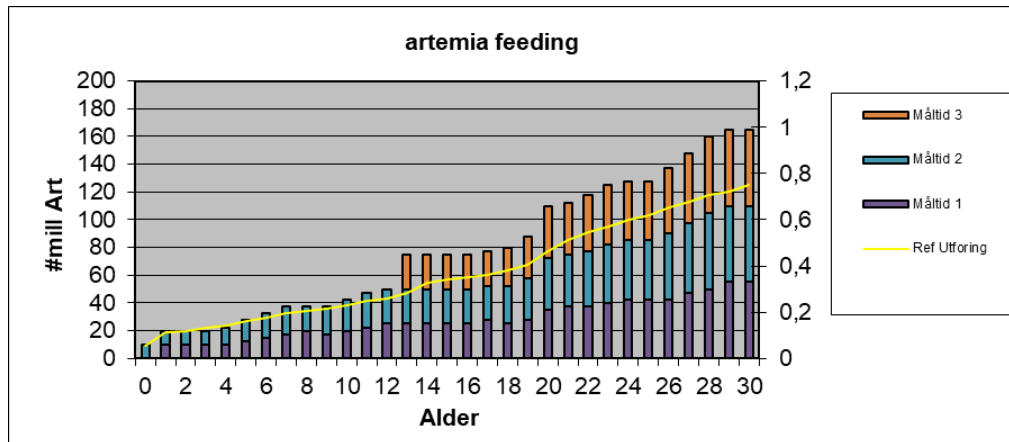
^c Golden Sea Produce, South Shian, near Connel, Argyll PA37 1SB, Scotland, UK

Accepted 14 October 1998

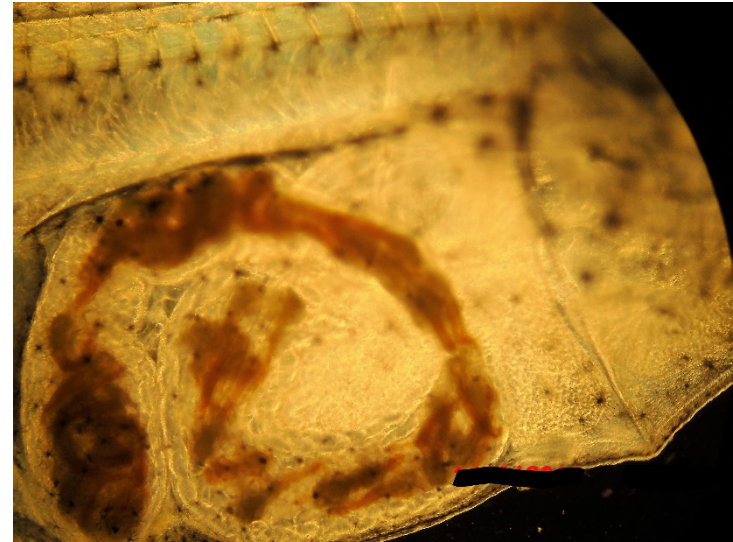
Larva biology/startfeeding

- Monitoring and controlling- on a every day basis is important to find the production errors you may have
- Sampling of larvae on a specific time after feeding
 - Feed uptake (prey count in gut)
 - Register the degree of digestion
 - Feeding incidence: Full/half full/empty gut?
 - Bacteriology (inside the gut? outside? Rod/round shaped?)
 - Organ development
 - Length devlopment
 - Larva behavior-
 - «what does the fish tell you?»
- Prey residual values in water column

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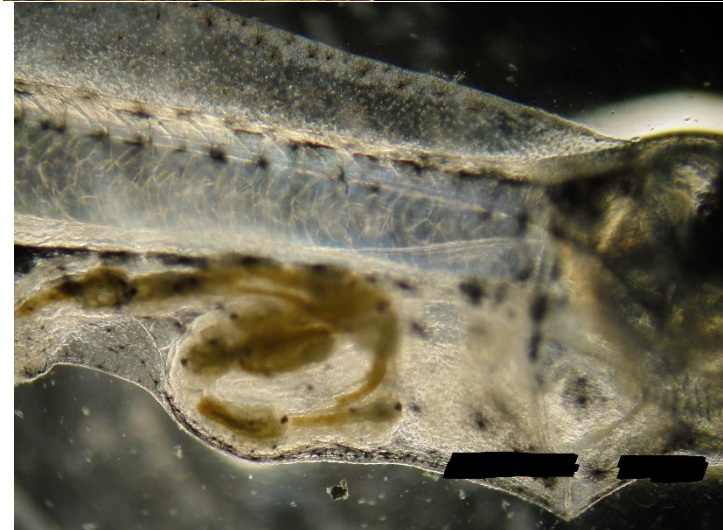


