PATOGEN®
WE INSPIRE ACTIONS
FOR HEALTHIER FISH

# SmoltTimer

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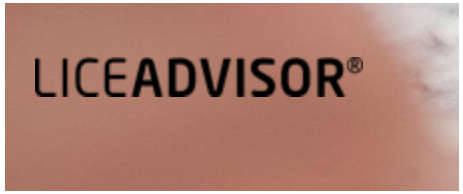
## PatoGen AS - 17 years of innovation for improving fish health

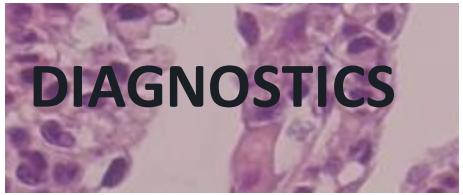
- Established in 2005
- Office and laboratory in Ålesund, Bodø and Oban (2021)
  - Office in Oslo and Scotland
  - Around 60 employes
- PCR-based business: Decision based for better fish health
- Sequencing technology
- Histology (2019) and Bacteriology (2021)

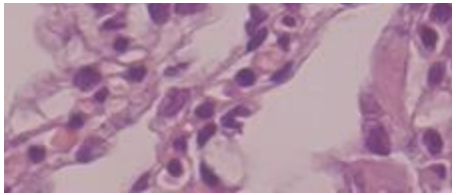
# Fürst Medical Laboratory

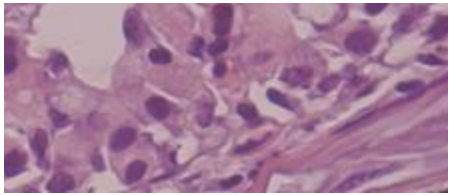
FÜRST | MEDISINSK LABORATORIUM

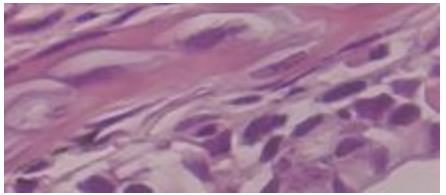
- Norway's largest private laboratory in the field of medical biochemistry, clinical pharmacology, microbiology and pathology.
- Norwegian owned company with main laboratory at Furuset in Oslo
- Efficient national logistics system









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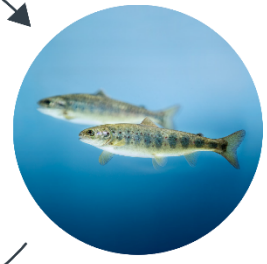
- Harvesting/Fertilization
- Incubation (Screening)
- Shocking
- Sorting
- Packing

EGG

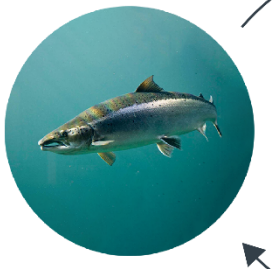


HATCHERY

- Incubation
- Hatching
- Yolk sack fry
- Start feeding
- On-growth
- Smolt

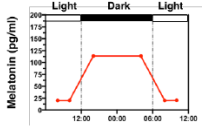
SEA-SITE

SLAUGHTER

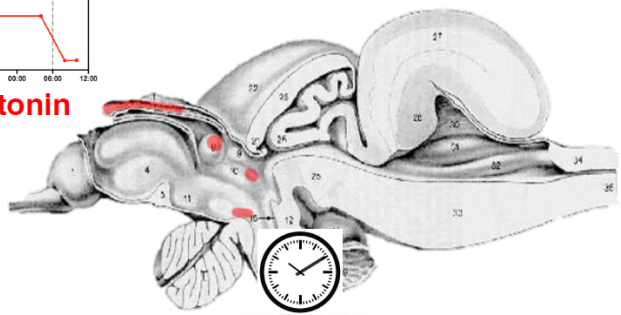


BROODFISH

# Seasonal timing - Changes in endocrinology




Melatonin



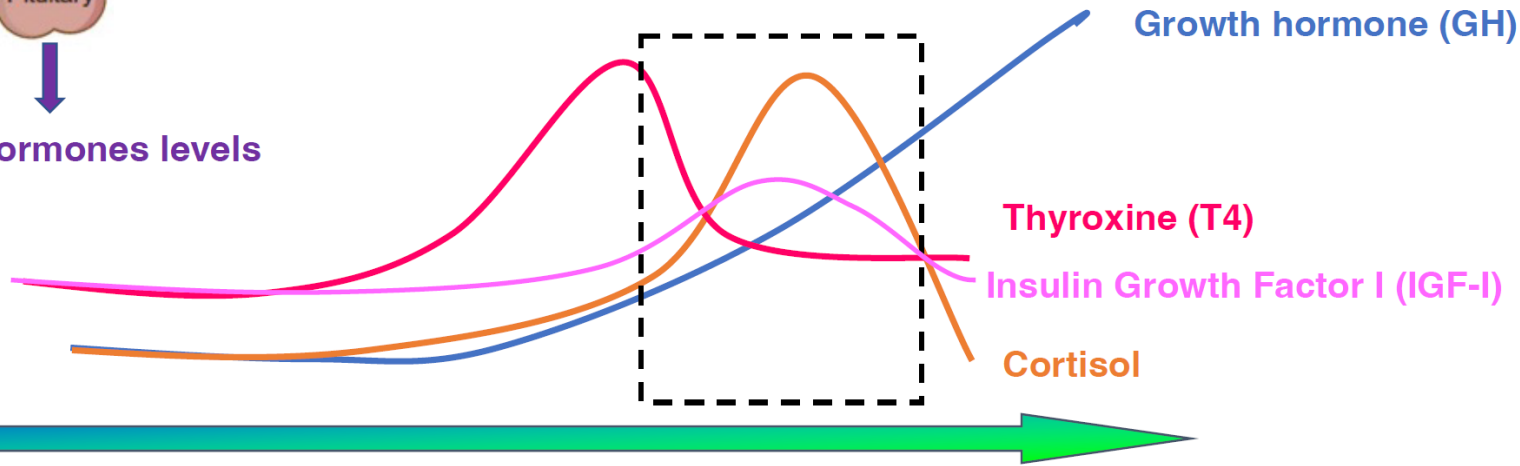
Changes in day length main zeitgeber

Temperature more determine the rate of development

'Smolt window'

Pituitary

Plasma hormones levels




Source: UiB

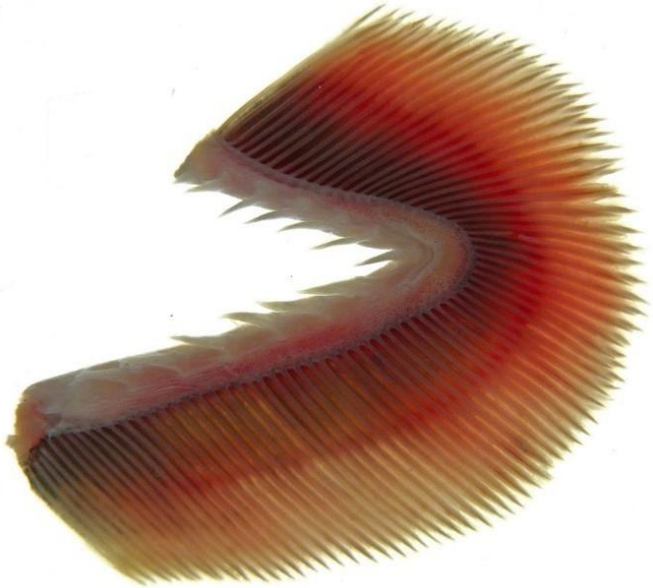


*Foto: T. Poppe*



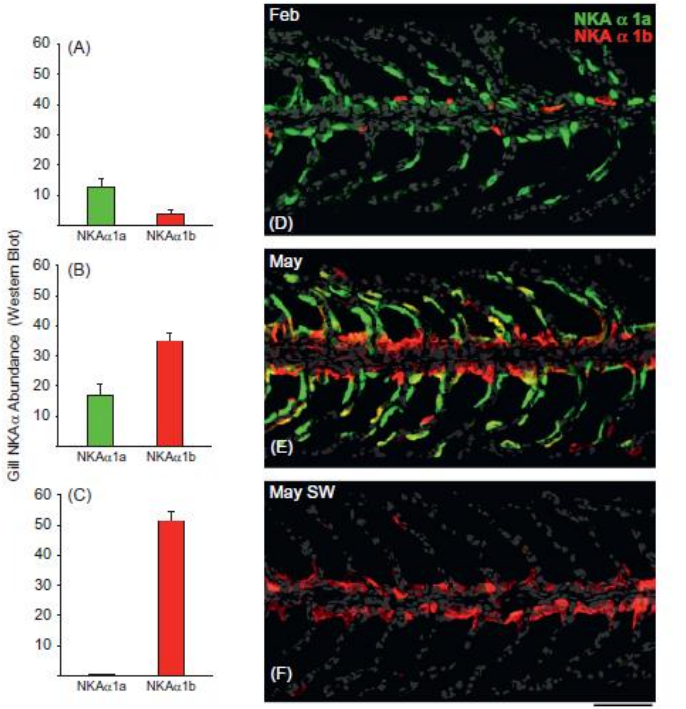
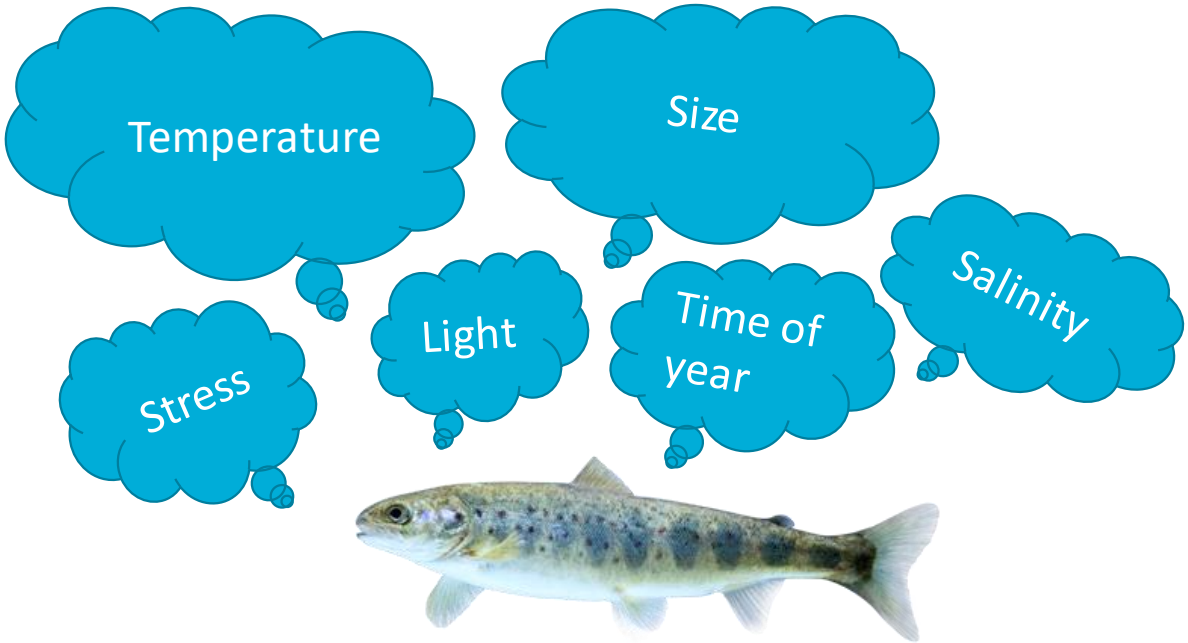


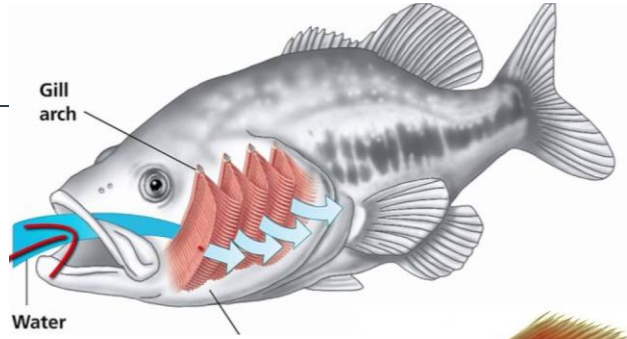

**Fig. 5.3.** Changes in branchial protein abundance (A–C) and immunolocalization (D–F) of NKAα1a (green) and NKAα1b (red) during smolt development and seawater (SW) exposure of Atlantic salmon (McCormick et al., 2013a). Fish were sampled in freshwater (FW) in February (A,D), FW at the peak of smolting in May (B,E), and after 2 weeks in SW in mid-May (C,F). NKA: $Na^+/K^+$-ATPase.