Healthy larva, good digestion,
Liver, gut, etc looks fine



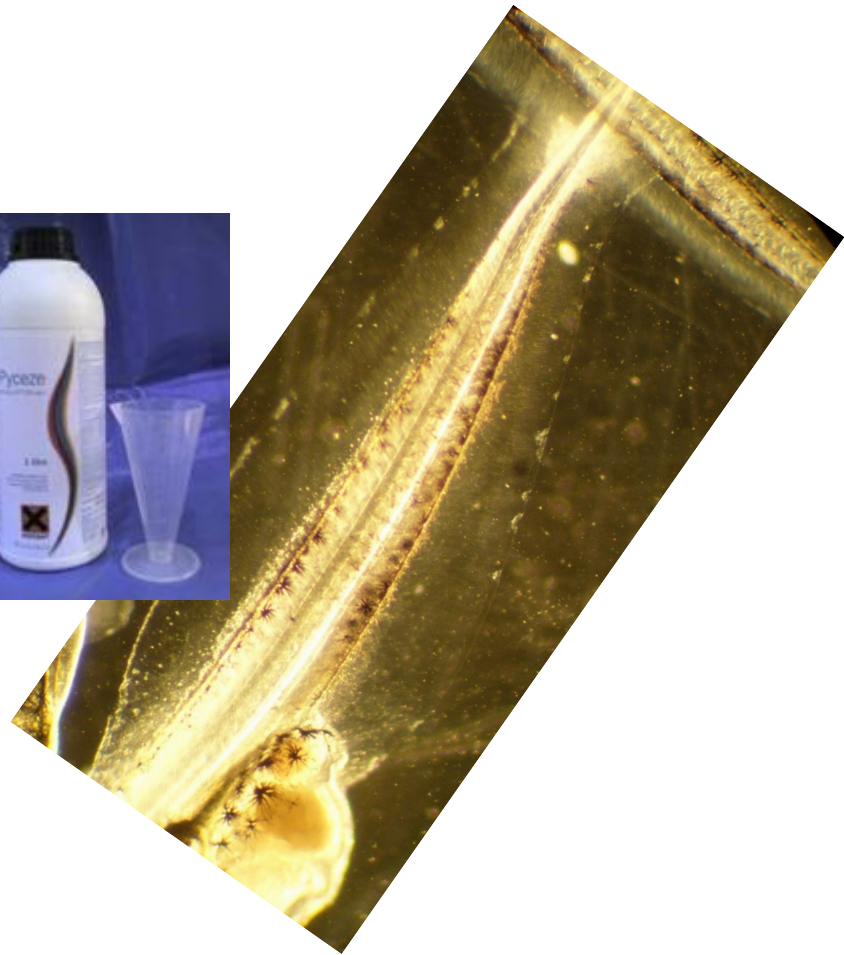
«skinny» dying larvae.

Feeding regime error!