# What affects smoltification?



# Anatomy and physiology

- Gas exchange happens over the gill lamellae

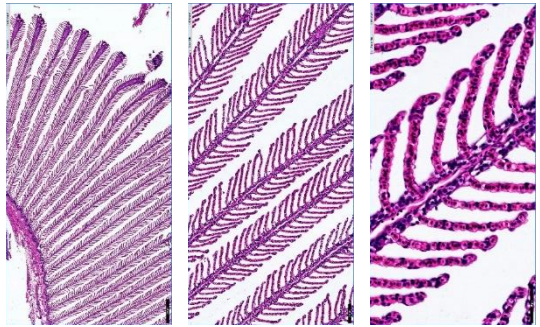


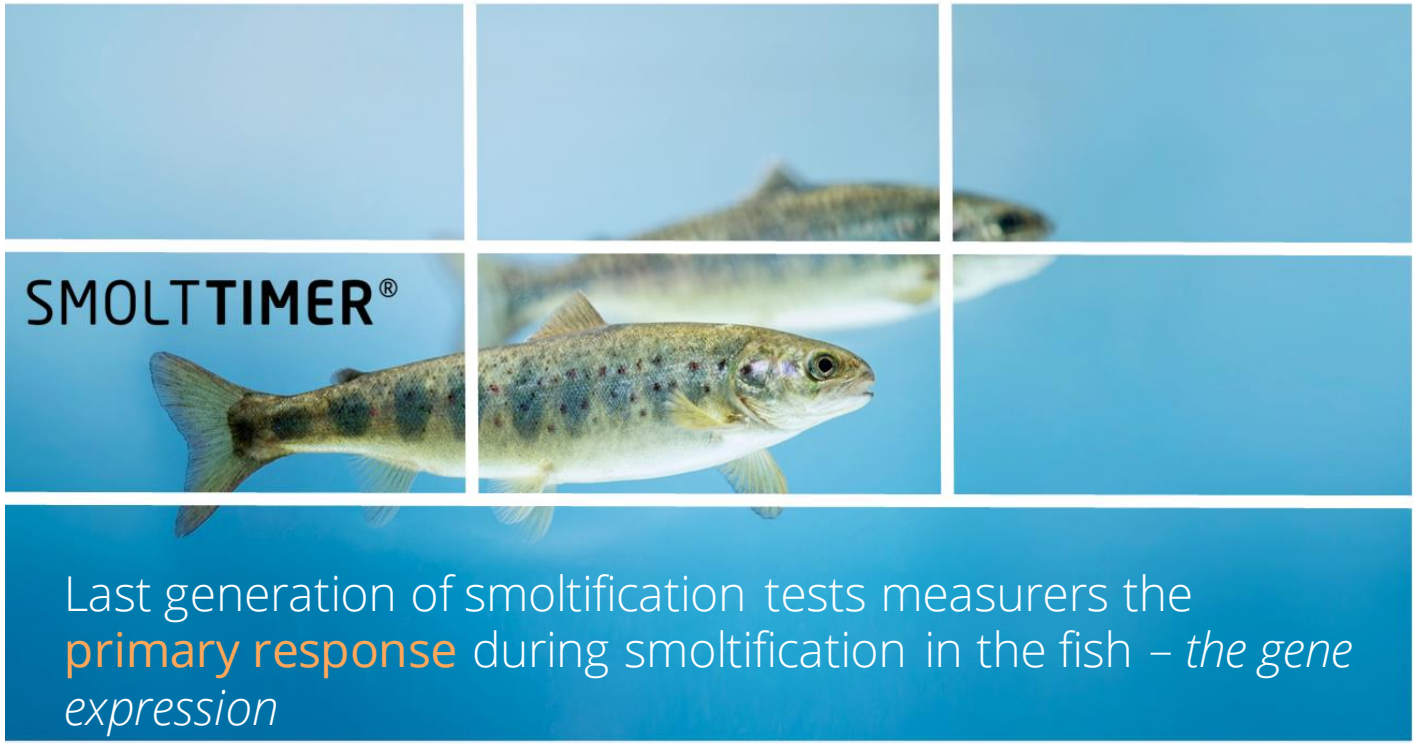

<u>Important functions that happens in the gill tissue:</u>

- Respiration – Uptake of $O_2$, excretion of $CO_2$
- Nitrogen excretion – Mainly ammonium
- pH regulation
- Osmo- and ion regulation
- Hormone metabolism
- Immune tissue