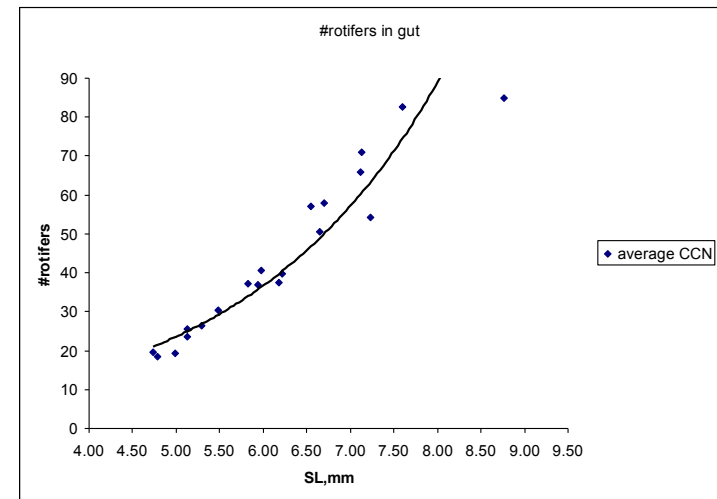


Bacterialayer on larva

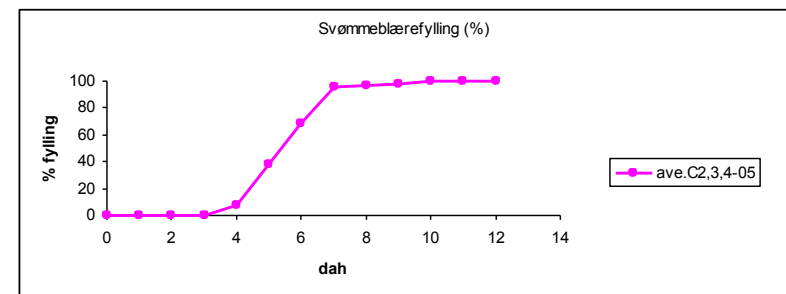
Nice and clean! 😊



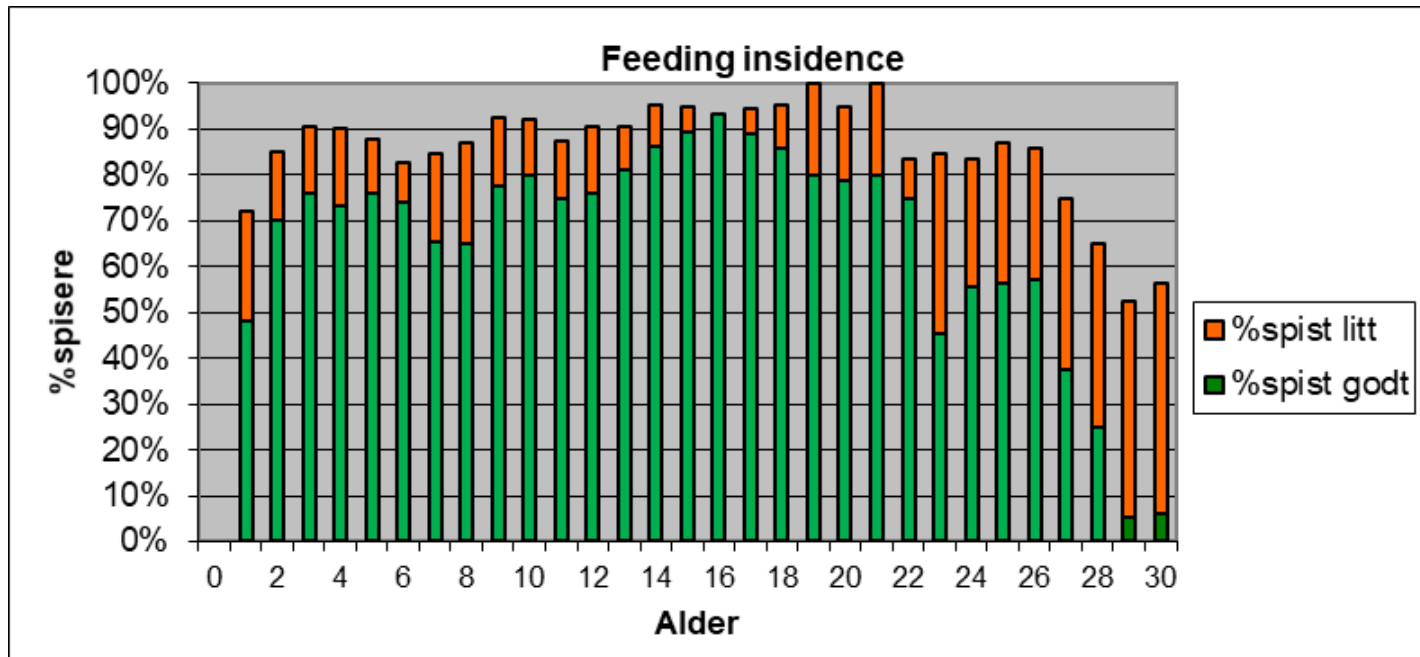
- Expected feedintake, cod
 - Predictibel
 - Deviation from curve is a good indication that someting is going wrong in the production!
- Same trend on *Artemia* intake on halibut