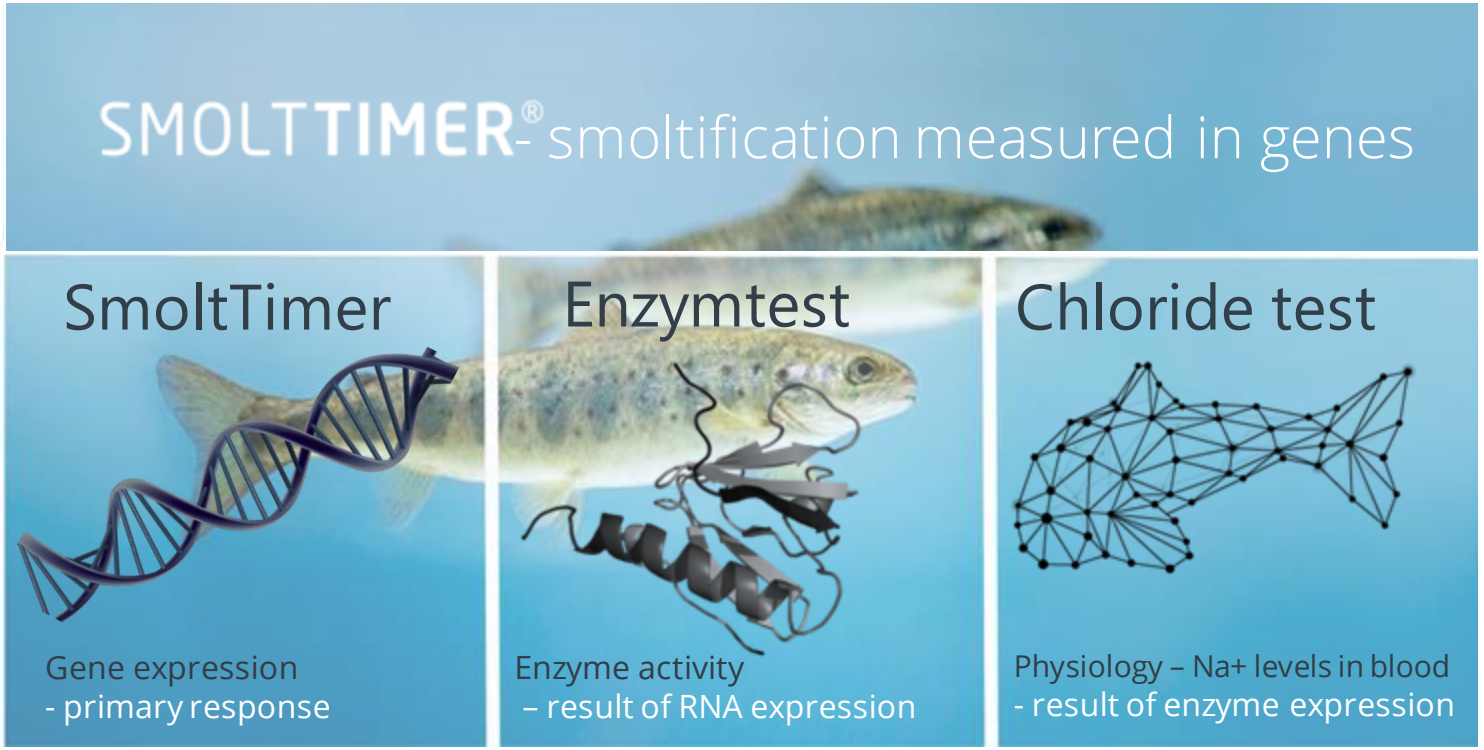
Multifunctional organ

*Foto: T. Poppe*






Decision based for appropriate measures at the right time

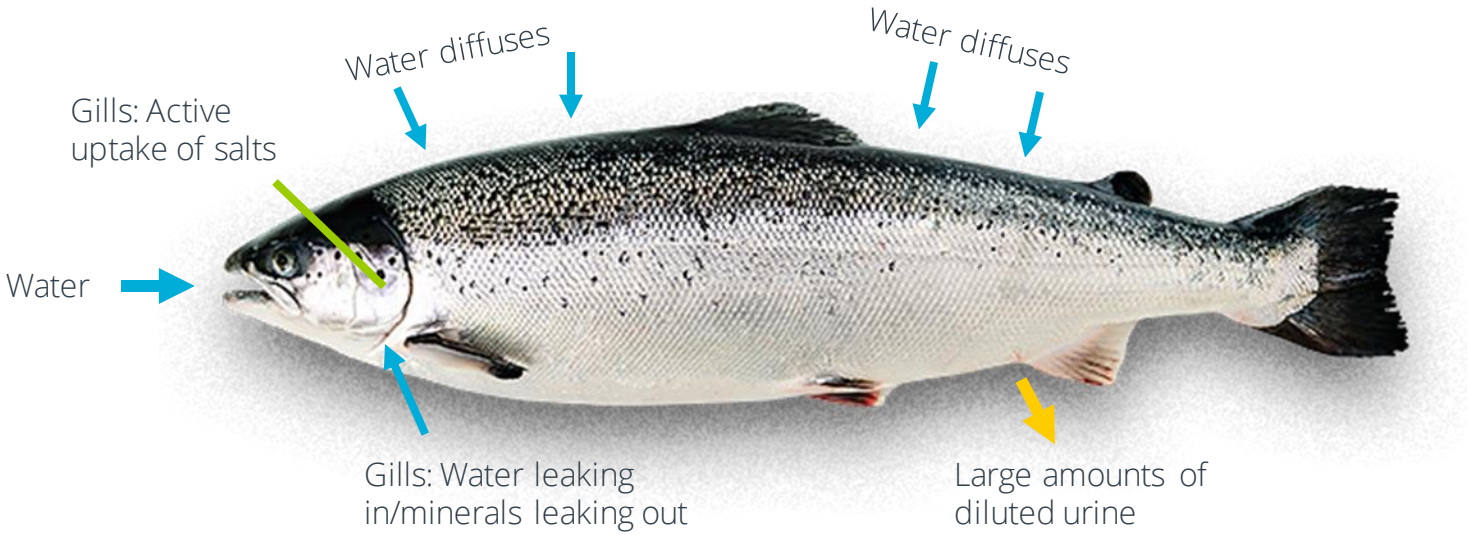



All these test are supported by observations

# SmoltTimer-analysis and algorithm

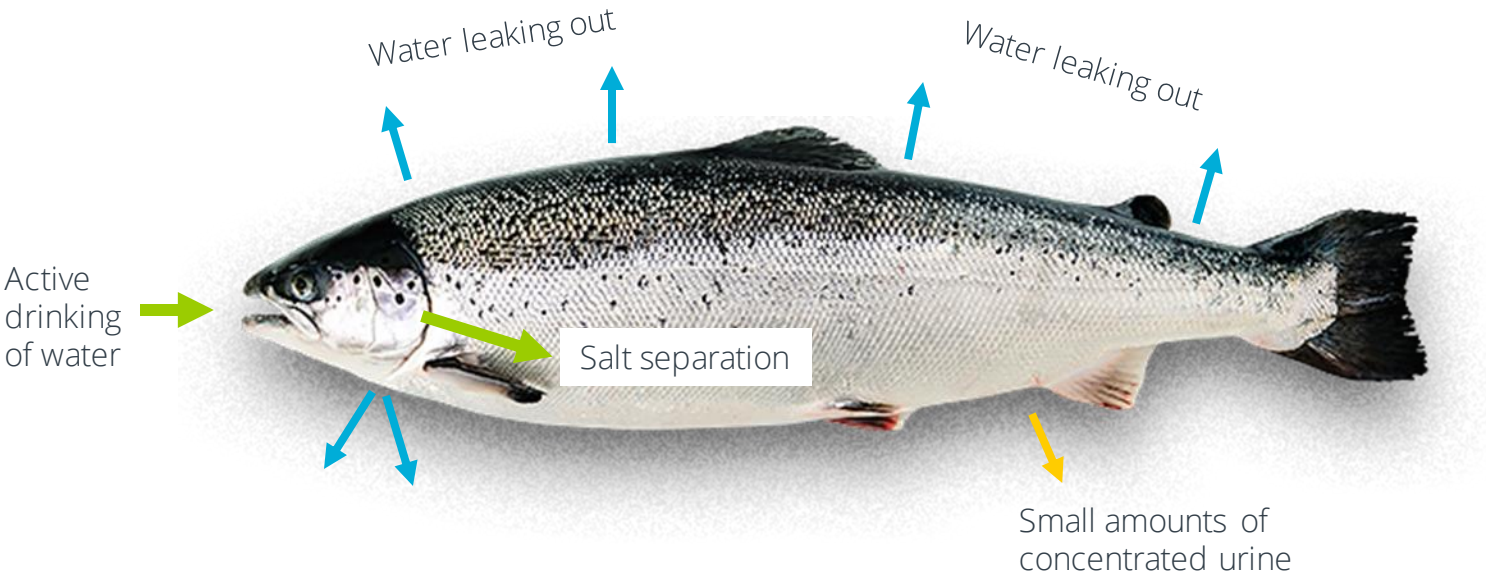
- Based on RT PCR technology – expression of the gene alpha1a (freshwaterATPasen)
- Possibility for direct comparison of fish groups and sites
- Forecast that shows expected development – based on analysis results, fish group and environmental parameters
- Simplified sampling and shipment with quick response time

# Salmon in freshwater




**A high SmoltTimer-value tells us that the fish effectively takes up salts from freshwater which increases the fish's ability to maintain the correct osmotic pressure in freshwater.**

# Salmon at sea

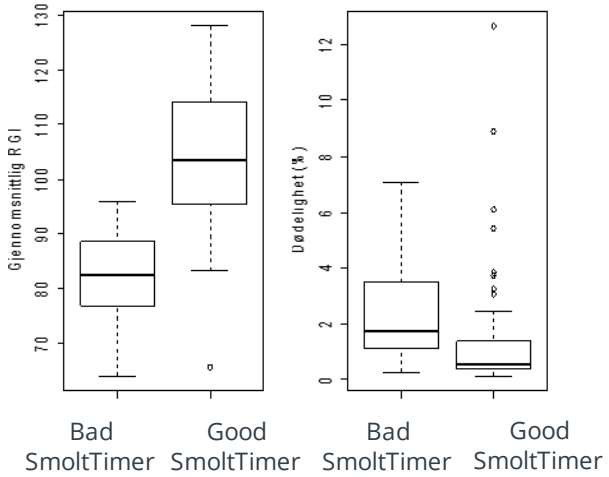



**A lower SmotTimer-value tells us that the fish effectively separates salts over the gills. Optimal SmoltTimer-Value prior to sea transfer is an average of 1.**

# Industry does not have a smoltification problem

«Statistical analyses shows that smoltgroups transferred with good SmoltTimer-values have a signific better growth and lower mortality the first 60 days at sea, than smolt groups transferred with suboptimal SmoltTimer-values.»

Peder Jansen
Professor
SLRC

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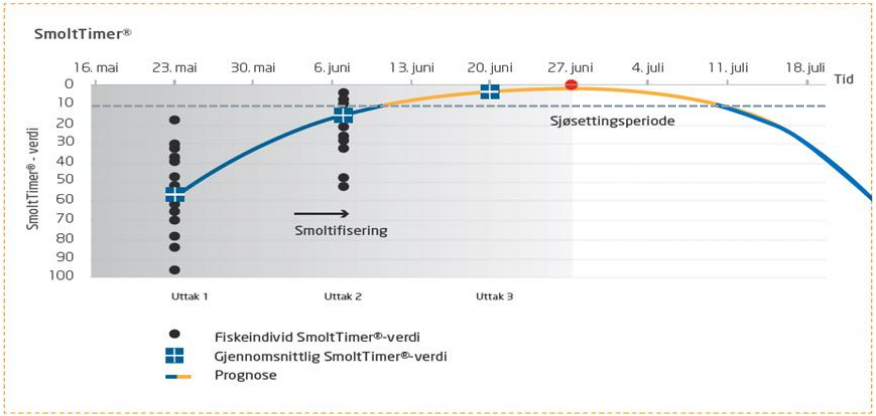
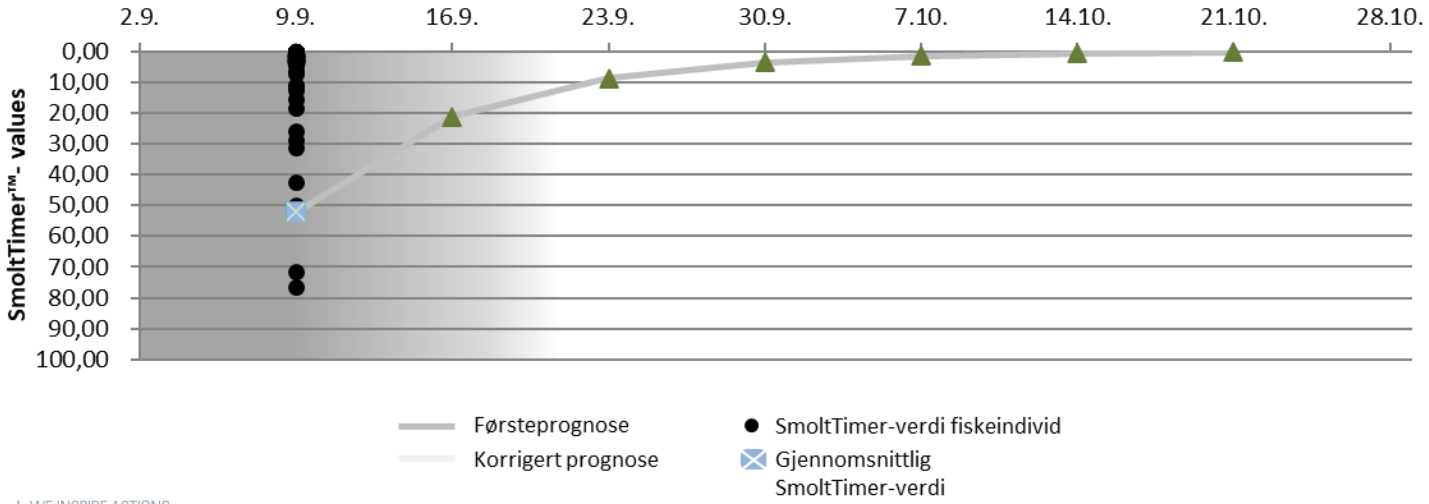
# SmoltTimer® - Report explanation



# SmoltTimer® - Expectation curve

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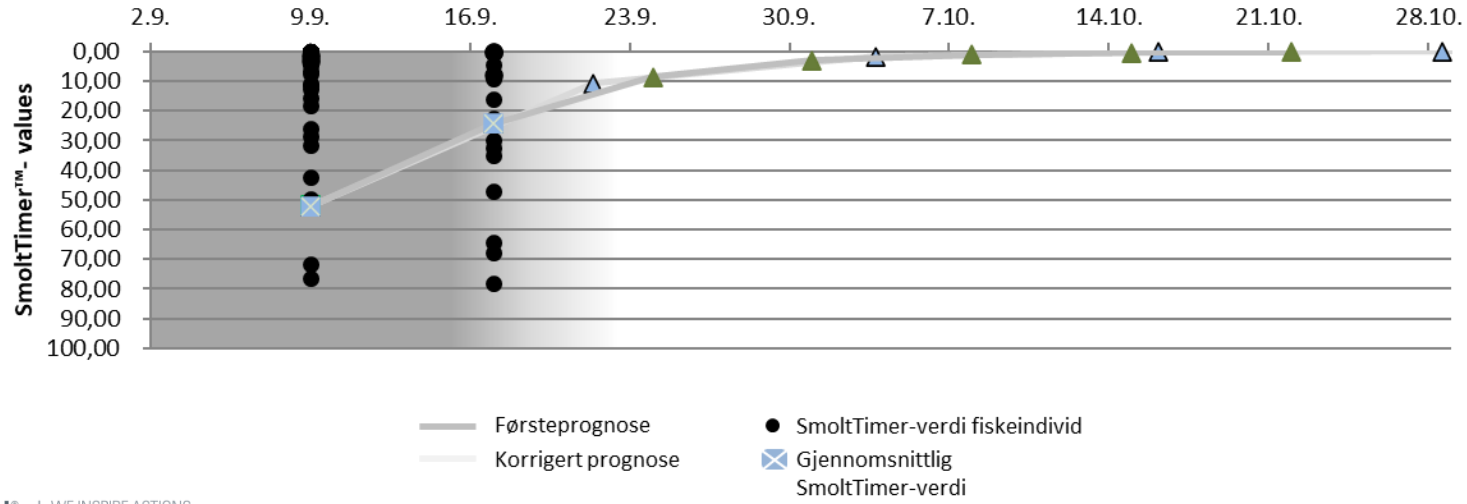
# SmoltTimer® - Expectation curve

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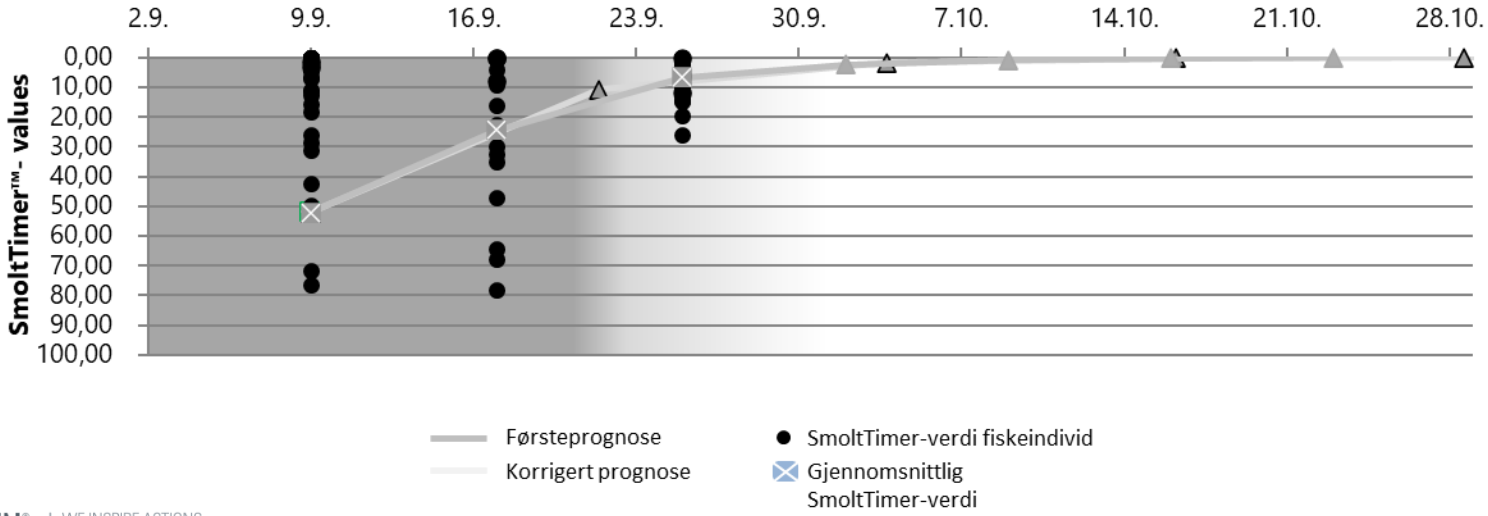
# SmoltTimer® - Expectation curve