- Swimbladder filling on cod larvae



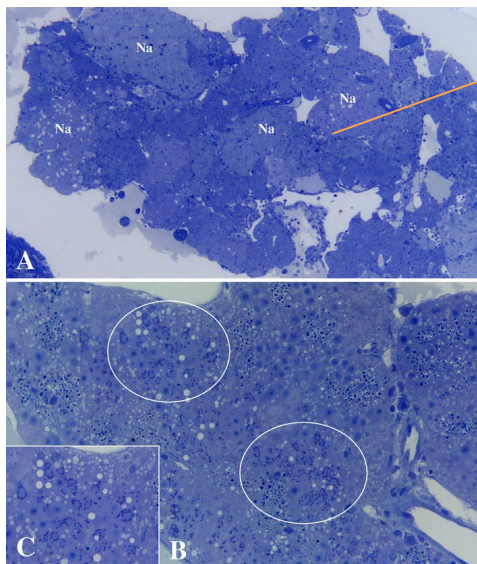
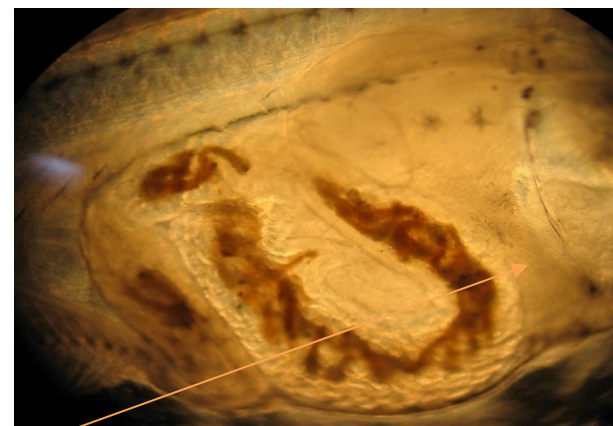
Impossible startfeeding!



You might have a virus problem!



Danger!: Liver necrosis

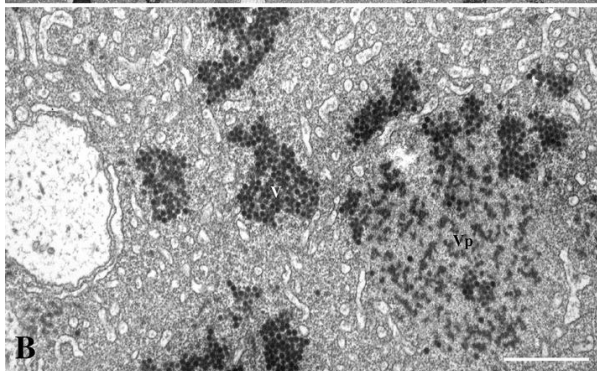
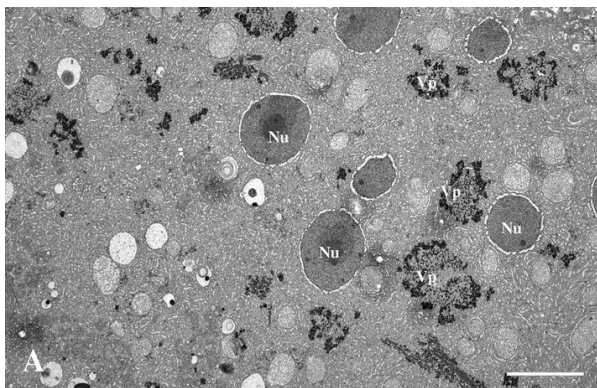


A. Multifocal necrosis (Na) in the liver of Atlantic halibut fry. **B.** Areas in pancreas tissue with formation of syncytia containing viroplasm (circles). **C.** Large subcellular inclusion, viroplasm (arrows), present in the pancreatic tissues

Blindheim et al., 2014

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4284399/>

Atlantic Halibut Reo Virus (AHRV)



A. Viroplasm (Vp) within a syncytial area in the liver. Cell nucleus (Nu). Bar = 5.0 μm . **B.** The viroplasm (Vp) consists of amorphous material with variable electron density and contains virions (V). Bar = 1.0 μm

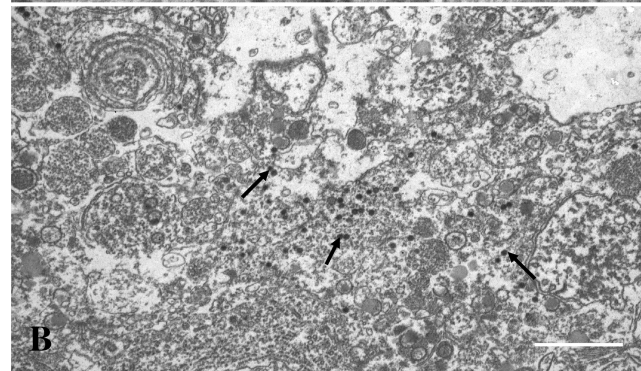
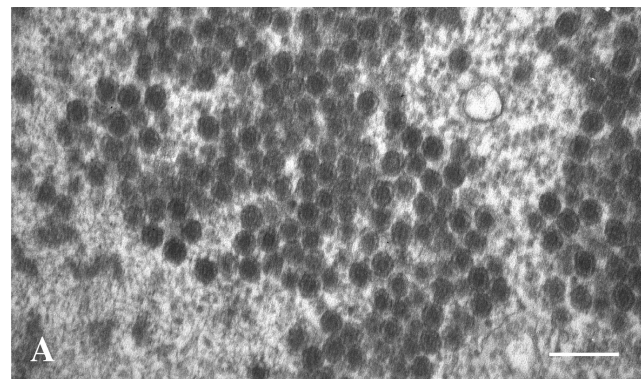