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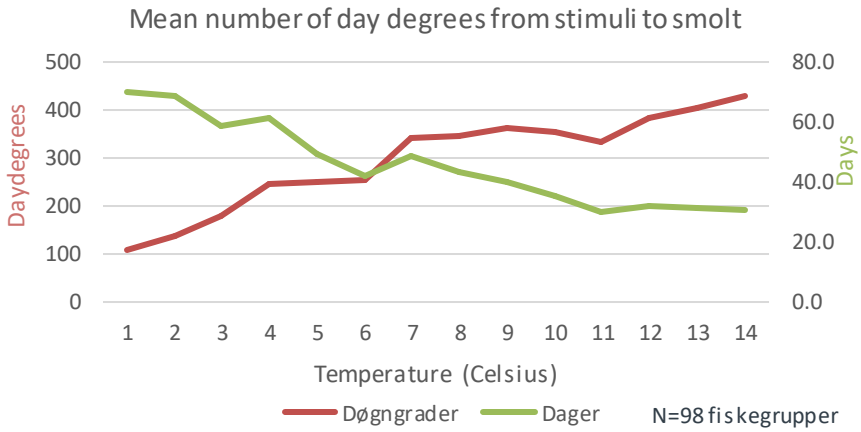
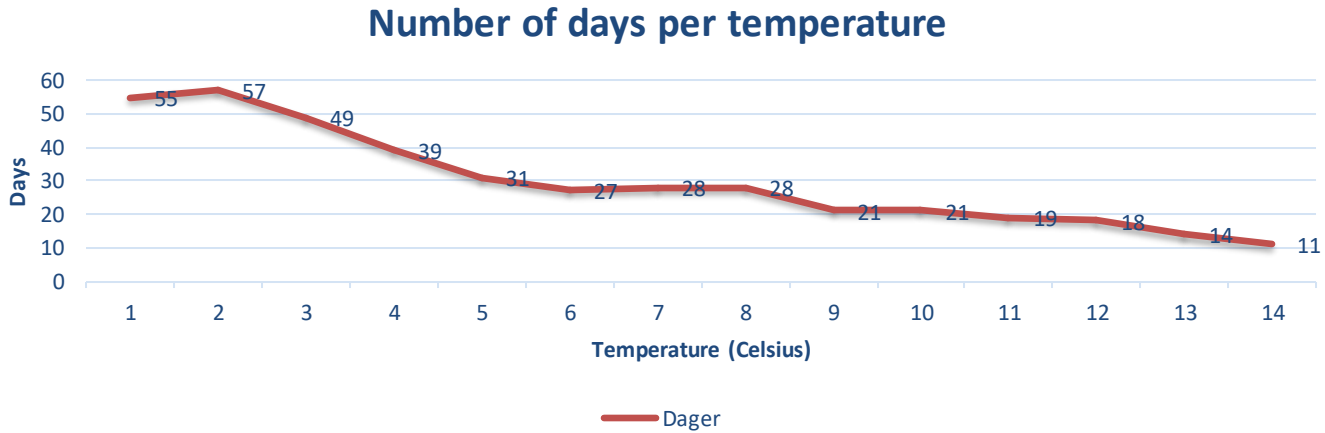
# Degree days – hot topic in hatcherys

- What is day degrees?
- How can you steer smoltification with day degrees?
- Which factors affect smolitification speed?



# Smoltificationpotential

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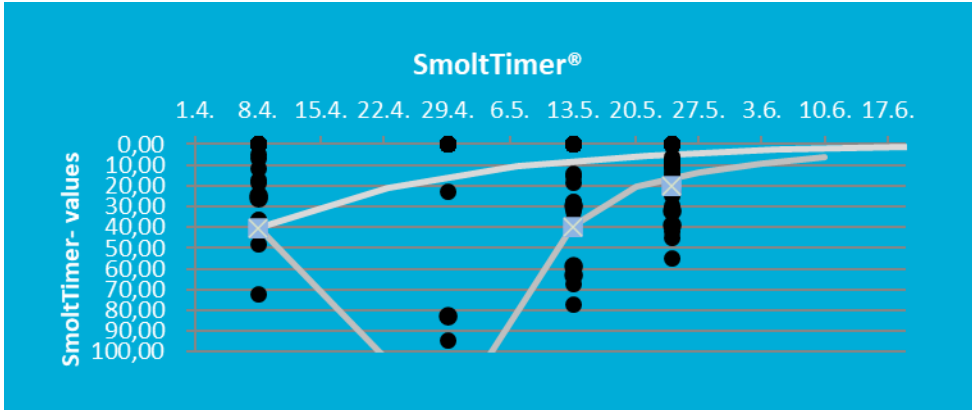
# Main reasons to devation during smoltification

## Serious deviations

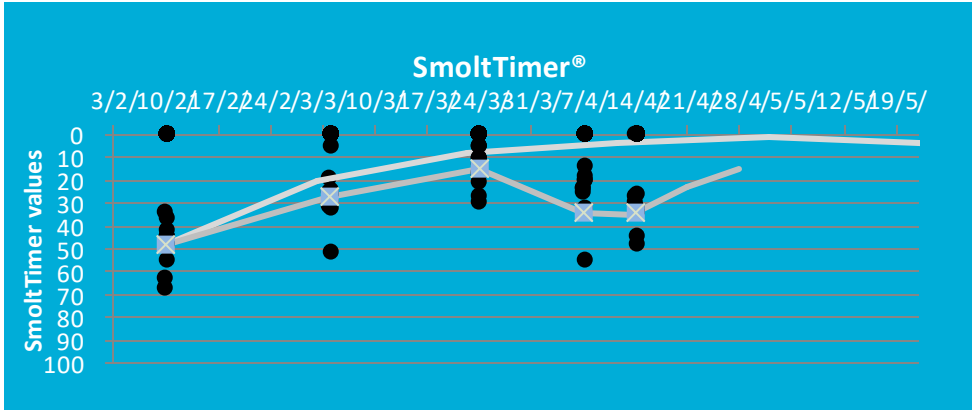
- Disease
- Flood – metal precipitation
- Sub-optimal handling
- Treatments



# Main reasons to devation during smoltification

## Moderate deviations

- Quick changes in water quality
- Fish groups out of sync
- Changes in feed



# In 2021 - 23% of the monitored groups were deviation groups

Main causes:

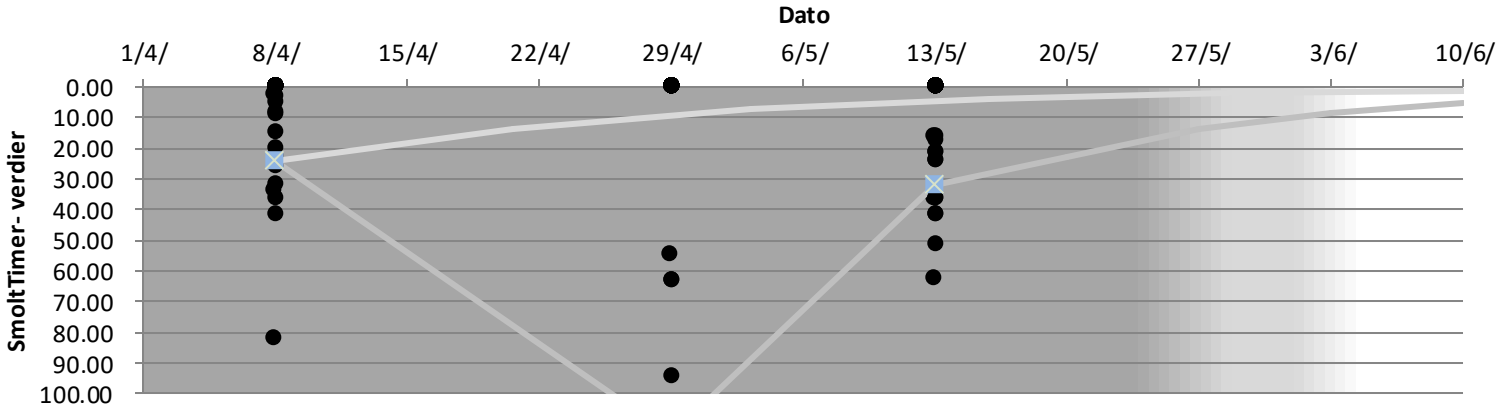
- Disease
- «No well boat available» / «Sea site not ready»
- Suboptimal stimuli
- Changes in water quality

| Method | Year | Fishgroups | Share transferred with optimal SmoltTimer-values | RGI (60d) | Mortality (60d) |
|---|---|---|---|---|---|
| ATPase | 2012 | 28 | 58,8% | 90,56% | 1,85% |
| SmoltTimer® | 2013 | 59 | 75,4% | 103,0% | 1,65% |
| SmoltTimer® | 2014 | 52 | 73,6% | 104,8% | 1,45% |
| SmoltTimer® | 2015 | 58 | 91,7% | 104,4% | 1,23% |

N= 166 smoltgroups

# Smoltification disturbed by disease outbreak

65% of the fish was infected with IPNV, CT-values down to 20,5, and 37% of the smolts were infected with PRV, CT-values down to 17,2. Samples taken out 19.04

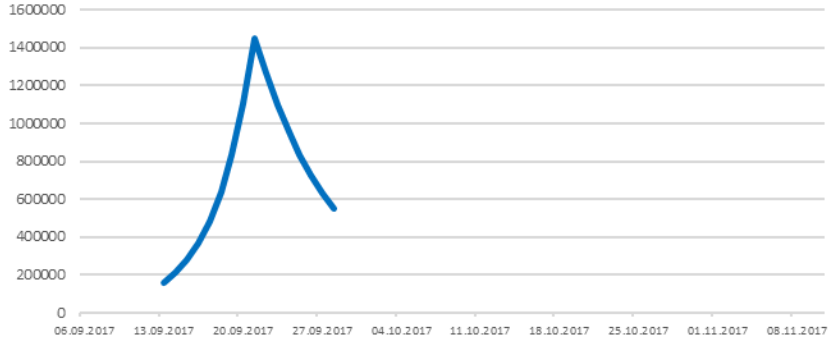


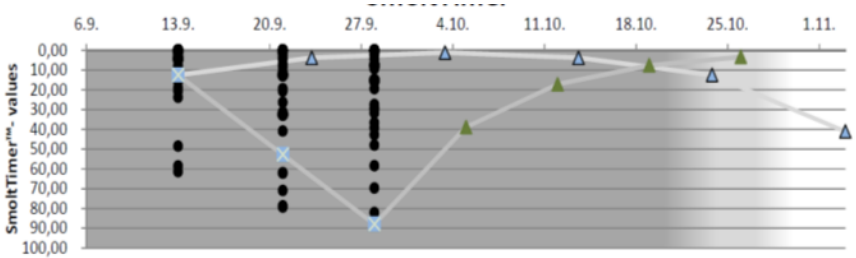

| Report for PatoGen Real-Time RT-PCR services | | | | | | Results |
|---|---|---|---|---|---|---|
| Method | Sampling | Salinity | Temperature | Samples | Approved samples | Average SmoltTimer® |
| SmoltTimer™ | 08.04.2013 | 0 ‰ | 3,8 °C | 15 | 14 | 24,1 |
| SmoltTimer™ | 29.04.2013 | 0 ‰ | 3,8 °C | 15 | 14 | 113,4 |
| SmoltTimer™ | 13.05.2013 | 0 ‰ | 3,8 °C | 15 | 14 | 31,9 |

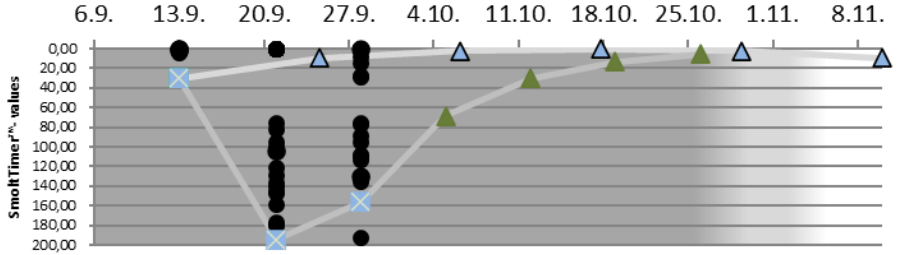
# PRV-infection correlates with SmoltTimer®

Infection pressure PRV

Infection pressure PRV

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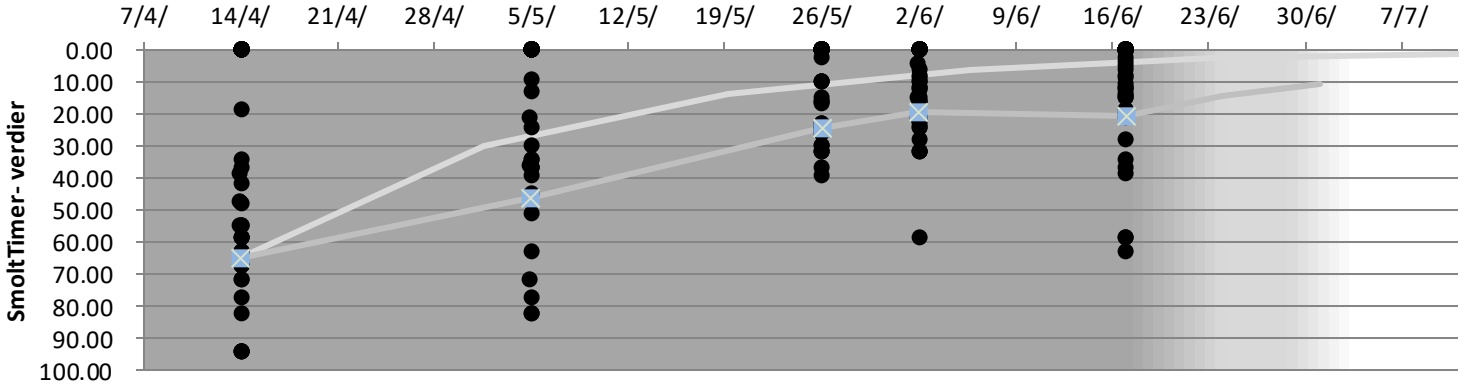
# Sub-optimal stimuli

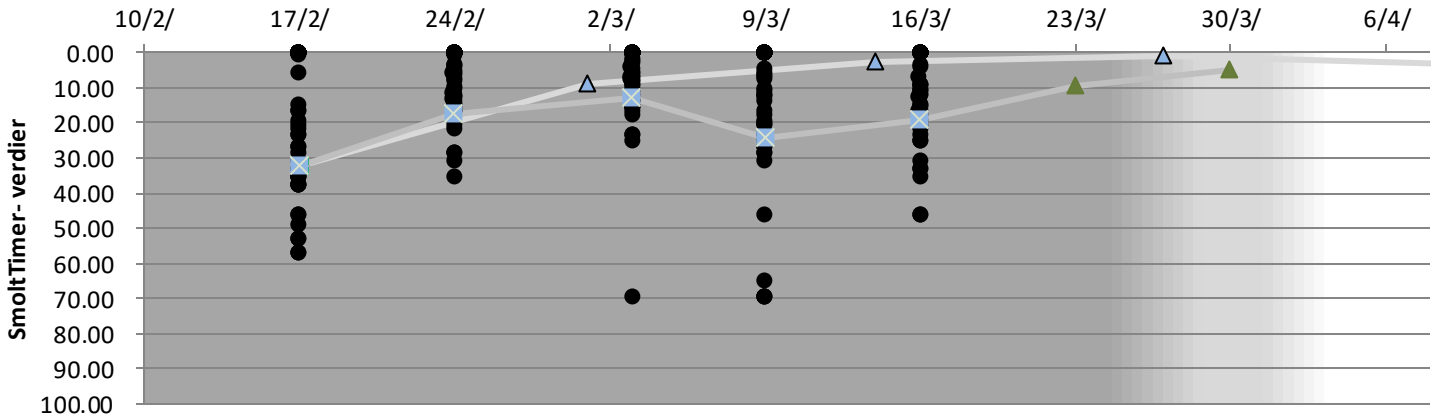
Day/night rhythm disturbed by lightpole outside production facility.
Solution: blackout curtains