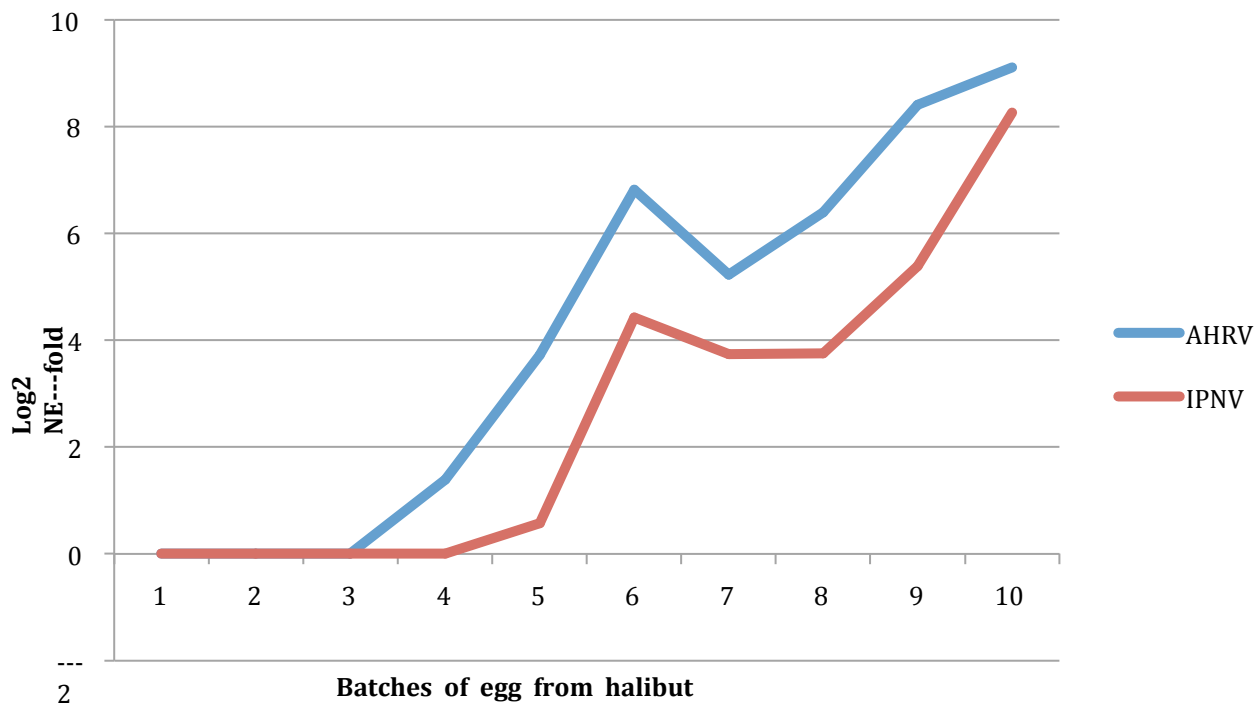
Fig. 4 A. Mature virions of approximately 70 nm in diameter. Some of the virions show a hexagonal shape (icosahedral particles). Bar = 200 nm. **B.** Section from a necrotic part of the liver showing cell debris and virions (arrows). Bar = 1.0 μm

Blindheim et al., 2014

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4284399/>

- Challenging with virus
- Marine fish species in aquaculture has at least 3 common virus types
 - IPNV
 - Reovirus
 - VNNV (NODA)
- Broodstock is the source
- Screening of eggs, larvae and broodstock is essential

Detected viral product ovary luid



Hatchery Health

- Never mix different generation in startfeeding! (even though it tempting!)
- Biology flow must go in one direction
- Sluice between the different production areas
- Limited access to production facilities
- Different production facilities: different equipment and clothes
- Disassembly, washing, disinfection and dry out between all cycles

Summary:

- Monitor your animals! And you will pick up anomalies in your production
- Love, passion and caring
- Screen your broodstock for potential pathogens

Thank you for your attention!