| Samlerapport for PatoGen Real-Time RT-PCR Analyser | | | | | | Resultat | |
|---|---|---|---|---|---|---|---|
| Analyse | Uttaksdato | Salinitet | Temperatur | Antall prøver | Godkjente prøver | SmoltTimer® gjennomsnitt | Spredning |
| SmoltTimer™ | 14.04.2015 | 1,4 ‰ | 2 °C | 30 | 30 | 65,3 | 3,59 % |
| SmoltTimer™ | 05.05.2015 | 1,6 ‰ | 2,7 °C | 20 | 20 | 46,5 | 5,55 % |
| SmoltTimer™ | 26.05.2015 | 1,6 ‰ | 3,8 °C | 20 | 20 | 24,2 | 5,00 % |
| SmoltTimer™ | 02.06.2015 | 1,6 ‰ | 4,5 °C | 25 | 25 | 19,3 | 4,90 % |
| SmoltTimer™ | 17.06.2015 | 1,6 ‰ | 4,8 °C | 25 | 25 | 20,6 | 8,72 % |

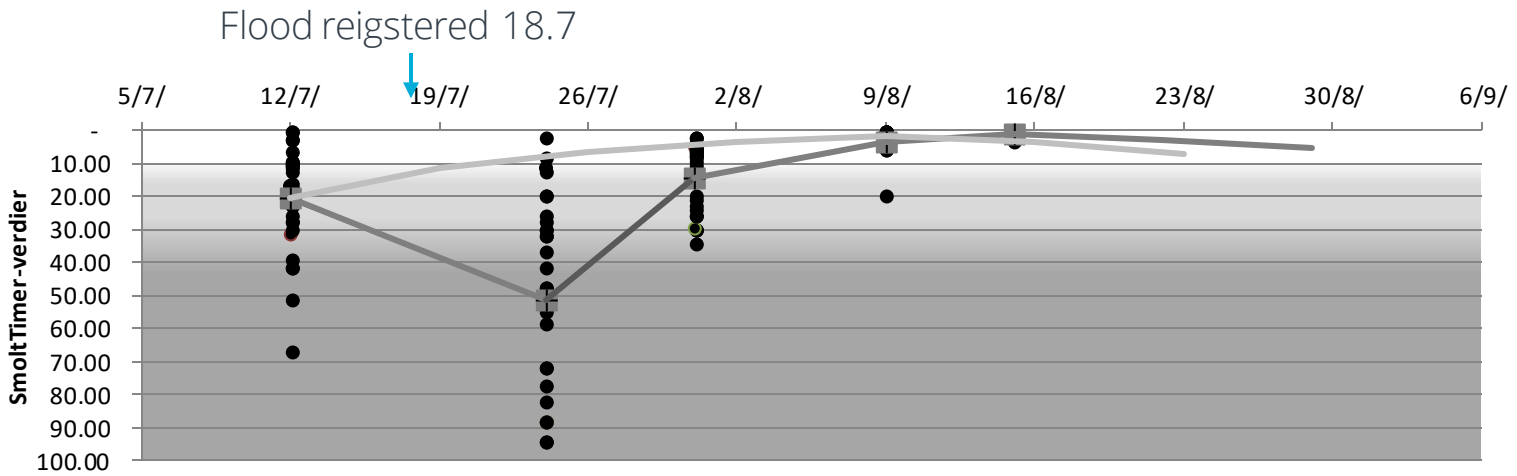
# Fishgroup out of sync – early maturation

## Large smolt prior to sea transfer – early maturation




| Andre smoltverdier | 17.02.2020 | 24.02.2020 | 03.03.2020 | 09.03.2020 | 16.03.2020 |
|---|---|---|---|---|---|
| Sølv | 4,0 | 4,0 | 3,8 | 4,0 | 3,9 |
| Parr | 4,0 | 4,0 | 3,8 | 4,0 | 4,0 |
| Finne | 4,0 | 4,0 | 3,9 | 4,0 | 4,0 |
| Snitt vekt | 545,7 | 558,0 | 566,0 | 605,4 | 636,0 |
| K-faktor | 1,16 | 1,25 | 1,17 | 1,12 | 1,11 |
| Temperatur | 11 | | 11 | 11 | 11 |

# Smoltification disturbed by flood




| Report Summary for PatoGen Real-Time RT-PCR Analyses | | | | | | | Result |
|---|---|---|---|---|---|---|---|
| Analysis | Sample date | Salinity | Temperature | Laboratory Method Identity | Number of Samples | Number of Approved Analyses* | SmoltTimer® |
| SmoltTimer™ | 12.07.2012 | 0 ‰ | 8 °C | | 30 | 30 | 20,5 |
| SmoltTimer™ | 24.07.2012 | 5 ‰ | 8,6 °C | | 30 | 30 | 51,6 |
| SmoltTimer™ | 31.07.2012 | 10 ‰ | 9,5 °C | | 30 | 30 | 14,4 |
| SmoltTimer™ | 09.08.2012 | 19 ‰ | 10,7 °C | | 30 | 21 | 3,4 |
| SmoltTimer™ | 15.08.2012 | 20 ‰ | 10,6 °C | | 30 | 30 | 1,4 |

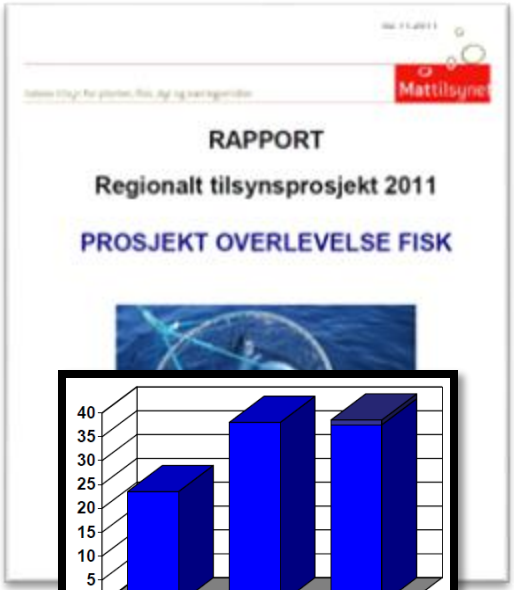
# Salmon Production today

- High density of fish
- Low consumption of water
- High energy consumption
- Fast growth
- Reduced generation time
- Production within and outside of season
- Frequent handling



PATOGEN®

# Optimal smoltkvalitet nødvendig for god prestasjon i sjø



# - Smoltkvaliteten er trolig viktigere enn lokaliteten

- Det finnes lokaliteter som bare har vellykkede utsett, men det finnes ikke noen lokalitet som bare har dårlige utsett. Det er derfor nærliggende å tro at smoltkvaliteten trolig har mer å si enn selve lokaliteten for å få et vellykket utsett, sier Geir Lasse Taranger ved Havforskningsinstituttet.

Tweet 0 Liker Bli den første blant dine venner til å like dette. Tips en venn Utskriftsvennlig

Elisabeth Nodland

De seks første måendene i sjøen er en svært risikabel pereiode for laksen. Havforskningsinstituttet har sett nærmere på dødeligheten ved utsett på ulike lokaliteter, og resultatene ble nylig publisert i den ferske risikorapporten for norsk oppdrettsnæring.

www.kyst.no 24.01.14